



Iona I,
Inner Clyde Estuary, Scotland

Undesignated Site Assessment:
Archaeological Report



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

IONA I, INNER CLYDE ESTUARY, SCOTLAND

UNDESIGNATED SITE ASSESSMENT ARCHAEOLOGICAL REPORT

Prepared by:

Wessex Archaeology
Portway House
Old Sarum Park
Salisbury
Wiltshire
SP4 6EB

Prepared for:

Historic Scotland
Longmore House
Salisbury Place
Edinburgh
EH9 1SH

March 2009

Ref: 53111.02q-6a

IONA I, INNER CLYDE ESTUARY, SCOTLAND

Ref: 53111.02q-6a

Summary

Wessex Archaeology was commissioned by Historic Scotland to undertake an undesignated assessment of the *Iona I*, the wreck of a paddle steamer lost in 1862 in the Inner Clyde Estuary near Greenock.

Existing data and previous investigations, notably geophysical surveys undertaken by Clydeport, were studied and their results incorporated with the results of a diving investigation undertaken between 1st and 5th March 2009.

The *Iona I* was built by J. & G. Thomson on the Clyde in 1855. After achieving considerable fame as a fast and well-appointed passenger steamer operating in the Firth of Clyde from Glasgow for David Hutcheson & Company, the vessel was bought by a businessman, probably Mr D. McNutt, to run goods to the Confederate States through the Union naval blockade during the American Civil War. After having been converted for this purpose, and whilst leaving the Clyde on the start of its first transatlantic crossing, the *Iona I* was involved in a collision with another vessel and sank.

The vessel currently lies on a silty seabed in almost 30m of water, about 100m south-east of the Whiteforeland Buoy in the Firth of Clyde Channel, off Greenock and Gaurock. The vessel survives partly intact on a roughly south-west to north-east orientation. The central 25m of the wreck is the best preserved part of the site, where the vessel survives up to upper deck height, with boilers, crankshafts and (probably) engines surviving *in situ*. Elsewhere the vessel is less well preserved and does not survive to deck height. One end of the vessel survives partly intact to the north-east. The remainder is mainly collapsed and what does survive is largely buried. Comparison with a model that is believed to have been made by the builders suggests that the forward end of the vessel probably lies to the north-east, although this is not certain.

The site has been subject to some salvage, most recently by avocational divers. A number of artefacts are known to have been recovered and some of these, including a builder's plate, reside in a private collection and have been examined by Wessex Archaeology.

The site has many strands of importance. The *Iona I*, or the 'Queen of the Clyde' as it was dubbed at the time, is an early and famous example of the Clyde passenger steamers that, along with the railways, first facilitated mass leisure activities in the 19th century. Built by a famous Glasgow shipbuilding firm, it is also an excellent example of the type of advanced ship design and marine engineering that was propelling the Clyde to world-wide steamship building pre-eminence in the mid-19th century. Lastly, but by no means least, it is also a good example of the type of ship that was used to help perpetuate the American Civil War by running supplies to the Confederate South. The wreck has the potential to advance our knowledge of all of these themes. This potential is enhanced by the existence of the wreck of the *Iona II*, the successor ship and also lost whilst in transit to America as a blockade runner. The *Iona II* is currently a designated wreck and lies off Lundy in the Bristol Channel.

Although the site has been subject to some salvage in recent years, this threat does not appear to be ongoing. The main threat to the site is deterioration caused by natural processes,

principally corrosion. As a result of these processes the wreck is gradually collapsing and will in time largely disappear. Protection against this threat is almost certainly impracticable.

Although the site is important, WA has not recommended designation under the Protection of Wrecks Act (1973) at this time. Instead largely passive monitoring and investigation is recommended, preferably in co-operation with a number of the stakeholders identified during the assessment. This management approach should be reconsidered on a periodic basis, or if and when a significant threat arises.

IONA I, INNER CLYDE ESTUARY, SCOTLAND

Ref: 53111.02q-6a

Acknowledgements

This investigation was commissioned by Historic Scotland, and the assistance provided by Philip Robertson, Senior Inspector of Marine Archaeology is gratefully acknowledged.

The facilities and other assistance, including geophysical data, provided by Clydeport were crucial to the success of the project and are also gratefully acknowledged (in particular thanks go to Captain Guy Henderson, Deputy Harbour Master; Douglas Hoad, Hydrographic and Dredging Manager; Caroline Baxter, Marine Administrator; the staff of Estuary Control and the crew of the workboat *Torch*).

The assistance of the crew of *Sound Diver*, Mark Lawrence of Lochaline Dive Centre and David Burden was also crucial to the success of the diving operations. Peter Moir, co-author of *Clyde Shipwrecks*, has provided video and other evidence that has proved important in describing and interpreting the site, and the research of Dr. Eric Graham into the history of Clyde-built blockade runners was also an invaluable source of information on the history of the vessel.

Wessex Archaeology would also like to thank the following people and organisations (alphabetical order):

- Stephen Adams
- Anne Bryson, Thistle Divers BSAC
- Clyde MRCC
- Glasgow University Archive Service
- Emily Malcolm and Rosemary Watt, Glasgow Transport Museum
- Charlie Mawer, OceanMermaid Survey
- Jon Nicolson, 'Finestrokes' Scuba Forum
- UKHO (notably Lorraine Beale)
- Elaine Watt, Clyde Diving
- Rebecca Tye, Deputy Receiver of Wreck

Niall Callan, Matt Astill, Simon Adey-Davies and Graham Scott carried out the fieldwork. Simon Adey-Davies and Graham Scott supervised the diving. The report was compiled by Graham Scott and Andrea Hamel, with research contributions from Niall Callan. Kitty Brandon prepared the illustrations. Quality control was carried out by Steve Webster, who also managed the project for Wessex Archaeology.

Data Licences

Material derived from the UKHO is subject to licence 820/020220/11 and the conditions on end-users and third parties contained therein. The following chart has been added to Schedule 1 Annex A: Digital use of Chart 1994 (edition 6 July 200). The chart used in **Figure 1** was obtained from the UK Hydrographic Office. The following notice applies:

This product has been derived, in part, from Crown Copyright Material with the permission of the UK Hydrographic Office and the Controller of Her Majesty's Stationery Office (www.ukho.gov.uk) All rights reserved.

NOT TO BE USED FOR NAVIGATION.

WARNING: The UK Hydrographic Office has not verified the information within this report and does not accept liability for the accuracy of reproduction or any modifications made thereafter.

IONA I, INNER CLYDE ESTUARY, SCOTLAND**Ref: 53111.02q-6a****Contents**

1.	ASSESSMENT BACKGROUND.....	1
1.1.	Introduction.....	1
1.2.	Document Parameters	1
1.3.	Objectives	1
2.	METHODOLOGY	1
3.	PROGRESS AGAINST OBJECTIVES	2
4.	REVIEW OF EXISTING DATA AND PREVIOUS SITE INVESTIGATIONS	3
4.1.	Existing Data	3
	RCAHMS.....	3
	UKHO.....	3
	Geophysics.....	3
	Ship Models	3
	Builder's Plans.....	4
	Contemporary Illustrations	4
	Contemporary Descriptions	4
	Vessel History and Circumstances of Loss.....	4
	Records Produced by Recreational Divers and Wreck Investigators	4
4.2.	Previous site Investigations and Finds	4
5.	SITE DESCRIPTION.....	5
5.1.	Site Location.....	5
5.2.	Shallow Geology and Hydrodynamic Environment	6
5.3.	Archaeological Features	7
	General Description	7
	Area 1.....	8
	Area 2.....	10
	Area 3.....	12
	Area 4.....	12
5.4.	Ecology.....	13
6.	INTERPRETATION	13
6.1.	Identification	13
6.2.	Orientation	13
6.3.	Post-wrecking Event Site History	15
	The Sinking and its Aftermath.....	15
	Late 19 th and Early 20 th Centuries	15
	Late 20 th and early 21 st centuries	15
7.	STATEMENT OF IMPORTANCE.....	17
8.	ARCHIVE.....	18
9.	GLOSSARY	18
10.	REFERENCES.....	18

Published sources.....	18
Non-published, newspapers and other sources	20
Internet sources	21
APPENDIX I: DIVE LOG	22
APPENDIX II: SURVEY EQUIPMENT.....	23
APPENDIX III: CONTEXT INDEX.....	24
APPENDIX IV: FINDS INDEX.....	26
APPENDIX V: RCAHMS SITE RECORD.....	28
APPENDIX VI: HISTORY OF THE <i>IONA I</i>	30
APPENDIX VII: ARCHIVE SOURCES FOR THE <i>IONA I</i>.....	41
APPENDIX VIII: <i>IONA I</i> TIMELINE	43
APPENDIX IX: RECORDING LEVELS.....	44

Figures

Figure 1	Site location
Figure 2a	Multibeam swath bathymetry of site and vicinity (© Clydeport)
Figure 2b	Multibeam swath bathymetry of site with sidescan sonar images (© Clydeport and OceanMermaid Survey)
Figure 3	2009 WA site plan
Figure 4	Multibeam swath bathymetry, oblique view looking north

Plates

Plate 1	Model of the <i>Iona I</i> (image courtesy of Peter Moir)
Plate 2	Detail of the <i>Iona I</i> model (© Glasgow Museums Service)
Plate 3	Contemporary illustration of the <i>Iona I</i> (image courtesy Peter Moir)
Plate 4	Sketch of site (© Peter Moir)
Plate 5	Cuprous pipe 2015 (scale 10cm divisions)
Plate 6	Unidentified iron cylinder 2011 from above (scale 10cm divisions)
Plate 7	Crankshaft/piston detail (© Peter Moir)
Plate 8	Builders plate found on the site
Plate 9	Scuttle found on site

Front Cover Clydeport Ocean Terminal seen from the Whiteforeland Buoy (the *Iona I* site lies just beyond the buoy)

Back cover A Wessex Archaeology diver enters the water from *Sound Diver* (© Simon Adey-Davies)

IONA I, INNER CLYDE ESTUARY, SCOTLAND

Ref: 53111.02q-6a

1. ASSESSMENT BACKGROUND

1.1. INTRODUCTION

- 1.1.1. This document has been prepared by Wessex Archaeology (WA) for Historic Scotland (HS). It constitutes an undesignated site assessment of the wreck of the *Iona I*, a Clyde-built paddle steamer lost in 1862 after being purchased in order to run the Union blockade of Confederate ports during the American Civil War.
- 1.1.2. The assessment was conducted as part of a programme of works undertaken as part of the Contract for Archaeological Services in Relation to the Protection of Wrecks Act (1973) (PWA). The site lies in UK territorial waters off Greenock and Gaurock in the Inner Clyde Estuary (Firth), Scotland (**Figure 1**).
- 1.1.3. The work was conducted in accordance with a set of assessment objectives agreed verbally between HS and WA.
- 1.1.4. The *Iona I* was in fact called the *Iona*. However it has since become increasingly common to call the ship the *Iona I* to avoid confusion with the later *Iona II* and *III*. The convention of referring to the vessel as the *Iona I* has therefore been adopted in this report. Any reference to the *Iona* is the *Iona I* unless otherwise stated.

1.2. DOCUMENT PARAMETERS

- 1.2.1. Every effort has been made to ensure that the facts contained within this report are correct. However, a number of actual and potential sources could not be traced or assessed in the time available and the diving fieldwork undertaken on the site was necessarily limited. As a result errors arising from the preliminary character of this study may therefore be present and comment and discussion from interested parties is therefore invited.

1.3. OBJECTIVES

- 1.3.1. The following objectives were set:
 - Assessment of the site for the purposes of possible designation under the Protection of Wrecks Act (1973), incorporating a Level 1a desk-based assessment and a Level 1b/2a diving assessment;
 - Liaison with current and potential stakeholders for the purposes of compiling the assessment.

2. METHODOLOGY

- 2.1.1. The methodology and content of this assessment comply with the Institute of Field Archaeologists' *Standard and Guidance for archaeological desk-based assessment*

(IFA 2008) and *Standard and Guidance for archaeological field evaluation* (IFA 2008).

2.1.2. The following methodology was adopted:

- Available data for the site was collated from a variety of published and non-published public and private sources prior to, during and following the diving operations;
- A WA level 1b and limited 2a diving assessment of the site was undertaken (for definitions see **Appendix XI**);
- Whilst the WA diving team was on site, additional archive and other research was undertaken at various nearby locations, including the Glasgow Transport Museum and the library of the John Watt Museum, Greenock;
- A meeting was held with Peter Moir and further information was obtained;
- Data acquired was subsequently processed and analysed and an assessment report prepared.

2.1.3. The geophysical data obtained from Clydeport and OceanMermaid was used as the basis for the site plan (**Figures 2a-b**).

2.1.4. The site lies within the area of navigation controlled by Clydeport and a commercial shipping channel. The diving operations were therefore subject to the port's permit to work system.

2.1.5. Diving operations were undertaken by a four person WA team using surface supplied diving equipment. The operations complied with the Diving at Work Regulations 1997 and the HSE Approved Code of Practice for Commercial Diving Projects Inland/ Inshore. A Diving Project Plan and Risk Assessment were prepared.

2.1.6. The diving operations were undertaken from *Sound Diver*, a 15m L.O.A. MCA coded inshore workboat. A two-point anchoring pattern was used to hold the vessel above the site.

2.1.7. The diving survey was undertaken using a long base line acoustic diver tracking system (Prospector) linked to a proprietary archaeological recording database (DIVA). Further details of the survey equipment are given in **Appendix II**.

2.1.8. Reference below to Diving Observations (DO) refers to data recorded during WA diving operations (see **Appendix II**).

3. PROGRESS AGAINST OBJECTIVES

3.1.1. The site was successfully assessed. Existing data and previous site investigations were investigated and reviewed. Diving operations were undertaken from 1st to 5th March 2009. Seven dives were undertaken, with a total of 154 minutes bottom time. Some time was lost to poor weather. Liaison was undertaken with a number of actual and potential stakeholders.

4. REVIEW OF EXISTING DATA AND PREVIOUS SITE INVESTIGATIONS

4.1. EXISTING DATA

RCAHMS

- 4.1.1. The site is recorded by the RCAHMS as a monument. The NMRS number is NS27NE 8007 and the monument record, available online, appears to have been last updated in December 2004. Full details of the monument record are given in **Appendix V**.

UKHO

- 4.1.2. The site is recorded by the UKHO as a wreck. The wreck report includes the following details:

Wreck Number	4155
Category	Dangerous wreck
WGS 84 position	55° 58.076' N 04° 47.194' E
Depth	22.5m
General depth	27m
Survey details dates	1983-2001

Geophysics

- 4.1.3. The site lies within the main shipping channel of the Clyde and is subject to periodic bathymetric survey by Clydeport. The most recent survey was undertaken in 2007 by Clydeport's hydrographic department, using a Reson 8125 multibeam swath bathymetry system.
- 4.1.4. Raw data for the site and its vicinity was obtained from Clydeport and processed by WA geophysicists (**Figure 2a**). A shapefile produced from this data was then added to the project GIS and used for diver tracking. The bathymetry also formed the basis of the site plan (**Figure 3**).
- 4.1.5. As a result of assistance from Clydeport, WA was able to contact Charlie Mawer of OceanMermaid Survey. Mr Mawer informed WA that he had regularly surveyed the *Iona I* in order to test sidescan sonar equipment and train operators. He agreed to provide WA with selected raw data from these surveys. Unfortunately this data proved to be corrupted and he was therefore unable to supply it. However, Mr Mawer was able to supply a number of sidescan images of the wreck, some of which WA have been able to roughly georeference (**Figure 3**). Data from these sidescan surveys has therefore been added to the site plan.
- 4.1.6. According to the UKHO Wreck Report, the site was subject to a geophysical survey by HMSML *Gleaner* in 1993. Hard copy images of the sidescan sonar data have been obtained from the RoW.

Ship Models

- 4.1.7. The Museum of Transport in Glasgow has a model of the *Iona I*. The museum catalogue's entry for the model reads as follows:

‘1888.44 Ship model of ‘Iona’ built 1855 by J & G Thomson, iron paddle steamer, 1:48 scale GMRC2: POD 08 Maritime Technology. Donated by David MacBrayne & Co.’

- 4.1.8. The model is currently in storage pending the opening of the new Riverside Museum. It is therefore not on display and not directly accessible to researchers. However, the museum was able to supply a number of photographs of the model in storage. It appears to require some restoration.
- 4.1.9. The model came into the possession of the predecessors to the Glasgow Museum Service in 1888. It differs considerably from the model of the *Iona II* and available information about the design of both the *Iona II* and *Iona III*. Its identification as the *Iona I* therefore appears secure. It is therefore likely to be the original builder’s model, and is also likely to be a reasonably accurate model of the ship as built, although this cannot be guaranteed and it may well differ in detail. WA has not had direct access to the model and has been unable to check its dimensions against the recorded dimensions of the ship.

Builder’s Plans

- 4.1.10. A search has been undertaken for plans of the vessel at a variety of archives, including the National Maritime Museum and the University of Glasgow Archives Service, which holds the surviving records of the shipbuilders. Enquiries have also been made through published works on Clyde-built vessels and researchers who are known to have undertaken work involving the *Iona I*. No plans of the vessel have been traced and it is thought unlikely that they survive.

Contemporary Illustrations

- 4.1.11. One contemporary illustration of the *Iona I* has been traced (**Plate 3**). The artist and the location of the original illustration had not been traced at the time of writing of this report. The representation appears to be very similar to the builder’s model.

Contemporary Descriptions

- 4.1.12. No detailed description of the *Iona I* has been located. What is known from contemporary sources is summarised in **Appendix VI**.

Vessel History and Circumstances of Loss

- 4.1.13. Documentary and other sources for the history of the *Iona I* and the circumstances of its loss are discussed in **Appendix VI** and **VII**.

Records Produced by Recreational Divers and Wreck Investigators

- 4.1.14. Peter Moir has recorded his investigations of the wreck in the form of a sketch plan, video and dive logs (Peter Moir pers. comm.). No other hard copy or digital records of avocational diver investigations have been traced, although the existence of various web-published descriptions of the wreck suggests that some records probably exist.

4.2. PREVIOUS SITE INVESTIGATIONS AND FINDS

- 4.2.1. Almost immediately after the loss, the wreck was searched for and located, possibly by means of wire sweep or grapnel. The salvage of the vessel appears to have been contemplated and it was sold to a Glasgow man in 1863, presumably for this

purpose. However, salvage was not achieved and it is not known whether it was actually attempted (see **Appendix VI**).

- 4.2.2. WA understands that commercial salvage work on the wreck was carried out in the 1950s (Guy Henderson pers. comm.). As at the date of this report, WA had been unable to trace anyone concerned. It is thought unlikely that records of the salvage exist, although it is possible that they were sufficiently newsworthy to have been referred to in the local press. It is also possible that salvaged material was reported to the local Receiver of Wreck (RoW), although any records created as a result would be from a time before the RoW became a centralised function and are thus not held by the current Receiver.
- 4.2.3. Informal discussions have suggested that intrusive investigation has been carried out in recent years by recreational scuba divers. In particular a large hole appears to have been dug within Area 3 (**Figure 3**). Information about exactly where within the wreck this has occurred and any finds recovered is very limited.
- 4.2.4. Video of the site seen by WA after this hole had been dug suggests that it was at least 0.5m deep in places and highly irregular in shape. It is not known whether finds were recovered from it or any records kept. A hand tape can be seen next to the hole and it is possible that some form of recording was undertaken. The excavator is reported to have been searching for muskets. Different sources consulted by WA are of the opinion that this activity is not ongoing at the present time.
- 4.2.5. Artefacts recovered from the site and currently in the possession of Peter Moir have been assigned object numbers and are listed in **Appendix IV**. These include a builders plate (**3001; Plate 8**), an indicator plate taken from a pedestal close to the top of and just south of the crankshafts (**3000**), a scuttle (porthole) (**3005; Plate 9**) and three glass bottles (**3002-3004**). The locations of the finds (based on Peter Moir pers. comm.) are shown in **Figure 3**.
- 4.2.6. It is understood that other scuttles may have been recovered from the site in recent years. In addition two ceramic toilet bowls, similar in form and decoration to that recovered from the *Iona II*, are reported to have been recovered. The current whereabouts of these finds is unknown.
- 4.2.7. The RoW has received only one droit for material recovered from the *Iona I*, A/1330. This is for material recovered or reported by Peter Moir (RoW e-mail). The RoW has been unable to identify any other droits that are likely to relate to the site (RoW e-mail). Thus it seems clear that finds from this site are under-reported, although this may be due in part to recoveries prior to the centralisation of the Receiver service in 1993.

5. SITE DESCRIPTION

5.1. SITE LOCATION

- 5.1.1. The site is situated in the Upper Clyde Estuary, off Greenock and Gaurock. It lies within the Firth of Clyde Channel, approximately 100m south-east of the Whiteforeland Buoy. The following position for funnel base **2013 (Figure 3)** has

been obtained from the multibeam swath bathymetry data supplied by Clydeport and has been confirmed by tracked diver survey:

Lat.	55° 58.0780' N
Long.	04° 47.1998' W
WGS 84 (zone 30N)	

5.2. SHALLOW GEOLOGY AND HYDRODYNAMIC ENVIRONMENT

- 5.2.1. The site lies on a seabed that slopes extremely gradually from west to east in a general depth of 27m. Approximately 30m to the south-west of the site the seabed rises in a bank trending north-west and then curving to the north-east about 50m from the site. There is also a very shallow slope to the east of the site.
- 5.2.2. Natural seabed sediments within the site were not subject to recording due to lack of time. However, casual observation and limited review of video evidence suggests that surface sediments comprise a mixture of sand and silt with some gravel and shelly material. A thin veneer of silt was noted to be present on all exposed surfaces and this became mobile in the water column when touched.
- 5.2.3. Due to the depth and sheltered location of the site, it is extremely unlikely to be impacted by wave action. There is no significant fetch.
- 5.2.4. Tides are semi-diurnal and the range is moderate. This results in fairly weak tidal currents. The nearest tidal diamond, to the west of the site, has a maximum velocity of 0.6m/s on spring tides (Admiralty Totaltide software). However, experience on site suggests that this velocity can be exceeded and that surface and seabed currents can differ significantly, with moderate currents being experienced at times on the seabed when the surface flow appeared slack and vice versa. The river flow and varying barometric pressure are likely to be influences.
- 5.2.5. Although significant sedimentary material was noted to be present in the water column, no direct evidence of significant sedimentary deposition or erosion was observed on the site. However, anecdotal evidence does suggest that the site is subject to this process. It is believed to be seasonal, with the site having the reputation of 'silting up' during the course of the summer months but being relatively clear by the end of winter (Peter Moir pers. comm.). Furthermore some of the descriptions of the site that are available suggest that at times the engine/boiler room spaces may be significantly more clear of sediment than observed by WA. It should be noted that all descriptions of sediment cover are as at the time of inspection by WA.
- 5.2.6. Most of the mobile sediment present on the seabed in the vicinity of the site is likely to have been transported by rivers draining over glacial landscapes of sand, silt and gravels. Sediments introduced from the Outer Estuary by tidal currents, which are typically sandy, are likely to be much less significant (Firth and Collins 2002: 20).

5.3. ARCHAEOLOGICAL FEATURES

General Description

- 5.3.1. The site is the wreck of a ferrous metal hulled paddle steamer. It is partially intact and lies upright and on an even keel. Part of the hull, possibly from the turn of the bilge down, is buried.
- 5.3.2. The size of the site, as defined by the geophysical evidence (**Figure 2a-b**), is approximately 56m long by a maximum of 15m wide. It approximates the shape of an elongated oval orientated roughly south-west to north-east. The visible wreckage appears to be contained within an area of roughly 470m².
- 5.3.3. Anecdotal evidence suggests that wreckage associated with the site has been found some distance away from this oval (Peter Moir pers. comm.). Although time constraints prevented WA from confirming this, the evidence is believed to be reliable. Therefore it appears that the site comprises of two parts:
- a central area of about 147m² that contains coherent wreckage and debris;
 - a wider area of unknown extent and object density that constitutes a debris field from the wreck.
- 5.3.4. Within the central area lies the hull of the vessel, orientated roughly south-west to north-east. One end of the hull appears to be present and exposed at the north-east end. The hull here is upstanding by an estimated 1-2m. Bounded to the south-west by a transverse bulkhead and about 4.5m long, it narrows to a v-shaped point level with the seabed at the north-east extremity. The other end of the vessel is either missing or is buried.
- 5.3.5. The amidships section of the hull survives to the level of the upper deck beams and sheerstrakes. This contains the *in situ* paddle and crank shafts and paddlewheel fragments, together with *in situ* engines, boilers, funnel bases, at least some associated pipe-work and a deck hatch. The total length of this section is approximately 25m, about 11m to the south-west of the crankshafts and 14m to the north-east. The hull in this section consists of ferrous metal shell plating, framing, bulkheads and sparse remains of an unsheathed wooden deck. It is upstanding 1-2m from the seabed. To the north-east it is bounded by a substantial transverse bulkhead. The sides of the hull are about 7m apart.
- 5.3.6. Between the north-east end of the hull and the amidships section the line of the hull can be traced. However, the framing and plating have largely collapsed outwards and this section contains very few features that are significantly upstanding, although a transverse bulkhead appears to remain in position.
- 5.3.7. To the south-west of the amidships section there are very few upstanding features, apart from a mound of coal. Although the hull of the vessel does appear to survive largely buried for some distance, it is not known whether the full length of the vessel survives. This part of the site is reported to have been subject to recent intrusive investigation by avocational divers.
- 5.3.8. Exposed ferrous metal sections of the wreck are universally concreted. The wreck is not stable, with signs of active corrosion in many places. In places this corrosion is at

a very advanced stage. Most exposed surfaces also have extensive cover of marine growth, mostly in the form of ‘short turf’.

5.3.9. For ease of description in the following sections the site has been divided into the following units (**Figure 3**):

- Area 1 (amidships section as described above and the seabed immediately surrounding it);
- Area 2 (the section of the wreck lying to the north-east of Area 1 and the seabed immediately surrounding it);
- Area 3 (the section of the wreck lying to the south-west of Area 1 and the seabed immediately surrounding it);
- Area 4 (the wider debris field).

Area 1

5.3.10. The central features of Area 1 are the crankshafts (**2003**) and paddle-shafts (**2004** and **2005**) that run across the full breadth (c.7m) of the vessel hull at this point.

5.3.11. The two crankshafts were not surveyed in detail but appear to be intact and comprise flange couplings, bearing surfaces, crank arms and crank pins. Two vertical piston shafts and couplings (**2038** and **2039**) were observed but no connecting rods. Although the cylinders themselves are buried, this indicates that the engine had two cylinders and was probably of the oscillating type (which dispensed with connecting rods). The machinery is upstanding from the seabed by up to c.1m.

5.3.12. The indicator plate to a valve controlling water supply (**3000**) was found attached to a pedestal level with the top of the crankshafts and immediately to the south-west of them. The function of this valve is not currently known. The pedestal no longer appears to be *in situ*.

5.3.13. The cranks are connected to two paddle-shafts (**2004** and **2005**). These were not examined in detail due to time constraints. Both paddlewheels are present, although the south-east paddlewheel (**2005**) has almost completely disintegrated with only fragments of the arms still *in situ*. Considerable debris from the wheel appears to be present in the immediate vicinity, although this was not examined and may also contain fragments of the paddle-box, which is no longer present and appears to have disintegrated.

5.3.14. Two small decorated ceramic toilet bowls (**3006** and **3007**) were found outside of the hull in the vicinity of **2005** (Peter Moir pers. comm.). They have apparently been recovered but their current whereabouts is unknown.

5.3.15. The north-west paddlewheel (**2004**) is in a state of partial disintegration. Again it was not closely examined but more substantial parts of the paddle arms are still attached to the paddle-shaft. The paddle-box is no longer present and the considerable debris below and in the vicinity probably contains fragments of both.

5.3.16. To the south-west of the crank and paddle shafts is an area of surviving ferrous metal deck beams (**2023**), arranged both longitudinally and transversely in a regular pattern. This covers the full width of the hull and extends up to 5m to the south-west. Traces of timber planking attached to the deck beams by bolts survive in places. A

deck stringer plate appears to be present along both sides of the hull (**2033** and **2034**). A hull compartment (**2032**) is visible in places below but is almost entirely filled by silt. The presence of the crank and paddle-shafts and upper deck beams indicates that the hull survives complete in Area 1 from the keel to the upper sheerstrakes.

- 5.3.17. To the south-west are two riveted ferrous metal parallel cylindrical boilers (**2024** and **2025**), arranged longitudinally. These are largely obscured by silt and sand, but the south-west ends are partly exposed. The diameter of these boilers could not be measured, but it is clear that they extend across most of the breadth of the hull at this point. Although they are partly buried, they are unlikely to exceed 5.5m long as they would then impinge on the space required for the engines.
- 5.3.18. On top of the boilers at their exposed south-west ends and apparently connected to both is a short open-ended and upright ferrous metal cylinder (**2010**). This is almost certainly the base of the funnel for the two boilers. Approximately 1-1.1m in diameter, it is bisected by a thin ferrous metal plate orientated in the same direction as the boilers that appears to separate the uptakes from each boiler. The uptakes are blocked by silt and sand. **2010** is approximately 7m away from the crankshaft.
- 5.3.19. To the north-east of the funnel base is an upright ferrous metal object (**2011**; **Plate 6**). Heavily concreted, its exact form could not be established in the time available, although it was noted to be at least partly cylindrical, with a roughly square shaped fitting on its closed upper end. It is upstanding by about 1.75m and was estimated to be at least 0.7m in diameter. The sidescan evidence suggests that it may be attached to the boilers below. Attached to **2010** by a 90 degree bend, at about one-third height on its south-west side, is a thin-walled upright cuprous pipe of 0.2-0.25m diameter (**2012**).
- 5.3.20. The function of **2011** and **2012** is uncertain. Neither they nor **2010** are accurately depicted in **Figure 4**. **2011** appears to have been described previously as a condenser, but the reasons for this identification are not explained. **2011** is probably a steam dome incorporating a pressure release valve. The proximity of **2012** to **2010** suggests that it may be the steam escape pipe attached to one of the funnels and which is visible in **Plate 1**. This pipe would have been used to vent excess steam.
- 5.3.21. The exact relationship of the deck beams **2023** to the other features described is uncertain because they do not appear to abut. However, **2023** is clearly above **2024** and **2025** but seems to be partly below **2011/2012**. They appear to be slightly above or level with **2010**. **2011** and **2012** would probably have been partially on the upper deck and would have been boxed in, as can be seen around the bases of the funnels in **Plate 1-2**.
- 5.3.22. To the south-east of **2010** the bathymetry indicates that the surviving structure drops away sharply, suggesting that it is partially collapsed or that this is the end of the boilers. However, a small hatch with low ferrous metal combing was observed (**2026**) a short distance to the south-east of **2010**. This may be a deck hatch giving access to the boiler room that has collapsed.
- 5.3.23. To the north-east of the crank and paddle shafts is a broadly similar arrangement, although the position of the funnels relative to the engines appears to be different.

The deck beams and stringers (**2023** and **2024/2025**) continue for about 3.5m north-east and to the transverse bulkhead **2031** along the hull sides. A compartment (**2035**) is visible below **2023** but again it is filled with sand and silt. This may be the engine/boiler rooms.

- 5.3.24. In one location a circular horizontal ferrous metal ring (**2041**) with a diameter of at least 0.5m was observed to be attached to the beams. Its function is unclear and it is conceivable that the attachment may be as a result of concretion rather than being deliberate.
- 5.3.25. Just to the north of paddle-shaft **2005** and sitting on **2023** is a rectangular metal box (**2040**). Although this was not surveyed, comparison of the dive video with the geophysics data suggests that this box is approximately 1.8-1.9m long, 0.7m wide and up to 1m high. The box is closed on all sides and appears to be a composite of iron with lead sheeting, although this cannot be confirmed. There is a small hole in the northern-facing long side, at between one-half and two-thirds of the height of the box, possibly for a valve.
- 5.3.26. The box is orientated north-west to south-east on its long axis and partly overhangs the hull edge. This suggests that it is not *in situ*. Whilst the possibility exists that it has been removed to its present position as a result of salvage activities, the size and weight of the box suggests that it has not been moved far. It may be a tank for storing or receiving water.
- 5.3.27. Approximately 3.8m north-east of **2003** is another cylinder (**2013**) which appears to be identical in form to funnel base **2010**. Immediately to the north-east of this is a structure (**2014**) that appears to be identical to **2011**. Between **2013** and **2014** is a cuprous pipe (**2015**; **Plate 5**) that appears to be identical to **2012**, although it was not clear whether it was attached to **2013**. A similar interpretation to **2010-2012** is suggested.
- 5.3.28. These structures appear to be attached to the top of two cylindrical boilers (**2036** and **2037**). The boilers are orientated south-west to north-east and laid out in an identical manner to the two other boilers **2024** and **2025**, with the funnels at the south-east end. Although these boilers are largely buried, comparison with **2024** and **2025** and the position of the end of the boilers suggested by the bathymetry data indicates that they have a length of up to 5.5m.
- 5.3.29. Approximately 11m north-east of **2003** is ferrous metal transverse bulkhead **2031**. This defines the north-east limit of compartment **2035** which contains the boilers. This compartment is partially filled with silt and sand and the deck below is not visible. Beyond that is another compartment (**2037**) between bulkheads **2031** and **2016** that is about 3.5m long. This was observed to be sand and silt filled with a scatter of large pieces of coal on the surface. Both **2016** and **2031** are upstanding by up to 1.5m.

Area 2

- 5.3.30. Area 2 is bounded to the south-west by a substantial ferrous transverse plate bulkhead (**2016**). This was estimated to be upstanding on the south-east side by over 1m.

- 5.3.31. At the north-east end of Area 2 is a triangular shaped section of vertical upstanding ferrous metal hull structure (**2017**). Bounded on the south-east side by a substantial transverse plate bulkhead (**2018**), the west and east sides consisting of ferrous metal shell plates narrow to a pronounced v-shaped point. At that point the structure is approximately 0.1m upstanding. The height of the structure rises to 1m south-east of this and the transverse bulkhead is 2-2.5m upstanding. Evidence of riveted construction is apparent.
- 5.3.32. The v-shaped point is constructed of two thin ferrous metal plates joined to what appears to be a near-horizontal ferrous metal bar or beam. This is orientated along roughly what would be the keel line of the vessel. This is no more than c.0.2m wide and its depth is unknown, although review of the dive video suggests that it is not deeply buried and may extend south-west some distance. It also appears to rise at a very shallow angle to the north-east.
- 5.3.33. The edges of **2017** were noted to be ragged and showing signs of having been exposed to mechanical failure, perhaps as a result of its partial collapse. The structure shows signs of active corrosion.
- 5.3.34. Peter Moir describes **2017** as formerly being more upstanding (Peter Moir pers. comm.). One of the more detailed descriptions available on the web suggests that the plating on the north-west and south-east sides are upstanding by 4m and 2m respectively (www.beyondmag.co.uk/wreck/paddle.htm downloaded 07/01/09). This suggests that significant collapse has occurred recently.
- 5.3.35. Interpretation of **2017** is uncertain. However, it is likely to form part of the bow or stern structure. The horizontal plate or beam is likely to be an iron rider plate or keelson or the very bottom section of the stem, and the plates attached to it are likely to be iron garboard strakes. Due to the narrowness of the structure at the far north-east end, it must have been very close to either the stem or stern post. If **2017** is the bow end of the vessel then **2018** may be a collision bulkhead.
- 5.3.36. The area between **2017** and the north-east edge of Area 1 was not inspected. However, evidence for it exists in the form of geophysical survey data and the descriptions given by avocational divers.
- 5.3.37. The sidescan sonar images and multibeam data (**Figures 2a-b**) suggest that the hull above the seabed is no longer *in situ* and has collapsed. Collapsed framing and shell plates are visible on both sides in the sidescan images but particularly on the south-east side. Within these the presence of exposed or shallow buried framing and plates following the alignment of extant sections of hull can just be seen, together with a major transverse bulkhead (**2021**) that has an exposed length of at least 4m. There are indications of other ship structure but they are difficult to interpret.
- 5.3.38. The overall impression given by the sidescan is that buried intact hull survives and connects **2017** and Area 1. Most of the structure above the seabed appears to have collapsed outwards.
- 5.3.39. Diver observations confirm the sidescan evidence, as buried hull appears to survive intact, with evidence of collapsed framing and shell plating outboard. Peter Moir reports that along the south-east edge a scuttle (port hole) has been observed to be

present every second frame in the collapsed hull sections and scuttle **3005** is reported to come from this part of the site (Peter Moir pers. comm.).

- 5.3.40. A mound of coal (**2022**) is shown just to the north-east of the transverse bulkhead that marks the boundary between Areas 1 and 2. The presence of this coal is confirmed as a low mound in the multibeam data.
- 5.3.41. The difference in height between the deck of the vessel in Area 1 and the seabed in this area is no greater than 2m. As the available evidence suggests that intact hull survives from seabed level down, it would appear that the hull survives from the keel upwards to roughly waterline level or possibly above.

Area 3

- 5.3.42. South-east of hatch **2026** deck structure within the line of the hull is not visible. However, a low mound (**2027**) does extend approximately 8m further to the south. This appears to consist, at least partly, of coal with a particular concentration at the high point at the south-east end of the mound. The builder's plate **3001** was recovered from the vicinity of **2027**, as were three glass bottles (**3002-4**) (Peter Moir pers. comm.).
- 5.3.43. The area south-east of **2027** was not inspected. Analysis of the bathymetry and sidescan suggest that there are no substantial sections of ship structure or other large objects beyond **2027**. However, Peter Moir believes that a large hole excavated by avocational divers was just to the south-east of **2027** and from this a number of artefacts have been recovered (Peter Moir pers. comm.).
- 5.3.44. Numerous concreted ferrous and other objects or fragments were observed in Area 3. The general impression was one of substantial fragmentary debris from the collapse of the vessel remains. The most significant of these was a large chain (**2028**) that emerged from silt and sand against the inboard side of the south-east hull and ran across the seabed to the north-west. It appears to be attached to a large shackle (**2029**), which in turn is attached to what may be one end of an anchor shank (**2030**). The other end was buried in **2027** and this interpretation could not be confirmed.
- 5.3.45. There are indications from previous diver observations that the hull of the vessel may continue buried to the south-west (**Figure 2a-b**), but WA diver observations are unable to confirm this. There is also no clear indication in the available sidescan or bathymetry data that this is present.

Area 4

- 5.3.46. No debris is visible in the multibeam data. However, analysis of the limited sidescan images suggests that hard reflectors, possibly indicating the presence of debris associated with the site, is present approximately 15m west of the northern end of Area 1. **Figure 2a-b** also shows debris away from the immediate environs of Area 1 on both sides.
- 5.3.47. During Dive 2 a flat J-shaped iron bar about 1m in length (**2019**) and a short iron pipe fragment (**2020**) were observed 4.5m and 0.5m west of **2017** respectively.

- 5.3.48. A ferrous metal object identified by Peter Moir as being a possible rudder was found to the north of the north-eastern extremity of Area 2 (Peter Moir pers. comm.). Further details are not currently available.
- 5.3.49. A debris field is reported to lie at one end of the site. Numerous artefacts, including jars of preserves, sealed bottles and binoculars are reported to have been excavated from it (anonymous pers. comm.).

5.4. ECOLOGY

- 5.4.1. No survey of the ecology of the site was attempted due to time constraints. However, the site was noted to be fairly rich in marine life, both in terms of marine growth growing on exposed archaeological features and fish and crustacea. The following were particularly prominent:
- The soft coral *Alcyonium digitatum* (Dead Man's Fingers) was found throughout the site adhering to concreted ferrous surfaces.
 - *Cancer pagurus* (edible crab) was also found throughout the site in some numbers.
- 5.4.2. The Inner Clyde Estuary is a Special Protection Area, largely as a result of its extensive intertidal sand and mud-flats and the presence of a range of wintering water birds.

6. INTERPRETATION

6.1. IDENTIFICATION

- 6.1.1. The site has previously been identified as being the wreck of the paddle steamer *Iona I*, built in 1855 and lost in 1862.
- 6.1.2. Contemporary accounts (**Appendix VI**) place the sinking of the *Iona I* in the general vicinity of the site. The wreck is that of a paddle steamer and no other paddle steamer is known to have been lost at this location. The dimensions of the site are broadly consistent with the known dimensions of the *Iona I* and the character of the wreck is consistent with known accounts of the vessel and with the builder's model. The finds recovered from the site are consistent with a 19th century date. Most importantly, a builder's plate with the name of the shipbuilders and with the known date of launching of the *Iona I* has been recovered from the site.
- 6.1.3. On the basis of the above the identification of the site as being the wreck of the *Iona I* can be considered to be very secure. The prospects of it being another vessel that has been misidentified as the *Iona I* are extremely remote.

6.2. ORIENTATION

- 6.2.1. Whilst the identity of the wreck is known, the orientation of the vessel within the site is uncertain. Although the ship clearly lies on a south-west to north-east axis, the evidence for which end is the bow and which the stern is contradictory.

- 6.2.2. The south-west end of the vessel hull is either buried or missing entirely. Brief inspection of the wreck structure at the far north-east end of the site (**2017**) suggests that is not inconsistent with the type of hull structure that might be expected at either the bow or the stern of the *Iona I*. Further and more detailed inspection is therefore required.
- 6.2.3. The theory that the stern is to the north-east has been advanced by Peter Moir. It is based on two strands of evidence. Firstly, a metal object has been found near **2017** that has been identified as being a possible rudder (Peter Moir pers. comm.). WA does not have a description of this object at the present time and are therefore unable to confirm the identification.
- 6.2.4. Secondly, Mr Moir suggests that artefactual evidence found in Area 3 to the south-west is more consistent with the forward end of the vessel than the aft and may be linked to the presence of accommodation there (Peter Moir pers. comm.). In particular Mr Moir points out that the builder's plate (**3001**) was found towards the south-west of the site. However, the internal layout of the vessel is not known and it is unclear whether the builder's plate would have been placed in the accommodation.
- 6.2.5. The north-eastern end of the site has also been identified as being the bow, although the reasoning behind this has not been explained. However, the builder's model and contemporary illustration (**Plates 1-3**) indicate that the *Iona I*'s funnels were not equidistant from the paddle-shafts. The stern funnel appears to have been further from the paddle-shafts than the forward funnel, about 7.15m and 3.84m respectively. The bathymetry of the site indicates that the funnel base to the north-east (**2013**) is about 4m north-east of the line that can be drawn across the wreck between the paddle-shafts and that the other funnel base (**2010**) is about 7.3m to the south-west. This suggests that the funnel base to the south-west is the after funnel and that the other is the forward funnel. It would therefore follow that the bow of the vessel is to the north-east.
- 6.2.6. Both the illustration and the model show both steam escape pipes to have been attached to the leading forward side of the funnels, facing the bow. If the cuprous pipes **2012** and **2015** are the bases of these steam escape pipes, then their position on the north/north-east sides of both funnel bases suggest that the forward-facing part of each funnel base faces north-east.
- 6.2.7. Contemporary accounts suggest that the other vessel collided with the *Iona I* about 12 feet (3.7m) aft of the starboard paddle box. Analysis of the builder's model suggests that the paddle box itself was about 6m long; with 3m either side of the paddle-shaft. Therefore if the bow is to the south-west, evidence of a substantial impact would be expected about 6.7m north-east of paddle-shaft **2004**. However, the bathymetry evidence suggests that the hull on this side extends unbroken for almost 11m. On the south-west side it continues unbroken for only 8.5m south-west of paddle-shaft **2005**. Even allowing for uncertainties with regard to the reliability of witness evidence, this evidence is more consistent with the south-west side of the hull of the wreck being the starboard side rather than the port side of the vessel.
- 6.2.8. The evidence currently available to WA suggests that the bow of the *Iona I* is more likely to lie at the north-east end of the site than to the south-west.

6.3. POST-WRECKING EVENT SITE HISTORY

The Sinking and its Aftermath

- 6.3.1. Contemporary accounts (see **Appendix VI**) suggest that the *Iona I* sank rapidly by the stern and that it was probably intact as it left the surface. It is therefore likely to have reached the seabed in one piece. It was badly damaged and the contemporary accounts suggest that the hull might have been partly severed aft of the paddle box. It is not known whether the stern was detached as it settled, but there is no archaeological evidence that is persuasive of this and it probably settled intact on the even keel that can be observed at the present time.
- 6.3.2. Although salvage appears to have been proposed in the aftermath of the sinking, the available evidence does not suggest that it actually occurred or, if it did, that any significant damage was done to the wreck (**Appendix VI**).

Late 19th and Early 20th Centuries

- 6.3.3. No archive or archaeological information exists to suggest that any human intervention on the wreck occurred. The wreck is likely to have gradually deteriorated and gradually collapsed as a result of corrosion and mechanical damage caused by the impact of water-borne sediments. The wreck may have been impacted from time to time by anchors and it is just conceivable that possible anchor **2030** may be the result of such activity.

Late 20th and early 21st centuries

- 6.3.4. Some salvage work appears to have been undertaken in the 1950s by Clyde-based professional salvors (Guy Henderson pers. comm.). No information has been traced with regard to what was salvaged and what impact it had upon the wreck.
- 6.3.5. For several decades at least the site has been attracting recreational anglers (various pers. comm.). There is no evidence that this activity has significantly impacted the site.
- 6.3.6. From at least the 1980s onwards the site has been visited by avocational divers. Although intrusive investigations were undertaken by some of these divers and trenches appear to have been dug to recover artefacts, there is no evidence that the wreck as a whole was seriously impacted by this activity.
- 6.3.7. The location of the site within a commercial shipping channel and within the area controlled by Clydeport may have deterred diving and salvage activity in recent years.
- 6.3.8. Most of the deterioration visible today, in particular the absence of upstanding hull structure to the south-west of Area 1 and the gap in outstanding structure in Area 2, has probably been caused by progressive deterioration and structural failure and collapse caused by corrosion and natural mechanical damage since the vessel sank. This process has probably been exacerbated by the natural and seasonal cycle of erosion and deposition that has been observed by avocational divers. Without details it is difficult to assess the impact of commercial salvage in the 1950s and casual salvage in the 1980s. However, if it took place, the excavation of sections of the area of the fore and aft holds is likely to have destabilised these parts of the site, and may have contributed to the current state of collapse in these areas.

- 6.3.9. Evidence for active corrosion of ferrous metal was observed across the site, particularly of the iron plates of the hull sides and boilers, some of which are now very thin. The site is clearly unstable and the gradual collapse that seems to have been occurring for most of the wreck's existence may now be in a more rapid phase. Certainly anecdotal evidence from avocational divers suggests that the paddlewheels have deteriorated significantly in the last 10-15 years.

7. STATEMENT OF IMPORTANCE

Site	<i>Iona I</i>		
Overall Importance	High	Overall Sphere of Interest	Local, regional, national, international
Theme	Assessment	Importance	Sphere of Interest
Build	The <i>Iona I</i> was an early Clyde-built steamship, produced by a shipbuilder noted for advanced designs. The <i>Iona I</i> therefore forms part of the early history of an industry that came to dominate national and worldwide ship production in the second half of the 19 th century. This industry helped shape the modern history of the region. As an individual wreck, the <i>Iona I</i> has many features representative of rapid developments in marine architecture and engineering that were taking place at the time. These features are well preserved. Some of these features, for example the oscillating engines, are very rarely preserved.	High	Local, regional, national, international
Use	The <i>Iona I</i> was used for two roles that are significant in social, maritime and wider history. Firstly as an early and famous Clyde passenger steamer. Secondly (albeit ineffectively) as one of the blockade runners that helped perpetuate the American Civil War by maintaining the supply of arms, materials and money into the Confederate States.	High	Local, regional, national, international
Loss	The loss of the <i>Iona I</i> , run down whilst attempting to leave the Clyde, was a notable incident at the time and has since become part of the maritime history of the Clyde and of the American Civil War. The story of the loss of the <i>Iona I</i> can be used as an entry point for a very wide range of educational and other outreach work.	High	Local, regional, national, international
Survival	Although it is subject to corrosion and other processes that are causing it to gradually deteriorate and collapse, substantial sections of the wreck survive largely intact. Most notably these include the amidships section of the wreck to upper deck level, which contains the engines and boilers. The surviving remains can be compared with those of the successor <i>Iona II</i> , which is also subject to archaeological study.	Moderate-high	Local, regional, national

Theme	Assessment	Importance	Sphere of Interest
Investigation	Although the site has been subject to investigation by avocational divers, nothing has been published other than in regional dive guides and the extent to which the work has been recorded is unclear. Anecdotal evidence suggests that more finds have been recovered than have been reported to the RoW. This assessment appears to be the first full archaeological study of the site. It has been subject to geophysical survey for the purposes of navigation and training and the results have now been incorporated into the archaeological study of the site. The site has potential for further archaeological study and for corrosion and related studies concerning the deterioration of iron and steel shipwrecks.	Moderate	Local, regional, national, international

8. ARCHIVE

- 8.1.1. The project archive consisting of an Access database, a GIS work space containing shape files and other data linked to the database and other computer records, together with digital photographs, DV tapes, dive logs and miscellaneous hardcopy photographs are currently stored at WA under project code 53111.

9. GLOSSARY

Oscillating Steam Engine: A compact design of steam engine which eliminates a connecting rod by having the piston rod directly attached to the paddle shaft crank. This requires the piston and cylinder to pivot or oscillate about an axis, normally achieved by mounting the cylinder on a trunnion. The first oscillating engine to be used afloat was put in the *Aaron Manby* during 1822 and the largest were the 836-ton monster that drove the paddlewheels of Brunel's *Great Eastern*. The main problem with this type of engine was how to supply and exhaust steam from the cylinders. This was usually solved by piping through the trunnions. However, as higher steam pressures became available, leakage at the trunnions became a serious problem. As a result oscillating engines fell out of favour and were replaced by inclined direct acting engines in the 1860s. Oscillating marine steam engines are still in operation in Germany, where two-cylinder engines power the preserved river paddle steamers *Meissen*, *Pirna* and *Krippen*.

10. REFERENCES

Published sources

- Allington, P. and Greenhill, B., 1997, *The first Atlantic liners: seamanship in the age of paddle wheel, sail and screw*, Conway Maritime Press
- Body, G., 1971, *British Paddle Steamer*,. David & Charles, Newton Abbot.
- Burt, F., 1937, *Cross-Channel and Coastal Paddle Steamers* (2nd edition, first published in 1934), Richard Tilling, London.

- Davies, K., 1980, *The Clyde Passenger Steamers*, Kyle Publications Ltd., Ayr.
- Duckwork, C.L.D., and Langmuir, G.E., 1937, *Clyde river and other steamers*, Brown, Son & Ferguson Ltd., Glasgow.
- Duckwork, C.L.D., and Langmuir, G.E., 1987, *West Highland Steamers* (4th edition, first published in 1935), Brown, Son & Ferguson Ltd., Glasgow.
- Dyer, H., 1886, 'Development of the Marine Engine' in *Proceedings of the Philosophical Society of Glasgow*.
- Firth, R.F. & Collins, P.E.F., 2002, *Coastal processes and management of Scottish estuaries: VI - The Firth of Clyde*, Scottish Natural Heritage Review No. 108
- Graham, E.J., 2006, *Clydebuilt: The blockade runners cruisers and armoured rams of the American Civil War*, Birlinn Ltd.
- Griffiths, D., 1993, 'Marine Engineering Development in the Nineteenth Century' in Gardiner, R. (ed.), *The Advent of steam: The Merchant Steamship before 1900*, Conway Maritime Press.
- Griffiths, D., 1997, *Steam at sea: two centuries of steam-powered ships*, Conway Maritime Press.
- McQueen, A., 1923, *Clyde river-steamers of the last fifty years*, Gowans and Gray Ltd., Glasgow and London.
- McQueen, A., 1924, *Echoes of the Old Clyde Paddle-Wheels*, Gowans and Gray Ltd., Glasgow and London.
- Moir, P., and Crawford, I., 2004, *Clyde Shipwrecks* (3rd ed.).
- Osborne, B.D., and Armstrong, R., 2007, *Scotland's Great Ships*, CPI Antony Rowe, Chippenham.
- Paasch, H., 1997 (originally published 1885), *Paasch's Illustrated Marine Dictionary*, Conway Maritime Press.
- Paterson, A.J.S., 1972, *The Victorian Summer of the Clyde Steamers (1864 -1888)*, W.J. Holman Ltd.
- Paterson, A.J.S., 1982, *Classic Scottish Paddle Steamers*, David & Charles.
- Ramsay, R.J., 1998, *Paddle Steamer Machinery: a layman's guide*, The Paddle Steamer Preservation Society.
- Rhodes, T., 1900, *Rhodes Steamship Guide*, George Philip & Son.
- Thomas, P.N., 1983, *British Steam Tugs*, Waine Research Publications.
- Ville, S., 1993, *Shipbuilding in the United Kingdom in the Nineteenth Century: A Regional Approach*, *Research in Maritime History No. 4*, International Maritime Economic History Association, Trustees of the National Museums and Galleries on Merseyside.
- Williamson, Captain J., 1987, *The Clyde Passenger Steamer, Its Rise and Progress During the Nineteenth Century: From the Comet of 1812 to the King Edward of 1901* (first published in 1904), SPA Books Ltd., Stevenage.
- Wise, S.R., 1991, *Lifeline of the Confederacy: Blockade Running During the Civil War*, University of South Carolina Press (first published 1988).

Non-published, newspapers and other sources

Greenock Telegraph Clyde Shipping Gazette, *Collision in the River The Steamer Iona Run Down*, October 4th 1862.

Greenock Telegraph Clyde Shipping Gazette, *The Iona*, October 18th 1862.

House of Commons Parliamentary Papers, 1857-58, *Steam vessels. Return of the whole of the registered steam vessels of the United Kingdom on the 1st day of January 1858; distinguishing vessels built of iron, and also vessels having screw propellers, and giving the aggregate number of vessels, and amount of tonnage; with an alphabetical index* (488).

House of Commons Parliamentary Papers, 1859, *Marine engines. Amended report to the Lords Commissioners of the Admiralty by the Committee on Marine Engines, with replies by the Surveyor of the Navy*, Session 2 [2583].

House of Commons Parliamentary Papers, 1860, *Steam vessels. Return of the whole of the registered steam vessels of the United Kingdom on the 1st day of January 1860; distinguishing vessels built of iron, and also vessels having screw propellers, and giving the aggregate number of vessels, and amount of tonnage; with an alphabetical index* (449).

House of Commons Parliamentary Papers, 1861, *Steam vessels. Return of the whole of the registered steam vessels of the United Kingdom on the 1st day of January 1861; distinguishing vessels built of iron, and also vessels having screw propellers, and giving the aggregate number of vessels, and amount of tonnage; with an alphabetical index* (371).

House of Commons Parliamentary Papers, 1862, *Steam vessels. Return of the whole of the registered steam vessels of the United Kingdom on the 1st day of January 1862; distinguishing vessels built of iron, and also vessels having screw propellers, and giving the aggregate number of vessels, and amount of tonnage; with an alphabetical index* (319).

House of Commons Parliamentary Papers, 1863, *North America No. 3. (1863). Correspondence respecting the Alabama*, Presented to both houses of Parliament by command of Her Majesty, printed by Harrison & Sons, London.

House of Commons Parliamentary Papers, 1864, *Return to an order of the Honourable the House of Commons, dated 14 March 1864; - for, a return, in tabular form, with consecutive numbers, of the whole of the steam vessels registered in the United Kingdom on or before the 1st day of January 1864 [...]* (371).

House of Commons Parliamentary Papers, 1865, *Steam vessels. Return of the whole of the registered steam vessels of the United Kingdom on the 1st day of January 1865; distinguishing vessels built of iron, and also vessels having screw propellers, and giving the aggregate number of vessels, and amount of tonnage, with an alphabetical index* (422).

The Times, *Clyde Steamers for the Confederates*, Thursday, 18 September 1862; pg. 10; Issue 24354; col C.

The Times, *Collision on the Clyde*. Monday, 6 October 1862; pg. 6; Issue 024369; col.F.

Wessex Archaeology, 2005, '*Iona II*, Lundy: Designated Site Assessment: Full Report, June 2005', Unpublished Report Ref 53111.03z.

Wessex Archaeology, 2008, '*Iona II*, Off Lundy Island, North Devon, Designated Site Assessment, Archaeological Report', December 2008, Unpublished Report Ref. 53111.03mmm.

Wessex Archaeology, 2009, '*Iona II*, Off Lundy Island, North Devon, Designated Site Assessment: Management Report', January 2009, Unpublished Report. Ref. 53111.02mmm.

Internet sources

www.calmac.co.uk/company-history.html re: David Hutcheson & Company

<http://gdl.cdlr.strath.ac.uk/airgli/airgli0112.htm> re: J. and G. Thomson

www.beyondmag.co.uk/wreck/paddle.htm re: wreck guide

http://website.lineone.net/~reivers.sac/clyde_wrecks/wreckpage.htm re: wreck guide

<http://finstrokes.com/divelinks/malin/iona.html> re: wreck guide

<http://www.oceanicmermaid.co.uk/> re sidescan sonar survey

<http://www.rcahms.gov.uk/search.html> re: Canmore database

www.scotland.gov.uk/Publications/2006/10/09095444/5 re: Scottish Government consultation

APPENDIX I: DIVE LOG

Dive	Date	Diver	Start time*	Max. Depth (m)	Bottom Time (min.)	Estimated Visibility (with hat light)	Notes	HW Greenock *
1	01/03/09	Scott	15:22	28	24	c.0.5-1m	Initial general visual inspection	15:05
2	02/03/09	Astill	12:33	28	20	c.0.5-1m	Visual inspection of north-east end of Area 2. Aborted due to loss of slack.	15:42
3	03/03/09	Callan	16:56	32	7	c.0.5-1m	Aborted due to movement of DSV	16:23
4	04/03/09	Callan	12:08	28	25	c.0.5-1m	Visual inspection of Area 1.	17:10
5	04/03/09	Scott	13:09	28	25	c.0.5-1m	Visual inspection and photographic survey of Area 1, north-east of crankshafts.	17:10
6	04/03/09	Astill	17:04	29	23	c.0.5-1m	Visual inspection of Area 1, south-west of crankshafts and Area 3.	17:10
7	05/03/09	Callan	10:52	26	30	c.0.5-1m	Visual inspection and photographic survey of Area 1, south-west of crankshafts and Area 3.	18:12

*All times G.M.T.

APPENDIX II: SURVEY EQUIPMENT

Diver tracking and object positioning was undertaken using a Sonardyne Prospector Long Baseline (LBL) acoustic tracking system. This system utilises a diver mounted transceiver to measure range and bearing to an array of acoustic signal emitting transponders deployed around the site. The accuracy of the system can be affected by a number of external factors and is variable, but it is possible using multiple measurements to obtain positions accurate to within 0.25m or less. Using this system combined with diver observations and geophysical data, it was possible to navigate the divers around the wreck and locate and identify features shown in the geophysical data and vice-versa.

In order to satisfy the project objectives an integrated recording system was utilised comprising an acoustic diver tracking system, taped measurements, a diver hat-mounted digital video camera, a digital still camera, a geographical information system (GIS) interface and a proprietary MS Access project database (DIVA). Observations and context records in the form of description, field measurement and video imagery were geo-referenced and logged in the project database.

Full digital colour video footage of the diving operations was recorded using a diver hat-mounted Colourwatch 306 single chip digital inspection camera and umbilical, recording onto MiniDV tape. The image produced by this system was displayed in real time on a surface monitor for the use of the diving supervisor and archaeological recorder. The use of this camera enabled the diving supervisor and recorder to participate actively in the site inspection.

APPENDIX III: CONTEXT INDEX

Context No.	Area	Description
2000	1-4	Seabed
2001	1-4	Wreck of <i>Iona I</i>
2002	1	Amidships section of <i>Iona I</i>
2003	1	Crankshafts
2004	1	Paddle-shaft (on north-west side of 2002)
2005	1	Paddle-shaft (on south-east side of 2002)
2006	1	Paddlewheel (on north-west side of 2002)
2007	1	Paddlewheel (on south-east side of 2002)
2008	1-3	Riveted ferrous hull comprised of plates and frames (on north-west side of 2002)
2009	1-3	Riveted ferrous hull comprised of plates and frames (on south-east side of 2002)
2010	1	Squat circular open ferrous cylinder, possibly flanged, with bisecting plate. Diameter c.1.0-1.1m. South or south-west of 2003 and 2011-12. Probable funnel base.
2011	1	Ferrous cylinder, closed at top, attached below (possibly to boiler), orientated vertically, at least 1m high. 2012 emerges from the southern side of it approximately at one-third height. South-west of 2003 and just north or north-east of 2010. Unidentified (possible steam dome and/or safety valve).
2012	1	Thin walled cuprous pipe of c.0.20-0.25m diameter. L-shaped. Long section vertical, short lower section horizontal. Attached at lower end to 2011, facing 2010. Broken at unattached end. Unidentified but possible steam pipe.
2013	1	Squat circular open ferrous cylinder, possibly flanged, with bisecting plate. Diameter c.1.0-1.1m. North of 2003 and south of 2014-15. Probable funnel base.
2014	1	Ferrous cylinder, closed at top, attached below (possibly to boiler), orientated vertically, at least 1m high. 2015 to the south-west of it. Unclear whether 2015 is attached to it. North-east of 2003 and just north or north-east of 2013. Unidentified (possible steam dome and/or safety valve).
2015	1	Thin-walled vertical cuprous pipe of c.0.20-0.25m diameter. Unclear whether attached at lower end to 2013, facing 2010. Broken at upper end. Unidentified but possible steam pipe.
2016	1	Transverse ferrous metal bulkhead defining Area 1-2 boundary. Full width of vessel, c.5.5m+, upstanding c.1-1.5m.
2017	2	Upstanding structure at north-east end of Area 2. Triangular shaped section of vertical upstanding ferrous metal hull structure. Estimated 3.5-4m long, max. c.2m wide. Consists of upstanding ferrous metal shell plates attached to narrow plate or beam narrowing to v-shaped point at north-east end. Transverse bulkhead (2018) at other end. Signs of active corrosion and mechanical damage/collapse.
2018	2	Transverse bulkhead, part of 2017
2019	4	J-shaped ferrous metal bar, c.1m long

Context No.	Area	Description
2020	2/4	Short ferrous metal pipe fragment.
2021	2	Transverse bulkhead, c.4m+ long.
2022	2	Low mound of coal.
2023	1	Area of surviving ferrous metal deck beams, arranged both longitudinally and transversely in a regular pattern, either side of crankshafts. Traces of timber planking.
2024	1	One of two riveted ferrous metal parallel cylindrical boilers, arranged longitudinally to the south-west of crankshafts. These are largely covered by silt and sand, but the south-west ends were partly exposed. Unlikely to exceed 5.5m long.
2025	1	As 2024 above.
2026	3	Possible deck hatch with combing.
2027		Extensive low mound, probably at least partly comprised of coal.
2028	3	Large ferrous metal chain, attached to 2029. Possible anchor chain.
2029	3	Large ferrous metal shackle.
2030	3	Large ferrous metal bar attached to 2029, part buried. Possible anchor shank.
2031	1	Transverse ferrous metal bulkhead. Upstanding up to 1.5m. Defines north-east end of 2035.
2032	1	Hull compartment below 2023 and south-west of crankshafts. Contains 2024 & 2025. May be engine/boiler room/s. Filled with silt and sand.
2033	1	Possible ferrous metal deck stringer plate along 2008.
2034	1	Possible ferrous metal deck stringer plate along 2009.
2035	1	As 2032, but north-east of crankshafts. Largely filled with silt. Contains 2036 & 2037.
2036	1	One of two riveted ferrous metal parallel cylindrical boilers, arranged longitudinally to the north-east of crankshafts. These are largely covered by silt and sand, but the north-east ends were partly exposed. Unlikely to exceed 5.5m long.
2037	1	As 2036 above.
2038	1	Piston rod attached to crankshaft on north-west side.
2039	1	Ditto, south-east side.
2040		Rectangular ferrous metal and lead enclosed box, c.1.8-9m long, 0.7m wide and up to 1m high. Small circular hole on one side. May be tank for storing or receiving water.
2041	1	Ferrous metal ring of at least 0.5m diameter lying on/attached to deck beams or stringer on south-east side.

APPENDIX IV: FINDS INDEX

The WA diving operations were non-intrusive and no finds were recovered. The following finds have however been recovered previously:

Object No.	Description	WA Photograph No.	Current Location
3000	Indicator plate of a water valve. Cuprous, probably cast brass. Inscribed 'J. & G. Thomson, Engineers & Iron Ship Builders, Clyde Bank Foundry, Glasgow. 1855.' Found mounted to a pedestal which has since collapsed at crankshaft level just to the south of the crankshafts. In two pieces.	5012	Collection of Peter Moir
3001	Builder's plate. Cuprous, probably cast brass. Inscribed 'J. & G. Thomson, Engineers & Iron Ship Builders, Clyde Bank Foundry, Glasgow. 1855.' Found detached at south-east end of site.	5013-4 (Plate 8)	Collection of Peter Moir
3002	Glass bottle. Moulded. Square base and body. Round shoulder and neck. 'Laid on' ring lip, probably for tight fitting cork. Collar at base of neck. Liver Bird or dove-like bird embossed on shoulder. Possible sauce bottle.	5015-6 & 5018	Collection of Peter Moir
3003	Glass bottle. Strap moulded. 'Whisky coffin' body form. Form of lip suggests post-1850 manufacture.	5017-8	Collection of Peter Moir
3004	Glass bottle. Moulded. Square base and body. Round shoulder and neck. Embossed decoration on base, possibly maker's mark. No pontil mark. Probably post-1860. Possible sauce bottle.	5018-9	Collection of Peter Moir
3005	Circular scuttle. Cuprous, probably cast brass. Comprises cuprous framed glass plate with single dog and small ring for pulling scuttle open, hinged to	5020 (Plate 9)	Collection of Peter Moir

Object No.	Description	WA Photograph No.	Current Location
	circular frame with six bolt or rivet holes for attaching scuttle to hull. No obvious sign of mounting point for a deadlight. Dog inscribed 'J. Roby Prescott(?)'. Possibly made by John Roby Limited, brass founders specialising in ships' equipment, who operated from a brass foundry in Rainhill, near Liverpool from the late 1850s.		
3006	Decorated glazed ceramic toilet bowl.	Not seen by WA	Unknown
3007	Decorated glazed ceramic toilet bowl.	Not seen by WA	Unknown

APPENDIX V: RCAHMS SITE RECORD**Iona I:** Tail of the Bank, Upper Firth of Clyde**Alternative Names:** Iona; Gourock Bay; Gourock Swimming Pool; Clyde House; Fort Matilda; Whiteforeland Buoy; Inner Clyde Estuary**Type of Site:** Paddle Steamer (19th Century)**NMRS Number:** NS27NE 8007**Map reference:** NS 2618 7850**Parish:** Maritime – Inverclyde**Council:** Inverclyde**Former District:** Maritime**Former Region:** Strathclyde**Archaeology Notes**

NS27NE8007 2618 7850

N55 58.0817 W4 47.1217

NLO: Gourock [name: NS 230 770]

Gourock Bay [name centred NS 247 777]

Greenock [name: NS 280 765]

Fort Matilda [name: NS 260 779]

Glasgow, 3rd Oct. The IONA (s), sunk off Gourock last night by collision with the CHANTICLEER (s): no lives lost. Source: LL, No. 15,130, London, Friday, October 3 1862.

Greenock, 2nd Oct. Part of the wreck of the IONA (s), which sunk after collision below this place last night, has washed ashore at Kilcreggan. Source: LL, No. 1 5,131, London, Saturday, October 4 1862.

Greenock, 9th Oct. The IONA (s), which sunk off Gourock 2nd Oct., after collision, belonged to Glasgow, and was bound from hence to Nassau, N.P., Capper, master. She was in ballast at the time. Source: LL, No. 15, 136, London, Friday, October 10 1862.

Glasgow, 14th Oct. The CHANTICLEER (s.s.), Brown, which was in contact off IONA (s), was bound down the Gourock, 2nd Oct., with the Clyde on a trial trip: after the collision she proceeded on to Bowling with her port bow stove and about 10 feet water in her fore compartment. Source: LL, No. 15,141, London, Thursday, October 16 1862.

NMRS, MS/829/72 (no. 10257).

Quality of fix = 0010

Evidence = Echo sounder

Horizontal Datum = OGB

General water depth = 27

Circumstances of Loss Details

The IONA I sank following a collision with the British ship, SS CHANTICLEER. Source: The Clyde Passenger Steamers, p.115.

Surveying Details

1 March 1983. A wreck was reported in 55 58 03N, 004 48 18W by the Vale of Evesham Sub Aqua Diving Club. This is possibly the IONA 1, which sank in 1862. Source: Petty Officer Wood, HMS Neptune SAC.

7 April 1983. It was reported that the wreck in 55 58 03N, 004 47 00W may be the IONA I, sunk in 1863. The IONA I sank following a collision off Clyde House, nr Fort Matilda. The wk located in 55 58 06N, 004 47 04W may be this vessel. Report by D Mcentee.

24 September 1985. The wreck lies in the approximate position 55 58 06N, 004 47 08W - close to the Whiteforeland buoy. The least echosounder depth was 23.6 in a general depth of 27 metres. Predicted tidal reduction 0.9 metres. Report by J Crowther.

6 July 1993. The site was examined on 8 May 1993 in 55 58 04.9N, 004 47 07.3W. NGR 22618 2e, 678489n. The least echosounder depth was 22.8m in a general depth of 26.5 metres. No scouring was observed. The sidescan sonar indicated a height of 2.4 metres. The wreck lies with its keel on an orientation of 060/240 degrees on a sand and mud seabed. The vessel is approximately 25 metres (82 feet) long with a central paddlewheel arrangement discernible on the sonar trace. A small section lies 10 metres to the NE of the main wreck. Report by HMS GLEANER.

Hydrographic Office 1995.

(Classified as iron paddle steamship: date of loss cited as 2 October 1862). Iona: this vessel was in collision and sank off Gourock Bay (Chanticleer). Capt. Capper. Registration: Glasgow. Built 1855. 174grt. Length: 68m. Beam: 8m.

(Location of loss cited as N55 58.07 W4 47.07). I G Whittaker 1998.

Material reported under RoW amnesty (2001):

A1330 2 maker's plates (inscription not cited), 1 porthole: from seabed NMRS, MS/829/35.

Tail of the Bank is not noted as such on the 1995 edition of the OS 1:50,000 map. Information from RCAHMS (RJCM), 6 December 2004.

References

Moir and Crawford, P and I (1988) Clyde shipwrecks, Wemyss Bay, 33-6

Ridley, G (1984) Dive West Scotland, London, 68, no. 126

Whittaker, I G (1998) Off Scotland: a comprehensive record of maritime and aviation losses in Scottish waters, Edinburgh, 309

APPENDIX VI: HISTORY OF THE *IONA I*

Clyde-built Paddle Steamers

At the end of the 18th century and beginning of the 19th, technological developments enabled the newly-discovered potential of steam power to be harnessed to drive a ship. In 1812, the first steamship on the Clyde, the paddle steamer *Comet*, was launched (Davies 1980: 16).

Construction on the *Comet* began in 1811 when Henry Bell ordered a wooden vessel 43.5ft in length with a breadth of 11ft from John Wood, a shipbuilder in Port Glasgow. He then fitted the vessel with a small side lever engine from John Robertson of Glasgow, and a horizontal boiler (Body 1971: 21). On each side of the vessel were two sets of paddlewheels. The launch of the *Comet* on 14th August 1812 attracted large crowds, curious to see a steamship at work, and on its maiden voyage, the *Comet* attained a modest 4.5 knots. Although it was not a financial success, the *Comet* started a new era in Clyde shipping (Body 1971: 21). Since its launch the *Comet* has also come to be regarded as a landmark in the development of the modern powered ship.

The paddle steamer proved to have a number of advantages over traditional sailing ships. Paddle steamers could work independently of wind and tide, greatly reducing voyage times. For example, on a sailing vessel, the voyage from Glasgow to Rosyth would be three or four days at best, while on a paddle steamer, the trip could be done in the same number of hours (Davies 1980: 16).

These new vessels were expensive, and this led to new forms of ownership. Small groups of individuals, once they had acquired a steamer, set about acquiring trade, often whatever was easiest to obtain. However, some groups set up to provide a service to specific communities or areas, and these were the forerunners of the modern ferry services. These new services soon meant that coastal communities, such as the islands of Bute, Arran and Cumbrae, as well as communities on the Kintyre peninsula, were provided with fairly regular services, while the vessels also served the mainland townships and villages along the way (Davies 1980: 16).

Over the 20 years after the launch of the *Comet*, paddle steamers continued to evolve. The paddlewheel arrangement of the *Comet* with two paddlewheels on each side was determined to be considerably less efficient than having just one paddlewheel per side, and larger engines were developed in order to achieve greater speeds. The use of wooden hulls continued, and all the first 78 steamships built for the Clyde were constructed of wood (Davies 1980: 17).

The first iron paddle steamer on the Clyde was the *Fairy Queen*, built by John Neilson of Glasgow in 1831 (Body 1971: 136). This vessel was 39.75 tons and 97' in length, and it was driven by the first oscillating engine on the Firth. Although it took a while to convince the general population of the advantages of iron hulls, there being considerable concern about whether or not iron could even float, iron ships triumphed. Iron hulls were lighter and faster than their wooden counterparts, and could provide more accommodation and easier stowage of cargo (Armstrong 1975: 103). In addition, iron hulls were safer, as they stood up better to collision. Finally, it was cheaper to build iron hulls as iron became more plentiful and as suitable timber stocks dwindled (*ibid.*).

In many ways, the history of the Clyde paddle steamers is inseparable from the social, economic and industrial history of the area. The paddle steamer, itself a product of the

industrial revolution, played a key role in travel and development along the west coast. Although early steam traffic was based on shipping cargo, it was not long before ship owners realised that carrying passengers could be as lucrative as shipping cargo, and thus a whole new trade came into being (Davies 1980: 12).

Glasgow, like many of the large, industrial cities in the mid-Victorian era, was known for its drabness, filth and disease (Davies 1980: 23) and it is not surprising that its residents looked forward to going 'doon the watter', where they could enjoy their leisure time in the fresh air and more sanitary conditions along the coast. The paddle steamers allowed increased access to the coast, where resorts rapidly developed to cater for the summer visitors. This growth included not only accommodation but also the provision of piers and the extension of existing harbour facilities. These new resorts attracted even more visitors, and the paddle steamer owners were quick to realise the potential of this lucrative business. At weekends and peak holiday times, as many as 30 steamers would leave Glasgow for one of these resorts (Davies 1980: 23).

One of the most important passenger routes was the Glasgow and Ardrishaig mail run, and it was of major trade value for its operators during the 19th century, when even the railways had not yet penetrated to the west Highlands (Paterson 1982). In many ways, steamships were better suited to the service than the railway, due to the difficult nature of the countryside, broken by sea lochs and islands. Paddle steamers offered the fastest most practical way to travel to the Highlands.

Shipbuilding itself was big business, as bigger and better paddle steamers were required. At the ship building peak, it is estimated that there were probably around 200 separate firms on the Clyde all engaged in shipbuilding and the engineering associated with it (Davies 1980: 19).

The paddle steamers were built to suit the unique geography of the Clyde, and the vessels were fast with shallow draughts, ideal for working around the shores and estuaries. These characteristics also made them suitable for other purposes and in the American Civil War (1861-1865) both sides of the conflict found that the Clyde-built boats made ideal blockade runners.

The American Civil War resulted from the 1860 election of Republican Abraham Lincoln who had campaigned against the expansion of slavery. In defiance of his policies on slavery, seven Southern states declared their secession from the Union. Hostilities began in April 1861, when Confederate forces attacked the U.S. forces at Fort Sumter in South Carolina. Both sides raised armies, and the Union established a naval blockade on the Confederacy's seaports in the Gulf of Mexico and on its Atlantic seaboard in order to gain an economic stranglehold. Because of this, blockade running soon developed into a lucrative trade. Blockade runners exported southern cotton and brought back the weapons and machinery so desperately needed by the largely agricultural Confederacy. Ship owners were able to sell their ships for huge profits, which they then used to buy vessels they could not previously have afforded. As fast as they could be built, these new ships were also snapped up for blockade running.

In the early days of paddle steamers on the Clyde, there had been no notion of shipping lines as such. However, by the last quarter of the 19th century, there were numerous fairly large

private companies operating, each concentrating on one area of operation and trade (Davies 1980: 23).

When the railway finally reached Glasgow and the Highlands, there were considerable changes to shipping practices and to the paddle steamers themselves. Not only were alternative routes now available to the public, but railways also began to operate their own shipping, and could dictate the timetables to suit their own ends. With their far greater financial resources, they were able to build very large and fast paddle steamers, and a whole new breed of ship began to appear, such as the *Duchess of Hamilton* in 1890 (Davies 1980: 30).

By the end of the 19th century, paddle steamers had reached their peak (Davies 1980: 30). This was a time when there were dozens of fine paddle steamers providing regular and excursion services along the west coast of Scotland.

In the early 1900s, steam technology advanced, and in 1901 the first screw driven passenger ship, the revolutionary *King Edward*, was launched. The *King Edward* demonstrated that paddle wheels were no longer necessary, and the turbine engines and triple screws provided impressive performance. These vessels excelled at longer runs across open waters (Davies 1980: 34). Further advancements came in the 1930s–1950s when coal gave way to oil as the fuel of choice.

During World War I, the Admiralty commandeered most of the Clyde fleet, along with most of the usable vessels around the UK. Those vessels that survived the war returned to the Clyde, but service was slow to pick up, in part due to financial restrictions caused by the Depression, and despite some semblance of pre-war glories being reached before World War II, the paddle steamers never recovered. After World War II, the railways were nationalised, and people's travel habits changed due to car ownership.

Description of the *Iona I*

The *Iona I* was an iron paddle steamer built in 1855 by J. & G. Thomson of the Govan yard, Glasgow, Scotland, to the order of David Hutcheson & Company. The *Iona's* tonnage (exclusive of engine room) was 173 tons, and the vessel had a gross tonnage of 325 tons (House of Commons Parliamentary Papers 1857-1858, 1860, 1861, 1862). The *Iona I* measured 225.2 feet in length, 20.4 feet in breadth, and had a hold depth of 9.0 feet.

The ship has been described as 'for a time about the finest Clyde steamer afloat' (Paterson 1972: 18). The *Iona I* was sleek, long of hull, and flush decked, with a slanting bow and square stern (Davies 1980: 134; Duckworth & Langmuir 1987: 27; Moir and Crawford 2004: 35; Paterson 1972: 18; Paterson 1982: 12). The vessel had a single mast, and the twin funnels were located fore and aft of handsome paddle-boxes. The vessel's furnishings were described as of unusually high quality for a river steamer (Paterson 1982: 12).

Although research has not revealed plans for the vessel, further details can be inferred from the ship's model held at the Glasgow Museum of Transport (**Plate 1** and **2**) and a painting of the *Iona I* (**Plate 3**). The following details have been extrapolated from these sources, and therefore all measurements are approximate. The single mast was located about a quarter of the way along the hull, about 16-17m from the bow. The first funnel was located about 30-31m from the bow, just in front of the paddle-box. The paddle-box itself measured about

6m across, and its centre point (35-37m from the bow) was very near the centre of the vessel – possibly only a metre or two nearer the stern. The second funnel was located a short distance (just over 3m) behind the paddle-box.

While some information about the vessel's machinery is known, other details can also be gleaned from secondary sources. The vessel had an oscillating engine, and was capable of speeds of up to 17 knots (Duckworth and Langmuir 1987: 27 and McQueen 1924). The oscillating engines were so named because of the action of the cylinders, which oscillated on trunnions. With this type of engine, the piston rods were integral with connecting rods driving directly onto the cranks, and slide bars and crossheads were unnecessary (Paterson 1972: 210). The big advantage of the oscillating engine was that it took up less space than the side-lever variety (Body 1971: 140).

Other types of engines were also in use at this time. Out of 34 paddle steamers on the Clyde in the 1850s, 20 had steeple engines, seven had oscillating engines and there were one each of the diagonal-oscillating, trunk and rotary types (Body 1971: 139-140).

Oscillating engines were popular during the early years of paddle steamer construction. However problems arose as higher steam pressures were achieved and it proved difficult to seal the moving parts. By the late 1800s, most builders had returned to fixed cylinder configuration (Davies 1980: 32). From the 1870s oscillating engines and steeple engines lost their place first to diagonal engines, then to compound diagonal engines and then to a variety of surface-condensing, tandem compound and triple expansion designs (Body 1971: 140).

In 1859, for the Lords Commissioners of Her Admiralty, the Committee on Marine Engines visited the factory and building yard of J. & G. Thomson to interview them about the types of engines they were producing (House of Commons Parliamentary Papers, 1859: 128-129). The builders were asked a series of set questions, and their responses reveal a considerable amount about the machinery they were building, and thus can provide details about the *Iona I*.

They indicated that they preferred tubular boilers, and that they generally worked to 20lbs pressure. The boilers were placed on iron beams, so that the bottoms were accessible. In the boiler, iron tubes were generally used, although they indicated that for men-of-war, brass tubes would be best, as iron ones deteriorate fast when laid up. For the engines, J. & G. Thomson indicated that they did not approve of high-pressure engines for marine purposes, particularly for salt water, and that in general their engines were screw direct action.

Different builders preferred different types of engines and boilers. For example, in the 1860s; Henderson Colborne & Company built vessels with diagonal engines and haystack boilers; while Tod & MacGregor and Barclay, Curle and Company built steeple engines and haystack boilers; and J. & G. Thomson were known for their boats with oscillating engines and horizontal boilers (Body 1971: 140). On the Clyde in the 1850s, out of 34 paddle steamers on the Clyde, 20 of the boilers were of the haystack type and five were tubular, with no details recorded for the others (Body 1971: 139-140).

Although the exact nature of the *Iona I*'s boilers has not been confirmed through archival research, given the fact that J. & G. Thomson were known for using horizontal boilers and that they themselves indicate their preference for these boilers, it is likely that the *Iona I* had this type of boiler.

The tubular or horizontal boilers were also referred to as locomotive or navy boilers (Paterson 1972: 215). Paterson indicates that with this type of boiler, the funnels had either to be spaced very close together, such as was the case for the *Iona III*, or else very far apart, because the funnel uptakes were placed at the ends of the boilers (*ibid.*). This type of boiler was cylindrical, with the combustion chamber joined to the uptakes by a nest of fire tubes. Paterson also notes that this type of boiler was heavier than the more common haystack boiler and generally less successful in that it steamed less reliably in conditions of natural draught (*ibid.*: 216-217).

History of the *Iona I*

The *Iona I* was built in 1855 by J. & G. Thomson. The firm was founded by James and George Thomson in 1845 and was located in Finnieston Street, Glasgow, where the business was at first confined to engineering (<http://gdl.cdli.strath.ac.uk>). In 1851, the company expanded and began building iron ships in a yard on the south bank of the Clyde at Govan. In 1859, the Committee on Marine Engines visited the J. & G. Thomson yard, and their report in the House of Commons Parliamentary Papers (1859) indicates that J. & G. Thomson employed 1,800 men in all their works. As a result of their visit, the Committee concluded that the works of Messrs Thomson were extensive and well adapted for the construction of marine engines. The company continued to grow, and in 1870 J. and G. Thomson founded the Clydebank Shipping Yard.

The *Iona I* was owned by David Hutcheson & Company, a steamer company that began in 1851, when Messrs Burns' West Highland steamboat interests were acquired. David Hutcheson & Company consisted of three partners – David Hutcheson, Alexander Hutcheson and David MacBrayne. The company mainly operated on the Royal Route from Glasgow through the Crinan Canal to Oban and Fort William and then on through the Caledonian Canal to Inverness, but also sailed to Stornoway and the Outer Isles. In 1879, David MacBrayne took exclusive control of the company after the retirement of his partners, at which time the operation became David MacBrayne Ltd. Throughout the late 1870s and 1880s, the company continued to expand with mail to Islay, Harris and North Uist from Skye.

In 1905, David MacBrayne retired, leaving the company to his two sons, who oversaw continued change and improvements. In 1969, the State-owned Scottish Transport Group was formed to operate MacBrayne's and the Caledonian Steam Packet Company on the Clyde, together with the Scottish Bus Company. Soon after the shipping companies were amalgamated, they were renamed Caledonian MacBrayne Ltd, the name under which the company operates today (www.calmac.co.uk).

In 1851, David Hutcheson & Company ordered the paddle steamer *Mountaineer* for the Clyde section of the Royal Route, from Glasgow to the Highlands, so named after a journey made by Queen Victoria. The *Mountaineer* was hailed as the swiftest steamer afloat when on her trials she ran at 15 knots (McQueen 1924: 129). The vessel was very successful, and it has been suggested that it was her success that was her undoing, as traffic swelled so quickly that only four years later, a larger vessel was required (Paterson 1982: 12).

The *Iona I* was launched in March 1855 as the *Mountaineer's* replacement on the Royal Route, taking passengers from Glasgow to Ardrishaig on Loch Fyne (Paterson 1982). The *Iona I* attained immediate success on this route, and in July 1855 she was chartered for the ceremony of visiting the Clyde lighthouses (Duckworth and Langmuir 1987: 27). The *Iona*

was a fast ship that could reach 17 knots, and the ‘blue riband’ was promptly claimed for her (McQueen 1924: 129). In August 1861, the *Iona I* broke down, but temporary repairs made in Kyles of Bute allowed the ship to steam slowly to Glasgow (Duckworth and Langmuir 1987: 27).

The *Iona I* spent eight seasons on the Royal Route, and would probably have had a long career, but for the outbreak of the American Civil War in 1861. During the American Civil War, the swift Clyde steamers became highly prized as blockade runners for the Confederate Navy, as their speed enabled them to escape the Federal blockades of the Confederacy’s seaports. The *Iona I*’s last passenger sailing on the Clyde was in September 1862, after which the vessel was sold for blockade running. The story was covered in the newspapers of the day:

CLYDE STEAMERS FOR THE CONFEDERATES – The favourite and crack steamer *Iona* was withdrawn from her station between Glasgow and Ardrishaig on Monday last, the beautiful saloon steamer *Fairy* taking her place. We are told that this withdrawal is caused by the *Iona* having been sold to the Confederates in America. It is also rumoured that the fine Belfast paddle steamer *Giraffe* and the West Highland steamer *Clydesdale* have also been disposed of to the same parties. If this be true, then the very flower of our Clyde passenger steamers will have been withdrawn, to make room, it is hoped, for others equal at least, if not superior, to those we shall have lost. The *Iona* is a steamer of world-wide fame. She has carried thousands upon thousands of passengers over the famed Royal route for years, many of them from the most remote parts of the globe; and, go where she will, she will maintain the character of our Clydebuilders and engineers. – *North British Mail (The Times, Thursday, Sep 18, 1862)*.

We understand that the fine steamer *Iona*, one of Messrs D. Hutchison [sic] & Co.’s fleet of West Highland steamers, which has been generally acknowledged ‘Queen of the Clyde’, made her last trip on her route from Glasgow to Ardrishaig on Saturday last, having been purchased. It is said that Mr. Mason, the Southern Commissioner who visited Glasgow recently, had something to do with the purchase. As it is she will likely leave the Clyde, after receiving some strengthening outfit, in a short time hence. It is also said two or three other of our crack steamers, if not already sold, are likely soon to be purchased for the same purpose. Should they go to the South they will likely form a line of steamers between some near neutral ports and one of the smaller Southern ports least likely to be affected by the blockade. The *Iona*’s place on the Highland route has been filled by the saloon steamer *Fairy* (*Greenock Advertiser* – quoted in Graham 2006: 111).

Although the *Greenock Advertiser* suggests the sale was connected to Mr. Mason, other sources indicate that the vessel was sold to George Wigg for the Navigation Company (Graham 2006: 210; Wise 1991: 305) or to David McNutt, a regular speculator in the blockade (Graham 2006: 112). This ambiguity of ownership is typical, as sales of vessels for blockade running were often covered by subterfuge, with vendors known to falsify paperwork or to use such vague phrases as ‘sold to South Coast interests’ (Davies 1980: 21). In any case,

ship-owners were well reimbursed for their vessels, and the *Iona I* was purchased for £20,000 (Wise 1991: 305).

D. McNutt later purchased the *Iona II* for blockade running, and is listed as her owner in the House of Commons Parliamentary Papers in 1864. The Glasgow firm of McLeash & McNutt were described by United States Consul Prettyman as violent sympathisers to the Confederate cause who were not only sending relief and assistance but were also likely gun-running under the guise of shipping 'hardware' from Glasgow to Nassau (Graham 2006: 42).

The United States Consul at Liverpool compiled a list of vessels known to be involved in blockade running (House of Commons Parliamentary Papers 1863). The list included all vessels that from 1st of August 1862 had either already sailed from Great Britain and Ireland or were being prepared to sail with contraband of war for the purpose of breaking the blockade of rebel ports. The list included the *Iona I* and 32 other steamers, as well as 13 sailing vessels.

Ships sold as blockade runners were often withdrawn from service without warning, and taken to small yards where they were hastily prepared for the Atlantic voyage. The ships would then set off under the cover of darkness so that they could be well clear of the Firth and watchful eyes before their disappearance was discovered (Davies 1980: 21).

In preparation for crossing the Atlantic, the *Iona I* was stripped of fittings and painted grey, and taken up on the Garelock to have her compass adjusted (Burt 1937: 317; Williamson 1987: 115). Loaded with coal and general stores, the *Iona I* set off from Glasgow at 2pm on 2nd October 1862 for Nassau, in New Providence, Bahamas, a noted base for blockade runners (Duckworth and Langmuir 1987: 28; Moir and Crawford 2004: 35; Osborne and Armstrong 2007).

At 7pm, the *Iona I* collided with the *Chanticleer*, a new steamer that had been undergoing speed trials that day. There are various accounts of what caused the collision, and it is not surprising that the testimonies of the vessels' crews differ considerably. The crew of the *Iona I* claimed that the *Chanticleer* suddenly appeared, without lights showing (Moir & Crawford 2004: 35). However, the crew of the *Chanticleer* argued that they had put their lights up on passing the Cloch Lighthouse, and it was the *Iona I* that suddenly cut across the path of their vessel to cause the subsequent collision (Moir and Crawford 2004: 35; Williamson 1987: 115). Some authors have suggested that it was the *Iona I* that was travelling without lights, perhaps to avoid the vigilant eyes of Federal agents (Paterson 1972: 18), while others suggest that the attempts to conceal her were far too successful (Davies 1980: 134).

Some reports state that the captain of the *Iona I* refused the services of a salvage tug while he haggled over who was to blame with the other captain, who was drunk (Graham 2006: 111). While they argued, the *Iona I* settled and sank.

The loss was reported in the Saturday 4th October edition of the Greenock Telegraph:

COLLISION IN THE RIVER: THE STEAMER IONA RUN DOWN
- Yesterday morning there was a startling announcement made in town, to the effect that the steamer *Iona*, lately purchased by the Confederates, had been sunk in the Channel off Whiteforeland Point. No one could tell how or why, and even till the time we write there

are only a few meagre shreds of information to be got at. The *Iona* came down from Glasgow on the Thursday and late in the afternoon was seen at the Tail of the Bank with her blue peter flying. A few minutes past seven o'clock, several people who were in the vicinity of the Battery heard a strange crashing sound, followed by loud cries, and a strong blowing off of steam. One gentleman who surmised from the sound that something must be wrong, went out of his house, and looking seawards, saw a large screw steamer with her bow pointing down the river, evidently in contact with a long low steamer which must have been the *Iona*. There seemed to be a great consternation on board of both vessels, and he heard a voice call loudly, "Will I run you inshore." In a short time a tug steamer was seen making towards the vessels, and arrived at them to render assistance, but in about a quarter of an hour the *Iona* sank. Both the tug and the larger vessel then proceeded up the river. Information reached town yesterday, that that morning a life-boat, a skylight, some buckets with the name Iona on them, some bigger pieces of wreck, were found strewn along the Kilcreggan shore. The vessel with which the *Iona* was in collision was said to be a large new screw steamer called the *Chanticleer*, which had been down the river on a trial trip. We are glad to say that intelligence reached the town that all people on board the *Iona* got safe on board of the other steamer, which must have landed them at Bowling or Glasgow. This accounts for the paucity of information in this quarter.

Another spectator of the unfortunate accident states that the *Iona* was proceeding down on the side next the shore, the *Chanticleer* coming up on the outside, and that before the collision he heard the cry "Port your helm" repeated energetically three times, and was followed by the screw steamer striking the *Iona* about the starboard paddle-box. The whole appears a strange affair, so strange that even up till last evening such an occurrence happening so near our own doors as opposite Clyde House was not generally known. The public will look with interest to the account given by the parties on board of both vessels. Since the above was in type, we learn that one of the seaman who was on board of the *Iona*, and who was in town yesterday evening, states that they were letting go the anchor at the time that the *Chanticleer* came steaming up. Both vessels had their lights shown, and the man on board the *Iona* shouted to the *Chanticleer* to sheer off, but she came on and struck them, and in a few minutes the *Iona* foundered. Her crew were all got safe on board the *Chanticleer* which went up the river, and landed them at Bowling, from whence they proceeded to Glasgow.

Two days later *The Times* recorded the sinking thus:

COLLISION ON THE CLYDE. – The *Iona*, a fine iron steamship, well known to highland tourists when she plied between Glasgow and the north-west coast of Scotland, was some time ago purchased by persons favourable to the Confederate cause, for the purpose of

running the blockade. She left Glasgow on Thursday, and proceeded to Gourrock [sic] Bay to adjust her compasses previously [sic] to her departure for America. She was there run into by the *Chanticleer*, a fine new vessel which was returning from her trial trip preparatory to going out to her station in China. The *Chanticleer* first grazed with her starboard the right paddle-box of the *Iona*, then struck her about a dozen feet nearer the stern, carrying away her after funnel and mainmast and cutting her right through the centre, to within two feet of her left side. The collision took place at 10 minutes past 7, and the two vessels remained in contact for half an hour, hanging to each other. It was apparent, however, from the damage done to the *Iona* that she would soon sink. Accordingly the whole of the crew were removed to the *Chanticleer*, and the two vessels were then separated. Not long afterwards the *Iona* went down in water 150 feet deep. She was heavily laden with stores for the Confederate Government. The damage done to the *Chanticleer* was inconsiderable (*The Times*, Monday Oct 6, 1962).

The eyewitness account of Mr. Peter Ferguson, who had been the engineer in charge of the *Chanticleer*, is recorded in *The Clyde Passenger Steamer* (Williamson 1987: 115):

Iona, Mr Ferguson says, had her compasses adjusted in the Gareloch immediately previous to her departure for America in October. This being done, she was crossing to Gourrock Bay for the night without lights, when, off Fort Matilda, she was run down by the new screw steamer *Chanticleer* which was returning to Glasgow from her trial trip.

The *Iona I* is recorded to have sunk off Gourrock (Davies 1980: 134; Paterson 1972: 18), or off Fort Matilda (Burt 1937: 317; Graham 2006: 111), in some 13 fathoms (23.8m) of water. The ship sank stern first, within 20 to 30 minutes of being struck. There was no loss of life, as the crew, some of their possessions, and even a stowaway, were taken off by the boats of the *Chanticleer*.

After sinking, there is a report of some of the *Iona I*'s wreckage washing up ashore at Kilcreggan, on the north shore of the Firth of Clyde (see *Greenock Telegraph*, October 4, above). Other newspaper articles indicate that the insurance underwriters planned to raise the vessel, and that soundings were made in the neighbourhood of Fort Matilda to ascertain the position of the wreck. On October 18, the *Greenock Telegraph* reported that:

THE *IONA* – It has been resolved by the underwriters to make an attempt to raise the *Iona*. Soundings have been made in the neighbourhood of Fort Matilda, to ascertain her position, and were, we understand, attended with success. Mr Blair, Procurator Fiscal, has precognosced several townsmen who witnessed the collision, and also both crews. It is likely, therefore, that, in addition to the inquiry by the Board of Trade, there will be a criminal prosecution.

There was a Board of Trade inquiry into the accident, heard in Glasgow (Graham 2006: 112). At the inquiry, a major issue for the Lloyd's insurers was the work that had been done to

strengthen the *Iona I* for her transatlantic voyage. The new owner of the *Iona I*, David McNutt, had paid over £5,500 to the original builders, J. and G. Thomson, to reinforce the ship's hull. After the hearing, an independent surveyor claimed that the *Iona I* would never have been able to make the ocean crossing if they had encountered rough seas, as the work done was insufficient (*ibid.*). This claim may well have been justified, as the *Iona II*, which was based on the first *Iona*, but with design improvements, and which was also sold for blockade running and underwent refitting, also failed to cross the Atlantic, and sank near Lundy Island in February 1864 in heavy weather (Duckworth and Langmuir 1987: 33; Paterson 1982: 13).

The following summer, the wreck of the *Iona I* was advertised for sale, and was sold to a Glasgow man in February 1863 for £95, but the purchaser never succeeded in salvaging her (McQueen 1924: 132). This gave rise to a report that the whole story of the sinking was merely a ruse to conceal the vessel's departure, however the full report of the incident leaves no room for such an idea (*ibid.*).

Iona II and Iona III

Local tradition was responsible for the naming of new vessels after much loved earlier ships, and therefore it is not surprising that the *Iona I* was followed by the *Iona II* and *Iona III*.

The *Iona II* was constructed by J. & G. Thomson for David Hutcheson & Company Ltd, and the ship was launched in May 1863 for the Ardrishaig route. The design of the *Iona II* was based on the previous *Iona*, and because of this, the archival information and archaeological evidence from the *Iona II* (see for example: Wessex Archaeology 2005, 2008 and 2009) can be used to better understand the *Iona*. Like the *Iona I*, *Iona II* had an oscillating engine and tubular boilers (Duckworth & Langmuir 1987: 32). However, the newer vessel embodied the latest improvements in construction, and was considered an even finer example of her class than the *Iona I* (Paterson 1972: 18; Paterson 1982: 13). The vessel was longer than the *Iona I*, with a length of 245 feet, a beam of 25 feet, a draught of 9 feet, and with paddle wheels 20 feet in diameter. The *Iona II* was also fitted with full deck saloons fore and aft.

After one summer on the Ardrishaig route, the *Iona II* was also acquired by David McNutt for a Richmond client for blockade running to the Confederate ports (Graham 2006: 113). However, shortly after refitting, and whilst en-route to Nassau, this vessel was also lost. It foundered at Lundy Island in the Bristol Channel on 2nd February 1864, whilst seeking shelter from a south-westerly gale in the approaches to the Bristol Channel (Duckworth and Langmuir 1987: 33; Graham: 2006: 210; Paterson 1982: 13).

The vessel had called at Queenstown (now Cobh in the Republic of Ireland) and there is some suggestion that the crew may have mutinied over fears about the seaworthiness of the vessel (Wessex Archaeology 2008: 12-13). These fears appear to have been borne out and the *Iona II* was probably lost as a result of a leak caused by the straining imposed upon her plates by being overloaded with the coal and other stores necessary to get it across the Atlantic (Wessex Archaeology 2008: 13). There must therefore be significant doubt as to whether the similar *Iona I* would have survived the Atlantic crossing.

The *Iona III* was also constructed by J. & G. Thomson for David Hutcheson & Company, and was launched in 1864. This vessel also reflected the designs of the previous *Ionas*, with a similar layout for the hull and machinery, and was also driven by an oscillating engine.

However, there were some modifications from the previous designs, and the *Iona III* was longer and beamier than her predecessors. In fact, the *Iona III* was longer than any other Clyde steamer of the day (Paterson 1972: 19). The vessel measured 255'5'' in length, 25'6'' in breadth, and had a hold depth of 9'. The vessel had a tonnage of 191 and a gross tonnage of 393 (House of Commons Parliamentary Papers 1865). The *Iona III* had fire tube boilers, referred to as the locomotive, horizontal or navy type, and Paterson indicates that because of this, the funnels were rather stubby, possibly to improve steaming, and were spaced widely apart as the funnel uptakes were placed at the ends of the boilers (1972: 215-216). The *Iona III* steamed for over 70 seasons in first-class service (Paterson 1982: 11).

APPENDIX VII: ARCHIVE SOURCES FOR THE *IONA I*

University of Glasgow Archive Services (GUAS)

Records concerning J. & G. Thomson (GUAS Ref: UCS 1). These records are owned by the National Archives of Scotland and held for them by GUAS.

This material has not been examined for the purposes of this assessment, but GUAS has confirmed that there are no documents specifically about the *Iona I* (William Bill, GUAS, e-mail). Nevertheless there may be relevant material contained in more general documents. Further work on the site should include an assessment of this material, which includes the following:

Catalogue Ref.	Description	Dates
UCS 1/11/1	Director's private letter book (indexed)	1857-63
UCS 1/34/1	Private ledger No. 1 (indexed)	1848-68
UCS 1/34/2	Private ledger No. 2 (indexed)	1864-85
UCS 1/34/4	General ledger (index UCS 1/34/4a)	1853-63
UCS 1/36/3	Cash book	1861-67
UCS 1/36/8-9	Cashbooks Nos. 3-4, 2 volumes	1859-69

The National Archives of Scotland

The following record has been traced during the course of the assessment but it has not been examined. It is recommended that it should be assessed as part of any further work undertaken on the site:

Catalogue Ref.	Description
CS96/5005	Steamship 'Chanticleer'. Claim of the owners of the 'Chanticleer' against the owners of SS Iona

House of Commons Parliamentary Papers

1857-58, Steam vessels. Return of the whole of the registered steam vessels of the United Kingdom on the 1st day of January 1858; distinguishing vessels built of iron, and also vessels having screw propellers, and giving the aggregate number of vessels, and amount of tonnage; with an alphabetical index. (488).

1859, Marine engines. Amended report to the Lords Commissioners of the Admiralty by the Committee on Marine Engines, with replies by the Surveyor of the Navy. Session 2 [2583].

1860, Steam vessels. Return of the whole of the registered steam vessels of the United Kingdom on the 1st day of January 1860; distinguishing vessels built of iron, and also vessels having screw propellers, and giving the aggregate number of vessels, and amount of tonnage; with an alphabetical index. (449).

1861, Steam vessels. Return of the whole of the registered steam vessels of the United Kingdom on the 1st day of January 1861; distinguishing vessels built of iron, and also vessels having screw propellers, and giving the aggregate number of vessels, and amount of tonnage; with an alphabetical index. (371).

1862, Steam vessels. Return of the whole of the registered steam vessels of the United Kingdom on the 1st day of January 1862; distinguishing vessels built of iron, and also vessels having screw propellers, and giving the aggregate number of vessels, and amount of tonnage; with an alphabetical index. (319).

1863, North America No. 3. (1863). Correspondence respecting the Alabama. Presented to both houses of Parliament by command of Her Majesty. London. Printed by Harrison & Sons. House of Commons Parliamentary Papers, 1864, Return to an order of the Honourable the House of Commons, dated 14 March 1864; -- for, a return, 'in tabular form, with consecutive numbers, of the whole of the steam vessels registered in the United Kingdom on or before the 1st day of January 1864 [...]. (371).

1865, Steam vessels. Return of the whole of the registered steam vessels of the United Kingdom on the 1st day of January 1865; distinguishing vessels built of iron, and also vessels having screw propellers, and giving the aggregate number of vessels, and amount of tonnage, with an alphabetical index (422).

Other Archive Material not Examined or Traced

Board of Trade Inquiry into the loss of the vessel

Lloyds Loss Books for 1862

Official Records of the Union and Confederate Navies (38 volume documentary archive available on-line)

APPENDIX VIII: IONA I TIMELINE

Date	Event
1855	Built by J&G Thomson, Glasgow.
Mar. 1855	Launched and entered service for David Hutcheson & Company. Used as an excursion steamer on the Royal Route from Glasgow to Ardrishaig. Achieved fame as the fastest and most luxuriously furnished excursion vessel in the region.
Aug. 1861	Temporary repairs made in Kyles of Bute after the vessel broke down.
Sept. 1862	Last passenger sailing. Vessel sold to David McNutt to become a blockade runner in the American Civil War. Stripped of fittings, painted grey and prepared for crossing the Atlantic.
2 Oct. 1862	Sank following collision with screw steamer <i>Canticleer</i> in the Inner Clyde Estuary. Board of Trade Inquiry subsequently held.
1863	Wreck sold to a Glasgow man. Salvage intended but not achieved.
1950s	Wreck reportedly subject to limited salvage work by local firm.
1983	Wreck known to have been visited by recreational scuba divers and provisionally identified as the <i>Iona I</i> by this date.
1983-2008	Wreck frequently visited by recreational divers. Intrusive investigations carried out and artefacts recovered. Wreck featured in published wreck inventories and dive guides.
2009	Wreck reported to be infrequently dived. Subject to archaeological investigation on behalf of Historic Scotland.

APPENDIX IX: RECORDING LEVELS

Level	Type	Objective	Sub-level	Character	Scope	Description
1	Assessment	A record sufficient to establish the presence, position and type of site.	1a	Indirect (desk-based)	A basic record based on documentary, cartographic or graphic sources, including photographic (incl. AP), geotechnical and geophysical surveys commissioned for purposes other than archaeology.	Documentary assessment / inventory of a site, compiled at the start of work on a site, and updated as work progresses.
			1b	Direct (field)	A basic record based on field observation, walkover survey, diving inspection etc., including surveys commissioned specifically for archaeological purposes.	Typically a 1-2 dive visit to the site (to assess a geophysical anomaly, etc.).
2	Evaluation	A record that provides sufficient data to establish the extent, character, date and importance of the site.	2a	Non-intrusive	A limited record based on investigations that might include light cleaning, probing and spot sampling, but without bulk removal of plant growth, soil, debris etc.	Typically a 2-4 dive visit to assess the site's archaeological potential, backed up by a sketch plan of the site with some key measurements included.
			2b	Intrusive	A limited record based on investigations including vigorous cleaning, test pits and/or trenches. May also include recovery (following recording) of elements at immediate risk, or disturbed by investigation.	Either an assessment of the buried remains present on a site; the recovery of surface artefacts; or cleaning to inform for example a 2a investigation.
3	In situ	A record that enables an Archaeologist who has not seen the site to comprehend its components, layout and sequences.	3a	Diagnostic	A detailed record of selected elements of the site.	The first stage of a full record of the site. This would include a full measured sketch of the site and a database (or equivalent) entry for all surface artefacts.
			3b	Unexcavated	A detailed record of all elements of the site visible without excavation.	Full site plan (i.e. planning frame or equivalent accuracy) with individual object drawings, and full photo record (possibly including a mosaic).
			3c	Excavated	A detailed record of all elements of the site exposed by open excavation of part or whole of the site.	This may take the form of full or partial excavation of a site.
4	Removal	A record sufficient to enable analytical reconstruction and/or reinterpretation of the site, its components and its matrix.			A complete record of all elements of the site in the course of dismantling and/or excavation.	

Level	Type	Objective	Sub-level	Character	Scope	Description
5	Intra-site	A record that places the site in the context of its landscape and other comparable sites.			A complete record of all elements of the site, combined with selective recording of comparable sites and investigation of the surrounding area.	

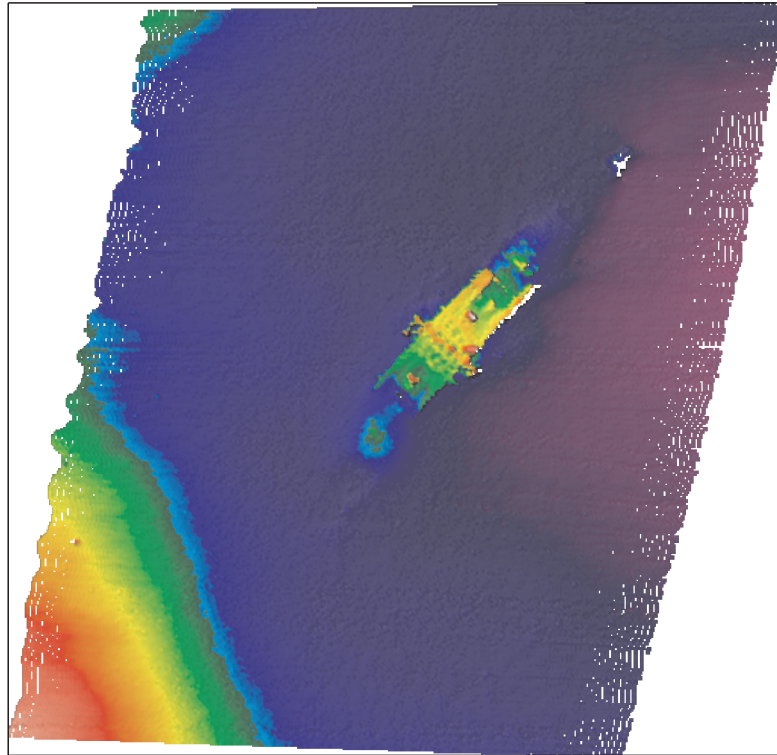
Note: these levels represent guidance formulated by Wessex Archaeology for use during the archaeological investigation of wreck sites. They are currently used by curators, but have not been formally accepted as a standard means of grading archaeological work.



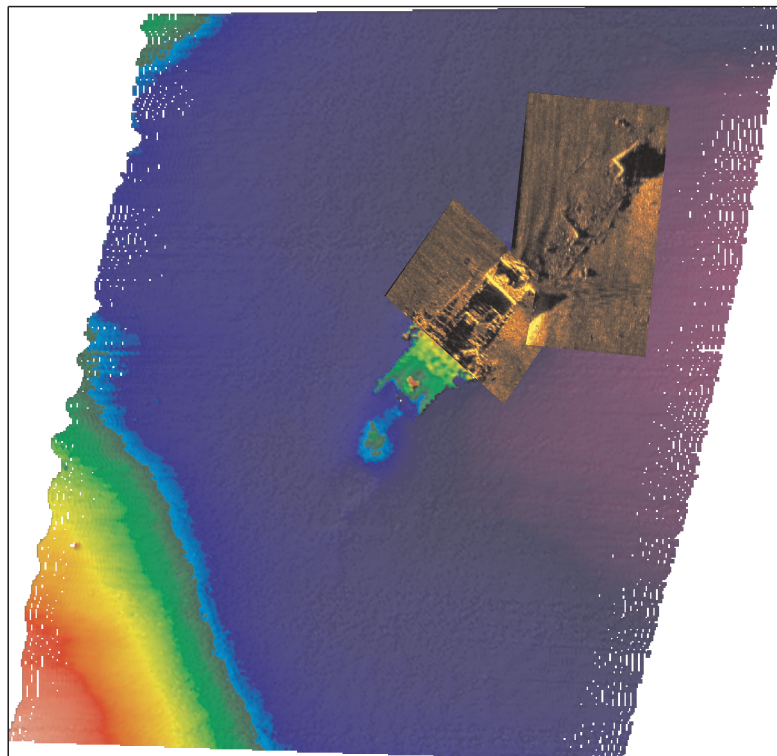
<p>● Geophysics and tracked diver position for funnel base 2013: 55°58.0780'N 04°47.1998'W (WGS84 zone 30N)</p> <p>Wessex Archaeology</p>	<p>Inset Digital Map Data © (2005) XYZ Digital Map Company. This product has been derived, in part, from Crown Copyright Material with the permission of the UK Hydrographic Office and the Controller of Her Majesty's Stationary Office (www.ukho.gov.uk) All rights reserved. (Wessex Archaeology Licence Number 820/020220/11) NOT TO BE USED FOR NAVIGATION WARNING: The UK Hydrographic Office has not verified the information within this product and does not accept liability for the accuracy of reproduction or any modifications made thereafter. This material is for client report only © Wessex Archaeology. No unauthorised reproduction.</p>			
	Date:	20/03/09	Revision Number:	0
	Scale:	1:20,000	Illustrator:	KJB
Path:		U:\Projects\53111\Drawing Office\Report figures\2008\z30_Iona II\Arch Report		

Iona I site location

Figure 1



A. Multibeam swath bathymetry of site and vicinity (copyright Clydeport)



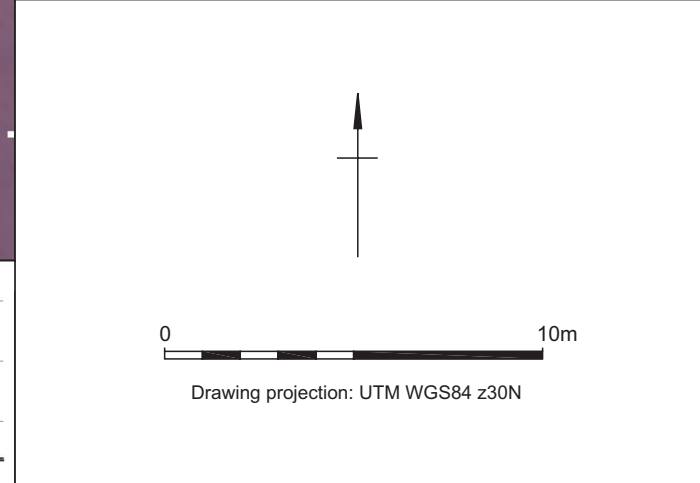
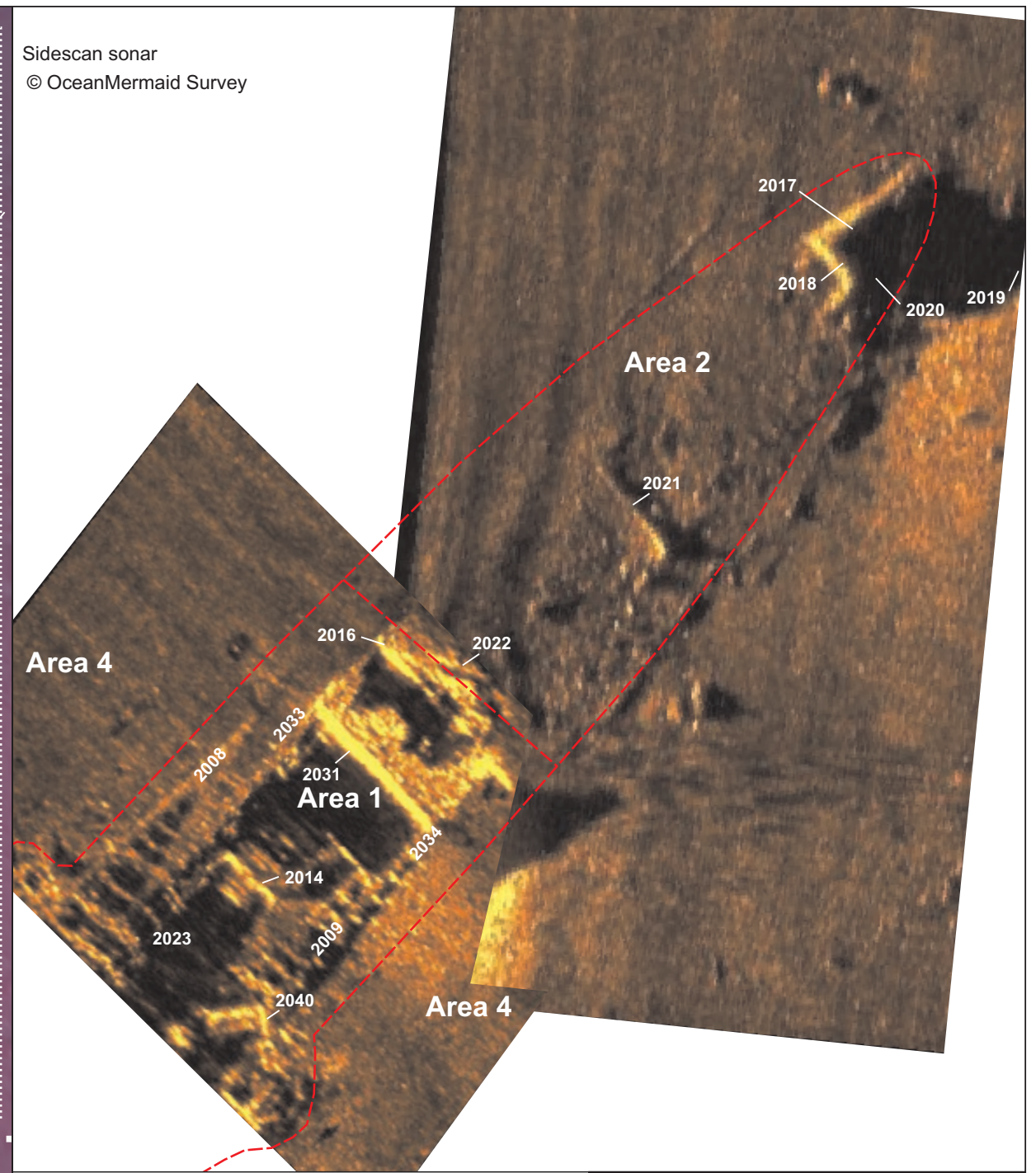
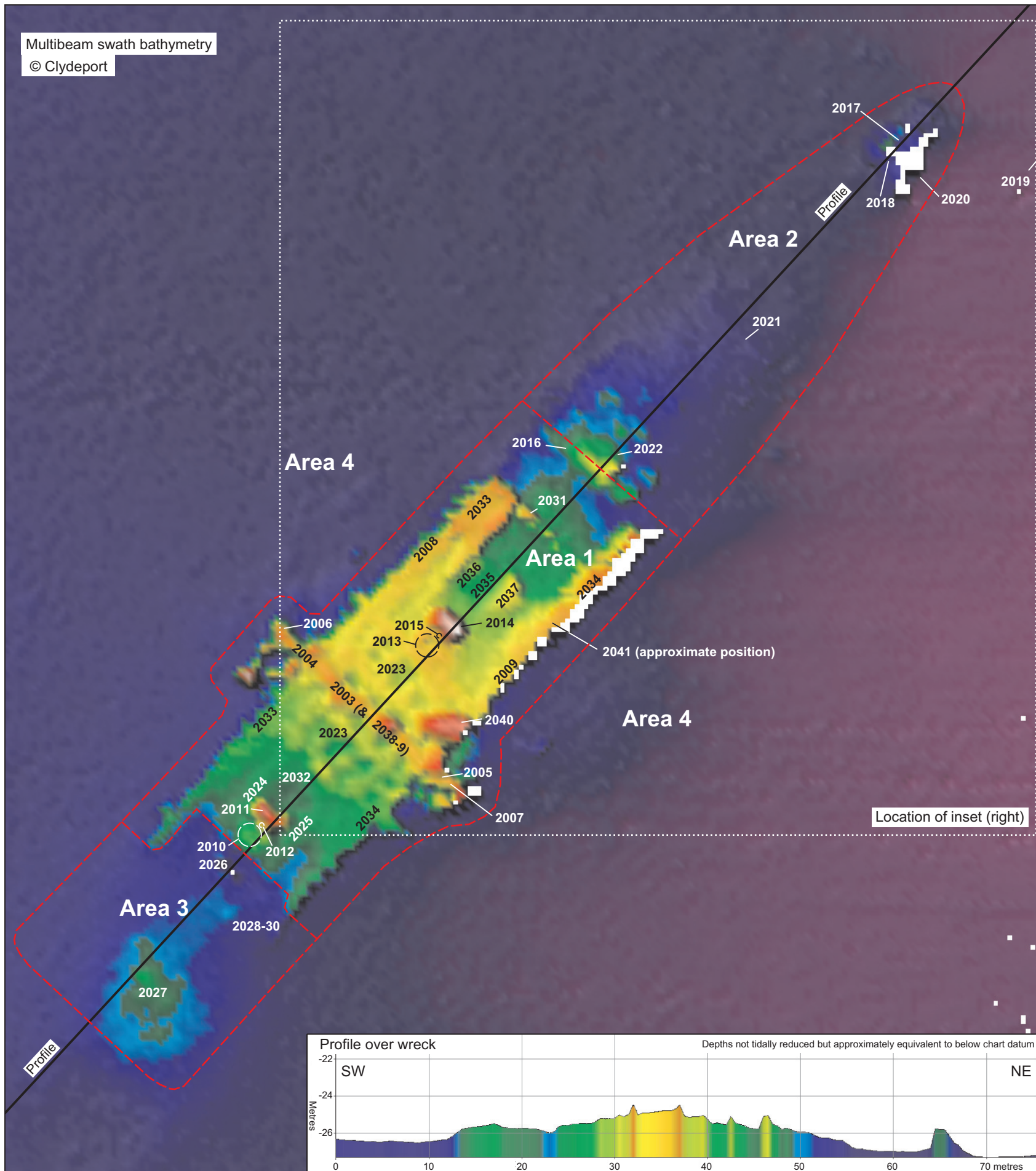
B. Multibeam swath bathymetry of site with sidescan sonar images (copyright Clydeport and OceanMermaid Survey)

Drawing projection: UTM WGS84 z30N



This material is for client report only © Wessex Archaeology. No unauthorised reproduction.			
Date:	20/03/09	Revision Number:	0
Scale:	1:1000	Illustrator:	KJB
Path:	U:\Projects\53111\Drawing Office\Report figures\2008\z30_Iona II\Arch Report		

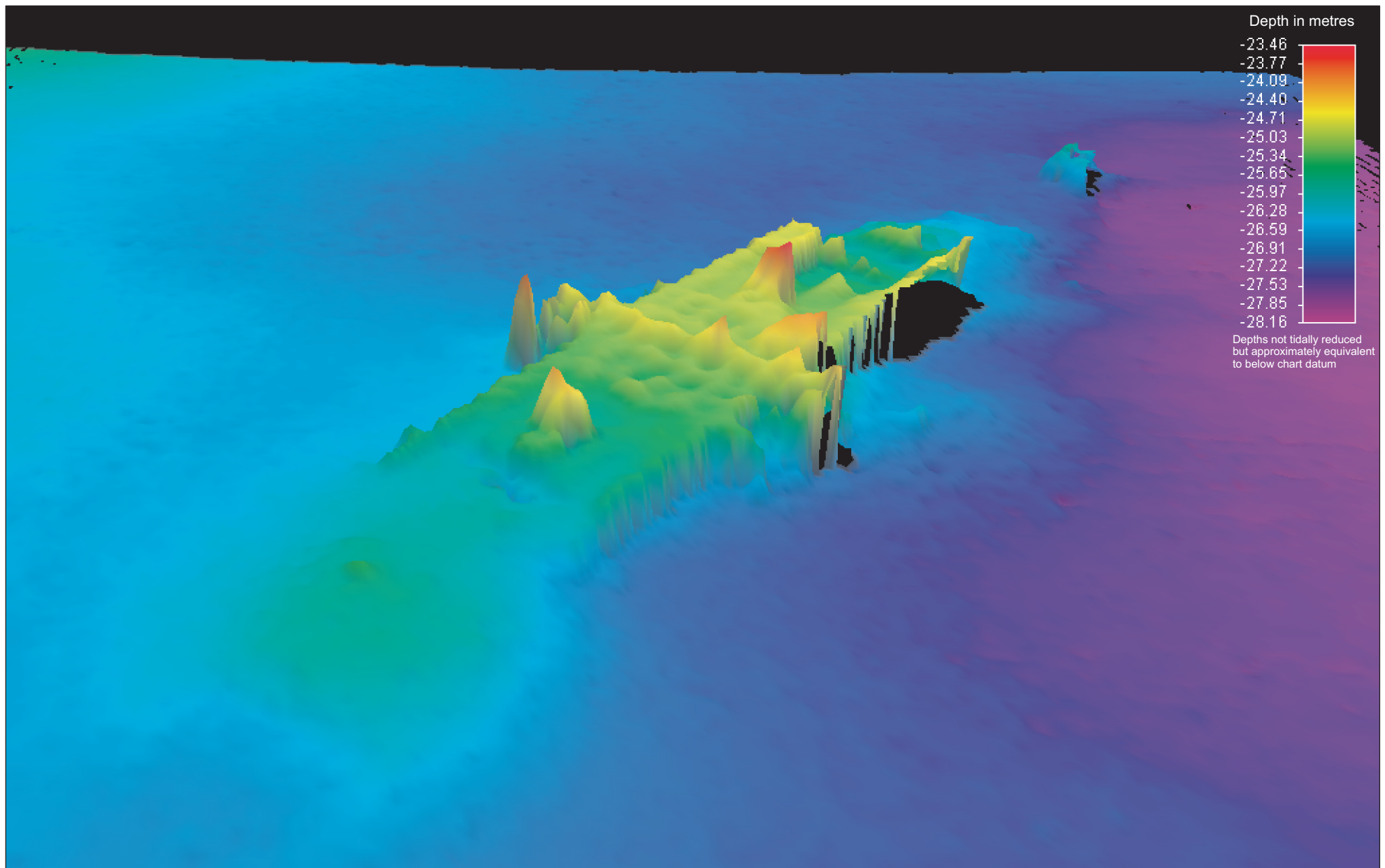





<small>This material is for client report only © Wessex Archaeology. No unauthorised reproduction.</small>	
Revision Number:	0
Illustrator:	KJB
Date:	06/04/09
Scale:	1:200 @A3 (profile 1:500 horizontal 1:250 vertical)
Path:	U:\PROJECTS\53111\Drawing
Office\Report Figures\2008\z30_2008_lona I	

2009 WA site plan

Figure 3



 <p>This material is for client report only © Wessex Archaeology. No unauthorised reproduction.</p>	Date:	06/04/09	Revision Number:	0
	Scale:	Not to scale	Illustrator:	KJB
	Path:	U:\PROJECTS\53111\Drawing Office\Report Figures\2008\z30_2008_\tona I		

Multibeam swath bathymetry, oblique view looking north

Figure 4

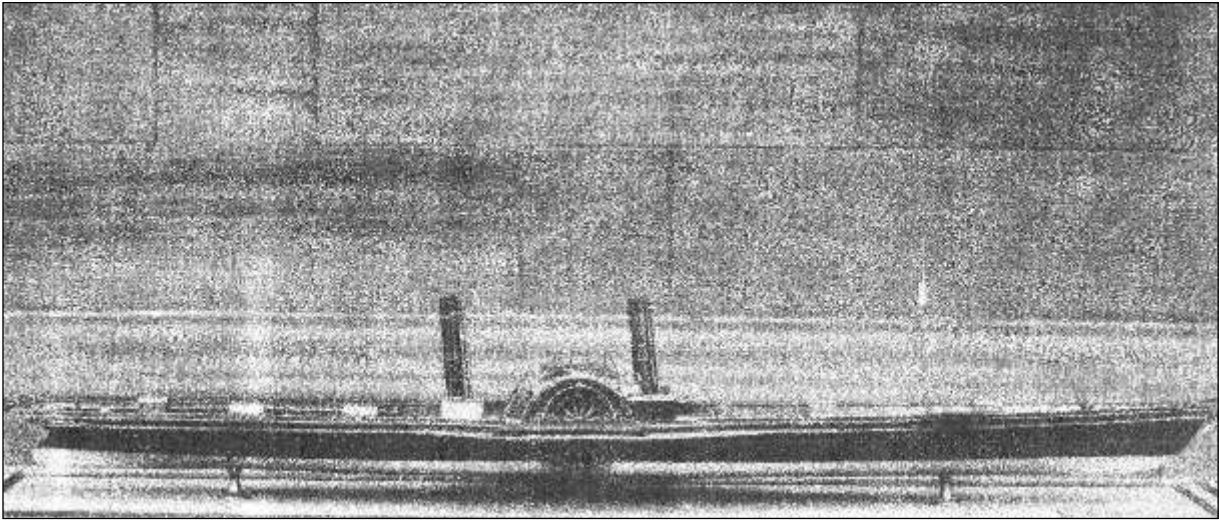


Plate 1: Model of the *Iona I* (courtesy of Peter Moir)



Plate 2: Detail of the *Iona I* model (copyright Glasgow Museums Service)

This material is for client report only © Wessex Archaeology. No unauthorised reproduction.

Date: 20/03/09

Revision Number: 0

Scale: N/A

Illustrator: KJB

Path: U:\PROJECTS\53111\Drawing Office\Report Figures\2008\z30_2008_Iona I\Undes report

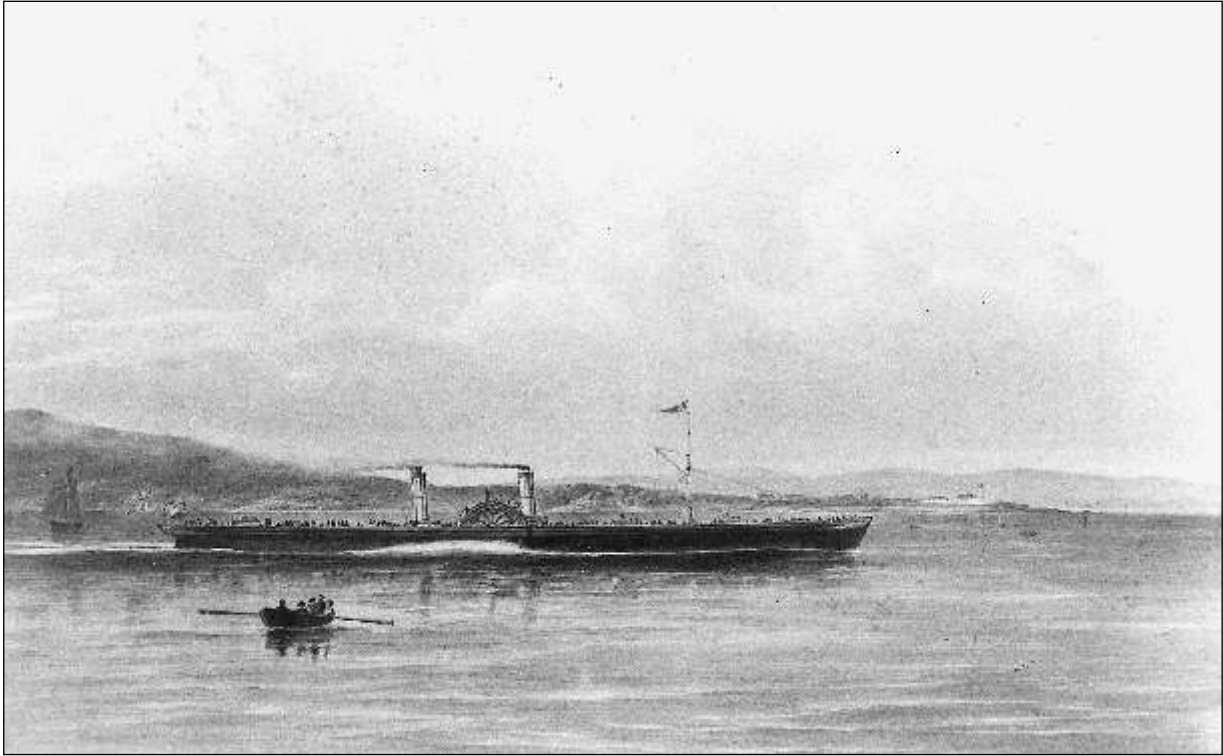


Plate 3: Contemporary drawing of the *Iona I* (courtesy Peter Moir)

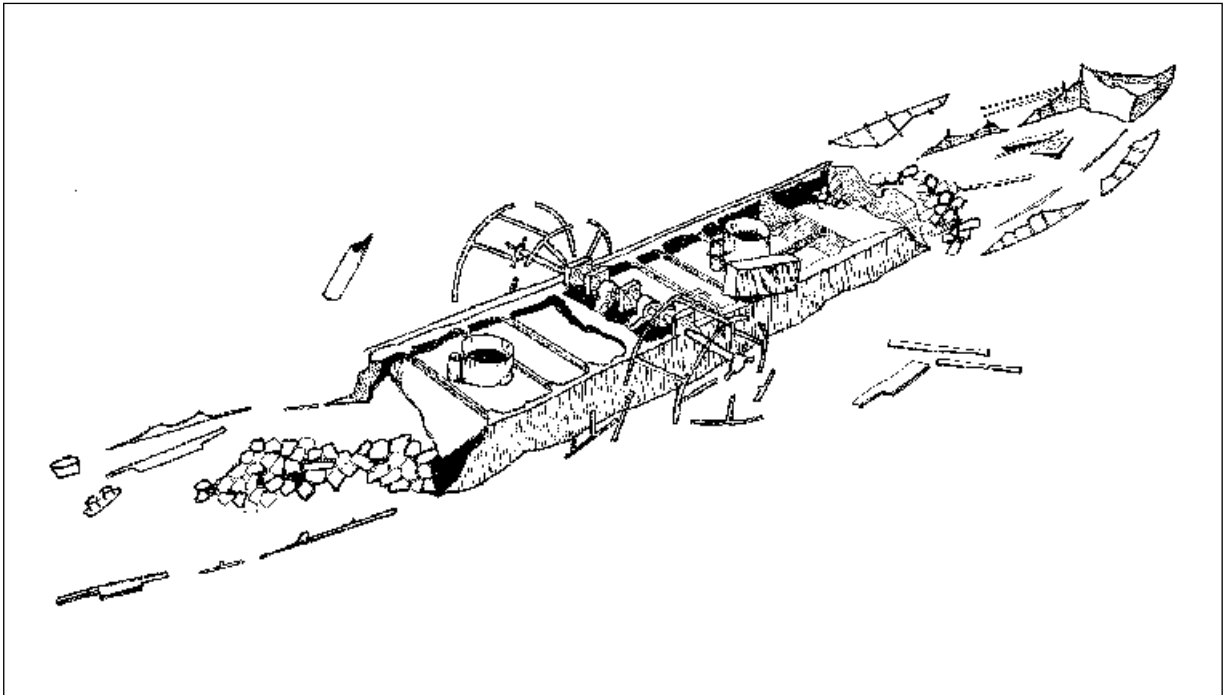


Plate 4: Sketch of site (copyright Peter Moir)

This material is for client report only © Wessex Archaeology. No unauthorised reproduction.

Date: 20/03/09

Revision Number: 0

Scale: N/A

Illustrator: KJB

Path: U:\PROJECTS\53111\Drawing Office\Report Figures\2008\z30_2008_Iona I\Undes report

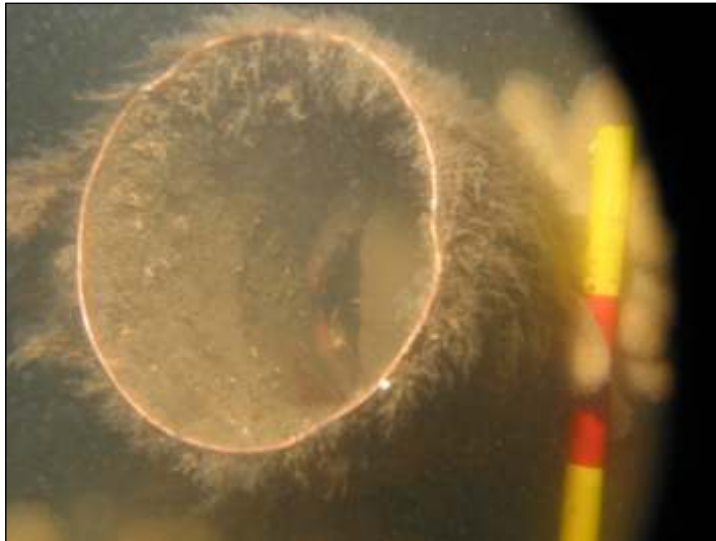


Plate 5: Cuprous pipe 2015 (scale 10cm divisions)



Plate 6: Unidentified iron cylinder 2011 from above (scale 10cm divisions)



Plate 7: Crankshaft/piston detail (copyright Peter Moir)



Plate 8: Builders plate found on the site



Plate 9: Scuttle found on site

This material is for client report only © Wessex Archaeology. No unauthorised reproduction.

Date: 20/03/09

Revision Number: 0

Scale: N/A

Illustrator: KJB

Path: U:\PROJECTS\53111\Drawing Office\Report Figures\2008\z30_2008_Iona I\Undes report



© Simon Adey-Davies.



WESSEX ARCHAEOLOGY LIMITED.

Registered Head Office: Portway House, Old Sarum Park, Salisbury, Wiltshire SP4 6EB.

Tel: 01722 326867 Fax: 01722 337562 info@wessexarch.co.uk www.wessexarch.co.uk

London Office: Unit 113, The Chandlery, 50 Westminster Bridge Road, London SE1 7QY.

Tel: 020 7953 7494 Fax: 020 7953 7499 london-info@wessexarch.co.uk www.wessexarch.co.uk



Registered Charity No. 287786. A company with limited liability registered in England No. 1712772.