

CITY OF ADELAIDE

A PROPOSAL FOR HER REUSE



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1. SUMMARY

- 1.1 During the 15 years that the 'City of Adelaide' has lain on a slipway at Irvine, various proposals have been put forward for her preservation or restoration; the options considered have ranged from restoring her to seagoing condition to preserving her afloat or ashore as a museum ship.
- 1.2 The cost of restoring the City of Adelaide as a ship is considerable due to her composite construction and also because only her bare hull remains without fixtures, fittings, furniture or rig. As a result of the high costs no proposal for her restoration or preservation has progressed and the Scottish Maritime Museum, who own the ship, are, as a last resort, intending to cut her into sections, some of which can then be displayed under cover in museums.
- 1.3 The proposal set out in the pages that follow approaches the problem of the City of Adelaide differently. Instead of restoring or preserving her as a ship, we propose to convert the ship's hull to a unique and distinctive building while retaining the features of the hull that made the ship so successful; her iron frame, her timber planking and her lines will all be preserved. Reusing the hull in this way has a number of advantages:

- The scheme will be unique. While small craft such as fishing boats have been reused as buildings, it has never been done with a full size ship.
- The City of Adelaide's lack of internal bulkheads gives very impressive internal spaces which are particularly suitable for use as a building.
- Inverting the hull reduces the stress on the most corroded parts of the ship's frames. Very little intervention steelwork will be required to support the hull which will enable the hull shape and the ship's construction to be readily observed and appreciated by visitors.
- The reused hull will be a highly iconic structure; it could form a centrepiece of a major waterside development.
- The maintenance cost will be similar to that of a building rather than a preserved ship.
- The project is sustainable and reversible. If a future generation wishes they will be able to reverse the process and restore or preserve the hull in a different way.

Essentially, our proposal is to change the City of Adelaide from a liability into an asset by giving her hull a new and completely different life as the upside down ship.



City of Adelaide at Irvine 2007

2. SHORT HISTORY

2.1 The history of the City of Adelaide is set out in detail on the websites of the Sunderland Maritime Trust and Save the Clipper Ship City of Adelaide Action Group; their respective web addresses are in Section 10 of this document. Set out below is a brief chronology of the ship's life.

1864 Built as a full rigged ship in Sunderland by William Pile and Hay. The City of Adelaide's principal dimensions are:

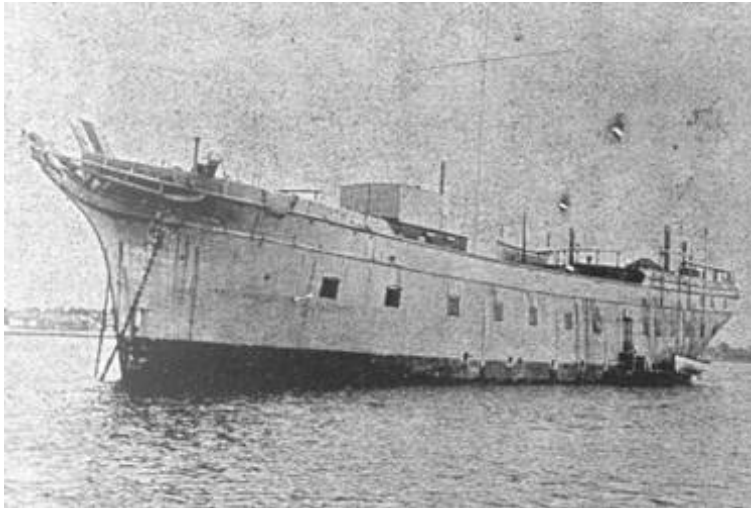
Length Overall	53.85m
Beam	10.13m
Draught	5.64m
Gross Tonnage	860

She was specifically designed as an emigrant ship with 14 first class cabins plus flexible accommodation for second class passengers on the 'tween deck.

1864 – Made a total of 23 voyages to South Australia carrying
1886 passengers and cargo.

1887 – Worked as a collier between the Tyne and Dover.
1889

- 1893 Purchased by Southampton City Council who derigged her and converted her to an isolation hospital ship moored on the River Test.



City of Adelaide as an isolation hospital at Southampton

- 1923 Purchased by the Royal Navy and name changed to HMS Carrick. She was moved to the Firth of Clyde where she was converted to a training ship for the Royal Navy Volunteer Reserve.
- 1949 Moved to Greenock and used first as a Navy Drill ship and then as a club ship for the RNVR Club of Scotland.
- 1990 Sold to the Clyde Ship Trust for £1.

- 1992 Given an 'A' Class listing by Scottish Heritage. The Clyde Ship Trust was dissolved and ownership was transferred to the Scottish Maritime Museum. The ship was moved to Irvine and some repairs carried out.

- 2000 The Scottish Maritime Museum offered the ship for sale to various historical organisations and museums; there were no offers. The museum applied for listed building consent to dismantle the ship.

- 18 Apr 2007 North Ayrshire approves the dismantling of the ship subject to conditions. One of the conditions is that the application has to be referred to Historic Scotland.

3. **SIGNIFICANCE**

3.1 Composite sailing ships with frames of iron and timber planking were built for a brief period from around 1860 to 1880. The first all iron ships predated the composite ships but early iron ships, while providing greater strength than timber ships, suffered a number of disadvantages. One problem is that their hulls lacked insulation so they tended to 'sweat' with condensation which could damage sensitive cargoes. Another difficulty was fouling of their hulls as early anti-fouling paints were not very effective. Timber planked ships had their bottoms sheathed with copper which is an efficient anti-fouling treatment. Iron hulled ships could not have copper sheathing so they tended to make slower passages than copper sheathed ships.

3.2 Composite ships were constructed with a riveted iron structural frame consisting of hull frames, stringers, deck beams and diagonal strapping to the hull and deck. Timber planking was then bolted to the iron frames, usually with bronze bolts.

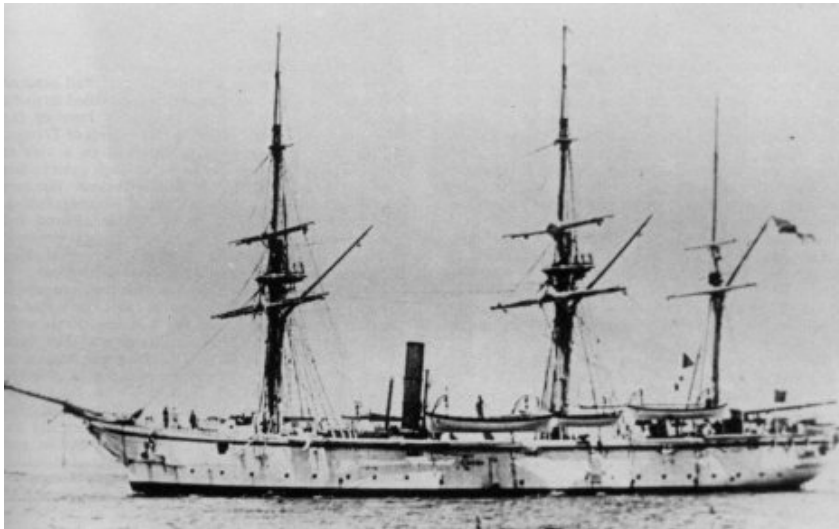
3.3 The use of an iron frame gave a rigid structure which could be made longer and narrower than a timber ship and could carry high rigging loads. The small section size of the steel frames gave more internal space than timber framed ships while the timber planking provided insulation and enabled copper sheathing to be attached for effective anti-fouling.

3.4 Composite ships were not easy to build requiring shipwrights skilled in riveted ironwork as well as timber work. However, the combination of the iron frame with timber planking produced the fastest ships of the age of sail.

3.5 While composite ships were built for speed their construction did not lend itself to longevity; in particular, the use of bronze bolts with iron frames results in corrosion of the ironwork. This feature together with the short period during which composite ships were built has resulted in there only being four left in the world today. The four are:

City of Adelaide	Built in Sunderland 1864
Cutty Sark	Built in Dumbarton 1869
Ambassador	Built in Rotherhithe 1869
HMS Gannet	Built in Sheerness 1878

- 3.6 HMS Gannet was built as a warship and is more heavily constructed than the other three. She is also different in having been built with an auxiliary engine with a retractable propeller. She has recently undergone a major restoration programme and is preserved afloat in a dock basin at Chatham Historic Dockyard.



HMS Gannet off Malta in 1894

- 3.7 Ambassador was launched in the same year as the Cutty Sark. She is of similar size and remarkably similar construction to her more famous cousin. Ambassador lies on San Gregorio beach, North of Punta Arenas in Chile. While she has been stripped of her timber planking, her iron frame remains an object of fascination. She is the same length as the City of Adelaide but with 600mm less beam.



Ambassador's stern

© James Delgado



© James Delgado

Ambassador showing internal space

- 3.8 Cutty Sark is part way through a major refurbishment programme whereby she is to be raised within her dry berth at Greenwich in order to provide additional function space below her hull. In essence she is being converted into a building with the ship, the 'right' way up, being built into the roof. To do this a steel framework is being constructed around her and within her lower hold.

**Cutty Sark in 2006**

- 3.9 The Cutty Sark project suffered a major set-back when the ship caught fire on 21 May 2007. Fortunately much of her original material, including the cabins and rig had been removed from the ship prior to the fire so the Cutty Sark's restoration project can still proceed albeit at an increased cost.

- 3.10 The City of Adelaide was the only one of the four ships built to carry passengers and these passengers were to be principally emigrants. Her role in supporting the colonisation and development of Australia has resulted in there being a wealth of documentary data available on her early passages; this material includes a number of diaries kept by her passengers.



City of Adelaide – 1864 Lithograph

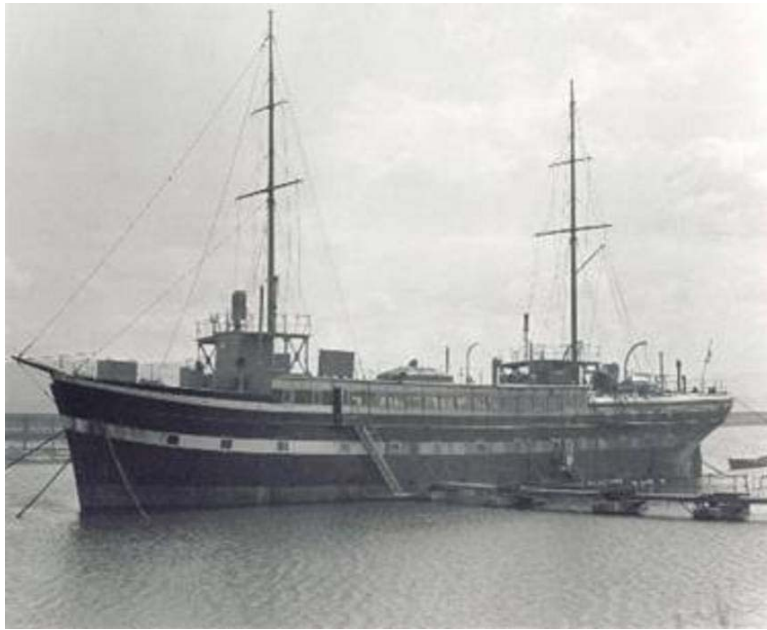
- 3.11 As Ambassador is now beyond saving, the City of Adelaide is one of only two composite built merchant ships which can be preserved for future generations. She is the only surviving composite built passenger ship and is consequently uniquely capable of providing an insight into the life of Australia's early immigrants.

- 3.12 We have inspected her to assess her structural condition; her ironwork is generally as good if not better than the Cutty Sark's. Her planking condition is variable but the great majority of it can be saved. Areas of her decks are more seriously decayed. Photos taken during our inspection can be seen at www.cityofadelaide.co.uk.

4. **THE PROPOSED SCHEME**

4.1 Concept

As all efforts to save the City of Adelaide by treating her as a ship have failed this proposal is for reusing her hull as a different form of structure – a building. To turn a vessel's hull into a building envelope is, in principle, a simple matter; all that is required is to invert the hull. Small craft such as fishing boats have frequently been reused in this way and examples can be seen in locations such as Holy Island in Northumberland where they are used as fishermen's sheds and also as a visitor centre.



The ship in 1923 as HMS Carrick on the river Clyde

While the principle of reusing vessels as buildings is not new it has not, as far as we can discover, ever been done with a full sized sailing ship. A fishing boat makes a relatively small single storey building suitable for a hut or workshop; the City of Adelaide will create a very much larger and more impressive building. She will provide three or possibly four levels of accommodation with the uppermost space, the main hold, measuring around 9m x 44m x 3.7m high. This highly unusual but attractive space could be suitable for many uses such as an art gallery, conference centre, museum, restaurant, theatre or similar functions which do not require much natural light.

The tween deck level will be of the same plan area but with less headroom. It could more readily be subdivided without losing impact. The windows that have been cut into the hull give reasonable natural light to the tween deck.

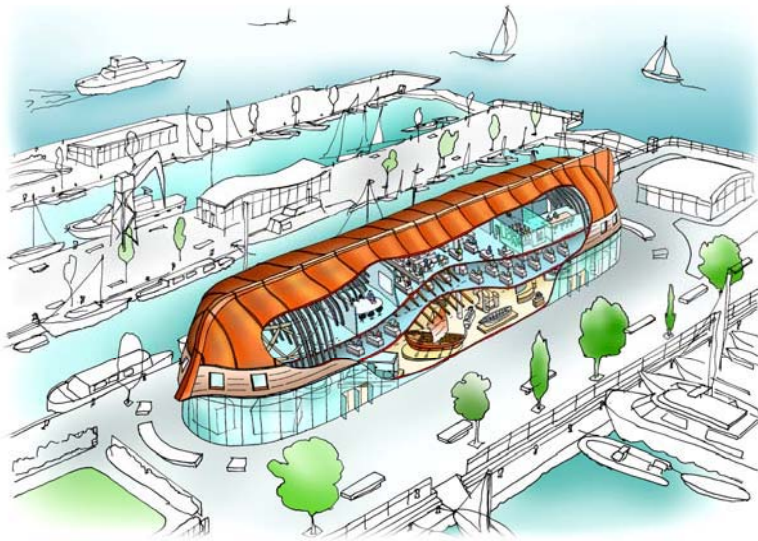


© Scottish Maritime Museum

City of Adelaide Main hold

Beneath the main deck of the ship the headroom will be determined by the level at which the hull is set. If the hull is set high there could be a floor beneath the poop deck and foc's'le decks giving four storeys at the hull ends but three storeys in the centre with a double height at ground level.

Access from the ground level to the upper levels would be by lift and staircases. The liftshaft could be set in the original hatch locations or alternatively, at ground level, be housed within a replica of the original deckhouse.



Artists impression of City of Adelaide reused at Glasgow City Docks

4.2 Structure

The structural strength of a composite ship lies principally in the iron frames with the timber planking present to keep out wind and water. While the condition of the City of Adelaide's iron frames is much deteriorated, the loads the frame will have to withstand when acting as a building are very much less than when she was sailing.

When a ship is ashore and supported on her keel the weight of her sides imposes a bending moment on the frames which tends to result in the gradual dropping of the bilges and loss of

deadrise. The effect is made worse by the stress being greatest on the lower portion of the frames which, since they have been immersed in bilge water, tend also to be the most corroded.



City of Adelaide Stern View

To prevent the bilges from sagging, cradles are required to spread the support over a wide area. If isolated props are used to support the ship local deflection of the hull around the props can develop over time. While supporting a ship on cradles preserves her hull shape, the cradles make it difficult to see and appreciate the shape of the lower hull.



City of Adelaide at Irvine showing condition of planking

Inverting the hull completely alters the loading in the frames; the frames now act as tied and propped arches acting principally in compression rather than bending. The stress in the most corroded lower part of the frames (now the upper part) is greatly reduced while the least corroded part of the frames near the gunwale takes the most load. As support can be virtually continuous along the hull perimeter, no part of the hull frame will be heavily loaded.

To provide additional support to the inverted hull, stubs of the three masts can be installed extending from the keelson to foundations in the ground. The masts can be used to provide additional support to the keel and, if required, support to the

tween and main decks. The mast stubs could have a secondary function as air handling ducts.

The decks will require supplementary beams to be placed between the existing beams to support a new levelled floor surface.

4.3 Conservation

As the stresses on the hull will be greatly reduced by being inverted, major conservation work will not be required. Parts of the iron framework will be impregnated with chloride ions which could create ongoing corrosion in the presence of moisture. By inverting the ship the previously wettest part of the structure around the keel will become the driest part. By providing air conditioning to the main hold area, the humidity can be maintained at a low level irrespective of the use of the space.

The conservation work required on the hull for its new use is expected to consist of the following work, some of which will need to be done at Irvine but the majority can be done at the ship's new location:

- Refasten sprung plank ends to hull
- Replace/repair seriously decayed timber
- Seal planking seams. A combination of methods is likely to be required with the wider seams being splined.
- Break out and remove concrete from the bilges
- Recopper the hull bottom (now the roof). Under the new copper, felt, insulation, plywood or other substrates can be applied
- Seal and paint the topsides. To reduce future maintenance to the minimum sheathing the topsides could be considered
- Fit new windows
- Refurbish, replace or seal portholes
- Wet blast the hull internally and paint.

This minimal approach to conservation is made possible because the hull will effectively be within an enclosure formed by its own new copper bottom which, unlike a ship's deck, is shaped to shed rain.

The extent of conservation or restoration work will also be minimised because the ship is no longer being presented as a ship. Thus there is no need or reason to replicate all the missing ship features such as the rig, the deckhouses, the winches, the

cabins or the furniture. Some elements can be reproduced if required, perhaps an upside-down captain's cabin, but it is not necessary for the project.

4.4 Benefits of the Scheme

The proposed scheme is designed to realise the maximum commercial benefit from the City of Adelaide's hull for the least capital and maintenance cost. At the same time the scheme preserves the hull intact and displays the hull in a manner which permits full appreciation of the hull shape and the method and quality of its construction.

The inverted hull will have very great presence standing over 11 metres high with a glazed lower perimeter wall. The hull is an object of beauty when viewed from inside or out and could make an ideal centrepiece building for a waterside regeneration project.

The inverted hull will provide a unique building structure; it will be historic, quirky, beautiful and, as a sustainable project in tune with the 21st Century.

The project is also unlikely to be copied since few, if any other ships lend themselves as well to this treatment. Her composite construction means that her hull is already well insulated unlike

later iron or steel ships which would need to have insulation added. There are few surviving earlier timber ships and those that have survived are mostly well preserved as ships; the remaining empty hulled timber ships are generally in too poor condition to be converted to buildings in this way.

Thus the City of Adelaide, if she is saved from being cut up by this scheme, can be expected to remain the only upside down ship in the World.

5. POSSIBLE SITES

- 5.1 The new location for the City of Adelaide has to be a site adjacent to navigable water since moving her any distance on land is likely to be prohibitively expensive. An ideal site would be a dockside in a regeneration area where the inverted hull would form a centrepiece of the site's redevelopment and thereby add value to the wider area.
- 5.2 Ideally the site will also have an historical connection to the ship. We have provisionally identified six possible locations although there may be other locations equally suitable.

5.3 Glasgow

The ship has spent more of her life in Glasgow than anywhere else and there is much local affection for her. An ideal location for the project could have been as part of the new extension to the Scottish Transport Museum but the new extension is now being built to a design by Zaha Hadid.

An alternative possibility is the City Docks regeneration project where the City of Adelaide could fit readily alongside the old dry docks. An image of the City Docks with a hull image superimposed is shown below:



5.4 Sunderland

The Sunderland Maritime Trust is an active campaign group in Sunderland working towards raising money for the return of the ship to the town where she was built. The group has a proposal for displaying her afloat in a wet basin. This proposal is ambitious and expensive so as a first stage the group is seeking to raise funds just to return the ship to Sunderland.

An alternative site in the docks is shown in the image below.



5.5 Middlesbrough

Middlesbrough does not have much of a historical link with the ship although it is possible that she called at the port during her coastal trading years. Middlesbrough does however have an ideal site for the project at the disused City Centre Docks where a major regeneration scheme is planned.

An image of the site with the hull superimposed is shown below:



5.6 Southampton

The City of Adelaide spent thirty years in Southampton as an isolation hospital ship and the port was also a port of call during her emigrant ship years.

Southampton City Council has plans for a major regeneration of Mayflower Park; depending upon the final choice of layout for the regeneration, the inverted City of Adelaide could add value to the project.

The image below of Mayflower Park with the hull superimposed shows the scale of the ship. As land reclamation is being considered as part of the regeneration, the position of the hull could be very different.



5.7 London

London was the City of Adelaide's departure port during her 23 years as an emigrant ship. There are a number of sites in London where her hull could be located. These range from opposite the Cutty Sark on the Isle of Dogs to the Royal Docks, Blackwall Peninsular or possibly at Convoys Wharf. A more intriguing location could be at Rotherhithe where the Ambassador was built in 1869.

5.8 Adelaide

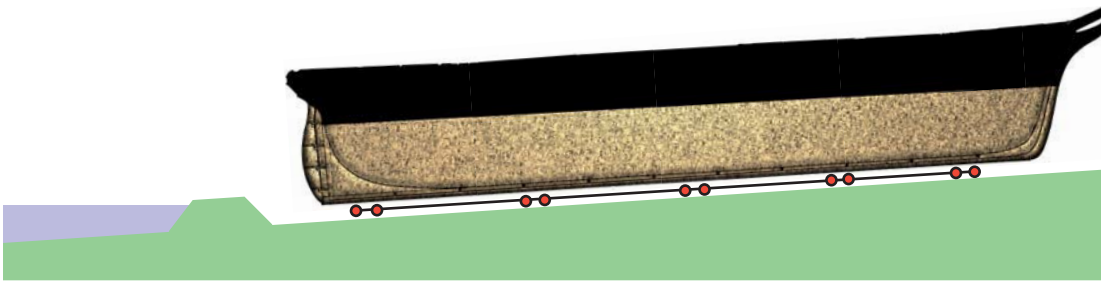
The Save the Clipper Ship City of Adelaide Action Group has plans to take the ship to Adelaide for preservation ashore. At present the group is attempting to raise funds just to transfer the ship to Australia.

Of all the possible locations the ship has arguably the greatest historical significance for Adelaide as she not only carried the City's name but also played a vital part in the early development of the City. Many of today's inhabitants of South Australia had ancestors who were passengers on the ship.

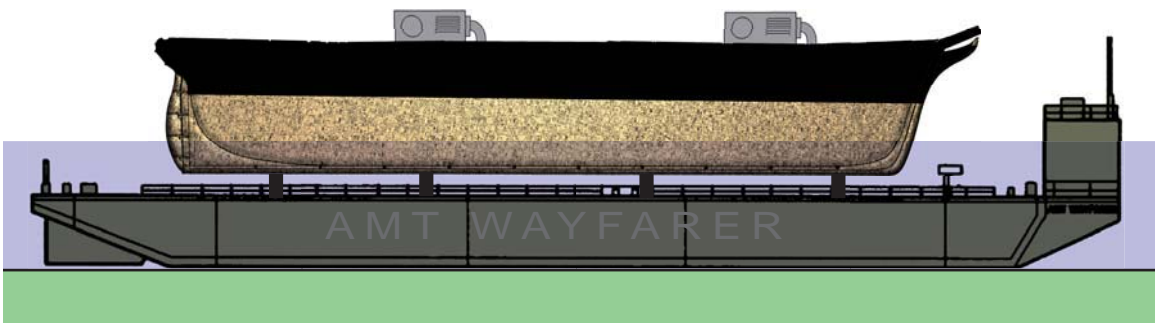
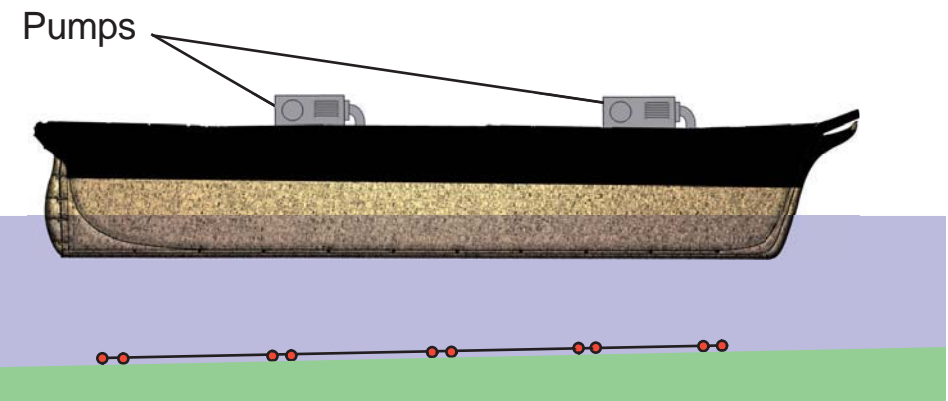
While Adelaide would make an ideal location for the project, the cost of transporting the ship half way round the world is likely to be a major obstacle.

Vessel Movement Sequence

1. Refasten loose planks to bottom and seal seams to above light water line. Remove bund and dredge channel as necessary.

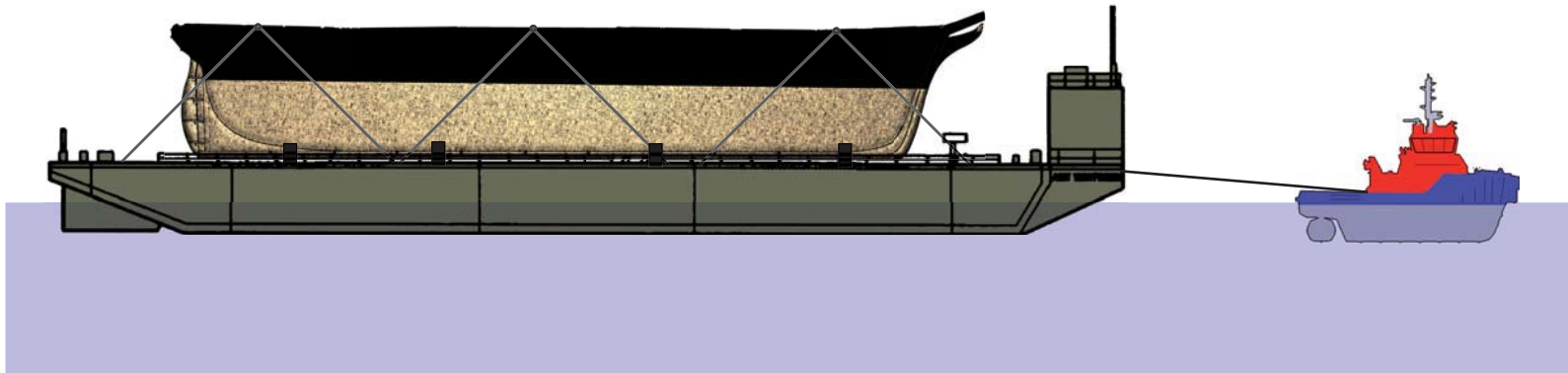


2. Winch cradle and ship down the slipway and then, as the tide rises, float ship off cradle. Use diesel pumps to deal with leakage.

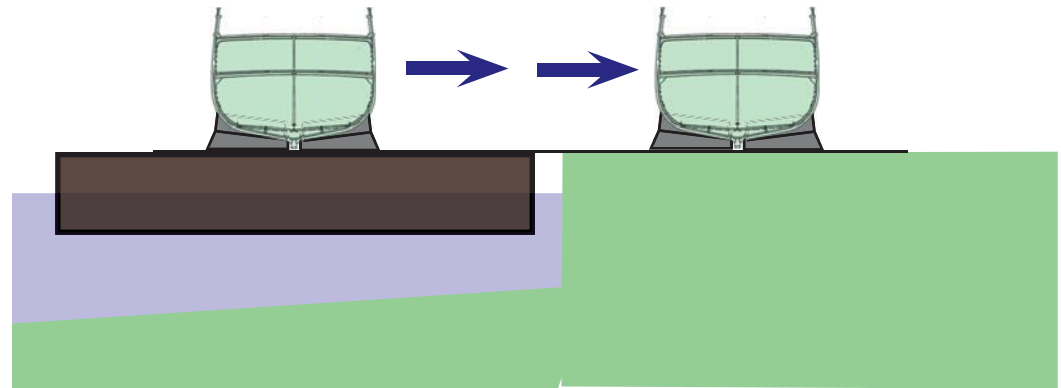


3. Prepare cradles on deck of submersible barge such as AMT Wayfarer. Sink barge in location with suitable water depth (circa 8-9m). Float on City of Adelaide.

4. Raise barge, secure ship and tow to new location.

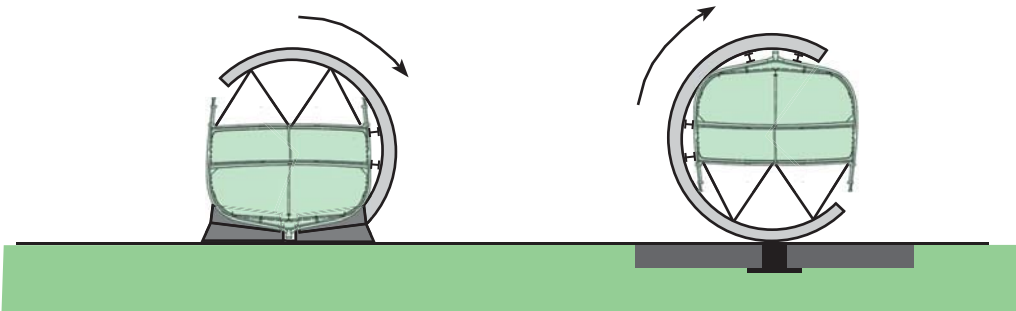


5. With barge alongside new location (presumably a dock or quayside) place skid rails to extend onto the shore. Skid cradles and ship sideways onto dockside. As the load is moved the barge is ballasted to compensate.



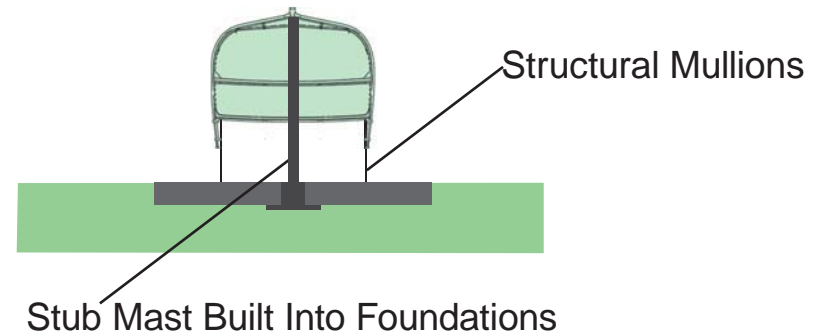
6. Build circular steel cradles around ship with longitudinal support beams between cradles. Temporary internal bracing may also be required.

Remove cradles used for the skid, roll the ship through 180 degrees; this can either be done on rails as shown or on rollers if sideways movement is not required.



7. Place permanent supports and remove circular cradle and temporary bracing.

Complete fit out of ship/building.



8. The most dramatic site for the ship may be partly on land and partly on a purpose built jetty shaped to her plan shape.

This solution would require a longitudinal skid prior to the roll over.

