The Australian Historic Shipwreck Preservation Project

Reburial of the *Clarence* (1850) and *James Matthews* (1841) shipwreck sites

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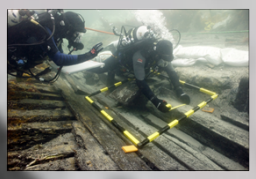
1. Introduction

The Australian Historic Shipwreck Protection Project (AHSPP) is a three year national collaborative project involving ten state, territory and federal Partner Organisations and three Australian universities, funded by an Australian Research Council Linkage grant, which commenced in 2012. The AHSPP aims to develop a maritime specific management planning process for underwater cultural heritage sites including nationally standardised procedures and general guidelines for site management and *in-situ* preservation. Two shipwreck sites were chosen for this longitudinal comparative study – *Clarence* (1850) located in Port Phillip Bay, Victoria and *James Matthews* (1841), which lies in Cockburn Sound, Western Australia. Both sites have been preserved *in situ* using two very different but innovative remediation strategies.



Clarence 2012

The *Clarence* and *James Matthews* sites were considered ideal for this project for the following reasons:

- Previously excavated and surveyed.
- Relatively small, easily accessible and < 5m water depth.
- Considered under threat by natural and anthropogenic forces.

James Matthews 1978

2. Process-based Methodology

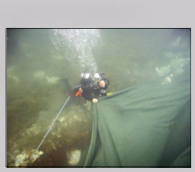
In order for any *in-situ* preservation strategy to be successful the following points must be addressed:

1. Ascertain the extent of the site.
2. Assess the physical, chemical and biological deterioration site processes.
3. Assess the pre-disturbance burial environment and the major factors affecting the stability of the site.
4. Identify the major material types present on the site and the extent of their deterioration.
5. Implement appropriate *in-situ* preservation strategies to mitigate further deterioration and stabilise the site.
6. Implement a long-term monitoring programme to evaluate the efficacy of the *in-situ* preservation strategies.
7. Provide alternative plans and procedures if the *in-situ* preservation strategies are unsuccessful.
8. Conservation, storage and curation of any recovered artefacts.

Each of these points is integral to a process-based approach when assessing underwater cultural heritage sites and establishing successful long-term conservation management plans.

Shade cloth (250 m²) mat folded in a concertina fashion.

Shade cloth fanned out starting at the end down current.



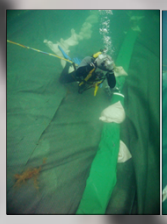
Unfurling the shade cloth.

Shade cloth following the contours of the wreck.

3. *Clarence - In-situ* Preservation Strategy

A pre-prepared shade cloth mat (250 m²) was deployed flush over the entire site, conforming to the wreck profile to encourage the formation of an anaerobic environment under the mat. The shade cloth was folded in a concertina fashion, which allowed the entire mat to be fanned out, starting down current, without recourse to deploying it in separate sections. The mat was then anchored with 250 x 20 kg UV stabilised, reinforced polymeric woven sandbags.

The shade cloth mat was then covered with three PVC tarpaulins (7 m x 14 m x 2 mm) for protection from anchor damage. Each tarpaulin was deployed individually, with each end unrolled from the mid-section of the site. When all three tarpaulins were in the correct position they were joined together with cable ties through plastic eyelets and heavy duty nylon tabs. Sandbags were then tied in place along the seams and edges of the mats with nylon straps. Another layer of sandbags was then placed on top of these to minimise any gaps along the seams. Approximately 3-6 lines of sandbags were placed along the bow and stern edges of the tarpaulin and another line of bags along the port and starboard side edges to seal any gaps and minimise water movement under the tarpaulin by strong currents and potential lifting by anchors. Finally, the entire interior of the tarpaulin was covered with approximately 1300 sandbags for added protection.

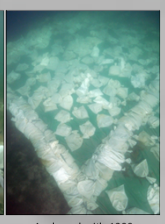


PVC tarpaulins on-site.

Unrolling the tarpaulins.

Joining the tarpaulins together.

Tying in the sandbags along the seams.



Anchored with 1300 sandbags.

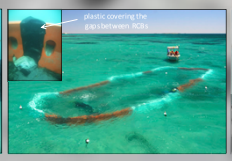
4. *James Matthews - In-situ* Preservation Strategy

Thirty six medium density polyethylene "road crash barriers' (RCBs) were deployed in a semi-elliptical arrangement around the wreck site. Each RCB unit (1.8 m length, 0.6 m width, 0.9 m height) and connecting pin (0.9 m length, 0.09 m diameter) was initially filled with 20 kg and 5 kg of blue metal, respectively. The floating RCB and pin were transported to the wreck site using a small tender, then three snorkelers slowly sank the barrier via air displacement. Two divers received the sinking RCB and physically manoeuvred the barrier into the correct position and then locked it in place with the connecting pin. The RCBs weighed approximately 15 kg under water and were easily manoeuvred on the seabed. Once the cofferdam was complete, each RCB was permanently anchored in place with a minimum of 120 kg of blue metal per barrier. The gaps between the barriers were sealed with high density, plastic roof damp coursing (450 mm width; 500 µm thick) about 2 m in length, placed over the gaps and anchored flush against the inner surfaces of the RCBs with zinc alloy tek screws. Within the confines of the cofferdam, 28 tonne (1015 x 20 kg bags) of clean, washed proprietary sand was dumped over the entire site using a custom built sand barge, producing a 5-15 cm sterile sand layer. Seven 4 m wide panels of shade cloth (Armashade 70% UV block) were sewn together and placed over the top of the cofferdam to prevent any loss of sand, minimise the ingress of dead seagrass and encourage the formation of an anaerobic environment.

RCB being transported to the site.

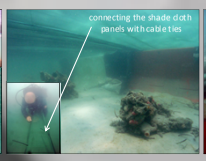
Snorkelers sinking the RCB.

Divers positioning the RCB and locking it in place with the connecting pin.



RCB cofferdam surrounding the site.

Dumping of sand on-site with the barge.

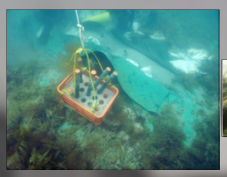


Sterile sand layer inside cofferdam with shade cloth cover.

Cofferdam covered with shade cloth.

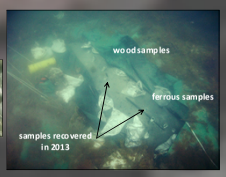
5. Post Preservation Monitoring

The physico-chemical environment of the reburied wreck sites are being monitored at regular intervals to determine if the applied *in-situ* mitigation strategies are conducive to the long-term preservation of the sites. Analyses include the chemistry of the seawater, sediments and the associated pore water (pH; redox potential, salinity, dissolved oxygen levels, total iron and organic content; sulphide and sulphate concentrations; nutrient [nitrogen and phosphorus] levels) and the type and nature of the sediments (moisture content; particle size distribution; porosity). It is also important to monitor the extent of deterioration of the major material types after reburial. However, since destructive sampling of reburied archaeological materials is inherently invasive, sacrificial modern samples were included within the reburial areas. Sacrificial wood samples and modern ferrous alloys were reburied on both wreck sites. Copper alloys were also reburied on the *James Matthews*. The sacrificial samples will be recovered and analysed annually. Corrosion surveys, weight loss, scanning electron microscope/energy dispersive x-ray analysis and x-ray diffraction spectroscopy will be performed on the metal coupons and the associated corrosion products. Maximum water contents, density measurements and microscopic and Fourier transform infra-red spectrometric analysis will be performed on the wood samples. The results of the biological and physico-chemical analyses of the sediments can then be correlated to the extents of deterioration of the sacrificial samples from the reburial area and extrapolated to the condition of the remaining archaeological material on-site to determine the success of the *in-situ* preservation programme.



Sediment core samples collected from the *Clarence* site in 2013.

Sacrificial modern samples on the *Clarence* site prior to reburial in 2012.



Sacrificial samples on the *Clarence* site prior to recovery in 2013.

6. Conclusions

These two *in-situ* preservation strategies have encouraged the formation of anaerobic environments on both wreck sites in less than a year and minimised physical damage via natural and anthropogenic forces, which is conducive to their long-term preservation. These observations have been supported by the results of the sediment and sacrificial sample analyses, whereby both the wood and metal coupons indicate minimal deterioration after reburial.

On-site monitoring of the sediment and analysis of sacrificial samples on the *Clarence* and *James Matthews* sites will continue until early 2015 to test the efficacy of these two different but innovative stabilisation techniques and provide a comparative analysis of practical protocols. This work will be critical to the future development of national policy, methodology and technical guidelines for *in-situ* preservation and management of at-risk historic shipwrecks.

Biological growth on the *James Matthews* cofferdam after six months.

Biological growth on the *Clarence* PVC tarpaulins after ten months.

Sacrificial wood samples recovered from the *Clarence* site after one year.

References

Richards, V., 2011. In-situ preservation – Application of a process-based approach to the management of underwater cultural heritage. In M. Staniforth, J. Craig, S.C. Jago-on, B. Ontiveros and L. Lacsina (Eds.), Proceedings of the Asia-Pacific Regional Conference on Underwater Cultural Heritage, 8-12 November 2011, Manila, Jericopim Publishing House, Manila: 769-785.

Shefi, D., Veth, P., Philippou, C., Rodrigues, J., Richards, V. and Harvey, P., 2014. The Australian Historic Shipwreck Preservation Project – interim progress report. In Proceedings of the 2nd Asia-Pacific Regional Conference on Underwater Cultural Heritage, 13-16 May 2014, Honolulu, Hawaii, eds H. Van Tilburg, S. Tripati, V. Walker Vadillo, B. Fahy and J. Kimura, 2014 Asia-Pacific Regional Conference on Underwater Cultural Heritage Planning Committee, Hawai'i, USA, pp. 507-520.

Veth, P., Philippou, C., Richards, V., Staniforth, M., Rodrigues, J., Khan, A., Creagh, D., Viduka, A., Barham, A., MacLeod, I., Harvey, P. 2013, The Australian Historic Shipwreck Preservation Project 2012: First report on the background, reburial and *in-situ* preservation at the *Clarence* (1841-50), Bulletin of the Australasian Institute for Maritime Archaeology, Vol. 37, 1-19.

Acknowledgments

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Further information

Please visit the AHSPP website http://www.ahspp.org.au/