

HISTORIC SHIPWRECK, THE *CLARENCE* (1841-1850)
CONSERVATION PLAN

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REPORT SUBMITTED TO THE VICTORIA ARCHAEOLOGICAL SURVEY

by

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SUMMARY

The wreck of the 67 ton schooner *Clarence*, located off St. Leonards in Port Phillip Bay is a site of cultural and natural significance. Wrecked in 1850, it is the earliest and best preserved Australian built vessel found in Victorian waters. The site has been extensively documented since its discovery in 1982. In keeping with the current Victoria Archaeological Survey policy on underwater cultural resource management, this study reports on the current status of the *Clarence*; identifies likely threats to the significance of the site and proposes measures to be taken to minimize any detrimental impact on the site and to maximize site interpretation.

STATEMENT OF SIGNIFICANCE

1. The *Clarence* is the oldest and best preserved wreck of an Australian built coastal trading vessel yet located in Victorian waters.
2. The *Clarence* is an example of early Australian shipbuilding methods which, through archaeological analysis of its remains, will yield information pertinent to a poorly documented area of Australian history.
3. The wreck site of the *Clarence* provides habitat requirements that are rare in Port Phillip Bay which attracts rare and/or previously unknown species of marine life.

STATEMENT OF CONSERVATION POLICY

1. Implement site stabilization measures to minimize and/or prevent the destruction of the significant, cultural and natural, fabric of the *Clarence*.
2. Implement a consistent policy of artifact retrieval and management that protects and promotes the significance of the *Clarence*.
3. Actively enforce the provisions of the *Clarence* Protected Zone by prosecuting those caught trespassing.
4. Establish an education programme on the Historic Shipwrecks legislation and cultural value of the *Clarence* that is specifically tailored for members of the fishing community who have English as a second language.
5. Maintain the restrictions of the *Clarence* Protected Zone with regards to public diver access until site stabilization measures have been implemented.
6. Promote and enhance the significance of the *Clarence* and maritime archaeology through;
 - * the publication of interpretive materials on a technical and popular level.
 - * the display and interpretation of artifacts of cultural significance from the *Clarence*.
7. Ease the restrictions regarding access to the *Clarence* Protected Zone for the V.I.M.S. Summer Education Programme and other such organized snorkel groups.
8. Sponsor and/or initiate research projects that will contribute to the science of the management of the *Clarence* and State's remaining submerged cultural resource.
9. Review the conservation plan;
 - * at the completion of the monitoring programme in May 1992

- * at the completion of site stabilization.
- * in 1995 and every five years after that.

RECOMMENDATIONS

10.3.1. ENVIRONMENTAL MONITORING PROGRAMME

- * Maintain the monitoring programme in its present form until May 1992.
- * Assign a Project Officer to oversee the monitoring programme.
- * Maintain and add data to the *Clarence* monitoring file in the format already established.
- * Carry out additional data collection procedures. They are:
 - 1/ 2m core samples from locations near the site using a sediment corer.
 - 2/ additional measurements of current velocities using dye traces.
 - 3/ a 40m x 30m area sand contour of the site, at 2m intervals.
- * Have the data collected in the monitoring programme appraised by a practitioner in a relevant field, i.e. marine engineer, sedimentologist, oceanographer.
- * Renew the permit allowing the disturbance of the site until the monitoring programme is completed.

10.3.2. ALTERNATIVE STABILIZATION METHODS

- * Appraise and implement suitable site stabilization to protect the significance of the site once monitoring programme is completed.
- * Seek advice from a practitioner in a relevant field, i.e. marine engineer, sedimentologist, oceanographer, when choosing a suitable stabilization method.
- * Apply sensitivity to the articles of the Burra Charter and M.A.U./V.A.S policy when choosing the method of stabilization.
- * Prepare and initiate a monitoring programme with any stabilization method implemented.

10.3.3. ARTIFACT RETRIEVAL AND MANAGEMENT POLICY

- * Actively seek to have artifacts pertaining to the cultural significance of *Clarence* interpreted and on display.
- * Produce a catalogue of the *Clarence* artifacts which would satisfy the requirements of archaeologists and which would appeal to the general public.
- * Implement an artifacts acquisition policy which involves raising vulnerable

artifacts of cultural significance.

- * Submit the recently raised gudgeon from the *Clarence* for scientific analysis.

10.3.4. SITE POLICING AND PROTECTION

- * Paint the *Clarence* pile yellow in accordance with Port Authority symbol standards.
- * Place the special top mark on the *Clarence* pile in accordance with Port Authority symbol standards.
- * Set up an offence file management system with the Department of Conservation, Forests and Lands enforcement branch for those who are caught violating the *Clarence* Protected Zone and prosecute those who are caught a second time.
- * Promote an educational programme for members of the fishing community who have English as a second language.

10.3.5. SITE INTERPRETATION

- * Deploy the underwater plinth on the site by January 1992.
- * Publish a 20 page "popular" booklet on the *Clarence* that enhances it's cultural significance and promotes the contribution of archaeology in understanding the cultural heritage.
- * Publish the historical report and the two archaeological reports on the *Clarence* as soon as possible.
- * Open the site to snorkel groups from the V.I.M.S. Summer Education Programme, for the summer of 1991-92.
- * Ensure M.A.U. participation in the V.I.M.S. Summer Education Programme.

10.3.6. PUBLIC VISITATION

- * Maintain the restrictions on Protected Zone access to the *Clarence* for the diving public until successful site stabilization has taken place.
- * Maintain the restrictions of the Protected zone with regards to uncontrolled anchoring and fishing.
- * Allow site access to snorkellers from the V.I.M.S. Summer Education Programme in the summer of 1991-92
- * Provide diver access for visitation from other scientists such as marine biologists

10.3.7. RESEARCH PROJECTS

- * Compose briefs for research projects and send to relevant institutions for expressions of interest.
- * Seek funding for such projects preferably in conjunction with relevant

institutions.

- * write a complete report on the interactionm of the *Clarence* and its environment based on data collected during the monitoring programme and elsewhere. This report should be published.

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(author's note; Plates 2 and 3 were not available at the time this report was written)

ABBREVIATIONS

M.A.A.V.	Maritime Archaeology Association of Victoria
M.A.U.	Maritime Archaeology Unit
V.A.S.	Victorian Archaeological Survey
M.S.L.	Marine Studies Centre
V.I.M.S.	Victorian Institute of Marine Sciences
V.G.G.	Victoria Government Gazette
R.f.D.	Recommendation for Declaration
C.M.F.N.	Clarence Monitoring Field Notes
H.S.A.C.	Historic Shipwrecks Advisory Committee
S.B.M.P.	Swan Bay; Marine and Wildlife Reserves; Proposed Management Plan
S.O.M.H.	Saving Our Maritime Heritage (M.A.U. policy document)
D.C.E.	Department of the Conservation and Environment

1.0 INTRODUCTION

1.1 BACKGROUND

In 1987 an excavation was conducted on the *Clarence* under the direction of the Victoria Archaeological Survey. The ensuing report on the *Clarence* outlined a number of recommendations that concerned the future management of the site. In April 1991 the author was employed for a period of eight months by V.A.S. under a National Estate grant, to implement the recommendations made in the 1987 excavation report and to produce a conservation plan for the site.

1.2 PROJECT STATEMENT

The project statement was as follows:

To write a conservation plan that identifies the existing and future environmental and human impacts on the morphology of the *Clarence*, which proposes mitigating measures to resolve the impacts identified and safeguard the significance of the site.

2.3 PROJECT OBJECTIVES

The project objectives were as follows:

- * Prepare a final draft of a conservation plan written along established heritage guidelines.
- * Prepare graphics and report layout.

Other project objectives were:

- * Review and implement recommendations made in the 1986 and 1987 reports on the *Clarence* (Harvey, 1986 and 1987a)
- * Make further recommendations for the short and long term site management of the resource based on research and on-site investigation.

2.0 BACKGROUND TO THE CLARENCE

2.1 LOCATION

The site of the *Clarence* is situated on the east bank of Coles Channel in Port Phillip Bay approximately 3.3 km south of St. Leonards jetty (latitude 38° 12' 15.03" and longitude 144° 43' 18.65") (FIGURE 1).

3.2 DISCOVERY

The wreck of the *Clarence* was discovered as result of a twelve month archival investigation by the Maritime Archaeology Association of Victoria. The location of the site is consistent with newspaper accounts reporting the wrecking of the small trading schooner, *Clarence* lost off Indented Head in September 1850.

The question of the identity of the wreck was quickly resolved. The dimensions of the vessel recorded by the M.A.A.V. were consistent with those on record for the *Clarence*. Furthermore timber samples taken from the site were analysed and found to be of a species of *Eucalyptus* indigenous to the coastal areas of New South Wales and southern Queensland (see timber identification in 2.4.2.). This fitted well with the fact that the *Clarence* was built on the Williams River in the Hunter Valley region of the New South Wales central coast.

The discovery of the *Clarence* was kept secret by the M.A.A.V., for fear that it may be plundered by divers, until September 1982 when the find was reported to the Maritime Archaeology Unit of the Victoria Archaeological Survey. The subsequent inspection of the site by the M.A.U. confirmed the findings of the M.A.A.V..

2.3 DOCUMENTARY EVIDENCE

Most of the documentary evidence that appears below has been obtained from Gesner's report on the historical background to the *Clarence* (Gesner, 1984).

2.3.1. THE VESSEL

The *Clarence* was a wooden two masted schooner of 67 tons. It was carvel built, single decked with a standing bowsprit and square stern. The registered hull dimensions of the vessel were fifty-one feet long, sixteen feet and three tenths wide (breadth) and eight feet seven tenths deep (depth of the hold). Between 1842 and 1850 a bust of a woman was fitted as a figure head (Register British Shipping Port of Hobart Town, Feb 1850).

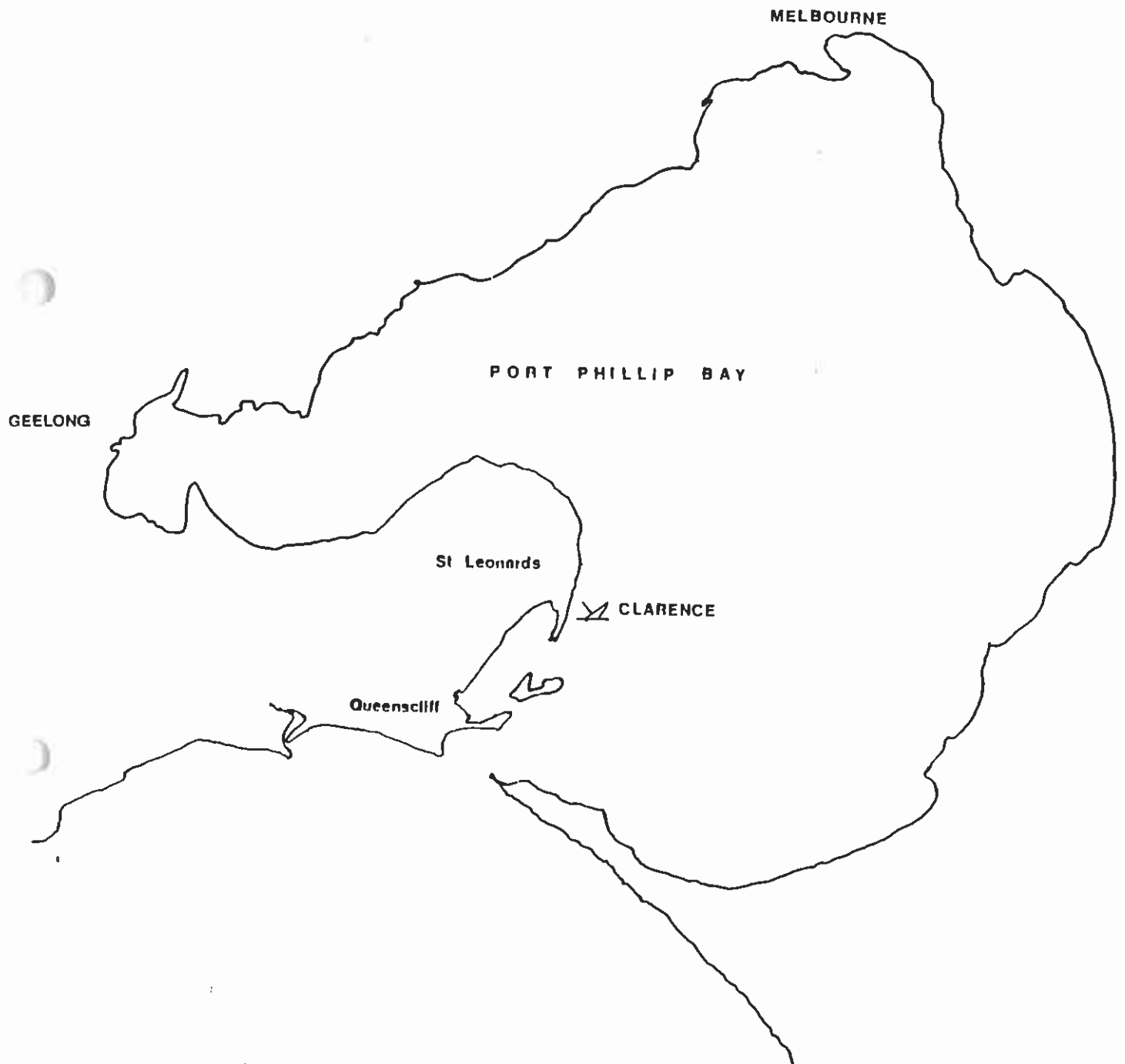


FIGURE 1 : LOCATION OF THE CLARENCE

2.3.2. HISTORY OF THE VESSEL

The *Clarence* was built on the Williams River in New South Wales for two Sydney merchants, Gordon Sandernais and Thomas Ayerst, in 1841. The vessel was probably built by or under the supervision of William Lowe at his Deptford shipyard.

The first two years of the *Clarence* life saw it engaged in the coastal trade along the New South Wales central coast (Broxham and Nicholson, 1988). The cargoes carried were timber, coal, grain and wool.

For the period from the middle of 1843 nothing is known of the activities of the *Clarence* until the 18th of January 1845 when the vessel left Sydney for Port Albert. Between July 1845 and May 1846 the *Clarence* was on a regular run from Port Albert to Hobart, with alternating cargoes of general goods and cattle. From May 1846 to September 1847 it traded to most of the ports of the South East coast of Australia, including Tasmania.

In September 1847 the *Clarence* was stranded at Warrnambool. The master and then part owner of the vessel, Captain Ainslie, was deemed at the time as having deliberately run the *Clarence* aground to collect the insurance for the vessel. The vessel was condemned by a Board of Enquiry and sold for 142 pounds.

After repairs and a refit the *Clarence* returned to its trading role, making voyages between Port Fairy, Launceston, Hobart, Port Phillip and Sydney. It carried passengers during this period and for that reason it is thought that the *Clarence* refitted after its stranding at Warrnambool with that purpose in mind. The *Clarence* continued this role till late 1848 when it switched exclusively to the trans-Bass Strait trade. The cargo carried during this period was mostly timber and general goods on the outward voyages from Hobart and sheep on the return voyages.

2.3.3. THE WRECK EVENT

On September 1850 whilst moored off Indented Head the *Clarence* parted from its anchor in a strong south easterly and ran aground on the West Sand in Coles Channel, Port Phillip Bay. It was declared a wreck and the estimated loss was 500 pounds.

The cargo of sheep that was to be delivered to Melbourne from Hobart was rescued. This action eventuated into a dispute over the salvage rights between the vessel's owners and some of the local Geelong residents who had rescued the sheep. Captain Dalton who was to appear at a hearing over the wrecking left the colony not long after the loss of the *Clarence*.

The wreck of the *Clarence* was still visible in August 1852 when the *Foig a' Ballagh* was lost close by.

2.4 ARCHAEOLOGICAL INVESTIGATION

2.4.1. THE OFFICIAL INSPECTION - 1982

The site was officially inspected on the 24th October 1982 by the Maritime Archaeology Unit. The site was found to be in 4 to 5 metres of water, well preserved, heeling slightly to port. Sections of frame on the port side were observed to stand 1m clear of the sand bottom (Wreck Inspection Report, 1982).

All assessments suggested that the vessel was buried almost up to the deck thereby giving the site the potential for valuable information to be obtained on early Australian shipbuilding. At the time it was the earliest located Australian built vessel in Victoria. It was on the strengths of this initial survey that moves were made to declare the wreck Historic.

2.4.2. PRE-DISTURBANCE SURVEY - 1985 (Harvey, 1986)

Following the initial inspection of the wreck, a multi-phase, long term project was established for the *Clarence*. The overall aims were:

1. To determine the extent of historical and archaeological evidence associated with the site.
2. Identify and define research prospects for more thorough archaeological investigation.
3. Formulate a long-term management programme for the site, using information gained from historical and field investigation

Aims of the pre-disturbance survey.

The specific aims of the survey were:

1. To produce a photomosaic of the site.
2. To conduct a remote sensing survey using:
 - a) a metal detector
 - b) a sub-bottom profiler
 - c) a proton-procession magnetometer

3. To assess the archaeological remains of the *Clarence* and indicate the potential information which could be obtained through a more detailed examination of the wreck site.
4. Document environmental conditions on the site in order to provide information on which future monitoring and management could be based.

Marine growth removal.

Before the pre-disturbance survey began, marine growths that obscured relevant features of the site were removed. A determined effort was made to remove and destroy as little growth as possible. Two types of marine growth were removed:

1. macro algae with large "bushy" thalli. The stems were severed approximately 4 cm from the holdfast.
2. Encrusting sponges on the timbers.

Before this activity was carried out a flora and fauna survey was conducted by Andy Stevens from M.S.L. and Vicki Brown from the then Melbourne and Metropolitan Board of Works (see 3.5.1. **Flora and Fauna Survey 1985**).

Remote sensing.

Of the three methods of remote sensing that were used in the survey, the magnetometer and the metal detector were the most useful. The sub-bottom profiler failed to produce any results that would assist in the interpretation of the site. The high acoustic reflectivity of the sediments was the reason for this (Harvey, 1986:55).

The magnetometer proved to be most effective instrument for determining concentrations of ferrous materials (Harvey, 1985:fig. 4.10). Many of the anomalies produced on the site were produced by objects that were visible on the surface however there was a significant signature located towards the bow which seem to be quite deeply buried, therefore the largest concentration of iron on the site (Harvey, 1985:56) (FIGURE 2).

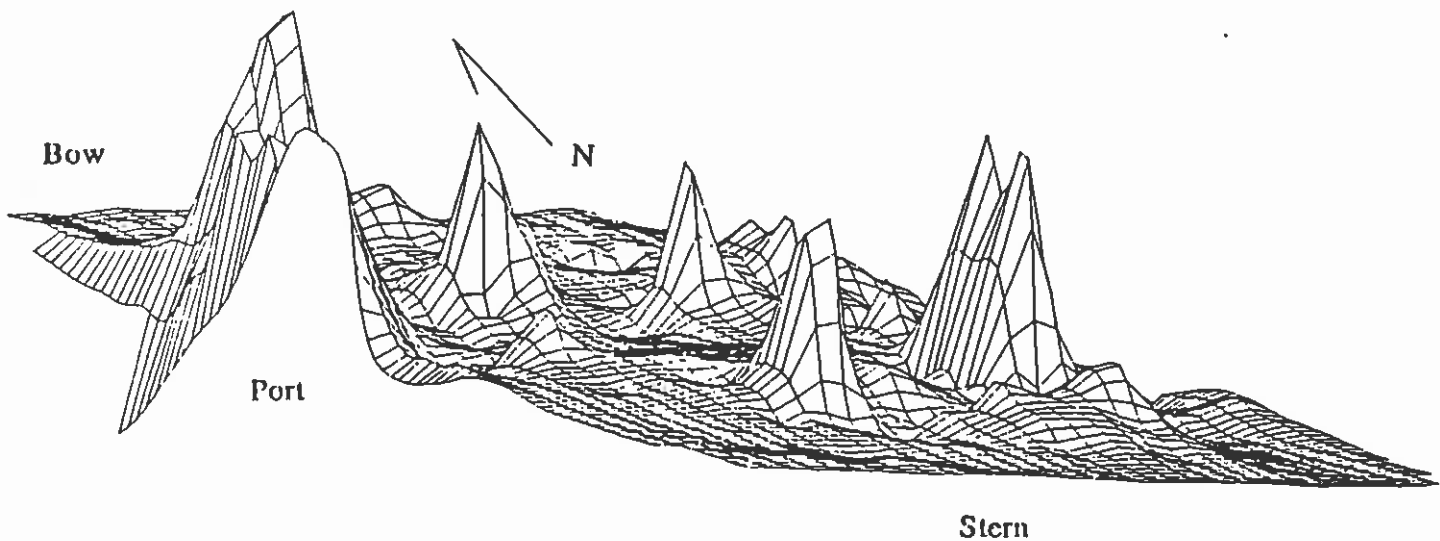


FIGURE 2 : MAGNETIC SIGNATURE OF THE *CLARENCE*
(Harvey, 1986:fig.4.10.)

Photomosaic.

The photomosaic conducted over the site provided a good plan view of the wreck which was useful in the production of the site plan. An elevation of the port side was done using a photomosaic which assisted in the production of the isometric projection of the wreck site (Harvey, 1986: Figs 5.1 and 5.2)(PLATE 1).

Site plan and isometric projection.

The site plan and isometric projection were produced primarily by trilateration, with assistance by photomosaic and profiling (FIGURES 3 and 4). The calculated residual error for the site plan was worked out at 2%, (0.4m over 20m).

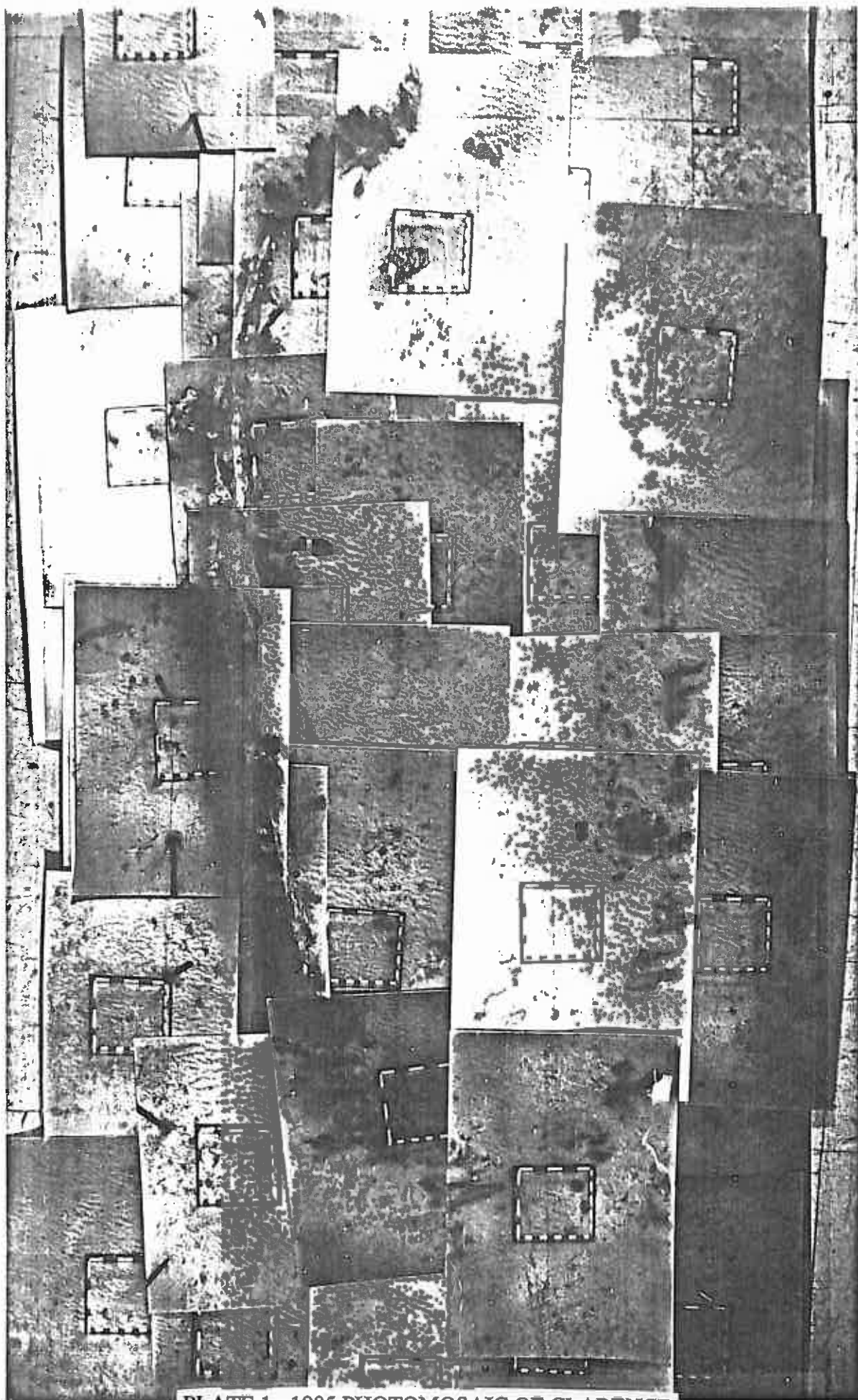


PLATE 1 : 1985 PHOTOMOSAIC OF CLARENCE

(Harvey, 1986 : fig. 5.1.)

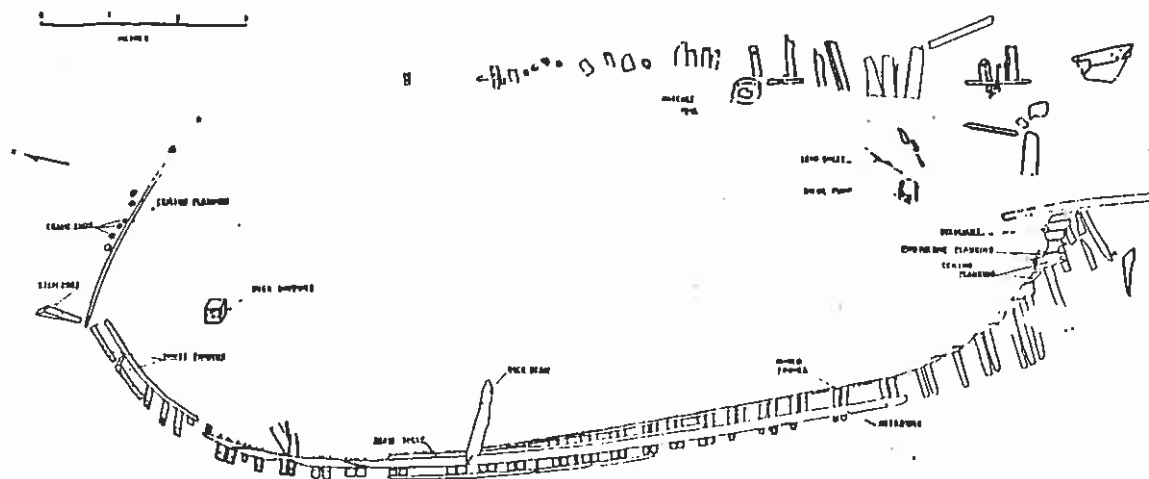


FIGURE 3 : 1985 PRE-DISTURBANCE SITE PLAN
(Harvey, 1986:fig. 6.1.)

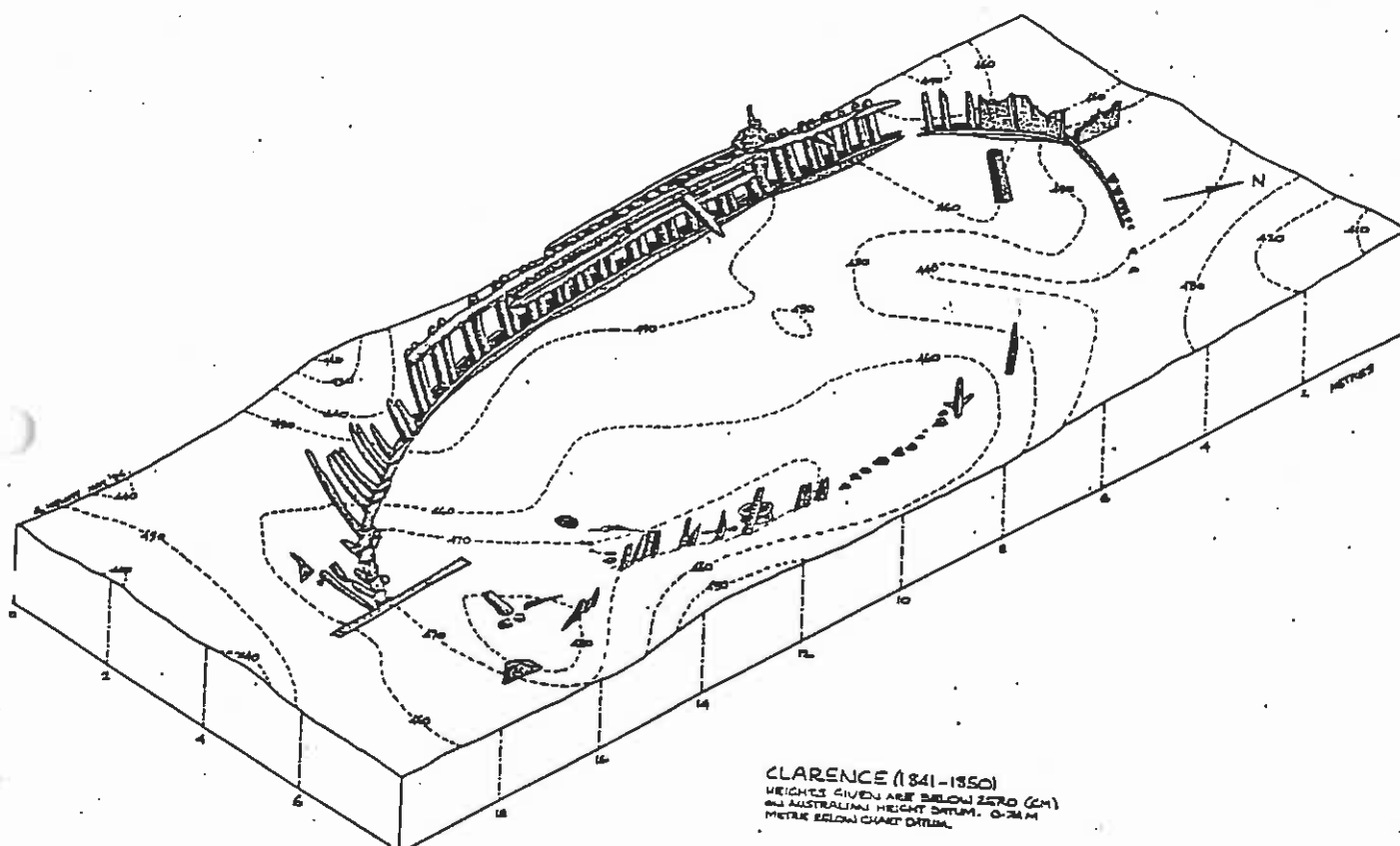


FIGURE 4 : ISOMETRIC DRAWING OF THE SITE.
(Harvey, 1986:fig. 6.2.)

Timber identification.

The timber samples taken during the survey were identified as:

FUNCTION	TYPE
Treenail	pale-coloured gum type eucalypt
Waterway	gum group eucalypt
Deck Beam	reddish gum group eucalypt
Frame near stern	stringybark group eucalypt
Frame near bow	pale coloured gum type eucalypt
Ceiling planking	pale coloured gum type eucalypt
Outer planking	gum group eucalypt
Protective planking	<i>Pinus sylvestris</i> , Baltic Pine

(Harvey, 1986:47)

The protective planking that was found near the stern of the vessel, overlay the ceiling planking and was the only timber found on site in 1985 that was not native to Australia.

Physical description.

At the conclusion of the survey a physical description was made of the site and is quoted below:

"The wreck of the Clarence lies in an area of fine grained, mobile sand. The longitudinal axis of the wreck was observed to lie in a north-south axis with the bow facing north.

The exposed structure of the wreck, particularly the port side, was found to be substantially intact. However, degradation of the exposed timbers both by biological and mechanical vectors was plainly evident. The port side of the vessel was the most coherent of the exposed wreckage, and is intact up to the level of the deck.

The starboard side of the wreck was found to be in a very poor condition compared with the port side. Frames were visible protruding above the sand although no evidence of paired frames is obvious. The least coherent section of the site is at the starboard stern quarter. At this location the wreckage is so confused that individual timbers cannot be identified with any certainty. Individual frames and an associated ceiling plank are visible just above sand level at the starboard bow of the vessel."

(Harvey, 1985:51-2)

The remaining archaeological potential of the site was seen to be substantial. The survey showed that the port side was intact almost to the deck level (approximately 1m above the sea floor). Documentary evidence indicated that the depth of the hold was approximately 2.6m (Gesner, 1984). Therefore approximately 1.6m of hull structure could be expected to be buried still buried beneath the sand. Given the preserved state that the exposed timbers it was considered that the buried remains of the structure would be in an excellent state of preservation (Harvey, 1985:53).

The rich archaeological potential for the site was further confirmed with some of the artifacts found on the site such as a decklight (Harvey, 1985:48, Fig. 7.2) This suggested that salvage on the site may have concentrated on the cargo rather than the ship's fittings.

One of the significant archaeological findings in the survey was the method by which the deck beams were fixed to the hull and the observed absence of hanging or lodging knees for the deck beams (Harvey 1985:54).

A search showed no evidence of any fastenings which would have been used to attach the knees to the deck beams. The deck beams form are puzzling as they were not butted or jointed into the frames in the "conventional" way but were fitted between the paired frames with their ends apparently flush with the inner side of the outer planking (FIGURE 5).

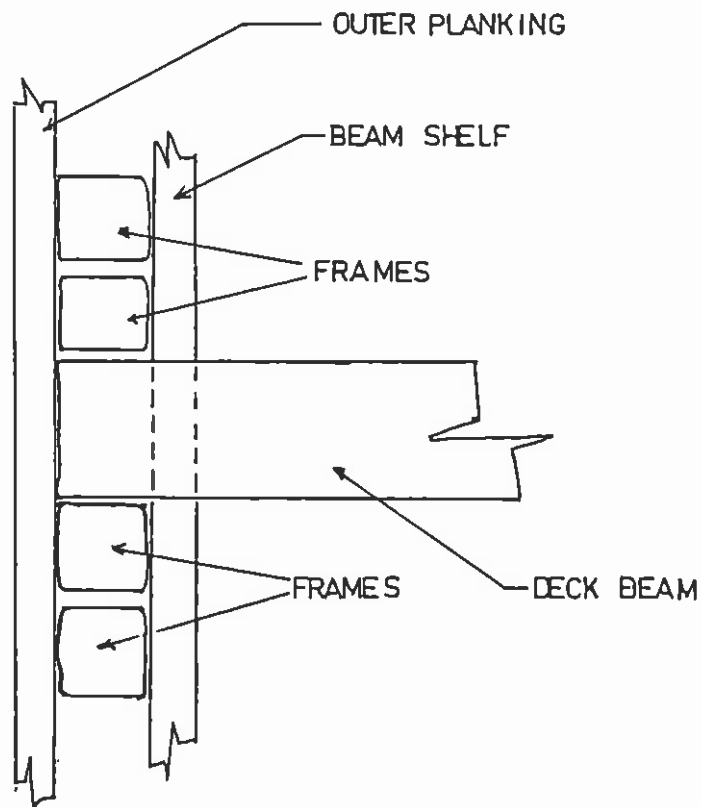


FIGURE 5 : METHOD OF ATTACHMENT OF DECK BEAMS

(Harvey, 1986:fig. 9.1.)

Such observations on the construction features of the *Clarence* have made it a vessel of unique importance. The *Clarence* is one of the few early Australian built vessels located in Victoria. The lack of comparable information on early Australian shipbuilding has raised questions of whether its departure from the traditional norms of British shipbuilding is representative of Australian built vessels of the period. If this is so then the follow up question is why should this be so?

Conclusions of the report.

The final conclusions of the report were:

- "1. *That the wreck is in an excellent state of preservation.*
2. *The potential for obtaining archaeological information is considerable.*
3. *The continuing recording of the environmental conditions on site would be of benefit not only for the Clarence but of other wrecks in the Bay."*

(Harvey, 1986:57-8)

Recommendations.

The following recommendations were made at the completion of the report:

"Management.

1. *That the current Provisional declaration be altered to ensure that the site is permanently protected under the provisions of the Historic Shipwrecks Act (1981).*
2. *That in the event of an excavation of the Clarence being undertaken, a parallel program of investigation be undertaken with the aim of determining the potential contribution of other Australian built vessels wrecked in Victorian waters. Also that wrecks found to be of significance to the development of Australian shipbuilding be protected in order to prevent degradation of the resource before thorough investigation of the sites can be completed.*
3. *That a pamphlet or similar publication outlining the research into the Australian built shipwreck resource, including the work on the Clarence site be produced in order that the aims and early findings of the excavation and other investigations be made available to the general public as soon as possible. Information relating to the project could also be incorporated into the M.A.U.'s existing education programme.*

Future research.

1. *That an excavation of the site be undertaken. This excavation should be aimed at determining the construction details of the vessel and relating them to the broader questions of the development of Australian shipbuilding outlined in both this report and that of Gesner (1984).*

Such an excavation should also serve to more clearly define research questions to be answered by investigation of other shipwrecks comprising the resource of Australian built vessels wrecked in Victorian waters.

2. *That monitoring of the environmental conditions on the Clarence site to be continued in order to ensure that any future deterioration is detected, and steps taken to prevent it. This monitoring should also enhance the body of information relating to environmental conditions affecting shipwrecks subject to similar conditions."*

(Harvey, 1986:59)

2.4.3. EXCAVATION - 1987

Acting on the recommendations made in 1986 report the *Clarence* was excavated a year later with the following aims:

- "1. *To record details of the vessel's construction and hull morphology in the areas exposed during the excavation, with the view of comparing them to British built vessels of a similar age, size and function. This would attempt to answer some of the questions relating to Australian shipbuilding that were raised in Gesner's historical analysis.*
2. *To raise a sample of fasteners and fittings from the wreck for metallographic analysis. This would be done to determine if possible the origin of the raw material used, the method of manufacture, and the type and quality of the raw material used in the manufacture of these items. This would attempt to answer some of the questions relating to Australian shipbuilding that were raised in Gesner's historical analysis (Gesner, 1984).*
3. *To examine the internal spaces of the vessel for any structural features which suggest alterations made to accommodate specific cargoes, such as sheep, timber and*

passengers. Investigation of internal structures of the hull might well yield evidence of how the vessel was built and/or modified for carrying specific cargoes.

4. *To continue the monitoring of sediment movement on the site, in the same manner as the work undertaken on this subject during the pre-disturbance survey. Few studies have been undertaken on how the disturbance of wrecksites affects their stability. A study of sediment movement on the site would increase the understanding of its stability and the implications for the site's future preservation. Consequently the information gained would have an important bearing on future management decisions."*

(Harvey, 1987a:3-6)

Artifact recovery.

For the excavation a policy for artifact retrieval was prepared in the form of guidelines (Harvey, 1987a:10). These guidelines had a profound influence on the conduct of the excavation. Elements of these guide-lines have been incorporated into 12.2.3. **Artifact Retrieval and Management Policy**. The essence of the 1987 policy was:

1. To ensure that only artifacts directly relevant to the aims of the excavation were to be raised.
2. To avoid overloading the limited available conservation facilities.
3. To ensure the safety from theft or looting of any intrinsically valuable or rare artifacts.
4. To ensure that the maximum information possible was obtained from the material which was raised.

The excavation.

Two trenches were excavated across the site, Trench 1 at the bow and Trench 3 toward the stern (FIGURE 6). It quickly became apparent during the course of the excavation of these two trenches that there was still a significant amount of internal structure and organic materials remaining. In accordance with the aims of the artifact acquisition policy it was decided to limit the depth of the excavation to the point where a significant amount of organic material began to appear. For this reason the excavation of Trench 2 was not attempted.

The information gained from the excavation enabled more detail to be added to the pre-disturbance survey site plan (FIGURE 7). Attempts at obtaining a sub-profile of the site using an air probe, so as to determine the shape of the hull was thwarted due to obstructions caused by the remains of decking and other non-visible materials.

Conclusions.

The excavation found that the *Clarence* was constructed with a limited use of copper alloy fasteners and sheathing and was fitted part with second-hand chandlery. This led to the initial hypothesis that when the *Clarence*

was constructed there was a shortage of basic chandlery items. However at the time the *Clarence* was built there was a growth in the shipbuilding industry in New South Wales (Gesner, 1984:appendix 7). This has led to the suggestion that the potential owners of the vessel were attempting to keep costs down (Harvey, 1987a:25). The presumed absence of hanging or lodging knees for deck beams would also be an indication of cost cutting as it would be hard to believe that there was a shortage of suitable timbers in Central New South Wales at this time. This also would reflect the desire to increase the cargo carrying capacity of the vessel and maintain a low registered tonnage.

The knowledge gained from the excavation suggested that "future work in the investigation of the Australian ship building theme raises the question of whether the cheap construction of the *Clarence* was the exception or the rule in early Australian shipbuilding." (Harvey, 1987a:26)

Recommendations.

The recommendations made at the end of the report were as follows:

"Management Recommendations"

1. *The frequency of surveillance and enforcement trips to the site by the M.A.U. should be increased.*
2. *A twelve month programme of sand level monitoring on the site should be undertaken in order to determine the stability of the site and the seasonal variability of the sand levels.*
3. *A set of reference stakes should be positioned on the site in order to simplify the recording of sand levels.*

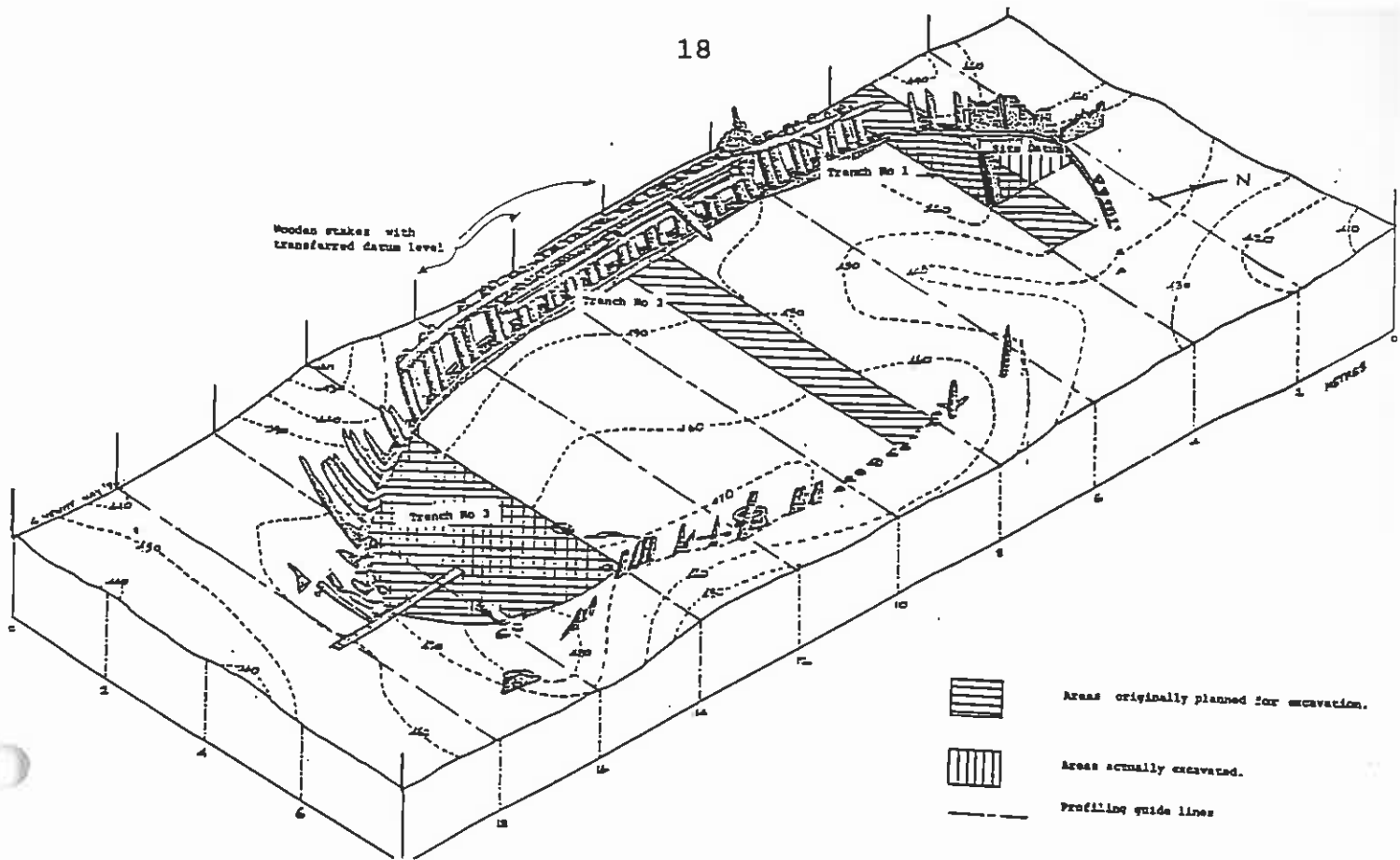


FIGURE 6 : LAYOUT OF TRENCHES, 1987

(Harvey, 1987a:fig. 1)

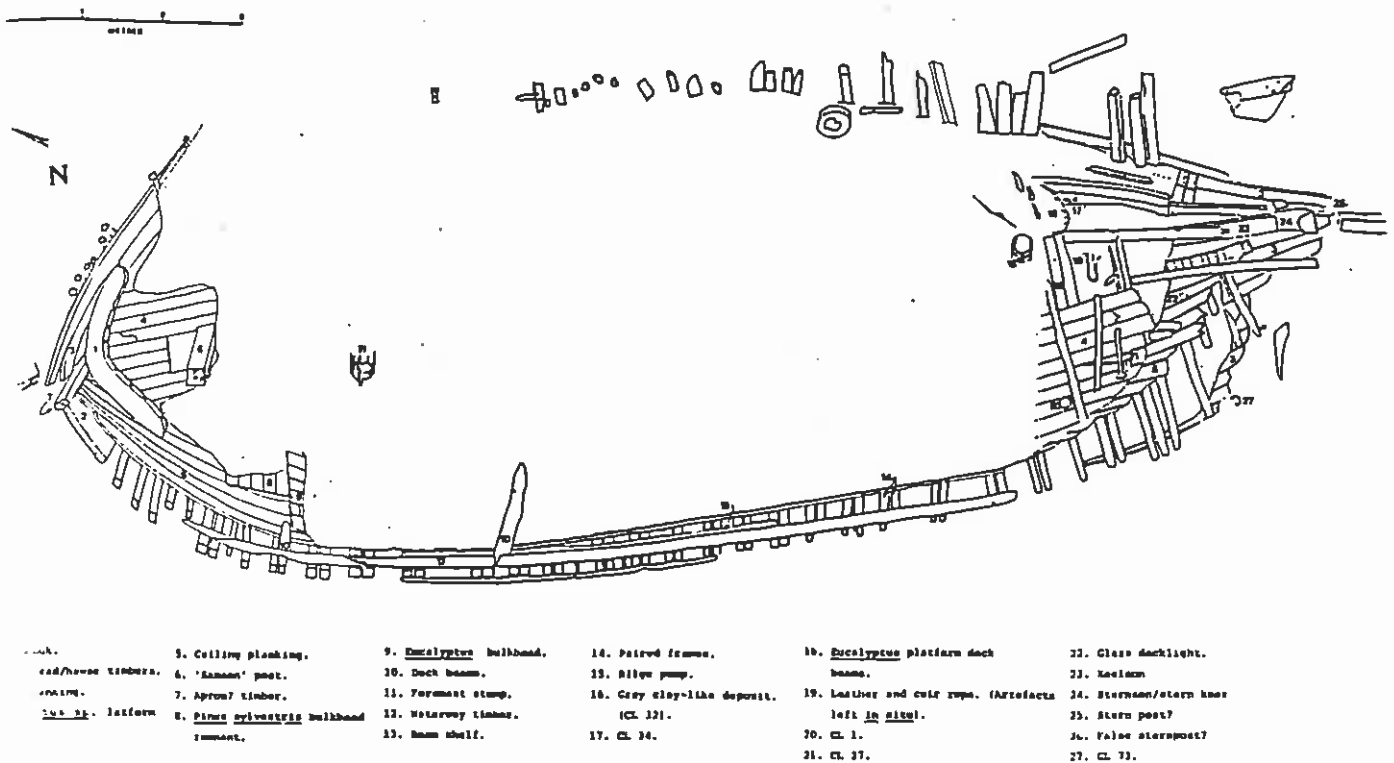


FIGURE 7 : SITE PLAN AFTER 1987 EXCAVATION

(Harvey, 1987a: fig. 4.)

4. *Monitoring of dissolved oxygen content in the sediments of the site should be conducted on a regular basis.*
5. *No further air probing should be conducted on this site until the effects of injecting air into sites are better understood.*
6. *Multi-lingual leaflets should be prepared for distribution to all those found near the site during the surveillance trips.*
7. *Multi-lingual signs giving details of the Protected Zone should be placed in conspicuous positions near the Queenscliff and St. Leonards boat ramps.*
8. *The size of the Protected Zone sign should be increased to ensure that it is legible from outside the protected area.*
9. *If the site can be shown to have returned to a stable state, a permit system similar to that used for the William Salthouse, should be established. This would provide access to the site by divers.*
10. *Interpretive material, including waterproofed siteplans and notes on the features of the wreck should be made available to visitors to the site. This material should be in place before the site is opened to the public.*

Research recommendations

1. *Future research should, at least, address the question: 'Was the method of construction used in the Clarence the exception or the rule?'*
2. *The monitoring of sand levels on the site has the potential to provide previously unavailable information on the movement of sediment on shipwreck sites within Port Phillip Bay. Similarly, the measurement of dissolved oxygen levels on the site would also provide data which will add to the knowledge of how artifacts are preserved in shipwreck sites. It was recommended that the results of future monitoring of the site are published or otherwise made available to other researchers."*

(Harvey, 1987a:31-2)

2.4.4. INSPECTIONS - 1987-91 (FIGURE 8)

Since 1987 there has been no scheduled archaeological work on the site. Visits to the site have been principally for environmental monitoring. However sediment erosion of the site has led to a number of construction features of the *Clarence* to be exposed. The most significant of these have been:

- * A "grown" knee.
- * A copper alloy gudgeon.
- * A pair of rounded frames at the starboard bow.

The Knee - The knee was observed during a visit to the site in April 1990 after it having been recently uncovered. It is situated on the outside of the hull on the port side, not far from the only remaining deck beam.

It measures 0.58 x 0.78 x 0.17m (23"x31"x7") with two iron through bolts on each arm. The knee has since suffered significant damage through shipworm infestation and may have been considerably larger.

The knee could not have served as a deck support as there no signs of fastenings on the remaining deck beams for the attachment of hanging or lodging knees were found (Harvey, 1987a:19). Wooden knees however perform other functions in a vessel apart from deck beam supports (Pasch, 1977:17-8).

The Gudgeon - The gudgeon was observed for the first time during 1990. It was situated adjacent to the port side of the stern post. During the course of the monitoring programme in 1991 it was becoming increasingly exposed each time the site was visited. During the two week field trip in August the decision was taken to raise it. The primary reason for its retrieval was due to fears that as it was an obvious and easily portable object, it could eventually be illegally removed. Furthermore the gudgeon is an artifact that is associated with the significance of the site and can therefore provide valuable information on the method of construction of the *Clarence*.

Once raised it was photographed and drawn (FIGURE 9 and PLATE 2). A visual inspection showed it to be well cast.

It is intended to take a sample from the gudgeon for further analytical testing. The presence of this well made artifact shows that at the time of the *Clarence's* construction, and after, there were ship's materials of high quality available. What is also significant is that leather padding was found associated with the gudgeon. It seems that the gudgeon was in some way just a bit too large for its spot on the stern post and some leather padding was inserted to provide a tight fit. This indicates that the gudgeon may not have been specifically cast for the *Clarence* but was bought on speculation, or second hand.

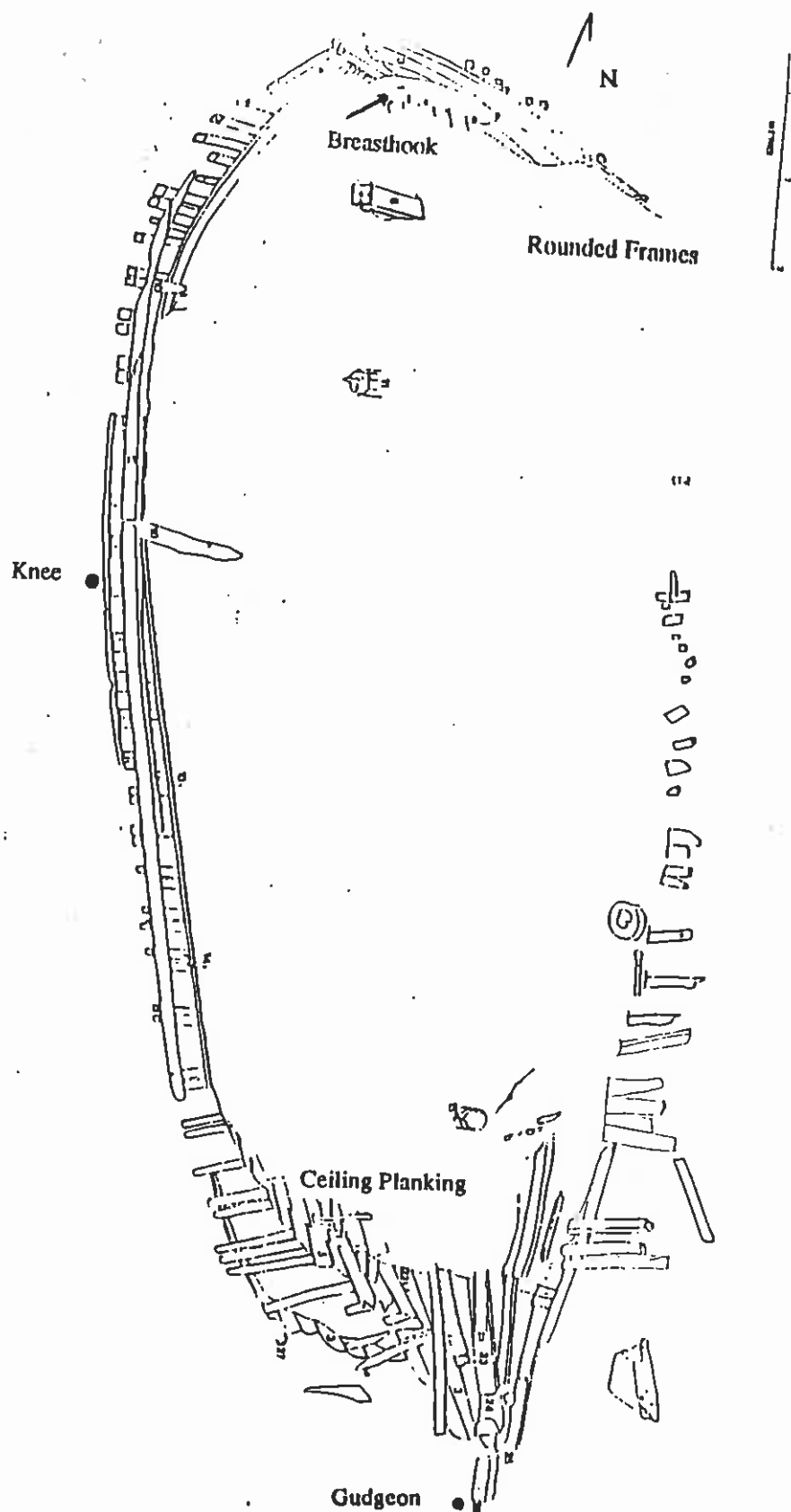


FIGURE 8 : 1991 SITE PLAN
(adapted from Harvey, 1987: fig 4.)

Round Frames - At the recently exposed hull at the starboard bow, two rounded timbers sawn off at the top have been observed. Their fixed position on the hull suggests that they may have been frames. They are of differing diameters, 0.13m (5") and 0.20m (8") and situated on either side of a single squared frame. The

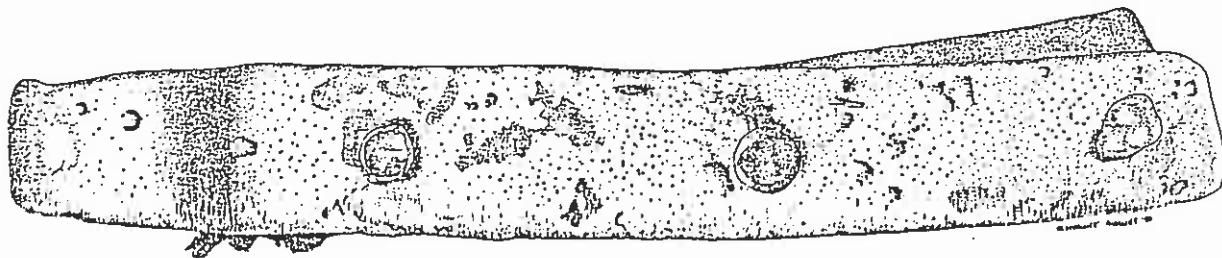
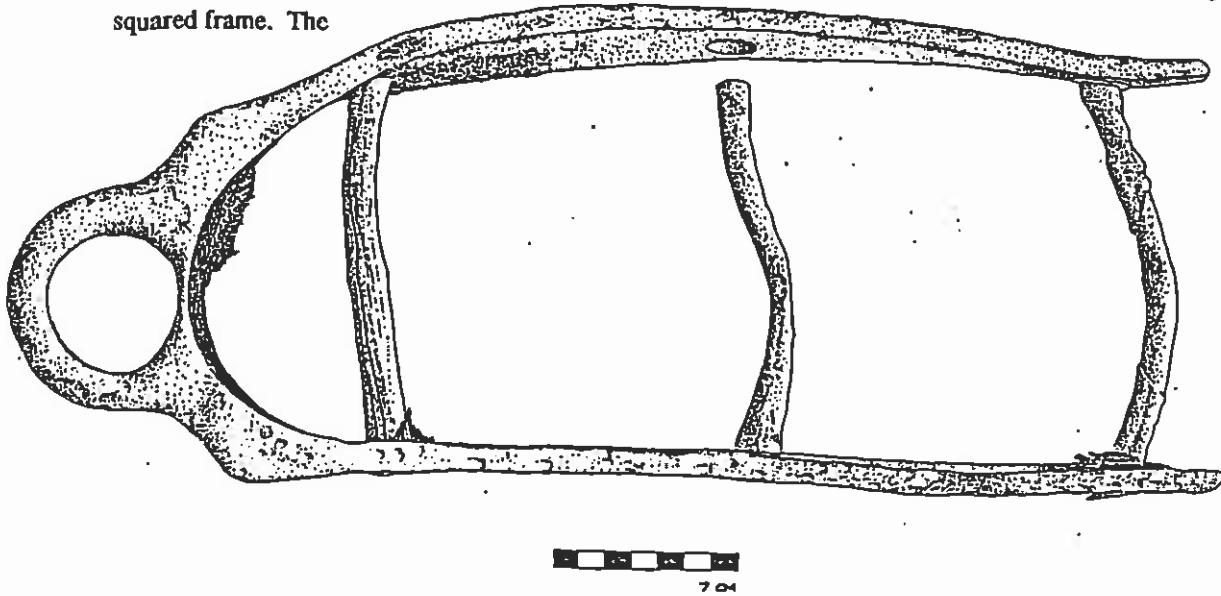


FIGURE 9 : CLARENCE GUDGEON

GUDGEON
CLARENCE
DRAWN BY - G. HEWITT 31/8/91

smaller timber, closest to the bow, has a treenail in the centre which suggests that it was a butt-dowel. They may be hanging futlocks that have not been squared. Their uneven size has resulted in the inner planking not sitting flush on the frames. These timbers might have been repairs to the *Clarence* when it ran aground at Warmambool. The hawser pipe on the starboard side had been torn out in the event (Gesner, 1984). If this observation is correct then we have an example of a standard of repair work which at best appears slipshod.

2.5 BIOLOGICAL INVESTIGATION

2.5.1 FLORA AND FAUNA SURVEY - 1985

The survey found that the plants recorded on the site are typically found in the southern end of Port Phillip Bay. It was suggested that the "...fairly strong currents and a sandy substratum probably result

in significant sand scour which would limit the richness of the algal community occurring on the wreck." (Harvey, 1986:Appendix 1)

The site also was host to wide variety of animal life such as decorator crabs, hermit crabs, sea urchins, eleven-arm starfish, small leather-jacket and stingrays.

The site although a habitat to the ubiquitous biota of Port Phillip Bay may also harbour rare or unique species. A timber sample sent to C.S.I.R.O. for identification contained a type of marine borer, *limnoria*, which had not to that date been found in Victoria (Cookson, 1991).

2.5.2. FLORA AND FAUNA SURVEY - 1991

One of the tasks of the environmental monitoring programme established in 1991 was to carry out a flora and fauna survey of the *Clarence*. The aims of this survey were to:

1. Identify any differences in the species inhabiting the site since the 1985 survey.
2. Identify biota that are detrimental and beneficial to the fabric of the site.
3. Identify the growth rates of plants on the site with the intention of determining the length of time that the site's timbers have been exposed.

The flora and fauna survey was carried out by O'Callahan from the Victorian Institute of Marine Sciences during the winter period of the monitoring programme (B. O'Callahan, 1991).

It quickly became apparent that all three aims of the survey could not be completed with the time and funds allocated. The fulfilment of the first aim was a relatively easy matter, however aims 2 and 3 could only be carried out in a cursory manner. This is because such investigations would require setting up controlled experiments and solid background research. The information gained from this survey has provided a starting point for further investigation. The direction for further research on this topic is discussed in 10.3.7. Research Projects.

One of the most significant biological finds of this survey was the discovery of a type of weedfish that was not known to the biologists at V.I.M.S. prior to the monitoring programme. There is still some debate whether this fish is a new species or a juvenile of a common weedfish (B. O'Callahan, 1991:pers. comm.). Furthermore a species of "paddle crab" quite common in nearby Swan Bay was observed on the *Clarence* with its own peculiar genetic derivation (P. O'Callahan, 1991:pers.comm.)

Findings such as these have brought the *Clarence* to the attention of local marine biologists as a site from which to study and observe some of the possibly rare species of marine life that inhabit Port Phillip Bay.

3.0 STATEMENT OF SIGNIFICANCE

In the Recommendation for Declaration the *Clarence* wreck site was considered to be significant on the basis of the following points:

- "1. *As the oldest wreck of an Australian built coastal trading vessel yet located in Victorian waters.*
2. *As an example of early Australian shipbuilding method which, through archaeological analysis of its remains, will yield information pertinent to a poorly documented area of Australian history."*

(R.f.D. File no. 70.2.4.)

This assessment has been proven to be correct as the 1986 and 1987 reports have shown. The *Clarence* has displayed characteristics that differ from traditional British shipbuilding techniques and for which parallels have not yet been found elsewhere. In addition the potential for the site to produce further information has been far from realised.

At present there are fifty five Australian built vessels, constructed prior to 1850, known to have been wrecked in Victorian waters (Shiplist, 1991). Of these fifty five, three excluding the *Clarence* have been located, two which have not been positively identified.* However taking into consideration the physical location and the state of preservation of these wreck sites the *Clarence* is the best preserved and most accessible of the early Australian built wrecks located so far (Coroneos, 1991a).

The biological investigations on the *Clarence* have produced results that have attracted interest of marine biologists. Therefore a third point of significance, that of natural significance, can now be included:

* These three wrecks are the;

- *Miranda* (1846-52), located at Wilsons Promontory
- *Diana* (1840-1844), located at Port Fairy
- *Essington* (1826-52), located at Port Fairy

The last two sites have not been positively identified (Strachan, 1987)

3. The wreck site of the *Clarence* provides habitat requirements that are rare in Port Phillip Bay which may attract rare and/or previously unknown species of marine life.

4.0 CURRENT STATUS OF THE *CLARENCE*

4.1 LEGAL PROTECTION

State Historic Shipwrecks Act (1981)

The *Clarence* was declared historic on the 5th September 1986. Under section 12(1) of the Act a 3.1 hectare Protected Zone was declared around the site. Activities such as boating, diving, fishing and anchoring are prohibited under section 20 of the Act.

Provisions of the following Acts also apply:

- * Commonwealth - Customs Act (1901)
- * Commonwealth - Navigation Act (1912)
- * Commonwealth - Protection of Movable Cultural Heritage Act (1986)

4.2 VISIBLE PROTECTION

Visible protection is afforded to the site by the following means:

- * **On- site protection** - An unpainted pile is situated 20m to the north of the site. On the pile is a sign stating that the area is declared the *Clarence* Protected Zone under the Historic Shipwrecks Act and that boating and diving is prohibited within 100m of the pile. The penalty for entering the zone is \$1000.
- * **Other signs** - Signs have been erected at boat ramps at Queenscliff, St. Leonards and Sorrento which show the position of the *Clarence* in the Bay and that there is a 100m exclusion zone around it. (PLATE 3)
- * **Navigation Charts** - The position of the *Clarence* is marked on chart AUS 158 with reference to the Historic Shipwrecks Act (1981)

- * **Participation of other Government agencies** - The Maritime Archaeology Unit has been in contact with the Water Police, the Queenscliff Police and Fisheries Inspectors who have been provided with an information kit outlining the positions of the protected wrecks in the Bay including the *Clarence*.
- * **MAU visitation** - The *Clarence* at present is visited by the Maritime Archaeology Unit at least twice a month. This is a result of the current environmental monitoring programme.
- * **Multi-Lingual leaflets** - One of the recommendations made in the 1987 excavation report of the *Clarence* suggested that multi-lingual leaflets be produced to be handed out to fishermen caught within the exclusion zone. It has occurred quite often that those caught anchored and fishing for *schnapper* within the zone claimed that they could not read the sign. According to the Department of Fisheries the main ethnic users groups in the Bay were Greek and Italian. The multi-lingual leaflets were produced with them in mind (FIGURE 10).

4.3 SITE INTERPRETATION

The following interpretive information on the *Clarence* is currently available:

- * **Information leaflet** - A double sided photocopied A4 sheet with information concerning the history of the *Clarence* and its position in the Bay has been produced by the Maritime Archaeology Unit. This pamphlet is taken by the Unit into the field and handed out to members of the public when the opportunity arises. It is intended to phase out this pamphlet with the launch of the Underwater Shipwreck Trail Information Kit (see below).
- * **Australia Post** - A commemorative postmark on the *Clarence* was issued by Australia Post in October 1985 (FIGURE 11).
- * **Archaeological and Historical reports** - An historical background and two reports on the pre-disturbance survey and subsequent excavation have been written on the *Clarence* (Gesner, 1984; Harvey, 1986 and 1987a). These reports have not been published and remain internal V.A.S. reports. A preliminary report on the *Clarence* pre-disturbance survey was published in the 1987 A.I.M.A Bulletin (Harvey, 1987b:14-16).

- * **Underwater Plinth** - Glass plaques to be installed on an underwater information plinth for the site have been made up in preparation of the inclusion of the *Clarence* into the Underwater Shipwreck Trail.
- * **Underwater Shipwreck Trail Information kit** - An information kit has been assembled in association with for the inclusion of the *Clarence* in the Underwater Shipwreck Trail. The information supplied consists of a;
 1. historical information leaflet outlining the history, the wreck event and the cultural significance of the *Clarence*.
 2. A3 foldout pamphlet of the work carried out by the M.A.U..
 3. line drawing of what the vessel may have looked like at the time of loss.
 4. contemporary underwater photographs of the site.
 5. isometric projection of the site.
 6. transit drawings to enable location of the site.
 7. information on site conditions at wreck sites and the most suitable conditions for diving.
 8. information on the flora and fauna inhabiting the site.

4.4 DIVER ACCESS

The legal status of the site as a Protected Zone under the State Historic Shipwrecks Act (1981) determines that any public access has to be administered through the permit system. This in turn involves the need for a surveillance capacity to monitor any illegal activity.

The authority to issue permits lies with the Director of the Victoria Archaeological Survey where they involve routine public access, and with the Minister for the Conservation and Environment where they involve site disturbance for research or site stabilization works.

29-31 Victoria Avenue, Albert Park, Vic. 3206. Telephone: (03) 6905322.

Victoria Archaeological Survey

Department of Conservation and Environment



Date

Our reference

Your reference

Below you are the remains of a vessel that has been declared historic under the Victorian Historic Shipwrecks Act (1981). Dragging anchors and nets have damaged the wreck in the past. It is within the interests of the Victorian Government and therefore of the Victorian people that this should not continue to occur.

For this reason the area has been declared a Protected Zone under the above mentioned Act. It is an offence to be within 100m of the pile without written authorization from the Minister of Conservation and Environment.

We are members of the Maritime Archaeological Unit of the Victorian Archaeological Survey. We have with us the necessary authorization to enter this area.

You are required to leave the area immediately. If you are caught within this Protected Zone again you will be prosecuted for breaching the above mentioned Act.

ΕΙΣ ΤΗΝ ΠΕΡΙΟΧΗ ΑΥΤΗ ΕΥΘΙΣΚΕΤΑΙ ΈΝΑ ΠΛΟΙΟ ΒΥΘΙΣΜΕΝΟ ΤΟ ΟΠΟΙΟ
ΈΧΕΙ ΑΝΑΓΝΩΡΙΣΤΕΙ ΩΣ ΙΣΤΟΡΙΚΟ ΑΠΟ ΤΗΝ ΚΥΒΕΡΝΗΣΗ ΤΗΣ ΒΙΚΤΩΡΙΑΣ.
(ΝΟΜΟΣ 1981)

ΕΙΣ ΤΟ ΠΑΡΕΛΘΟΝ, ΔΥΝΗΤΑ, ΑΓΝΗΡΕΣ ΣΥΘΩΜΕΝΕΣ ΠΑΤΗΣΤΡΕΨΑΝ ΑΡΗΚΤΑ ΜΕΡΗ ΤΟΥ
ΝΑΥΑΓΙΟΥ. Η ΚΥΒΕΡΝΗΣΗ ΤΗΣ ΒΙΚΤΩΡΙΑΣ ΚΑΙ ΓΕΝΙΚΑ Η ΠΟΛΙΤΕΙΑ ΕΥΘΙΣΤΕΡΟΥΝΤΑΙ
ΔΙΑ ΤΗΝ ΔΙΑΣΩΣΗ ΤΟΥ ΠΛΟΙΟΥ. ΔΙΑ ΤΟΥΤΟ, ΣΥΜΦΩΝΑ ΜΕ ΤΟΝ ΑΝΩΤΕΡΩ ΝΟΜΟ
ΑΠΑΓΟΡΕΥΕΤΑΙ ΝΑ ΠΛΗΣΙΑΣΗ ΟΠΟΙΟΣΔΗΠΟΤΕ ΣΤΗΝ ΠΕΡΙΟΧΗ ΚΑΙ ΣΕ ΑΚΤΙΝΑ
100 ΜΕΤΡΩΝ ΑΠΟ ΤΗΝ ΣΗΜΑΔΟΥΡΑ ΧΩΡΙΣ ΓΡΑΠΤΗ ΑΔΕΙΑ ΑΠ' ΤΟ ΥΠΟΥΡΓΕΙΟ
ΠΡΟΣΤΑΣΙΑΣ ΤΟΥ ΠΕΡΙΒΑΛΛΟΝΤΟΣ.

ΕΙΜΑΣΤΕ ΜΕΛΗ ΤΗΣ ΝΑΥΤΙΛΙΑΚΗΣ ΑΡΧΑΙΟΛΟΓΙΚΗΣ ΈΡΕΥΝΑΣ ΤΗΣ ΒΙΚΤΩΡΙΑΣ
ΚΑΙ ΕΧΟΥΜΕ ΕΙΔΙΚΗ ΑΔΕΙΑ ΕΙΣΟΔΟΥ ΣΤΗΝ ΠΕΡΙΟΧΗ.

ΣΑΣ ΠΑΡΑΚΑΛΟΥΜΕ ΝΑ ΕΓΚΑΤΑΛΕΪΨΕΤΕ ΑΜΕΣΩΣ ΤΗΝ ΠΕΡΙΟΧΗ. ΟΙ ΠΑΡΑΒΛΗΤΕΣ
ΘΑ ΣΥΛΑΜΒΑΝΟΝΤΑΙ ΚΑΙ ΘΑ ΤΙΜΩΡΟΥΝΤΑΙ ΣΥΜΦΩΝΑ ΜΕ ΤΟΝ ΑΝΩΤΕΡΩ ΝΟΜΟ.

In queste acque si trovano dei reperti archeologici che
in passato sono stati danneggiati da ancore e reti da
pesca.

Il governo del Victoria ha deciso di salvaguardare questi
reperti archeologici dichiarandoli protetti dal Victorian
Historic Shipwrecks Act (1981).

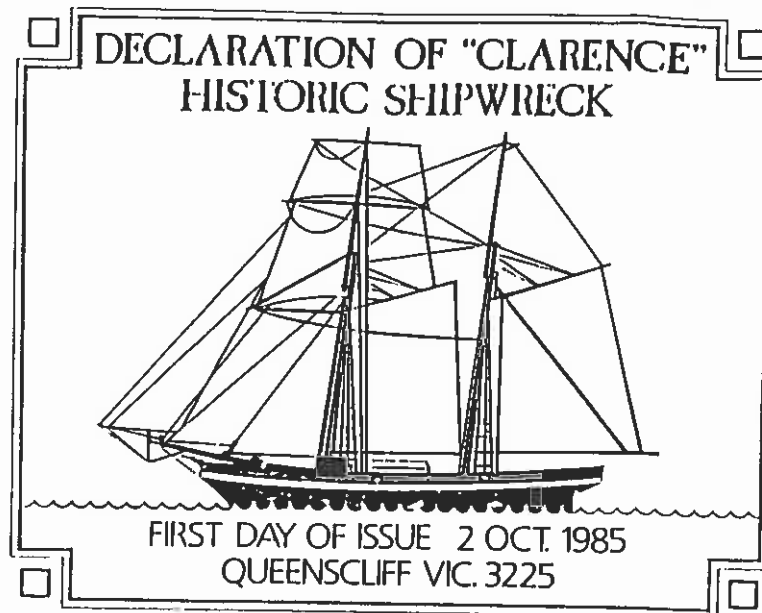
É vietato navigare entro cento metri del pilone senza
l'autorizzazione scritta del Ministro per la
Conservazione e l'Ambiente (Minister of Conservation and
Environment). Solo gli appartenenti dell' Ente
Archeologico Marittimo (Maritime Archaeological Unit)
sono autorizzati ad entrare questa zona.

Siete obbligati a lasciare la zona immediatamente.
Chinque verrà trovato entro queste acque sarà punito per
aver contravvenuto al suddetto divieto.

3722(P1)

FIGURE 10: MULTI-LINGUAL LEAFLET

SOUVENIR ²⁹ POSTMARK



NOW AVAILABLE

FIGURE 11 : CLARENCE COMMEMORATIVE POST MARK

Permits at present are not being issued to the general public. The reason for such a measure is due to concerns expressed by the Maritime Archaeology Unit over the stability of the site. Unsupervised and unregulated public access to the site may inadvertently further destabilize the site which would lead to the destruction of cultural materials.

There has been no evidence to suggest illegal diver visitation to the site since the monitoring programme began in April 1991. This is not too surprising. Though the site is easily accessible by boat, shallow and divable for most of the year, it is not considered to be the "good dive" category and as it is not close to popular diving areas, very few recreational divers would see it as worthwhile to make the trip to the site.

4.5 PHYSICAL DETERIORATION

Since the 1987 excavation of the *Clarence* the site has lost a considerable amount of sediment, primarily around the bow on the starboard side and the stern on the port side. Ship's timbers have begun to appear along the centre of the site, including the breast hook at the bow (FIGURE 8).

It seems that the state of sand loss on the site is about the level that was reached during the excavation; despite efforts made to cover the site to its original sand level with sand and dead sea grass (see Appendix B; 1987 Excavation). For example the ceiling planking at the port/stern was reported to have been reached during the excavation after the removal of 0.40m of sand (FIGURE 8). In 1991 it is

visible most of the time (C.M.F.N., 1991). Measurable sand loss can also be seen on the starboard bow where the rounded frames have become visible (see 2.4.4. Inspections 1987-91). In the 1985 site plan the upperpart of one of the adjacent frames was just visible; in 1991 approximately 0.25m of that frame was exposed.

Sand erosion has led to the uncovering of material to the port side of the hull remains. Such material includes what appears to be a hatch cover, a lead sheathed timber, copper "scupper", a "grown" knee and a copper alloy gudgeon (FIGURE 8).

In addition to having lost a significant amount of sand, there has been some physical damage to the fabric. For example the deck beam closest to the bow has disappeared along with a section of ceiling planking below it and the chain plate concretion on the exterior of the hull. The cant frame on the port side that was still standing during the excavation has since collapsed but is still visible.

This sand erosion does not seem to be confined only to the *Clarence*. Erosion on the *William Salthouse* has been an on-going problem since its discovery in 1982. A major reason for this is due to the de-stabilization of the site caused primarily by looting and the 1983 V.A.S. excavation. However the nature of the site's location, in an area of shifting sand dunes and strong currents, is the main contributor to the damage. However more recently other sites in the Bay have shown the same tendency to lose sand cover. There has also been an increase in the number of sites reported to the M.A.U. that have been recently uncovered. Further investigation might show that the problem faced by the *Clarence* might be one that is occurring Bay wide, but the problem at hand is to assess the threat of erosion to the fabric of the site (see Appendix B)

5.0 POSSIBLE FUTURE FOR CLARENCE

5.1 PUBLIC ACCESS

The *Clarence* has been targeted for inclusion into the extended Underwater Shipwreck Trail. The interpretive kit is planned to be launched in the 1991-2 financial year. The issue of Protected Zone access is still under review by the MAU in conjunction with H.S.A.C. but the timing of the opening and the scale of diver access to of the *Clarence* will be dependent on the findings of the environmental monitoring programme. At present the site should not be open to public diver visitation until site stabilization measures have been undertaken.

With the opening of the site to the public, recreational divers will have the opportunity to view part of Victoria's and Australia's heritage. The site will also enable the diving public to enjoy the variety of marine life that the *Clarence* sustains. The dive charter operators have a desire to see restricted sites

like the *Clarence* opened up as they would be able to provide their diving clientele a wider variety of diving locations to choose from.

5.2 ARCHAEOLOGICAL RESEARCH

Despite the archaeological work that has already been carried out on the *Clarence* the site has still much to offer with regards to data that can be obtained. Future research questions may lead archaeologists to revisit the site for the purposes of gathering specific data. The exposed fabric of the site can still supply much information to research questions which were not covered in the pre-disturbance survey and the excavation. However it is highly unlikely that another V.A.S. initiated excavation will take place on the *Clarence* in the near future, the primary reason being cost, strain on present staffing levels, the restricted storage and conservation facilities available to the Archaeological Sciences Unit and the lack of display outlets. (see 9.3 Resources of the Archaeological Sciences Unit)

The continuation of the monitoring programme should see the site visited on a regular basis by the staff and volunteers of the Victoria Archaeological Survey and the Maritime Archaeology Association of Victoria till 1992.

5.3 MARINE BIOLOGICAL RESEARCH

The recent biological findings on the site may stimulate investigation by marine biologists on the marine life of the *Clarence*. This should be encouraged by V.A.S.

5.4 V.I.M.S. SUMMER EDUCATION PROGRAMME

Results from the participation of marine biologists in the *Clarence* monitoring programme the site may be used in an educational capacity for summer schools conducted by the Victorian Institute for Marine Sciences. The *Clarence* will be introduced to guided groups of snorkellers as an example of the adaptation of marine life to an artificial reef. The relative shallowness of the site (4msw) would be within the capabilities of snorkel groups.

5.5 WRECK SITE DYNAMICS

One of the recommendations of this report is that the environmental monitoring programme continue until mid 1992. The information gained from the programme will not only be of benefit in the decision making process for the management of the site but will also contribute to the management of other sites with similar environmental conditions in Port Phillip Bay.

The environmental monitoring programme on the *Clarence* is pioneering research. No other State has undertaken or is currently undertaking such rigorous monitoring of wreck sites. V.A.S. has the opportunity to improve and build on the techniques being applied to the monitoring of the *Clarence*. The fostering of environmental monitoring as a tool for site management will give V.A.S. a level of expertise that no other State can provide.

5.6 PHYSICAL DETERIORATION

The results from the monitoring programme so far have led to the conclusion that the physical remains of the *Clarence*, if left as is, will continue to experience accelerated deterioration in the future (see 8.0 Impact of perceived threats to site significance).

5.7 CHANGE IN SAND DUMPING REGIME AT QUEENSCLIFF CUT

The Port of Melbourne Authority in 1987 made a number of recommendations that addressed the problem of ongoing erosion at Swan Island (S.B.M.P., 1991:46). The primary recommendation involves the removal of the entrance spit off the Queenscliff Cut. This, activity along with other measures that call for a change in the current sediment dumping regime, would free up sediment obstructed by the presence of the training walls (S.B.M.P., 1991:46). The implementation of the recommendations may result in the increase of sediment cover the *Clarence* (S.B.M.P., 1991:50). The repercussions for the *Clarence* have been identified as the following:

- * improved preservation conditions for organic remains will develop as a result of anaerobic conditions being created by the newly covered areas of the site.
- * the partial covering of the site will diminish its interpretive and recreational value
- * the natural significance of the site may be affected in such a way that the relevant aspects of the significance may be lost or modified

(S.B.M.P., 1991:50-1)

At the time of writing the major recommendations of the Port of Melbourne report have not been implemented. It is not known when or whether the sand pumping regime will be changed. Furthermore although the *Clarence* has been identified as a site that may be potentially affected the chances are remote because of its distance from the areas that are being affected by erosion (see Appendix B; Loss of sediment in the Bay).

5.8 GREENHOUSE EFFECT

The increasing intensity of the Greenhouse effect is an issue that could have an impact on the future of the *Clarence*. It has been estimated that the sea level in Port Phillip Bay will rise between 10-30cm by the year 2030 and to between 20-70cm by 2080 (S.B.M.P., 1991:13). Such a development would be of benefit to the preservation of the *Clarence*. An increase in the depth of the site will decrease the effects of wind generated waves which in turn will reduce sediment erosion on the site (Coroneos, 1991b; 2.5 Wave Prediction). More seriously, actions taken by the Government in response to the Greenhouse effect may threaten the significance of the site (Buckley, 1991). The Government response to the Greenhouse effect has not been included in 7.0 Perceived Threats to Site Significance as there yet no tangible indication as to how the actual threat to the site will occur.

6.0 IDENTIFICATION OF USER GROUPS

Based on the discussion in the above section the user groups that would access the *Clarence* have been identified as the following:

- * Maritime archaeologists
- * Maritime Archaeology Association of Victoria
- * Marine biologists
- * Marine biology student groups
- * Recreational divers
- * Dive charter operators

Maritime archaeologists

Potential size of user group - 20 to 30

Maritime Archaeology Association of Victoria

Potential size of user group - 30 to 40

Marine biologists

Potential size of user group - not known at present

Marine biology student groups

Potential size of user group - 300-400

Recreational Divers

Potential size of user group - 80,000

Dive Charter Operators

Potential size of user group - 25-30

7.0 PERCEIVED THREATS TO SITE SIGNIFICANCE

The *Clarence* has been stated to be of cultural significance because of the contribution it can make to the study of early Australian shipbuilding. Therefore the significant fabric of the site is the structural remains of the vessel, as well as artifacts that are related to the function of the vessel (i.e. ships fittings).

The *Clarence* has been stated to be of natural significance as it provides rare habitat requirements that attract rare species of marine life. The significant fabric of the of the site therefore is the marine life on the site and the physical remains of the vessel.

A perceived threat to the site significance is any impact that may destroy or aid in the destruction of;

- * the structural remains of the vessel, whether articulated or not.
- * artifacts relating to the function of the vessel.
- * marine life that inhabits the site.

7.1 DESTRUCTION OF SITE THROUGH NATURAL FORCES

The natural forces identified to be a threat to the significance of the *Clarence* are:

- * mechanical damage to exposed fabric.
- * detrimental marine infestations.
- * sediment loss from the site.

Mechanical damage: Current-borne objects and the increase in current velocity due to wave action can cause the breakage of friable fabric and the dislodgement of ship's timbers. Increased wear on metal artifacts such as fastenings through aggressive polishing can also occur.

Marine infestations: Exposed wooden parts of the site are vulnerable to degradation from biological organisms. The primary active biological decomposers are marine borers such as shipworms and *limnoria* as well as micro-organisms. Evidence is also mounting that marine animals such as sea

urchins and eleven armed starfish also have detrimental effect on the wooden elements of the site (B. O'Callahan, 1991; pers. comm.).

Sea urchins have the effect of actually wearing away wood while the eleven armed starfish devours sedentary growth on timbers. Sedentary marine growths assist in the protection of the timber elements from physical damage from current-borne objects.

Sediment erosion: The loss of sediment from the site increases the damage that would be inflicted on the site from the two threats described, through the exposure of a greater surface area of the vessel. Sediment erosion would also result in the site being more susceptible to the force of the current and marine borer infestation. Sediment erosion would result in the exposure of organic materials such as rope and leather that would be under threat of bacterial degradation and of metal objects which would corrode at a faster rate due to increased contact with salt water. Sediment erosion would also lead to some upright sections of the wreck becoming increasingly unsupported resulting in accelerated collapse.

7.2 DESTRUCTION OF SITE THROUGH HUMAN INTERFERENCE

Three types of threat to the site fabric through human intervention have been identified. They are:

- * unintentional
- * careless
- * deliberate

Unintentional threat is essentially concerned with diver activity contributing to the ongoing sediment erosion of the site. This has been observed during the monitoring programme (Coroneos, 1991b;2.3 Sand Levels). The effect would undoubtedly be multiplied by an increase in numbers and the relative inexperience of the divers. At present there is no way in which to quantify erosion created by divers on the *Clarence*.

Careless threat to the site is the damage that can be caused through anchoring and fishing and from divers removing or killing marine life on the wreck site. This threat can be overcome through education and the enforcement of legislation.

Deliberate threat is the wilful damage the site through digging of holes in the site and removing material from the wreck site. Legislation is in place to guard against this threat.

7.3 ASSESSMENT OF PERCEIVED THREATS

The detrimental impact of the likely threats to site significance will vary in accordance to magnitude and time. Some threats at present can be minimized and prevented, others cannot. What follows below is an assessment of the likely threats outlined in 8.1 and 8.2:

1/ The mechanical damage to exposed parts of the site at the present time cannot be quantified as it is a continuing long term and possibly random/sudden process. Also there are no known measures that can be taken against such threats that are within the M.A.U. budget and which are acceptable under the ICOMOS guidelines, the Burra Charter and M.A.U./V.A.S. policy (see 9.1. V.A.S./M.A.U. policy)

2/ A similar argument can be put forward for the threats posed by the marine life of the site. Shipworm infestation is prolific on the exposed timbers of the site. There are a number of methods which can prevent shipworm damage but most of them are not practical and environmentally acceptable (Cookson, 1986:1). All that can be done is to monitor their effects and the rate of degradation. The effects of other marine animals such as urchins and starfish have been noted but there has not been enough research done to be able quantify the extent and rate of their damage. Furthermore it would be premature to consider the eradication of such organisms as it could lead to an imbalance in the ecology of the site which may in the long run be detrimental to the significance of the place both culturally and naturally.

3/ With regards to vessels fishing and anchoring in the Protected Zone there has been a number of vessels observed anchoring in the zone and these were warned off. There has been no evidence in the time that the monitoring programme has been in place that damage has been caused to the site though such activities. As a likely threat this is considered to be of a low priority. This does not imply that enforcement measures in place to prevent anchoring on site should be relaxed.

4/ The threat of uncaring and intentional damage by divers is low. This is due to the fact that the site at present is not accessible to the public. There has been no evidence of divers destroying marine life on site. In the event of the site becoming open to the general public divers would be warned not to disturb the marine life. There is no reason to believe that informed divers would ignore such a request.

The threat of intentional damage to the site is not a pressing issue. The *Clarence*, unlike wrecks such as the *Loch Ard*, is not known to be a site which has artifacts that would interest those of the diving public who make it a hobby to souvenir objects from shipwrecks. The policy for such artifacts that may appear on the site is covered in 12.2.3. **Artifact Retrieval Policy.**

The threat of sediment erosion is the most detrimental to site significance in its magnitude and its immediacy. When the site was discovered in 1982 it was in a relatively stable condition. Over the years since the wrecking the rate of decomposition would have slowed down considerably due to the building up of "natural" protection in the form of marine growths on the timbers. In a stable environment wrecks such as the *Clarence* reach a state of near equilibrium where electrochemical and biological activity virtually ceases. Once this point is reached a wreck site can survive almost indefinitely unless disturbed by human forces or the environment is altered (Brown, et al, 1988:143).

Since the 1987 excavation it is evident that the site has lost sand. Continuing erosion of the site would result in the exposure of material that had previously been protected by sediment. Newly uncovered material, whether it be organic or metal suffers, an initial impetus of deterioration as it adjusts to its new environment. This process would lead to the irretrievable loss of cultural information and is therefore undesirable.

Sediment erosion and factors that can contribute to it, such as excessive diver access, are threats that through rigorous monitoring can be:

- * measured and assessed.
- * minimized or prevented.

In order to assess the threat of sediment erosion and the contribution of diver visitation to site significance a programme was established in May 1991 to collect environmental data on the *Clarence* site through frequent monitoring (Coroneos, 1991b; Appendix A The *Clarence* Environmental Monitoring Programme).

8.0 IMPACT OF PERCEIVED THREATS TO SITE SIGNIFICANCE

There has been no obvious sediment erosion occurring on the site since the monitoring programme was started. Measurements taken in late September and October 1991 indicate that sand levels are increasing which suggests that there may be a seasonal pattern developing.

It appears that the sediment distribution on the site has reached a state of equilibrium, however this does not necessarily mean that the site itself is stable. Sand levels at the bow and stern are down to the stage reached in the 1987 excavation. In these two localities sizable intact surface areas of the vessel are exposed for part of the year. In 1987 digging stopped when this level of intact wreck material was reached. The presence of intact remains formed a barrier which prevented the excavators from continuing and this may be the reason why sediment erosion at present has also been checked.

Such conditions are not to be expected to continue. When excavated, the ceiling planking at the stern and the breasthook at the bow were in relatively good condition. In 1991 they are showing signs of marine borer infestation despite intermittent exposure. Marine borer attack can also be observed on the knee on the port side of the wreck. When first observed in April 1990 there was little evidence of shipworm damage (Harvey, 1991:pers. comm.). In June 1991 when the knee was recorded and photographed it was noticed that the top 0.15m of the knee was scarred with shipworm burrows.

Marine borer infestation of wood weakens the structural integrity of the fabric. The breasthook is a pivotal part of a vessel's structure which keeps the bow timbers in place. The weakening and eventual loss of the breasthook would result in the disarticulation and eventual destruction of the intact bow section of the *Clarence*. The loss of the ceiling planking would expose more of the vessel to mechanical and marine borer damage. All this will result in the further weakening of the structural integrity of the site as well as the irretrievable loss of cultural information. It is not known how long it will be before this happens.

The site, if left in its present condition, will deteriorate until a stage of equilibrium is again reached in the future. By that time it is quite likely that much more of the cultural significance will have been destroyed.

9.0 CONSTRAINTS ON IMPLEMENTATION OF CONSERVATION POLICY

9.1 V.A.S./M.A.U. POLICY (S. O. M. H., 1990)

The Victoria Archaeological Survey has policy commitments to:

- * facilitate the general public gaining access to its heritage, and to communicate knowledge of that heritage to the public.
- * ensure the protection and enhancement of the archaeological heritage as a resource for everyone.
- * implement baseline heritage of all shipwreck sites.
- * implement management programmes designed to preserve these areas from damage and to educate and inform the public.
- * minimize damage to all archaeological resources by physical protection, conservation and law enforcement.

9.2 RESOURCES OF THE MARITIME UNIT

- * The Maritime Archaeology Unit currently has only three permanent and one temporary staff.

The staff of the Maritime Archaeology Unit has a wide range of responsibilities in the identification, assessment, protection and management of over 600 recorded shipwrecks in Victoria. It is not possible for the Unit to maintain a long term, labour intensive monitoring programme on the *Clarence*. Furthermore each member of the Unit has set responsibilities which require full time attention. The addition of extra responsibilities would risk the output and quality of work currently produced by the Unit. This constraint also applies to any stabilization measures that may be required on the site.

- * The Maritime Archaeology Unit has a limited budget.

This is a major constraining factor in determining the frequency of monitoring visits to the *Clarence*. The lack of sophisticated monitoring equipment used in the programme is also a factor. These financial constraints should also be kept in mind when looking at the application of site stabilization methods. Outside funding may be required.

9.3 RESOURCES OF THE ARCHAEOLOGICAL SCIENCES UNIT

- * Conservation work undertaken by the Archaeological Sciences Branch is only undertaken on collections which have clear research and display values identified for them.
- * As from February 1992 the Conservator for the Archaeological Sciences Branch will be taking maternity leave for an indefinite period of time and there are no plans to fill the position in the near future.
- * VAS does not have the facilities to act as an artifact repository on a major scale.

9.4 LEGAL AND STATUTORY

a) Port Rules

- * Any stabilization works involving the introduction of materials which could provide a threat to safe navigation for shipping must be approved by the Manager of the Port of Melbourne Authority under the provisions of Marine Regulation 503.

The M.A.U. is required to demonstrate that the method of stabilization;

- would not alter the environment.
- will be useful to all potential client groups.
- will have a monitoring programme set in place for assessment.
- can be removed at, or less, than the cost of installment.

(Tyshing, 1991:pers. comm.)

b) Australian Heritage Commission

The *Clarence* is listed on the register of the National Estate which requires adherence to the principles of the Burra Charter and ICOMOS guide-lines.

10.0 STATEMENT OF CONSERVATION POLICY

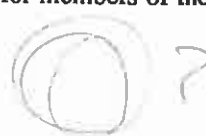
A "...conservation policy sets out in summary the conservation approach and use proposed for the place. It is a key statement on which future decisions will be based. The over-riding factor in the preparation of the policy is the need to retain or enhance significance..."

(Kerr, 1983:15)

The aim of the *Clarence* conservation policy is to protect and promote site significance.

The statements of the conservation policy are as follows:

1. Implement site stabilization measures to minimize and/or prevent the destruction of the significant fabric of the *Clarence* both cultural and natural.
2. Implement a consistent policy of artifact retrieval and management that protects and promotes the significance of the *Clarence*.
3. Actively enforce the provisions of the *Clarence* Protected Zone by prosecuting those caught trespassing.
4. Establish an education programme on the Historic Shipwrecks legislation and cultural value of the *Clarence* that is specifically tailored for members of the fishing community who have English as a second language.



5. Maintain the restrictions of the *Clarence* Protected Zone with regards to public diver access until site stabilization measures have been implemented.
6. Promote and enhance the significance of the *Clarence* and maritime archaeology through;
 - * the publication of interpretive materials on a technical and popular level.
 - * the display of artifacts of cultural significance from the *Clarence*.
7. Ease the restrictions regarding access to the *Clarence* Protected Zone for the V.I.M.S. Summer Education Programme and other such organized snorkel groups.
8. Sponsor and/or initiate research projects that will contribute to the *science* of the management of the *Clarence* and State's remaining submerged cultural resource.
9. Review the conservation plan;
 - * at the completion of the monitoring programme in May 1992
 - * at the completion of site stabilization.
 - * in 1995 and every five years after that.

10.1 REASON FOR POLICIES

Conservation Policies 1 - 5 refer to the issue of protecting site significance. Information presented in this report has shown that the *Clarence* has the potential to provide valuable information both cultural and natural significance. To allow the significance of the place to be diminished would result in the loss of knowledge.

Permitting diver visitation is in accordance with M.A.U./V.A.S. policy. Public access will give first hand experience of the State's and nation's European and natural heritage. It will increase awareness of Victoria's wreck resource and its value. It will also bring to light the work that the MAU is doing for the public. However public diver visitation is dependant on its perceived detrimental impact on site significance. Observations made during the monitoring programme have shown that divers can contribute to the loss of sediment from the site. Therefore public diver access should not be permitted until site stabilization has taken place. Safeguarding of the significance of the place is the overriding factor.

Conservation Policies 6 and 7 refer to the issue promoting site significance. The publishing of interpretive materials will promote the *Clarence* and its significance to a wider public. Interpretive materials in this context also includes publications of an archaeological/technical nature. The M.A.U. has a policy of accountability to the general public but it is also accountable to its peers.

Conservation Policy 8 has arisen from observation that there is a lack of information available on the interaction of wooden wrecksites with their underwater environment. With regards to the likely threats to the fabric of the site, precious little is known or has been written on the quantitative and qualitative effects of the underwater physical/biological/chemical environment on ship's timbers. This type of data would be invaluable in determining rates of degradation and mitigating measures for prevention. Little is also known of the behaviour of currents, and consequently sediments, on wreck sites of differing configurations and in differing environments. Information such as this would greatly assist in the formulation of future conservation plans.

The review mechanism in Conservation Policy 9 is essential as unforeseen circumstances in the form of new threats and drastic changes to the site environment may make aspects of this conservation plan obsolete.

10.2 CONSEQUENCES OF CONSERVATION POLICY

The implications of the conservation policy are:

- 1 that the implementation of site stabilization may;
 - * affect the natural significance of the site.
 - * diminish the recreational and interpretive value of the site.
- 2 that public diver access to the *Clarence* is denied until at least June 1992.
- 4 that additional funding from the MAU budget or from outside would be required for;
 - * implementing site stabilization.
 - * publishing interpretive materials.
 - * establishing an education programme for fishermen who have English as a second language.
 - * sponsoring research projects.

10.3 STRATEGY FOR IMPLEMENTATION

10.3.1. ENVIRONMENTAL MONITORING PROGRAMME

At present the monitoring programme has been running for six months. The assessments made in this report on the stability of the site have been made with incomplete information.

It is essential that the programme be carried out for the remaining six months in its current form. Furthermore there are additional data collection procedures that should be carried out before May 1992 (Coroneos, 1991b; Appendix A The Clarence Environmental Monitoring Programme). The completion of full year's consistent monitoring of the site would better place the staff of the M.A.U. to make decisions on the choice of which site stabilization technique to employ.

It is strongly suggested that assumptions made on the site situation from the data collected from the monitoring programme be re-evaluated by a practitioner in a relevant field.

To run and adequately record the information of the monitoring programme it is essential that a Project Officer be assigned to control the monitoring programme. The duties of the Project Officer would be to:

- * act as project leader
- * carry out the monitoring programme in the established format.
- * schedule the twice monthly visits to the *Clarence*.
- * ensure there are sufficient divers for the required tasks on the day.
- * take responsibility for the on-site monitoring.
- * record information obtained from the monitoring programme in the standardized manner.
- * maintain a record of the weather for three days prior to the site visit.

Recommendations:

- * maintain the monitoring programme in its present form until May 1992.
- * assign a Project Officer to oversee the monitoring programme.

- * maintain and add data to the *Clarence* monitoring file in the standardized format.
- * carry out additional data collection procedures. They are:
 - 1/ 2m core samples from locations near the site using a sediment corer.
 - 2/ additional measurements of current velocities using dye traces.
 - 3/ a 40m x 30m area sand contour of the site, at 2m intervals.
- * have the data collected in the monitoring programme appraised by a practitioner in a relevant field, i.e. marine engineer, sedimentologist, oceanographer.
- * renew the permit allowing the disturbance of the site until the monitoring programme is completed.

10.3.2. ALTERNATIVE STABILIZATION METHODS

It has already been stated that the cultural significance of the *Clarence* is under definite threat from natural forces (see 8.0 Impact of Perceived Threats To Site Significance). The magnitude of the threat can not be ascertained at present. This will become clearer at the completion of the monitoring programme in May 1991. The choice of which stabilization method to use also cannot be made until the data from the monitoring programme is analysed.

Observations made so far see that it is essential that the bow and stern of the site are covered to prevent further damage from marine borers. Ideally the site should be returned if possible to its pre-1987 state.

The choice of stabilization for the *Clarence* should follow as closely as possible the Conservation Principles outlined in the Burra Charter. The relevant articles of the Charter are:

"Article 2 conservation policy should retain the cultural significance of the place.

Article 3 conservation policy should respect the existing fabric with the least physical intervention.

Article 4 conservation policy should utilize all disciplines which can contribute to the study.

- Article 5 conservation policy should take into account all aspects of the cultural significance and not emphasise one at the expense of the others.*
- Article 8 conservation policy should be sensitive to the visual setting, colour, texture, scale and form of materials. There should be no new constructions or intrusions that lessen the appreciation and enjoyment of the place.*
- Article 11 Preservation is appropriate where the existing state of the fabric itself constitutes evidence of specific cultural significance.*
- Article 12 Preservation is limited to the protection, maintenance and where necessary, the stabilization of the existing fabric but without the distortion of its cultural significance."*
- (Burra Charter, 1981)

It should be pointed out that all stabilization measures should be reversible for the following reasons:

- * the stabilization method may initiate a greater detrimental impact.
- * a more efficient alternative may be found
- * further archaeological investigation may take place in the future.

With these points in mind six alternative stabilization methods have been considered in Appendix A. They are by no means exhaustive.

The implementation of any stabilization measures would require an additional monitoring programme to assess the progress and effects of the implemented measure.

Recommendations:

- * appraise and implement suitable site stabilization to protect the significance of the site once monitoring programme is completed.
- * seek advice from a practitioner in a relevant field, i.e. marine engineer, sedimentologist, oceanographer, when choosing a suitable stabilization method.
- * apply sensitivity to the articles of the Burra Charter and M.A.U/V.A.S policy when choosing the method of stabilization.

- * prepare and initiate a monitoring programme with any stabilization method implemented.

10.3.3. ARTIFACT RETRIEVAL AND MANAGEMENT POLICY

Valuable cultural artifacts or worthless pieces of ship?

Paul Johnston, 1991 AIMA Conference, Adelaide

VAS at present has a collection of *Clarence* artifacts that were obtained from the 1987 excavation. These artifacts are undergoing conservation treatment, and treated material is kept in the basement of the conservation lab at Francis Street in central Melbourne. V.A.S. does not have the facilities for the display of material. It is in the interests of both the public and other archaeologists to be able to have access to the material. The M.A.U./V.A.S. has a policy of facilitating general public access to its heritage. This applies to sites and to items of cultural significance that were retrieved from these sites.

The promotion of the collection for illustration and study can be achieved through a catalogue. Such a publication would give the opportunity for archaeologists and historians unable to access the material to be aware of what is available. A catalogue of the material excavated in 1987 appears in the excavation report (Harvey, 1987a:Appendix 3). Such a catalogue could be presented in a manner, i.e. with lengthy descriptions, drawings and reconstructions that would appeal to the public.

Artifacts have appeared on the site as a result of erosion. The gudgeon is a case in point (2.4.4. *Inspections 1987-91*). The appearance of the gudgeon presented the M.A.U. with a dilemma; the artifact was small, portable and likely to attract the attention of divers. With the site earmarked for inclusion into the Underwater Wreck trail it was thought that the gudgeon would eventually be removed by divers. The decision was made to recover it after its position was recorded.

There was another consideration however that was considered more relevant. The question was asked; would the gudgeon provide more information on the significance of the site if it was raised? The answer was yes and the information obtained can be seen in 2.4.4. *Inspections 1987-91*.

The decision on whether to raise the gudgeon was based on two assessments.

The first assessment was concerned with the cultural value of the artifact. The gudgeon was seen to be part of the fabric that pertained to the cultural significance of the site. As this was the only gudgeon found on the site so far it was deemed to be able to provide valuable information on early Australian shipbuilding. The raising of the gudgeon would result in a closer visual inspection as well allowing a

more detailed record to be made of the artifact (drawing and photography). Furthermore the artifact has the potential to yield more information through metallographic analysis.

This assessment was then followed by an examination of the physical situation of the gudgeon. It was in danger of gradual physical deterioration as it was becoming uncovered and more exposed to corrosion. It was also in danger of being looted as it was in good condition, portable and an object that would tempt divers who "souvenir" objects off wrecks.

From this example a artifact acquisition policy could be put in place should further material become visible on the site. It is as follows:

1. is the artifact in danger from;
 - a. the environment
 - b. looting
2. is the artifact rare in the context of the wider Australian cultural significance?
 or
 is the artifact relevant to the cultural significance of the site?
3. can further information be obtained from the artifact if it is raised?

If the answers to these criteria are yes then the artifact should be raised.

One consideration that has not been taken into account is the return of the artifact to the site once the desired information is obtained. Article 10 of the conservation principles of the Burra charter is explicit on this matter. It states that the removal of contents which form part of the cultural significance of the place is unacceptable unless it is the sole means of ensuring their security and preservation. Such contents should be returned should changed circumstances make this practicable (Burra Charter, 1981). Such considerations have obviously not taken into account artifacts from a marine environment. Such artifacts cannot be returned to the same environment after removal as this will increase their degradation rate.

To conclude it is important not to let an artifact of cultural significance be destroyed through theft or natural processes as it would lead to the loss of knowledge and the possible closure of the site to the general public.

Recommendations

- * actively seek to have artifacts pertaining to the cultural significance of *Clarence* interpreted and on display.
- * produce a catalogue of the *Clarence* artifacts which would satisfy the requirements of archaeologists and which would appeal to the general public.
- * implement an artifacts acquisition policy which involves the raising of vulnerable artifacts of cultural significance.
- * submit the recently raised gudgeon from the *Clarence* for scientific analysis.

10.3.4 SITE POLICING AND PROTECTION

At present there are protection measures in place to protect the site from looting and other damage (4.2. Visible protection). There are additional steps that should be taken however as on a number of visits to the site the M.A.U. has caught fishermen within the 100m Protected Zone.

The pile on the site is unmarked and unpainted. The sign can only be read from a short distance away. By painting the pile yellow and placing a "special" top mark on the pile, those caught in the Protected Zone will have no excuse. Both the paint used on the pile and the top mark should conform the Port Authority symbol standards.

Expenses for this task will be low as the MAU has sufficient yellow paint for the job. Allocation of funds for the purchase of the materials for the top mark and the personal expenses for M.A.U. staff could be more than adequately covered by the M.A.U. budget.

In discussions with the Fisheries Department it was pointed out that fishermen are not concerned with Protected Zones unless they know that they are enforced (Houghton, 1991:pers.comm.). Therefore a file should be maintained on trespassers and integrated with Department of Conservation, Forests and Lands records. Furthermore a letter explaining their violation should be sent. Those caught on the site a second time should be prosecuted.

Concerning the issue of members of the community who have english as a second language, the multi-lingual aspect the multi-lingual leaflets should be followed up with an education programme specifically tailored for the non-English speaking community. Interviews on ethnic radio is an example.

The presence of the Underwater Information plinth will also act as a form of enforcement (see 10.3.5. Site Interpretation).

Recommendations

- * paint the *Clarence* pile yellow in accordance with Port Authority symbol standards.
- * place the special top mark on the *Clarence* pile in accordance with Port Authority symbol standards.
- * Set up an offence file management system with the Department of Conservation, Forests and Lands enforcement branch for those who are caught violating the *Clarence* Protected Zone and prosecute those who are caught a second time.
- * promote an educational programme for members of the fishing community who have English as a second language.

10.3.5 SITE INTERPRETATION

The interpretive materials available on the *Clarence* have been outlined in 4.3. Site interpretation. At present the full interpretive potential of the *Clarence* has not been realised. With the production of the Underwater Wreck Trail Information Kit, the pending deployment of the underwater plinth on site and the site's eventual re-opening to the public this imbalance will have gone some way to being redressed. There are some other aspects however concerning the interpretation of the site that need to be explored.

In November 1991 the *William Salthouse* guide will be launched. This thirty-two page colour booklet is presented at a popular level with information on the history of the vessel and the wreck. The significance of the site and the archaeological work that has been carried out on it has been emphasised. An approach on similar lines should be taken for the *Clarence*.

This publication would be the same size and length as that of the *William Salthouse* guide. Through the use of line drawings and artists reconstructions the booklet should illustrate:

- * the history of the vessel
- * the wrecking process
- * the archaeological work that has been done
- * what was found
- * the significance of the site
- * the future of the site

By putting emphasis on reconstructions public awareness and interpretation will be enhanced. Though artist's reconstructions of themes such as the construction of the *Clarence* and the wrecking process may not be entirely archaeologically accurate they should nevertheless draw on archaeological

evidence. This will promote the value of maritime archaeology in re-creating the past rather than supplementing maritime history.

These booklets would be made widely available to tourist shops in the Port Phillip Bay area as well as in maritime museum bookstores.

The importance of publishing archaeological information on the *Clarence* has been discussed already in this report. It should become one of the priorities of the M.A.U. to have the 1984 historical report by P. Gesner, the 1985 Pre-Disturbance Survey and 1987 Excavation Report both by P. Harvey published either as three separate reports or combined into one.

Flora and fauna surveys that have been carried out on the site, revealed the variety and accessibility of the marine life. It has been previously discussed that the organisers of the V.I.M.S. summer education programme are keen to include the *Clarence* as part of their itinerary. This should be actively encouraged and promoted by the M.A.U. with the aim of having snorkel groups visiting the site in the summer of 1991-2.

Recommendations:

- * **deploy the Underwater Plinth on the site by January 1992.**
- * **publish a 20 page "popular" booklet on the *Clarence* that enhances its cultural significance and promotes the contribution of archaeology in understanding cultural heritage.**
- * **publish the historical report and the two archaeological reports on the *Clarence* as soon as possible.**
- * **open the site to snorkel groups from the V.I.M.S. Summer Education Programme, for the summer of 1991-92.**
- * **ensure M.A.U. participation in the V.I.M.S. Summer Education Programme.**

10.3.6 PUBLIC VISITATION

Public diver visitation to the *Clarence* should not be permitted until the site has been stabilized sufficiently. There should also be no relaxation in Protected Zone restrictions with regards to boating and fishing.

Participants in the V.I.M.S. Summer Education Programme should be allowed access to the site as snorkellers are seen to pose no threat to site stability provided that they are properly supervised and briefed. The organisers of the summer programme would be required to abide by the restrictions set by

the Project Officer regarding access to the site. These restrictions would involve outlining acceptable mooring locations for vessels.

Marine biologists wishing to visit the site should be permitted to do so. However the same restrictions would apply to them with regards to mooring. Another requirement that should be put in place is ensuring that the site is only dived during periods of slack water to minimize sediment loss.

Recommendations

- * maintain the restrictions on Protected Zone access to the *Clarence* for the diving public until successful site stabilization has taken place.
- * maintain the restrictions of the Protected zone with regards to uncontrolled anchoring and fishing.
- * Allow site access to snorkellers from the V.I.M.S. Summer Education Programme in the summer of 1991-92
- * provide diver access for visitation from other scientists such as marine biologists

10.3.7. RESEARCH PROJECTS

The lack of information available on the effects and the rates of degradation on exposed ship's timbers as well as the effects of current and sediment movements on wrecks has been discussed in 7.3. Assessment of Perceived Threats and in 10.1. Reasons for Conservation Policy.

The data collected during the *Clarence* environmental monitoring programme should provide the base for future research projects. An internal report, *The Clarence and its Environment*, has been written by the author (Coroneos, 1991b). A complete report with a more rigorous analysis of the data obtained should be written once the monitoring programme has been completed. Furthermore this report should be published.

An approach to professionals to undertake such research programmes might be costly and so efforts should be made to seek out students, preferably post graduates. This would not only lessen the cost of the projects but the institutions that they would belong to would have facilities that V.A.S. could access.

If V.A.S. is to follow the path of developing an expertise in site management then links should be established with research institutions.

Recommendations

- * compose briefs for research projects and send to relevant institutions for expressions of interest.
- * seek funding for such projects preferably in conjunction with relevant institutions.
- * write a complete report on the interactionm of the *Clarence* and its environment based on data collected during the monitoring programme and elsewhere. This report should be published.

APPENDIX A

Option 1 Sand bagging

There are two ways in which the site can be sand bagged, the first is to:

- (a) place the bags in areas where scouring occurs.
- (b) cover the whole site.

The advantages of this system is that it would be a relatively cheap option as the M.A.U. has sufficient quantities of sandbags in store for the task. Other expenses would include the cost of sand, cement and the allocation of money for a two to three day field trip for the stabilization.

The major disadvantage is that Port Rules require that the sand bags be of a biodegradable material. This would mean that the hessian bags would have a low life expectancy (six to twelve months depending on environment and whether a concrete mix is used) and therefore once they deteriorate the sand that they contain will erode away and the site will return to the state it was before. Sandbagging therefore is a short term solution.

This option will not introduce sand on the site but will prevent further sand erosion.

Option 1(a)

Advantages -

- * will require less sand bags and therefore less time to deploy.
- * will have a less visual impact on the site.

Disadvantages -

- * may create new current flow patterns on the site which in turn might create new detrimental scouring.

To minimize the creation of new scouring a study would be need to be done to determine where to place the sandbags so they cause the minimum amount of damage, and also to determine where new scouring would occur. This would require the assistance of an expert in the field which would involve time and money. Alternatively such a project may be offered to University students.

Option 1(b)**Advantages:**

- * will not require a study to be made to determine impact that new current flows will create

Disadvantages:

- * will require more sand bags and more time to deploy.
- * will impact on the visual setting of the site.

Option 2 Synthetic matting systems

It may be possible to stabilize the site using long mats of polypropylene webbing. A geotextile product called "Polyfelt TS" is available and widely used in civil engineering. Applications include foundation engineering and drainage. Although the technique has not been used on an underwater site, it would theoretically work by trapping the sand underneath the mat, but would allow water to filter through. Apart from long term durability the major issue to be addressed is whether it can be securely anchored to the site so that it would not float free and create a threat to shipping.

Advantages:

- * low cost: a budget of less than \$2000 would allow the site to be carpeted. Extra resources however would be needed to anchor the mats on the site.
- * the colour of the material would allow it to merge with the sediment and therefore be visually unobtrusive.
- * the nature of the material would promote further marine growth which would stabilize the site and secure the mats.

Disadvantages:

- * the material would be difficult to handle underwater.
- * it is not biodegradable
- * should be tested before applied on site.

Options 1 and 2 were considered in the *William Salthouse* Conservation Plan (Strachan, 1988:18 and 19)

Option 3 Artificial seaweed mats

In response to scour problems experienced by off-shore oil installations in the North sea, a number of marine engineering companies have deployed synthetic seaweed mats designed specifically to trap sand and permanently prevent the reoccurrence of scour. The mats have been used by various oil companies since 1984, and ESSO-Shell Australia are considering introducing it in Australia. The US Navy has also used the system for cable stabilization in San Diego. It has also been used on bridges and piers.

The synthetic seaweed mats work by building a stable mass fibre-reinforced sandbank around the installation. The artificial seaweed fronds fibrillate, reducing the current velocity around the structure, and trapping sand which deposits onto the mats. A cohesive bank is formed which is highly compacted, and so resistant to the effects of tidal flow that a high powered water jet is required to dislodge the sand once in place.

Ce-grass matting (CEBO LTD) has been used to great effect on the *William Salthouse*.

Advantages:

- * the M.A.U. has left over Ce-grass from the *William Salthouse* project. However more mats may be required.
- * it is environmentally acceptable and visually pleasing.
- * it is a reliable system. It has been tested up to 10 knot current situations and the breaking strain of the system far exceeds the performance requirements for the site.
- * the system works immediately reducing the effects of current flow around the wreck.
- * does not provide a threat to navigation as the Ce-grass is secured to iron mesh which in turn is kept in place on the sea bed by having sections of railway iron placed on the mats.
- * the system will not only prevent further erosion but will also encourage a build up of sand. This will reduce the amount of exposure of the existing fabric thereby

minimizing the destruction to the significance of the place from acknowledged physical and biological threats.

Disadvantages:

- * the covering of the site would diminish the recreational value of opening the site as there would be less to see.
- * the Ce-grass will provide a habitat for marine life as has occurred on the *William Salthouse*, however the increase in sand levels may bury existing marine growth and change the entire ecosystem of the site. This may alter the natural significance of the place.

The use of this system will effectively make any future archaeological work on the site difficult and costly. It should not be implemented unless it is absolutely necessary for the preservation of the cultural significance of the site.

Alternatively the Ce-grass matting could only be placed in areas where scouring occurs, particularly adjacent to the upright frames of the site. Prior to the implementation of this method a study to determine the impact of altered current and sediment flows should be undertaken (see **Option 1; sand bagging**)

Option 4 Floating weed catchment system

During the course of the monitoring programme it has been observed that floating sea weed contributes to the build up or maintenance of sand on the site (see Appendix B).

By stretching rope or wire, attached to starpickets across the site, floating weed would catch and therefore slow velocity of the current across the site and lead to the deposition of sediment

Advantages:

- * cheap. Cost of starpickets and rope.
- * would not take long to put in place.
- * an accelerated natural solution.

Disadvantages:

- * might cause damage to the site if anchors or fishing line caught on it.

- * the ropes may not be strong enough to maintain the tension of caught weed.
- * the site being crisscrossed with rope would significantly detract from visual enjoyment.
- * will have little control over where weed catches and therefore may not cause sediment build up in the desired places.
- * build up of sediments at various spots on the site may result in the creation of new scour areas.
- * the presence of floating weed may be a seasonal occurrence and therefore the measure may only work for part of the year.

Option 5 Placement of low fences

This option is a more sophisticated version of option 4, however with more control. This involves placing low fences, constructed from plastic mesh, across areas of the site affected by scouring. This would facilitate the entrapment of floating weed as well as promoting the build up of sand.

This method was used to some effect in 1985 on the *William Salthouse* (Strachan, 1988:6-7).

Advantages:

- * relatively cheap to install
- * more control in the deposition of sediment than option 4

Disadvantages:

- * may cause damage to the site from anchors and fishing line being caught on it.
- * this system will create low lying dunes which may cause scouring in other places on the site.
- * will require some expertise to place the fences so as to maximize the effect and minimize any detrimental impact.

Option 6 Deposition of gravel

This method would involve the deposition of blue metal gravel, or equivalent, either over the whole site or in areas where scouring occurs. A gravel size would be chosen that could not be moved by water movements on the site. The size of the gravel would be dependent on the maximum water velocity that could be attained on the site through a combination of current speed and wave action. A calculation of the maximum wave base would also be essential so as to determine whether or how far the gravel will sink into the sand. This would be important to know as it may make this method of stabilization ineffective. This can be countered by the placement of plastic mesh underneath the gravel.

Advantages:

- * will be unobtrusive, as it will be covered with a layer of sand.
- * relatively easy to install
- * should not create additional scouring problems.
- * can be easily removed.

Disadvantages:

- * could be expensive. Could cost up to \$800 if option to cover site is chosen.
- * will require some calculations that would need to be confirmed by an acknowledged expert in the field.

APPENDIX B POSSIBLE REASONS FOR SEDIMENT LOSS FROM THE CLARENCE

The monitoring of sand levels on the *Clarence* in 1991 has shown that there is no gross sediment erosion on the site occurring (Coroneos, 1991b:2.3 Sand Levels). Information available so far seems to indicate that sand levels remain stable during the winter period with signs that during summer the overall sand levels increase. Yet it has been demonstrably shown through the comparison of sand profiles taken in October 1987 and 1991 that the site has lost a considerable amount of sediment (see 4.5 Physical Deterioration and Coroneos, 1991b:2.3 Sand levels). What follows below is a discussion on the possible reasons of why this has occurred.

Loss of sediment Port Phillip Bay.

It has been recognised that there has been a net loss of sediment in Port Phillip Bay (Port of Melbourne, 1987). A number of reasons have been put forward to explain the loss which are:

- long term changes in weather conditions.
- local earth movements.
- minor changes in sea level.
- "natural" loss of sediment from the system.
- interference of the cyclic movement of sand by man-made structures.

Of these five possible reasons the last, the interference of the cyclic movement of sand by man-made structures, is the most contributory factor, especially in relation to the *Clarence* (Reid, 1991:pers. comm.).

The natural movement of sediment along the western side of the Bay is in a clockwise or northerly direction (Bowler, J.M., 1966:20 and Reid, 1991:pers. comm.). The construction of the training walls at Queenscliff Cut in 1935 and the subsequent lengthening of the wall in 1956 and 1960 have interrupted the cyclical flow of sediment (S.B.M.P., 1991:45 and Reid, 1991:pers. comm.). The building of groynes and sea walls on Swan island beaches have also had an effect (S.B.M.P., 1991:41). The result is that the current follows its natural flow pattern but there is diminished sand replenishment to the north of the Queenscliff Cut. This retardation of the northward movement of sediments is responsible for the erosion of sections of the eastern shores of Port Phillip Bay north of Swan Island beacon to St. Leonards (Reid, 1991:pers. comm.).

It is difficult to say at present whether the loss of sediment on the *Clarence* is attributable to the disruption to natural sediment transport caused by man-made structures at Queenscliff and Swan Island. It is most likely that the site is sufficiently far enough off shore not to be affected (Reid, 1991:pers. comm.). However should it be shown that there is connection then it should be recognised

that erosion on the site is not a recent phenomenon (over the last 4 years) but the process that may have started as early as 1935. Prior to that date it would be conceivable to assume the *Clarence* may have been totally covered, hence the excellent state of preservation when it was discovered. The possibility of the site being "recently" uncovered was raised in the 1985 Pre-Disturbance Survey (Harvey, 1986:53).

Sand Waves

The movement of sand in the form of "waves" over the *Clarence* may result in alternating and dramatic changes in sand levels on the site. Approximately 5,000 to 10,000 m³ per year of sand is transported in the area (Hindwood, 1991:pers. comm.). It could be that the differences in levels between 1987 and 1991 is attributable to the respective presence and absence of a sand wave of considerable size.

Sand waves are a common phenomenon on the Nepean Bay Shoals (Beasley, 1966:72). In the West Channel sand waves of considerable size run from west to east across the tide. The movement of sand waves over the *William Salthouse* is a contributory factor for erosion on the site.

Observations made on the *Clarence* in 1985 and 1987 have mentioned the occurrence of sand waves moving in a NW to SE direction (Harvey, 1987a:13). The size of these waves however are not large enough to bring changes in sand levels comparable to the differences between the 1987 and 1991 sand levels (Coroneos, 1991b:2.3 Sand Levels).

Sand waves with magnitudes of a similar scale with those found in the West Channel are not known to occur in the vicinity of the *Clarence* (Reid, 1991:pers. comm.). A search of charts of the area dating back to the 1830's has not produced any evidence of significant changes in depths in the vicinity of the *Clarence* that could be attributable to sand waves. The search however has not been rigorous and there is scope for further work to be done in this area.

Current Borne Weed

During the 1985 and 1987 survey and excavation it was observed that significant amounts of current borne seaweed had to be removed from the site grids at the start of each work session (Harvey, 1986:18 and 1987a:12). The presence of floating seagrass on the site has the effect of slowing down the current velocity and thereby reducing the loss of sediment on the site and encouraging the deposition of current borne sediments.

From the time when the monitoring programme began in May until September 1991, the volume of floating weed observed on the site did not approach levels seen in the survey and excavation (C.M.P.F.N., 1991). Two explanations for this absence were given at the time. One explanation was that the increased volumes of floating seaweed was a seasonal occurrence. The second explanation

was that for some unknown reason conditions in the Bay have changed in the last few years that see less quantities of current borne sea weeds.

Two visits to the *Clarence* in October 1991, the month that both the survey and excavation took place, seem to have validated the first explanation; that the occurrence of current borne sea weed was a seasonal. With the presence of floating sea weed on the site the sand levels have risen correspondingly (Coroneos, 1991b:2.3 Sand Levels).

Though it seems that occurrence of floating sea weed is seasonal it has been included as a possible reason for sand loss as there has been some notable and unexplainable disappearances of marine fauna in the Bay. The dying out of certain sea grass beds in the Bay and the disappearance of the floating kelp at Point Lonsdale may indicate a trend that could be effecting sand levels on the *Clarence* (Reid, 1991:pers. comm.). At present there is no way of quantifying then volume of floating sea weed passing over the *Clarence* in 1991 for comparison with other years, however it decrease in volume of current borne marine fauna should be considered as a factor, if only remote, for the loss of sediment on the site.

Sea Grass Beds (*H. Tasmanica*)

The 1982 (24th Oct) wreck inspection of the *Clarence* reported that the site was difficult to locate from the surface due to "large amounts of sea grass and weed". In 1991 the outline of the site can be clearly seen from the surface (Coroneos, 1991:2.1 Site Morphology). The 1985 photomosaic of the site shows patches of seagrass established within the site (PLATE 1). In the space of 10 years the distribution of sea grass on the site has altered considerably.

The importance of seagrass communities for the stability of bottom sediments has long been recognised, as they:

- 1/ they act as baffles trapping sediment and stabilizing and binding it.
- 2/ they can reduce water movement, preventing removal of sediment.

(S.B.M.P., 1991:13)

Seagrass distribution is dependant on a number of abiotic and biotic factors. The abiotic components are salinity, temperature, dessication tolerance, depth, light intensity and wave action (S.B.M.P., 1991:13). Through their deep root system sea grass beds are quite stable once they are established (Reid, 1991:pers. comm.). However there are many cases where the loss of seagrass communities are not readily explained (Reid, 1991:pers. comm.).

There have been some theories put forward to try explain this phenomenon. In one study the increased abundance of *H. Tasmanica* in the Rosebud-Rye region of Port Phillip Bay has been attributed to the reduced smothering of seagrass by mobile sand bars. The decline of *H. Tasmanica* in Western port was possibly due to bioturbation by the snapping shrimp *Alpheus euphyrosyne*. The burrowing activities of this shrimp increased sea-water turbidity and deposition of sediment on *H. Tasmanica*. Also the accumulation of epiphytes on the leaves of *H. Tasmanica* caused shading which reduced sea grass growth. The grazing of this algae by molluscs would reduce this impact. (S.B.M.P., 1991:13).

The absence of sea grass beds within the interior of the wreck can be directly attributed to the 1987 excavation (see below), however this does not explain the overall loss of sea grass on the site. It may be possible that the sea grass cover on the site may increase in the summer months as the minimum growth period for *H. Tasmanica* generally occurs in the winter, but it certainly will not reach the 1982 coverage (S.B.M.P., 1991:13). Whatever the reasons for the decrease in the seagrass communities over the site their absence would be a contributory factor toward the loss of sediment on the site since 1987

1987 Excavation

When looking at the reasons for sediment loss on the site since 1987, the excavation itself in that year seems to be major factor. The excavation of two trenches at the bow and the stern appears to have disturbed the cohesion of the site.

The entry in the Day Book 13th October mentions that the first "...30cm or so of sand is well bound together by seagrass and tube worms." Below that layer there was another "...layer of shells consisting mostly of scallop and mussel shells which is about 20cm deep." (Excavation Day Book, 1987:13th Oct.). At the end of the excavation the trenches were backfilled with kelp and other weeds to speed up the rate of sediment deposition (Excavation Day Book, 1987:6th Nov.)

The presence of this layer of compact seagrass matting must have performed the function of a "protective cap" on the site which was sufficiently cohesive to resist current and wave generated velocities. This matting was most likely built up in the years just after the wrecking of the *Clarence* from floating sea weed caught inside the intact hull and compressed through time. Attempts to simulate the pre-excavation of the site by backfilling with kelp and other weeds were not successful as the deposit would have been more loosely bound than the original material.

It is possibly that the currents assisted by wave action gradually eroded away the areas that had been backfilled, creating scour pits. The scour pits in turn accelerated the local current velocities which eventually dislodged seagrass matting layer adjacent to the scour pits and eventually spread to other parts of the site.

The morphology of the site in 1991 could be the result of this action. The protective covering on the site seems to have disappeared. The monitoring of sand levels show that the site is not losing sand at an alarming rate, and that is it has reached a state of equilibrium; **for the time being**. This is because the present sand level within the wreck overlies a substantial, and consequently, stable layer of ship's timbers. In 1987 excavation in both trenches ceased when intact decking was reached. In 1991 the areas that were exposed in the excavation are often visible (see **4.5 Physical Deterioration**). In effect the sand level on site has reached the point where the excavation stopped. These timbers are for the moment preventing further erosion on the site. Given the degraded conditions, in the terms of shipworm infestation, of the intermittently exposed breasthook at the bow and the ceiling planking at the stern it will only be a short time before their structural integrity is lost (see **8.0 Impact of Perceived Threats to Site Significance**). This will inevitably lead to further erosion of the site.

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