Heritage Impact Statement

Heritage Impact Statement for HMVS *CERBERUS*

This Heritage Impact Statement forms part of a permit application for the use of concrete to infill and stabilise the remains of HMVS *Cerberus*

20th January 2018

Victorian Heritage Register Number VHR S0117

Address and location description:

Half Moon Bay, offshore, Port Phillip. Latitude South 37 degrees 58.1 minutes. Longitude East 144 degrees 0.4 minutes (Anderson 2002).

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For:
Bayside City Council (owners)

Heritage Impact Statement

The HMVS *Cerberus* performed a pivotal role in the defence of Port Phillip after its arrival in 1871. After Federation, *Cerberus* became the Commonwealth Naval Forces first capital ship serving as a fleet tender to the Williamstown Naval Depot. When the Royal Australian Navy was established during 1911, the ageing *Cerberus* was retained, serving as Port Guard Ship during the First World War (Gillett and Graham 1977: 43, Gillett 1982:95). In 1921, *Cerberus* was towed to Geelong, renamed *Platypus II* and moored in Corio Bay as depot hulk for the fleet of J-class submarines gifted by Britain to the RAN. A proposal to commission *Platypus II* was rejected by the Naval Board during 1921. The following year, pressed by financial strictures, the Naval Board decided to scrap the submarine fleet (White 1992:115). *Cerberus* was sold to the Melbourne Salvage Company in 1924 and stripped of removable fittings (Herd 1986:14). Attempts to remove the thick wrought iron armour were not cost effective and the hulk was purchased by Sandringham Council in 1926 to be sunk as a breakwater for the Black Rock Yacht Club (Cahill et al. 1983:15).

<u>Existing condition of the heritage place</u>

After 67 years of exposure, corrosion had weakened the lighter steel and iron framing in the lower buoyant hull so that it was no longer able to sustain the considerable weight of the armoured breastwork, armour belt, Coles turrets and the four ten inch Armstrong RML guns. Under the pressure of heavy onshore weather, the frames of the buoyant hull collapsed and the otherwise intact armour belt and superstructure sank to a level where the main deck was awash at high water (Figure 1). A further collapse occurred during 1994. The volunteer organisation Friends of Cerberus campaigned successfully in obtaining a grant from the Victorian Government to fund removal of the guns which have been placed on the seabed to seaward of the wreck and are subjected to cathodic protection from a galvanic anode groundbed system. The guns were removed in order to reduce the weight imposed upon the weakened lower hull members.

Prior to collapse, the scuttled Cerberus sat on the seabed with the water level approximately similar to its fighting trim. Although the visible volume of the wreck has been reduced by collapse, the familiar profile of the vessel remains. However, the next catastrophic collapse of Cerberus is predicted to entail the breaking up of the main deck as the unsupported weight of the armour hinges the remaining structure out of alignment. In 2003, consulting engineers GHD conducted a structural analysis of *Cerberus* as part of a brief for design of a supporting structure for the wreck. Based on corrosion rates determined experimentally by Dr Ian MacLeod in 1994, GHD considered that the *Cerberus* deck beams are approaching loadings four times greater than their safe working capacity (MacLeod 1995, GHD 2003:i).

A Maritime Heritage Unit inspection during 1999 noted splitting of the sternpost and a recent diving inspection carried out by Malcolm Venturoni of the Professional Divers Group reported that a 20 metre length of the bow structure is now entirely without support (M. Venturoni pers. Comm. 17th October 2017). The armour is segmental and the individual pieces are bolted to relatively lightweight steel substructures. Collapse of this arrangement is most likely to result in a general loss of coherence and the result will be the disappearance of the *Cerberus* as it has been known to generations of Victorians.

GHD's engineering assessment was that hull failure and collapse was likely in the near future and was a certainty in the absence of effective conservation methods. Collapse of the *Cerberus* not only results in the loss of an iconic part of Victoria's maritime cultural landscape, it also presents requirements for potentially very costly measures to contain the hazards that would likely result, such as tonnes of liberated teak that now backs the armour. GHD has estimated the cost of removal of the wreckage should this be necessary to manage public risk and visual amenity at ten million (2003) dollars (GHD 2003:29).

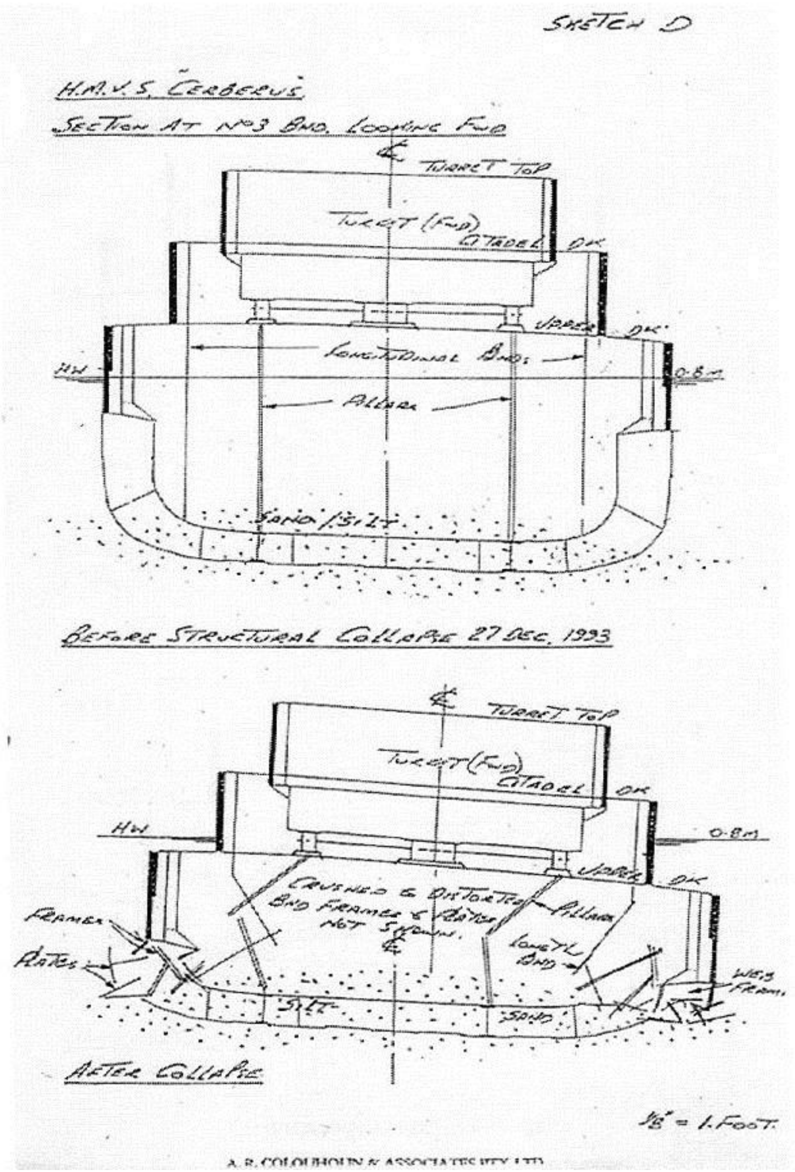

Figure 1 Naval Architect Alan Colquhoun's sketch of a section of *Cerberus* before and after collapse

During 2012, DSTO Maritime Platforms Division conducted an ROV-based survey on *Cerberus* for Bayside City Council. The aims of this work included recording video imagery of the structural support beneath the turrets, ultrasonic measurement of thickness of supporting beams, assessment of debris within the hull, a general external survey, a general environmental assessment and remote corrosion potential measurement. Bad weather curtailed the allocated time on site and difficulty was experienced with deploying the ROV due to sand encroachment and debris. The ROV survey, however confirmed the intactness of the armour belt and the existence of a break in one of the transverse beams beneath the after turret. Otherwise, these beams were coated with marine concretion but evidently intact. Remote ultrasonic thickness measurement on the internal structure proved inconclusive, but external corrosion potential measurements indicated that at the time of survey, the cathodic protection groundbed system was reasonably effective (Neill *et al*. 2012).

The latest ROV survey by Professional Divers Group conducted 22nd September 2017, found that the hull remains are sound and that no breaks or cracks were present in the armour belt, breastwork or decks. A minor subsidence was, however, noted in the forward turret. The majority of the internal spaces were found to be accessible for inspection by ROV. The vessel now lies with a 9 degree list to starboard and the lower edge of the armour belt on the starboard side is buried 200 to 300 mm in silt except for a distance of 20 m aft from the bow and 10 m forward from the stern. On the port side, the majority of the length of the armour belt is exposed with a gap between its bottom edge and the seabed of 200 to 400 mm over a 45 m length. Alarmingly, all mesh barricades fitted to deck penetrations were found to have failed. The majority of the internal subdivision and support has either collapsed or corroded away and apart from the underdeck structure supporting the turrets, there is little support for the hull sides and deck (Venturoni 2017).

Current use of the registered place

The principal function of the *Cerberus* today continues to be a breakwater protecting the beach at Half Moon Bay. Perhaps a more fundamental role is *Cerberu*s as an important feature in the maritime cultural landscape of Port Philip, familiar to countless members of the public as a notable landmark.

Prior to collapse the wreck had also been a favoured site for swimmers, sightseers, snorkelers and SCUBA divers. However, in 1994, considerations of public risk led to a Protected Zone being declared under the *Historic Shipwrecks Act 1981*. A 0.5 hectare exclusion zone was gazetted, with rectangular boundary dimensions 50 m on both sides from centreline parallel to it and 5 metres from the bow and stern (Anderson 2002). Unfortunately, the Protected Zone has failed to prevent public access by paddlers, swimmers, snorkelers and divers as noted by Bayside Leader journalist Trent Evans (25th October 2017). This is despite publicity surrounding the discovery of the body of a snorkeler within the wreck during May 2010 (*Age* 20th May 2010). Although responsible websites do warn divers and snorkelers of the exclusion zone and the danger posed by the wreck, other organisations apparently choose to ignore warnings. A recent example is organiser 'Tim' of an inflatable kayak club website which invited members to paddle to *Cerberus* and snorkel there during December 2017 ('Tim' 2017).

<u>The proposed works</u>

As discussed in the supporting document (Hewitt 2017) **Appendix A**, the present Permit application is in respect of a proposal to install a permanent supporting core of monolithic concrete within the hull and breastwork of *Cerberus* as a means of supporting the mass of the armour belt, breastwork, turrets and decks. This approach, involving the placement of 1,700 cubic metres of concrete, has been adopted as a means of securing and conserving *Cerberus* by supporting the wreck remains and preventing further collapse. Filling the internal spaces of the wreck with concrete and continuing a regime of galvanic cathodic protection for the immersed exterior is considered to offer a multi-generational guarantee that the familiar profile and presence of *Cerberus* in Half Moon Bay can continue.

In the selection of a supporting medium for Cerberus, and a proposed methodology for its installation, great emphasis has been placed on constructability and cost. The key attribute of a viable methodology is one that allows the installation of the supporting medium to meet structural and durability requirements at a price point dictated by the available budget. The method must also be safe for personnel involved in the process and at the same time be free from environmental risk. One extremely important consideration driving the selection of the methodology, determined by the precariousness of the vessel, is that no penetration within the internal spaces by divers can be scheduled. Important too for assuring a positive public perception of the project and maintaining control of budget is the need to minimise potential delays. These considerations have led Professional Divers Group to review the possible use of both land and marine-based platforms for infilling works with a particular view to the impact on budget of weather-related delay. The methods required for retaining the filling material, cost and the likely environmental consequences of spillage were also necessary considerations in the selection of concrete as the filling material from a range of possibilities (Venturoni 2017a). A copy of this assessment matrix of cost and risk in relation to the use of concrete, cement stabilised sand, epoxy grout and foam is attached as **Appendix B**. Venturoni's assessment addressing the attributes of constructability, durability and strength, environmental issues and cost, may be summarised as follows:

CONCRETE

Concrete installation: The infilling material would be pumped from shore at **low risk** because that method eliminates the requirement for large marine plant (barges) to be used thus avoiding major risk to budget from delays caused by weather during mobilisation, demobilisation and multiple loadouts with concrete. Concrete is a proven product and the placement method is also proven in a submerged marine environment. The self-levelling attribute of concrete will readily allow filling of voids. Placement would be achieved through existing penetrations in layers from the bottom up, encasing all internal components of the wreck with the ability to monitor effectiveness of filling between pours.

Concrete strength and durability: The concrete specified has a compressive strength of 32 MPa and good cohesive strength. These attributes will allow the mass of the *Cerberus* structure to be supported and reduce the risk of collapse of the armour. Concrete is resistant to abrasion and scouring by sand. Concrete structures have survived in Port Phillip in excess of 100 years (eg. Tuckey Light platform and Breakwater Pier). Concrete has resistance to water ingress and its alkalinity will have a tendency to passivate iron with which it is in contact thus affording a measure of corrosion mitigation to internal surfaces. **The risk is assessed as low**.

Environmental issues: Concrete can be contained and managed according to the detailed methodology during placement and gravity-filled containment bags can be used to deal with overflows and slurries for subsequent removal. Once cured, concrete has no environmental effect; immediate site impacts will be negligible and marine growth disturbed during works will re-establish within 6 to 9 months. (For environmental assessment refer to Silvey (2017) which is attached as **Appendix C**). **The risk is assessed as low**.

Cost: The use of shore-based pumping for delivery means that this infill material offers the **most cost effective and least - risk option** for long-term support and stabilisation (and avoidance of penetration into internal spaces). Product loss is minimal and the required quantity is calculated so there is little possibility for price variation.

CEMENT-STABILISED SAND

Installation: Due to the distance off-shore, cement-stabilised sand cannot be delivered by pumping. Localised mixing is required and the material would be pumped from a barge moored alongside. However, cement-stabilised sand is a proven product in a submerged marine environment and except for the problem of delivery by pumping from shore, may be placed in the same manner as concrete. The requirement for large marine plant (barges) involves risk to budget from delays caused by weather during mobilisation, demobilisation and multiple loadouts. Because of this factor, **the risk is assessed as medium**.

Durability and strength: Cement-stabilised sand has lower cohesive strength and in the critical attribute of load bearing capacity, is considerably weaker than concrete, having a compressive strength of 5 tp 10 MPa. Cement-stabilised sand is less resistant to abrasion and scouring than concrete and may require remediation in the shorter term. The lower cohesive strength and ability to encapsulate and grip the metal structure is lower than concrete. These factors produce a **risk assessment as medium.** However, stabilised sand is less resistant to water permeation than concrete and ongoing corrosion would be expected. Expansion of corrosion products may cause localised failure of cemented sand. The **risk of this is assessed as high**

Environmental issues: With methodology and precautions in place as for concrete**, the risk is assessed as low.**

Cost: Although cement-stabilised sand is the lowest material cost option, the cost of marine plant over the duration of placement causes this to be an over-all costlier option with lower durability and hence the **risk is assessed as high.**

EPOXY GROUT

Constructability: Epoxy grout is a proven product for placement in submerged marine applications and reliable for filling voids 100%. It can be placed from the bottom up and the same opportunities for monitoring apply as for concrete. The grout can be placed through existing penetrations and it is possible for the material to encapsulate all structural components. The **risk from those perspectives is accordingly assessed as low**. However, the product cannot be pumped from shore and would need to be locally mixed (it is a two-pack material) and pumped from a barge. Marine plant is subject to delays due to weather so the **risk assessment is medium**. Further, 1,700 cubic metres of epoxy grout requires long lead time for manufacture, supply and delivery. Local manufacture in such quantity is unlikely. **Concern over supply logistics results in a risk assessment of medium.**

Durability and strength: Product has excellent durability and strength (compressive strength 100 MPa), good resistance to sand scour and abrasion and good adhesion to wreck structure. Also, moisture permeability is low and hydrophobic property gives useful corrosion protection. **Assessed risk is low**.

Environmental issues: Installation in bulk requires the presence on site of large volumes of hazardous material and accidental spillage prior to mixing would produce environmental problems difficult to contain. **Environmental risk is assessed as high**. However, **once mixed, with appropriate handling, environmental risk is low** given the hydrophobic nature of the material and its ability to displace water. Once installed and cured, the **environmental impact is nil.**

Cost: Epoxy grout is the most expensive option. It is a high cost product requiring the use of marine plant for installation. Although product loss during installation is minimal, the cost per litre of any additional quantity required, together with uncertainties in supply, lead to an assessment of **high financial risk**.

VARIOUS FOAM INFILLING

Constructability: Due to distance and product behaviour, foam (a 2-pack product) cannot be pumped from shore and hence installation involves the use of barges for local mixing and pumping. The risks associated with marine plant operation, as previously discussed, result in an assessment as **medium risk**. However, foam is an unproven product in *submerged* marine environments and the methodology for installation and void-filling is undetermined. Further, the reaction of the product to salt water while immersed during curing is undetermined. As foam is buoyant, placement will necessarily be from the top down and the effects of this on void-filling and encapsulation of wreck structure is unknown. The top-down process cannot be effectively monitored. The top-down placement of foam is expected to require additional through-hull penetrations to allow voids to be filled. **These are all considerations assessed as high to very high risk**.

Durability and strength: Cured foams have quite low cohesive and compressive strength which varies between products but lies within the range 1 to 10 MPa. It is possible that installed foam would have inadequate compressive strength to support the mass of the armour and turrets. Further, the adhesive strength in contact with metal structure is likely to be low and accordingly, the capacity of foam infill to prevent structural collapse is at best questionable. The **assessed risk is high**. These products have low resistance to sand abrasion and scouring. Loss of material over time is to be expected and future remediation might be required. **The risk of this is assessed as medium**. Products investigated have low resistance to water permeation which will promote corrosion, expansion of corrosion products and local failure of the infill. A foam infill will need to have resistance to a range of possible chemical exposures. Hydrocarbon-resistant foam is important as infills may be exposed to fuel/oil spills in this high boating traffic area. Chemically affected foam will require to be remediated. The foam product will need to be non-flammable, particularly where installed above tide level. Most foams, although non-flammable are affected by fire and if this was to occur, remediation would be necessary. **Associated risks are assessed as high**. Foam products would need to be UV resistant and deck penetrations would need to be capped. **The assessed risk is medium**. The cured density of foam products is around 15kg per cubic metre. Installation of 1,700 cubic metres of foam of that density will produce a buoyant upward lift of 1,675 tonnes when fully submerged. This upward force and the heavy top structure above water, together with low bond strength to the remaining bottom structure, produces a significant risk of the wreck rolling over when subject to heavy onshore weather. **The risk of this is assessed as high**.

Environmental issues: Containment requires sound methodology for placement and significant additional works to form up and seal upper hull and deck penetrations. The probability of spillage of mixed material during installation is high and the buoyant nature of the foam will necessitate the use of a floating containment boom and a vessel for retrieval of spillage. Each of the two parts of the product prior to mixing is extremely hazardous to the environment both locally and to a broader area should accidental spillage occur. Once cured, the foam infill would have no environmental effect and mechanical damage to marine biota would self-repair within 6 to 9 months. However, clean up methods for areas on the external hull and other surfaces within the containment boom are undetermined. The products investigated generally contain and will release traces of hazardous formaldehyde during curing. **The risks attached to the foregoing considerations are assessed as high**.

Cost: Independent of the foam filling product selected, the cost of marine plant deployment during placement makes this a more expensive option for a less durable and higher risk alternative. There is a possibility of additional cost to replace material lost through spillage during placement as a result of the influence of undetermined methodologies influencing both placement and containment. **The financial risk is assessed as high**.

COMPARATIVE BUDGET ESTIMATES FOR THE ALTERNATIVE INFILL MATERIALS

Concrete	**$0.6 - 0.7 M**
Cemented sand	**$1.6 - 1.7 M**
Epoxy grout	**$11.5 – 12 M**
Foam	**$1.4 – 1.5 M**

Of the infill materials canvassed, concrete is the only material that can be used according to the available budget, the major reason being the ability to install the material by pumping from shore without having to deploy expensive and financially risky marine plant. The physical properties of epoxy grout are attractive as a supporting medium, but the cost of both procurement and installation is prohibitive. Cement-stabilised sand is a weaker alternative to concrete but would probably be acceptable except for the probability of the need for future remediation and the high impact on price of the requirement for deployment of marine plant during placement. Infill with 2-pack foam has no advantages at all, except for being easier to physically remove if required. Notwithstanding, it must be considered that removal of a massive quantity of buoyant foam would present other potentially very expensive requirements for control and disposal of floating debris.

DETAILED METHODOLOGY FOR INSTALLATION OF CONCRETE

The concrete will be pumped to the vessel from a temporary works compound in the carpark on shore via a 4 inch rigid delivery pipeline placed across the seabed between the wrecksite and the inshore reef. The rigid pipeline avoids danger to navigation and waterway users. A flexible rubber pipeline will be used to connect the concrete pump across the inshore reef to the rigid delivery pipe, which will avoid damage to the reef. A further rubber delivery pipe will connect to the seaward end of the rigid pipeline to allow concrete to be distributed within the wreck.

Deep penetrations on the main and upper decks will be blanked off with timber shuttering and progressively removed according to infill level. This will ensure that the hull will be filled to the level of all penetrations and limit spillage from within the hull during placement. The open spaces at seabed level on the port side, at the bow and stern, together with some 20 metres length of gap below the armour belt on the starboard bow, will be blanked off and a geofabric skirt will be secured against the hull with sandbagged walls during infilling (**Figure**

2). Debris from the wreck surrounding the hull that may be hazardous to divers working adjacent to the vessel will be relocated nearby for site safety.

The geofabric will extend to form a silt curtain around the site to prevent concrete or concrete slurry from spillage into the immediate environment. A staged pour approach will be employed to avoid excessive pressure within the structure and to prevent the blanking and containment arrangement from becoming overextended. A staged pour strategy also limits the passage of concrete trucks to reasonable daylight working hours and allows for the inevitable periods of bad weather without a severe impact on budget. During placement of concrete, slurry and displaced water will be pumped from within the hull and delivered to a containment within a geobag placed alongside on the seabed for subsequent removal.

It is anticipated that site preparation will take ten days and pumping for placement of a maximum of 1,700 cubic metres of 32 MPa concrete will require a further twelve days. This will be followed by some five days of dismantling and demobilisation.

All underwater work is to be performed by an occupational dive team with qualified supervision, all in accordance with AS/NZS2299.1.2015.

If time and budgetary considerations permit, it is intended that the four ten-inch 18 ton RML guns removed from Cerberus and placed to seaward of the wreck would be moved to a location close to the wreck on the inshore side and the galvanic cathodic protection arrangement reinstated. The aim of this movement is to enhance the experience of snorkelers and swimmers visiting *Cerberus* when the need for a protected exclusion zone is removed following infill.

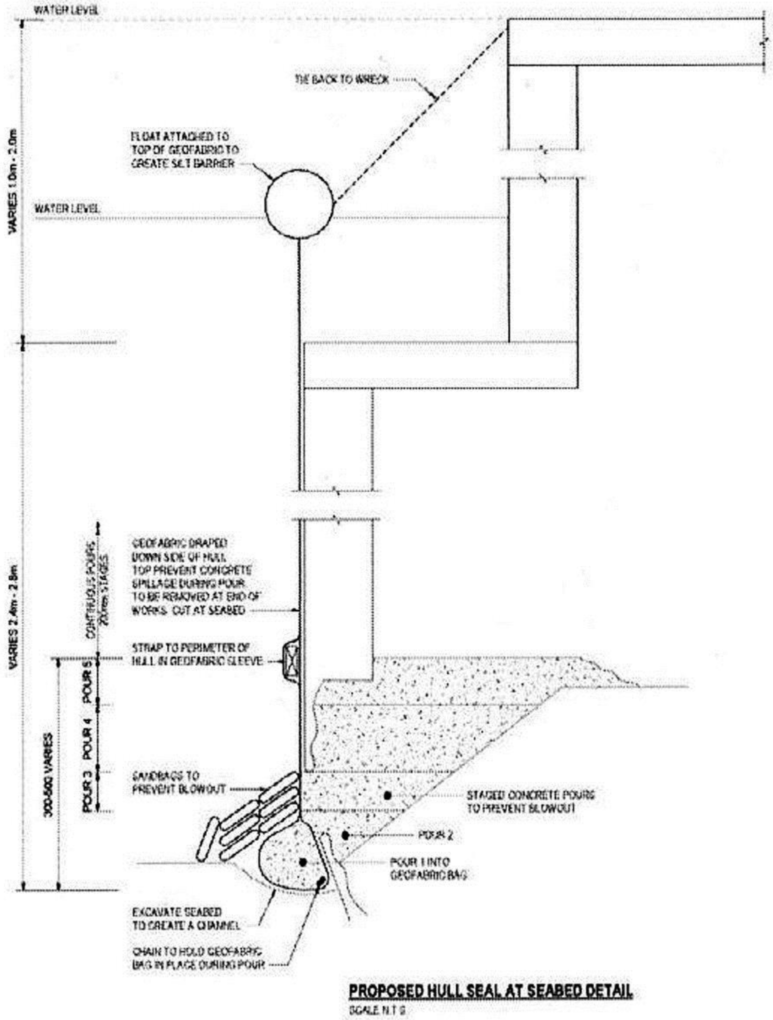

Figure 2 *A part section of hull (not to scale) showing method of dealing with gaps at base of armour belt (source: Venturoni 2017)*

Discussions covering environmental considerations including post-installation monitoring and reporting with particular reference to re-establishment of sessile marine biota and control of invasive algae, are included as sections 6 and 7 in the supporting documentation (Hewitt 2017) which is attached as **Appendix A**.

The cultural heritage significance of the place or object, including setting and any archaeological values or potential

Ross Anderson's HMVS *Cerberus* Conservation Management Plan (Anderson 2002) was prepared at a time that coincided with GHD's ambitious design for installation of a fabricated supporting structure within the vessel and an array of driven piles around the wreck. The aim of this proposal was to enable the vessel to be jacked up to its pre-collapse level and then securely supported so that the mass of armour, turrets and breastwork would no longer bear directly upon the corroded buoyant hull structure (GHD 2000). Sadly, this very expensive approach could not be funded and the idea lapsed. Nevertheless, Anderson's CMP, which drew upon the prior work of Shirley Strachan, remains a comprehensively useful assessment of the heritage significance of *Cerberus* and includes a relevant conservation policy.

Anderson's assessment of heritage significance is reproduced *verbatim* below:

"3.0 Statement of cultural heritage significance

The Cerberus' primary historical significance is as a unique example of an important early stage in the technological development of the modern battleship. The Cerberus has other aspects of cultural heritage significance which are listed below.

3.1 International

The Cerberus possesses considerable international historical significance as it was an experimental vessel, being the first unrigged British-built iron breastwork Monitor ever constructed depending entirely on steam for propulsion. Its construction led the way for acceptance of designs for sea-going unrigged steam turret ships. As the first of a class of seven coastal defence 'Monster' Class ships constructed 1867-1870 the Cerberus represents a radical break with British warship building and naval tradition including ironclad wooden ships, and iron hulled ships mounting broadside armament such as the HMS Warrior (1860). Its delivery voyage to Australia via the Suez Canal was the longest voyage ever undertaken by a Monitor Class vessel, and it is believed to be the first ship destined for Australia to use the Suez Canal.

Nathaniel Barnaby, Reed's successor in the role of Chief Constructor, followed the designs of Reed to produce the sea-going breastwork turret ships HMS Devastation and HMS Thunderer in 1873, which were basically an enlarged Cerberus design. This class of ships became the mainstay of maritime nations' naval strength until the introduction of the Dreadnought class of big gun battleships in 1906. Thus the Cerberus represents an experimental, formative stage in the design of the modern sea-going battleship.

The known resource of either Monitor-class or turret vessels that is available for research and study worldwide is limited, consisting of the following seven vessels:

- HRMS Buffel (23/7/1868 –still floating) – ironclad single turret-ram, built Robert Napier and Sons, Glasgow, on display Rotterdam Maritime Museum.

- HMVS Cerberus – (1867-1926) twin turret breastwork monitor, designer E.J. Reed, built Palmer and Sons, partially collapsed shipwreck site scuttled as a breakwater.

- Huascar (1865 –still floating)– 1130 ton ironclad single turret ship built for Peruvian Navy, designer Capt. Cowper Coles, built Laird and Birkenhead, currently berthed in Talcahuano, Chile as a museum ship.

- Lajta (ex Leitha)(1871 –still floating) – single turret river monitor built for Austro-Hungarian Navy, hull only (engines and boilers removed) berthed War History Museum, Budapest.

- USS Monitor – (1862 – 1862)- single turret monitor, designer John Ericsson, two Dahlgren cannon, US National Marine Sanctuary historic shipwreck site, 70 metres depth, Cape Hatteras USA. Currently being archaeologically excavated and conserved by National Oceanic and Atmospheric Administration and US Navy. Artefacts and major components of historic fabric including the propeller and turret/ guns have been excavated and recovered for conservation. The five year effort is costing US$14 million (AUS$ 26 million) and a new museum is being constructed at a cost of US$30 million (AUS$56.9 million).

• HNLMS Schorpioen – 2175 ton ironclad single turret-ram (1868 –still floating), Royal Dutch Naval Museum, Middelburg.

• Solve – (1875 – present/ still floating) 460 ton monitor built Norrkoping, Sweden, decommissioned 1920. Single non-rotating turret, was converted to oil barge, currently under restoration at Gothenburg Maritime Centre, Sweden.

Of these vessels the Cerberus is the only breastwork Monitor, and only twin turret Monitor still in existence. It is also the only one of the above ships not being restored as a museum ship, or with an associated museum.

The HMS Captain (1870), a rigged twin turret warship designed by Captain Cole (who died along with over 400 men when the ship capsized in a storm) is an as yet unlocated shipwreck site, lost in deep water in the Bay of Biscay off Cape Finnisterre, Spain.

3.2 National

Two months after Federation, on 1 March 1901 the Australian states transferred their naval forces and personnel to the Australian Federal Government, but they continued to be administered by the states until the Commonwealth Defence Act 1903 was enacted on 1 March 1904 (Department of Defence: p. 12). The Victorian Colonial Navy was the largest of the colonial navies, and as the largest vessel the Cerberus became the Commonwealth Naval Force's first capital ship.

When the Royal Australian Navy was constituted on 10 July 1911 the Cerberus continued to provide service as a fleet tender based at Williamstown. Though by this time an ageing relic, the Cerberus was still considered serviceable enough for the RAN to designate it as Port Guard Ship for Port Phillip in World War I. On 1 April 1921 HMAS Cerberus was renamed HMAS Platypus II and acted as a tender to the fleet of six J-Class submarines based at Westernport and Geelong.

The current RAN shore training facility HMAS Cerberus is named after the Cerberus.

HMVS Cerberus was listed on the Register of National Estate on 25 March 1986 (Record Number 005787).

3.3 State

Designed and built to the Victorian colonial government's specifications as a harbour defence vessel the HMVS Cerberus was the flagship of the Victorian navy, the most powerful of the Australian colonial navies. Based at Williamstown for almost its entire service life, it was designed to steam within the relatively sheltered confines of Port Phillip. The Cerberus was vital to the defence strategy for shipping in Port Phillip and the ports of Melbourne and Geelong. It was intended to eliminate the necessity for expensive shore fortifications and provision of troops in Port Phillip by having a mobile floating battery. The Cerberus reflects the increase in colonial Victorian wealth and consequent move towards self-protection in the event of an invasion or attack by an enemy power. The Cerberus has a long association with the defence of Port Phillip, which continued when the RAN designated it Port Guard Ship for Port Phillip in World War I.

The Cerberus was first registered as an 'historic building' by the Victorian Historic Buildings Council on 20 August 1982. On 6 October 1994 it was gazetted as an historic shipwreck under the Historic Shipwrecks Act 1981 with a 0.5 hectare Protected Zone surrounding it.

The Historic Shipwrecks Act 1981 was subsumed by the Heritage Act 1995, and the Cerberus is listed on the Victorian Heritage Register as Item S117.

The Cerberus' position within Port Phillip demonstrates an unbroken association with the Bay, and ".she has closer ties with the history of Melbourne than any other vessel" (City of Sandringham: p. 4).

The HMVS Cerberus is part of a small and significant colonial naval shipwreck resource in Australia that includes HMVS Countess of Hopetoun (Swan Island, VIC), HMVS Lonsdale (Queenscliff, VIC) and HMSAS Protector (Heron Island, QLD).

3.4 Local

The Cerberus was obtained by the then Sandringham Municipal Council on 2 September 1926, to be sunk as a breakwater for the Black Rock Yacht Club at Half Moon Bay. Since then the Cerberus has become a landmark heritage feature of the local land and seascape, and has strong local community associations with regard to sightseeing, swimming, diving, yachting, boating, fishing and social activities. It was used to fire starting guns for yacht races, and its centenary in 1968 was celebrated by simulating its warship role with loud shots and smoke (Effenberger,, 1995: 8).

The cultural re-use of the Cerberus in a 'defence' role against natural forces as a breakwater has led to the association of the Cerberus with Black Rock and the Sandringham Municipal Council – renamed the City of Bayside - for 76 years. The current owner of the Cerberus is the City of Bayside.

The Cerberus is listed as a navigation mark for mariners in this locality (Australia Pilot Vol II, 1982: 85).

3.5 Aesthetic

In visual terms the Cerberus presents the unusual and striking form of a shipwrecked battleship close to shore. The Cerberus is a dominant cultural heritage feature of Half Moon Bay, and is a major cultural heritage feature of the Port Phillip maritime land/seascape generally.

The existing fabric, prior to its collapse in 1993, demonstrated the above water profile and low freeboard of a Breastwork Monitor Class turret ship – as if it were still afloat. The intact breastwork, deck and turrets are an important aesthetic feature, and if the deck continues to collapse and possibly break into sections, much of the site's aesthetic significance will be lost.

It is this aesthetic significance that is hoped to be retained through the emplacement of a supporting structure.

3.6 Archaeological

There are no surviving builder's plans or drawings of the Cerberus. However there are later 'as fitted' plans prepared by Chatham Dockyard (Nicholl: p.66). The remains of the Cerberus hull, superstructure, armament, machinery and fittings are therefore a significant source of technical and archaeological information. While it was sunk as a breakwater after having been stripped of fittings, individual artefacts have been recovered from the site indicating the site is not sterile.

There exists potential for artefacts to be located within the hull and seabed exhibiting aspects of its service life throughout which it was permanently manned by Victorian Naval and Royal Australian Naval personnel living onboard.

One source has stated that the Cerberus had its Lowmoor iron removed prior to scuttling (Noble:p.100). Evidence of removal of armour from the aft turret exhibits this aspect of the Cerberus' history, however the removal of armour for scrap was deemed to be too difficult and uneconomic by the Melbourne Salvage

Company (Effenberger, 1995: 7). This is evidence both exhibiting human behaviour and explaining the Cerberus' existence in its present intact condition.

Architectural rubble is recorded to be the ballast used in the towing and sinking of the Cerberus as a breakwater (Effenberger, 1995: 8), and it is expected that this material remains within the hull of the Cerberus.

3.7 Historical

The Cerberus can be directly associated with the following historical figures:

Hugh Childers – Victorian Government Auditor General, Collector of Customs, Commissioner for Trade and Customs, Member for Portland in Legislative Assembly, Victoria's First Agent-General in England, Junior Lord of the Admiralty (1864), First Lord of the Admiralty (1868)

Edward J. Reed – Admiralty Chief Constructor, builder of the Cerberus

Captain Cowper Phipps Coles R.N.– Naval theoretician and tactician, designer of HMS Captain (1870) and Coles turrets.

3.8 Technical

The reverberations of the 1862 battle between the wooden ironclads USS Monitor and CSS Virginia (CSS Merrimac) were felt in navies, and by naval architects throughout the world. The Admiralty's chief constructor E.J. Reed learnt many valuable lessons from the US Civil War, Crimean War and from ongoing Admiralty ironclad and floating battery experiments. Reed's design for the Cerberus borrowed features from the Monitor such as steam propulsion, revolving turrets, armour plating and low freeboard. The double bottomed hull concept was an innovation used for the first time in Brunel's SS Great Britain, and later used by the Admiralty in HMS Warrior. Reed incorporated new innovations to improve seaworthiness and safety for the crews, such as the thickly armoured breastwork encasing the holes in the deck for the turrets and engine, longitudinal framing, watertight bulkheads, twin deck, buoyancy chambers, and the valves and pumps used to sink it to a lower profile when engaging the enemy. It was the first unrigged Monitor to incorporate both fore and aft revolving turrets (being unrigged allowed maximum use of field of fire). Reed noted that the cost of these many innovations was the number of lives lost in iron-clad experiments. It is a tribute to Reed's design that after the controversial capsizes of similar top heavy and low freeboard turret ships USS Monitor (1863) and HMS Captain (1870), and with the additional top weight of bulwarks and rigging for its voyage to Australia, the Cerberus did not capsize despite listing a reported 40 degrees in a Bay of Biscay storm.

The existence of the intact deck, breastwork and both Coles turrets with rifled muzzle loading guns and operating mechanisms in situ is of tremendous significance to the understanding and interpretation of the technicalities of the Cerberus, and early turret and Monitor class warships generally.

With reference to the iron plating used in the Cerberus' construction, the breastwork armour is a key innovation developed by Reed, which at a stroke solved the problems of armour protection for the crew and enclosing the openings in the deck to render the Monitor design more seaworthy. The breastwork demonstrates the fact that the Cerberus was built to defend itself from above-water battery fire. Juxtaposition of the relative thicknesses of the hull plating and armoured breastwork demonstrate the Cerberus was constructed prior to the acceleration in the development of submerged torpedo attack and mine warfare, which was occurring even as the Cerberus was being launched.

3.9 Scientific

Scientific studies have been carried out on the Cerberus by practitioners in the disciplines of archaeology, conservation, metallurgy, engineering and marine biology. As a historic structure with a variety of known metal thicknesses the Cerberus has value as a scientific study in corrosion and collapse, and maritime archaeological site formation processes.

3.10 Recreational

Recreational activities such as sightseeing, swimming, diving, boating, fishing and partying have all occurred on and around the Cerberus prior to it being declared a Protected Zone.

A key objective of the stabilisation works is to enable safe public access to the structure, such as for tourism or diving activities. As a visible historic shipwreck close to shore within Port Phillip the Cerberus has significant value as a recreational and tourism drawcard, and for interpretation of maritime heritage.

3.11 Ability to demonstrate

In terms of its ability to exhibit aspects of social and cultural life in Victoria, the Cerberus demonstrates:

- the design, layout, armament, technology and fittings of a Monitor Class war ship
- an integrated coastal defence system for Port Phillip
- Victoria's/ Australia's colonial dependency on Britain for engineering and defence solutions
- increasing colonial self sufficiency for funding and implementation of defence solutions
- life on board a Monitor Class war ship

The Cerberus should be understood and interpreted in context with existing related artefacts and sites of 19th century Victorian naval and maritime history, including:

- possible gun-raft submerged wreck site at Port Melbourne (Port Melbourne Unidentified No. 1)
- Beaconsfield Parade Defence Reserve, Sandridge
- Muzzle loading cannon removed from HMVS Nelson (various locations)
- CSS Shenandoah cannon, Churchill Island
- HMVS Countess of Hopetoun 1st class torpedo boat submerged wreck site, Swan Island
- HMVS Lonsdale 2nd class torpedo boat wreck, buried in landfill in the grounds of Queenscliff Maritime Centre
- South Channel Fort (artificial shoal fort)
- Popes Eye Annulus (uncompleted shoal fort foundations)
- Williamstown defences
- Point Nepean fortifications
- Fort Queenscliff
- J-Class submarines (Cerberus in role as depot ship HMAS Platypus II, 20th Century defences)
- Osborne House Naval and Maritime Museum, Geelong

All of the above aspects of significance have been taken into account in the formulation of the conservation policy" (Anderson 2002).

What physical and/or visual impacts will result from the proposed works? i.e. what will be the effect on the cultural heritage significance of the place?

Before addressing these questions, it is useful to consider the conservation policy expressed in Anderson's CMP which begins with the general statement:

"The conservation policy for the Cerberus may be simply stated as ***retaining what historic fabric remains as completely as possible in the course of stabilising the structure***" (Anderson 2002, his emphasis).

Anderson then cited Strachan's draft conservation policy (Strachan 1995) which lists those aims that such a policy should cover:

- Conserve all existing fabric
- Retain and keep accessible the structural and spatial relationship between the most significant features including the sternpost, upper hull structure and plates, deck and timbers, guns and mechanisms
- Maintain the significant visual profile/silhouette
- Keep the Cerberus in Half Moon Bay, Victoria

It is important to emphasise that the present proposal substantially addresses and complies with this policy. However, the use of infill as a supporting core for the vessel at once raises the possibility of conflict in terms of accessibility which would become impossible for *internal* spaces while retaining and maintaining the spatial relationship between the most significant features as noted above. It is possible that Strachan's emphasis was upon conflicts associated with proposals for removal of key features from the wreck such as turrets, breastwork and decks for conservation and display ashore locally and elsewhere as have from time to time been made. Such proposals would clearly involve destruction of those spatial relationships, cause loss of significant visual profile, and remove significant parts of the vessel from its present location.

Anderson noted that collapse of the deck of *Cerberus*, as has been presaged, would result in similar outcomes, negating all but the last of Strachan's aims expressed in her draft conservation policy.

Anderson (2002) cited the guidelines for stabilisation of historic vessels published as *Standards for Historic Vessel Preservation Projects* by the US National Park Service. These guidelines stress identification, retention and preservation to the greatest extent possible of historic fabric as well as material, elements and features that are important in defining the historic character of a vessel. However, these guidelines do not recommend "irreversibly altering the essential form of the vessel during the stabilisation process". Although stabilisation by infilling using any of the methods canvassed above would be more or less difficult to reverse should that be required, it is argued that infilling would act to sustain the essential form of the vessel rather than alter it. Leaving the vessel unsupported would indeed be inviting outcomes contrary to Strachan's draft conservation policy and the US National Park Service guidelines.

In short, installation of a supporting core into *Cerberus* would not impact upon visual significance. On the contrary it would prevent the threatened total loss of visual significance from a collapse of the structure.

However, the impact of this proposal upon cultural heritage significance is a different matter that requires further consideration. Clearly infilling will render the internal spaces inaccessible so that technical and archaeological information within those spaces could not be investigated. Although *Cerberus* was stripped methodically by salvors prior to scuttling, as Anderson (2002) has pointed out, individual artefacts have been recovered from the site indicating that it cannot be considered as sterile. There is a potential for artefacts to be located within the hull and these, together with the corroded remains of the buoyant hull structure now more or less flattened onto the seabed, would, according to the present proposal, become covered or encapsulated within the monolithic concrete supporting core.

Is the registered place or object in a World Heritage Environs Area?

No

If there are detrimental impacts on the cultural heritage significance of the place or *o*bject, provide reasons why the proposal should be permitted

It must be remembered that at present, the internal spaces of *Cerberus* are not safely accessible by diving archaeologists. Internal monitoring by ROV is the only safe expedient (that is, safe for divers, not necessarily safe for ROVs). There can be no foreseeable future archaeological investigation of internal spaces unless a supporting structure of the type envisaged by GHD in 2000 is installed. To be realistic, the funding for such an expensive undertaking (GHD estimated $5.2 million in year 2000 dollars) is beyond the bounds of possibility within that foreseeable future, so questions concerning reversibility are moot at best.

Archaeologically, this is a regrettable outcome, but it must be weighed against the potential for total loss of the vessel which is the inevitable outcome of one of Anderson's alternative strategies consisting of a combination of cathodic protection and "managed collapse". This non- interventionist option relies on a continuation of the (tragically ineffective) public exclusion zone as the means of minimising risk and liability issues. The exposure of the owners of the wreck to the possible consequences of those issues must be considered against Anderson's assertion that "managed collapse" is the most simple and cost-effective option. Anderson does admit, however, that managed collapse is "…most likely to result in the break-up of the deck and loss of the site's aesthetic, technical and recreational significance..." (Anderson 2000).

Finally, it must be understood that the proposed use of concrete for supporting infill within *Cerberus* compromises two principles of the Burra Charter, firstly that conservation should not impact upon cultural significance and secondly that changes which "…reduce cultural significance should be reversible, and be reversed when circumstances permit." (Walker and Marquis-Kyle 2004:54). Concrete infill could be removed if necessary but would be difficult and expensive. Walker and Marquis-Kyle in their commentary on the Burra Charter do appear to offer a lifeline to *Cerberus* in their assertion that "…Non-reversible changes should only be used as a last resort…" (2004:54).

The very real threat of imminent collapse, together with the failure to find a viable alternative conservation method, underscores the argument that *it is time to adopt a last resort*. The necessary budget for installation of a supporting core of concrete is now secured and we are able and ready to effectively stabilise and preserve *Cerberus* for all Australians.

<u>If there are detrimental impacts on the cultural heritage significance of the place or object, detailed alternative proposals that were considered and reasons why they were dismissed</u>

Many proposals and schemes for conservation of the wreck of *Cerberus* have been made during the past forty-five years. The *Cerberus* Preservation Trust, later to become the Maritime Trust of Australia, had aimed during the early 1970s to refloat the vessel and move it into a permanent dry dock, but engineering assessments revealed severe structural problems within the buoyant hull due to corrosion. More importantly, the funds required for such an ambitious undertaking were not to be found. Undeterred by this failure, interested members of the public continued to press for conservation of *Cerberus* in view of its extraordinary historical importance. As time has passed, ongoing corrosion, despite application of galvanic groundbed cathodic protection, has caused much further deterioration resulting in the collapse of the buoyant hull under the massive weight of armour and turrets during 1993 and 1994.

Following the collapse, Shirley Strachan called together a body named the HMVS *Cerberus* Advisory Committee to consider possible options. A technical panel of this body appears to have reviewed four options prior to September 1995 (Strachan 1995). In summary, these were:

1. Filling with sand pumped into the wreck and then protecting the external slump zone with rock beaching
2. Plating the external hull and filling with concrete
3. Driving an array of piles around the vessel then jacking it up and underpinning beneath
4. Dismantling the wreck, removing it to another place and reassembling it on a dry berth.

Option 1 was viewed as a least-cost option on the basis of an apparently untested assumption that a local supply of suitable sand within dredging and pumping distance might be available. The cost was estimated at $0.1M. This estimate apparently did not include the cost of rock beaching and the approach was admitted to be a short-term expedient only. According to Malcolm Venturoni (pers. comm. 17th October 2017), unless rock beaching is carefully engineered, it will not afford long-term protection on the higher energy seaward side of the vessel. Effective rock beaching for the seaward side of *Cerberus* would require individual placement of selected large boulders from a barge which is a prohibitively expensive procedure. More effective in the long term would be the use of multihedral-shaped concrete castings that tend to interlock, but these would be even more expensive.

Unless the sand remained packed tightly under the turrets and breastwork upper deck, the weight of the armour would continue to rest upon the corroded hull structure and the infill would be ineffective. It was acknowledged, however, that infill with sand allowed ready removal if desired and was essentially a reversible approach. Sand infill would also mitigate the public risk but regular maintenance would be an ongoing cost.

The idea of using cement-stabilised sand in lieu of plain sand arose as a means of achieving more reliable structural support for a longer time before remediation is inevitably required; but at the cost of significantly reduced reversibility. As has been noted earlier, cement-stabilised sand presents a durability risk, has lower cohesive and compressive strength than concrete and is prohibitively expensive to install as major marine plant is required.

Options 2 and 3. It is not clear from the Strachan report summary why concrete infill was rejected. Perhaps a clue to this is that the estimated price of concrete infill was, according to present 2017 costings, very significantly over-estimated while the cost of option 3, piling, jacking and underpinning, was wildly underestimated. In Strachan's summary, the cost of concrete infill was the same as the lower estimate in the range for option 3. Significantly, the cost of option 3 in Strachan's summary was estimated some years before the design and engineering brief for option 3 was awarded to GHD. In terms of 2017 dollars, the present cost of the GHD version of option 3 would probably be at least ten times the cost of concrete infill.

Although not stated explicitly, issues of reversibility probably also had a bearing on the rejection of concrete. However, to be realistic, the selection of option 3, *based with hindsight on erroneous cost estimates*, was a foregone and thoroughly understandable conclusion. Option 3 was adopted, much of Anderson's CMP (2002) was written around it and GHD conducted a series of geotechnical and mechanical tests on the site. The fact that the GHD proposal ultimately foundered from absence of funding is historically certain.

In passing, it is worth noting that the GHD design involved a considerable amount of non-reversible works directly affecting the heritage significance of *Cerberus*. These works included cutting away of the remaining buoyant hull from beneath the armour belt to reduce load during jacking, cutting away of dangerous structural elements, using powerful water jetting to move sediments, installing internal supports under heavy topweights and drilling extensively into the armour for attachment of supports. Anderson's CMP acknowledged this and set out management protocols in response.

Option 4 was rejected on the basis of cost, but it is evident that when Strachan prepared her draft conservation policy, ideas of removal of the wreck from Half Moon Bay were unacceptable.

According to Malcolm Venturoni (pers. comm. 17th October 2017), a proposal to stabilise *Cerberus* by infilling with broken stone, consolidated using epoxy grout under pressure, has been considered but rejected on the bases of material cost and practicability. The cost of epoxy grout in large quantities has been discussed earlier and it is clear that placement of stone and the grouting technique could only be performed from expensive marine plant. This approach presents problems with reversibility and would be clearly more expensive than concrete infill for achievement of a similar result.

The option of "managed collapse" has been discussed earlier and rejected because proposals to do nothing, with or without continued cathodic protection, will inevitably result in total collapse of the vessel and loss of most of its heritage significance. Nevertheless, members of the public having high profiles within relevant interest groups have been heard and reported as saying that they would prefer to see *Cerberus* collapse rather than concrete infill being used. The motivation for this stance appears to range from petulance over rejection of a pet scheme to earnest reservations concerning reversibility. For whatever reason this stance is adopted, it is argued that it is a short-sighted view that evades the longer-term spirit of Strachan's and Anderson's stated conservation policy.

<u>What measures are being proposed to avoid, limit or manage the detrimental impacts?</u>

Given the dangerous nature of the site, it is not possible for divers, archaeological or otherwise to penetrate the interior of *Cerberus*. This means that pre-infill detailed archaeological survey and excavation within internal spaces, although highly desirable, cannot be carried out. Although deployment of ROVs is possible within internal spaces and further recording is possible by remote video and still photography, marine fouling, sedimentation and low visibility produce only low-resolution data. While such a program has merit, it cannot be expected to yield the fine-grained data that would usefully add much to the existing record of the remaining structure within *Cerberus*.

It is intended that all works on the site will be supervised archaeologically and in particular that at least a qualified diver with archaeological experience will be deployed on the site during all works. Any evidence relating to Cerberus would be systematically recorded and a full photographic record maintained. A full account of the work done and any changes to the fabric of HMVS Cerberus during the infill process, together with details of materials used and materials left in place on the site, will be provided within a project report in accordance with the requirements of the Burra Charter Articles 31, 32 and 33, also Section 5 (Australian ICOMOS 1999:9, 17; Walker and Marquis-Kyle 2004:94-7).

Engaging, accurate and inspiring public interpretation both on shore and on site, together with enhanced accessibility for visitation, is an absolutely essential component of the conservation work required for HMVS *Cerberus*. However, it must be recognised that no budget is available to be allocated towards interpretation and access within the current project. When we have successfully stabilised the site, ensured the long-term existence of the vessel and mitigated the present public risks, the exclusion zone can be revoked. At that time, Bayside City Council will be in a position to seek substantial funding for this next important and exciting phase. Bayside City Council has no objection to requirements for public access and interpretation to become Conditions of the Permit for which application has been made.

Has the proposal been influenced by, or does it address any Local Planning Scheme or *Building Act 1993* requirements?

No.

Conclusion

The fate of the wreck of HMVS *Cerberus* is at a crossroads. Structural engineering surveys conducted over a decade ago suggested that it was even then facing imminent catastrophic collapse due to advanced corrosion. The massive topweight of turrets, breastwork and armour belts were then inadequately supported by weakened hull structure. The profile, outline and presence of this immensely important historic warship is deceptive in that the thick Lowmoor iron armour yet shows little evidence of the fundamental weakness of the underlying structure that presently holds the parts together. Over the past forty-five years, serious attempts have been made to ensure the preservation of *Cerberus.* Much engineering skill and thought has been dedicated to devising appropriate and workable methodologies. However, in each case, adequate funding could not be found and the proposals had to be abandoned.

Now, through the efforts of the public interest group Friends of Cerberus, funds have been obtained from Commonwealth sources and shortfall funding has been allocated by Bayside City Council, the owner and manager of the wreck. After thorough consideration of alternatives, it is now proposed to use an infill of monolithic concrete poured within the envelope of the vessel as a means of supporting the topweight and maintaining the integrity of the armour belt, breastwork, decks and turrets. If this proposal can be carried out, we may expect the familiar bulk of the Cerberus to remain for the foreseeable future as it presently is, a key historical landmark within the maritime cultural landscape of Port Philip and within Half Moon Bay in particular.

The selection of concrete infill has been demonstrated to provide a low-risk, environmentally friendly and now totally-funded possibility. The funding available is not sufficient to allow consideration of any known alternative approaches. Concrete infill is not a perfect solution. The use of concrete infill involves a loss of cultural significance as details of internal structure and potential archaeological data within the hull will remain inaccessible. At present, the internal spaces are inaccessible due to danger of collapse, so there is little change in that regard. Nevertheless, a serious concern relates to the difficulty of reversing the process of infill in the perhaps unlikely event of that requirement ever arising in the future. The Burra Charter only considers the use of non-reversible methods of conservation to be acceptable as a last resort. Attempts to apply less intrusive and more easily reversible methods have failed over the years due to their high cost and an unwillingness to commit the necessary funding. In the meantime, the Cerberus has deteriorated to the verge of catastrophic loss and it is indeed time to adopt what may reasonably be perceived as a last resort.

The *Cerberus* can be retained, but that is not all. With the wreck made safe with concrete infill, the present exclusion zone can be revoked and the familiar wreck can be given back to the public. With the *Cerberus* secured for generations to come, access can be encouraged, its recreational value enhanced and the site interpreted so that all may understand why it is so important.

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Wandong, 20th January 2018

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