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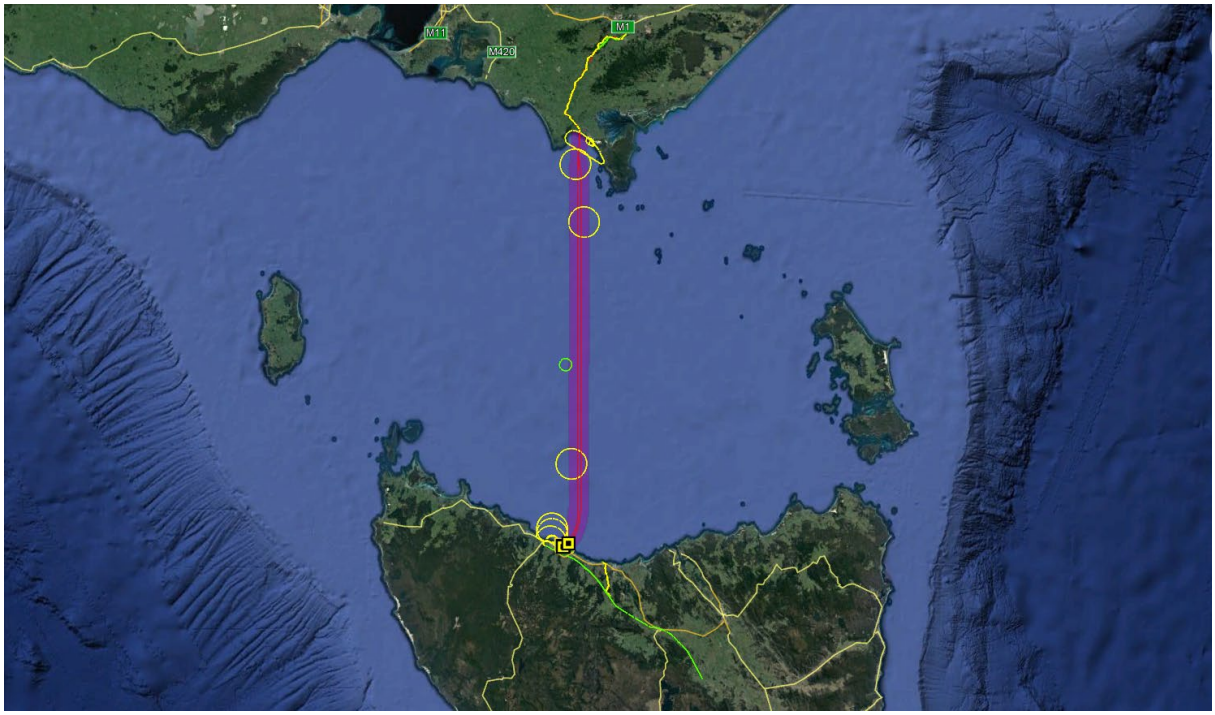
Cosmos Archaeology Pty Ltd

Marinus Link Project



Maritime Archaeological Desktop Assessment

Bass Strait

Gippsland, Victoria and NW Tasmania

September 2021

Marinus Link Project
Maritime Archaeological Desktop Assessment

Prepared for:

Tetra Tech Coffey Pty Ltd

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September 2021

Cosmos Archaeology Job Number J18/08

Cover image: Overview of dual conceptual Marinus Link Cables from Victoria to Tasmania (Source: Google Earth)

Revision	Description	Date	Originator	Reviewer	Approver
V0	Draft HA	19-01-2019	MB	CC	CC
V1	Draft HA	28-03-2019	CM	CC	CC
V2	Draft HA	08-04-2019	CM	CC	CC
V3	Draft HA	22-05-2019	CM	CC	CC
V4	Updated legislation	14-01-2020	CM		
V5	Update cable routes	25-05-2021	KB	CC	CC
V6	Incorporate new text supplied by client and update figures	16-06-2021	CM	CC	CC
V6	Minor edits to figure and tables	01-09-2021	CM	CC	CC

EXECUTIVE SUMMARY

Marinus Link Pty Ltd the proponent is proposing to construct a high voltage direct current (HVDC) electricity interconnector between Tasmania and Victoria, to be known as Marinus Link. Marinus Link will allow for the continued trading, transmission and distribution of electricity within the National Energy Market (NEM). It will stretch from Tasmania, across the Bass Strait to Victoria, up to and including the converter station(s) in each of the states.

The interconnector will provide a second link between the Tasmanian and Victorian electricity grids enabling greater energy transfer between Tasmania and the NEM.

In Tasmania, a converter station will be located at Heybridge near Burnie at a 10 ha site at Heybridge. The converter station will facilitate the connection of Marinus Link to the Tasmanian transmission network at 220 kilovolt (kV) alternating current. Converter stations comprise transformers, switchgear, closed stormwater runoff systems with oil inceptors, a control room and a large building containing the HVAC/HVDC converter technology. There will be two subsea cable landfalls at Heybridge with the cables extending from the converter station across the Bass Strait to Waratah Bay in Victoria. The preferred option for shore crossings is horizontal directional drilling (HDD) to about 1 km offshore where the cables would then be trenched, where geotechnical conditions permit. If geotechnical conditions are not favourable, open trenching or a hybrid methods comprising short HDD and trenching will be used to construct the crossings.

Approximately 250 kilometres (km) of subsea HVDC cable is required to cross Bass Strait. The preferred technology for Marinus Link is two 750 megawatt (MW) symmetrical monopoles using ±320 kV, cross-linked polyethylene insulated cables and voltage source converter technology. Each symmetrical monopole will comprise of two identical size power cables and a fibre-optic communications cable. The cables will be laid at a distance of up to approximately 2 km apart.

In Victoria, the shore crossing will be located at Waratah Bay with underground cable for approximately 90 km to the converter station site in the Hazelwood area. The route crosses the Waratah Bay–Shallow Inlet Coastal Reserve. From the land-sea joint the land cable will run northwest to the Tarwin River valley, which it follows north to the Strzelecki Ranges. The route crosses the ranges between Dumbalk and Mirboo North, before descending to the Latrobe Valley where it turns northeast to the Hazelwood area, connecting to the existing 500kV network via a converter station.

Cosmos Archaeology has been commissioned by Tetra Tech Coffey Pty Ltd (Coffey) to undertake a maritime archaeological desktop assessment for Marinus Link.

Cosmos Archaeology established a maritime archaeology study area 5 km either side of the underwater dual conceptual cable routes' centrelines. This was done because shipwrecks are often found many kilometres away from their historically documented location of loss. Establishing a study area wider than the project survey area ensured that unlocated shipwrecks whose estimated positions had large margins of error were captured in this assessment.

The survey area was defined as 1 km either side of the route centreline in the nearshore marine waters and 2.5 km either side of the dual conceptual cable routes' centrelines in offshore waters.

The assessment found that 31 maritime archaeological sites, all being wrecks, were possibly located within the study area. The exact locations of these wrecks are not known. Eighteen of these wrecks were identified as possibly being located within the survey area. Of the 18 identified shipwrecks, 14 were of wooden construction and less than 500 tons, leaving one large steel vessel of 7,000 tons and three of an unknown construction. Of the 14 wooden shipwrecks, four had an engine, meaning they could be detected by a magnetometer, as well as a side scan and multibeam sonar.

An examination of drop video surveys conducted in the nearshore areas identified a number of cultural objects. The heritage significance of these cultural objects could not be

determined from the footage and no further action is recommended until the marine geophysical data surrounding these finds is reviewed.

A more informed impact assessment cannot be made at this stage without having reviewed the marine geophysical data that is yet to be acquired for the project and the cultural heritage significance and legislative status are determined for seabed anomalies that cannot be avoided. A process for identifying and mitigating potential impacts to maritime archaeological heritage is presented in Section 8 which emphasises the avoidance of any seabed anomaly by re-routing the conceptual cable route(s) in the first instance with an inspection whether it be diving or by remote operated vehicle (ROV). If an anomaly is inspected and found to be cultural, mitigation measures will be presented which will be proportional to the level of significance and the scale of impact to the site. Approvals may also be required to impact the site as well as to undertake disturbance based mitigation measures. The relevant heritage legislation is presented in Section 4.

Based on the available information presented in this maritime archaeology desktop assessment no revision of the provided conceptual subsea cable routes or route position list (RPL) is required. Based on the findings of this assessment it is recommended that:

Recommendation 1

A suitably qualified maritime archaeologist to review side scan sonar and any other marine geophysical data to identify any seabed anomalies that are potentially cultural such as shipwrecks, maritime infrastructure or dump sites located within the project survey area prior to the route being confirmed.

Recommendation 2

Suitably sized buffers should be established on seabed anomalies of potential cultural heritage significance identified from the marine geophysical data and/or verified maritime archaeological sites. The size of the buffer is to be sufficient so as to ensure adequate protection of the anomaly/site.

A suitably qualified maritime archaeologist should be engaged to assess the required buffer zone for each seabed anomaly of potential cultural heritage significance and/or verified maritime archaeological site.

In situations where the establishment of a buffer around a seabed anomaly will pose difficulties for the routing of the cables, the anomaly should be investigated, under the supervision of a maritime archaeologist, with the purpose of establishing its cultural heritage significance. If the anomaly is found to be not cultural or culturally significant, the buffer will be removed.

Recommendation 3

A person who discovers a shipwreck in Commonwealth waters is legally obliged to notify the appropriate authorities as soon as practicable under the Underwater Cultural Heritage Act 2018*. The Department of Agriculture, Water and the Environment must be notified if any unknown or un-located shipwreck sites are identified in the remote sensing data. This can be done through an online form for the 'Notification of discovery of underwater cultural heritage', available through https://dmzapp17p.ris.environment.gov.au/shipwreck/public/forms/notification.do?mode=add*

If the wreck is discovered within State waters (within 3 nm of the coast) the relevant delegated State authority under the Underwater Cultural Heritage Act 2018 *is to be contacted:*

Heritage Victoria
Department of Planning and Community Development
GPO Box 2392
MELBOURNE VIC 3001

Tel: (03) 9938 6894
Email: heritage.victoria@delwp.vic.gov.au
Website: www.dtpli.vic.gov.au/heritage/shipwrecks-and-maritime

Historic Heritage
Parks and Wildlife Service
GPO Box 1751
HOBART TAS 7001
Tel: 1300 827 727
Email: mike.nash@parks.tas.gov.au
Website: www.parks.tas.gov.au/index.aspx?base=1729

Recommendation 4

All ammunition dump sites should be considered live and appropriate safety measures undertaken. The Department of Defence http://www.defence.gov.au/uxo/ should be contacted for further information.

Recommendations as part of forward works program

The conceptual forward works program for this project includes the following:

1. Review by a qualified maritime archaeologist of the marine geophysical survey data acquired for this project. A list of geophysical anomalies of potential cultural heritage significance within the project survey area will be provided with recommendations to avoid the anomalies by re-routing the dual conceptual cable routes if necessary.
2. Those anomalies which cannot be avoided are to be assessed for potential cultural heritage significance and legislative (heritage related) status. The assessment will require physical inspections either by diving or remotely operated vehicle (ROV). The cultural heritage significance of a cultural site will be assessed against the criteria and guidelines used by the Victorian, Tasmanian and Commonwealth governments.

   Mitigation measures will be provided for maritime archaeological sites with confirmed locations whose impact cannot be avoided. Mitigation measures may range from no further action if the maritime archaeological site is of no or minimal significance, to excavation, if the site is highly significant. Mitigation measures will also include monitoring and notification protocols during the implementation phase of the project.

   Heritage relevant approvals/permits may also be required, should a protected maritime archaeological site be impacted, with the conceptual mitigation measures for that site usually being listed as part of the conditions for the approval.
3. Carry out the mitigation measures before, during and possibly after the implementation phase of the project.

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Background

Cosmos Archaeology has been commissioned by Tetra Tech Coffey Pty Ltd (Coffey) to undertake a maritime archaeological desktop assessment of the most favourable routes for Marinus Link, HVDC interconnector cables between Victoria and Tasmania. The conceptual routes cross Bass Strait making landfall at Heybridge in Tasmania, crosses the shore in Victoria at Waratah Bay and connects to the existing electricity network in the Hazelwood area.

1.2 The Maritime Archaeological Study Area

A project survey area has been provided by Coffey, which defines the standard area for field investigations for the project. This area is 100 m either side of the cable routes, which are separated by approximately 2 km across Bass Strait. The Tasmanian nearshore area the survey area is approximately 1 km wide. The Victorian nearshore survey area is approximately 2.5 km wide at the coast, reducing to approximately 350 m before separation of the cables offshore.

Nearshore waters are defined as the point where the seabed transitions from hard substrate to sandy/sediment substrate or 40 m water depth if hard substrate extends that far from shore. The shore marker will be the highest astronomical tide (HAT) of the Tasmania coast and Victorian coast.

The maritime archaeological study area defined by Cosmos Archaeology for this report is larger than the project survey area and defines the area required to characterise baseline conditions and assess impacts for the maritime archaeology assessment. The study area has been defined as a broader area than the survey area as the exact positions of the majority of the documented shipwrecks in Bass Strait are not known and some shipwrecks could be potentially located over a wide area. Historical or estimated positions for some wrecks could have a margin of error of a few kilometres. The comparison between the project survey area and the maritime archaeological study area is presented as:

	Project survey area		Study area (maritime archaeology)	
	Corridor width	Distance either side of route centrelines	Corridor width	Distance either side of route centreline
Nearshore	1-2 km	100 m (x2)	10 km	5 km (x2)
Offshore	210 m	100 m (x2) + 2 km distance between each centreline	12 km	5 km (x2) + 2 km distance between each centreline

The Marinus Link cable routes are represented in Figure 1 and the nearshore areas are represented in Figure 2 and Figure 3.

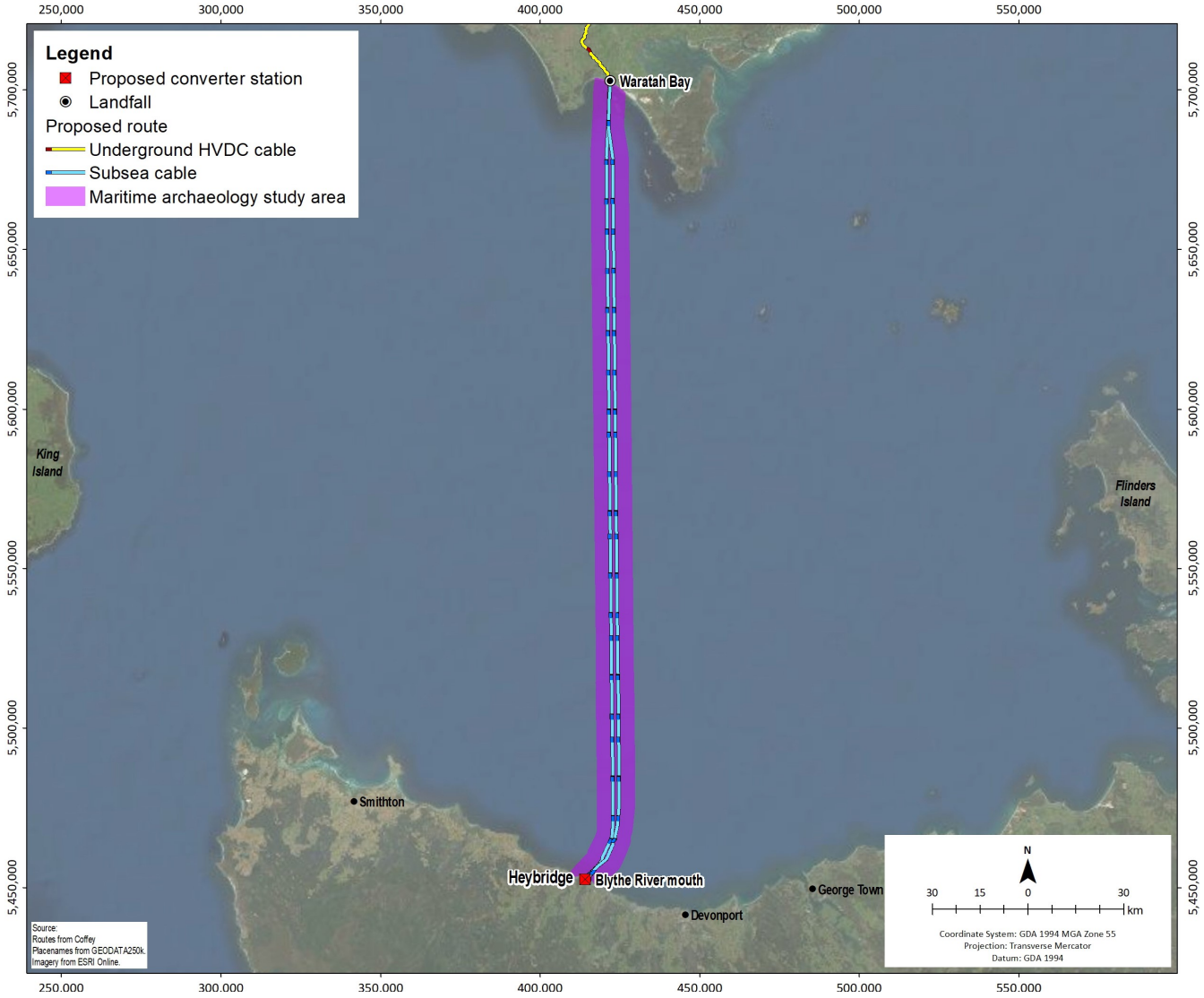


Figure 1: Marinus Link marine overview.

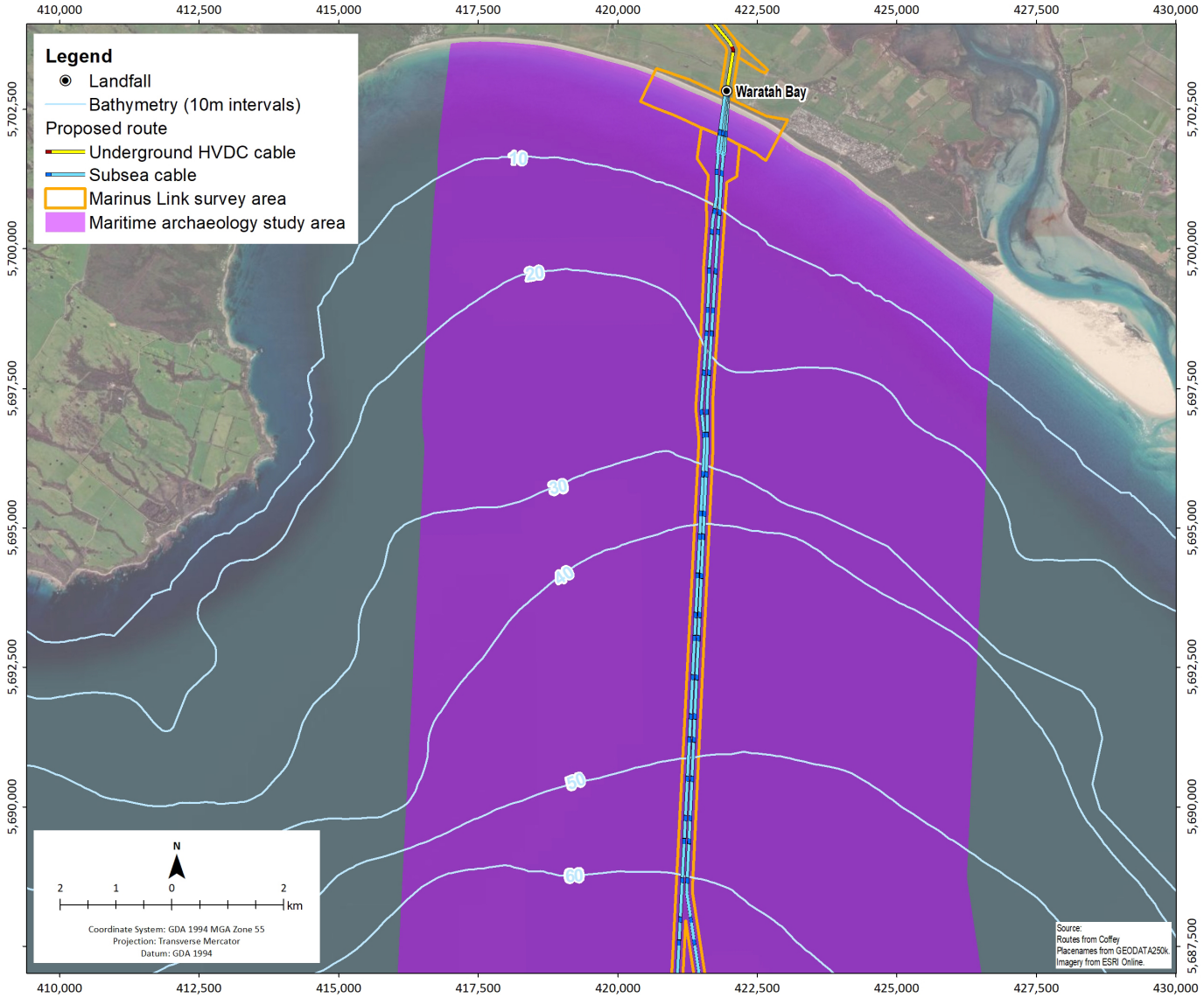


Figure 2: Victorian nearshore project survey area (Waratah Bay).

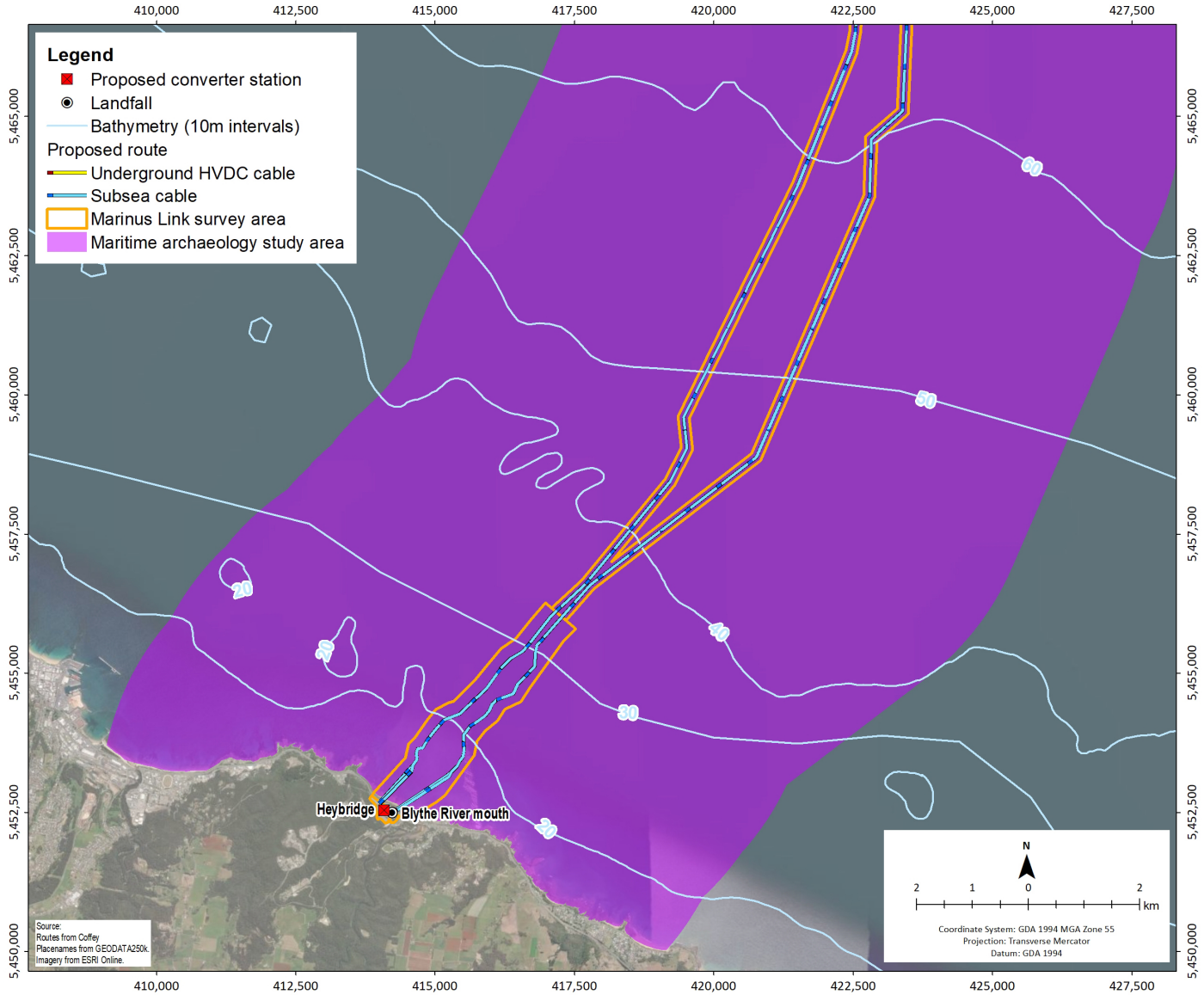


Figure 3: Tasmania nearshore project survey area (Blythe River).

Cosmos Archaeology has provided a list of known and potential sites within the study area. This is to provide flexibility if the route has to change slightly and/or undergo re-alignment. The list is included in Tables 3 to 5 of this report and the possible site locations are presented in Figures 6, 9 and 10.

1.3 Scope of the Study

The study scope includes the following:

- Provide a list of known and potential maritime archaeological sites (including shipwrecks and dump sites) possibly located within the study area.
- Provide an outline of potential impacts from the cable surveys or installation.
- Provide a forward works maritime archaeology program for Marinus Link.
- Provide a description of the different types of potential maritime archaeological sites on the seabed and provide advice on how to identify these sites in the future geophysical survey.

This study examines maritime archaeological sites which are defined as wrecks (ship or aircraft, dumped material, maritime infrastructure and associated deposits on, or under the seabed below the highest astronomical tide). While this report addresses only the potential cultural heritage aspects of dumped munitions, more information about unexploded ordnance should be obtained from a suitably qualified UXO specialist or the Department of Defence.

This study does not assess any impacts on submerged terrestrial sites, that is, Aboriginal sites that became inundated with sea level rise at the end of the Pleistocene, around 10,000 years ago. This is because the nature of the conceptual works is anticipated to stay within recent marine (Holocene) sediments and as such would not disturb buried sites.

2 PROJECT DESCRIPTION

Marinus Link Pty Ltd is proposing to construct a high-voltage direct current (HVDC) electricity interconnector between Tasmania and Victoria, to be known as Marinus Link. Marinus Link will allow for the continued trading, transmission and distribution of electricity within the National Energy Market (NEM). It will stretch from Tasmania, across the Bass Strait to Victoria, up to and including the converter station(s) in each of the states, as shown in Figure 4. The interconnector will provide a second link between the Tasmanian and Victorian electricity grids enabling energy transfer between these regions in the NEM.

In Tasmania, a converter station will be located at Heybridge near Burnie. The converter station will facilitate the connection of Marinus Link to the Tasmanian transmission network at 220 kilovolt (kV) alternating current. Converter stations comprise of transformers, switchgear, closed stormwater runoff systems with oil inceptors, a control room and a large building containing the HVAC/HVDC converter technology. There will be two subsea cable landfalls at Heybridge with the cables extending from the converter station across the Bass Strait to Waratah Bay in Victoria. The preferred option for shore crossings is horizontal directional drilling (HDD) to about 1 km offshore where the cables would then be trenched, where geotechnical conditions permit. If geotechnical conditions are not favourable, open trenching or a hybrid methods comprising short HDD and trenching will be used to construct the crossings.

Approximately 250 kilometres (km) of subsea HVDC cable is required to cross Bass Strait. The preferred technology for Marinus Link is two 750 megawatt (MW) symmetrical monopoles using ±320 kV, cross-linked polyethylene insulated cables and voltage source converter technology. Each symmetrical monopole will comprise of two identical sized power cables and a fibre-optic communications cable. The cables will be laid at a distance of up to approximately 2 km apart.

In Victoria, a single shore crossing will be located at Waratah Bay with underground cable for approximately 90 km to the converter station site near Hazelwood. The route crosses the Waratah Bay–Shallow Inlet Coastal Reserve. From the land-sea joint, the land cable will run northwest to the Tarwin River valley which it follows north to the Strzelecki Ranges. The route crosses the ranges between Dumbalk and Mirboo North before descending to the Latrobe Valley where it turns northeast to Hazelwood. The route follows the transmission lines to the proposed converter station site (32 ha) adjacent to Hazelwood Terminal Station.

Land cables will be laid 0.5 m apart in trenches with a nominal width of 2 m and minimum depth of 1.5 m. Where the symmetrical monopoles are to be accommodated in separate trenches, the trenches will be at least 1 m apart and up to 3.5 m apart depending on the easement configuration. The land cables will be directly laid in the trenches or installed in conduits in the trenches. A linear strip up to 20 m wide will be disturbed when laying the land cables. Temporary access and temporary laydown areas will be required. Where possible, existing roads and tracks will be used for access, for example, farm access tracks or plantation forestry tracks. Land cables will be installed in ducts under sealed roads using horizontal boring and in ducts under major watercourses using HDD, where geotechnical conditions permit. An area up to 1 ha either side of the feature is required to construct road and watercourse crossings using HDD.

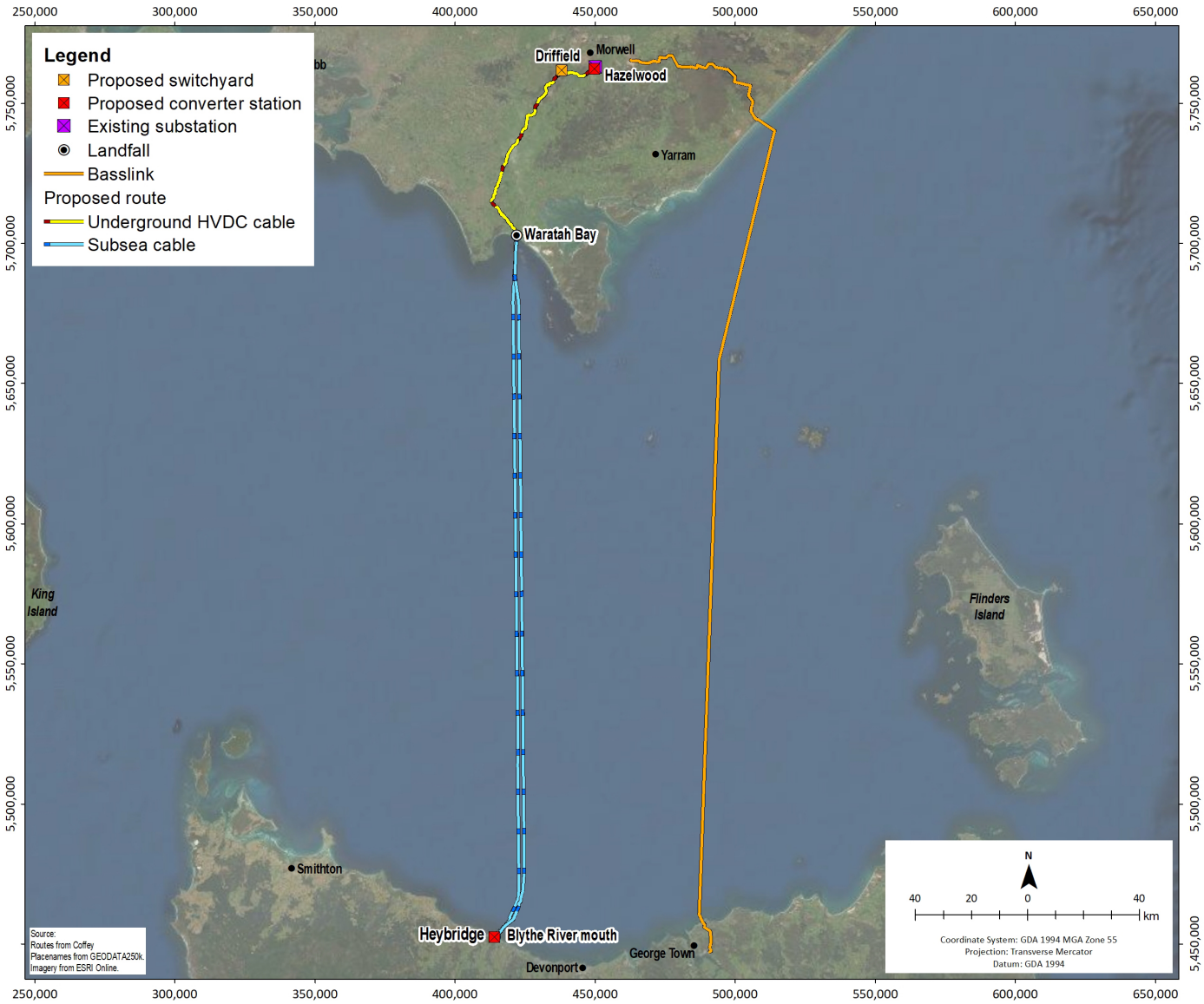


Figure 4: Marinus Link overview.

3 METHODOLOGY

This desktop study has used various sources to prepare a list of known and potential shipwrecks, as well as other maritime archaeological sites in the study area. Research is confined to what is available online and in the consultant's extensive library.

3.1 Sources Consulted

Online sources include databases and websites. These sources are presented in Table 1. Past reports by Cosmos Archaeology were also consulted, including a 2002 maritime archaeological assessment of the Telstra BS-2 Cable in Victoria, a 2007 report on a wreck identified during the installation of a submarine cable system and one previous assessment for a cable route passing through Bass Strait.[1]

Table 1: List of online database sources used

Source	Online Location
Australian Government Department of the Environment and Energy – Australasian Underwater Cultural Heritage Database (AUCHD)*	https://www.environment.gov.au/heritage/underwater-heritage/auchd
Australian Government Department of Defence and Australia Hydrographic Service – Sea Dumping in Australia (AHS SD)	http://www.hydro.gov.au/n2m/dumping/dumping.htm
Heritage Council Victoria – Victorian Heritage Database – Shipwrecks (VHD)	http://vhd.heritagecouncil.vic.gov.au/

*It should be noted that, although the state of Victoria maintains an individual online database of shipwrecks and/or maritime cultural heritage, Tasmania relies on the AUCHD.

The data sources are described below.

Australasian Underwater Cultural Heritage Database (AUCHD)

The Australasian Underwater Cultural Heritage Database is managed by the Australian Government Department of Agriculture, Water and the Environment. The current database was launched in December 2009 and includes all known shipwrecks, aircraft and other maritime cultural heritage in Australasia. At the time of the production of this report, the database contained information on:

- 10,457 shipwrecks, of which 6,970 have reasonably accurate locations;
- 215 aircraft, of which 103 have reasonably accurate locations, and;
- 250 items of other maritime cultural heritage, of which 157 items have either been found, or have near exact locations.

Department of Defence and Australian Hydrographic Service – Sea Dumping in Australia (AHS SD)

This database of sea dumping sites is managed by the Australian Government Department of Defence with information supplied by the Australian Hydrographic Service. It contains information on sea dumping in Australia, including links to information on specific sites.

Heritage Council Victoria – Victorian Heritage Database – Shipwrecks (VHD)

The shipwrecks area of the Victoria Heritage Database is managed by the Heritage Council of Victoria. It contains information and details of shipwrecks that are listed on the Victorian

[1] **Cosmos Archaeology, 2002,** *Maritime archaeological assessment of the Telstra BS-2 Cable in Victoria*; **Cosmos Archaeology, 2007,** *Wreck Found During Geophysical Survey*, report for Alcatel Submarine Networks Ltd on behalf of Telstra; **Cosmos Archaeology, 2017,** *Indigo Central Cable Maritime Archaeological Desktop Assessment.*

Heritage Register (VHR). At the time of the production of this report, the database contained 776 records of shipwrecks.

3.2 General Statements on site locations

Few of the sites presented in this study have accurate positions. This is because most of the wrecks in the study area have not been located and, therefore, only broad areas within which they can be expected to be found can be presented with any confidence. As for the wrecks which have been located, designating accurate positions was not always possible as, in most cases, it is not known how their positions were recorded, such as with global positioning systems (GPS) or a compass/sextant. Furthermore, positions of known wrecks may have been taken off the charts and, therefore, reductions in precision due to plotting and scaling could be expected. Coordinates provided in some databases could also have been inferred from vague historical accounts which could place the site within a relatively large area. This issue is proportionately compounded for sites that are lost at increasingly greater distances from the coast of Australia.

GPS coordinates have become increasingly reliable, however it must be noted that positions recorded with GPS in the 1980s to 1990s had accuracies of 100-300 metres. Sites found and recorded by GPS closer to shore are likely to have had their location updated over time, but sites further from the coast and/or less accessible may still be listed with inaccurate coordinates. There are also different geodetic datums used by GPS units, but the datum is sometimes not recorded with the coordinate which leads to errors when using the same coordinates with a different datum. User error can also occur when a recorder, or someone copying the location records, interprets the coordinates in the wrong style, such as reading coordinates in degrees, minutes, seconds as degrees, decimal minutes. Based on these scenarios and more, it is safe to assume that there is always a degree of inaccuracy with provided coordinates of sites.

To account for the various factors which contribute to the confidence in the accuracy of the positions provided, all the items presented in this study have been given an estimation of accuracy presented as a radius in metres from the position given. Standard accuracy radius estimates are provided in Table 2, however, some sites may be given a unique position accuracy depending upon the quality of information available regarding their position.

Table 2: Standard estimated accuracy radius distances.

Accuracy (radius)	Reasoning
200 m	Position derived from sonar survey or obtained by GPS since 2001.
500 m	Site has been inspected by government archaeologists prior to 2001 and not visited since.
4000 m	Positions provided by reliable source but are unverified
9500 m	Positions provided by unknown source

Australasian Underwater Cultural Heritage Database (AUCHD)

Information presented in the Australasian Underwater Cultural Heritage Database is compiled from each of the State and Territory historic shipwreck agencies, or supplied by collecting institutions holding historic shipwreck objects. The integrity or source of the information held by these agencies is unknown. The size of the area in which an individual wreck could be found varies depending on the historical information available. Located wrecks have a latitudinal and longitudinal position, but the accuracy of that position could not be determined as the method used in obtaining the position is not known.

Department of Defence and Australian Hydrographic Service – Sea Dumping in Australia (AHS SD)

The locations of sea dumped materials provided by the Department of Defence are given by the Australian Hydrographic Service. Dumped materials of heritage value can include abandoned vessels and historic munitions, such as WWII era aircraft components and Lend-Lease material.[2] It is unclear where the Australian Hydrographic Service obtained the positions of the dumped materials. These locations are supposed to be where the materials were designated to be dumped, but it can be assumed that those dumping the materials may not have been particular about the final location of the dumped materials. An example of this was identified in a previous report by Cosmos Archaeology that found the Narrabeen Dumping Ground (a ship graveyard), Sydney, although having a high concentration of wrecks at its location, also had a dense concentration of sites between four to five kilometres east of the designated dumping area.[3]

State Shipwreck Database (VHD)

Most of the shipwrecks obtained from this source have not been found (or, more accurately, if they have been found, they have not been reported). Similar to the AUCHD, shipwrecks that do have a known location, either in the form of latitude and longitude, or a distance from a known point on land, do not have a known accuracy. The information can originate from public contribution or historic sources, and coordinates may originate from estimates. Shipwrecks that have been inspected by government archaeologists can be considered reliable; however, this is a very small proportion, possibly around 5%, of shipwrecks listed in this database.

[2] **Cosmos Archaeology, 2014,** INPEX Ichthys LNG Project : Nearshore Development – Dredging. East Arm, Darwin Harbour, Northern Territory. Relocation of Heritage Objects and Removal of debris. Prepared for Tek Ventures Pty Ltd

[3] **Cosmos Archaeology, 2007b,** Submarine Cable System, Landfall Option – Collaroy: Underwater Heritage Impact Assessment Baseline Review, report prepared for Patterson Britton and Partners.

4 LEGISLATION

The conceptual cable routes pass through Victorian and Tasmanian state waters, as well as Commonwealth waters. The relevant statutory requirements concerning maritime cultural heritage for Commonwealth and State waters are outlined in this section. The jurisdiction for state legislation includes the seabed and the water column up to 3 nm from the coast, however, Commonwealth legislation may take precedence in some matters.

4.1 Underwater Cultural Heritage Act 2018

The *Underwater Cultural Heritage Act 2018 (UCHA 2018)* came into effect on 1 July 2019, replacing the *Historic Shipwrecks Act 1976.* The new Underwater Heritage Act continues to provide protection for historic shipwrecks in Australian waters, expanding protection to historic aircraft wrecks within Commonwealth waters, and establishes the Australasian Underwater Cultural Heritage Database (AUCHD) as a register of underwater cultural heritage. Under Part 2, Division 1, Subsection 16, the following articles of underwater cultural heritage are automatically protected:

(a) all remains of vessels that have been in Australian waters for at least 75 years;
(b) every article that is associated with a vessel, or the remains of a vessel, and that has been in Australian waters for at least 75 years;
(c) all remains of aircraft that have been in Commonwealth waters for at least 75 years;
(d) every article that is associated with an aircraft, or the remains of an aircraft, and that has been in Commonwealth waters for at least 75 years.

Australian waters include all waters from the Territorial Sea Baseline (TSB) to the extent of the continental shelf. Commonwealth waters exclude any waters three nautical miles seaward from the TSB.

At the time of this writing, vessels and aircraft wrecked before 1945, and their associated articles, are automatically protected under the Act.

Under Part 2, Division 1, Subsection 17 of the Act, shipwrecks, aircraft wrecks and their associated articles, that do not meet the criteria for automatic protection may be granted protection by the Minister. Furthermore, the Minister may declare other kinds of articles of underwater cultural heritage protected if the Minister is satisfied that they are of heritage significance. Such articles could be interpreted to include submerged terrestrial sites, historic cables and pipelines, or dumped material, that may be located in Commonwealth waters, Australian waters, or in waters beyond Australian waters, depending on the articles concerned.

Under subsection 18, the Minister may declare an article of underwater cultural heritage, beyond the outer limits of Australian waters protected, if the Minister is satisfied that the article is of heritage significance to Australia.

Under Subsection 19, the Minister may provisionally declare an article of underwater cultural heritage protected if the Minister is satisfied that the article *may* be of heritage significance.

Under subsection 20 of the *UCHA 2018,* the Minister may, by legislative instrument, declare an area containing protected underwater cultural heritage to be a protected zone. Specific conduct within a protected zone may be prohibited.

Under Part 3, Division 1, Subsection 23, a person may apply to the Minister for a permit authorising the person, persons specified in the permit, or persons generally to engage in specified conduct relating to protected underwater cultural heritage.

Engaging in prohibited conduct within a protected zone without a permit is subject to criminal and civil penalties, including imprisonment. Under the Act, it is an offence to directly or indirectly physically disturb or otherwise damage protected underwater cultural heritage, or cause the removal of protected underwater cultural heritage from waters or its archaeological context. Part 3, Division 2, Subsections 29 – 40 outline further offences under the Act.

4.2 Tasmanian Historic Cultural Heritage Act 1995

The Tasmanian *Historic Cultural Heritage Act 1995* is the primary piece of State legislation affording protection to all items of historic cultural heritage in Tasmania. The Act aims to promote the identification, assessment, protection and conservation of places holding historic cultural heritage significance. It also establishes the Tasmanian Heritage Council, which is part of the State's resource management and planning system. Under this Act, the Heritage Council is to maintain the Tasmanian Heritage Register of places, comprised of places deemed to be of State historic cultural heritage significance. Under Section 16 (2) of the Act, an assessment of historic cultural heritage significance is based on the following criteria:

a) *The place is important to the course or pattern of Tasmania's history;*
b) *The place possesses uncommon or rare aspects of Tasmania's history;*
c) *The place has the potential to yield information that will contribute to an understanding of Tasmania's history;*
d) *The place is important in demonstrating the principal characteristics of a class or place in Tasmania's history;*
e) *The place is important in demonstrating a high degree of creative or technical achievement;*
f) *The place has strong or special associations with a particular community or cultural group for social or spiritual reasons;*
g) *The place has a special association with the life or works of a person, or group of persons, of importance in Tasmania's history;*
h) *The place is important in exhibiting particular aesthetic characteristics.*

Approval is required for any works at a registered place which, if carried out, may have an adverse effect on that place's historic cultural heritage significance. Part 6 of the Act sets out the required process for approval to undertake works for places which are listed on the register.

Part 9 of the Act applies to shipwrecks, including those which are at least 75 years old from the date of the wreck, as well as maritime relics. The Heritage Council may enter a shipwreck in the Heritage Register, which need only contain a general description of the shipwreck and its general location. A person must not undertake an activity which is likely to result in the physical disturbance, or change to the fabric or condition of a shipwreck without the Heritage Council's approval. However, a person may apply to the Heritage Council for approval to undertake activities that may have this effect by lodging an application for approval.

Section 72 of the Act states that a person who finds a shipwreck must report the finding to the Heritage Council within 30 days after finding it.

4.3 Victorian Heritage Act 2017

The Victorian *Heritage Act 2017* is the primary piece of state legislation affording protection to all items of cultural heritage significance in Victoria, including historic archaeological sites and artefacts, historic buildings, structures and precincts, cultural landscapes and places, gardens, trees and cemeteries, shipwrecks and significant objects. The *Heritage Act 2017* establishes the Victorian Heritage Register – a register of declared places considered to have state level cultural

heritage significance; and the Victorian Heritage Inventory – a listing of all known historical archaeological sites and artefacts in Victoria.

Under Part 1, Section 3 of the Act, an archaeological artefact is defined as an object (other than a shipwreck artefact) which provides information of past activity in the State and:

a) Is associated with an archaeological site; or

b) Is associated with a registered archaeological place; or

c) Is associated with an approved site of archaeological value; or

d) Is associated with a place that was an archaeological site, registered archaeological place or approved site of archaeological value;

An archaeological site is defined as a place (other than a shipwreck) which:

a) Contains an artefact, deposit or feature which is 75 or more years old; and

b) Provides information of past activity in the State; and

c) Requires archaeological methods to reveal information about the settlement, development or use of the place; and

d) Is not associated only with Aboriginal occupation of the place;

A historic shipwreck is defined as:

*(1) Subject to subsection (5), a **historic shipwreck** is a shipwreck that has been situated in Victorian waters –*

a. For 75 years or more; or

*b. For the number of years specified under proclamation under section 6 (a **proclaimed number of years**).*

(2) Subsection (1) applies whether or not the existence or location of the shipwreck is presently known.

*(3) In addition, but subject to subsection (5), a shipwreck that has been removed from Victorian waters at any time becomes a **historic shipwreck –***

a. 75 years after the likely date that the shipwreck first came to rest on the sea-bed; or

b. If there is a number of years specified under proclamation under section 6, the proclaimed number of years after the likely date the shipwreck first came to rest on the sea-bed.

(4) Subsection (3) does not apply to a shipwreck that has been salvaged or recovered if the salvage or recovery was not contrary to any law in force at the time it occurred.

*(5) A shipwreck is not a **historic shipwreck** if it is –*

a. A shipwreck specified under proclamation under subsection (6); or

b. A shipwreck of a class specified under proclamation under subsection (6).

(6) The Governor in Council, by proclamation published in the Government Gazette, may specify a shipwreck, or a shipwreck of a specified class, is not a historic shipwreck.

A historic shipwreck artefact is defined as:

*(1) Subject to subsection (5), a **historic shipwreck artefact** is a shipwreck artefact that has been situated in Victorian waters –*

a. For 75 years or more; or

*b. For the number of years specified under proclamation under section 6 (a **proclaimed number of years**).*

(2) Subsection (1) applies whether or not the existence or location of the object is presently known.

*(3) In addition, but subject to subsection (5), a shipwreck artefact that has been removed from Victorian waters at any time becomes a **historic shipwreck artefact –***

a. 75 years after the likely date that the object first came to rest on the sea-bed; or

b. If there is a number of years specified under proclamation under section 6, the proclaimed number of years after the likely date the object first came to rest on the sea-bed.

(4) Subsection (3) does not apply to an object that has been salvaged or recovered if the salvage or recovery was not contrary to any law in force at the time it occurred.

*(5) A shipwreck artefact is not a **historic shipwreck artefact** if it is –*

a. An object specified under proclamation under subsection (6); or

b. An object of a class specified under proclamation under subsection (6).

(6) The Governor in Council, by proclamation published in the Government Gazette, may specify an object or an object of a specified class, is not a historic shipwreck artefact.

The act expands the definition of *shipwreck* and *shipwreck artefact* by including any marine concretions and accretions that have become attached to shipwreck artefacts or to the remains or any part of the remains of the shipwreck.

Under section 73 of the *Heritage Act 2017*, it is an offence to remove any registered shipwrecks, historic shipwrecks, registered shipwreck artefacts and historic shipwreck artefacts from the State.

Under section 74, it is an offence to knowingly, negligently, or recklessly take, destroy, damage, remove, disturb, dispose of, or otherwise interfere with any registered shipwreck, historic shipwreck, registered shipwreck artefact or historic shipwreck artefact. Offences under this section are indictable.

Section 76 states it is an offence to be near registered shipwrecks, historic shipwrecks, registered shipwreck artefacts or historic shipwreck artefacts with certain equipment, including salvage or recovery equipment, explosives, instruments or other equipment that could be used to damage or interfere with the above.

Under section 80, a person who finds a shipwreck or shipwreck artefact must, within 7 days, provide the Executive Director a notice in writing, setting out a description of the shipwreck or shipwreck artefact and a description of the place it is situated which is sufficient to enable the shipwreck or shipwreck artefact to be located. Under section 80, it is also an offence to conceal the location of a shipwreck or shipwreck artefact.

Under sections 87, 88, and 89 it is an offence to knowingly, recklessly, negligently or otherwise: remove, relocate, or demolish, damage or despoil, develop or alter, or excavate all or any part of a registered place; or remove, relocate or demolish, or damage or despoil, or alter, a registered object; or disturb the position of an object that is a fixed registered object.

Under section 123, it is an offence to knowingly or negligently deface, damage or otherwise interfere with, or carry out an act, likely to endanger a site recorded in the Heritage Inventory or an archaeological site not recorded in the Heritage Inventory. Furthermore, a person must not, without a permit, knowingly uncover or expose, or knowingly disturb or excavate any land for the purposes of uncovering or discovering a site recorded in the Heritage Inventory or an archaeological site not recorded in the Heritage Inventory. Under section 127, if an archaeological site is discovered, it must be reported to the Executive Director within 30 days after the discovery.

5 MARITIME ARCHAEOLOGY CHARACTERIZATION

5.1 Overview of maritime archaeology in Bass Strait and its western and eastern approaches

From the 1830s, interstate shipping to and from colonial ports on the southern, western and eastern coasts of Australia travelled through the notoriously rough Bass Strait, a journey that was 600 nautical miles shorter than going around the south of Tasmania. The Strait is studded with islands, shoals and reefs which has produced a disproportionately large number of shipwrecks. Installation of navigational aids and the construction of lighthouses to reduce the loss of shipping commenced in the 1830s.[4]

One of the largest islands in Bass Strait that was notoriously hazardous for ships is King Island with over 60 recorded shipwrecks.[5] Bass Strait separates Tasmania from the mainland of Australia and had to be traversed regularly by ships carrying passengers and materials to Tasmania. The crossing to Tasmania is one of the longest trips of overnight passenger ferry services in the world.[6]

Just outside of Port Phillip Bay is a formal vessel disposal area (Figure 5). This is located at 38° 21' S, 144° 25.5' E with a diameter of 3 miles (4.83 km, 2.61 nm). This area was established as one of 14 Commonwealth Areas in Australian waters designated for the disposal of ships in an attempt to control watercraft abandonment. Though, as stated in Section 2.2, dumping is likely to have occurred outside of this zone. The zone is approximately 150 km to the north-west of the study area.[7] No dumped material associated with the designated Commonwealth Disposal Area 3 will be located within the study area.

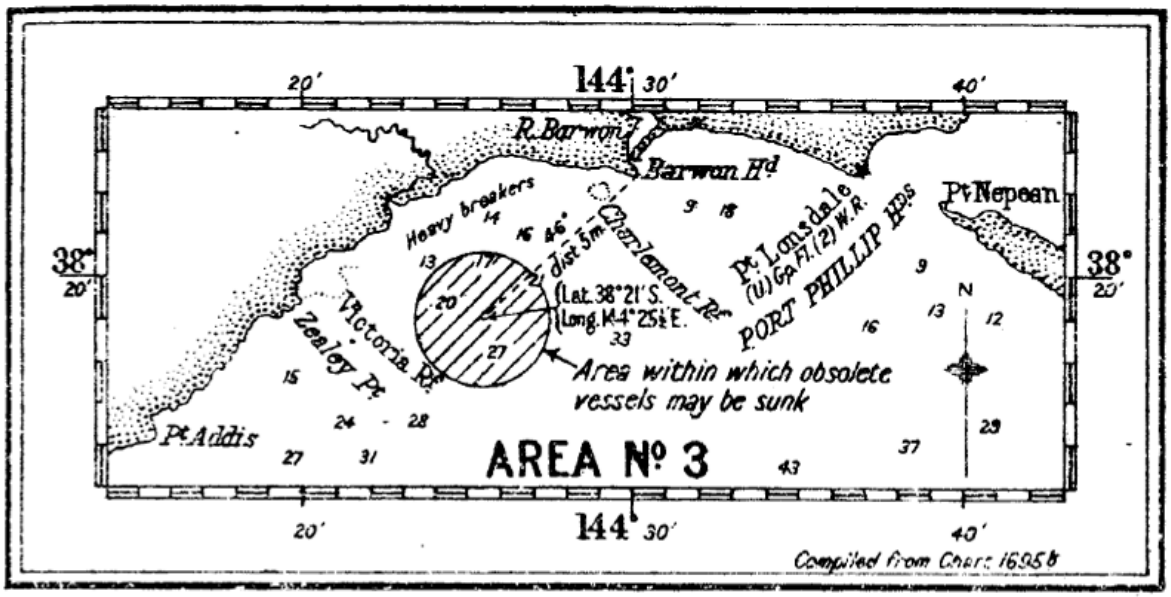


Figure 5: Commonwealth Disposal Area 3 (Melbourne and Geelong).[8]

[4] **Australian Government, n.d.**, 'Early Australian shipwrecks', [Online] http://www.australia.gov.au/about-australia/australian-story/early-austn-shipwrecks, accessed 20 Oct 17.
[5] **Australasian Underwater Cultural Heritage Database**
[6] **Hopkins, David, 1994**, The Shipping History of the Bass Strait Crossing, Devonport, Tasmania.
[7] **Richards, N., 2002,** *Deep Structures: An Examination of Deliberate Watercraft Abandonment in Australia*, thesis for Doctor of Philosophy, Department of Archaeology, Flinders University of South Australia: 242
[8] *Op. Cit.* Richards, N., 2002: 452.

5.1.1 Summary of Cultural Activities

From the review of the known history of the study area the following activities were identified as previously and/or currently occurring across Bass Strait:

- Colonisation and the development of ports and harbours;
- Intrastate and interstate shipping;
- International shipping, and;
- Sea dumping of ammunition, boats, chemicals and other items.

5.1.2 Types of Maritime Archaeological Sites

From the historical and archaeological summary presented above, the following site types can be expected to be found within the study area:

- Shipwrecks;
- Sea dumping sites, and;
- Maritime infrastructure

5.2 Known Maritime Archaeological Sites in Study Area

This study identified a total of 18 known maritime archaeological sites possibly located within 5 km of the two conceptual subsea cable route's centrelines. Nine of these sites are possibly located within 500 m of the conceptual cable route's centrelines. These sites are presented in three sections: first, those within Bass Strait offshore study area; second, the nearshore site in Tasmania (Blythe River mouth); and third, the nearshore site in Waratah Bay, Victoria.

5.2.1 Within the Bass Strait Offshore Study Area

There are four maritime archaeological sites identified to be possibly within 5 km of the Bass Strait offshore conceptual cable routes' centrelines (Table 3 and Figure 6). These are:

- Two shipwrecks, and;
- Two ammunition dumps

One of the wrecks, the S.S *Kanowna,* was lost in 1929 when it struck a rock off Wilsons Promontory in foggy conditions and drifted into Bass Strait and sank in deep water. The position of where it sank has been given as 22 km (12 nm) SW of Cleft Island. In 2005 a dive team, Southern Explorations, announced they had found the wreck in 80 m of water, 50 km into Bass Strait.[9][10] No coordinates were given and though it is almost certain that the wreck was found by the dive team, this does not appear to have been recognised by the relevant government agency – Heritage Victoria.

The other wreck, *Martha & Jane*, sprung a leak 43 km (24 nm) NE of Table Cape. There are no known reports of this wreck being found.

The approximate positions of both wrecks place them within 5 km of the conceptual subsea cables' centrelines. Due to the general nature of the recorded positions, a 9.5 km accuracy has been assigned to these sites. This means that either wreck could potentially be located within the project survey area and/or on the centreline of the dual conceptual cable routes.

The positions of the dumped ammunition sites place them beyond 5 km of the dual conceptual subsea cable routes but the accuracy of the positions have been assessed as being +/- 4 km. This means that dumped material could be situated within the project survey area. It should be noted that such dump sites could cover a wide area that could extend for a few kilometres.

[9] **Southern Ocean Exploration Website: (**Archived) https://web.archive.org/web/20150228134855/http://www.southernoceanexploration.com/, accessed 13 Jun. 19.
[10] **The Age: Fyfe, Melissa,** 2005 "A mystery laid to rest as Gallipoli ship found off the Prom" June 6, p.1.

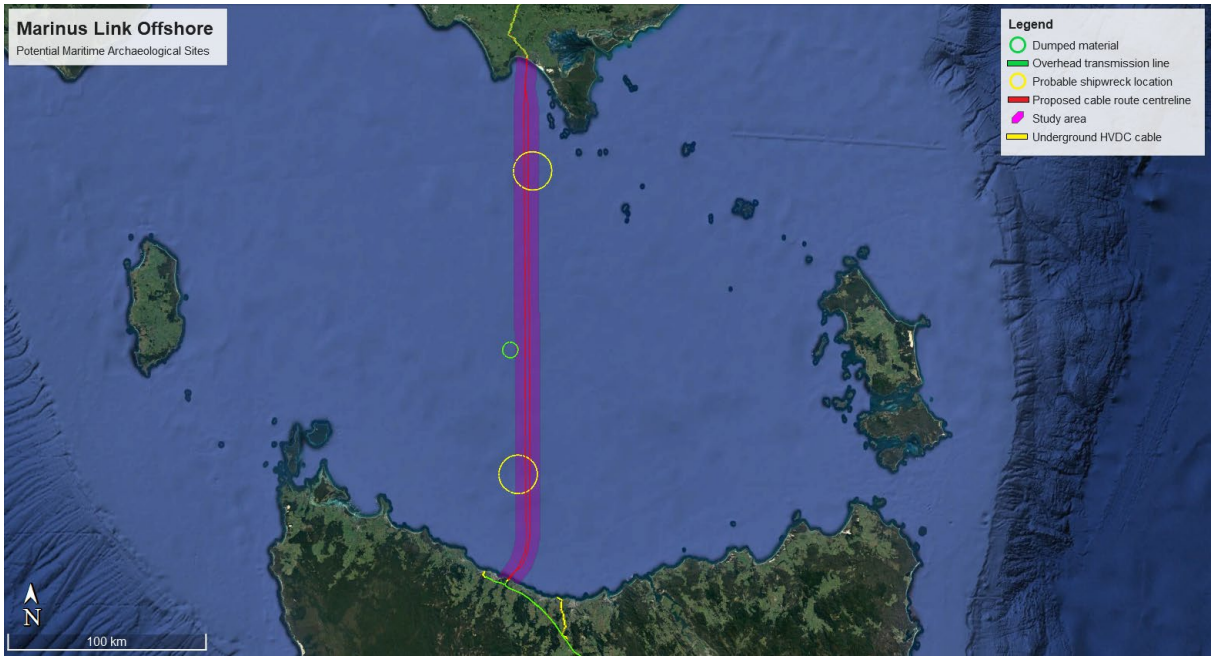


Figure 6: Potential sites located within the Bass Strait offshore study area and survey area. Note, the AHS SD shows the location for both ammunition dump sites as identical. It is possible that this is only one dump site, added twice to the database.

5.3 Tasmanian Coast Maritime Archaeological Heritage

In 1824, the Van Diemen's Land Company (VDLC) was founded in order to develop a sheepherding industry in Tasmania. The company applied for land and was granted 250,000 acres in the north western region of Tasmania (Figure 7). The company established a port at what is now Burnie, on Emu Bay, building a company store and a small jetty.

Figure 7: Map of the grants of land to the Van Diemen's Land Company in the North Western Area of Tasmania. VDLC land grant outlined in yellow, approximate dual conceptual Marinus Link subsea cable landfall circled in red[11]

[11] **Van Diemen's Land Company Records, 1824-1930**, Reels M337-64, M585-89 Van Diemen's Land Company 35 Copthall Avenue London EC2 National Library of Australia State Library of New South Wales Filmed: 1960-

The development of Burnie followed the establishment of other ports on the northern coast of Tasmania, including George Town in 1804, and Launceston in 1824. Today, Burnie is Tasmania's largest port, handling over 4 million tonnes of freight in 2014-2015 along with 55% of Tasmania's container task.

Further maritime industries throughout the north western area of Tasmania were located at the Cam River and Leith Point. The Cam River industries included several boatyards and shipbuilders from the mid-19th century. James Dyson is credited with building the first ship on the Cam River, launching *Maldon Lewis* on 31 October 1867[12]. The construction site of the *Maldon Lewis* was described as being on "the east side of the river," near a ferry house owned by Mr. R.W. Turner. Shipbuilding also took place near Leith, on the River Forth from at least 1852. Notable ships included the *Red Gauntlet,* a wooden steamship built by Henry Charles Stephens in 1890[13].

In addition to shipping and shipbuilding, the north coast was the site of a number of fisheries, including shore-based whaling from at least the early 1830s. Contemporary maps show numerous "fisheries" located on the nearshore and intertidal zones on the northwest coast, and the VDLC is known to have operated an unsuccessful whaling station near Circular Head from 1833 to 1834[14] (Figure 8). A number of shore-based whaling sites have been archaeologically excavated, exhibiting similar characteristics towards the choice of location, and were frequently built near river mouths and headlands.[15]

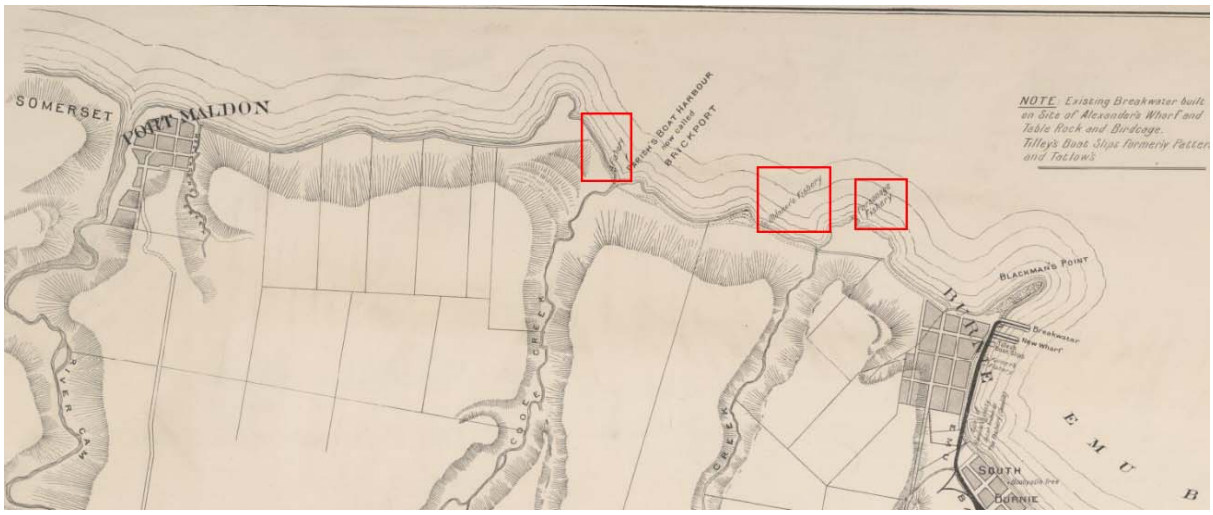


Figure 8: Fisheries located near Burnie, Tasmania. Fisheries shown in red.[16]

5.3.1 Blythe River Mouth

Eight maritime archaeological sites were identified as being possibly located within 5 km of the cable route's centrelines in the Blythe River mouth nearshore study area (Table 4 and Figure 9). All eight sites are shipwrecks.

None of the wrecks have been reported as being found. The positions for these items were supplied by the Australasian Underwater Cultural Heritage Database (AUCHD). The accuracy of the wreck locations varies according to the historical information available.

[12] **Launceston Examiner 1867** 'RIVER CAM', *(Tas:1842 - 1899)*, 9 November, p. 5. , Viewed 18 Jan 2019, http://nla.gov.au/nla.news-article36647132
[13] **Launceston Examiner 1890** 'LAUNCH OF THE S.S. RED GAUNTLET', (*Tas: 1842 - 1899)*, 21 August, p. 2. Viewed 18 Jan 2019, http://nla.gov.au/nla.news-article39554109.
[14] **Nash, Michael 2003** *The Bay Whalers: Tasmania's Shore-based Whaling Industry*, Navarine Publishing, 84-85.
[15] L**awrence, Susan 2006** 'Whalers and Free Men Life on Tasmania's Colonial Whaling Stations', *Australian Scholarly*, 42-43.
[16] **Van Diemen's Land Company. 1901-13?**, A diagram of the northern part of the Van Diemens Land Company Estate of Emu Bay. Truscott & Son, [London] viewed 18 January 2019 https://nla.gov.au/nla.obj-229928301/view

Those vessels wrecked close to or on shore at or near an identifiable location such as Sulphur Creek or Emu Bay were given an accuracy position of +/- 2 km.

Based on the assessed accuracies of one shipwreck, *Midge,* it could be potentially be located within the project survey area and conceivably be located on either of the conceptual cable routes' centrelines.

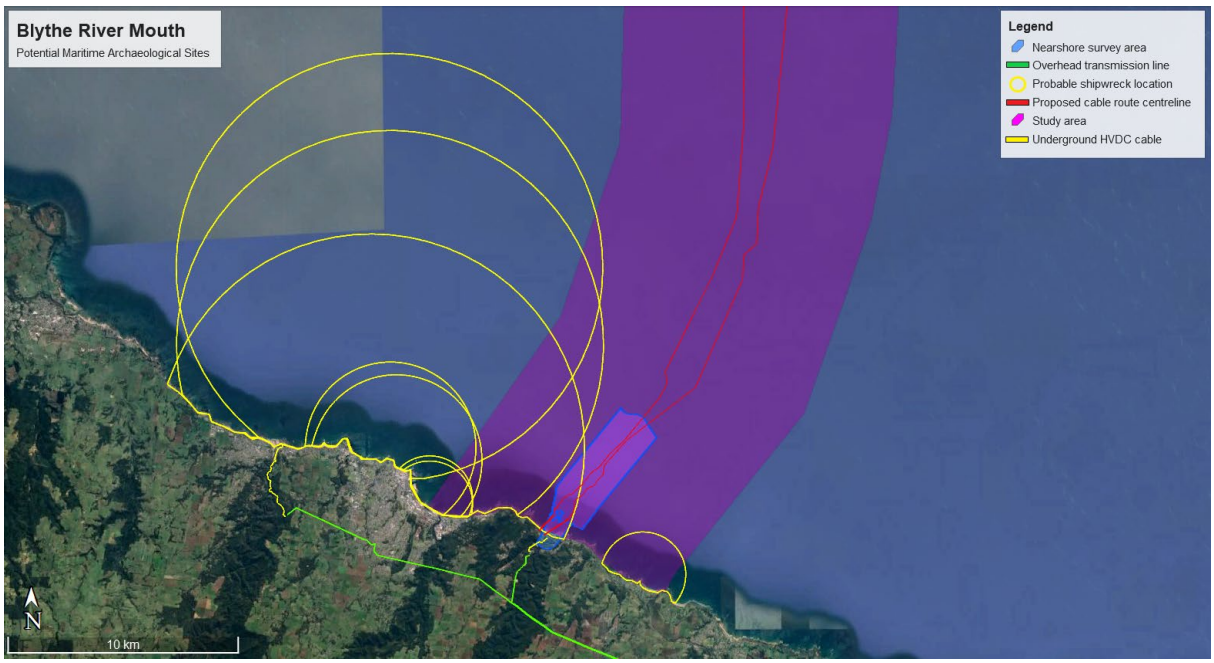


Figure 9: Potential sites located within the Blythe River mouth nearshore maritime archaeology study area. (Base Image: Google Earth)

5.4 Victorian Coast Maritime Archaeology Heritage

Waratah Bay has a coastline approximately 50 km in length. It is roughly semi-circular in shape and extends from Darby River, Wilsons Promontory National Park, northwest to Shallow Inlet and Walkerville, and then south-west to Cape Liptrap in South Gippsland, Victoria[17]. Waratah Bay is listed on the National Trust, is of State Significance, (Place ID 70489) and is listed on the Victorian Heritage Register.

In 1803, it was originally named Paterson Bay by French navigator Baudin during an expedition to map the coast of Australia. In 1858, it was renamed Waratah Bay after the ship named S.S. *Waratah* captained by William Bell became disabled with a damaged rudder while rounding Wilson's Promontory on its way between Sydney and Melbourne. The ship sought shelter in the bay and reported it to be a good, safe anchorage, giving rise to the name Waratah Bay[18].

From 1878, the western area of Walkerville in Waratah Bay was mined for limestone, with six kilns constructed in close proximity to the lime deposits of the cliffs adjacent to Walkerville South Beach. The majority of the lime was sent to Melbourne, but shipments were also made to Sydney, as well as to more local destinations such as Lakes Entrance. Production of limestone reached its peak in the 1890s, however by the end of WW1 lime mining had been replaced by other building materials such as concrete[19]. In 1926,the Walkerville Lime Kilns were closed.

[17] **Victoria Heritage Database Report 2005,** Statement of Significance, Waratah Bay. Report accessed: 18 Jan 19.
[18] **Victorian Places 2019b, '**Walkerville' [Online] https://www.victorianplaces.com.au/walkerville, accessed 18 Jan 19
[19] **Victoria Heritage Database Report 2005**, Statement of Significance, Walkerville Lime Kilns. Report accessed: 18 Jan 219.

5.4.1 Waratah Bay

Six maritime archaeological sites were identified as being possibly located within 5 km from the dual conceptual cables' centrelines in the Waratah Bay nearshore study area (Table 5 and Figure 10). All six sites are shipwrecks.

None of the wrecks have been reported found. The positions for these items were supplied by the Australasian Underwater Cultural Heritage Database (AUCHD). However, the location provided by the AUCHD for these six wrecks is believed to be a "placeholder" location, as all six sites are given the same coordinates. The associated historical record indicates that these ships either ran aground or were sunk near the shore in Waratah Bay. The large semi-circular polygon in Figure 10 is used to visualise the shore area of Waratah Bay, while the small semi-circle refers specifically to the wreck of *Domain,* known to have run aground near Shallow Inlet. Refer to Section 3.1.2 for discussion of the assessment of accuracy.

Based on the assessed accuracies of the six wrecks, all are possibly located within the project survey area and one or more could conceivably be located on one or both of the conceptual cable centrelines.

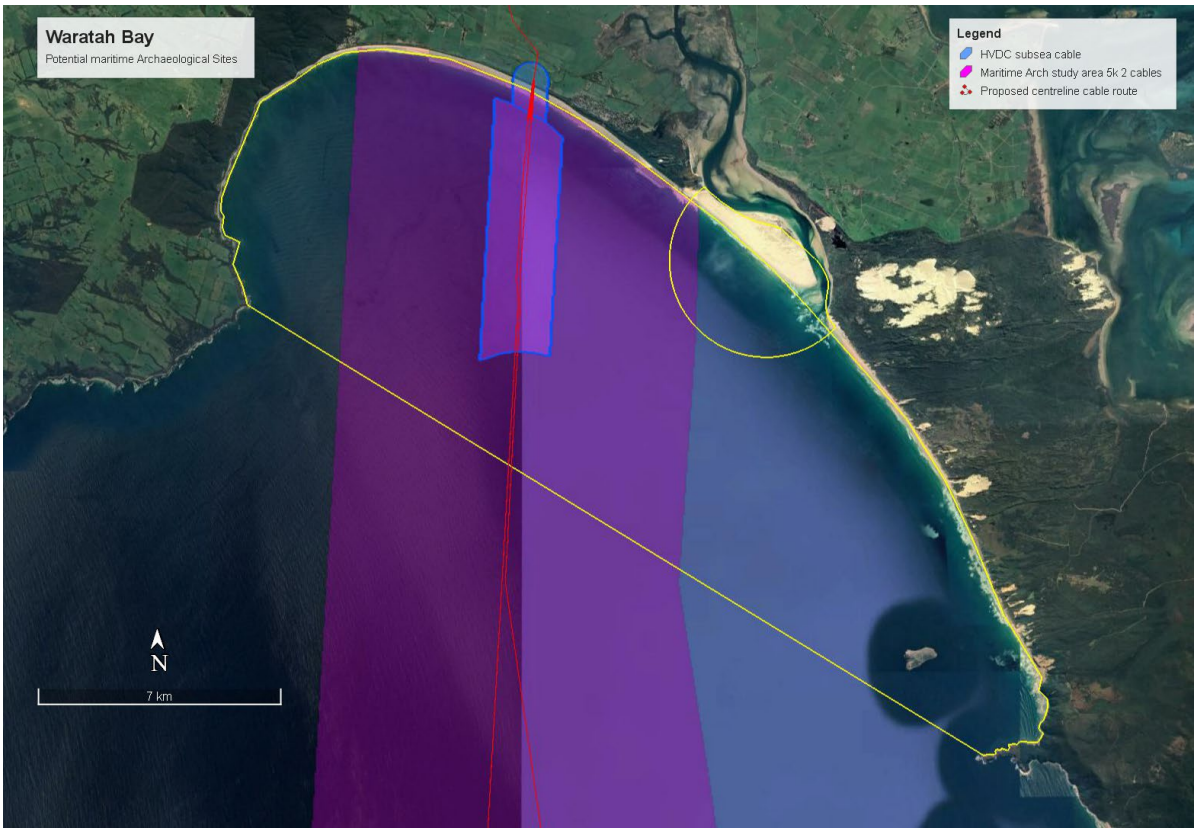


Figure 10: Potential sites located within the Waratah Bay nearshore maritime archaeology study area (magenta). Yellow semi-circle and polygons indicate the areas within which shipwrecks could be located. Blue outlined areas indicate the 2 km nearshore survey area while the offshore project survey area is 5000 m wide either side of the cables. The red lines indicate the dual conceptual Marinus Link subsea cable routes' centrelines and landfall**.** (Base Image: Google Earth)

Table 3: Known maritime sites within the Bass Strait offshore maritime archaeological study area

Object	Location (UTM Zone 55 G/H)		Location (Lat/Long Decimal Degrees)		Centre point distance from cable (km)	Position accuracy (km)	Source	Description	Year Built	Construction	Engine	Tonnage	Notes
	Easting (m E)	Northing (m S)	Latitude (S)	Longitude (E)									
Shipwreck	418800	5502982	40.62000	146.04000	3.70	9.25	AUCHD	*Martha & Jane*	1869	Wood	No	86	1878, sprang a leak and abandoned 23 miles NE Table Cape.
Shipwreck	424994	5648460	39.31000	146.13000	4.07	9.25	AUCHD	*S.S. Kanowna*	1903	Steel	Yes	7000	1929, struck a rock and sank twelve miles SW Cleft Island, Wilsons Promontory.
Ammunition Dump	414743	5562514	40.08333	145.99999	7.17	4.0	AHS SD	Small arms	N/A	N/A	N/A	N/A	Small arms. 4 tons. 9/7/69
Ammunition Dump	414743	5562547	40.08303	146.00000	7.20	4.0	AHS SD	Small arms	N/A	N/A	N/A	N/A	

Table 4: Known maritime sites within the Blythe River mouth maritime archaeological study area

Object	Location (UTM Zone 55 G/H)		Location (Lat/Long Decimal Degrees)		Centre point distance from cable (km)	Position accuracy (km)	Source	Description	Year Built	Construction	Engine	Tonnage	Notes
	Easting (m E)	Northing (m S)	Latitude (S)	Longitude (E)									
Shipwreck	418532	5450798	41.09000	146.02999	4.28	2.0	AUCHD	*Swallow*	1854	Wood	No	66	1876, vessel sprung a leak, capsized and foundered near Sulphur Creek, Emu Bay.
Shipwreck	409254	5453798	41.06200	145.91999	5.32	2.0	AUCHD	*James Gibson*	1842	Wood	No	16	1844, vessel driven ashore from anchorage during gale, Emu Bay
Shipwreck	409252	5454020	41.06000	145.92000	5.43	2.0	AUCHD	*Wave*	1854	Wood	No	33	1855, vessel driven ashore from anchorage during gale, Emu Bay.
Shipwreck	409252	5454020	41.06000	145.92000	5.43	2.0	AUCHD	*Lucy*	1852	Wood	No	25	1863, vessel driven ashore from anchorage during gale, Emu Bay, Burnie.
Shipwreck	407487	5460660	41.00000	145.89999	0.78	9.25	AUCHD	*Meteor*	1881	Wood	Yes	22	1893, vessel sprang a leak and foundered offshore, Cam River.

Object	Location (UTM Zone 55 G/H)		Location (Lat/Long Decimal Degrees)		Centre point distance from cable (km)	Position accuracy (km)	Source	Description	Year Built	Construction	Engine	Tonnage	Notes
	Easting (m E)	Northing (m S)	Latitude (S)	Longitude (E)									
Shipwreck	407445	5463990	40.97000	145.89999	1.56	9.25	AUCHD	*Blythe Star*	1945	Wood	Yes	138	1959, explosion and fire on board, vessel eventually foundered off Burnie, Bass Strait.
Shipwreck	406702	5456209	41.04000	145.88998	3.32	9.25	AUCHD	*Midge*	UNK	Wood	No	10	1868, parted from anchors while sheltering from gale, Emu Bay, near West Park.
Shipwreck	407543	5456219	41.04000	145.89999	3.93	4.0	AUCHD	*Ariel*	1850	Wood	No	49	1853, vessel drifted onto Blackmans Reef, Emu Bay, hull broke up completely.

Table 5: Known maritime sites within the Waratah Bay maritime archaeological study area

Object	Location (UTM Zone 55 G/H)		Location (Lat/Long Decimal Degrees)		Centre point distance from cable (km)	Position accuracy (km)	Source	Description	Year Built	Construction	Engine	Tonnage	Notes
	Easting (m E)	Northing (m S)	Latitude (S)	Longitude (E)									
Shipwreck	419463	5683366	38.99500	146.06999	1.43	9.25	AUCHD	*Domain*	1834	Wood	No	UNK	1846, the vessel was blown ashore in Waratah Bay by a gale
Shipwreck	419463	5683366	38.99500	146.07000	1.43	9.25	AUCHD	*Alcandre*	1862	Wood	No	UNK	1877, sprung a leak and sank near shore.
Shipwreck	419463	5683366	38.99500	146.07000	1.43	9.25	AUCHD	*Bravo*	1866	Wood	No	297	1877, wrecked Waratah Bay, raised and sold as hulk, fate unknown.
Shipwreck	419463	5683366	38.99500	146.07000	1.43	9.25	AUCHD	*Spencer*	UNK	UNK	No	UNK	1854, blown ashore between Cape Liptrap and Wilsons Promontory
Shipwreck	419463	5683366	38.99500	146.07000	1.43	9.25	AUCHD	*Coquette*	1883	Wood	No	UNK	1892, foundered in Waratah Bay.
Shipwreck	419463.26	5683366.96	38.995000	146.070000	1.43	9.25	AUCHD	*Orbost*	1885	UNK	UNK	UNK	1904, dragged anchors and driven ashore near Wilsons Promontory.

5.5 Potential Maritime Archaeological Sites in the Study Areas

There is a potential for maritime archaeological sites to be located within the study area or surrounds that have not yet been found and/or provided a position (see glossary: potential). This is of further relevance in deeper water that is not commonly accessed by recreational boat users or divers.

While all shipwrecks listed on the VHR have been included on AUCHD, the VHR often does not supply a location for the shipwreck and AUCHD does, based on a sometimes-vague description from historical accounts. Although the positions in AUCHD have been searched and those near the two cables have been included in Table 3, Table 4 and Table 5, it is possible that many of the AUCHD positions are highly inaccurate. As a result, many shipwrecks that have been discounted could actually be located within the study area.

The following table details shipwrecks listed on the VHR which are not supplied with locations but which have been described as being in Bass Strait (without any further indication of location) (Table 6). This list is by no means exhaustive as many other shipwrecks in Bass Strait have not been located, and there is a high potential for many other unknown shipwrecks as well.

Table 6: Shipwrecks that have unknown locations within Bass Strait.

Name	Year Built	Year Wrecked	Construction	Tonnage	Rough Location	Source
Bat	1865	1882	Iron	194	Bass Strait	VHR
Content	1872	1877	UNK	124	Bass Strait	VHR
Favourite	1849	1852	Wood	UNK	Bass Strait	VHR
Kenmore	1882	1894	Iron	UNK	Bass Strait	VHR
Handa Isle	1881	1918	UNK	UNK	Bass Strait	VHR
Mercator	1863	1893	UNK	UNK	Bass Strait	VHR
Result	1852	1880	Wood	UNK	Bass Strait	VHR
Ruby	1834	1859	UNK	UNK	Bass Strait	VHR
Vixen	UNK	1856	UNK	UNK	Possibly Victorian waters	VHR
Victoria	1886	1908	UNK	UNK	Bass Strait	VHR
May Jennings	UNK	1890	Wood	UNK	Bass Strait	VHR
Adelheid	1870	1873	Wood	UNK	Bass Strait	VHR
Madagascar	1837	1853	Wood	952	Bass Strait	VHR

UNK denotes unknown

There is also a possibility that there may be further unreported shipwrecks within the study area. However, the northern coast of Tasmania is more indented than the Victorian coast and has historically been more closely settled. As a result, there are more accounts of wrecking events and more geographical features to act as a reference point. Wrecks that have not been found can be more precisely located based on these historical accounts.[20] As such, the AUCHD locations provided for wrecks that have not been found in Tasmanian waters can be considered more accurate than those from other states.

Maritime infrastructure relating to the Walkerville Limestone mining and kilns in Victoria, including, small unrecorded lime boat shipwrecks, cargo, jetties, and wharves may be located to the west of the Waratah Bay study area. Maritime infrastructure features can include pile stumps, linear mounds of rock ballast, artefact deposits, anchors and other types of moorings.

It is unlikely that there are unknown relatively recent dumping locations as the Australian Government *Environment Protection (Sea Dumping) Act 1981* includes the requirement of a

[20] *Op. Cit.* **Diversity Commercial Diving & Maritime Archaeology, 1999**: 10.

permit to dump material, which are kept on record and made public through Australian Notices to Mariners. It is possible, but unlikely, that the Australian military undertook further dumping in Bass Strait that went unrecorded, especially prior to WWII.

During World War II, German naval forces covertly laid mines in Bass Strait. The German navy utilised captured Norwegian tanker ship, *Storstad,* to lay mines off Wilson's Promontory and Cape Otway in late October, 1940. The mines laid by *Storstad* were responsible for sinking the British steamer *Cambridge,* two-and-a-half miles south of Wilson's Promontory on 8 November 1940. Less than 24 hours later, the American merchant ship, *City of Rayville* was sunk off Cape Otway. The Naval Board closed Bass Strait to shipping and began minesweeping operations, eventually removing a total of twelve mines from two minefields. Although the minesweeping operation was considered successful, and Bass Strait was quickly reopened for shipping, mines continued to wash ashore in subsequent years[21]. Though these events took place to the east of the study area, there is the remote possibility that the mooring and chain from a mine or a sunken mine itself may be in the vicinity of the dual conceptual cable routes.

[21] **Hermon, Gill G 1957,** *Volume I: Royal Australian Navy*, 1939 - 1942. pg 270-271.

6 PREDICTED CONDITION OF MARITIME ARCHAEOLOGY SITES

6.1 Introduction

The condition of any maritime archaeological resource is affected by environmental and cultural factors as well as the nature of the seabed.

With regards to the study area, the following factors will have the greatest impact on site formation processes:

- Type of wrecking event;
- Soft marine sediments;
- Mechanical damage caused by waves;
- Salvage;
- Anchor and trawl drags, and;
- Chemical and biological degradation.

6.2 Site Environment

The exact composition of the seabed along the dual conceptual cable routes is currently unknown. As such, the predicted condition for sites in the following sections includes both sandy and rocky seabed conditions in order to address the most likely scenarios.

6.3 Shipwrecks

There are at least 16 known shipwrecks and AHS SD dumped boats located within 5 km of the dual conceptual subsea cable route's centrelines. The construction of these vessels includes iron, steel and wood, built between 1834 and 1945, with tonnages ranging between 10 tons to 7,000 tons.

Adverse weather is a primary reason for the loss of vessels. In heavy seas, vessels may founder, especially if they are poorly maintained or small in size. In most cases vessels are wrecked because they have lost steerage and collided with something, such as land or a submerged reef.

The likelihood of vessels wrecking further out to sea becomes increasingly unlikely with greater distance from shore. Despite this, the loss of a vessel by mishap such as a fire or unseaworthiness, though not common, can occur anywhere.

6.4 Site Formation

The wrecking event is the first factor that influences site formation. Depending on the reasons or forces behind wrecking, the ship may be mostly complete or extensively broken up. A vessel rarely falls or sinks as a result of little or no damage; it is more likely that a vessel would run aground, cause damage to the hull, and then sink with part of the vessel intact and part damaged. This scenario is still not the most common since usually the force of initial impact is sufficient to break the vessel and cause considerable damage[22]. The vessel would then sink in large pieces, depending on the damage, or remain stuck until it is broken up by physical or human forces. Another reason for a wrecking event is fire which, depending on the extent of the fire, can cause a considerable amount of breaking up and scrambling of the ship material before it reaches the seabed.

It is reasonable to assume that a large majority of shipwrecks within the study were purposefully dumped or scuttled. In this scenario, the vessel's structural remains would

[22] **Muckelroy, K., 1978,** *Maritime Archaeology*, Cambridge University Press, Cambridge.

remain highly intact, although it may have been salvaged for key parts before discard and it would have expected to be void of artefactual remains.

The seabed upon which a shipwreck lies has the greatest effect on site formation processes, in particular with wooden hulled vessels, with other factors also having contributory effects. Regarding salvage, it is a general rule that the deeper the water in which a vessel sinks and the more remote the location, the less likelihood of it being salvaged at the time of loss. Rapidly changing technology in recent times has allowed salvage at greater depths.

With regards to vessels coming to rest on a sandy or muddy seabed, the archaeological site will usually be formed in the following manner:

- Vessel comes to rest on the seabed.
- The wreck will settle into the seabed up to a certain depth, dependent on the resistance of the sediments and the weight of the vessel. It is a general rule, especially with iron hulled vessels, that wrecks sink into mud up to their waterline.
- Parts of the vessel which protrude above the water may be salvaged for re-use. Non-perishable, accessible and high value parts of the vessel situated underwater may also be removed.
- Biological processes will commence immediately, attacking the exposed timbers and other organic elements of the wreck. This will lead to the weakening of the hull's integrity and eventually disappearance of the organic elements above the seabed.
- If it is in shallow water, wind generated waves would act upon the broader surfaces of a wreck thereby breaking down exposed components into sections. These sections will orientate themselves to prove the least resistance to the direction from which the waves are more commonly generated.
- Large waves will raise sediments into suspension, thereby resulting in cultural objects, including the hull of the wreck, sinking further into the marine sediments. The older the wreck the deeper it would be buried, unless a hard-alluvial substrate is present close to the surface of the seabed against which the wreck will rest.
- Cultural behaviour will have the effect of scrambling wreck sites and masking their presence. Dragging anchors and trawling will spread wreck material and may also result in the 'ploughing up' of buried cultural material.
- Salvaging will have a destructive effect on the hull and organic elements that have survived below the seabed, as well as by removing artefacts and creating a scatter of remaining material around the wreck site.

With regards to vessels coming to rest on a rocky seabed, the archaeological site will usually be formed in the following manner:

- Vessel comes to rest on the seabed.
- Parts of the vessel which protrude above the water may be salvaged for re-use. Non-perishable, accessible and high value parts of the vessel situated underwater may also be removed.
- Biological processes will commence immediately, attacking the exposed timbers and other organic elements of the wreck. This will lead to the weakening of the hull's integrity and eventually disappearance of the organic elements above the seabed.

- Elements of the vessel and cargo will deteriorate rapidly if left exposed on rock. Ferrous elements may survive but may be corroded to an extent that they are difficult to identify.
- Where there are pockets of sand within the reef, vessel and cargo elements may be present and buried. They could be exposed after large storms.
- Cultural behaviour such as dragging anchors and trawling will not greatly affect wrecks in areas where there is a rocky seabed.
- Salvaging will have a destructive effect on the hull and any organic elements that have survived below the seabed, as well as by removing artefacts and creating a scatter of remaining material around the wreck site.

6.5 Condition

Assessing the condition or, more precisely, the structural integrity of the shipwrecks is of relevance because this can provide an indication of the nature and scale of the obstacle that could affect the cables' laying process. Shipwreck condition also relates to its 'detectability'. A number of factors influence the condition of shipwrecks, the primary ones being: the materials used in the construction of the vessel, the bottom type upon which the wreck rests, the depth of the wreck and its age.

With regards to detecting wreck sites, the two most common remote sensing techniques that could be applied would be magnetometer and side scan sonar surveys. The side scan sonar would be more useful in detecting high profile wreck sites while the magnetometer is best employed in searching for sites with a high ferrous content which are partially buried or resting on a rocky bottom.

Generally speaking, the 'younger' the wreck is, and the deeper it sunk in the water column, the better preserved it would be. Also, a wreck resting on a sandy bottom would be better preserved than if it was resting on a rocky bottom. In conjunction with these factors, the method and type of construction of the vessel is the most important variable when it comes to assessing the condition of a wreck.

Iron/Steel Hulled Wrecks

If resting on a sandy bottom it could be expected that the hull integrity of the wreck would be relatively intact. The hull along midships may have collapsed but the stern and bow sections may still be upright or heeled to one side. The engine components, if any, would be largely intact and *in situ*. Such vessels on a rocky bottom would be relatively disarticulated, though the components of the vessel would still be present. Iron/steel wrecks on either bottom type can be detected using a magnetometer. Locating such a wreck site on a rocky bottom with side scan sonar would be difficult but the opposite is true with such wrecks on a sandy seabed.

Wooden Hulled Wrecks with Engines

In most cases the hulls of such wrecks would have disappeared. However, in situations where the wreck rests on a sandy bottom, sections of the hull may have been preserved under the sand. The engine components of such wrecks would be visible. A magnetometer can detect such wrecks on either bottom type. Such wrecks on a rocky bottom would be difficult to detect with side scan sonar, but the opposite is true with such wrecks on a sandy seabed.

Large Tonnage (> 100 ton) Wooden Hulled Wrecks (Sail)

In most cases the hulls of such wrecks would have disappeared. However, in situations where the wreck rests on a sandy bottom, significant sections of the hull may have been preserved under the sand. There would be enough ferrous material present, such as anchors, chain and winches, for such wreck sites to be detected using a magnetometer. The identification of such wrecks site using side scan sonar would be difficult as it could appear

as scattered dumped debris, unless the cargo the vessel was carrying was non-perishable, in which case a linear mound may be visible.

Small Tonnage (< 100 ton) Wooden Hulled Wrecks (Sail)

The same as for large tonnage vessels except that the size of the target and the amount of ferrous material present would be considerably less. It would be difficult to detect using a magnetometer and may be mistaken for dumped material debris from side scan sonar imaging.

Within Study Area

Of the identified shipwrecks and boat dumps within the study area that have known tonnage, the majority of shipwrecks (13 out of 16) were of wooden construction and all but one were less than 300 tons. These range from construction dates of 1832 to 1945. Out of the 13 wooden shipwrecks, two had engines. Wooden hulled vessels generally survive poorly above the surface of the sediment, with a possibility of significant sections of the hull preserved beneath the sand. The engine components of such wrecks would be visible and may appear on a magnetometer.

For larger vessels, there may be a significant amount of ferrous material from ship fittings that would resist the degradation experienced by wooden elements and create a debris pile on top of the sediment. The ferrous remains may appear in side scan sonar data but would be difficult to identify as it would appear as a scatter of dumped debris rather than having the shape of a ship. This would be even less likely for smaller vessels with less ferrous remains.

Only one of the 16 identified shipwrecks, SS *Kanowna*, was identified as being of steel or iron construction. If an iron or steel shipwreck is found, it is likely that a large amount of the hull would still remain for these vessels along with engine components and other large internal features. If located on a rocky seabed, these shipwrecks would likely be of high relief. Even if the seabed is sandy, these shipwrecks may still be prominent features due to their size and loss within the last 150 years; although this is a considerable amount of time for natural forces to break down the wreck or cover it with sediment, the size of the wrecks are large enough to endure these processes with only minimal to medium effect. These wrecks would likely be very visible in side scan sonar data as a long-defined feature. The high relief of the vessel would likely create a considerable amount of ‘shadow’ in the data.

If a shipwreck is found of iron and steel constructed vessels, smaller than 500 tons, a reasonable amount of the hull would likely still remain for these shipwrecks and dumps, more so for the newer built and larger vessels. On rocky seabed they would likely be of high relief but on sandy seabed it may be that these smaller shipwrecks have sunk further into the seabed or experienced sedimentation and so would have a much lower relief. These shipwrecks and dumps may still appear in side scan sonar data similar to the larger vessels but would be smaller features and perhaps less defined.

6.6 Sea Dumping

The locations of sea dumping of ammunition, boats, chemicals and other materials have been recorded and made available by the Australian Government Department of Defence and Australian Hydrographic Service. The location and amount of the material dumped is documented; however, the exact location of the dumped material may differ from that recorded due to the depth of water where the material was dumped and/or accuracy of the relocation of the dump site.

Information is provided by the Australian Hydrographic Service, including links to spreadsheets which contain information of specific sites. The sites are grouped into five main categories, including ammunition, boats, chemicals and other materials, as well as dumping grounds. Each record includes information such as latitude and longitude, date of dumping and description of materials. In addition, information on sea dumping has been made public through Australian Notices to Mariners since 1982.

The types of ammunition listed in sea dumping records include unexploded depth charges, guns and cartridges. It must be assumed that all ammunition is currently live and appropriate precautions should be taken in regard to these sites. The last category is of other materials. This includes army medical stores, ceramics, residue from grain cleaning, iron ore, artificial reefs, dredge spoil, obsolete equipment and even food scraps.

There are two ammunition dumps and one boat dump located in the study area and surrounds. The ammunition dumps include projectiles, depth charges and three 'various' dumps including generators, fuses, igniters, shells, flares and cartridges. The one boat dump is described in the shipwrecks section above (see Section 6.3).

Ammunition dumps could appear as a mound or as a low relief scatter of debris on the seabed. The site configuration depends on the speed of the dumping vessel at the time of disposal and the assumption that the ammunition was dumped inside its containers. Due to the relatively recent timing of these dumping events and the fact that the ammunition largely consists of iron, it is likely that the ammunition is still largely intact.

If the ammunition, chemical and other dumping sites were formed in a mound they may have good relief against the seabed, especially a rocky seabed, and may be detected in side scan sonar data as a mound. It is more likely that the dumps are low lying and of low relief as a result of having been discarded from a moving vessel, in which case they may be identifiable as a scatter similar to a rocky seabed. Ammunition, drums and demolition materials on the seabed or only buried under shallow sediment would still be largely intact. This would result in the items being easier to detect via magnetometer due to their ferrous properties.

6.7 Maritime infrastructure sites and associated deposits

The nearshore areas of northern Tasmania and Victoria have experienced the development of small and large industries resulting in the construction of maritime infrastructure such as wharves, jetties, moorings and seawalls from the first quarter of the 19th century onwards. Structures associated with merchants, quarrying, timber works, shipbuilding, the whaling industry, shipping and quarantine services may also be present in the nearshore areas. Not all such structures would have been depicted on historical maps. The identification of parallel pipes near the shore at the Blythe River mouth may indicated the remains of pipelines from a tioxide plant which operated from the 1960s to the 1990s.

Remains of these structures may still exist in the seabed in the form of cut-off piles, abandoned moorings, collapsed timbers and linear mounds of rock rubble which are known to be associated with 19th century jetty construction. These linear mounds of rock rubble can commonly be mistaken for modern groynes. Former slipways associated with ship building industries could also be located in the near shore areas.

Deposits associated with maritime infrastructure would have built up around and beneath the structures. Artefacts would have fallen beneath and between the deck planking of jetties and wharves as well as off the vessels moored alongside. Such deposits can include accidental and/or deliberate discard of items such as personal objects, food and drink containers, fishing equipment as well as damaged and removed material from maintenance of the structure. These smaller items may have fallen through the sandy seabed to become buried beneath the surface or similarly buried by any sedimentation in the area. As the abovementioned structures were associated mostly with industrial activities, there could be a higher concentration of tools and machinery parts under, within and around the structures.

Archaeological deposits would have formed below vessels accessed and moored off maritime infrastructure sites. The vessels in the area include a mix of recreational craft, passenger liners, and industrial vessels associated with a number of industries including shipbuilding, fishing, sheep trade, and logging. Discard of items from vessels can be accidental or deliberate, and can include personal objects, food and drink containers, ships fittings and equipment, fishing and boating equipment as well as cargo from vessels passing through the areas. Such deposits can consist of a range of materials and are mostly single items but can also occur in scatters created by one event or multiple events. Higher concentrations would be expected closer to shore at Blythe River mouth and Waratah Bay rather than in Bass Strait.

6.8 Optimal marine geophysical survey methods

A range of techniques is available for detecting underwater archaeological sites. All have their advantages and disadvantages. More often than not these technologies are used together so as to offset their individual deficiencies and provide a better picture of the natural and cultural characteristics of a study area. Also, there are circumstances when no available technique would be suitable for detecting certain site types in certain seabed environments. The most common geophysical survey technologies for marine environments and their suitability for detecting marine archaeological sites and materials are described below.

Side Scan Sonar

Side scan sonar produces an image which is the equivalent of an oblique black and white aerial photograph with shadows. This technology is excellent for identifying seabed composition and low relief cultural objects. Ecologists use it to map natural features like reefs or seagrass beds while dredging contractors use it to identify debris and obstacles on the seabed which may impede their work. Side scan sonar has very limited use for identifying cultural objects on rocky seabeds.

Multibeam Sonar

Multibeam sonar is an underwater version of LIDAR. It is used extensively for bathymetric surveys. The resolution of the survey is expressed as 'bin'. The smaller the bin or grid size, the higher the resolution. For maritime archaeology a bin size of 0.5 is sufficient. Multibeam sonar is excellent for obtaining accurate topographical models of the seabed and can provide accurate measurements and representations of large objects such as metal hulled wrecks. Its weaknesses are that the system does not discriminate between different textures or seabed composition. Therefore, it is difficult to interpret a mound on the seabed as being composed of sand or rock and so it has the same limitations as side scan sonar when looking for cultural material on rocky or undulating seabeds. Additionally, because of the large amount of data being collected during a survey, the operator deletes or cleans up points as they go along according to what is perceived to be erroneous or eccentric points and software 'artefacts'. This has led to cultural objects being deleted from surveys. The best way to overcome this issue is to induct surveyors on how to recognize significant cultural heritage as it may appear on the seabed. The preceding sections in this report form the basis for such an induction.

Gradiometer

Gradiometers are marine metal detectors that detect disturbances in the earth's magnetic field, such as those caused by ferrous objects. A gradiometer comprises of two magnetometers which are a fixed distance apart. Gradiometers are able to estimate the mass and distance of an anomaly from the sensor head. Gradiometers are mostly used to locate buried ferrous objects such as cables and unexploded ordnance and are useful for maritime archaeology when looking for sites with a large ferrous component, such as a timber steamer launch that was wrecked on rocky ground or is mostly buried. Where the underlying bedrock has high ferrous content, gradiometers are limited to detecting large ferrous objects such as iron-hulled vessels.

Seismic or sub-bottom profiling

Sub-bottom profiling is the marine equivalent of ground penetrating radar. This form of remote sensing technology is primarily used to record geological strata below the seabed to assist engineers in their design of marine structures as well as to assist dredge contractors in understanding the material they will be encountering. Seismic profiling has the ability to detect anomalies buried under the seabed. Its application in the detection of buried shipwrecks, particularly timber ones, has often provided inconclusive results. This is because the low frequency signals used to detect large geological structures tens of metres under the seabed requires a reduction in resolution and does not detect relatively thin sites close to the seabed surface. High frequency scans could achieve better results but by sacrificing the acquisition of suitable geological data deep below the seabed. Large buried anomalies detected by seismic profiling are difficult to interpret. For example, the anomalies

could appear to be the top of a rocky hill or a cultural object. The tops of these features are often located a number of metres under the seabed making them difficult to access through diver operated excavation techniques.

For this study, side scan sonar is considered the optimum tool for identifying seabed anomalies of potential cultural heritage significance. Multi-beam sonar with properly inducted marine surveyors is good but not optimal, especially when trying to identify low relief sites. Gradiometer use would be useful if the project was required to determine whether a low lying 'reef' or scatter of objects on the seabed was cultural or natural.

Seismic profiling is of limited use in the context of this study at present. It may be useful if an assessment of submerged Aboriginal sites is required, as seismic profiling can identify submerged and buried Pleistocene landscapes (see Section 1).

The scope and method of the marine geophysical survey was reviewed on 27 February 2021 and was found to be acceptable as it was using magnetometer and side scan sonar in tandem as well as multibeam sonar and seismic profiling. The use of a magnetometer will detect ferrous objects but will not provide reasonable estimates for the size of the ferrous object or possible burial depth unlike a gradiometer. This should not be an issue for this project in relation to steep/iron hulled wrecks or timber wrecks with engines and/or with anchors/chain.

7 REVIEW OF VIDEO SURVEYS

Under a separate scope, video surveys were conducted by CEE Pty Ltd (CEE) at the two nearshore areas, Blythe River mouth (Heybridge) in Tasmania, and Waratah Bay in Victoria. This was done to assist with marine ecological component of this project. Such surveys are of limited value for the purposes of identifying underwater cultural heritage in the form of shipwrecks. Nevertheless, it is possible, albeit a low possibility, that the video surveys may have recorded culturally significant objects on the seabed.

The video surveys used waterproof drop cameras towed from a vessel to record still images and HD video. The camera was angled oblique to the seabed and towed some distance above it. HD video was continuously recorded, while still images were captured every two seconds. Footage was captured in transects with GPS location.

Footage was reviewed to identify any submerged cultural remains on the nearshore seabed. Video footage was reviewed alongside still images, with the still images offering far better picture quality. When an object was identified as being potentially cultural in origin, the video timestamp and photo number were noted and recorded. The location of the object was then estimated using the timestamp as a reference against the length of the transect.

A summary of the surveys conducted by CEE is as follows:

- 15 January 2019: Survey of Heybridge alignment. 33 towed video transects at Heybridge.
- 17 February 2019: Survey of Waratah Bay: 28 towed video transects

Five underwater features of potential cultural heritage significance were identified at the Blythe River mouth. This is to be expected in an area of relatively intense cultural activity ranging over 150 years. The linear features identified off the Blythe River mouth could potentially be chain associated with a mooring, anchor and/or a wreck. These features are to be considered for further investigation – diving or ROV – after the marine geophysical data has been reviewed.

Figure 11 shows the CEE benthic ecology survey sites at Blythe River mouth (Heybridge) and Table 7 presents the images of features of potential cultural heritage significance.

No objects were identified from the drop camera surveys at Waratah Bay.

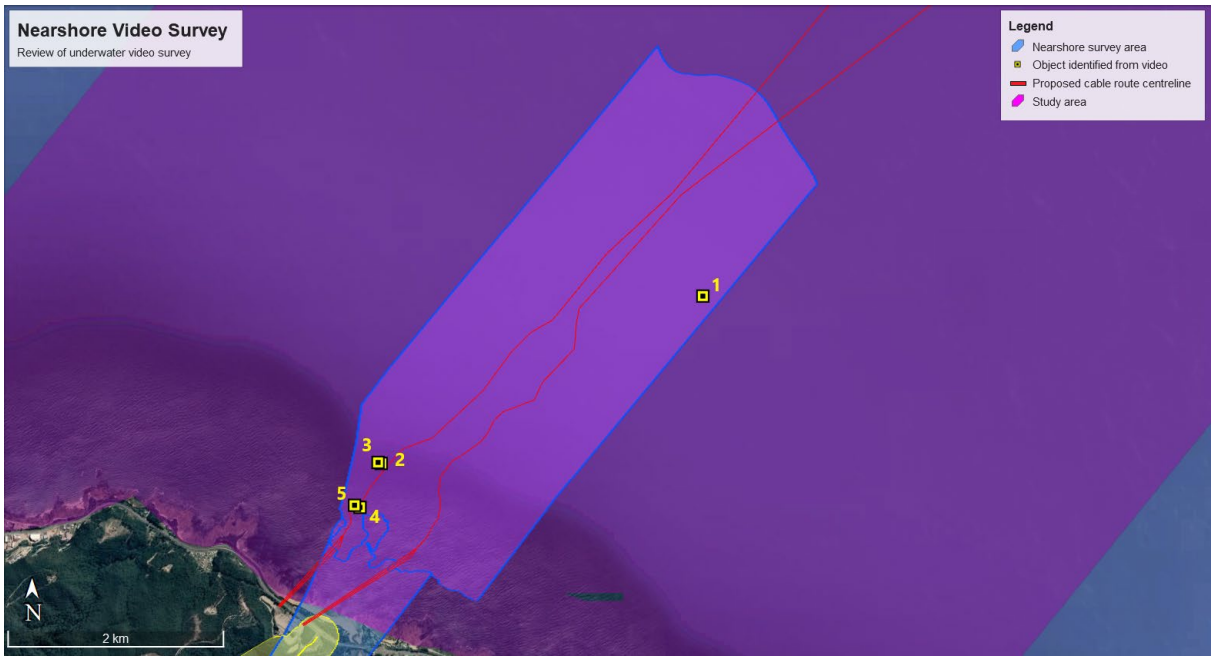
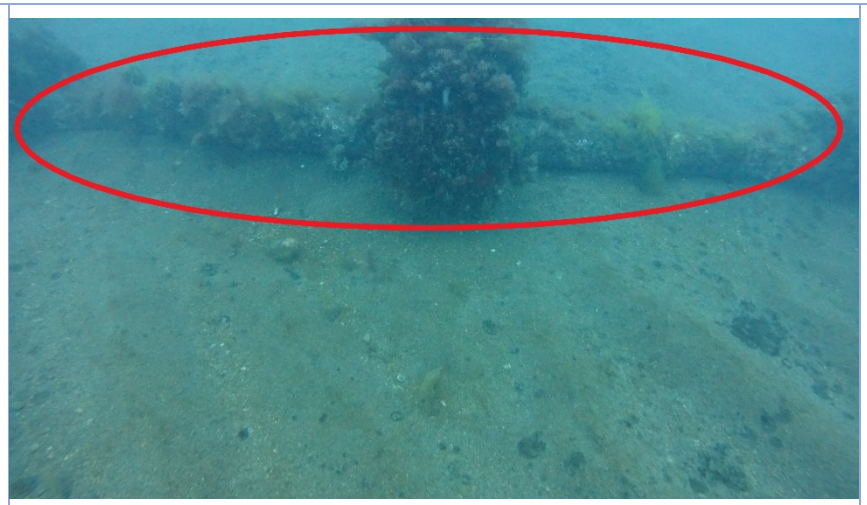
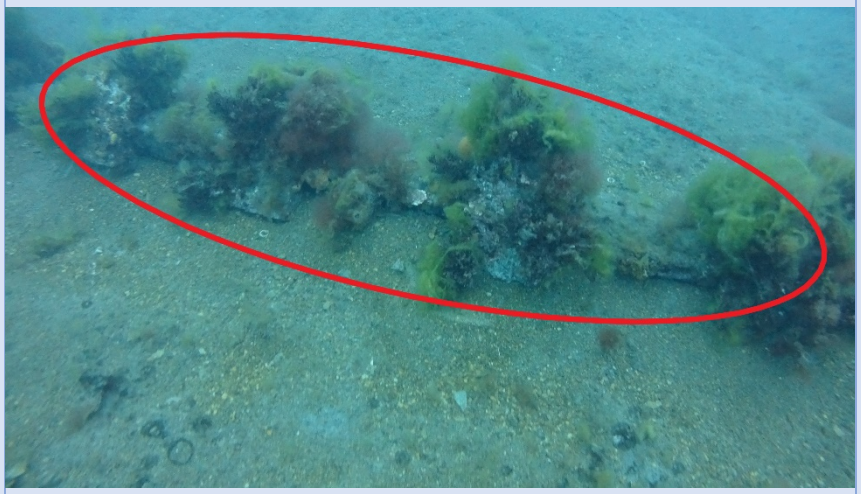
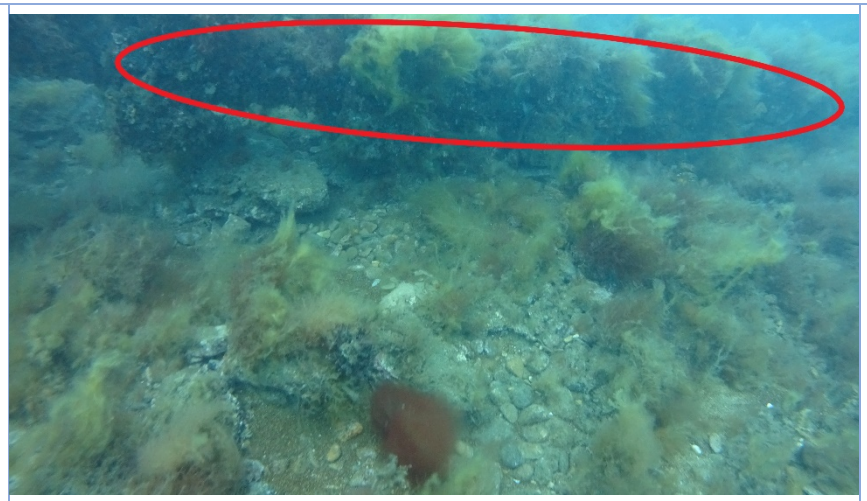
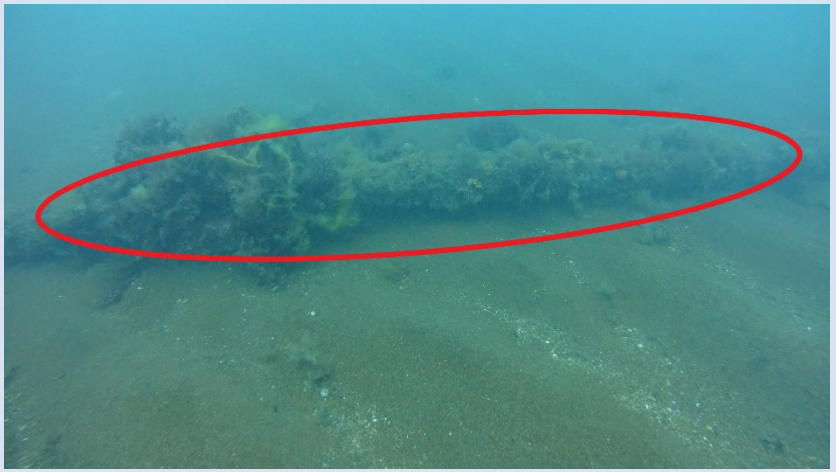


Figure 11: Map of potential underwater cultural heritage sites identified from drop camera survey at and Blythe River mouth.

Table 7: Review of nearshore camera footage (Lat/Long in Decimal Degrees).

Feature	Location	Transect	Latitude	Longitude	Description	Photo	Action
1	Blythe River mouth	HEY_E03	41.046369	146.024334	Single brick, red brick or concrete		Review marine geophyiscal data to inform whether or not this location is to be inspected (ROV or diving)

2	Blythe River mouth	HEY_W08	41.060540	145.987946	Pipe, potentially old tioxide pipeline		Review marine geophyiscal data to inform whether or not this location is to be inspected (ROV or diving)
3	Blythe River mouth	HEY_W08	41.060456	145.987590	Pipe, potentially old tioxide pipeline		Review marine geophyiscal data to inform whether or not this location is to be inspected (ROV or diving)

4	Blythe River mouth	HEY_W09	41.064275	145.985532	Pipe, potentially old tioxide pipeline		Review marine geophyiscal data to inform whether or not this location is to be inspected (ROV or diving)
5	Blythe River mouth	HEY_W09	41.064099	145.984916	Pipe, potentially old tioxide pipeline		Review marine geophyiscal data to inform whether or not this location is to be inspected (ROV or diving)

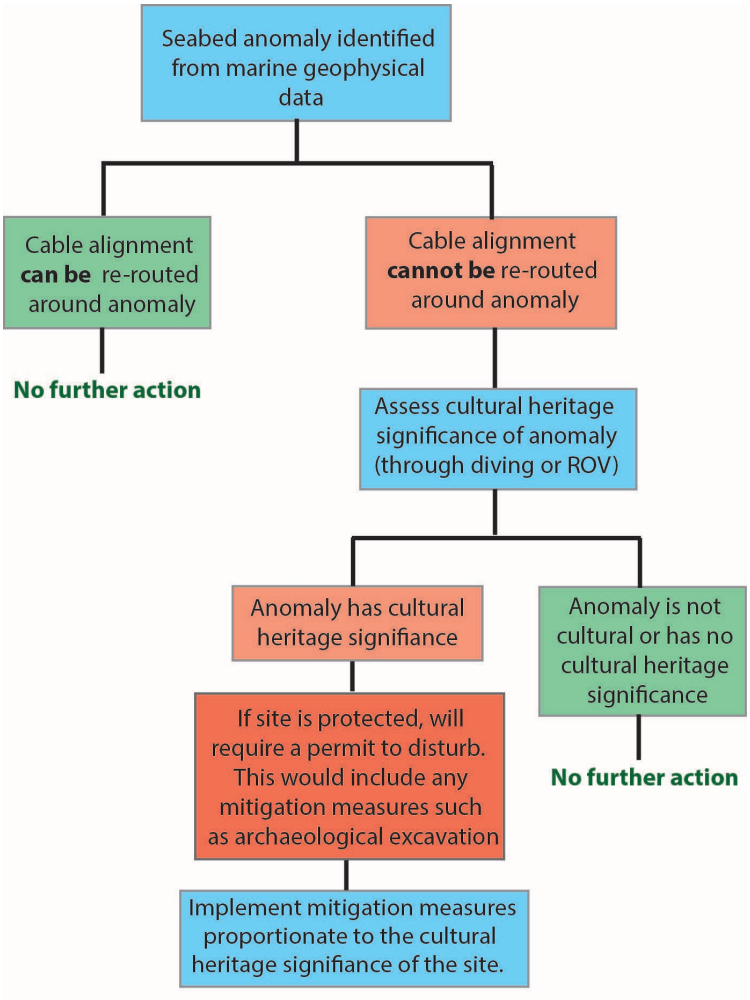
8 PRELIMINARY POTENTIAL IMPACTS AND MITIGATION

The process of laying a cable can physically impact underwater cultural remains, the scale of impact ranging from the dislocation of individual artefacts (minor impact) to the weakening of the structural and archaeological integrity of a wreck (major impact). The impact of a future wreck on the structural integrity of the cables should also be considered.

No impact assessment for maritime archaeological remains can be carried out at this stage of the project. This is because it is not known at present whether any of the potential maritime archaeological sites which have been identified in this study are located on the dual conceptual cables' routes. This can only be determined after the data collected from the marine geophysical survey has been reviewed by a qualified maritime archaeologist and potential cultural anomalies are identified. Such anomalies should be avoided, with sufficient buffer, without the requirement to determine their cultural heritage significance.

If the dual conceptual cable routes cannot avoid a potential cultural anomaly, then the anomaly should be inspected, whether by diving or ROV, so as to assess its cultural heritage significance. If the anomaly has cultural heritage significance, then mitigation measures proportional to its assessed level of significance and scale of impact should take place. This could range from non-disturbance archaeological recording to archaeological excavation. If the site is protected under State and/or Commonwealth heritage legislation (see Section 4), permits may be required to disturb the site. This would also include any mitigation measures that require disturbance such as archaeological excavation.

The above process for identifying and mitigating potential impacts to maritime archaeological heritage is expressed in the following flow diagram:



This desktop study has identified a number of areas that will require further assessment of the potential impact of the dual conceptual cable routes on maritime archaeological sites.

These areas are presented in Table 8. The requirement for further assessment is stated for each area as well as a range of mitigation options.

Table 8 Preliminary list of marine archaeological constraints

Area	Site type	Potential maritime archaeology	Required further assessment	Possible mitigation options
Bass Strait	Shipwreck	S.S *Kanowna*; A known but unlocated shipwreck in the deeper waters of Bass Strait. Potential for another two wrecks in the area.	1/ Qualified maritime archaeologist to review marine geophysical data. 2/ If anomalies present and impact unavoidable conduct ROV inspection to assess cultural heritage significance.	1/ Route re-alignment. 2/ If impact unavoidable conduct archaeological recording, ranging from non-disturbance to excavation depending on scale of impact and level of significance. Permit(s) may be required to disturb site, including mitigation.
Waratah Bay	Maritime infrastructure	Very low potential for remains of early piers, jetties, breakwaters, other structural remains, and associated artefacts.	1/ Qualified maritime archaeologist to review marine geophysical data. 2/ If anomalies present and impact unavoidable conduct diving inspection to assess cultural heritage significance.	1/ Route re-alignment. 2/ If impact unavoidable conduct archaeological recording, ranging from non-disturbance to excavation depending on scale of impact and level of significance. Permit(s) may be required to disturb site, including mitigation.
Waratah Bay	Shipwreck	Six shipwrecks within the Bay. Three ships are reported to have run ashore; one was reported to have been raised and sold as a hulk and two have unknown wrecking positions.	1/ Qualified maritime archaeologist to review marine geophysical data. 2/ If anomalies present and impact unavoidable conduct diving or ROV inspection to assess cultural heritage significance.	1/ Route re-alignment. 2/ If impact unavoidable conduct archaeological recording, ranging from non-disturbance to excavation depending on scale of impact and level of significance. Permit(s) may be required to disturb site, including mitigation.
Blythe River mouth	Shipwreck	Eight shipwrecks within the Blythe River mouth study area. Three ships are reported to have run ashore in Emu Bay, one was reported to have capsized and foundered near Sulphur Creek.	1/ Qualified maritime archaeologist to review marine geophysical data. 2/ If anomalies present and impact unavoidable conduct diving or ROV inspection to assess cultural heritage significance.	1/ Route re-alignment. 2/ If impact unavoidable conduct archaeological recording, ranging from non-disturbance to excavation depending on scale of impact and level of significance. Permit(s) may be required to disturb site, including mitigation.
Blythe River mouth	Maritime infrastructure	Two pipes running parallel on the seabed, identified by underwater video survey.	1/ Qualified maritime archaeologist to review marine geophysical data. 2/ If anomalies present and impact unavoidable conduct	1/ Route re-alignment. 2/ If impact unavoidable conduct archaeological recording, ranging from non-disturbance to excavation depending on scale of impact and level of

			diving or ROV inspection to assess cultural heritage significance.	significance. Permit(s) may be required to disturb site, including mitigation.

The potential impacts to submerged terrestrial sites is beyond the scope of this study. This is because cable laying projects invariably stay within recent Holocene marine sediments and do not impact pre-inundation (Pleistocene) landscapes where submerged terrestrial Aboriginal sites would be located. However, upon review of the marine geophysical data there may be areas – such as a reef, low mound or the exposed banks of a paleo-channel - where the cable routes pass which could be considered prospective for the presence and survival of submerged terrestrial sites. In this instance a predictive model will be prepared on the condition and type of submerged Aboriginal sites that maybe present followed by an impact assessment. Mitigation measures will be similar to those presented in this report which is to re-align the cable route(s) in the first instance and if this is not possible undertake archaeological recording which could range from non-disturbance survey to excavation.

9 CONCLUSION

This study makes the following conclusions:

- Nine maritime archaeological sites have been identified that could be possibly located within the project survey area. These are all shipwrecks.
- Of the nine identified shipwrecks, six are of wooden construction and less than 500 tons, one is of steel construction and 7,000 tons, and two are of an unknown construction. Of the six wooden shipwrecks, none were powered by an engine.
- Although the information available is thorough, the locational data available are, for the most part, estimates. It was therefore necessary to provide an estimate of position accuracy, in the form of metres, from the supplied coordinates.
- It must be considered that, along with the known maritime archaeological sites, there are many shipwrecks without known positions that may be located within the study area and surrounds off Victoria, Tasmania and in Commonwealth waters. If a shipwreck is identified, either through review of geophysical survey, visual inspection, or during works, it is a legal requirement to report the find to the relevant state department as soon as possible.
- There is a very low potential for maritime related infrastructure sites of cultural heritage significance at Blythe River mouth and Waratah Bay.
- The appearance and ability to identify known and potential maritime archaeological sites varies depending on the age of the site and seabed type, appearing either as a definitive long feature, a scatter of smaller features, or nothing at all. Based on known and potential sites, a review of the nearshore survey and the subsea cable routes survey data is needed by a qualified maritime archaeologist and will likely locate any remains associated with the identified shipwrecks, maritime infrastructure and dumps based on their construction and likely site formation processes.
- Based on the available information at this stage of the maritime archaeology desktop assessment, no revision of the cable routes is required.

Based on the findings of this assessment it is recommended that:

Recommendation 1

A suitably qualified maritime archaeologist to review side scan sonar and any other marine geophysical data to identify any seabed anomalies that are potentially cultural such as shipwrecks, maritime infrastructure or dump sites located within the project survey area prior to the route being confirmed.

Recommendation 2

Suitably sized buffers should be established on seabed anomalies of potential cultural heritage significance identified from the marine geophysical data and/or verified maritime archaeological sites. The size of the buffer is to be sufficient so as to ensure adequate protection of the anomaly/site.

A suitably qualified maritime archaeologist should be engaged to assess the required buffer zone for each seabed anomaly of potential cultural heritage significance and/or verified maritime archaeological site.

In situations where the establishment of a buffer around a seabed anomaly will pose difficulties for the routing of the cables, the anomaly should be investigated, under the supervision of a maritime archaeologist, with the purpose of establishing its cultural heritage significance. If the anomaly is found to be not cultural or culturally significant, the buffer will be removed.

Recommendation 3

A person who discovers a shipwreck in Commonwealth waters is legally obliged to notify the appropriate authorities as soon as practicable under the Underwater Cultural Heritage Act 2018. *The Department of Agriculture, Water and the Environment must be notified if any unknown or un-located shipwreck sites are identified in the remote sensing data. This can be done through an online form for the 'Notification of discovery of underwater cultural heritage', available through https://dmzapp17p.ris.environment.gov.au/shipwreck/public/forms/notification.do?mode=add*

If the wreck is discovered within State waters (within 3 nm of the coast) the relevant delegated State authority under the Underwater Cultural Heritage Act 2018 *is to be contacted:*

Heritage Victoria
Department of Planning and Community Development
GPO Box 2392
MELBOURNE VIC 3001
Tel: (03) 9938 6894
Email: heritage.victoria@delwp.vic.gov.au
Website: www.dtpli.vic.gov.au/heritage/shipwrecks-and-maritime

Historic Heritage
Parks and Wildlife Service
GPO Box 1751
HOBART TAS 7001
Tel: 1300 827 727
Email: mike.nash@parks.tas.gov.au
Website: www.parks.tas.gov.au/index.aspx?base=1729

Recommendation 4

All ammunition dump sites should be considered live and appropriate safety measures undertaken. The Department of Defence http://www.defence.gov.au/uxo/ should be contacted for further information.

10 FORWARD WORKS PROGRAM

The conceptual forward works program for this project includes the following:

1. Review by a qualified maritime archaeologist of the marine geophysical survey data acquired for this project. A list of geophysical anomalies of potential cultural heritage significance within the project survey area will be provided with recommendations to avoid the anomalies by re-routing the conceptual cable routes if necessary.
2. Those anomalies which cannot be avoided are to be assessed of their cultural heritage significance and legislative (heritage related) status. The assessment will require physical inspections either by diving or remote operated vehicle (ROV). The cultural heritage significance of a cultural site will be assessed against the criteria and guidelines used by the Victorian, Tasmanian and Commonwealth governments.

   Mitigation measures will be provided for maritime archaeological sites with confirmed locations whose impact cannot be avoided. Mitigation measures may range from no further action if the maritime archaeological site is of no or minimal significance to excavation if the site is highly significant. Mitigation measures will also include monitoring and notification protocols during the implementation phase of the project. Detailed information on the construction methods should be available at this stage.

   Heritage relevant approvals/permits may also be required should a protected maritime archaeological site be impacted, with the conceptual mitigation measures for that site usually being listed as part of the conditions for the approval.
3. Carry out the mitigation measures before, during and possibly after the implementation phase of the project.

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GLOSSARY

The following abbreviations are used throughout this report:

AHS	Australian Hydrographic Service
AHS SD	Australian Hydrographic Service Sea Dumping in Australia
AUCHD	Australian National Shipwreck Database
EEZ	Economic Exclusion Zone
GPS	Global Positioning System
HAT	Highest Astronomical Tide
Identified	Refers to archaeological sites known from historical records, such as a shipwreck event reported in a newspaper. A shipwreck identified in the historical record does not mean its location is known. This would require field investigation and verification of an anomaly derived from the interrogation of marine geophysical data obtained from survey(s) undertaken for this project.
.kmz	Keyhole Markup Language Zip (file type used in Google Earth)
km	Kilometres
nm	Nautical Miles
Potential	Archaeological potential refers to archaeological sites that are predicted on the basis of culturally activity, which is usually not documented in the historical record. For example at anchorage there will be usually be anchors, chain and archaeological deposits formed by objects being discarded.
ROV	Remote Operated Vehicle (often used for diving over 30 m depth)
RPL	Route Position List (the alignment of the subsea cable routes)
Tonnage	Calculation of the interior volume of a ship. These volumes are expressed as tons where one ton measurement is 100 cubic feet capacity.
TAS	Tasmania
TSB	Territorial Sea Baseline
UNK	Unknown
UCHA 2018	*Underwater Cultural Heritage Act 2018*
VDLC	Van Diemen's Land Company
VHD	Victorian Heritage Database
VHR	Victorian Heritage Register
VIC	Victoria
WWII	World War Two
WWI	World War One