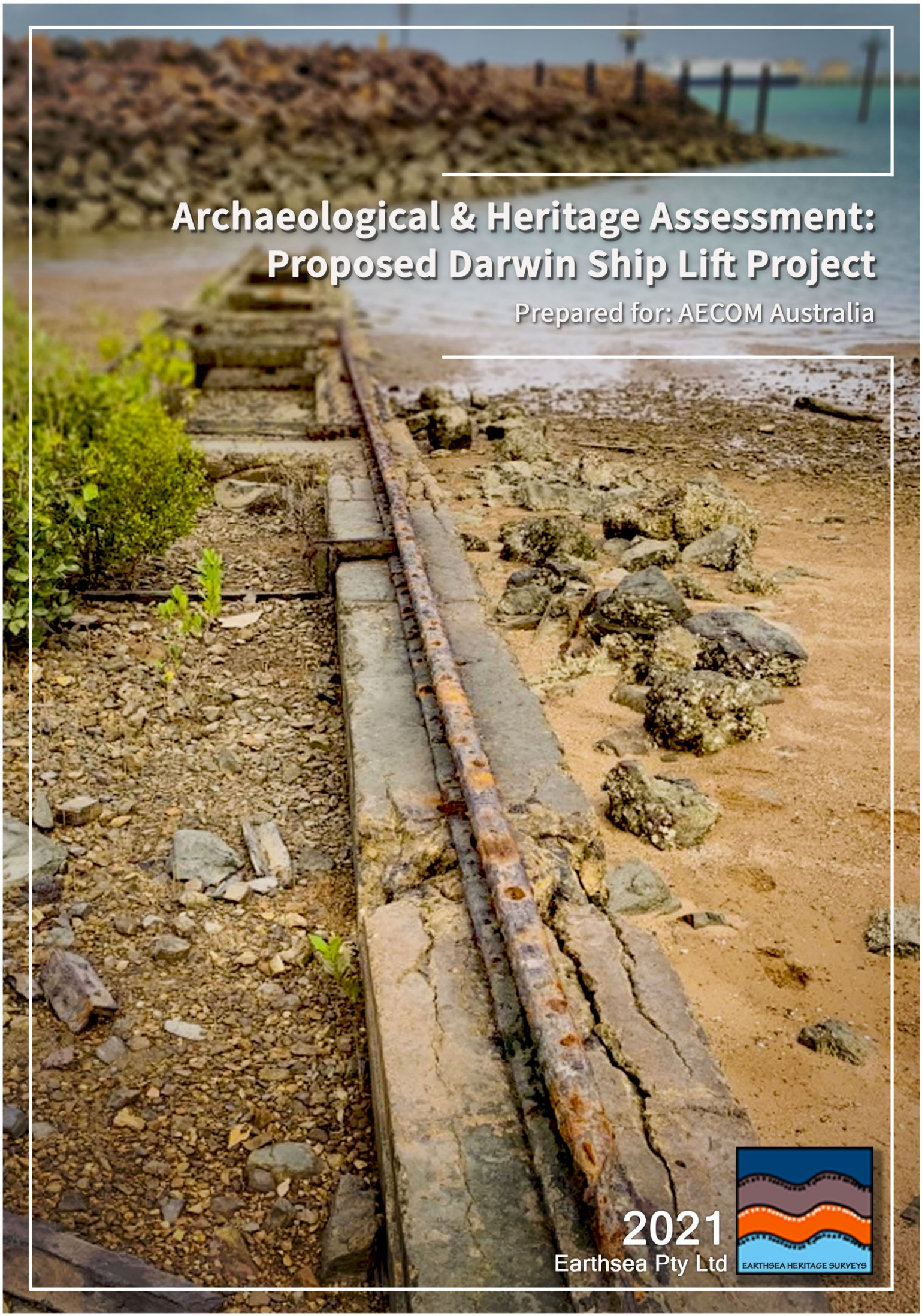
Appendix M
Cultural Heritage Assessment



Archaeological & Heritage Assessment: Proposed Darwin Ship Lift Project

Prepared for: AECOM Australia

2021

Earthsea Pty Ltd

EARTHSEA HERITAGE SURVEYS

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Archaeological and Heritage Assessment: Proposed Darwin Ship Lift, NT.

(FINAL REPORT)

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Cover Image: RAAF Catalina Flying Boat Base, Marine Section Slipway

Contents

Figures and Tables

1 Executive Summary

The Northern Territory Government (NTG) is developing northern Australia's largest ship lift facility on the East Arm estuary of Darwin Harbour. The Darwin Ship Lift Project (the Project) will cover approx. 27 hectares of land and intertidal zone on the southern shore of East Arm Peninsula approx. 660 metres eastward of the East Arm Port.

The Terms of Reference of the Environmental Impact Statement (EIS) issued by the NT Environmental Protection Authority (NT EPA) required a heritage assessment report providing baseline information regarding historic or Aboriginal cultural heritage values and significance that may be impacted upon by the Project, including register searches, provision of an Authority Certificate under the NT *Aboriginal Sacred Sites Act* 1989 and the current status of approvals, permits and clearances in relation to the protection of heritage places and items pursuant to the NT *Heritage Act* 2011.

The EIS Terms of Reference also require the identification of risks to heritage values during the construction and operation of the Project. Accordingly, this heritage report was required to develop procedures and management measures to mitigate impacts on sacred sites, significant heritage sites, proscribed Aboriginal archaeological sites and so far, unidentified items or sites of heritage significance discovered during the construction of the project.

Beyond the approx. 27 hectares the Project construction footprint, the proposed works may impact on areas outside of the immediate Project Area by altering tidal currents in the East Arm area to varying extent. For this reason, this heritage study focused on heritage places within the Project footprint, coupled with those that may be inadvertently impacted on by the construction and operation of the ship lift.

The heritage and archaeological assessment identified that part of the Project will overlay the remaining features of the WWII era RAAF Flying Boat Base. The remaining features of the WWII era 'Z Special Unit, Lugger Maintenance Section' lies approx. 50 metres to the east of the Project boundary. A single Aboriginal midden site known as 'East Arm 1' lies approx. 90 metres from the eastern boundary of the Project and will not be impacted upon by the construction or operation of the ship lift.

In additional, the study highlighted that two registered Sacred Sites, Catalina Island and Old Man Rock, lie within 1000 metres of the Project Area. These sites are highly significant to Larrakia people. The Authority Certificate for the Project construction states that no person working on the Project should enter either sacred site and no harm should come to either of the sites as a result of construction or operation of the ship lift (see Appendix A). This report finds that there is a low risk of impacts on Catalina Island due to changes in tidal flows around the island and almost no risk of impacts on Old Man Rock[1].

The Project construction phase will cover the remaining RAAF East Arm Flying Boat Base (FBB, also known as the Catalina Flying Boat Base) sites with fill and concrete. These sites are not currently on the NT Heritage Register and are not protected by the provisions of the NT *Heritage Act* 2011. There is no reasonable mitigation strategy for the FBB sites. The recommendations propose interpretative signage close to the Project to indicate that the area was once the location of the RAAF East Arm Flying

[1] This report draws on the MetOcean Solutions hydrological study completed in January 2021 for this assessment.

Boat Base and its significance as a base for Allied operations in the South West Pacific Area during WWII.

This study also reports on the former Harbour Defence Motor Launch (HDML) 1321 which is at present on a hard stand within the Project footprint. The report notes that HDML1321 is owned privately and cannot be housed within the Project footprint during construction or operation of the Project.

The report makes recommendations on mitigation strategies for Catalina 2, a WWII RAAF flying boat wreck approx. 230 metres south of the planned dredge and revetment construction area of the Project. The report also summarises previous archaeological and heritage studies in the East Arm area, including the maritime studies completed by Cosmos Archaeology in 2015 and 2017. The Cosmos maritime report included a survey for metallic objects in the Project area, including UXO. The UXO recovered by this survey include approx. 1000 0.50 calibre machine gun rounds dated 1942.

2 Introduction

The Northern Territory Government (NTG) are developing northern Australia's largest ship lift facility on the East Arm Peninsula within Darwin Harbour. The Darwin Ship Lift Project (the Project) will enable the maintenance and servicing of Defence, Border Force, commercial and private vessels. In addition, the ship lift will be able to service and maintain vessels from the developing offshore oil and gas industries.

The Project plans to be operational by 2025. The Project will include the construction of waterside and landside infrastructure within a 27-hectare project area including:

- ship lift of approximately 26 metres (m) width and 103 m length, capable of lifting vessels weighing up to 5,500 tonnes (t) including associated platform, blocking trestles and vessel transfer system
- self-propelled modular transporter (SPMT) vessel transfer system
- approximately 13 hectares (ha) of hardstand area for ship repair and maintenance
- vessel wash area with separate contained drainage and treatment system
- stormwater system to capture and treat runoff water before discharge
- enclosed blast and paint facility with separate contained drainage system
- site services and utilities
- security infrastructure
- ancillary facilities including:
    - administration building
    - ship lift control room
    - SPMT garage.
- access channel and dredged manoeuvring areas
- six wet berths
- heavy lift platforms suitable for a 100 t crane at each berth
- revetments and quay structures.

Multiple marine service providers will be able to operate concurrently at the ship lift, providing vessel operators with a variety of maintenance services within a secure area. The proposed Project will be a key component of the infrastructure providing services to the Northern Territory maritime sector, enabling long term growth of the region's industrial potential.

2.1 Scope of the Study

The Terms of Reference for the Project Environmental Impact Statement (Section 2.2.4 p12) outlines the following minimum requirements for cultural and historic heritage reporting for the Project[2]:

[2] Note that definition includes the Project footprint and areas that may be impacted upon by the construction and operation of the Project. .

1. Identify all places and items with historic and/or Indigenous cultural heritage values within or adjacent to the footprint.
2. Identify all places and items with historic and/or Indigenous cultural heritage values that are currently listed and protected under heritage legislation (note some items and places may have heritage values but are not currently protected under legislation).

Section 2.2.4 of the Terms of Reference notes baseline information to be included in the heritage study includes:

1. Register searches on the Commonwealth Heritage Database, the Commonwealth Heritage Register and the National Heritage Register.
2. Register searches on the NT Heritage Register and the NT Archaeological Database held by Heritage Branch, NT Department of Tourism Sport and Culture.
3. A description and location of Aboriginal and non-Aboriginal sites places or objects of natural, historic and cultural heritage significance, current utilisation and spiritual significance. This includes using published archaeological and anthropological sources, registers, consultations and other research. A half day site visit was planned for early December 2019 to survey the small mangrove section for Aboriginal archaeological sites or artefacts and rerecord the remaining features of the Catalina Flying Boat Base (FBB).
4. Provision of a current Authority Certificate for the project area issued by the Aboriginal Areas Protection Authority of the Northern Territory.

The research undertaken to complete the above requirements included:

1. A half day site visit to re-record the remaining features of the Flying Boat Base and survey the mangrove section for Aboriginal archaeological sites and objects (See Section 5.3 and 6.1).
2. Online searches on Commonwealth and NT Heritage Registers including the Commonwealth Heritage Database, the Commonwealth Underwater Cultural Heritage Database, the NT Heritage Register and the NT Archaeological Database (See Section 3.3).
3. Research in the NT Heritage Branch library and the NT Library for historical documentation on the Flying Boat Base, the Catalina wreck sites and the neighbouring Lugger Maintenance Section of the Z Special Unit.
4. Searches on the Australian War Memorial databases, the Australian National Library databases and the NT image library.

2.2 Project Location and Land Tenure

The Project site covers one marine and three land parcels including freehold, leasehold and perpetual lease land. The remaining over-water land component of the project is unalienated Crown land that is shown as part administrative section 7398, Hundred of Bagot (excluding the access channel).

A summary and map of the current land tenure of the Project Area is provided in Table 1 and Figure 2 below.

Table 1: Land Tenure

Parcel	Location Name	Parcel Area (ha)	Tenure Type	Owner
5420	Hundred of Bagot	1.72	Freehold	Paspaley Pearls Properties Pty Ltd
5163	Hundred of Bagot	2.65	Crown Lease Term	Paspaley Pearls Properties Pty Ltd
6370	Hundred of Bagot	0.562	Crown Lease Term	Paspaley Pearls Properties Pty Ltd
5167	Hundred of Bagot	5.76	Crown Lease in Perpetuity	Paspaley Pearls Properties Pty Ltd

Figure 1 Project Location, East Arm, Port Darwin, NT.

2.3 Native Title

There are currently no registered Native Title Determination Applications or Native Title Determinations within the Project Area.

Notwithstanding this, the authors understand the Project Area falls within the traditional lands of the Larrakia People and remains an important part of their cultural and spiritual landscape.

2.4 The Authors

Project Archaeologist: Richard Woolfe

Richard holds a Bachelor of Archaeology from the University of New England, a Grad Dip in GIS and Geomatics from Charles Darwin University and a Masters in Heritage Management and GIS from the University of New England. Richard has 18 years' experience in cultural heritage management consultancy in the Northern Territory and Queensland. Richard also has extensive experience in community consultation with Aboriginal groups and the wider community. Richard conducted the 2002-2003 review of the NT *Heritage Conservation Act 1991* and co-drafted the original instructions for the NT *Heritage Act 2011*.

Project Archaeologist: Ben Keys

Ben holds a Bachelor of Archaeology with Honours from Flinders University, South Australia. He has extensive experience in cultural heritage management and community consultation, coupled with the management of largescale mining projects in the Northern Territory. Ben also has a professional background in land access management and aspects of environmental management, including mining compliance. He has been an author of several published academic archaeological journal articles and has been invited to speak at several mining industry conferences in the Northern Territory.

3 Legislative Context

3.1 The legislative and social basis for Cultural Heritage Protection

The significance of places and materials associated with the cultural record varies substantially, depending upon one or a combination of its aesthetic, historic, scientific, social or spiritual values for past, present or future generations (Australia ICOMOS Burra Charter, 2013). Through time, these values can change or be impacted upon by both natural mechanisms and human intervention. To ensure impacts to the potential cultural heritage values of a place or object are understood, protected or managed accordingly, a range of legislation has been enacted since the 1970s.

This legislation has occurred at the state, territory, and national level. This is the result of the evolution of the Australian constitutional framework, particularly the inclusion of new themes, such as Aboriginality, heritage and the environment into an existing regulatory framework. The result of this developmental change is that the Commonwealth retains responsibility for Indigenous issues, while the States and Territories retain control of land use and development approvals. Therefore, both Commonwealth and the Northern Territory Acts may apply in particular circumstances within the Northern Territory.

The following Sections are provided so that there is a robust understanding of the legislative framework which may pertain to the Project Area.

3.1.1 Commonwealth Acts

***Aboriginal Land Rights (Northern Territory) Act 1976* (ALRA).** This Act changed Aboriginal reserves within the Northern Territory to freehold title held in trust. The Act mandated the formation of Land Councils to act in the interests of Northern Territory Aboriginal people in the areas of land, access to lands, employment and the development of businesses. The Act also defined Sacred Sites as 'sites that are sacred, or otherwise significant, in the Aboriginal Tradition'. The Act protected these sites from damage, whether accidental or intentional. The NT *Aboriginal Sacred Sites Act 1989* uses this definition of sacred in its purpose of protecting these sites outside of Land Trust lands. On Pastoral Lease Lands, the general procedure is for the AAPA to conduct the Sacred Site surveys with the relevant Site Custodians, then issue an Authority Certificate under the Act (see Section 3.1.2 below). The registered Sacred Sites adjacent to the Project Area are defined by the terms of the ALRA.

Native Title Act 1993 (NTA). Native Title is "the communal, group or individual rights and interests of Aboriginal people and Torres Strait Islander people in relation to land and waters, possessed under traditional law and custom, by which those people have a connection with an area which is recognised under Australian law (Section 223 NTA) (National Native Title Tribunal 2016)". The NTA establishes the processes to determine where native title exists, how future acts impacting upon native title land may be undertaken, and to provide compensation where future acts extinguish or are inconsistent with the existence or exercise of native title (DCP 2016). The Act gives Indigenous Australians who hold native title rights and interests (including native title claims) the right to access and use traditional lands, be consulted and, in some cases, to participate in decisions about activities proposed to be undertaken on the land. A search of the Native Title Register indicated that there are no Native Title claims or determinations in the Project Area.

***Aboriginal and Torres Strait Islander Heritage Protection Act 1984*.** This Act is a site protection Act of 'last resort', meaning that the Act is meant to provide emergency protection for Aboriginal and Torres

Strait Islander heritage sites when all other avenues have been exhausted. Generally, an Aboriginal person or group of persons, must apply to the Minister to have protective covenants placed over an area or site (DEE 2016). The power to provide such protection resides in Section 51 of the Constitution giving the Commonwealth powers on Aboriginal issues. Therefore, this Act may override all State and Territory cultural heritage acts. To the knowledge of the Consultant, there are no active applications over the Project Area arising from this Act.

The *Environment Protection and Biodiversity Conservation Act* (EPBC Act) commenced on 16 July 2000. The EPBC provides for a National Heritage List of natural, historic and Indigenous places that are of outstanding significance to the nation. The EPBC also provides for a Commonwealth List that includes natural, historic and Indigenous places of significance that are owned or controlled by the Commonwealth. Ownership or control of these places allows the Commonwealth to protect or manage these places according to the significance of the place. The Commonwealth Department of Environment and Energy administers the EPBC, including administration of the heritage lists and providing support to the Australian Heritage Council established under the Australian Heritage Council Act 2003. The Department maintains the Australian Heritage Database which includes places on both Commonwealth lists, all places on state registers and other places included in the former Register of the National Estate established in the 1970s.

The ***Underwater Cultural Heritage Act* 2018** replaced the *Historic Shipwrecks Act* 1976 on 1 July 2019. The new Act continues to protect shipwrecks in Commonwealth waters. In addition, the new Act automatically broadens protection to include all aircraft that were sunk in Commonwealth waters more than 75 years ago (i.e. older than Dec 1945). The *Underwater Heritage Act*:

1. recognises that human remains found within shipwrecks or sunken aircraft must be treated with respect and not as artefacts.
2. enables protection of Australia's underwater cultural heritage in waters outside of Australia from actions by Australians.
3. broadens protection to sunken aircraft and other underwater cultural heritage sites.
4. elevates the role of the public by recognising their role in promoting awareness, understanding, appreciation and appropriate use of Australia's underwater cultural heritage.
5. modernises and strengthens the range of compliance and investigation powers, while adopting a graduated approach to enforcement.
6. continues the successful delegated framework for day-to-day management in collaboration with the Australian States and Northern Territory[3].

Commonwealth waters extend from the three nautical mile 'line' to the 200 nautical mile line. State or Territory waters include all estuaries to an imaginary line drawn across river and harbour entrances out to the three nautical mile line. Thus, the Commonwealth has no jurisdiction over Darwin Harbour waters. However, the Commonwealth, States and the Northern Territory signed the Australian Underwater Cultural Heritage Intergovernmental Agreement in 2010. This agreement outlines coordinating roles and responsibilities between the Parties, including allowing the Commonwealth cross jurisdictional coordination and secretarial roles in protecting underwater cultural heritage. As a result of this the Commonwealth has created an underwater cultural heritage database for all jurisdictions, presented in the register searches below. The NT still has jurisdiction over Darwin

[3] See https://www.environment.gov.au/heritage/underwater-heritage/underwater-cultural-heritage-act assessed 17 December 2020.

Harbour waters and has chosen not to protect some underwater cultural heritage which may be seen by some as outside the spirit of the 2010 agreement (see NT Heritage Register extract and mapping below).

3.1.2 Northern Territory Acts

***Aboriginal Sacred Sites Act 1989*.** The NT *Aboriginal Sacred Sites Act 1989* protects sites that are 'sacred and otherwise of significance in the Aboriginal Tradition'. Sacred Sites are protected whether the location of the site is known or not by any person or company seeking to do work on lands. The Act is administered by the Aboriginal Areas Protection Authority. The Authority can issue a Certificate indemnifying any proponent for an area upon application and payment of a fee. The Certificate will contain conditions limiting or preventing works in and around registered and recorded Sacred Sites. The Authority Certificate will contain maps outlining any restricted work areas within the area of application. There are two registered Sacred Sites within the meaning of this Act adjacent to the Project Area.

***Heritage Act 2011*.** The NT *Heritage Act* came into effect on 1 October 2012. The Act provides protection for the same classes of places as the previous NT *Heritage Conservation Act 1991*, with some changes. As under the previous Act, members of the community can nominate areas, places, sites, buildings, shipwrecks and heritage objects to the register. If the Minister agrees that these features are of special significance to the heritage of the NT, the place is added to the register and receives statutory protection. The Act allows for processes to approve works and maintenance for a heritage place.

As under the previous Act, the *Heritage Act* provides a 'blanket' or 'presumptive' protection for Aboriginal and Macassan archaeological places and objects until a decision by the Minister to either permanently protect these places or permit their disturbance or destruction. This decision-making process is triggered by an application to disturb these places. There are penalties for accidental or deliberate destruction of these sites.

The Policy developed from the *Heritage Act* includes the following in relation to Aboriginal archaeological places and objects[4]:

1. Aboriginal explanations about the meaning and significance of these places must be acknowledged.
2. Aboriginal people have the right to be involved in decision making concerning these places.
3. Traditional Owners (and Site Custodians) must be:
    a. Told of the intent to carry out archaeological survey work or research.
    b. Involved in the field work if possible.
    c. Consulted about the progress and told of the findings and recommendations.
    d. Acknowledged for their contribution.

The NT Heritage Act has jurisdiction within and adjacent to the Project Area (see Section 2.3.1 below for details).

[4] https://nt.gov.au/leisure/arts-culture-heritage/indigenous-heritage-information. Accessed 1 December 2017.

3.2 Regulatory Organisations

Aboriginal Areas Protection Authority (AAPA). The AAPA is an independent statutory authority established under the *Northern Territory Aboriginal Sacred Sites Act 1989*. The Authority is responsible for the protection of Aboriginal sacred sites on land and sea across the Northern Territory. The AAPA seeks to implement a practical balance between sacred site protection and economic development.

Heritage Branch, NT Department of Tourism, Sport and Culture is the regulatory authority responsible for administering most sections of the NT *Heritage Act 2011*. Heritage Branch is responsible for administering the NT Heritage Register, the NT Archaeological Database and providing logistical support for the NT Heritage Council.

3.3 Register Searches

3.3.1 Northern Territory Heritage Register

Table 2 below present the results of the NT Heritage Register search for places located within, or adjacent to the Project Area.

Table 2: Extract from Northern Territory Heritage Register, accessed online 3 September 2015.

Site Name	Description	Relationship to Proposed Project	Status	Gazettal Date	Decision - not to declare - Date
WWII Catalina Flying Boat A24_1 (Catalina 1)	First Catalina Flying Boat to be delivered to the RAAF and third aircraft ever to fly across the Pacific. Sank 30 August 1945 enroute to Singapore.	Approx. 4250 metres southeast	Declared	2 December 2015	
WWII Catalina Flying Boat A24 69 (Catalina 2)	WWII Catalina Flying Boat serving with the RAAF. Sank in Darwin Harbour 14 December 1945 while serving in repatriation and supply duties into S.E. Asia.	Approx. 200 metres south. May be near the dredged channel	Not Declared		30 November 2015
WWII Catalina Flying Boat A24 206 (Catalina 3)	Late war Catalina serving in mine laying in S.W. Pacific theatre. Destroyed June 1945 due to mine explosion while rearming.	Approx. 990 metres southeast	Not Declared		30 November 2015
WWII Catalina Flying Boat #41 US Navy Patwing 10 (Catalina 4)	One of three Catalinas sunk at mooring on 19 February 1942 by Japanese air raid. Part of USN Patrol Wing 10.	Approx. 1800 metres south	Declared	1 April 2015	
WWII Catalina Flying Boat #4 or #8 US Navy Patwing 10 (Catalina 5)	One of three Catalinas sunk at mooring on 19 February 1942 by Japanese air raid. Part of USN Patrol Wing 10.	Approx. 1900 metres south	Declared	1 April 2015	
WWII Catalina Flying Boat #4 or #8 US Navy Patwing 10 (Catalina 6)	One of three Catalinas sunk at mooring on 19 February 1942 by Japanese air raid. Part of USN Patrol Wing 10.	Approx. 1950 metres south	Declared	1 April 2015	
WWII Quarantine Anti-Aircraft Battery Site	WWII Anti-Aircraft Battery protecting the eastern approaches to Port Darwin	Approx. 1600 metres northeast	Declared	30 August 1996	

Site Name	Description	Relationship to Proposed Project	Status	Gazettal Date	Decision - not to declare - Date
WWII Catalina Flying Boat Base (FBB), East Arm	Catalina FBB located to the west of the Project Area. The remaining features of this base include the Catalina Ramp, RAAF Marine Section Slipway and a concrete mooring block	Within Project Area	Not Declared		5 August 2014
WWII Lugger Maintenance Section (LMS)	The LMS was a cover name for a base housing part of the Z Special Unit, black operations commando unit operating in SE Asia during WWII. This force was, in part, the forerunner of the modern Australian Special Forces.	Approx. 200 metres to east.	Not Declared		7 April 2015

3.3.2 Northern Territory Archaeological Database

A search of the NT Government Archaeological Site Database (administered by Heritage Branch, NTG) indicates that there are a number of previously recorded Aboriginal archaeological sites located within one kilometre of the Project Area on East Arm Peninsula. As presented in Table 3 below, these sites include Aboriginal shell middens, stone artefact scatters and isolated stone artefacts. WWII sites, such as the FBB and LMS features are not included on this table.

Table 3: Northern Territory Government Archaeological Site Database, sites within 1000 metres of the Project footprint.

Site ID	Site Name	Site Type	Contents	Ethnic Origin	Easting	Northing	Status
50730020	East Arm 1	Shell midden	Midden, mound	Aboriginal	706612	8618784	Damaged by erosion.
50730065	East Arm 2 (Catalina Island)	Shell midden, isolated stone artefact	Midden, stone artefact	Aboriginal	707212	8618684	Sacred Site, status of archaeological site not known
50730066	East Arm 3	Shell midden	Midden	Aboriginal	705912	8619484	Likely destroyed, limited access due to Port Security
50730131	EA1[5]	Shell scatter	Midden	Aboriginal	707369	8619722	
50730144	Indigenous Site 1	Shell midden, stone artefact scatter	Shell, stone artefacts	Aboriginal	706101	8619839	Unknown, limited access to site due to Port Security

[5] Site EA1 is not the same as Site East Arm 1. In the NT Archaeological Database, site names are created by the archaeologist or researcher who located the site rather than by the NT Heritage Branch staff.

Figure 2: NT Archaeological Database Sites within 1000 metres of the Project Area

3.3.3 Sacred Sites in and near the Project Area

Authority Certificate C2019/004 dated 18 January 2019 notes conditions for the following Sacred Sites:

1. Catalina Island, Registered Sacred Site 5072-66.
2. 'Old Man Rock' known as 'a rock in the harbour in East Arm' in the current certificate, Registered Sacred Site 5073-90.

Certificate C2019/004 is included here as Appendix A. The proponent and all contractors should be aware of the conditions of this certificate, including the attached map.

3.3.4 Australian Heritage Database

There are no places listed on the Australia Heritage Database within the Project Area or for East Arm Peninsula and Quarantine Island.

3.3.5 Commonwealth Underwater Cultural Heritage Register

There are a number of registered ship and aircraft wrecks listed on the Commonwealth Underwater Cultural Heritage Register for the Darwin Harbour region. These entries are almost identical to the NT Heritage Register entries and are included for information. As noted in Section 3.1.1 the Commonwealth does not have jurisdiction in Darwin Harbour waters, however for completeness Table 4, Table 5 and Figure 6 below list the entries on the register within 4 km of the Project Area. Note that the condition and status of each wreck not verified by the Consultants.

Table 4: Commonwealth Underwater Cultural Heritage Register Shipwrecks within 4km of Project Area.

Site ID	Vessel Name	Vessel Type	Year Wrecked	Easting	Northing	Notes
3408	Con Dao 3	Unknown	1978	705074	8618753	Scuttled by Vietnamese crew
3427	East Arm Barge 1	Barge	Unknown	707254	8619512	
3428	East Arm Barge 2	Barge	Unknown	707253	8619401	Possible ex RAAF bomb scow
3429	East Arm Vietnamese Boat 1	Unknown	Unknown	708969	8616180	Vietnamese refugee boat
3430	East Arm Vietnamese Boat 2	Unknown	1976	707036	8619513	Vietnamese refugee Boat
3435	Unidentified Wreck	Unknown		712644	8613276	Elizabeth River
3477	Kelat	Iron hulled sailing ship	1942	704087	8617543	Used as coal hulk in Darwin Harbour from February 1942. Sunk as a result of Japanese Air Raid 19 Feb 1942.

Table 5: Commonwealth Underwater Heritage Register for Aircraft within 4km of the Project Area.

Site ID	Aircraft Name	Alternate Names	Aircraft Type	Year Lost	Easting	Northing	Notes
8074	Consolidated PBY5 Catalina A24-1	Catalina 1	PBY5	1945	709615	8615290	Catalina 1. Lost 30/8/1945. Take off crash ex Darwin for Singapore POW repatriation.
8075	Catalina A24_69 Catalina 2	Catalina 2	PBY5A	1945	706137	8647882	Catalina A24_69 caught fire at mooring
8071	Catalina 3	Catalina 3	PB2B	1945	707459	8617851	Sunk at mooring after accidental depth charge explosion during re-arming
8072	Catalina 4	Catalina 4	PBY5 28-5MNE	1942	706142	8616090	Catalina USN #41
8073	Catalina 5	Catalina 5	PBY4	1942	706795	8616196	Catalina USN #4/8. Sunk at anchor by strafing Japanese aircraft
8099	Catalina 6	Catalina 6	PBY4	1942	704842	8616763	Catalina USN #4/9
8427	Supermarine Spitfire A58-56	Spitfire A58-56	Spitfire Vc[6]	1943	707773	8616078	Lost 5/9/43 while on test flight. Engine developed glycol leak and caught fire
8400	Supermarine Spitfire A58_9	Spitfire A58_9	Spitfire Vc	1943	704633	8617871	15/3/1943. Pilot shot down and killed over Darwin Harbour by Japanese Zero fighter.

[6] Spitfire Vc (Mark 5, variant C) was the tropical version of the Spitfire.

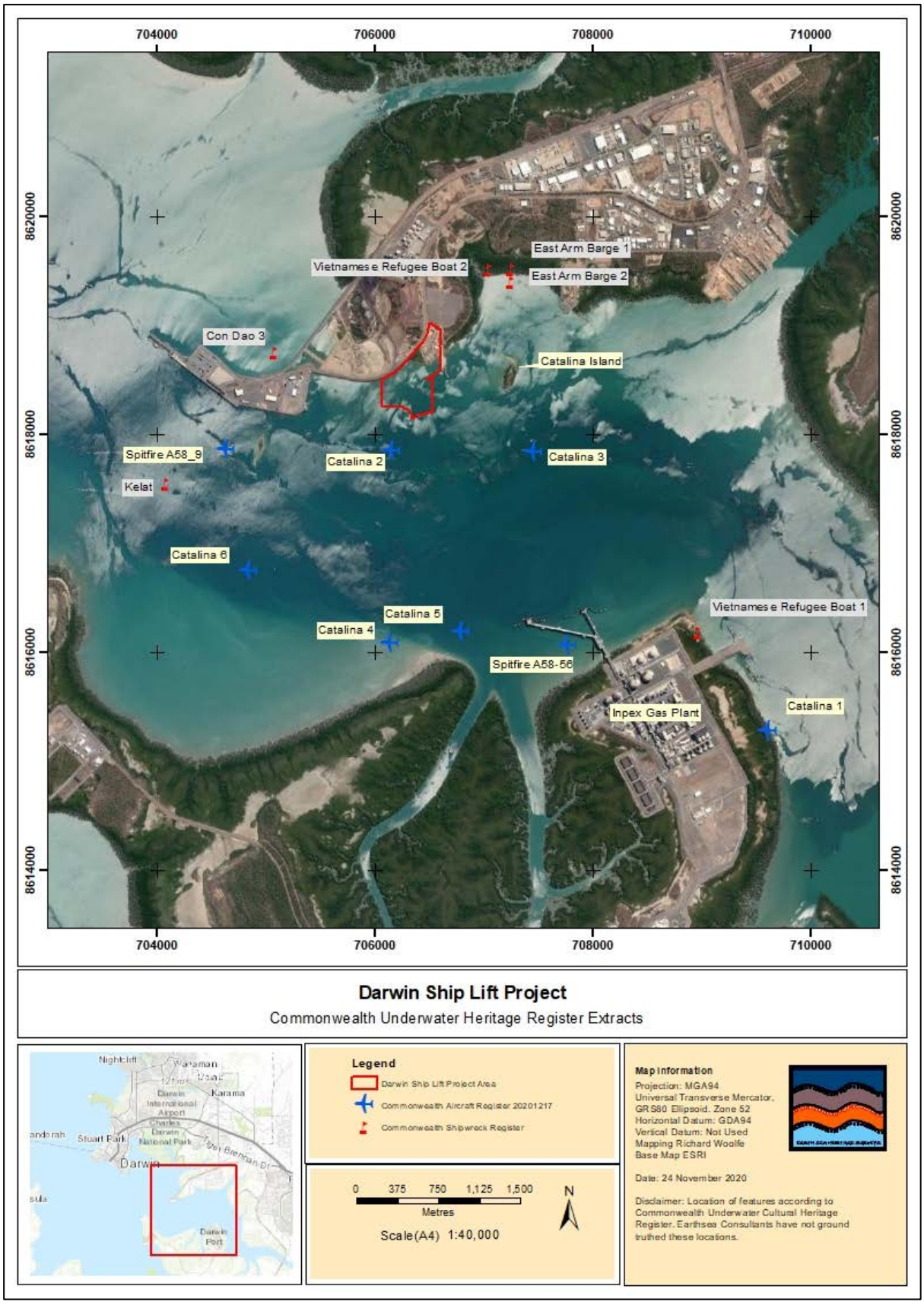

Figure 3: Locations of items on Commonwealth Underwater Heritage Register.

4 Physical and Environmental Setting

4.1 Physical Environment Overview

The Project Area is located along the northern margin of East Arm approx. 700m east of the existing Darwin Port Facility. As presented in Figure 3 below, the site was originally an island within Darwin Harbour, named Quarantine Island due to the location of a quarantine station. The quarantine station became the accommodation for the East Arm Catalina FBB and the LMS for the Z Special Unit (see Background History Section 4.2 below). Quarantine Island no longer exists as an island as the mangrove area separating it from the mainland was filled during the early 1990s (Jung 2000:106). Prior to the connection to the mainland, Quarantine Island was an isolated place with access to Darwin Harbour and low topography suitable for building.

Quarantine Island, now known as 'East Arm', originally comprised areas of high ground with tropical woodland vegetation surrounded by intertidal mangrove forests which are partially or completely inundated by water at high tide. Swampy conditions developed in low lying areas between the high ground during the wet season.

The study area is surrounded by an extensive zone of tidal flats. The tidal flats are gently inclined surfaces underlain by sand in low tidal areas and mud in mid-high tidal levels. Mangroves typically occupy the mid-high tidal mud flats and form a peripheral belt. Within the high tidal mud flats, areas of salt flats and samphire flats have developed as a result of hypersaline groundwater conditions precluding mangrove establishment.

The general hinterland landforms around Darwin Harbour comprise of dissected upland terrain, low strike-ridges and hills (approximately 15-40 m high mostly along the southern coastline, formed on shales, siltstones and sandstones of the Proterozoic Burrell Creek Formation) and intervening alluvial flats (Wood et al. 1985, Pietsch 1986, Burns 1997:1). Sediments of Cainozoic age cover most of the region and consist of Tertiary and Quaternary soils and laterite exposures. Quaternary sands, silty clay, laterites or ferruginous clayey sand are associated with drainage lines and low-lying country (Pietsch 1986).

Around the peninsula coastline a wide fringe of low closed mangrove forests merges into extensive tidal mudflats formed from marine alluvium and mud, clay and silt (Brocklehurst and Edmeades 1996). Sandy shelly chenier ridges and small areas of salt flats also occur (Pietsch 1986).

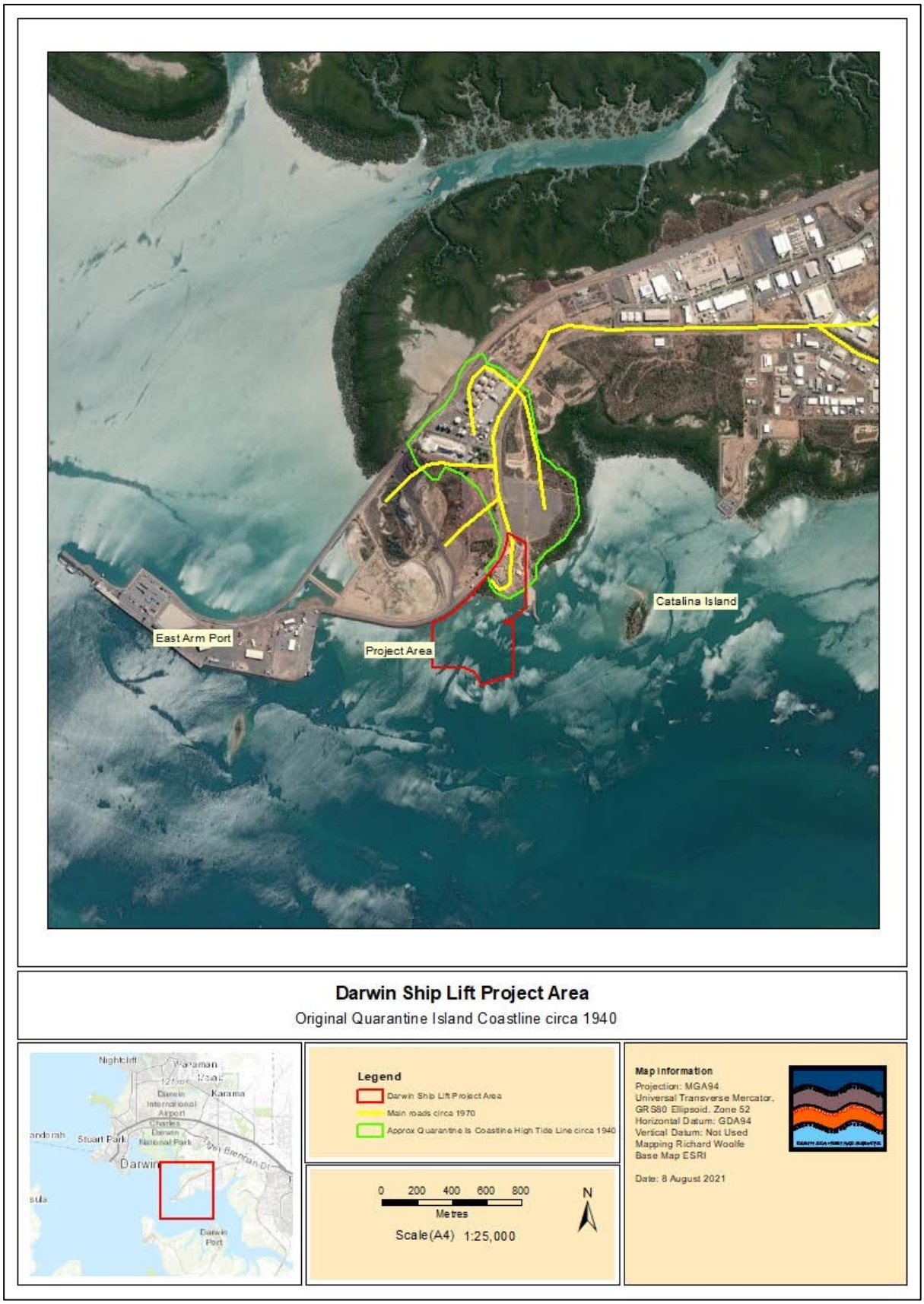

Figure 4: Original Coastline of Quarantine Island circa 1940. Coastline drawn from RAAF aerial images taken 1940

5 Cultural, Archaeological and Heritage Background

5.1 Cultural Background

Source: Leaanna Rahmah, former Research Anthropologist for Earthsea Pty Ltd. Edited reprint from Earthsea 2011, Archaeological Survey of the East Arm Wharf Expansion Darwin, NT. Report for URS Corporation, author Daryl Wesley. This section is included to provide background to the Larrakia ownership and use of the Darwin Harbour area and East Arm. Traditional uses of the land are evident in the high density of archaeological sites on Quarantine Island and on Middle Arm.

According to ethno-historical sources, East Arm Peninsula falls within the traditional country of the Larrakia (e.g., Foelsche 1882; Tindale 1974). Parkhouse, the paymaster of South Australian railways at Port Darwin for some years, wrote "The territory of the Larrakia, in which Port Darwin is situated, embraces the seaboard from Shoal Bay to Southport, and extends inland to the forty-sixth mile on the railway line" (Parkhouse 1895:638). He noted that the Larrakia were closely allied and intermarried with the Wulna people occupying the territory to the east and west of Adelaide River.

In the early days of European settlement ethno-historical documents describe the Larrakia as heavily dependent on fish, crabs and shellfish (Basedow 1907; Foelsche 1882). Fish and crabs were procured from reef pools or from constructed fish stone or wood traps using the tides, or from rivers, creeks and waterholes by spearing, netting or using certain poisonous barks or leaves to stupefy the fish (Basedow 1907:23; 1925; Foelsche 1882). Dugout canoes were used for fishing and hunting of dugong and turtles (Basedow 1907:22-25, 1925:131,162-4), and bark and dugout canoes used to transport items such as turtles and shellfish (King 1969:89).

The ethnographic and historical accounts reveal a rich material culture and ceremonial life practiced by the Larrakia and neighbouring groups (Basedow 1907; 1925:248-382; Foelsche 1882:4-7; 1886:255; Parkhouse 1895). A variety of ceremonies were held to celebrate gatherings and battles with neighbouring groups, initiation of the young and funerals (Foelsche 1882:4-7; Spencer 1912:19). The anthropologist Ronald Berndt (1951:234) describes the cyclical seasonal ritual and ceremonies such as the Kunapipi which were performed by NT groups including the Larrakia, in order to ensure continuation of the human species and a constant supply of food. Large quantities of food were required to feed people gathered for ceremonies. Major camping places were usually found where there were permanent sources of fresh water. Kangaroos and wallabies could be ambushed along well-used paths to waterholes, and ducks, geese and other birds, along with swamp plants such as waterlilies, could be obtained (Basedow 1907:19-27; Foelsche 1882:12-14).

Material culture obtained from Aboriginal locals at Port Darwin in the early years of the European settlement demonstrates extensive use of natural resources. Much of the material culture consisted of perishable items, such as body ornaments made of reed beads, feathers, bark or fur, bamboo and reed spears, nets and bags and wood implements (Basedow 1907:31-39; Foelsche 1882; Kerr 1971:111). The most visible remains of subsistence and settlement activities in the region likely to be preserved in the archaeological record are mounds of shell. Preserved within these deposits are likely to be the skeletal remains of other animals that were exploited such as fish, crab, kangaroo, wallaby, snake and bird.

Other items of material culture likely to be preserved in the archaeological record include stone spear heads, stone axes, stone pestles (pounding stones) and grinding stones (mortars), hearths made from stone or lumps of termite nests, and stone or shell tools used for cutting or scraping (Foelsche 1882; Basedow 1907). Reports describe Aboriginal people along the NT coast, including Larrakia, using heated stones and termite nest material in ovens in the ground to cook kangaroo and some plant foods such as yams, cycad palm nuts, wild rice and water lilies (seeds), which were gathered in the late dry from freshwater swamps and processed by grinding with mortars and pestles and cooked in earth ovens (Basedow 1907:27; Foelsche 1882:12-14).

Also likely to survive are pieces of ochre, used to decorate implements, weapons or message sticks (Basedow 1907:36, 46), or mixed with emu fat to paint youths for initiation ceremonies, warriors preparing for ceremonial battles, and also the bodies of the dead (Basedow 1925:184, 208, 249-250; Foelsche 1882:11). It is also possible that human skeletal remains may be found in sandy beach ridges or near shell mounds. Foelsche (1882:5-6) recorded that the Larrakia buried their dead in shallow graves.

The ethnographic information indicates that subsistence strategies would have been focused around certain landscape features, and these are likely to contain archaeological material. This includes localities in close proximity to sources of water and to sources of raw material suitable for stone artefact manufacture, such as creeks, waterholes, ridges and hills. In coastal areas the junction between tidal areas or the mangrove zone and the adjacent higher ground would be expected to have high archaeological potential.

5.2 Background History: Quarantine Island, Flying Boat Base, Z Special Force Lugger Maintenance Section.

5.2.1 Darwin in WWII Overview

The build up to WWII commenced in the Northern Territory in the early 1930s, with the recognition of Darwin's importance as a naval refuelling base (McKenzie-Smith 1995: 4). A naval oil fuelling depot was constructed on Stokes Hill between 1929 and 1941. Improvements to the Port Darwin's defences commenced from 1932, resulting in the installation of a number of fixed naval and anti-aircraft guns during the period up to the commencement of war with Japan in late 1941 (McKenzie-Smith 1995:4-5). This included a heavy AA battery approx. 1.6 km north of the Project Area, now a heritage site.

On the morning of 19th February 1942, dive bombers and escort fighters from the Japanese 'Nagumo' carrier force attacked Port Darwin inflicting significant shipping and aircraft losses to US, British and Australian forces in the harbour and airfields. Japanese land-based bombers later attacked the RAAF Station (now Darwin Airport) and Darwin township, carrying out low level attacks with little opposition. The months before the raid had seen an escalated build-up of military personnel supporting operations in Timor, the Netherlands East Indies (NEI), Malaya and Singapore. After the fall of Singapore on 15 February, the occupation of Netherlands East Indies and Timor and the arrival of Japanese troops in New Guinea, Australian troops were withdrawn from the Middle East to await the seeming inevitable invasion.

The major defeat of the Japanese Navy in the Coral Sea and then Midway, plus the defeat of Japanese units in the Owen Stanley Ranges and at Milne Bay, made an invasion of Australia unlikely. The war against Japan then turned into a struggle to claw back areas of the Pacific and Asia. This was a war ideally suited to the US Navy and Army air forces.

The proximity of Darwin to Timor and the NEI offered an opportunity for an air campaign against targets in Japanese occupied territory. The opportunity was taken seriously by Australia, the US and Britain, and the Top End became a large military stepping off point into SE Asia. Much of this air power was directed out of the Top End against Japanese targets in S.E Asia.

The Allies also developed covert operations into Japanese territory, using Darwin and other locations as bases. Australia developed a largely covert organisation under the name 'Services Reconnaissance Department', whose aim was to encourage native opposition to the Japanese, to disrupt supply lines and to gather intelligence for the Allies. In addition, maritime bombers from the US Navy and the RAAF were used to lay mines, drop commandos, rescue downed aircrews, general search and rescue, maritime surveillance and for attacks on shipping. These forces used the Doctors Gully Flying Boat Base, the Quarantine Island Catalina Flying Boat Base and the Gove Airfield for these operations. The historical background below outlines the history of the Quarantine Island FBB and the SRD LMS (Z Special Force).

5.2.2 Quarantine Island

Quarantine Island is named after the second Quarantine site in Darwin Harbour constructed in 1931 (Dermoudy 1993:1). The site saw the construction of buildings and infrastructure for the housing of people identified for physical isolation due to medical quarantine. In 1941, the site was identified as a potential base for military units due to the inherent security of Quarantine Island (land access was only via a causeway), the suitability for small boat landings and the existing Quarantine buildings (approx. 80 buildings of various types).

5.2.3 Z Special Unit, Services Reconnaissance Department (SRD)

In April 1942, General Sir Thomas Blamey ordered the establishment of an 'Inter-Allied Services Department', a cover name for Special Operations Australia activities against the Japanese. This original unit was established under the British Special Operations Executive (SOE), famous for its covert activities in occupied Europe. This unit subsequently was transferred to the Allied Intelligence Bureau (AIB), established in June 1942 under Australian Colonel C. G. Roberts. AIB had an overall task of assembling intelligence on Japanese operations in the South West Pacific area[7].

In March 1943, relationships with the AIB, who also answered to the Americans under McArthur, were so bad that Blamey ordered a restructure of the Special Operations Australia units in a group known as the Services Reconnaissance Department (SRD). Prior to this, starting in June 1942, most personnel in special operations were administered in a company sized structure called 'Z Special Unit' or 'Z Special Operations' (Courtney 1992:2). The tasks of the SRD were to raid Japanese targets as far away as Singapore and southern China, collect intelligence on Japanese operations and make contact with

[7] www.home.st.net.au/dunn/sigint/srd.htm

resistance forces in S.E Asia. The primary role of the organisation was to train, organise and supply Asian guerrilla forces and conduct ground-based reconnaissance into Japanese occupied territory.

Z Special Unit was composed of Australians, New Zealanders, British, Timorese, Dutch, Portuguese and Indonesians operatives. While most of the unit's operations were conducted in Timor and Borneo, the most famous operation by SRD was 'Operation Jaywick', a commando attack on shipping in Singapore Harbour. The force used a captured Japanese fishing boat *Kofuku Maru* (renamed *Krait*). Jaywick operatives paddled kayaks into Singapore Harbour to attach 'limpet' mines to shipping. This resulted in the sinking of approx. 39,000 tons of shipping. A similar raid was conducted in September-October 1944, 'Operation Rimau' was a failure, with 22 men of the operation being killed in action or executed as prisoners of war.

SRD maintained over 20 stations, bases and locations around Australia[8]. These included the:

- SRD Training Facility, Z Experimental Station, Cairns.
- The Fraser Island Commando training school.
- SRD Training Facility, Careening Bay Camp, WA.
- The SRD Advanced Training Camp, Darwin (located at Peak Hill on Darwin Harbour).
- The SRD Base, Leanyer Communications Station, NT.
- ISD/SRD/AIB Base, LMS, NT.

Z Special Unit operations were launched by submarine, flying boat, parachute landings and small boats disguised as typical Asian vessels. Units often used 'folboats' (folding canoes of rubber and canvas) and 'sleeping beauties' (semi-submersible or fully submersible vessels with small electric engines). By the end of the war, Z Special Unit had been allocated four 66' trawlers (known as the 'Snake Boats'), the Krait (see Figure 4) and two mother ships HMAS Anaconda and HMAS Mother Snake (both 125' wooden motor vessels). The Snake Boats were named Black Snake, Diamond Snake, Grass Snake, River Snake, Sea Snake and Tiger Snake[9]. Some of these vessels used the LMS in Darwin as departure points for Asia.

[8] www.specialoperationsaustralia.com/soa/training-and-base-locations.

[9] www.gunplot.net/zforce/srd.html

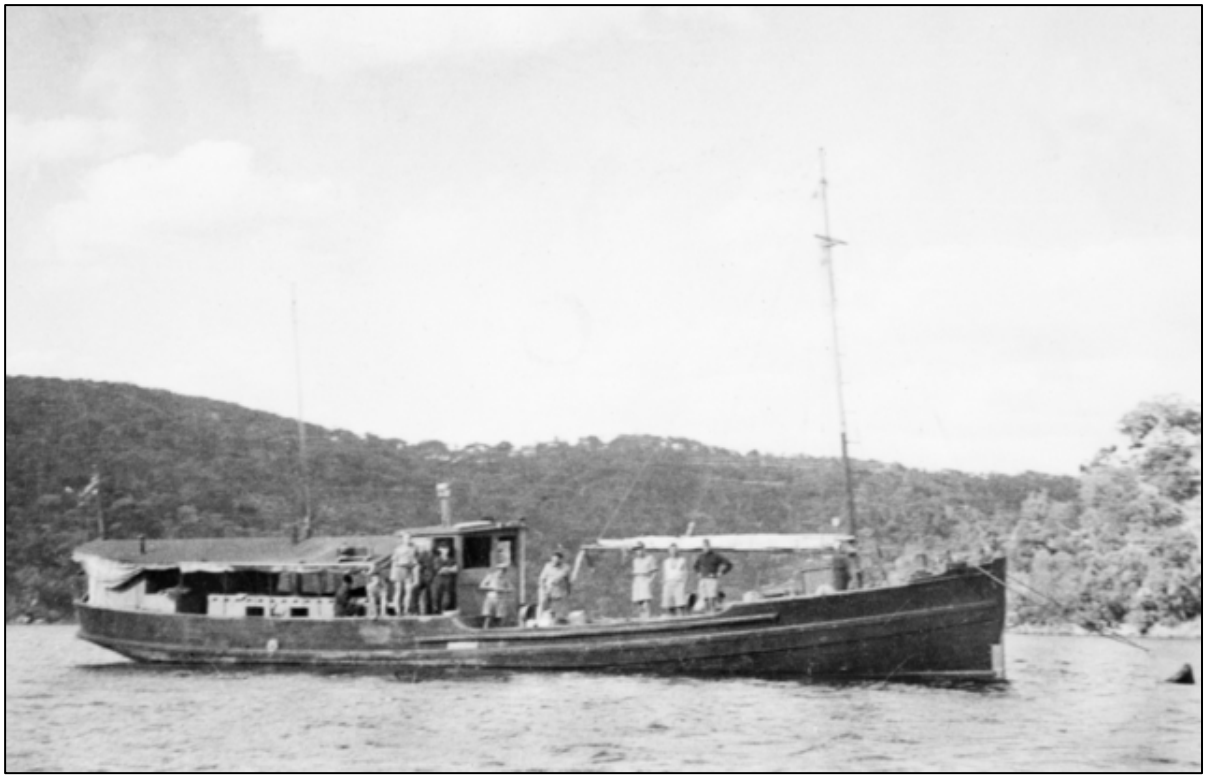

Figure 5: Krait at an SRD station near Sydney prior to Operation Jaywick (ARM)

The extent to which the Australian led Special Forces in WWII trained their American counterparts is debateable. The US led AIB was undoubtedly inexperienced in jungle warfare and black operations; however, the Australian led SRD was equally inexperienced and had to learn by their mistakes in operations. The Australians did have the advantage of three years of war in Europe before the start of the Japanese war to gain general combat experience. Two facts remain however, firstly, the SRD operations became a model for conducting a successful guerrilla campaign in jungle conditions and the force was a multinational one, with US and Canadian officers occasionally participating in operations.

5.2.4 Lugger Maintenance Section

The history of the LMS below is compiled from records collated by Bob Alford for a report on the Peak Hill SRD training base. Alford's document is quoted extensively below, along with the AWM or NAA archive reference.

An area on the south eastern shore of Quarantine Island, including the former Quarantine Station buildings were allocated to SRD in April of 1943 (AWM Series: A3269/12). In June, the adjacent area to the north and west was allocated to the RAAF for the new Catalina Flying Boat Base (see Section 5.2.5). No records were found indicating the date that the LMS was completed or commenced operations; however, it is known that by July 1943 the Officer in Charge of the LMS had selected a satellite training and staging camp location at Peak Hill.

The LMS site itself could be considered remote in 1943 terms. There was a track out to the Quarantine Station (now the extension of Berrimah Road). This was the only access point other than by boat, so it ensured a level of secrecy for the operations, including the movements of the Snake Boats to and

from Asia. According to Dermoudy (1995:4) the LMS was a large base, with its training role areas much larger than the 'Lugger Maintenance Section' built along the shoreline.

A high level of secrecy was required as the LMS was more than a maintenance unit (although the maintenance unit actually did exist). The LMS was a cover name for a much larger part of the SRD operation: the preparation of black operations deep into enemy territory to conduct reconnaissance, develop guerrilla operations and conduct a covert war against enemy supply lines.

The Peak Hill camp, located on Middle Arm on Darwin Harbour, was part of the LMS command (see Figure 5). This camp had two primary objectives, firstly, it was a remote base used to train Timorese and Portuguese nationals as guerrillas to be inserted back to Timor. Peak Hill was their first training appointment, and the best recruits were then sent on to Fraser Island Commando School for intensive training. The Timorese nationals were generally not trusted by the leadership at the LMS. There are numerous reports of 'problems' with the Timorese nationals, fears over security of operations, hence the Timorese were camped at the Peak Hill site as much as possible, where they were not allowed to visit Darwin. The second role for the Peak Hill Camp (starting in 1944) was that of a final training and staging ground for SRD mission personnel going to SE Asia.

Figure 6: Buildings in the main section of the LMS, now demolished. Camera looking west. Courtesy of Jim Gayton Collection, NT Library, PH0515 0046.

5.2.5 Catalina Flying Boat Base

Building commenced on the new FBB shortly after Quarantine Island was occupied by the LMS. At its peak in 1944 the base had accommodation for 90 officers, 120 NCOs and 430 airmen (aircrew and ground crew) (Dermoudy, 1995:6). The LMS site split FBB into two sections, one with the slipways,

maintenance workshops, jetties, tarmacs and boat facilities, the other with the living quarters for the unit.

The facility housed a range of units including the 10 Patrol Wing US Navy, 42 & 43 Squadron RAAF and later No.122 Air-Sea Rescue Flight (Alford 2011:66). All these units were Catalina equipped. In addition, 200 Flight, a Catalina equipped flight unit based at East Arm FBB was formed for the specific purpose of assisting in SRD operations (Alford 1991:67). Alford (2011:65) also reports the loss of 33 Catalina aircraft and 173 crew in operations throughout the war years.

The FBB was decommissioned as a RAAF facility in 1947 with the relocation of No.122 Air-Sea Rescue squadron. The site continued to be used for various roles such as housing Vietnamese refugees and in a continuation of its pre-war role as a Quarantine Station. Today most of the FBB has been demolished for industrial development. The surviving features in 2015 were the Catalina ramp, the RAAF Marine Section Slipway, a mooring pile and some fragments of a fuel pipeline.

Flying boat operations began in January 1942 when a detachment of US Navy Catalinas from Patrol Wing 10 were based off Quarantine Island (Jung 2009:1). Three of the Catalinas were sunk in a Japanese air raid on Darwin on 19 February 1942.

Construction of the FBB as a base for the RAAF commenced in late 1942, but the site was not ready for occupation until September 1943 (Dermoudy 1993:1). It appears actual occupation of the base commenced with the arrival at East Arm of No.20 Squadron in September 1944 (Jung 2009:2). No.20 Squadron and the LMS shared the Island with a security fence between them. In December 1944, No.112 Air Sea Rescue Flight was formed by No.20 Squadron. This flight operated from the Island until October 1947 and was the last military unit to leave the Island.

There are few remaining features of the Catalina FBB. These consist of:

1. The original RAAF Marine Section Slipway used to launch rescue vessels to assist aircraft returning with damage or wounded air crew and small vessel maintenance.
2. The original Catalina Ramp used to remove aircraft from the water for maintenance.
3. Parts of the Catalina tax apron is still visible at the top of the ramp. It is unknown if all the apron is WWII vintage, or only parts thereof.
4. A concrete mooring buoy near the ramp. Several sources site this feature as a Catalina mooring buoy used to anchor out the aircraft while awaiting removal from the water. The buoy has been moved toward the LMS base to allow for construction of the Multi-user Barge Ramp Facility (MUBRF).

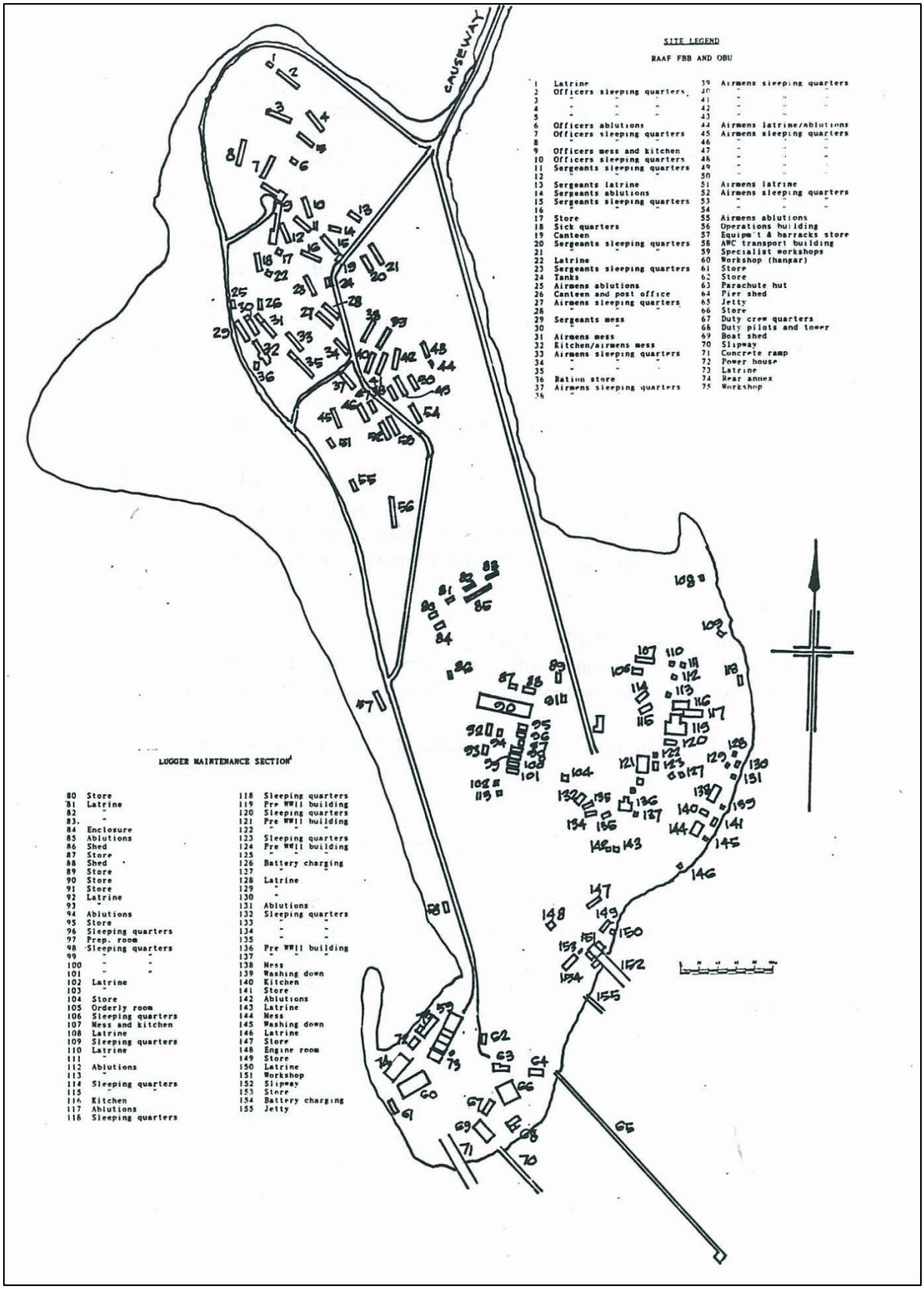

Figure 7: Quarantine Island 1946 Map showing Project Area in the south, LMS base and accommodation on east side, Flying Boat Base accommodation on north side (Dermoudy 1995)

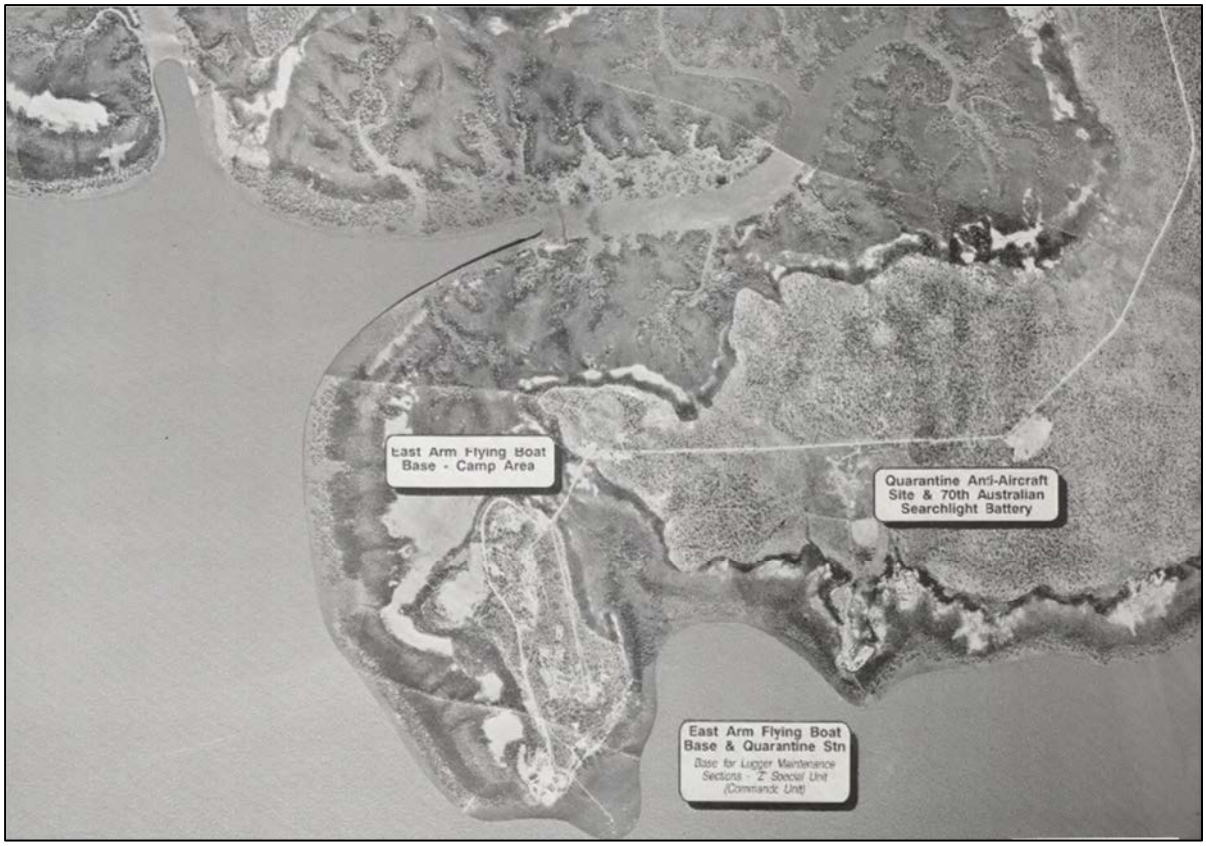

Figure 8: Quarantine Island and East Arm Peninsula May 1945. Image shows causeway to FBB and LMS bases (National Library of Australia https://nla.gov.au/nla.obj-293364179/view)

Figure 9: Buildings associated with the Catalina Flying Boat Base to the north of the survey area.

5.2.6 Small Ships and the Lugger Maintenance Section

Z Special Unit and the Catalina Flying Boat Base were supported by a number of small ships and other craft in a variety of roles ranging from support for the Catalinas, rescue vessels for downed airmen, harbour defence, anti-submarine defence and forward operations inserting Z Special commandos into Timor, New Guinea and Borneo.

Z Special Unit were allocated a number of small ships following the success of Operation Jaywick in September 1943. These vessels included the Krait, a 21 metre Japanese fishing vessel captured in 1941 and used to transport Z Special Unit commandos to Singapore, departing from Onslow in WA. The Krait later sailed from Darwin on operations to the islands to the north of Australia. The Krait is on display at the Australian National Maritime Museum in Sydney.

Following the success of the Krait, four 20 metre vessels known as the Snake Boats were built and commissioned into service in 1944. These four vessels, River Snake, Blake Snake, Tiger Snake and Sea Snake were used to ferry commandos and supplies into Timor, New Guinea and Borneo on Z Special Unit operations. All four transited the LMS in Darwin during 1944-45. The Snake Boats were supported by two mother ships, 38 m timber vessels named HMAS Anaconda and HMAS Mother Snake.

Z Special Unit were also allocated several small vessels on a temporary basis including Fairmile Motor Launches ML429, 814 and 815, plus Harbour Defence Motor Launches HDML1321 and 1324. The Fairmile B series were designed in the UK and built in large numbers during WWII (at least 650 in the UK and 35 in Australia). The Fairmile B was primarily designed for anti-submarine operations but were used for a number of activities including air crew rescue and carrying Z Special operatives into and out of S.E Asia[10]. Following WWII numbers of Fairmile B's were sold off and converted to ferries or private motor cruisers. There are currently four surviving Fairmile B's in the UK.

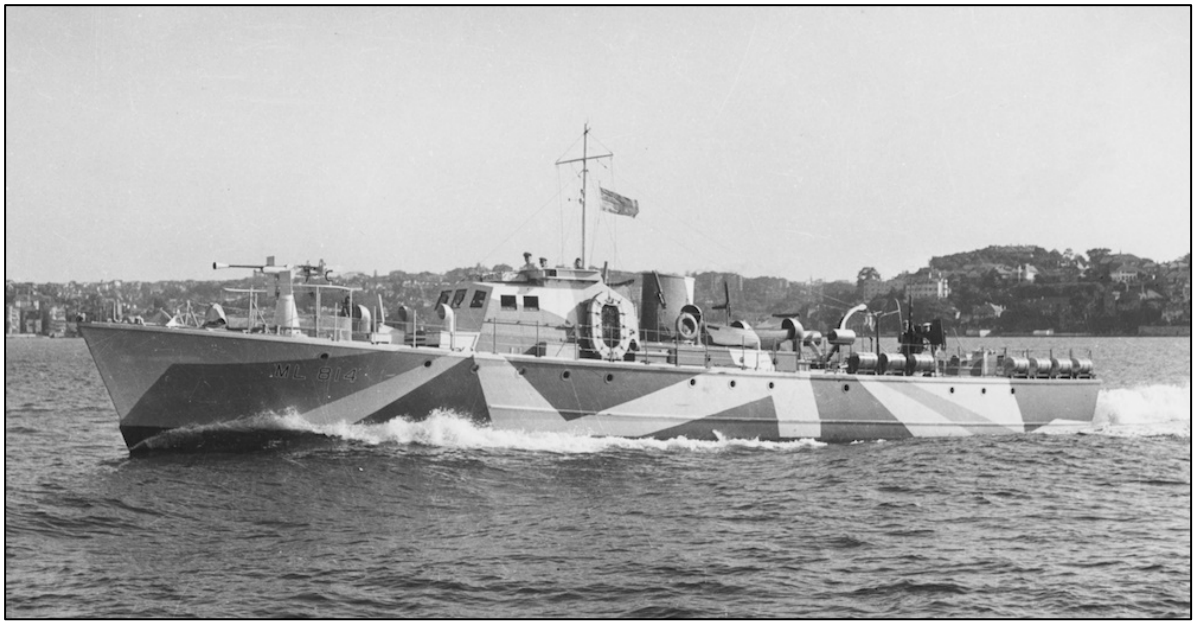

Figure 10: Fairmile B, ML-814 operating as a submarine chaser (https://www.navy.gov.au/ml-814)

[10] https://www.navy.gov.au/ml-814 accessed 8 December 2020.

HDML 1321 was one of thirty motor launches built for the Royal Australian Navy during WWII and the first of eight built in Australia. These vessels were 22 metres long and constructed of timber. They were designed as Harbour Defence vessels, armed with depth charges, a 20 mm auto cannon and a variety heavy and light machine guns. HDML1321 was completed in November 1943 and proceeded up the Australian east coast to Milne Bay in New Guinea, arriving on 1 February 1944. Her orders were to carry out support operations for the Allied Intelligence Bureau (AIB) personnel including Australian coast watchers from M Special Unit.

HDML 1321 operated in New Guinea waters until April 1945 when she was seconded to support a Z Special Unit insertion of operatives onto the Japanese held island of Muschu near Wewak. The purpose of the mission, code named Operation Copper, was to carry out reconnaissance on the island to determine Japanese strength, capture a prisoner for interrogation and map Japanese fixed defences. The mission went badly from the start, resulting in the deaths of seven of the eight operatives. The survivor, Sapper Mick Dennis, was awarded the Military Medal for bravery on the operation.

Figure 11: HDML1321 on slipway Purdon and Featherstone Hobart 1943

HDML 1321 continued operations in the New Guinea area for the remainder of the war and returned to Sydney in November 1945. She was then redesignated as a Seaward Defence Boat and later renamed Rushcutter. The vessel remained in service with the navy until 1970, the last of the WWII HDML vessels to be paid off. The vessel was sold in 1970 and was converted into a charter boat named Tambourine Bay. The vessel seems to have changed hands several times in the period between 1970 and 2006, being renamed MV Rushcutter again along the way. According to the Naval Historical Society of Australia web site, the MV Rushcutter was purchased by Wendy and Tracy Geddes in 2006 and taken to Nhulunbuy in the NT. The vessel then operated as a tour and dive boat in Darwin. MV Rushcutter sank at her moorings on 19 October 2016, later beached adjacent to the former Catalina Ramp on East Arm.

The vessel was then sold to a Darwin consortium with intentions of restoring the vessel to this WWII condition and handing it over to the NT Military Museum on East Point for permanent display.

Figure 12: HDML1321 New Guinea circa 1944 (Australian Navy History Site)

5.2.7 Quarantine Island Heavy Anti-Aircraft Battery

Other military activities on Quarantine Island included the establishment of significant Anti-Aircraft (AA) sites for the defence of the harbour east of the then Port area. The largest extant AA position is the Quarantine Anti-Aircraft site established in 1941. The current structures were built in September 1942 by personnel from the Civil Construction Corps and 2nd and 14th Heavy AA Batteries. Part of the earth works used for the battery seems to have been sourced from local Indigenous shell middens. The battery operated with 4 QF 3.7 inch AA guns, the standard heavy AA gun used throughout the British and Commonwealth forces. The battery had a number of supporting weapons including a 40 mm Bofors AA gun and several Lewis guns used for close range AA operations. The unit was supported by Radar and a Vickers Predictor Mark IV. The 3.7 inch battery was moved out in November 1944. The site is still largely intact and has been a declared Heritage Place since September 1996. Additional units

were stationed in the East Arm and Quarantine Island area including several Anti-Aircraft Search Light (AASL) units manning several positions[11].

5.2.8 Post War Quarantine Island

In 1946, most of the military buildings on Quarantine Island were sold by the Commonwealth and the remaining buildings were prepared for hand back to the Quarantine Station service (Dermoudy 1993:1). The LMS slipway and workshop were retained for the servicing of boats used for the Channel Island Leprosarium until 1956. This feature remains until today, along with some of the building foundations of the LMS, the Catalina Ramp and the RAAF Marine Section Slipway.

Quarantine Island was used to house Vietnamese refugees from the mid to late 1970s (Dermoudy 1993:2). The Island's facilities were also used to house and quarantine the crews of numbers of foreign fishing vessels seized in the waters to the north of Australia. The Quarantine Station passed from Commonwealth to NT ownership in May 1981 (Dermoudy 1993:2). The Catalina boat ramp was used in 1981 for barge operations in the export of uranium oxide. A security fence was erected around the site, and concrete poured to raise the level of the ramp and the former Catalina maintenance area and hanger. Since the 1980s, the Catalina ramp has been used as a public boat ramp and as a marine industry base through Bhagwan Marine.

5.3 Background Indigenous Archaeology

5.3.1 Traditional Ownership

As outlined in the ethno-history in Section 5.1 above, the Larrakia are recognised as the traditional owners of an estate extending from Cox Peninsular in the west to Shoal Bay and Gunn Point in the east. Larrakia lands include the Darwin Harbour and its hinterland toward the south. There are approximately 2000 Larrakia people living in greater Darwin region comprising eight major family groups[12]. The Larrakia are custodians for many registered sacred sites in Darwin Harbour and its surrounds. A principle Dreaming for the Larakia and surrounding Aboriginal groups is the Rainbow Serpent that travels from Port Keats, Daly River, Darwin and beyond via the ocean. Numerous areas of spiritual and cultural significance are found within Larrakia country which includes conception and birth sites, men's and women's ceremony sites, burial sites, petroglyph rock art and features in the landscape which represent the movement and location of various Dreamings.

5.3.2 Indigenous Archaeology of Darwin Harbour and Hinterland

An overview of previous archaeological studies in the Darwin Harbour and hinterland provides a context for evaluating the archaeological significance of any sites and artefacts found in the Project Area. A search of the NT Archaeological Site Database for Larrakia lands (Cox Peninsula, Darwin Peninsula, Shoal Bay Peninsula and the southern regions of Darwin Harbour) reveals 787 entries. Of these, 659 are of Indigenous origin, or combined Indigenous and European origin. Of the 659 site, 444

[11] Source: NT Heritage Register, WWII Quarantine AA Battery Site http://www.ntlis.nt.gov.au/heritageregister/f?p=103:302:2903983901465170::NO::P302_SITE_ID:64

[12] Source: http://larrakia.com/about/the-larrakia-people/ Accessed 3 September 2015

(67%) include shell middens and mounds. Sites including stone artefacts, quarries or knapping locations were recorded in 331 sites or 51% of the total (note that a considerable number include multiple content types).

The remaining Indigenous sites include relatively small numbers of Indigenous historic sites, skeletal remains, petroglyph (pecked or ground rock art) sites and stone arrangements. Examples of combined traditional and historic Indigenous places include ceremonial grounds such as Gardens Oval and the remains of the Channel Island and Middle Point Leprosarium.

Many of the previously recorded pre-contact sites are clustered on Wickham Point and around Haycock Reach on the southern coastline of Middle Arm Peninsula (outside the Project Area). The Wickham Point sites include eleven shell mounds recorded during surveys for development of the Phillips LNG Plant (Crassweller 2001a, 2001b; Heritage Surveys 1997; URS 2002). Another forty-four shell middens and mounds were recorded within areas of dense monsoon vine thicket during construction work for the Conoco Phillips plant. Eleven of these middens were analysed and radiocarbon dated as part of salvage excavations (Crassweller 2002a, 2006b). All middens in this region dated thus far originated in the pre-European period.

Radiocarbon dates have been obtained on mounds and middens on the southern peninsula coastline around Haycock Reach (Bourke and Crassweller 2006, Earthsea Heritage Surveys 2009). Earthsea Heritage Survey's excavation in Hudson Creek returned calibrated dates of between 1994 years before present (BP) and 2163 years BP based on Accelerator Mass Spectrometry (AMS) radiocarbon testing of ark cockle (*Anadara granosa*) and carbon samples. These dates are typical for the Darwin Harbour shell middens and mounds, confirming Bourke (2005) and Crassweller's (2006) dates between 2100 years BP and 600 years BP.

To the knowledge of the consultants, only one recorded occurrence of rock art for the Darwin region has been recorded on the southern coastline of the Middle Arm Peninsula (Bourke 1994, 2005a, Hiscock and Hughes 2001, Richardson 1996). The rock art (petroglyph) sites were described by Bourke (1994), and Bourke and Mulvaney (2003) as part of larger surveys of midden sites along the Middle Arm Peninsular.

5.4 Background Historical Archaeology

5.4.1 Archaeological description of the FBB surviving features

There are few remaining terrestrial structures from the RAAF FBB. These consist of the RAAF Marine Section slipway, remnants of a jetty, a tarmac area and parking apron and ramp. The former slipway is a substantial structure consisting of a concrete and steel rail for the slipway trolley. There are no visible remains of the trolley or the winch/cable. There are a number of extra rails lying parallel to the slip, possibly from the upper slipway where the rails are absent, or from the bituminised Catalina apron to the west. The concrete ramp, which used to bring Catalina Flying Boats out of the water, is located to the south and below the tarmac and apron.

Located higher and to the north of the slipway and the Catalina Ramp is a large level area with what appears to be old bitumen and concrete that are likely part of the Catalina taxiway and maintenance shed floor. Part of the taxiway appears to have been eroded away, showing the compressed gravel surface preparation underlying the bitumen.

The remains of the FBB Jetty are located to the north of the RAAF Marine Section Slipway and approximately 30 metres south of the location of the LMS Jetty. The Jetty was constructed during 1944 and measured 274.3 metres long (Cosmos Archaeology 2017:7). There is a large mooring block close to the slipway and another adjacent to the shore remains of the RAAF jetty. It is likely these blocks were used to moor Catalinas close to the ramp prior to maintenance. The construction method for these blocks consists of 'layered' concrete with prominent local aggregate, similar to the construction of many building foundations of WWII vintage.

5.4.2 Archaeological description of the Lugger Maintenance Section, 'Z Special Unit'

There are a number of surviving features of the LMS (Earthsea 2010). These include the small vessel maintenance slipway, concrete foundations for workshops, engine rooms, battery charging rooms, the mess complex, latrines, washhouse, stores, and various ancillary buildings. Artefacts include scattered refuse consisting of broken glass, bricks and other masonry, broken fibro sheet and ferrous materials such as corrugated iron.

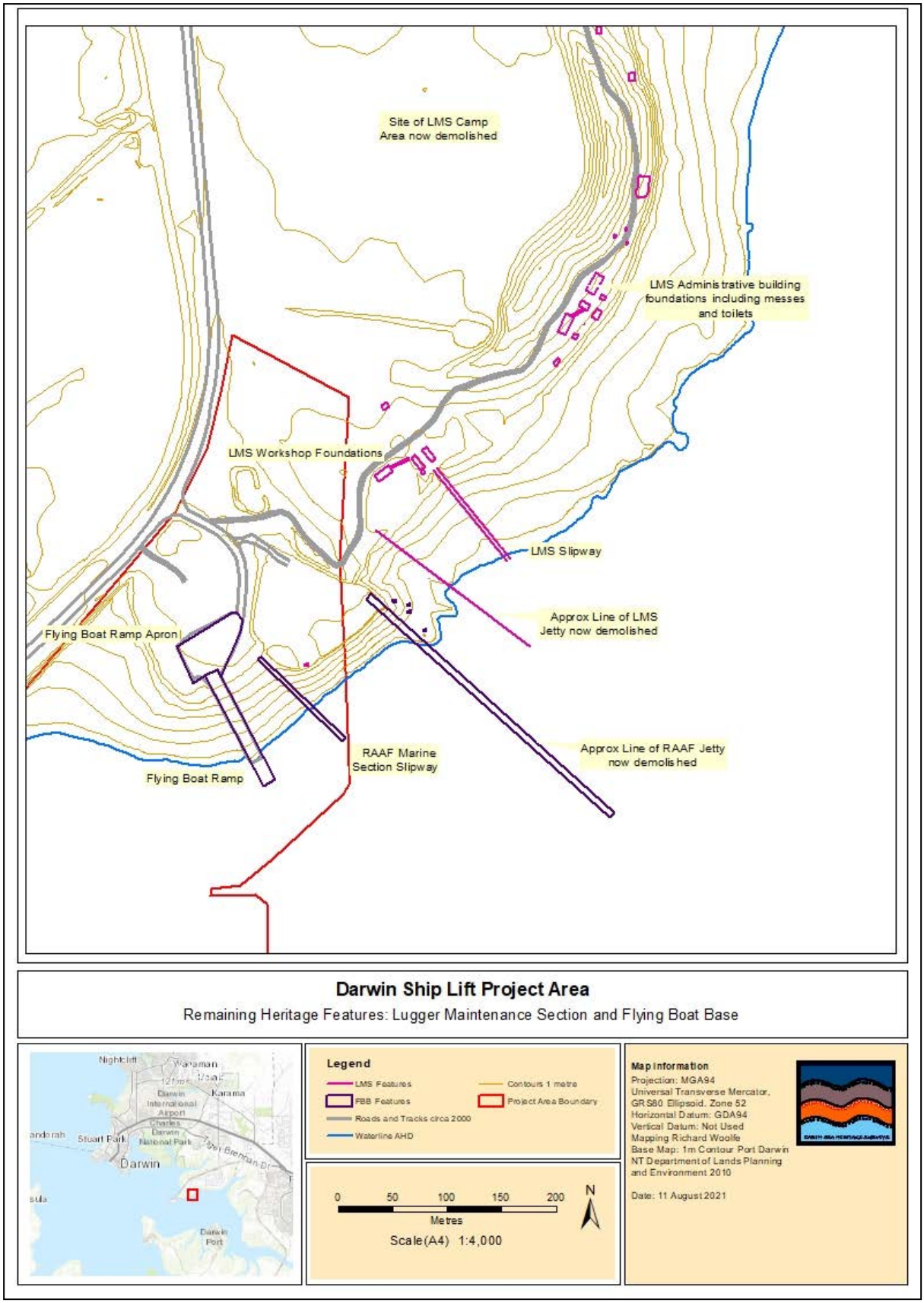

Figure 13: Major remaining features of the Lugger Maintenance Section and Flying Boat Base against the Project Area Boundary (Earthsea 2010)

5.4.3 Maritime Archaeological Studies

There have been a number of archaeological studies on the Catalina wrecks in Darwin Harbour (i.e. Cosmos Archaeology 2015, 2017; Jung 2000, 2001, 2009).). Further studies have monitored the condition of each wreck, recording the impact of recreational fishing and diving on site integrity (i.e. Cosmos Archaeology 2014). Additional studies in and near the Project Area include two maritime surveys and artefact analysis reports by Cosmos Archaeology in response to the proposed construction of the MUBRF (Cosmos Archaeology 2015 and 2017).

The 2015 study focused on locating, excavating and analysing ferrous materials in the MUBRF and Ship Lift Project Areas to the east and south of the Catalina Ramp (See Figure 13 below). The survey used a magnetometer to identify 52 magnetic anomalies across the planned Project Area. These magnetometer observations were physically located using a diver (n=49 out of 52 targets) or by foot at low water spring tide (n=3 out of 52 targets) (Cosmos Archaeology 2015:41). A total of 365 magnetic and non-magnetic cultural artefacts were recovered during the study. A further magnetometer survey was then completed to find any additional targets, including Unexploded Ordinance (UXO) (Cosmos Archaeology 2015).

Figure 14: MUBRF project area 2015 showing location to the south of the FBB site with dive targets in red

Artefacts were then photographed, identified and rated on a heritage significance rating system. Identified UXO objects, including between 1000-1500 0.50 calibre rounds and 300 0.30 calibre rounds were located, but not counted or analysed due to OHS concerns. This ammunition was undoubtedly associated with the FBB, many of the 0.50 calibre cartridges were stamped with the date '1942' (Cosmos Archaeology 2015:41). Many PYB Catalinas used 0.50 calibre machine guns in defence and for ground or shipping attack.

The temporal phase analysis for the Project, presented in Table 7, indicates that 60% of artefacts originated in the early 20th to mid-20th century including WWII (Cosmos Archaeology 2015:44). In

terms of functional analysis, approx. 20% of the assemblage would be identified as relating to WWII, almost all military aircraft parts and ground support equipment (Cosmos Archaeology 2015:48). It is important to note that the 2015 diver survey located and investigated all magnetometer observations, with some returning UXO. No larger UXO, such as maritime bombs, torpedoes or mines were found or recovered. While this does not preclude future finds, it does reduce the risk of finding additional UXO.

Table 6: Temporal Phase analysis of artefacts from Cosmos Archaeology 2015

TEMPORAL PHASE	NO. OF OBJECTS	% OF ASSEMBLAGE
Late 19th to early 20th century	2	0.6%
Early 20th century to mid 20th century;1930s-early 1950s, including World War II era	219	60%
Mid to late 20th century; late 1950s-1970s	16	4.4%
Late 20th century;1980s onwards	36	9.8%
Indeterminate	92	25.2%

The second Cosmos Archaeology excavation was conducted in September 2015 prior to the construction of the MURBF (Cosmos Archaeology 2017). The study focused on several features recorded during the 2015 magnetometer survey under the site of the former RAAF Jetty. The study analyses the artefacts associated with the former jetty and the post depositional process acting on parts from the collapsed jetty (see Figure 14 below reprinted from Cosmos Archaeology 2017:33). The study recovered and recorded 251 artefacts of which two percent were ferrous. No UXO was recovered during this survey, most having been removed in the first study.

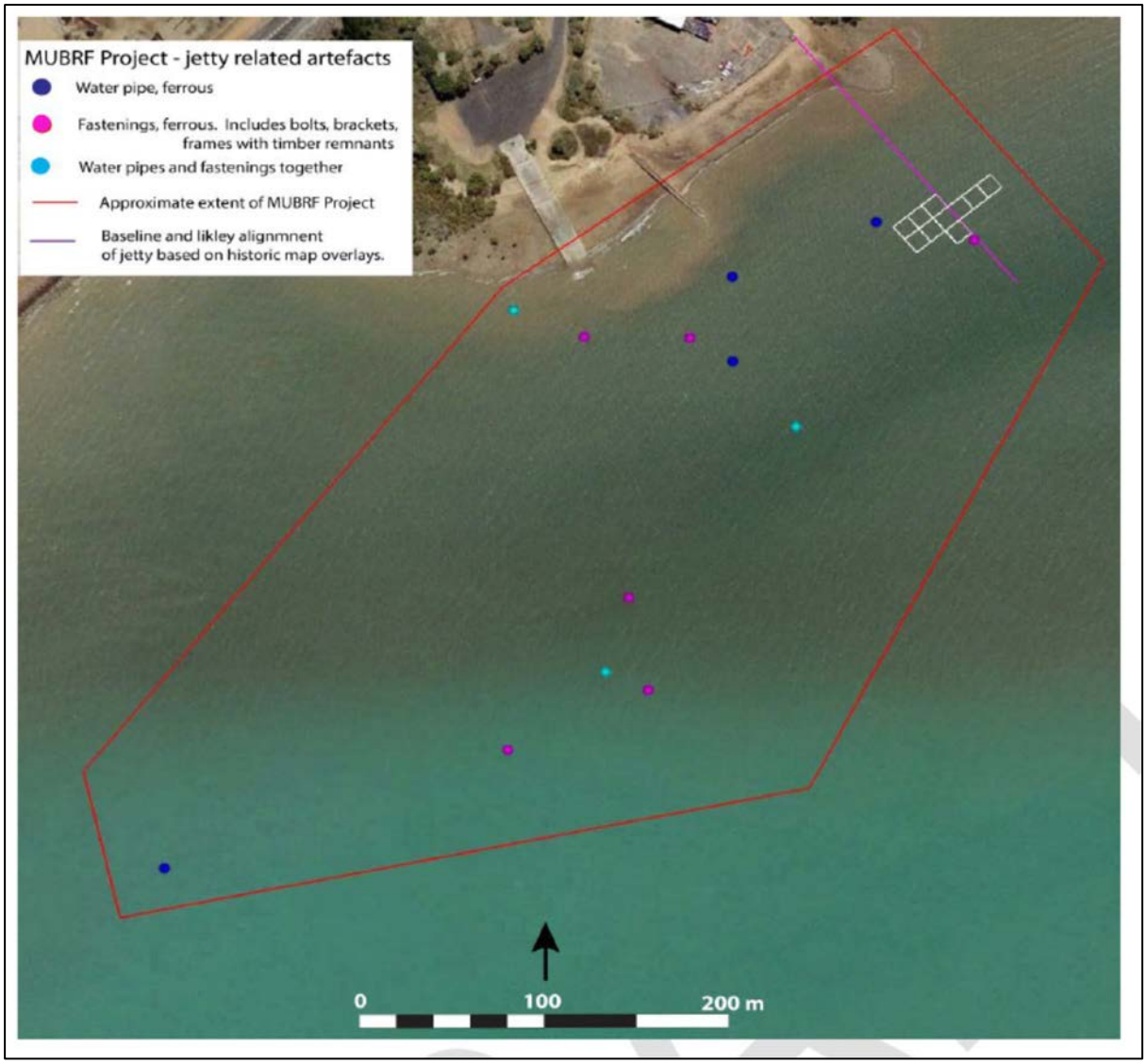

Figure 15: Cosmos Archaeology September 2015 survey and excavation of former RAAF Jetty site. This site in now part of the MUBRF.

6 Survey Methodology

This study is primarily aimed at compiling a heritage impact assessment for the Project Area including a desktop review of the existing heritage features. However, a short field visit was planned and executed with two primary objectives:

1. Create a visual record of the FBB and part of the LMS site to add to the existing images and mapping from 2003, 2010, 2015 and 2016 projects completed by Earthsea.
2. Conduct a site condition audit for the remaining features of the site.
3. Conduct a survey for Aboriginal sites or artefacts on an area of remnant mangroves on the western edge of the Project Area.

6.1 Visual Recording of Project Area

The Project Area, including the remains of the FBB and the LMS, were identified for development in the late 1990s. Since then, there have been a number of heritage projects conducted in the area, resulting in an archaeological and visual record of the remains of the bases. The rationale for this approach was based on the understanding that these features would not be declared by heritage legislation and should be recorded for future reference.

6.2 Site Condition Audit

The field survey also aimed at conducting a site condition audit of remaining features of the FBB and parts of the LMS. Condition information was then compared to past surveys to determine the rate of deterioration of the remaining features in the Project Area. A springs low tide in the middle of the day was selected for the survey time, allowing imaging and condition reporting for objects in the tidal zone.

6.3 Survey for Aboriginal archaeological sites and artefacts

A small area of extant mangrove community, totalling 1.0 ha, was surveyed to ascertain if any archaeological sites of Aboriginal origin were in this section. The results of this survey are shown in Section 7 of this report.

6.4 Survey Recording

Earthsea Consultants use a number of site recording methodologies in the field including:

1. Data recording using a field GIS such as GBM Mobile software based on a Trimble Nomad GPS, tested accuracy to 3 metres in open terrain without differential correction.
2. Site and transect data recording is done using Fulcrum App, a field GIS software for tablets.
3. Image recording using Fulcrum App on a Samsung ActiveA2 tablet and a Canon EOS1300D Digital SLR.

7 Survey Results

7.1 Aboriginal Archaeological Survey

No additional Aboriginal archaeological sites were recorded in the 1.0 ha remanent mangrove within the Project Area. The consultant also determined that NT Archaeological Database Site 50730020 East Arm 1, was not within the Project footprint. It is likely that the original coordinates were incorrect and this site Is located in the western section of the Lugger Maintenance Section area, approx. 110 metres to the northeast of its mapped location (see Table 8 below for updated coordinates, Figure 17 below of new location).

The site can be described as a small midden site approx. 3 metres in radius and 150 mm in depth eroding out of a sand bank on the high tide line near the LMS Slipway and former workshops. The shell material was entirely *Anadara granosa*. Excavations and dating of similar middens around Darwin Harbour have resulted in dates between 2500 and 500 years BP (i.e. Earthsea Keys and Raupp 2008; Bourke, P. 2005A). The same authors note that these sites are very common along the Darwin Harbour shoreline. As noted above, the midden site is outside of the Project area and unlikely to be disturbed as a result of construction of the Darwin Ship Lift Facility.

Table 7: Amended location for 'East Arm 1' Archaeological Site

Site ID	Site Name	Site Type	Contents	Ethnic Origin	Easting	Northing	Status
50730020	East Arm 1	Shell midden	Midden, mound	Aboriginal	706612	8618784	Original site registration
50730020	East Arm 1	Shell midden	Midden	Aboriginal	706683	8618841	Amended location for this site

Figure 16: Part of Archaeological Site 50730020 likely to be 'East Arm 1' within the LMS site rather than the Project Area..

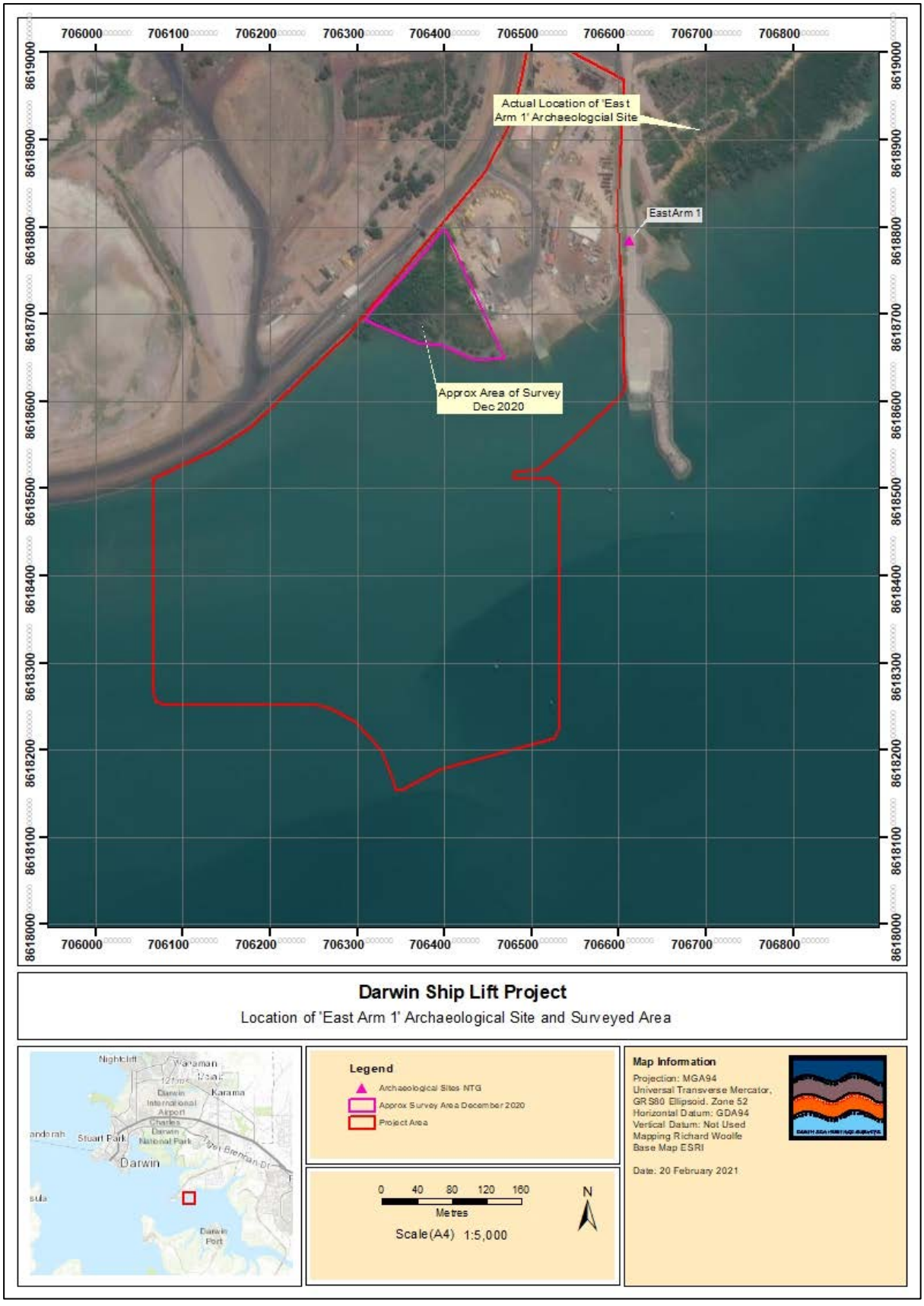

Figure 17:Location of Archaeological Site 'East Arm 1' and survey area map

7.2 HDML 1231 (MV Rushcutter)

Former WWII naval vessel HDML 1231, renamed MV Rushcutter, is now on a hard stand in the Bhagwan lay down area on the former FBB, after being hauled away from the high tide line in 2019. The vessel is in fairly poor condition following a period on the bottom of Darwin Harbour then beaching next to the former Catalina ramp on East Arm near the high tide line.

Images of the hull and superstructure were taken on 2 December 2020 to record the vessel's condition. The Consultants are not qualified and licenced marine surveyors, and therefore cannot report on the practicality of restoring the vessel to seaworthy condition. Representatives of the Department of the Chief Minister have discussed the status of the Rushcutter with its current owner. The Department's representatives report that the current owners have no money or land to store the vessel at the time of writing this report. Additionally, it is not clear if it is even possible to restore the vessel given its current condition.

The vessel will have to be moved to allow for the construction of the Ship Lift, however its temporary or ultimate destination are not clear. One option remains the Common User Facility as a temporary home. According to the Naval Historical Society of Australia, the current owners are interested in restoring the vessel to its WWII condition and then displaying her on a hard stand at the Darwin Military Museum which may or may not be feasible[13].

To the knowledge of the Consultants, there has been no nomination of the vessel to the NT Heritage Register and therefore no heritage significance assessment completed and presented to the NT Heritage Council.

[13] https://www.navyhistory.org.au/ranships/hmas-rushcutter/

Figure 18: HDML 1321 on hardstand atop the former Catalina Flying Boat Base tarmac

Figure 19: Image of HDML 1321 on hardstand. Note damage below the waterline and separation of rudder from the rudder shaft

Figure 20: Port side propeller showing damage

8 Cultural and Archaeological Significance

8.1 Historic Heritage Significance

Quarantine Island and the East Arm Peninsular were selected as a place for the development of a new port and related infrastructure in the 1990s. Work started with demolition of the Quarantine buildings and the remaining buildings associated with the LMS in the mid-1990s. The remaining features were nominated to the NT Heritage Register in 2013. The Heritage Council recommended declaration in 2015 with the following Statement of Heritage Value:

> *'The WWII Catalina Boat Ramp, the Crash Boat Slipway* (RAAF Marine Section slipway), *and the concrete mooring block at East Arm Darwin Harbour were associated with a large and strategically significant Catalina Flying Boat Operational Base (FBB), which was occupied by the Royal Australian Air Force (RAAF) during WWII. The Catalinas were flying boats which could land and take off on the water eliminating the need for airstrips altogether. Operations launched from the FBB included bombing raids, mine laying, supply drops, aerial surveillance operations and rescue missions. Following the war the FBB was used to support a squadron of Catalinas dedicated to air and sea rescue. The Catalina ramp provided the means for the crew to bring the Catalinas in and out of the water, in order to facilitate maintenance and repairs. The block was likely used to moor Catalinas close to the ramp during these procedures. The crash boat slipway serviced the rescue boat which was deployed to monitor operations and assist in emergencies, for example to recover injured crewmen.*
>
> *Originally the Base consisted of approximately 70 buildings spread over a large area. The Catalina ramp, crash boat slipway and block, which are in close proximity to each other, are all that now remains of the FBB. As remnants of the Base, these features are highly valued by veterans who served there and by veterans and their families who have a special appreciation for RAAF operations.*
>
> *The FBB was situated on land that, prior to the War, was a Commonwealth Quarantine Station. The Quarantine Station was relocated elsewhere during the war years, but was re-established back at that site some years after the War. The land on which these features are located became part of the post-war Quarantine Station, and the Catalina ramp in particular was used for Quarantine purposes until the 1980s'*[14].

During 2015, the Minister for the Environment decided not to declare the FBB, the Z Special Unit LMS and Catalina's 2 and 3 under Section 35 of the NT *Heritage Act*. As a result, these sites are not protected under the Act.

8.1.1 Significance of HDML1320

The former Harbour Defence Motor Launch HDML1320 is currently on hard stand in the Project Area after a period on the bottom of the harbour and on the low tide line beside the Catalina Ramp. As noted in Section 7 above, the vessel is in poor condition but may be salvageable as a museum exhibit. A number of people have supported the project to salvage the vessel leading crowd funding of approx.

[14] http://www.ntlis.nt.gov.au/heritageregister/f?p=103:302:::NO::P302_SITE_ID:173499

$50,000. Most of this money was used to move the vessel from the water's edge to its current location on the hard stand. Further funds will be necessary to move the vessel to another location for further repairs. The NT Government will help facilitate movement of the vessel away from the site if required. The vessel will not be impacted upon by the construction of the Darwin Ship Lift Facility.

To the knowledge of the consultants there is no formal significance assessment for HDML1320. It is not within the scope of this document to provide a heritage assessment of the vessel.

8.2 Indigenous Cultural Heritage Significance.

8.2.1 Archaeological Sites

As noted in Section 7 above, the survey did not record any archaeological sites of Aboriginal origin within the small area of mangroves in the Project Area.

8.2.2 Sacred Sites

The Project Area is close to two registered Sacred Sites protected under the NT Aboriginal *Sacred Sites Act* 1989. These sites, Catalina Island and Old Man Rock, are both on the AAPA register of sacred sites. An AAPA certificate is current for the Ship Lift Project with conditions including avoiding impacts on the sand bar on the northern end of Catalina Island (see Appendix A).

Earthsea consultants have worked with a number of Larrakia Rangers completing heritage surveys in the Darwin Harbour region. On each occasion, the Larrakia representatives have confirmed the highly significant nature of Catalina Island and Old Man Rock to Larrakia people. Of particular concern is the potential of the East Arm development to impact on the tidal flows around Catalina Island leading to the loss of the sand bar on the northern end of the island.

9 Heritage Impact Risk Assessment

9.1 Heritage Impact Risk Assessment Methodology

Construction of the proposed Darwin Ship Lift Facility will involve land reclamation, pile driving, construction, dredging to provide adequate low tide access to facility and the installation of navigational marks and aids. The Project is therefore likely to impact on heritage sites as per Table 9 below using the risk assessment methodology outlined in Table 8.

The risk assessment process notes potential risks to the heritage values of listed sites, rates them using the tables below, suggests mitigation strategies and assesses the residual risk to heritage values. Note that the risk assessment table below does not rate heritage sites that are unlikely to have any impacts at all, such as Catalina 1 or the Quarantine Heavy AA site (see Table 8 below). The risk assessment distinguishes between protected heritage sites which are on a register and protected by law (such as Catalina Island) or heritage sites which are on a register but not protected by law (such as the Catalina FBB or Catalina 2). Sites which are to be destroyed by the construction of the facility, the Catalina Ramp and the RAAF slipway, are recorded in Table 8 noting that no mitigation strategy is possible.

Table 8: Risk Assessment Methodology

Likelihood Rating	Descriptors (Probability Level Descriptors)
1. Almost Certain	Several incidents of a similar nature have occurred here.
2. Likely	A previous incident of a similar nature has occurred here.
3. Possible	Could have occurred already without intervention.
4. Unlikely	Recorded recently elsewhere.
5. Very Unlikely	It has happened elsewhere.
Consequences	
1. Extreme	**Aboriginal Heritage:** Complete destruction or removal of sites across multiple areas, including sites outside of the Project footprint resulting from construction or operation of the facility. **Non-Aboriginal Heritage**: Complete loss of heritage values intrinsic to State or Commonwealth significant site or sites, including sites outside of the Project footprint resulting from construction or operation of the facility.
2. Major	**Aboriginal Heritage: Complete destruction or removal of multiple sites in a localised area.** **Non-Aboriginal Heritage**: Substantial reduction in heritage values intrinsic to State or Commonwealth significant site or complete loss or heritage values intrinsic to non-State or Commonwealth significant site.
3. Moderate	**Aboriginal Heritage:** Substantial damage, destruction or removal of a single Aboriginal site. **Non-Aboriginal Heritage**: Partial reduction in the heritage value intrinsic to State or Commonwealth significant site.
4. Minor	**Aboriginal Heritage:** Partial and localised impact on one or more Aboriginal heritage sites. **Non-Aboriginal Heritage**: Detectable impact to State or Commonwealth significant site with heritage values remaining largely intact. OR Partial reduction in heritage value intrinsic to non-State/Commonwealth significant site.
5. Negligible	**Aboriginal Heritage:** No measurable change in existing natural and human processes impacting on Aboriginal heritage sites. **Non-Aboriginal Heritage**: No measurable alterations to existing natural and human processes already impacting on heritage sites.

9.2 Potential Impacts on Heritage Sites and Objects

9.2.1 Catalina Island

Catalina Island and Old Man Rock are registered Sacred Sites within the meaning of the NT *Sacred Sites Act* 1989. As noted in Section 10 below, the sand bar on the northern extremity of Catalina Island is of special significance to Larrakia people. There are concerns within the Larrakia community that changing the coastline around Quarantine Island will cause this sand bar to erode (Earthsea 2015).

A hydrological study modelling the impacts of planned changes in the shoreline on tidal flows in East Arm and around Catalina Island (MetOcean 2020) was commissioned for the Project EIS. The study indicates that, while some changes in flow may occur as a result of the construction of the Darwin Ship Lift Facility, they are relatively minor and unlikely to affect Catalina Island.

9.2.2 Old Man Rock

Old Man Rock is approx. 1000 metres southeast of the Project[15]. The MetOcean report does not note specific impacts on the rock due to changes in hydrology, however the report does indicate minor changes in flow due to the construction of the Project (MetOcean 2020:23-24) These changes in flow are of a relatively small magnitude, and it is very unlikely that this will impact on the rock itself.

9.2.3 Catalina Flying Boat Base sites

The scope of works for the Project indicates that the construction will cover the Catalina ramp, apron, RAAF Marine Section slipway and the mooring buoy with fill and concrete. In 2015, the Minister for the Environment decided not to declare the FBB under the NT *Heritage Act* 2011. Therefore, these sites do not have protection despite having some heritage significance. There are no mitigation measures proposed for these sites.

9.2.4 Catalina 2

Catalina 2 is located approx. 880 metres west southwest of the Catalina Ramp and 230 metres directly south of the Project dredge and revetment area[16]. While this site has heritage value it is not protected under the NT *Heritage Act*. As noted in Section 3.3 above, the site is on the Commonwealth Underwater Cultural Heritage Register (Aircraft Wrecks) and on the NT Archaeological Site Database.

Catalina 2 rests in relatively shallow water, approx. 5.5 metres at lowest astronomical tide (LAT). Potential changes in the tidal flows resulting from the construction of the Project are noted in the MetOcean report (2020:44). The MetOcean study indicated a potential increase of 0.02 m/s in current speeds across the site. This increase in speed is above the threshold to cause erosion across the site and would only likely occur between 2 to 4% of the time over a month, or approximately up to 30 hours per month (MetOcean 2020:52). Lower current speeds do occur, but these are more likely to hold fine sediments in suspension rather than allow for deposition.

The potential for increased commercial vessel traffic and propeller induced wash in the vicinity of Catalina 2 has the potential for additional erosion or deposition of sediment around the wreck site.

This report recommends further sediment monitoring for the Catalina 2 site using the same methodology outlined in the Cosmos 2014 report 2. This should be undertaken prior to construction and at the commencement of operations. An exclusion zone around the site should be established to limit the impact of larger vessels around the wreck site.

9.2.5 Catalina 3

Catalina 3 is approx. 990 metres to the southeast of the Project Area. The MetOcean report indicates minor changes in current flows as a result of the construction of the Project. While major impacts on

[15] Old Man Rock beacon is located at 12 degrees 29.852 minutes S, 130 degrees 54.236 minutes S or 706908mN 8617700m (MGA94).

[16] Catalina 2 is located at 12 degrees 29.748 minutes South and 130 degrees 53.81 minutes East GRS80 Ellipsoid. MGA 94 grid reference: Zone 52 706137mE 8617882mN. (Cosmos Archaeology 2014)

the site are unlikely, sediment monitoring should be undertaken prior to construction and at the commencement of operations.

9.2.6 Lugger Maintenance Section, Z Special Unit

The LMS is located on the north eastern side of the MUBRF (see Project Location Map Section 2.5). While there have been some impacts on the LMS site following the construction of the MUBRF and CUF, it is unlikely that the construction of the Project will impact on the LMS.

9.2.7 HDML1321 Rushcutter

This report finds that HDML1321 may have some heritage significance to the people of the Northern Territory and Australia. It is beyond the scope of this report to make recommendations on the ultimate fate of the vessel, however relocating the vessel to another location such as the Darwin Military Museum may serve to conserve the heritage values of the vessel and allow the construction of the Darwin Ship Lift Facility.

9.2.8 Under water cultural objects

This report uses the two Cosmos Archaeology maritime studies (2015, 2017) to determine the risk of damage to underwater cultural heritage associated with the WWII uses of the Project Area. The Consultants find that the two Cosmos studies have considerably reduced the risk of finding UXO during dredging and construction activities. The Consultants also find that there is a high likelihood of locating further underwater cultural objects within the Project Area during dredging and construction. There are several mitigation or management options to address this issue:

1. Conduct a further maritime survey to recover, record and analyse artefacts prior to the commencement of works. Experience shows that this option is the most effective in managing impacts from an archaeological perspective.
2. Contract a maritime archaeologist to monitor dredging operations, including recovery, reporting and analysing artefacts. This option is often used in maritime and terrestrial archaeology but has inherit problems such as the potential to miss artefacts in dredge spoil or the potential to damage artefacts precluding effective recording.
3. Have a maritime archaeologist on call to investigate any finds during works. This allows for the investigation of unusual finds but has the same issues as point 2 above.

Table 9: Heritage Impacts and Risk to Heritage Features

ID	Heritage Site Name	Risk Description	Unmitigated impact of heritage values	Likelihood	Consequence	Risk Rating	Mitigation/Management	Residual Risk
1	Catalina Island	Changes in tide flows around island causes either erosion or depositional event	Sand bar at north of Catalina Island is lost as a result of changes to the hydrology.	Unlikely	Major	Medium	Monitor sediment mobility around island, including during construction and at completion of construction. Note that monitoring will not prevent impacts on the Catalina Sacred Site.	Low
2	Old Man Rock	Changes in tide flows around island causes either erosion or depositional event	Sediment deposits change as a result of changes in hydrology, impacting on the Sacred Site.	Very unlikely	Major	Low	Monitor sediment mobility around Old Man Rock during construction and at the completion of construction.	Low
2	Catalina Flying Boat Base RAAF Marine Section Slipway	Heritage feature will be covered with concrete	Destruction of heritage feature	Certain	Major	High	Heritage signage at entrance to the Darwin Ship Lift Facility showing images of FBB and brief history	Medium
3	Catalina Flying Boat Base Catalina Ramp	Heritage feature will be covered with concrete	Destruction of heritage feature	Certain	Major	High	Heritage signage at entrance to the Darwin Ship Lift Facility showing images of FBB and brief history	Medium
4	Catalina Flying Boat Base apron and fittings	Heritage feature will be covered with concrete	Destruction of heritage feature	Certain	Minor	Medium	Heritage signage at entrance to the Darwin Ship Lift Facility showing images of FBB and brief history	Medium
5	Lugger Maintenance Section	Accidental damages from machinery	Impact on heritage feature	Rare	Minor	Low	Site unlikely to be impacted upon during construction of Project	Low
6	Catalina 2	Changes in tide flows around site due to construction and increased flows due to propellor wash impacts on site	Increased flow mobilises Catalina 2 crash site aircraft components. Catalina 2 is in approx. 5.5 metres of water (chart datum LAT)	Possible	Moderate	Medium	This report recommends a pre- and post-construction condition assessment be undertaken on the Catalina 2 wreck site (see recommendation 10.1.3 below) and the establishment of an exclusion zone around the site	Low
7	Catalina 3	Changes in tide flows around the Project cause sediment deposition or erosion around the crash site.	Increased flow mobilises Catalina 3 crash site aircraft components.	Possible	Moderate	Medium	This report recommends a pre- and post-construction condition assessment be undertaken on the Catalina 3 wreck site (see recommendation 10.1.4 below).	Low

ID	Heritage Site Name	Risk Description	Unmitigated impact of heritage values	Likelihood	Consequence	Risk Rating	Mitigation/Management	Residual Risk
8	HCML1321	Current owners fail to move vessel to another storage	Potential for the vessel to be demolished and removed during construction	Possible	Moderate	Medium	Owners to move vessel prior to commencement of works	Low
9	Underwater Cultural Objects	Damage to remaining underwater cultural objects during construction	Remaining cultural objects destroyed without study.	Likely	Moderate	Medium	Maritime archaeologist on call to investigate artefacts recovered during dredging and construction.	Low

10 Project Recommendations

The following section outlines recommendations arising from this report. A site specific heritage management plan (HMP) is attached to this report as Appendix B.

10.1 Site Specific Recommendations

10.1.1 Catalina Island

a) Monitor changes in tidal flow and sediment mobility around Catalina Island. This should include monitoring the sand bar on the northern end of the island for changes in sediment deposition or erosion during construction and at the end of construction

10.1.2 Old Man Rock

a) Monitor changes in tidal flow and sediment mobility around Old Man Rock for changes in sediment deposition or erosion during construction and at the end of construction

10.1.3 Catalina 2

a) A maritime archaeological inspection of the Catalina 2 site should be undertaken prior to commencement of construction works. This site investigation should form part of a heritage condition assessment report that would be used in conjunction with previous heritage inspections of the site (i.e. Cosmos Archaeology 2014). The condition assessment report will be a baseline study by which future impacts, if any, can be assessed.
b) Plan to avoid physical impact on the Catalina 2 site by establishing an exclusion zone around the wreck site.
c) A second site inspection and condition assessment report should be prepared for the Catalina 2 wreck site twelve months after the Darwin Ship Lift Facility becomes operational. This investigation should be used to identify changes, if any, that have occurred to the site. Recommendations from the results of the comparison between this report and the baseline study should decide if further mitigation strategies and longer-term monitoring of the site would be required.

10.1.4 Catalina 3

Catalina 3 is located approx. 990 metres to the south-east of the Project Area and may be subject to altered hydrological conditions as a result of the construction of the Project. This report recommends:

a) A maritime archaeological inspection of the Catalina 3 site should be undertaken prior to commencement of construction works. This site investigation should form part of a heritage condition assessment report that would be used in conjunction with previous heritage inspections of the site. The condition assessment report will be a baseline study by which future impacts, if any, can be assessed.
b) A second site inspection and condition assessment report should be prepared for the Catalina 3 wreck site prior to commencement of operations. This investigation should be used to identify changes, if any, that have occurred to the site resulting from changes in the hydrology. Recommendations from the results of the comparison between this report and the baseline study should decide if further mitigation strategies and longer-term monitoring of the site would be required.

10.1.5 Catalina Flying Boat Base

a) Install appropriate heritage signage describing the FBB and LMS and their role in Darwin's history. This should be installed in a public place, possibly the current recreational boat ramp to the northeast of the LMS site.

10.1.6 HDML1321 Rushcutter

a) This report finds that HDML1321 may have some heritage significance to the people of the Northern Territory and Australia. It is beyond the scope of this report to make recommendations on its ultimate fate, however moving the vessel to another location would not impact on the vessel's remaining heritage value. Note that the responsibility to move the vessel remains with the current owners.

10.1.7 Underwater Cultural Objects

a) This report recommends using a qualified maritime archaeologist to be on call during dredging operations to investigate significant artefacts located in any spoil. Significant artefacts include aircraft engines, airframes, weapons, propellers etc. It is recommended to use the Northern Territory Government Heritage Branch maritime archaeologist where possible.

10.2 General Recommendations

a) Develop a site-specific Heritage Management Plan (HMP) for the Ship Lift planning and construction period. This HMP should include information on site heritage for contractor inductions.

10.3 Potential for Previously Undetected Aboriginal Archaeological Sites

The consultants believe that locating additional Aboriginal Archaeological sites is unlikely within the Ship Lift Project Area. However, if in the course of construction, further Aboriginal sites or artefacts are located, then work should be stopped immediately in that area and the Director of NT Heritage Branch contacted for further instruction. If human remains are located, refer to Appendix B, Heritage Management Plan for instruction.

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12 Appendix A: Sacred Sites Authority Certificate

13 Appendix B: Guidelines for the management of heritage features during construction of the Darwin Ship Lift Facility

Appendix B:

Heritage Management Plan, Darwin Ship Lift Project

Earthsea Pty Ltd

Version 1.2, 2021

Heritage Management Plan, Darwin Ship Lift Project

1. Scope of this document

This document is intended as a heritage management plan and quick reference guide to the management of heritage values during the construction phase of the Darwin Ship Lift Project. The document describes the actions required by managers, contractors and employees in relation to unforeseen circumstances such as the discovery of human remains or unexploded ordinance during the construction of the Darwin Ship Lift Facility. While these circumstances are unlikely to occur, contingency planning for such occurrences will lower risk to the Project and site personnel. This document should be stored with site managers and must be included in any site induction for staff, employees and contractors.

This management plan is intended as a practical guide and does not include an assessment of significance for the remaining features of the WWII RAAF Flying Boat Base. As noted in the report above, the RAAF Flying Boat Base was assess against the NT *Heritage Act* significance criteria and found to be significant to the Northern Territory. The document is intended as a 'living document', which is designed to be updated as required to maintain accuracy. The document includes sections with step-by-step instructions covering the following key risk area:

1. Discovery of human remains
2. Discovery of artefacts of Aboriginal origin
3. Discovery of submerged WWII artefacts
4. Discovery of unexploded ordinance

2. Discovery of Human Remains

Discovery of human remains is a relatively common event in Darwin Harbour. Human remains are generally divided into modern and traditional burials through police and coroner processes. Modern remains include those of missing persons and occasionally those resulting from misadventure or criminal activity.

Traditional burials are interred remains of Aboriginal origin resulting from traditional practices before or just after the settlement of Darwin. Police forensic professionals will determine if discovered remains are traditional or modern and will treat each case differently based on this assessment. Traditional burials are unlikely to be located on the Darwin Ship Lift Project Area. The following procedure complies with the provisions of the NT *Coroners Act* (Courtesy NT Heritage Branch).

What to do if human remains are found or suspected:

1. Stop work and secure the area. Human remains are sometimes disturbed in the act of discovery, but further impacts are to be avoided.
2. Establish a 50-metre exclusion zone for all personnel and activities.
3. The senior Ste Manager should immediately contact the NT Police assistance line on 131444. NT Police will contact the Senior Heritage Officer, NT Heritage Branch and the CEO of the Aboriginal Areas Protection Authority.

4. Resume work only after completion of Police and NT Heritage Branch investigations and appropriate removal of remains according to the NT *Coroners Act*.

3. Discovery of artefacts of Aboriginal origin

Archaeological sites and artefacts of Aboriginal origin are common around Darwin Harbour and hinterland. These sites and artefacts are protected under the NT *Heritage Act* and must not be disturbed without a permit under the Act. Archaeologists surveyed the ground surface of the Darwin Ship Lift Project Area prior to the commencement of construction work and no Aboriginal archaeological sites or artefacts were located. However, it is not possible to survey below the surface of the ground without extensive excavation.

The following procedure applies in the unlikely event of discovery of Aboriginal archaeological sites:

1. Stop work and secure the area.
2. Establish a 50-metre exclusion zone for all personnel and activities.
3. The senior Site Manager should immediately contact the Senior Heritage Officer, NT Heritage Branch on 08 8999 5010 or 0439 685 310. Note that contacting the NT Heritage Branch is compulsory under the Act.
4. Do not resume work in the exclusion zone until a clearance is given by the Senior Heritage Officer attending.
    a. Before work can recommence, there may also be a requirement to seek a permit through Heritage Branch i.e., an Application to carry out work on heritage place or object[1]

4. Discovery of submerged WWII artefacts

The Darwin Ship Lift Project Area was the site of a major World War II base known as the East Arm Flying Boat Base, run by the Royal Australian Air Force. Between 1943 and 1945 naval aircraft from the base flew missions into South East Asia and New Guinea in support of the Allied war effort. In the course of this activity, considerable amounts of aircraft debris, armaments and ammunition were dumped or dropped overboard within the Ship Lift Project Area. Two maritime surveys conducted in 2015 located and removed some of these artefacts but it is likely that some remain in place. The 2015 survey also recorded large quantities of bottle glass and other historical debris representing years of use. These artefacts are not protected by the NT *Heritage Act*, however it is important to record and remove significant artefacts from the site if possible. The following procedure applies to the discovery of significant submerged WWII artefacts, such as major aircraft, vessel, vehicle or armament components (e.g. wings, engines, fuselage, cockpit, land gear or machine gun parts):

1. Stop work and secure the area.
2. Establish an appropriate exclusion zone for all personnel and activities.
3. The senior Site Manager should immediately contact the Director NT Heritage or the Maritime Archaeologist , NT Heritage Branch on 89995010 or 89995036.

[1]https://nt.gov.au/leisure/arts-culture-heritage/visit-a-cultural-or-heritage-site/aboriginal-heritage-information

4. Do not resume work in the exclusion zone until a clearance is given by the Site Manager following consultation with the Senior Heritage Officer attending.

5. Discovery of unexploded ordinance (UXO)

As noted above, there is potential for the discovery of unexploded ordinance within the Ship Lift Project Area. In 2015, approx. 1000 0.50 calibre machine gun rounds were removed from an area near to the Ship Lift Project Area. Historical accounts note the loss of aerial bombs during rearming operations. While the Project Area and approaches have been surveyed by magnetometer in 2015, it is possible that some UXO remain insitu. If a UXO is suspected:

1. Stop work and secure the area.
    a. Do not touch or disturb the item in any way.
    b. Do not attempt to move the item to a 'safe' location.
2. Establish an appropriate exclusion zone for all personnel and activities.
3. If possible, take a photo of the potential UXO without further approaching or disturbing the item.
4. The senior Site Manager should immediately contact the NT Police on 131444 or 000 if it is an emergency. The NT Police will contact the appropriate Defence personnel to attend the site and dispose of the item.