NORTHERN TERRITORY GOVERNMENT

AECOM

Darwin Ship Lift Supplementary EIS

Prepared for
Department of Infrastructure, Planning and Logistics
ABN: 84 085 734 992

AECOM

Supplementary Environmental Impact Statement

Darwin Ship Lift Project

08-Jul-2022
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Executive Summary

Introduction

Since the submission and public exhibition of the Draft Environmental Impact Statement (EIS) in November 2021, the Darwin Ship Lift Project (the Project) has received public and government advisory agency comments. Parallel to the Northern Territory Environment Protection Authority (NT EPA) approvals process, a two-party Early Contractor Involvement (ECI) process has further progressed the Project design.

This Supplementary EIS has been developed to address comments from stakeholders on the Draft EIS while also providing updates based on the design refinements made to date. As the Project design has been further refined, impact assessments of key changes to the Project design have been considered and relevant mitigation strategies updated.

Design refinements

Several updates have been made to the design, which have a net beneficial outcome by reducing the overall potential environmental impact through design mitigation. The proposed design updates as a result of the ECI process have been considered in this Supplementary EIS.

Importantly, the proposed design mitigations largely respond to key concerns raised through the Draft EIS exhibition process by reducing the risks associated with marine, land-based transport, and resultant air and noise impacts.

The key design refinements made as part of the ECI process updates include:

- refined method of reclamation works
- decrease in piles required
- decrease in fill import
- decrease in rock import
- decrease in pavement import
- decrease in material transport
- increase in hardstand area
- minor increase in dredge volume.

Draft EIS Submissions

A total of 9 submissions were received on the Draft EIS. These consisted of 8 submissions from NTG Agencies and 1 public submission. Additional information to be included in the Supplementary EIS was also provided by the NT EPA which requested further information on specific agency submissions. The submissions and subsequent studies or further responses are discussed below.

Air Quality and Greenhouse Gases

The DEPWS comments on Air Quality and Greenhouse Gases requested further modelling and assessment in accordance with the NSW Approved Methods, and additional assessment of fugitive emissions, VOC emissions and additional sensitive receptors.

The Air Quality Impact Assessment (AQIA) for the Draft EIS was undertaken in accordance with the approved Terms of Reference (ToR) for the Project, which does not specify the use of NSW Approved Methods. To address the DEPWS submission, a sensitivity analysis was conducted comparing the NSW Approved Methods and the method adopted for the Project's AQIA. Differences between the two methods were identified and were found to have no significant influence on the results of the original AQIA for the Project.

Further discussion of fugitive and VOC emissions has been provided. The discussion highlights that the modelling inputs in the Draft EIS are based on conservative assumptions, and that with these conservative assumptions the modelling did not predict exceedance of air quality goals at sensitive

receptors for any pollutant species. To aid in understanding potential impacts outside the boundary of the site, as required by the NSW Approved Methods, an additional contour plot was also developed for VOCs.

Additional sensitive receptor locations identified by DEPWS at the suburbs of Weddell, Mitchell and the Elizabeth River boat ramp have been discussed further. These additional receptors have not been included in modelling on the basis that the modelling undertaken for the Draft EIS has not predicted any exceedances of the adopted air quality goals at these locations.

Noise

In response to the DEPWS comments on noise impacts of the Project, additional background monitoring was conducted at locations considered to be at the highest risk of receiving Project related noise impacts. The findings from the additional data collected did not change the assessment conducted for the Draft EIS, but provides further confidence for the noise criteria levels set for the Project for both operation and construction phase. As with air quality, further assessments were also conducted on the Project's activities such as abrasive blasting, with no material changes to the impact assessment presented in the Draft EIS identified.

Marine Environmental Quality

The DEPWS comments on the Draft EIS related to the Project's reclamation methodology, water quality trigger values and cumulative impacts. A key concern raised by DEPWS was around the considerations of sediment suspension from reclamation activities. The Draft EIS also received one public submission from Environment Centre Northern Territory (ECNT) regarding the dredging campaign.

Design refinements from the ECI process have developed a methodology incorporating a bunded reclamation area to separate potential water quality impacts occurring during the reclaim process from Darwin Harbour. This updated methodology, alongside mitigation measures developed as part of the Draft Dredging and Dredge Spoil Disposal Management Plan (DDSPMP) (included as an appendix to this report) will reduce the risk of sediment plume impacts generated as a result of Project activities.

The management of tailwater and water quality targets were also raised by DEPWS. In response, the tailwater management process using the East Arm dredge ponds and similar monitoring and mitigation methodologies applied for previous dredging campaigns in East Arm has been further detailed.

While trigger values have been further considered as part of developing the Draft DDSPMP, no further updates were found to be required.

Finally, cumulative impacts from multiple dredging campaigns were further considered through liaison with other Proponents planning future dredge campaigns in Darwin Harbour. The Project's zones of impact during its dredging program is not anticipated to spatially align with other campaigns throughout its duration.

Marine Flora and Fauna

The DEPWS commented on the Draft EIS related to the impacts of Project activities on marine flora and fauna and communities. Specifically, the impacts of night-time construction activities, light availability and habitat mapping of benthic communities and management measures for marine species. The Draft EIS also received one public submission from ECNT relating to underwater noise and impacts on marine species.

In response to these comments, detailed environmental management framework (EMF) strategies have been developed for vessel interactions, underwater noise from piling and dredging alongside lighting recommendations and the implementation of vessel speed limits. These EMFs provide targets, key performance indicators, management, mitigation measures and reporting requirements that will be applicable throughout the Project's construction.

The habitat mapping for benthic communities developed as part of the Draft EIS was also updated based on new information released after the submission of the Draft EIS. In response to the submissions, the Proponent has completed further habitat condition surveys of the benthic communities at South Shell Island and Catalina Island.

Social, Cultural and Economic Surrounds

The AAPA comments on the Draft EIS related to the AAPA certificate requirements. Specifically, that no damage is to occur to the sacred sites nearby the Project. The Proponent is committed to managing and monitoring potential impacts through the deployment of mitigation measures such as, the deployment of silt curtains and monitoring of the dredge plume outlined in the Draft Dredging and Dredge Spoil Management Plan as well as mitigation measures such as vessel speed limits and No-Go Zones to be outlined in the Construction Environmental Management Plan.

The Heritage Branch comments on the Draft EIS identified concerns relating to the Flying Boat Base (FBB), specifically the conservation of its heritage values. The Proponent has committed to providing data that has been recorded for the Project to date, alongside maritime surveys and the display of public signage. These future works will be conducted in liaison with the Heritage Branch and will also involve further development of a Heritage Interpretation Plan.

DIPL comments on the Traffic Impact Assessment requested further information on the mitigation measures for truck use during Project construction. Following improvements identified through changes in construction methodology, truck movements are expected to be significantly reduced (~75 %) and sources of material have been located closer to the Project. This has been identified as a key reduction in transport impact for the Project. Furthermore, the NTG is committed to trialling a Heavy Vehicle Priority System. This will allow uninterrupted truck movements outside of peak hours and will further reduce the potential impacts associated with trucks stopping and starting frequently.

DCMC also requested further information on the economic figures and studies that were used in the Draft EIS. The ACIL Allen (2019) report and subsequent discussions and analysis Government has undertaken includes information that was commercial-in-confidence at the time, and remains so, which was the basis of the full economic information not being included in the Draft EIS. The economic figures are also discussed further, including the Proponents approach to addressing uncertainty around the Project's economic potential.

Environmental Management

The DEPWS comments on the Draft EIS requested further information on the environmental management plans for the Project's construction and operation. Draft Construction Environmental Management Plans have been developed for the construction of the Project by the ECI contractors and submitted to the NTG as part of the tender submissions. However, due to the stringent probity requirements of the two-party ECI process, these plans are unavailable for disclosure. These environmental management plans were informed by the EMF presented in Chapter 13 of the Draft EIS.

A Draft DDSPMP (included in this SEIS) has been prepared in accordance with NT guidelines to provides more detailed mitigation strategies that minimise impacts to Darwin harbour ecosystems. This document will inform the Dredging Contractor's DDSPMP which will be submitted for approval prior to commencement of dredging.

The EMF in Chapter 13 of the Draft EIS has been updated to consider stakeholder comments and design refinements and has been upgraded to a standalone document (included in this SEIS) to inform stakeholders on the required management and mitigation measures for the construction and operation of the Project. The final construction environmental management plans for the Project will be reviewed by DIPL and in the case of the DDSPMP will also be reviewed by an independent expert.

Supplementary EIS Outcomes

This Supplementary EIS has addressed stakeholder submissions on the Draft EIS which has included undertaking supplementary baseline surveys and impact assessment modelling to review and update the Draft EIS. These assessments mostly reaffirmed the Draft EIS outcomes and were mostly found not to materially change the nature or scale of Project impacts. Design refinements undertaken as part of the ECI process have also been considered and were overall found to have a net environmental benefit compared to the Draft EIS. These design refinements, and updated Environmental Management Plans (Draft DDSPMP & updated EMF) have further reduced environmental risks associated with reclamation activities, and mostly reduced impacts to key environmental factors.

1.0 Introduction

1.1 Overview

The Northern Territory Government (NTG) is delivering the Darwin Ship Lift Project (the Project) which comprises of the construction and operation of a ship lift facility and an adjacent maintenance facility at East Arm, Darwin. The Proponent of the Project is the NTG. The early design and procurement of the Project has been managed by a dedicated NTG Ship Lift Project Team within Department of the Chief Minister and Cabinet (DCMC). Final procurement and construction will be managed by the Department of Infrastructure, Planning and Logistics (DIPL).

The location of the Project at East Arm is consistent with long-term master planning for Darwin. The NTG has been developing land at East Arm for marine industries since 2004 and in 2014, proposed to include a ship lift as part of the development of its East Arm Marine Industry Park. The NTG's vision is for the Project to be enabling economic infrastructure that will grow the maritime sector and enhance Darwin's competitive advantage as a marine repair, maintenance and sustainment centre for Northern Australia. Government and business stakeholders suggest the facility will be foundational infrastructure for a marine services precinct, consolidating a range of marine services on the East Arm Peninsula.

In November 2018, the Northern Territory Environment Protection Authority (NT EPA) determined that the Project requires assessment under the *Environmental Assessment Act* 1982 at the level of an Environmental Impact Statement (EIS). To address the Terms of Reference (ToR) developed by the NT EPA the Proponent prepared a Draft EIS.

The Draft EIS was submitted to the NT EPA in early November 2021 and was subsequently circulated to NT Government Advisory Agencies. The public exhibition of the Draft EIS ran from 12 November 2021 until 14 January 2022.

1.2 Summary of Submissions

On 11 April 2022 direction to prepare a Supplement to the Draft Environmental Impact Statement (Supplementary EIS) was provided to the Proponent by the delegate of the NT EPA under section 12(3)(a) of the Environmental Assessment Administrative Procedures (1984).

A total of 9 submissions were received on the Draft EIS. These consisted of 8 submissions from NTG Agencies and 1 public submission. Additional information to be included in the Supplementary EIS was formally provided by the NT EPA on 11 April 2022. Table 1 summarises the key factors that the submissions focused on and described in the final ToR document for the Project. Individual comments and the Proponents response are provided in Section 3.0, with the full comments list found in Appendix A: Summary of Submissions Received and Cross Reference Table.

Table 1 Submissions received on the Draft EIS

Key Environmental Factor	Objective	NTG agency comments (8 submitters)	Public comments (1 submitter)
Air quality and Greenhouse Gas	Maintain air quality and minimise emissions and their impact so that environmental values are protected.	4	N/A
Marine environmental quality	Maintain the quality and productivity of water, sediment and biota so that environmental values are protected.	10	3
Marine flora and fauna	Protect marine flora and fauna so that biological diversity and ecological integrity are maintained.	4	4

Key Environmental Factor	Objective	NTG agency comments (8 submitters)	Public comments (1 submitter)
Social, economic and cultural surroundings	Protect the rich social, economic, cultural and heritage values of the Northern Territory.	10	N/A
Other	Other items not associated with the key environmental factors raised by the final ToR.	11	N/A

1.3 Structure of this Supplementary EIS

The structure of this Supplementary EIS is designed to complement the Draft EIS. This document is organised as follows:

- Section 2.0 outlines the progression of Project design updates following a two-party Early Contractor Involvement (ECI) design process. This process has progressed the concept design and through design mitigation has further reduced environmental impacts.
- Section 3.0 and 4.0 present individual submissions received from NTG agencies and the public alongside the Proponents Response to addressing each submission.
- Section 5.0 presents further information formally requested by the NT EPA on 11 April 2022 alongside the Proponents Response to addressing the request for information.
- Section 6.0 presents changes and an errata list to the Draft EIS resulting from addressing submissions or further considering Project design refinements proposed to be implemented through the ECI design process. These sections should be read in conjunction with their corresponding chapter or appendix within the Draft EIS.
- Section 7.0 discusses the changes from the ECI design process presented in Section 2.0 and provides an updated impact assessment for relevant changes. These updated impact assessments have been used to review and revise the Project's Risk Register (Appendix D), and Environmental Management Framework (Appendix E).

The document is further supported by the following appendices:

- Appendix A: Summary of Submissions Received and Cross Reference Table
- Appendix B: Operational Noise Figures
- Appendix C: Draft Dredging and Dredge Spoil Placement Management Plan
- Appendix D: Updated Risk Register
- Appendix E: Updated Environmental Management Framework.

2.0 Project Update

2.1 Design Refinement Overview

Following the submission of the Draft EIS in November 2021, the Project procurement for the detailed design and construction of the Darwin Ship Lift Project has progressed with the selection of two preferred contractors who have participated in an Early Contractor Involvement (ECI) process to tender for the contract to deliver the Project through design and construction.

The short-listed contractors have continued to progress the concept design in parallel but separate to each other, and have submitted final tender submissions to the NTG which are currently being considered for award.

Several updates have been made to the design, which have a net beneficial outcome by reducing the overall potential environmental impact through design mitigation. The proposed design updates as a result of the ECI process have been considered in this Supplementary EIS.

However, given that these ECI concept designs cannot be released at this time (due to being in an active procurement process), the NTG has reviewed the designs and has provided inputs into the revised impact assessment process documented through the Supplementary EIS by providing an overarching design change that is able to be applied across both ECI submission designs.

As part of the ECI process, Contractors have included the following draft management plans as part of their tender submissions including:

- Construction Environmental Management Plan
- Construction Management Plans
- Marine Works Management Plans
- Traffic Management Plans
- Stakeholder Management Plans.

Each of the ECI contractors are committing to environmental requirements described in the Draft EIS, as illustrated through the development of construction methodologies and designs to minimise impacts to the environment, and as also required through the construction contract. Any additional environmental requirements that result from the updated Environmental Management Framework (EMF) through the Supplementary EIS process will be covered by Provision Sum items which have been allocated by the Proponent.

Project design updates proposed by the ECI contractors have not materially altered the concept reference design as presented in the Draft EIS Project Description (Chapter 2). However, aspects of the Project design that have progressed to a point whereby the “worse-case-scenario” (as presented in the Draft EIS) can be refined, are presented in Table 2 below.

These updates to the design may further improve (depending on which ECI contractor is selected through the ECI procurement process) but are able at a minimum to be achieved by both submissions and are therefore considered to be appropriate for updating the impact assessment, and to review and update the risk assessment and proposed mitigation strategies in the EMF.

Importantly, the proposed design mitigations largely respond to key concerns raised through the EIS exhibition process by reducing the risks associated with marine, land-based transport, and resultant air and noise impacts.

The key design refinements made as part of the ECI process updates include:

- refined method of reclamation works
- decrease in piles required
- decrease in fill import
- decrease in rock import
- decrease in pavement import
- decrease in material transport
- increase in hardstand area
- minor increase in dredge volume.

These updates are further described in (Table 2) and detailed in Section 2.2. Design updates are considered in responding to submissions to the Draft EIS, and updating the Impact Assessment in Section 7.0 of the Supplementary EIS.

Table 2 Design refinements following ECI process

Design Aspect	Draft EIS Design	Current Design	Impact update	Impact on Relevant Environmental Factor*				Other Environmental Factors
				Air Quality and Greenhouse Gas	Marine Flora and Fauna	Marine Environmental Quantity	Social, economic, and cultural surroundings	Noise
Reclamation method	Progressively fill from the shoreline in a seaward direction until the extent of the proposed reclamation is reached	Construction of a bund (rock revetments) at the outer edge of the reclaim area prior to the placement of dredge spoil within the reclaim area.	Reduced risk of sediment impact resulting from land reclamation. Potential improvements to water quality and reduction to impacts on marine flora and fauna.	**No Change**	**Significantly reduces submitters concern about impact risk**	**Significantly reduces submitters concern about impact risk**	**Significantly reduces submitters concern about impact risk (cultural heritage)**	**No Change**
Piling	Up to 485 piles	Up to 300 piles	Significantly reduced pile numbers from Draft EIS. This will substantially reduce the duration of piling noise.	**Minor improvement**	**Substantial Improvement**	**No Change**	**No Change**	**Substantial Improvement**
Fill import	400,000 m^3 from up to 20km away from the Project site	Up to 100,000 m^3, with the potential to obtain most from within 5 -10 km of the Project site	Significantly reduced volumes of imported fill requirement due to the use of dredge spoil within the reclaim area. The balance of fill is likely to be sourced from within 5 - 10km of the Project site.	**Substantial improvement**	**No Change**	**No Change**	**Substantial Improvement (traffic)**	**Minor improvement**
Rock and pavement import	62,500 m^3 of filter and armour rock	40,000-55,000 m^3 of filter and armour rock	Up to 35 % decrease in rock armour required. Additionally, up to 9,600 m^3 of rock can be acquired from the site meaning less rock imported.	**Minor improvement**	**No Change**	**No Change**	**Substantial Improvement (traffic)**	**Minor improvement**
	90,000m^3 of pavement material sourced from Mt Bundy	Approximately 60,000m^3 of pavement material	Significantly less imported pavement material (Approximately 30% decrease), which is sourced from Mt Bundy.	**Minor improvement**	**No Change**	**No Change**	**Substantial Improvement (traffic)**	**Minor improvement**
Transport	Approximately 13,000 trips	Approximately 3,000 trips	Total truck movements are dramatically decreased from what was presented in the Draft EIS (Approximately 75% decrease). This is due to less imported material required and a greater truck capacity than was presented in the Draft EIS.	**Substantial improvement**	**No Change**	**No Change**	**Substantial Improvement (traffic)**	**Minor improvement**
Hardstand	14.3 ha ○ 5.5 ha existing land ○ 8.8 ha reclaim	Approximately 16 ha ○ 5.5 ha existing land ○ 10.5 ha reclaim	An additional 1.7ha of reclaim area, within the disturbance area presented in the Draft EIS.	**Minor increase No material changes to Impact Assessment**	**Minor increase No material changes to Impact Assessment**	**Minor increase No material changes to Impact Assessment**	**No Change**	**Minor increase No material changes to Impact Assessment**
Dredge volume	500,000 m^3 ○ 185,000m^3 unconsolidated ○ 315,000m^3 consolidated	Up to 520,000 m^3 ○ 70-100% to be used in reclaim	Minor increase (4 %) in dredging may be required.	**Minor increase No material changes to Impact Assessment**	**Minor increase No material changes to Impact Assessment**	**Minor increase No material changes to Impact Assessment**	**No Change**	**Minor increase No material changes to Impact Assessment**

* The revised impact assessment consideration to support the design mitigation updates is provided in Section 7.0

2.2 Design Refinement Considerations

As described in Table 2 and as considered in the updated Impact Assessment in Section 7.0 of the Supplementary EIS, the following updates have been identified through the ECI designs.

2.2.1 Refined Method of Reclamation Works

Dredging methodologies proposed by the ECI contractors have included the creation of a bund (rock revetments) at the outer edge of the reclaim area prior to the placement of dredge spoil within the reclaim area. The contractors have proposed this method for the following reasons:

- decoupled dredging and reclaim activities, therefore one is not wholly reliant on the other
- creates a work front from which berth construction can occur concurrently with dredging and reclaim activities
- eliminates the impacts of the large tides on activities
- reduces the environmental impacts associated with the reclaim activities.

At this stage two potential construction strategies are proposed to develop the reclaim area:

1. The bund wall will be developed to fully enclose the reclaim area prior to the placement of dredge spoil within the bund wall.
2. The bund wall will mostly encapsulate the reclaim area, with an opening along the western side to allow barges to enter the reclaim area to deposit the dredge spoil. The opening will have silt curtains across its width to prevent suspended sediment from entering the harbour.

The bund wall will provide a suitable work platform that will not deteriorate, erode or present safety concerns when subject to tidal inundation. For this reason, the bund construction will use a crushed rock material of varying sizes with the fine sediment fraction removed. The addition of silt curtains and geotextile coverings over the bund wall may be included (if required) to further reduce the likelihood of sediment from the reclaim works leaving the reclaim area.

To further mitigate sediment impacts during the construction of the bund wall, either of the following will be implemented:

- The soft sediment will be removed to the Darwin Port dredge spoil ponds prior to the construction of the bund wall.
- Construction will utilise the mass of the progressively advancing bund to push/displace the fines sediments from under the bund footprint. Silt curtains will also be used during this construction method.

These management measures will be incorporated into the contractors final Dredging and Dredge Spoil Placement Management Plan (DDSPMP).

2.2.2 Decrease in Piles Required

The Draft EIS modelled a conservative worst-case scenario for the number of piles required for the Project. The total number of piles required for the Project based on the ECI designs will be significantly less than estimated in the Draft EIS. The key impacts of less piles required will be a reduction in the transport associated with getting the piles to site and a reduction in the duration of the piling works themselves thereby reducing the duration of terrestrial and underwater noise.

2.2.3 Decrease in Fill Import

The Draft EIS modelled a conservative worst-case scenario for the import of general fill, which included all material for land reclamation being exported from offsite. Current construction methodologies have between 70% and 100% of the dredge spoil being suitable for use within the reclamation area. There are additional sources of clean fill close to site that can be utilised for this Project, including 60,000 m^3 from the eastern side of the Common User Facility, 400 m northeast of the Project site. The Proponent is also investigating opportunities to obtain fill from a site approximately 5km to the north of the Project

site and also suitable dredge spoil from other projects if programs align. These include from the Mandorah New Marine Facilities Project and the SANTOS Barossa Pipeline Project.

The net result is a significant decrease in the amount of general fill anticipated to be required to be imported for the Project, from 400,000 m^3 proposed in the Draft EIS, to the current estimate of up to 100,000 m^3.

2.2.4 Decrease in Rock and Pavement Import

The quantities of rock and pavement material anticipated to be required for the Project by the ECI contractor designs is significantly less than the volumes estimated in the Draft EIS (i.e. approximate reduction of up to 35%). These materials are largely sourced from Mt Bundey on the Arnhem Highway approximately 100 km from the Project site.

2.2.5 Decrease in Material Transport

The abovementioned reduction in general fill, rock and pavement required for the Project, from what was presented in the Draft EIS, has led to a decrease in the total truck movements anticipated for this Project. Additionally, the modelling undertaken for the Traffic Impact Assessment (Appendix L: Traffic Impact Assessment of the Draft EIS) suggested a truck capacity (60 t per truck) that was significantly less than the legal road limit (120 t per truck). A decreased volume required and an increased truck capacity (100 t per truck) sees the total truck movements decreased from approximately 13,000 as presented in the Draft EIS to approximately 3,000 trips.

2.2.6 Increase in Hardstand Area

The Draft EIS estimated that 14.3 ha of hardstand would be required for the Project, of which 5.5 ha would be developed on existing land and 8.8 ha would be developed through land reclamation over the intertidal area to the south of the Project footprint. Following the ECI process an additional 1.7 ha is proposed to be reclaimed to the south of the Project footprint, increasing the total area of hardstand to 10.5 ha. This change is proposed to occur within the disturbance area presented in the Draft EIS.

2.2.7 Minor Increased in Dredge Volume

Due to refinements of the reclamation works and an increase in total hardstand area there has been a minor increase in the amount of dredging required for the Project. The Draft EIS estimated that a total of 500,000 m^3 of dredged material would be required for the Project. Following ECI design updates, this estimate has increased by approximately 4% up to 520,000 m^3. While this presents a minor increase in dredged material, it is now proposed to utilise 70 % to 100% of the dredge spoil as part of the land reclamation fill as a result, reducing the amount of fill import for the Project and thereby substantially decreasing the amount of truck related road transport.

2.2.8 Managing Ongoing Design Refinement

The current Project designs are described as “developed designs”, meaning they are beyond concept and approaching a detailed or final design stage. While it is anticipated that changes in the design moving forward will continue, these are unlikely to materially change the environmental impacts to an extent that cannot be appropriately mitigated through environmental management.

The Project has put in place a robust Environmental Management Framework (see Appendix E) to ensure that design changes are appropriately considered by the successful ECI contractor during the ongoing design phase and through the construction phase. This is particularly the case for key environmental risk associated with marine values.

In the case that ongoing future design refinement requires design changes that could materially increase the environmental impact of the Project beyond that described in the Draft EIS, and unable to managed through the EMF, then a variation to the Project will be sought from the NT EPA.

2.3 EPBC Referral Update

A Referral under the EPBC Act (1999) was lodged, and subsequently validated by Department of Agriculture, Water and Environment (DAWE) in August 2021 (2021/9002). An Action Decision made under Section 75 and Section 87 of the EPBC Act was provided by DAWE on 9 December 2021. The Project was determined a “Controlled Action” and requiring assessment and approval under the EPBC

Act. It was determined that the Project may have a significant impact on the following controlling provisions under the EPBC Act:

- Listed threatened species and communities
- Listed migratory species.

The Decision on Assessment Approach determined the Project is to be assessed via Preliminary Documentation. A request for additional information for the Preliminary Documentation was provided by DAWE on 2 February 2022. The Preliminary Documentation is currently being prepared.

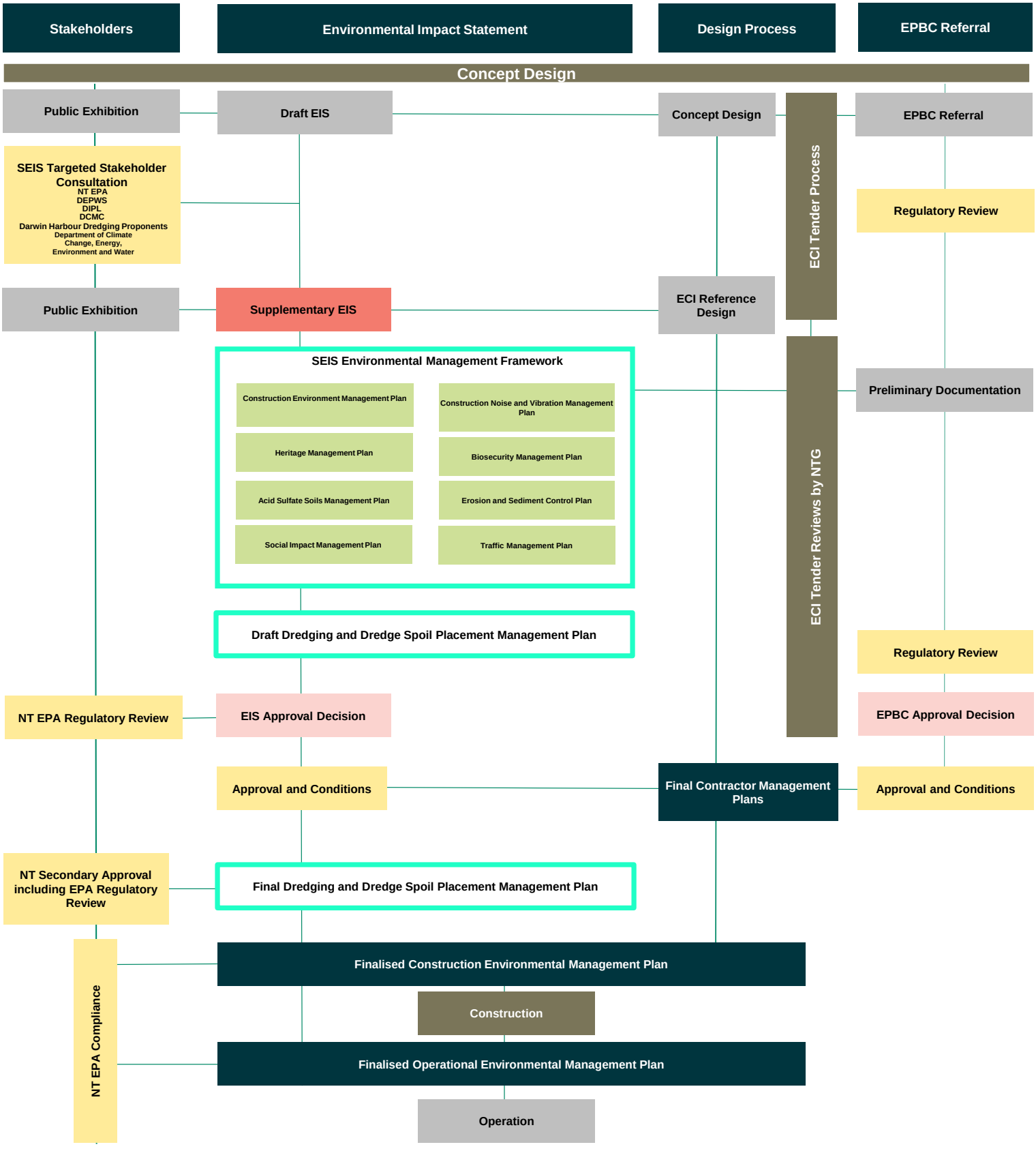
2.4 Approvals Management and the ECI Process

The current management of the Project is described in Figure 1, which displays a conceptual timeline of the following programs:

- the EIS process under Northern Territory approvals
- the Project design process
- stakeholder interaction following the Draft EIS submission
- Commonwealth approvals process.

Figure 1 details the current stage of the EIS (currently at the Supplementary EIS stage) alongside the suite of environmental management plans that have been developed as part of the Draft EIS and design submissions. It also shows the environmental management plans and approval requirements that will be developed before construction begins.

Figure 1 Project design and approval process



3.0 Response to submissions - Submissions from Northern Territory Government Agencies

The following Section provides responses to NTG agency submission on the Draft EIS. The responses have been prepared on behalf of the Proponent by AECOM and their specialist subconsultants, unless otherwise stated. A full copy of all agency submissions is provided in Appendix A.

3.1 Air Quality

3.1.1 DEPWS Comments

Air quality impact assessment (AQIA) must be conducted as per NSW approved methods using the Level 2 assessment method. Modelled concentrations must be assessed against recommended criteria provided in the document, noting that the values used for some primary air pollutants are equivalent to values used in the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) standards and some of these standards were strengthened recently. Cumulative impact of primary air pollutants are assessed at identified receptor sites and incremental impact of toxic air pollutants are assessed at and beyond the boundary of the development.

Fugitive emissions must be included in the emissions inventory for the model. Examples of fugitive emissions include dust from stockpiles and the volatilisation of vapour from vats, open vessels, or spills and materials handling. Abrasive and abraded surface coating materials that cannot be fully contained in the blast and paint facility may become airborne during the abrasive blasting process, and these fugitive emissions must be modelled.

The Elizabeth River Boat Ramp and the future suburbs of Weddell and Mitchell should be included as sensitive receptors.

In addition to xylenes, there are several toxic compounds and odorous compounds in paint emissions and the AQIA of these should assessed, as well as the heavy metals in emitted abrasive material.

3.1.2 Proponent Response

DEPWS has provided four overarching comments as submissions to the Draft EIS, which suggested revision of the AQIA and remodelling.

A meeting was held including AECOM and DEPWS representatives on Friday 11 March 2022, during which the DEPWS submission to the Draft EIS was discussed. Agreement was reached regarding the approach to addressing DEPWS comments and providing further information for the basis of the methodology undertaken for the Draft EIS.

AECOM has responded to the comments from DEPWS in this section. For clarity, the responses to the comments are grouped by topic, rather than in order of the comment provided, as follows:

- **Section 3.1.2.1** addresses the adopted air quality assessment methodology for the Project and use of the *Approved Methods for Modelling and Assessment of Air Pollutants in NSW* (NSW EPA 2017).
- **Section 3.1.2.2** addresses the assessment of fugitive emissions from construction and operation of the Project.
- **Section 3.1.2.3** addresses the assessment of additional sensitive receptors of concern
- **Section 3.1.2.4** addresses assessment of additional pollutants of concern.

3.1.2.1 NSW Approved Methods for Modelling

There are no prescribed requirements from either Northern Territory Government guidelines or the Project's Terms of Reference to undertake AQIA using any specific assessment method. Specifically, assessment in accordance with the NSW Approved Methods for Modelling (NSW Approved Methods) Level 2 assessment methodology was not a requirement for the AQIA.

As such the approach that was adopted for undertaking the AQIA was developed specifically for the Project and is based on the requirements of the approved Terms of Reference and guidance from a

variety of relevant guidelines and documents primarily originating from Queensland, but also considering air quality goals from New South Wales (NSW) and Victoria.

The outcomes of the modelling completed for the Draft EIS showed that the impact to air quality from the Project is not considered significant. A sensitivity analysis was conducted to assess the NSW Approved Method and the method adopted for the Project. Based on this analysis the overall impact is not expected to change if the NSW Approved Method were adopted, as such it is not proposed that further modelling is undertaken. However, a summary is provided below in Table 3 to compare the approach adopted in the Draft EIS with the requirements of the NSW Approved Methods Level 2 assessment method, as identified in the DEPWS submission.

Table 3 Comparison of NSW Approved Methods Level 2 methodology and the Draft EIS methodology

Aspect	NSW Approved Method Level 2 Methodology Requirement	Draft EIS Methodology Comparison
Project emissions	Site specific emissions inventory	Consistent
Meteorological data	Site-specific meteorological data or site representative meteorological data, determine mixing height and stability class using recommended methods	Consistent
Background air quality data (Contemporaneous)	Use of contemporaneous (hourly varying) monitoring data as background concentrations for pollutant species. At each receptor, add hourly varying dispersion model predictions to the corresponding measured hourly varying background concentrations to assess cumulative impact	Consistent for NO_2
		Not consistent for other pollutant species due to different methodology applied (PM_{10}, $PM_{2.5}$, SO_2 and CO) or absence of monitoring data in the Northern Territory (VOCs)
Application of assessment criteria (excluding air toxics)	Cumulative impact is assessed against criteria at the nearest existing or likely future off-site sensitive receptor, and the Project contribution to cumulative must be reported	Consistent
	Background concentrations must be included using ambient monitoring data	Consistent
	Cumulative impact (incremental impact plus background) must be reported as the 100th percentile	Consistent
Application of assessment criteria for air toxics (VOCs)	Incremental impact assessed at and beyond the boundary of the development	Not consistent, incremental impact not assessed at and beyond boundary
	The incremental impact for each pollutant must be reported in concentration units consistent with the criteria and as the 99.9th percentile of dispersion model predictions for Level 2 impact assessments	Consistent

As shown above in Table 3, the method adopted for the Draft EIS AQIA is generally consistent with the method prescribed by the NSW Approved Methods with the exception of the following items:

- Use of contemporaneous (hourly varying) monitoring data as background concentrations for pollutant species.
- Incremental impact of VOCs assessed at and beyond the boundary of the development

The impact of the use of contemporaneous monitoring data for the assessment is provided below. Further discussion on the assessment of the incremental impact of VOCs at and beyond the development boundary is provided in Section 3.1.2.4.

Background Air Quality Data

Two methods were used in the AQIA for considering background air pollutant concentrations:

- For the assessment of nitrogen dioxide (NO2), contemporaneous monitoring data for oxides of nitrogen (NOx) and ozone (O3) were used following the Ozone Limiting Method (OLM) as described in Section 8.1.2 of the NSW Approved Methods.
- For the assessment of particulate matter (PM10 and PM2.5), carbon monoxide (CO), sulfur dioxide (SO2), and volatile organic compounds (VOCs) the 70th percentile of measured pollutant concentrations was adopted as the background concentration for assessment of the 1 hour and 24 hour air quality goals, with measured annual average concentrations adopted as the background for pollutants with annual average goals.

This method described above is the method prescribed by the Brisbane City Council Air Quality Planning Scheme Policy (AQPSP), which is applied widely in Queensland.

It is noted that monitoring of VOCs is not undertaken in the Northern Territory. Due to the absence of VOC monitoring data, cumulative assessment of VOC emissions using contemporaneous monitoring data is unable to be undertaken as it requires site representative monitoring data which is not available for VOCs.

To determine the potential influence of the use of contemporaneous monitoring data on the outcomes of the AQIA (for PM_{10}, $PM_{2.5}$, CO and SO_2) a sensitivity analysis was undertaken for the construction phase modelling which assessed PM_{10}, $PM_{2.5}$, CO and SO_2. The sensitivity analysis considered maximum predicted incremental Project concentrations at sensitive receptors, added to the measured maximum background concentrations from the Northern Territory Environment Protection Authority (NT EPA) monitoring stations for each pollutant species.

The sensitivity analysis was completed for pollutants with short-term average goals (1 hour and 24 hour) as annual average predictions would not change with the use of contemporaneous background data. It is highlighted that this sensitivity analysis is highly conservative as contemporaneous background concentrations fluctuate hour by hour and the likelihood that the maximum background concentration would coincide with the maximum predicted Project contribution is low. The results of the sensitivity analysis are presented in Table 4 below.

Table 4 shows that the cumulative concentrations at the worst affected receptor using the maximum background concentrations from NT EPA stations are compliant for CO and SO_2 for all averaging periods. Therefore, for these pollutants, the use of the contemporaneous method would have no influence on the results of the AQIA.

Table 4 also shows that the cumulative concentrations at the worst affected receptor using the maximum background concentrations are not compliant for PM_{10} and $PM_{2.5}$. However, the exceedances are the result of elevated background concentrations of PM_{10} and $PM_{2.5}$, which exceed the air quality goal without contribution from the Project. AECOM has reviewed NT EPA air quality monitoring reports for the years 2017, 2018 and 2019, and determined that all measured concentrations which exceeded the PM_{10} and $PM_{2.5}$ goals in these years were the result of bushfires and vegetation burning. These events are classified as “exceptional events” and are excluded by the NT EPA when assessing compliance against the National Environment Protection (Ambient Air Quality) Measure air quality goals.

The 70^{th} percentile concentration approach for background air quality as adopted in the AQIA is well suited to scenarios when elevated concentrations occur as a result of exceptional events. With respect to the Project, the method adopted for the assessment of PM_{10} and $PM_{2.5}$ is considered robust. As discussed in Chapter 9 of the Draft EIS, the impact of the Project on air quality is not predicted to be significant.

For projects where background concentrations are elevated due to exceptional events, the NSW Approved Methods Level 2 approach requires that the number of additional exceedances resulting from Project emissions is determined. In the case of the Project, despite the minor contribution to PM_{10} and

$PM_{2.5}$ concentrations at sensitive receptors (refer Table 4), additional exceedances would occur on days which are affected by exceptional events for which measured concentrations are slightly below the air quality goal. On this basis it is considered that the use of the NSW Approved Methods Level 2 approach does not offer further clarity on the severity of the impact of Project emissions.

National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) 2021

In absence of Northern Territory specific air quality goals, the AQIA was undertaken considering air quality goals from Queensland, NSW and Victoria, specifically:

- Queensland Government Environmental Protection Policy (EPP) (Air) (2019),
- New South Wales Environment Protection Authority (NSW EPA) Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2016), and
- Victoria Government Environment Reference Standard and Guideline for Assessing and Minimising Air Pollution in Victoria.

The air quality goals prescribed within the *National Environment Protection (Ambient Air Quality) Measure* (AAQ NEPM), which was amended in 2021, are more stringent than the air quality goals prescribed by the Queensland, NSW and Victorian documents listed above for NO_2 and SO_2. A comparison of air quality goals across states and criteria is provided in Table 3.1 of Appendix J: Air Quality and Greenhouse Gases Technical Report of the Draft EIS.

Table 4 shows that if the AAQ NEPM goals for NO_2 and SO_2 were adopted for the AQIA, compliance would still be consistent for the worst affected sensitive receptor, and therefore would be achieved for all sensitive receptors, regardless of the approach to background air quality (e.g. either 70^{th} percentile or maximum background as a surrogate for contemporaneous assessment).

Table 4 Sensitivity analysis of maximum background results and NEPM AAQ 2021 criteria for the construction phase

Pollutant	Averaging period	Adopted air quality goal (µg/m³)	Worst affected receptor	Project contribution at receptor (µg/m³)	AQIA method (70th percentile or annual maximum)		Maximum background sensitivity analysis	
					Adopted background (µg/m³)	Cumulative concentration (µg/m³)	Maximum Background (µg/m³)	Cumulative concentration (µg/m³)[c]
PM_{10}	24 hour	50	R15	3.6	29.5	33.1	**91.5**	**95.1**
	Annual average	25	R1	0.2	23.0	23.2	23.0	23.2
$PM_{2.5}$	24 hour	25	R1	1.3	11.9	13.2	**115.4**	**116.7**
	Annual average	8	R1	0.2	9.8	10.0-	**9.8**	**10.0**
NO_2[a]	1 hour	226[a]	R2	n/a	n/a	86.4	n/a	n/a
	Annual average	56[a]	R1	n/a	n/a	4.5	n/a	n/a
SO_2	1 hour	523[b]	R15	21.5	1.9	23.4	88.1	109.6
	24 hour	209[b]	R1, R15	1.2	2.0	3.2	12.3	13.5
	Annual average	52	R1	0.2	1.7	1.9-	1.7	1.9
CO	8 hour	10,000	R15	14.9	573.0	587.9	5,599.0	5,614.0

Table notes

Concentrations highlighted in **bold** exceed the adopted air quality goal.

n/a Not applicable for NO_2 as the OLM method was adopted for assessment of this pollutant.

[a] NEPM criteria for NO_2 1 hour maximum is 151 µg/m³ and NO_2 annual average is 28 µg/m³ for comparison.

[b] NEPM criteria for SO_2 1 hour maximum of 262 µg/m³, and 24 hour maximum of 52 µg/m³ for comparison.

3.1.2.2 Fugitive Emissions

Fugitive emissions are considered in the Draft EIS, both in dispersion modelling and in the recommendation of mitigation and management strategies to minimise the potential for fugitive emissions from the construction and operation of the Project. The consideration of fugitive emissions for the construction and operation phases of the Project is discussed in the following sections.

Construction Phase

Dispersion modelling of emissions during the construction phase included the following fugitive emission sources:

- loading material to trucks
- trucks unloading material
- bulldozer activity on material/material placement
- graders
- wheel generated dust
- wind erosion from the entire active site area (including the location of stockpiles).

There are no other significant fugitive emission sources which are considered to require assessment for the construction phase.

Targeted mitigation measures for fugitive emissions from stockpiles and material handling have been presented in Section 9.8 of Chapter 9 of the Draft EIS. To further address comments from DEPWS on the Draft EIS, additional mitigation measures have been provided below in Section 6.1.6.

Operation Phase

Fugitive emissions have not been assessed in detail for the operation phase as fugitive emissions from open vessels and spills are either considered minor emission sources, or emission events which will occur very infrequently (e.g. a major spill), and thus are difficult to model accurately. It is not expected that open vats and vessels which are at risk of causing spills and other fugitive emissions would be required for the operation of the Project. Heavy metals as a pollutant of concern from fugitive emissions have also not been considered as it is not expected that they would have a significant impact to air quality at sensitive receptors during the operation phase of the Project.

The design of the blast and paint facility building is intended to provide a controlled environment capable of negative and positive pressure scenarios. Abrasive and abraded materials (particulates and heavy metals) that may become airborne would be fully contained within the enclosure of the blast and paint facility by design and captured by air filtration installed as part of the blast and paint facility. Appropriate filtration systems would be selected to ensure efficient removal of VOCs and particulates (including heavy metals). Whilst specific pollutant removal efficiency of the filtration system will be dependent on the selected system, Preferred and Alternative Methods for Estimating Air Emissions from Surface Coating Operations (Eastern Research Group Inc, 2001) suggests properly operated and maintained, carbon adsorption filter technology can provide VOC reductions of 90%-95%, and particulate filters can frequently achieve reductions in excess of 90%. The installation of air filtration to the blast and paint facility is included in the mitigation measures recommended for the Project in the Draft EIS.

The blast and paint building is likely to be approximately 80m in length, which is sufficient length for the building to enclose the majority of the vessels intended to be serviced by the facility. For any vessels that are too large to fit wholly inside the building, the portion of the vessel which is outside the building would be enclosed in a temporary extension to maintain the controlled environment and to prevent fugitive emissions from works undertaken in the area outside the blast and paint facility building. The installation of temporary enclosures for larger vessels is included in the mitigation measures recommended for the Project in the Draft EIS.

As discussed in Section 9.3.1.2.1 of Chapter 9 of the Draft EIS, emissions from the blast and paint facility have been estimated based on an existing shipyard, the BAE Systems Henderson Shipyard. It is not certain as to whether the BAE Systems Henderson Shipyard includes air filtration or not. However,

the results of the modelling of emissions from the blast and paint facility (as discussed in Section 9.7.1.2 of Chapter 9 of the Draft EIS) do not exceed criteria at modelled sensitive receptors, and therefore do not warrant further assessment of the benefit of air filtration.

As discussed in Section 9.3.1.2.2 of Chapter 9 of the Draft EIS, the maximum recommended separation distance for boat building and maintenance, metal coating or metal finishing activities from the NT EPA Guideline: Recommended Land Use Separation Distances is 1 km. As the closest sensitive receptors to the Project are located in excess of 5 km from the Project boundary, the risk of significant impacts from fugitive emissions from the blast and paint facility is considered to be very low.

It is noted that a Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP) will be employed to ensure open vessels and vats are avoided on site, and any open containers are covered to prevent volatilization of vapours and spills.

The assessment is inherently conservative due to the assumptions made and the tendency of dispersion models to over predict pollutant concentrations. However, acknowledging the conservatism of the assessment the results of the modelling do not predict exceedance of air quality goals at sensitive receptors. Concentrations above the relevant air quality goals outside the boundary of the facility are expected to be infrequent and are not expected to result in significant air quality impacts to the area for which exceedance is predicted. Further discussion of impacts outside the boundary is provided in Section 6.1.4 and Section 6.1.5.

3.1.2.3 Additional Sensitive Receptors

Sensitive receptors included in the AQIA are discussed in detail in Section 9.6 of Chapter 9 of the Draft EIS. DEPWS comment on the AQIA recommended the addition of the future residential suburbs of Mitchell and Weddell, as well as the Elizabeth River Boat Ramp, as sensitive land uses to be considered in the AQIA.

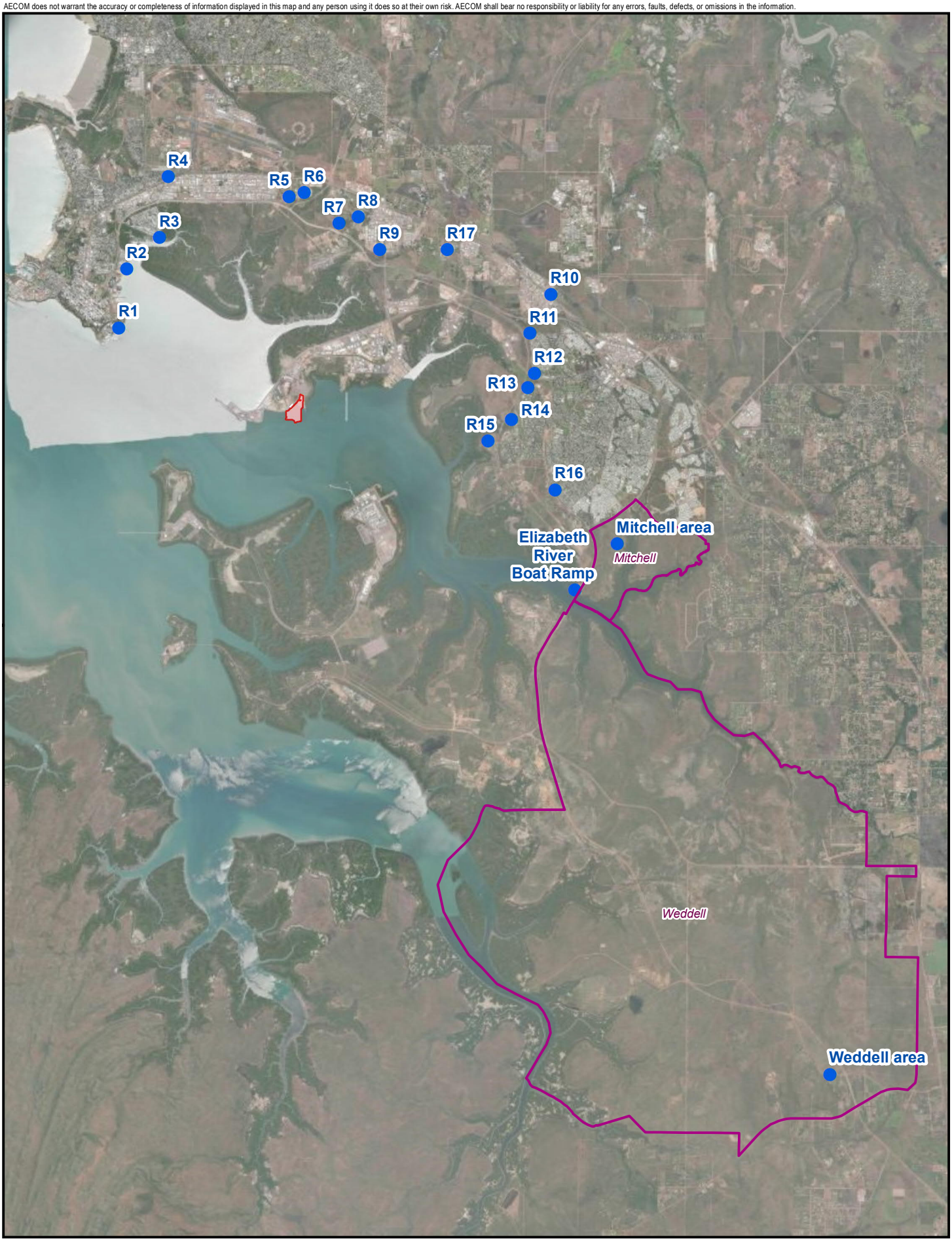
As stated in the Draft EIS, the NT EPA Guideline: Recommended Land Use Separation Distances defines sensitive land uses as:

"…land uses where people live or regularly spend time and which require a particular focus on protecting the health and wellbeing of humans and amenity values from the emissions of an activity".

The NT EPA Guideline also states:

"…sensitive land uses may include but are not limited to residential premises, accommodations facilities… and some outdoor recreation facilities".

Irrespective of the whether the boat ramp can be classified as a sensitive receptor with respect to air quality, all three of these locations are located further away from the Project and in the same orientation (south-east) as sensitive land uses which have already been considered in the AQIA. The location of the future residential suburbs of Mitchell and Weddell, the Elizabeth River Boat Ramp and the location of the receptors already included in the AQIA are shown in Figure 2.



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LEGEND

- Study area
- Area of Proposed Receptors
- Sensitive Receptors
  - R1: Stokes Hill area
  - R2: Stuart Park area
  - R3: Bayview area
  - R4: The Narrows area
  - R5: Winnellie area
  - R6: Winnellie area
  - R7: Connawarra area
  - R8: Hidden Valley Holiday Park
  - R9: Berrimah area
  - R10: Darwin Free Spirit Resort
  - R11: Durack area
  - R12: Durack area
  - R13: Marlow Lagoon area
  - R14: Marlow Lagoon area
  - R15: Marlow Lagoon area
  - R16: Moulden area
  - R17: Berrimah area

Additional receptors

- Elizabeth River Boat Ramp
- Mitchell area
- Weddell area

Note:
The layout is indicative only

Location of existing and future sensitive receptors

NORTHERN TERRITORY GOVERNMENT OF AUSTRALIA
DARWIN SHIP LIFT PROJECT

Figure 2

A4 size

The AQIA did not predict any exceedances of the adopted air quality goals at any of the included sensitive receptor locations for either the construction or operation phase. Therefore, based on the relative location of the future residential suburbs of Mitchell and Weddell, and the Elizabeth River Boat Ramp, exceedances are also not expected at these locations. Residences or sensitive uses that are located further away from the site than the currently modelled receptors are also not expected to be impacted by the Project, even though they may not have been specifically modelled.

The concentration contour plots presented in Figure 9-5 to Figure 9-13 in Chapter 9 of the Draft EIS show the pollutant concentrations in the area surrounding the Project. Although Mitchell, Weddell and the boat ramp are not shown in these figures, the figures illustrate that concentrations at receptors closer to the Project are well below the air quality goals, and therefore predicted concentrations at Mitchell, Weddell and the boat ramp are also predicted to fall well below the air quality goals. Approximate concentrations at additional receptors Mitchell, Weddell and the boat ramp have been derived based on nearest concentration contour in PM_{10} 24 hour, PM_{10} annual, and NO_2 1 hour contour plots (Figure 9-5, Figure 9-6 and Figure 9-9 respectively). Predicted cumulative concentrations at all three locations for the construction phase are expected to be:

- Less than 15 µg/m³ for 1 hour 24 hour $PM_{2.5}$
- Less than 12 µg/m³ for annual average PM_{10}
- Less than 34 µg/m³ for annual average NO_2
- Less than 10 µg/m³ for 1 hour incremental total VOC
- Less than 10 µg/m³ for 24 hour total VOC, and
- Less than 4.8 µg/m³ for annual average total VOC.

All other pollutants and averaging periods are expected to be well below adopted criteria

Predicted results for the operation phase are expected to be less than 20 µg/m³ for 1 hour incremental total VOC. The expected results at new receptors are less than all adopted air quality goals for all averaging periods.

The inclusion of additional sensitive receptors in the AQIA is not considered necessary based on the results of assessment and the location and orientation of these land uses relative to the sensitive receptors that have been included in the Draft EIS.

3.1.2.4 Assessment of VOCs and Odour

Detailed emissions information is not available for the blast and paint facility. In absence of site-specific information, estimation of VOC emissions was undertaken based on National Pollutant Inventory (NPI) reported emissions for an existing shipyard, the BAE Systems Henderson Shipyard located in Western Australia. The BAE Systems Henderson Shipyard is a larger facility than the Project, and therefore adoption of emissions from this shipyard is considered to provide a conservative estimate of emissions.

Due to data limitations with respect to emissions from the blast and paint facility, assessment of VOC emissions was undertaken via a conservative screening assessment. The screening assessment was undertaken by assessing predicted total VOC concentrations at sensitive receptors against the strictest air quality goals for the most common individual VOC species in paint products, being benzene, toluene and xylene. The strictest air quality goal was determined considering both the air quality goal and the existing background concentration for each VOC species, based on monitoring data from Gladstone, Queensland (due to the absence of Northern Territory VOC monitoring data). The pollutant with strictest air quality goals was determined to be benzene. The identification of the strictest air quality goal is explained in Section 9.4.4 in Chapter 9 of the Draft EIS.

Dispersion modelling of emissions from the blast and paint facility determined that emissions of total VOCs (based on the BAE Systems Henderson Shipyard) summed with adopted background benzene concentrations did not exceed the air quality goals for benzene. As compliance is predicted for the strictest air quality goals (for benzene), compliance would also be predicted for all other VOC species.

It is noted that predicted total VOC concentrations are conservative as VOC emissions from the blast and paint facility would not consist of one species alone.

Assessment of Project only (incremental) total VOC concentrations (99th percentile 1 hour) at the boundary of the site (as required by the NSW Approved Methods) is discussed in Section 9.7.1 of Chapter 9 of the Draft EIS. However, contour plots for VOC concentrations were not presented in the Draft EIS. In response to the DEPWS comment, further assessment of VOC emissions, including concentration contour plots, is provided below in Section 6.1.

Assessment of odour from the operation of the blast and paint facility for the Project is discussed in Section 9.3.1.2.2 of Chapter 9 of the Draft EIS. The Draft EIS states that as odour is primarily linked to VOC emissions, odour impacts at sensitive receptors are expected to be negligible as the predicted VOC concentrations are well below the adopted air quality goals.

3.2 Operational Noise

3.2.1 DEPWS Comment

Historical data from different studies have been compiled and used for background noise at identified receptors. The proponent must measure background noise at residential receptors.

Include future sensitive receptor locations such as Weddell and Mitchell, which are potential development sites. Include noise emissions from abrasive blasting activities.

There will be several service providers working at the development during the operational period, ensure that noise emissions from these operators have been estimated and included in the projections.

3.2.2 Proponent Response

DEPWS has provided four overarching comments relating to the terrestrial noise impact assessment (TNIA) undertaken for the Draft EIS.

A meeting was held including AECOM and DEPWS representatives on Friday 11 March 2022, during which the DEPWS submission to the EIS was discussed. Agreement was reached regarding the approach to addressing DEPWS comments and to undertaking additional baseline monitoring at nominated locations.

AECOM has responded to the comments from DEPWS in this section.

3.2.2.1 Background Noise Monitoring

Through their submission DEPWS required that the proponent measure background noise at residential receptors. Whilst a high degree of confidence was able to be achieved through the use of available information further baseline data was collected to support the Draft EIS.

Additional background noise monitoring was undertaken at two locations between 12 and 26 April 2022 inclusive. These locations are considered to be representative of the closest noise sensitive receivers to the Project and are considered to be at the highest risk of potentially receiving Project related noise impacts. Given their relatively low background noise levels compared with locations closer to noise sources such as major roads or urban/industrial noise sources these locations are considered to represent a conservative baseline.

Details of the logger locations are included in Table 5.

Table 5 Noise logger details

Address	Logger type	Logger serial number	Location	Façade/Free Field
16 Packsaddle Road, Marlow Lagoon	NGARA	8780EA	Close to boundary fence	Free field
5/13 Marlow Road, Berrimah	NGARA	878005	At boundary fence	Free field

Results from this monitoring are presented in Table 6 below.

Table 6 Noise monitoring results, dB(A)

Address	$L_{Aeq, day}$ 7am – 6pm	$L_{Aeq, evening}$ 6pm – 10pm	$L_{Aeq, night}$ 10pm – 7am	RBL Day 7am – 6pm	RBL Eve 6pm – 10am	RBL Night 10pm – 7am
16 Packsaddle Road, Marlow Lagoon	47	44	42	34	34	34
5/13 Marlow Road, Berrimah	57	53	50	41	40	40

The data collected from the two locations in Table 6 were used to set criteria for sensitive receivers around where the noise loggers were placed. The criteria did not change significantly from the previous results developed and presented in Appendix K: Terrestrial Noise and Vibration Impact Assessment in the Draft EIS. This further confirms the criteria are appropriate for locations where they are most critical and likely to be most affected. The findings from the additional data collected does not change the assessment conducted for the Draft EIS, but provides further confidence for the noise criterial levels set for the Project for both operation and construction phase. The results of the noise logger deployment are discussed further in Section 1.1 alongside Project specific noise criteria.

3.2.2.2 Additional Sensitive Receptors

Through their submission DEPWS required that the proponent include future sensitive receptor locations such as Weddell and Mitchell, which are identified as future development sites.

Sensitive receptors included in the TNIA are discussed in Chapter 3.1 of the Draft EIS TNIA. DEPWS comments on the addition of the future residential suburbs of Mitchell and Weddell as sensitive land uses to be considered in the TNIA. These locations are located further away from the Project and in the same orientation (south-east) as sensitive land uses which have already been considered in the TNIA (i.e. Marlow Lagoon Palmerston).

The Draft EIS TNIA (nor the updates to the TNIA presented in Section 1.1 of this Supplementary EIS to the EIS) did not predict any exceedances of the Project specific assigned noise levels at any of the included sensitive receptor locations for either the construction or operation phase. Therefore, based on the relative location of the future residential suburbs of Mitchell and Weddell, exceedances are not expected at these locations. Residences or sensitive uses that are located further away from the site than the currently modelled receptors are also not expected to be impacted by the Project, even though they may not have been specifically modelled.

3.2.2.3 Abrasive Blasting

Through their submission DEPWS required that noise emissions from abrasive blasting activities be included in the TNIA.

The noise model used in the Draft EIS TNIA has been amended to include a specific sound power level for abrasive blasting to address this comment. Operational contours are presented in Appendix C: Operational Contours. The sound power level was taken from typical noise generating activities on a similar site. Results demonstrated that there is no increase in the operational noise scenario at any noise sensitive receptor. This is due to the sound power level of abrasive blasting activities being 17 dB less that the combined sound power level of all other proposed site activities.

3.2.2.4 Service Provider Noise Emissions

Through their submission DEPWS commented that the Draft EIS TNIA should ensure that noise emissions from any service providers working at the development during the operational phase of the Project have been estimated and including in noise projections.

The TNIA was undertaken based on an assumed operational scenario based on available information at the time of the assessment. This included a comprehensive review of facilities and equipment likely to be in use by potential service providers at the site during operation (Chapter 2.2 in Chapter 2 of the Draft EIS).

To allow flexibility for changes in operational scenarios during future design refinement a worst case scenario approach was taken, as such all noise emissions from the Project were considered in the TNIA to occur simultaneously. This also included service providers. This is considered to be a highly conservative approach given that not all noise sources would be occurring concurrently. Despite this conservative assumption, no exceedances of the Project noise trigger levels have been identified at any relevant sensitive receptor.

3.3 Analyse Acid Sulfate Soils

3.3.1 DEPWS Comment

The disturbance of land with an acid sulfate soil risk should be avoided, however if disturbance is necessary for a proposed development area, then an acid sulfate soil field investigation will be required. The geotechnical site investigation must be undertaken by a suitably qualified and experienced professional, preferably a Certified Professional Soil Scientist (CPSS) with Soil Science Australia, in accordance with the Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines to delineate the presence of acid sulfate soils. Essential to an investigation is the requirement for Chromium Reducible Sulfur (CRS) soil testing at an appropriate site density and to a soil depth immediately below the proposed disturbance.

If acid sulfate soils are detected through CRS testing, and exposure of these soils is still unavoidable then an acid sulfate soil management plan is required. The acid sulfate soil management plan will include the following:

- *exact location of the proposed disturbance*
- *depth and volume of soil to be disturbed (m 3)*
- *clearly presented CRS results*
- *acid base accounting results which clearly indicate an accurate liming rate*
- *appropriately designed treatment pads*
- *lime/soil mixing regimes*
- *an appropriate monitoring program.*

3.3.2 Proponent Response

3.3.2.1 Acid Sulfate Soils

It is acknowledged that Potential Acid Sulfate Soils (PASS) may exist within the Project footprint. For this reason, an Acid Sulfate Soil Management Plan will be a requirement of the Design and Construction Contractor (Construction Contractor) prior to commencement of any ground disturbing works.

Based on the works required there are two possible ways in which Acid Sulfate Soils (ASS) may be exposed, these are:

1. During the clearing of the small, isolated stand of mangroves within the site; and
2. During the disposal of unconsolidated dredge spoil within the Darwin Port dredge spoil ponds.

The exposure of ASS during clearing of the mangroves will be mitigated by cutting the trees at the base (to minimise ground disturbance) and then removing the vegetation for mulching and reuse on the site for erosion and sediment control. The root ball of the mangroves will not be disturbed during this process. The site will then be filled over to create hardstand area. It is anticipated that this process will eliminate the risk of ASS exposure.

The management of dredge spoil within the Darwin Port dredge spoil ponds includes the ability to monitor and control the flow of tail water as it moves between the different ponds. At these points (weir boxes) there is the potential to dose tail water to improve the pH and decrease the likelihood of ASS forming. The use of the dredge ponds to successfully manage tailwater and ASS risks has been well established during previous major dredge campaigns.

3.4 Zone of Impact and Zone of Influence

3.4.1 DEPWS Comment

The zone of impact and influence was determined using the WA EPA Technical Guidance for Environmental Impact Assessment of Marine Dredging Proposals (EPA 2016) and was based solely on plume and sediment transport modelling for dredging activities. The sediment composition for dredge material is largely sand and coarse sediments. As a result of sediment characteristics, the modelling results suggest that the zones of impact and influence are restricted to the Project footprint for most of the time.

The Flora and Fauna Division considers this assessment is inadequate because it did not include plume modelling for land reclamation activities (see Appendix I). Land reclamation activities will resuspend muddier surface sediments into the water column, in particular within the mangrove habitat. Given that dredging activities and land reclamation both occur at the same time and over the same seven quarter-periods, the zone of impact and influence should be remodelled to accommodate the cumulative impacts of both activities.

If modelling changes the zone of impact and influence, then risk assessment for benthos and water quality should be reassessed.

3.4.2 Proponent Response

3.4.2.1 Draft EIS Methodology

As identified by DEPWS, land reclamation works were not considered in the sediment transport modelling undertaken for the Draft EIS. It is noted that the modelled scenario does not completely align with the Project description as described in Chapter 2: Project Description of the Draft EIS, due to the evolving Project design since the modelling was completed. A comparison between the modelled dredging scenario and the Draft EIS Project design is provided in Table 7.

Table 7 Modelled dredging campaign versus Draft EIS Project design

Aspect	Modelled	Proposed in the Draft EIS
Volume of unconsolidated material	324,800 m^3	185,000 m^3
Volume of consolidated material	0	315,000 m^3
Material disposal location / method	Within the settlement ponds located at EAW.	Used as fill to construct the reclaimed area of the Project within a bunded area, or within the onshore settlement ponds at EAW if material is not suitable for use as reclamation fill.
Tailwater treatment and discharge to Darwin Harbour	Via the permeable section in the bund wall to the north of EAW, after water quality is deemed suitable for discharge. This scenario was modelled by AIMS (2013).	Where dredged material is used as fill, water will be run off into Darwin Harbour adjacent to the reclamation area, with silt curtains used to manage turbid plumes. Where material is disposed into the EAW settlement ponds, the return of tailwater will be as described for the modelled scenario.

The dredging scenario modelled to inform the Draft EIS was deemed to provide a conservative prediction of zones of potential impact and influence associated with the current proposed dredging design because:

- The volume of unconsolidated material to be dredged, and the area over which dredging will occur, has been reduced substantially compared to those upon which the modelling was based.

- Dredging and removal of consolidated material anticipated to be present in the current dredge footprint is expected to produce less intense plumes than dredging of unconsolidated material. The larger rock fragments and coarse material generated will settle more rapidly to the seabed, hence the plumes are not expected to disperse as widely as those from dredging of unconsolidated material.
- Results of the modelling show that dredging related turbidity is predominantly transported by tidal currents and is not predicted to continue to increase over time as dredging progresses.

As the previous modelling was considered to be sufficiently conservative and additional changes to the construction process (i.e. construction of a bund wall into which dredged material will be placed to construct the reclamation area) have been made, further mitigating the generation of turbid plumes for reclamation, resulting it was considered that re-modelling the dredging and reclamation process was not warranted for the Draft EIS.

3.4.2.2 Construction Methodology

During the development of the design and construction methodologies, following the submission of the Draft EIS, both short-listed ECI contractors have identified the need to separate the reclaim and dredging activities for the reasons listed in Section 2.2.1. Construction of a bund wall at the seaward extent of the proposed reclamation area will help to contain suspended sediments that may otherwise have entered harbour waters as a result of reclamation activities. This will be further managed through the use of geofabric textiles and silt curtains to retain suspended sediments within this bunded area.

The revetments around the reclaim area will physically separate the dredging and reclamation works and will be constructed in such a way that any existing soil on the landward side of the bund that may be disturbed by the placement of dredged material will not migrate into harbour waters. With the changes to the reclaim methodology and implementation of mitigation measures to reduce the impact of suspended sediment, updated plume modelling for reclamation activities are not considered necessary for the Project.

It is also noted that, in the unlikely event that plumes generated during construction are greater than predicted and lead to exceedances of trigger values, works will need to be modified or ceased until such time that trigger values can be met. Meeting the environmental objectives for dredging and managing dredging and reclamation such that trigger levels are not exceeded will provide the best outcomes for the project, not only environmentally, but also in terms of schedule and cost. As such, all necessary steps will be taken to ensure that trigger values set for the Project are not exceeded.

3.4.2.3 Dredging and Dredge Spoil Placement Management Plan

The final Project design, including the actual dredging and reclamation methodologies, will be detailed within the Contractors Dredging and Dredge Spoil Placement Management Plan and the Contractor's Construction Management Plan respectively; drafts of these plans have been submitted to the NTG as part of the final ECI design submission. The Contractors Dredging and Dredge Spoil Placement Management Plan will be approved by the relevant regulator prior to the commencement of construction.

It is noted that:

- The approved Final DDSPMP will include a water quality management framework (WQMF) that is designed to mitigate the potential for the dispersed suspended sediments (from both dredging and dredged material placement [including land reclamation activities]) to reach benthic communities at concentrations, durations and frequencies that are sufficiently high as to pose a risk of causing detectable changes in these communities. A preliminary WQMF is provided in Table 8.
- The WQMF includes corrective actions that will be implemented in the event that monitoring indicates that the risk of potential impacts to benthic communities from dredging and dredged material placement (including reclamation) is unacceptably high.
- If corrective actions are triggered, further monitoring will be undertaken to demonstrate that the implemented corrective actions have reduced the risk of impacts to benthic communities to levels that are no greater than those predicted by the modelling undertaken for the Draft EIS.

- As the Project is prepared to accept the risks associated with implementation of the WQMF within the approved Final DDSPMP (such as Project delays and additional costs attendant to implementation of corrective actions), it is considered that remodelling is not required at this juncture.

Table 8 Water Quality Management Framework – Darwin Ship Lift Project

Water Quality Management Framework – Darwin Ship Lift project	
Element	Maintenance of water quality in East Arm
Commitments	Any waste discharge license conditions
Objective	To minimise the potential for impacts upon the hard coral and filter feeder communities at South Shell Island from turbid plumes resulting from dredging and reclamation activities.
Target	• No instances of exceedance of turbidity trigger levels at a distance of 150 m down-current of the operating dredge (or its associated pipeline) or the reclamation revetment. • No detectable decline in proportion of living hard corals or filter feeders within benthic communities at South Shell Island and Catalina Island monitoring sites as a result of the Project.
Key Performance Indicators	• Number of instances of exceedance of reactive water quality monitoring criteria (trigger levels) at the sampling locations 150 m down-current from the sources that require corrective actions to be implemented to return water quality in East Arm to an acceptable level. • Number of instances in which monitoring of hard coral and filter feeder communities at South Shell Island and Catalina Island monitoring sites is triggered.
Management	Cutter Suction Dredge (CSD): • Cutter head and pump speeds managed to minimise dispersion of fine sediments from the cutter head. • Pipeline integrity maintained to reduce the potential for spoil leakage from joints between sections. Backhoe Dredge (BHD): • Speed of bucket movement through water column managed to minimise loss of sediments into the water column. • No overflow from barges. Silt curtains at any locations where runoff or suspended sediments may enter harbour waters from the reclamation area.
Monitoring	Dynamic, real-time, reactive water quality monitoring 150 m down-current of the operating dredge, the pipeline (if a plume is emanating from it) and the reclamation revetment, at locations where turbidity is observed to be highest. Measurement of turbidity levels (as a proxy for Suspended Sediment Concentration, SSC) through the entire water column at these locations. Determination of whether the maximum turbidity levels within observable plumes exceed the allowable SSC of 100 mg/L (measured as turbidity, 140 NTU) at a distance of 150 m from these sources. In the event of exceedance, review of daily satellite images (MODIS-Aqua/Terra observations (EnSTaR, 2020) to assist in determining whether the turbidity level at 150 m from any Project source can be attributed to the dredging activity, or whether it is a result of broader regional influences (e.g. due to a period of high rainfall or elevated wave action, or to other turbidity-generating activities within the harbour). The method of daily satellite imagery review is detailed further in Section 3.5.2.2. Baseline and post-dredging assessments of proportions of live hard corals and filter feeders within benthic communities at South Shell Island and Catalina Island monitoring sites.

Water Quality Management Framework – Darwin Ship Lift project	
	If required, due to exceedance of turbidity trigger levels at 150 m down-current from Project sources, assessment of hard coral and filter feeder communities at South Shell Island monitoring sites.
Reporting	• Daily reporting of monitoring data by Contractor to Proponent. • Monitoring report to the NT EPA at the conclusion of dredging. • Trigger level exceedances 150 m down-current of any sources of turbid plumes from the dredging and reclamation activities will be reported by Contractor to Proponent within 24 hours of the exceedance occurring. • A report on corrective actions implemented to address the cause of the exceedance will be submitted by Contractor to Proponent within two business days of the notification. • Contractor will notify Proponent of the outcome of their investigation into attributability of the exceedance to dredging within three business days of the notification. • Contractor will notify Proponent of the outcomes of any monitoring of the South Shell Island and Catalina Island benthic communities that is triggered by turbidity level exceedances; this will be provided within five business days of completion of monitoring.
Corrective Actions	• Slowing the CSD cutter head speed or slew speed of the dredge, reducing the rate of disturbance at the cutter head. • Repairing pipeline joints to eliminate leakage of spoil. • Slowing the speed of raising the BHD bucket through the water column. • If required, reducing or suspending dredging activity during certain tidal periods when the migration of dredge plumes towards South Shell Island and Catalina Island is greatest. • Relocating the dredge to an alternate dredge face. • Temporary cessation of dredging.
Term	For the duration of dredging, the construction of the bund wall and any other activity that is identified as having potential to generate sediment plumes.
Responsibility	• Contractor's Project Manager to ensure monitoring program and water quality management measures are implemented. • Contractor is required to take direction from the Proponent's Project Manager as necessary. • Proponent to ensure Contractor's documents are compliant with this WQMF.

3.5 Coastal processes, sediment transport and plume model triggers

3.5.1 DEPWS Comment

The draft EIS proposes to establish a reactive water quality monitoring program as part of the Dredging and Dredge Spoil Placement Management Plan. To support this the proponent undertook water quality monitoring over a period of six weeks and nine weeks during the late Dry season and Wet respectively. In addition, the data was compared to data collected by URS (2008, 2011) for the INPEX project and pooled for analysis to determine appropriate trigger levels for mitigation actions. The draft EIS arrives at similar trigger values that were used for INPEX's reactive monitoring program.

The INPEX reactive monitoring program relied on turbidity data that were logged over a number of days and assessed whether triggers were exceeded and mitigations actions were required.

A summary of INPEX's nearshore environmental monitoring program (Cardno 2014) reports that coral cover was reduced at South Shell Island during its coral monitoring program. Monitoring at the site indicated an increase of sediment deposition. However, Cardno could not attribute this solely to dredging activities.

Further there is a high likelihood that the zone of impact / influence is larger than predicted (see comments above re Cumulative Impacts and Zone of Impacts/influence), and therefore may impact on further afield benthic primary producing habitats.

Therefor the Flora and Fauna Division recommends the proponent:

a) review its trigger values by considering a precautionary approach in determining trigger values for its Dredging and Dredge Spoil Placement Management Plan, and

b) implements a monitoring program that uses live turbidity data to allow continuous assessment of duration and frequency turbidity levels against trigger values, so that appropriate management actions can be immediately implemented if trigger values are exceeded.

3.5.2 Proponent Response

The Proponent acknowledges that the DEPWS comment on the "*high likelihood that the zone of impact / influence is larger than predicted, and therefore may impact on further afield benthic primary producing habitats"* is a concern surrounding potential suspension of sediment from reclaim activities not captured by plume modelling completed in the Draft EIS. Section 3.4 discusses this limitation, which has since been addressed in the ECI designs from both contractors. The development of a bund wall surrounding the reclaim area before infilling, alongside additional erosion and sediment control measures such as geofabric textiles and silt curtains, is understood to significantly reduce the likelihood for the zones of impact and influence to be larger than the original, conservative plume modelling developed for the Draft EIS.

3.5.2.1 Trigger Level Development Revision

The methodology applied to assess the suitability of adopting the INPEX trigger levels is described in Section 7.3 and Section 7.4.4.2 of the Draft EIS. It is emphasised that the water quality data collected for the Project were not pooled with the INPEX data.

As detailed in Section 7.4.4.2 of the Draft EIS, established remote sensing methods (developed by specialist researchers through the Western Australian Marine Science Institution [WAMSI] Dredging Science Node [DSN]) that were adopted to compare Total Suspended Solids (TSS) concentrations in East Arm over the period during which the INPEX data were collected, and over more recent years (2016-2020). The median and 95th percentile TSS concentrations over the 'INPEX' period were lower than those over the 2016-2020 period. Hence adopting the trigger levels developed for the INPEX project (and also applied for the neighbouring East Arm Wharf (EAW) expansion dredging campaigns [Marine Supply Base {MSB} and Multi User Barge Ramp Facility {MUBRF}]) is considered to represent a suitably precautionary approach. No further amendments to trigger levels are proposed.

3.5.2.2 Monitoring Strategy

The monitoring strategy to be implemented during the dredging and land reclamation campaign will be detailed within the EMF in the Construction Contractor's approved Final DDSPMP. A preliminary WQMF is presented in Section 3.4.2 above.

It is emphasised that the monitoring program will incorporate the following:

- Dynamic, real-time turbidity monitoring will be undertaken in the immediate vicinity of the dredging and land reclamation activities. This will be consistent with the approved monitoring approach implemented during the neighbouring MSB and MUBRF dredging campaigns. The sections of the turbid plumes in which the TSS concentrations are highest at the time of monitoring will be targeted. Such flexibility would not be possible to achieve if telemetered turbidity meters were to be utilised at fixed locations.
- Due to the risks to the Project of suspension of dredging being required to mitigate a trigger level exceedance, the routine, real-time turbidity data will be monitored closely to detect any trends that may indicate an elevated risk of trigger level exceedance. This will enable the pre-emptive implementation of corrective actions (such as those in the WQMF) to reduce the risk of an exceedance occurring.

If, however, the dynamic, real-time monitoring detects an exceedance of the turbidity trigger level, then:

- If it is immediately apparent that the exceedance is due to the dredging or reclamation activities, then the most appropriate corrective actions within the WQMF will be immediately implemented to reduce the TSS concentrations within the plume to below the trigger level (as confirmed through continued TSS monitoring).
- If there is some uncertainty as to whether the exceedance is due to the dredging or reclamation works, or to another source or sources, then an attributability assessment will be immediately triggered; this will include consideration of potential natural sources (e.g. meteorological conditions, tidal effects) and anthropogenic sources (i.e. other human activities) of turbidity.
- Satellite imagery (such as MODIS, which is available twice daily) for the period leading up to, and including, the time of the trigger level exceedance will be a key information source for the attributability assessment. Analysis of the satellite imagery will build on the work of the Western Australian Marine Science Institution Dredging Science Node (WAMSI DSN) (e.g. Fearns et al 2017) to enable the consideration of TSS concentrations broadly within East Arm, rather than at discrete, fixed monitoring stations which may not be located within areas that are exposed to the highest TSS. Indeed, the use of fixed monitoring stations may have been a contributing factor towards projects elsewhere recording declines in benthic community health in the absence of trigger level exceedances.
- Whilst it may take up to 48 hours following exceedance of the trigger level to consider all of the data sources available for the attributability assessment, it is noted that there is no credible risk of any exceedance at 150 m of the source leading to detectable impacts upon benthic communities that are greater than 500 m from the source occurring within such a timeframe. Rather, impacts may occur in response to prolonged exposure to elevated turbidity levels, hence there will be an urgent need to implement corrective actions (such as those in the WQMF) if it is deemed from the attributability assessment that the trigger level exceedance was associated with the dredging or reclamation activities. The corrective actions will continue to be implemented until such time as the dynamic, real-time monitoring indicates that the turbidity trigger level is no longer being exceeded at 150 m from the dredging and reclamation activities.

3.6 Marine environmental quality, water quality – bund walls

3.6.1 DEPWS Comment

The draft EIS provides options for their dredging campaign. Under option 1, a cutter suction dredge will be used, with dredge material being pumped to pond K and subsequently pond E before the supernatant is discharged through permeable bund walls into Darwin Harbour. Further the draft EIS notes that testing of tail water will be undertaken before discharge to ensure all environmental targets are met.

Discharge of tail water through permeable bund walls seems to infer that there is no control over when the discharge takes place. This seems to contradict the statement that testing of all tail water will be undertaken before discharge.

The Flora and Fauna Division recommends that the Dredging and Dredge Spoil Placement Management Plan addresses how environmental targets will met if supernatant is discharged from pond E through permeable bund walls.

3.6.2 Proponent Response

3.6.2.1 Management of Tailwater Ponds

The management of tailwater within the Darwin Port dredge spoil ponds is displayed in Figure 3 and Figure 4. Figure 4 is an image taken for the 2012 MSB dredging campaign. The proposed tailwater management for the Project will be similar to this dredging campaign as it will utilise the same dredge ponds and will install silt curtains as required to ensure the final water quality meets the standards for discharge into Darwin Harbour. The management of the tailwater process will be as follows:

1. Tailwater will flow from the dredge spoil that has been deposited in Pond K towards Pond E (north). Larger sediment particles will drop out as the tailwater progresses.
2. The flow of tailwater into Pond E (north) is via a weir box. At this location, the flow of tailwater can be regulated. Monitoring of the tailwater can also be undertaken as well as dosing (e.g. with lime if pH is too low) if required.
3. Tailwater in Pond E (north) can be controlled via the weir box leading to Pond E (south). Additionally, a series of silt curtains can be placed across Pond E (north) to ensure sufficient deposition of finer particles occurs prior to tailwater moving to Pond E (south).
4. Tailwater can be monitored at the weir box before it enters Pond E (south). Additional silt curtains can be placed within Pond E (south) to further improve the quality and ensure compliance of any tailwater exiting Pond E (south) into Darwin Harbour. Should an exceedance be detected at the weir box between Pond E (north) and Pond E (south), flow of tailwater into Pond E (south) will be stopped at the weir, halting discharge of the tailwater into Darwin Harbour.

The management of this approach means that the tailwater reaching the permeable bund wall at Pond E (south) has been effectively treated for discharge into Darwin Harbour. This management approach is consistent with that implemented for the MSB and MUBRF dredging campaigns and is described in greater detail in the Draft DDSPMP (Appendix C: Draft Dredging and Dredge Spoil Placement Management Plan).

PROJECT ID 60633505
CREATED BY JY
APPROVED BY
LAST MODIFIED 30 MAY 2022
PYoung

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DATUM GDA 1994, PROJECTION MGA ZONE 52
0 80 160 240 320
Meters

Data sources:
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2016).

LEGEND

- Project footprint
- Approximate pond boundary
- Tailwater flow path
- Potential silt curtains

Tailwater Monitoring Locations

- Settlement pond monitoring
- Tailwater release monitoring

Proposed Monitoring Locations and Tailwater Flow

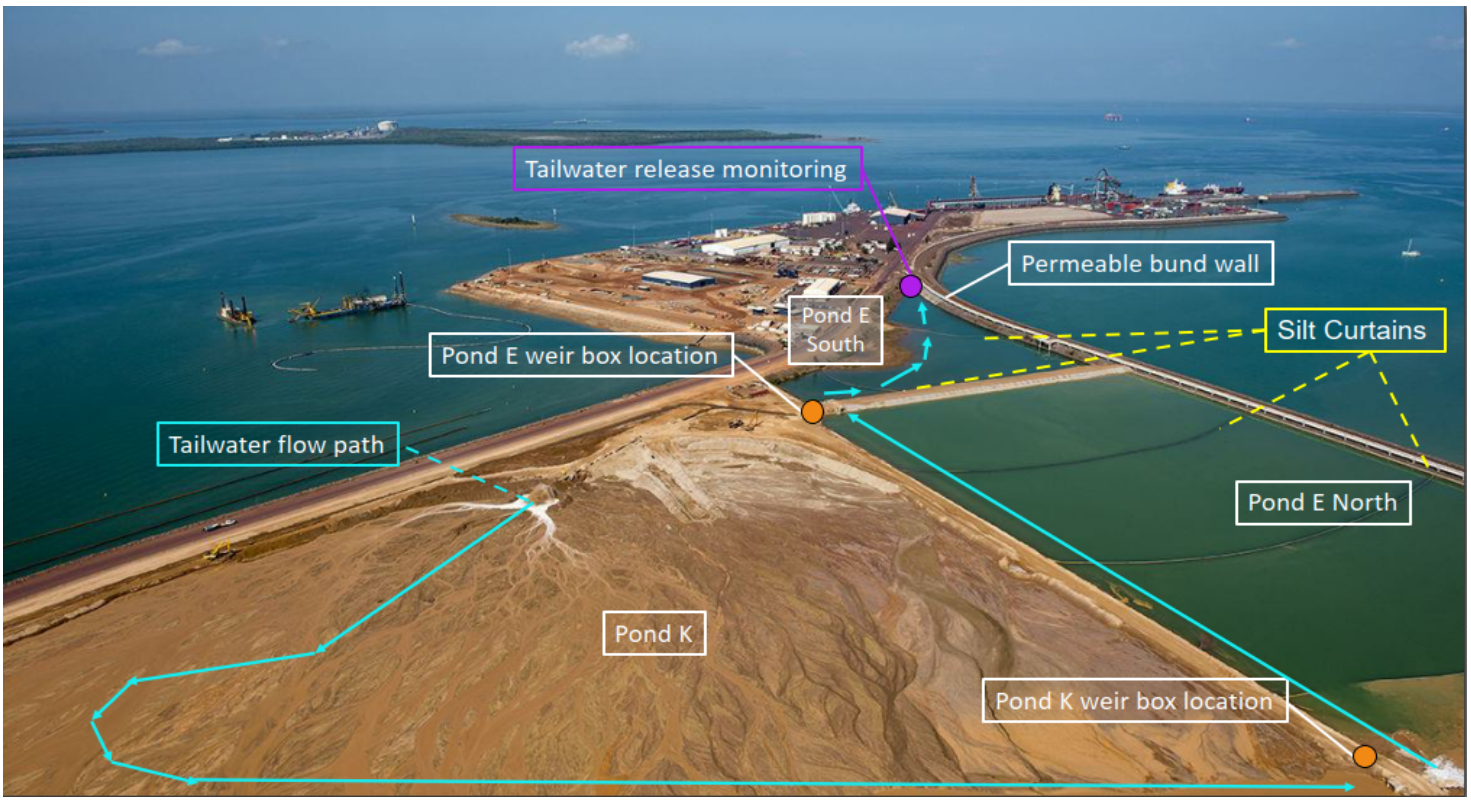
NORTHERN TERRITORY GOVERNMENT OF AUSTRALIA
DARWIN SHIP LIFT PROJECT

Figure
3

Map Document: \\na.aecomnet.com\lfs\APAC\Darwin-AUDWN1\Legacy\Projects\606x\60633505\900_CAD_GIS\920_GIS\MXD\20220524_Flow Paths\60633505_Fig15_A4P_Proposed_Tailwater_Flow_Paths.mxd (cameron.adams)

A4 size

Figure 4 Proposed monitoring locations and tailwater flow based of the 2012 MSB dredging campaign



3.7 Marine environmental quality, Water quality

3.7.1 DEPWS Comment

The draft EIS discusses how the proponent wishes to reclaim land for hard stand and land based infrastructure. It proposes to infill incrementally from the land seawards until the revetments can be placed. Filling incrementally will cause sediment to be resuspended, and water, laden with excess suspended sediment from dredge disposal, will drain into Darwin Harbour. Tidal flow could cause extensive sediment plumes. The extent of this sediment plume has not been established (see Zone of impact and influence and Cumulative impacts comments).

The draft EIS does not provide any actions for mitigating elevated suspended sediments caused by infill activities.

The Flora and Fauna Division recommends that the Dredging and Dredge Spoil Placement Management Plan discusses options to mitigate sediment plume from infill activities. This should also include an assessment whether revetments can be placed before infill commences and thus containing the extent of the sediment plume within the reclamation area.

3.7.2 Proponent Response

3.7.2.1 Reclaim Development Process

As described in Section 2, since the submission of the Draft EIS the Project's design and construction methodologies have been refined. The current approach to the development has responded to the DEPWS concern regarding the reclamation methods through the creation of an outer bund wall (revetment) and to then backfill behind this wall. The reasoning for this methodology is to:

- Decouple the dredging and reclaim activities; therefore, one is not wholly reliant on the other.
- Create a work front from which berth construction can occur concurrently with dredging and reclaim activities.
- Eliminate the impacts of the large tides on the landside activities.
- Reduce the environmental impacts associated with the reclaim activities.

The results of the above methodology changes will be that any sediment mobilisation caused by the reclaim activities will be contained behind the bund wall and will not be released into the harbour.

3.7.2.2 Total Suspended Solids

The Project will adhere to any TSS trigger levels that are imposed on the Project. The management of sedimentation on the Project site will be one of the highest priorities for the Construction Contractor. The management practices implemented for the Project (as described in the management plans included as Appendix C: Draft Dredging and Dredge Placement Management Plan and Appendix E: Updated Environmental Management Framework) of this document are considered to be more than sufficient to ensure that trigger levels are not exceeded. The Project also acknowledges that if nominated trigger levels are exceeded, then works may have to be reduced or even cease until such time as the trigger levels can be met.

3.8 Marine ecosystems, Migratory and marine vertebrate fauna

3.8.1 DEPWS Comment

The draft EIS notes that construction and operational activities will be 24/7. It also mentions that it intends to mitigate interaction through visual assessments by trained observers.

The Flora and Fauna Division requests a clarification of how the proponent intends to mitigate interaction during night time construction and operational activities when visual assessments are likely to be inadequate.

3.8.2 Proponent Response

3.8.2.1 Vessel Interaction

The environmental monitoring and management measures to mitigate the potential for interactions to occur with protected marine fauna during night-time, or other periods of low visibility that may impede effective visual observations, are included in the Protected Species Management Framework (PSMF) within the Draft DDSPMP (Appendix C: Draft Dredging and Dredge Spoil Placement Management Plan).

During the Project's operational phase, for safety reasons any commercial vessel movements within the vicinity of the facility, including its approaches, will be conducted at speeds that are sufficiently low as to not pose a risk of physical impacts to protected marine species. The target vessels for the Project are commercial vessels up to 5,500 tonnes.

3.8.2.2 Piling

Piling is currently planned during daylight hours. However, Project timelines may require night works. As indicated in the preliminary PSMF in Table 9 below, similar management measures would be undertaken in the event that these works are required to be undertaken during periods of reduced visibility. Works outside of planned construction hours will also require a risk assessment to be conducted and further mitigations applied, as described in Appendix K: Terrestrial Noise and Vibration Assessment of the Draft EIS.

3.8.2.3 Dredging

Construction activities that commence prior to sunset, or prior to a period of low visibility (where continuous visual observations to a distance of 1000 m from the dredge or piling barge are not possible), will be permitted to continue unless:

- Within the preceding 12 hours, there have been three or more suspensions of construction activities due to protected species encroaching within the Response Zone (a zone around the activity that is of smaller dimensions than the Observation Zone, and within which it is considered that there is a greater potential for adverse effects to occur).
- There is a non-operational period exceeding 30 minutes.

If either of these 'exclusions to continuity' occur, then construction will not recommence until the Observation Zone is once again able to be effectively monitored by a trained Marine Fauna Observer (MFO).

The rationale for this approach is that the main potential source of behavioural disturbance to protected species is when the construction works are commencing after a non-operational period. If construction activities continue uninterrupted into a period of reduced visibility (including night-time) and protected species enter the Exclusion Zone, then it suggests that they will not be experiencing adverse impacts. Furthermore, while the dredge is operational, at least one crew member is a trained MFO and acting as lookout for protected marine species at all times.

3.8.2.4 Protected Species Management Framework

A preliminary PSMF for vessel interactions, underwater noise due to piling and dredging activities are presented in Table 9 to Table 11; the management measures therein are consistent with those within Darwin Port's Long Term Dredging Management Plan.

Table 9 Protected Marine Species Management Framework – physical interaction

Protected Species Management Framework – physical interaction	
Element	Vessel interaction with protected marine species.
Objectives	• Minimise the risk of injury to, or mortality of, protected marine species. • Develop and maintain awareness of the need to protect marine species.
Targets	• No incidents of vessel interaction with protected marine species. • All dredging personnel to complete an HSE induction, including protected marine species awareness and management requirements. • All vessel masters competent in protected marine species interaction procedures. • At all times that the dredge and piling equipment is operational, at least one crew member is a trained MFO.
Key Performance Indicators	• Number of incident reports. • Number of reported sightings of live, injured or dead marine fauna. • Number of personnel completing an HSE site induction. • Availability of MFO trained crew member on operating dredge and piling equipment.
Management	• Training of Vessel Masters in interaction procedures and specified crew as MFOs. • A trained MFO must be on duty, above deck with good visibility, during all dredging and piling operations. • On each occasion that the dredge and piling equipment has been non-operational for a period exceeding 30 minutes, a visual assessment shall be undertaken of the 150 m radius Observation Zone by the MFO for a period of 10 minutes. Dredging will not recommence until no protected marine species have been sighted within the 150 m radius Observation Zone for a period of 10 minutes. • The assessment of the Observation Zone will be made from an elevated position on the dredge, where a clear line of sight is achievable to the edge of the zone. • The MFO will not be engaged in any other activities during the 10-minute assessment period. • Every 30 minutes whilst the dredge is operating, the MFO will dedicate a period of five minutes for scanning (from an elevated position) for protected marine fauna within the Exclusion Zone. • If protected marine species are sighted within the Observation or Exclusion Zone, then a response in accordance with vessel interaction procedures will be implemented. Dredging will be temporarily suspended if turtles, dugongs or dolphins enter within 50 m of the cutter head, or dolphins with calves enter within 150 m of the cutter head (i.e. the Exclusion Zone). • Dredging that commences prior to sunset, or prior to a period of low visibility, will continue unless, within the preceding 12 hours, there have been three or more suspensions of dredging due to protected species encroaching within the Exclusion Zone • When the CSD cutter head is used, it will only start when it is positioned near the seafloor, and rotation will be stopped before the cutter is raised through the water column. • Guidelines on approach distances for protected marine species will be followed. • Support vessels will adhere to Darwin Port speed restrictions. • Support vessels will not approach, circle or wait in front of wildlife for the purposes of casual viewing. • Watch will be maintained for stranded, injured or dead protected marine fauna; if observed, the NT Government Marine Wildwatch line (1800-453-941) will be contacted for retrieval, treatment or post-mortem of the fauna.

Protected Species Management Framework – physical interaction	
Monitoring	• Regular monitoring for the presence of stranded, injured or dead marine fauna. • Marine fauna observations (refer to management section).
Reporting	• Daily submission of marine fauna observations sheets by Dredging Contractor to the Proponent • Weekly summary reporting by Dredging Contractor to the Proponent of number of sightings, incidents and corrective actions. • Monitoring report to the Proponent at the conclusion of dredging. • Any vessel interaction incidents and protected species injury or mortality will be reported to the Proponent within 24 hours of the incident occurring. The Proponent and/or the Construction Contractor (as applicable) will also notify the NT EPA and the Department of Climate Change, Energy, Environment and Water (DCCEEW).
Corrective Actions	• In the event that an incident or near miss occurs between vessels and protected marine species, the incident will be investigated and discussed to further improve awareness to reduce risk of collision. • For mobile vessels associated with the Project, a 5 knot vessel speed limit will be applied in areas where frequent sightings (an average of >1 per day in any one week) are made of protected marine species. • If protected marine species approach within the Caution Zone, vessels that are under way will proceed at a “no wash” speed.
Term	For the duration of dredging activities.
Responsibility	• Proponent to ensure Dredging Contractor’s documents are compliant with this DDSPMP. • Dredging Contractor implements protected marine species management and monitoring program. • Dredging Contractor’s Project Manager to liaise with DEPWS on response to stranded, injured or dead marine fauna and potential recovery, treatment or post-mortem.

Table 10 Protected Species Management Framework – underwater noise (piling)

Protected Species Management Framework – underwater noise (piling)	
Element	Impact of underwater noise on protected marine species.
Objectives	• Minimise the risk of disturbance to marine species from underwater noise from piling. • Establish and maintain awareness of the importance of protecting marine species.
Targets	• No avoidable disturbance to protected marine species as a result of noise generated during piling activities. • All personnel associated with piling operations to complete an HSE induction. • At all times that piling barge is operational, at least one crew member is a trained MFO and acting as lookout for protected marine species.
Key Performance Indicators	• Number of audits and incident reports. • Number of reported sightings of live, injured or dead protected marine species. • Number of personnel completing an HSE site induction. • Availability of MFO-trained crew member on operating piling barge.
Management	• Pile driving activities will only be undertaken during daylight hours. • Pile driving will commence each day with the "soft start" procedure, where pile driving impact force will be gradually scaled up over a five minute period. This is considered to provide an opportunity for any sensitive marine animals to leave the area before full hammering energy is realised. • The MFO will undertake assessments of the Observation and Piling Response Zones as follows:

Protected Species Management Framework – underwater noise (piling)	
	• On each occasion that the piling barge has been non-operational for a period exceeding 30 minutes, a visual assessment will be undertaken of the 750 m radius Observation Zone by the MFO for a period of 20 minutes. Piling will not recommence until no protected marine species have been sighted within the 500 m radius Piling Response Zone for a period of 10 minutes. • The assessment of the Observation Zone will be made from an elevated position on the piling barge, where a clear line of sight is achievable to the edge of the zone. • The MFO will not be engaged in any other activities during the 20-minute assessment period. • Every 30 minutes whilst the piling barge is operating, the MFO will dedicate a period of five minutes for scanning (from an elevated position) for protected marine species within the Start-up Exclusion Zone. • Once piling operations have commenced, if protected marine species enter within 500 m of the pile being driven (i.e. the Piling Response Zone), then piling will be temporarily suspended. This is likely a conservative basis as it is noted that a turtle would need to loiter within that immediate location for an extended period, if the suggested noise exposure criteria were to be exceeded (as weighted for hearing acuity and based upon recommendations in Southall et al. [2019]). Piling will not recommence until no protected marine species have been sighted within the 500 m radius Piling Response Zone for a period of 10 minutes. • Piling that commences prior to a period of low visibility (defined as where continuous visual observations to a distance of 1000 m from the piling barge is not possible), will continue unless, within the preceding 12 hours, there have been three or more suspensions of piling due to protected marine species encroaching within the Piling Response Zone. • Pile driving activities commenced prior to a period of low visibility attributable to rainfall may continue, noting the significant in-water noise generated by precipitation, such that this natural noise source would act to diminish the relative perceptibility of pile driving noise. The generation of underwater noise by all vessels will be reduced by ensuring that: • All equipment is maintained in good operating condition (balancing, greasing, etc.) and have proper noise control systems in place. • All noise minimisation measures such as mufflers, special enclosures and sound-insulation mounts are fitted and working. • Revolving equipment such as propellers and drive shafts are balanced to reduce vibration. • Equipment such as thrusters and auxiliary plant are switched off when not in use (i.e. not running in standby mode).
Monitoring	• Turtle observations (as per Management section above). • Watch will be maintained for the presence of stranded, injured or dead protected marine species. If observed, the NT Government Marine Wildwatch line (1800-453-941) will be contacted for retrieval, treatment or post-mortem of the animal(s).
Reporting	• Daily submission of marine fauna observations sheets from Piling Contractor to the Proponent. • Weekly summary reporting to the Proponent of number of sightings of protected marine species. • Monitoring report to the Proponent at the conclusion of piling. • Any suspected noise-related incidents will be reported by the Piling Contractor to the Proponent within 24 hours of the incident occurring. • Any corrective actions implemented in response to suspected noise-related incidents will be detailed in the weekly report to the Proponent.

Protected Species Management Framework – underwater noise (piling)	
Corrective Actions	In the event that noise-related impact is suspected, the incident will be investigated to confirm a noise-related impact has occurred and identify the most appropriate action(s) to reduce the potential for further impacts to occur. This may include one or more of the following: • Implementation of additional noise reduction measures (e.g. bubble curtains, if these prove effective within the prevailing tidal current conditions). • Increasing the radius of the Observation Zone to 900 m.
Term	For the duration of pile driving activities.
Responsibility	• Piling Contractor to ensure works are undertaken in compliance with this EMF. • Piling Contractor to implement turtle management and monitoring programs. • Project Manager for Piling Contractor to liaise with Proponent and DEPWS on response to stranded, injured or dead protected marine species and potential recovery, treatment or post-mortem. • Piling Contractor to implement noise management aboard all vessels.

Table 11 Protected Species Management Framework – underwater noise (dredging)

Protected Species Management Framework – underwater noise (dredging)	
Element	Impact of underwater noise from dredging on protected marine species.
Objectives	• Minimise the risk of disturbance to protected marine species from underwater noise from dredging. • Establish and maintain awareness of the importance of reducing impacts upon protected marine species
Targets	• No avoidable disturbance to protected marine species as a result of noise generated during dredging activities. • All dredging personnel to complete a Health, Safety & Environment (HSE) induction. • At all times that dredge is operational, at least one crew member is a trained MFO and acting as lookout for protected marine species.
Key Performance Indicators	• Number of audits and incident reports. • Number of reported sightings of live, injured or dead protected marine species. • Number of personnel completing an HSE site induction. • Availability of MFO-trained crew member on operating dredge.
Management	• MFO to undertake assessments of the Observation, Start-up Exclusion and Dredging Response Zones as follows. • On each occasion that the dredge has been non-operational for a period exceeding 30 minutes, a visual assessment will be undertaken of the 750 m radius Observation Zone by the MFO for a period of 20 minutes. Dredging will not recommence until no protected marine species have been sighted within the 500 m radius Start-up Exclusion Zone for a period of 10 minutes. • The assessment of the Observation Zone will be made from an elevated position on the dredge, where a clear line of sight is achievable to the edge of the zone. • The MFO will not be engaged in any other activities during the 20-minute assessment period. • Every 30 minutes whilst the dredge is operating, the MFO will dedicate a period of five minutes for scanning (from an elevated position) for protected marine species within the Start-up Exclusion Zone. • Once dredging operations have commenced, if protected marine species enter within 50 m of the dredge, or a dolphin with calf enter within 150 m of the dredge (i.e. the Dredging Response Zones), then dredging will be temporarily suspended. Dredging will not recommence until no protected marine species have been sighted within the 500 m radius Start-up Exclusion Zone for a period of 10 minutes.

Protected Species Management Framework – underwater noise (dredging)	
	• Dredging that commences prior to sunset, or prior to a period of low visibility (defined as where continuous visual observations to a distance of 1000 m from the dredge are not possible), will continue unless, within the preceding 12 hours, there have been three or more suspensions of dredging due to protected marine species encroaching within the Dredging Response Zone. • The generation of underwater noise by all vessels will be reduced by ensuring that: - All equipment is maintained in good operating condition (balancing, greasing, etc.) and have proper noise control systems in place. - All noise minimisation measures such as mufflers, special enclosures and sound-insulation mounts are fitted and working. - Revolving equipment such as propellers and drive shafts are balanced to reduce vibration. - Equipment such as thrusters and auxiliary plant are switched off when not in use (i.e. not running in standby mode).
Monitoring	• Protected marine species observations (as per Management section above). • Watch will be maintained for the presence of stranded, injured or dead protected marine species. If observed, the NT Government Marine Wildwatch line (1800-453-941) will be contacted for retrieval, treatment or post-mortem of the animal(s).
Reporting	• Daily submission of marine fauna observations sheets from Contractor to the Proponent. • Weekly summary reporting to Proponent of number of sightings of protected marine species. • Monitoring report to the Proponent at the conclusion of dredging. • Any suspected noise-related incidents will be reported by Contractor to Proponent within 24 hours of the incident occurring. • Any corrective actions implemented in response to suspected noise related incidents will be detailed in the weekly report to Proponent.
Corrective Actions	In the event that noise-related impact is suspected, the incident will be investigated to confirm a noise-related impact has occurred and identify the most appropriate action(s) to reduce the impact. This may include one or more of the following: • Implementation of further noise reduction measures. • Restriction on vessel movements/activities. • Increase in the radius of the Observation Zone to 900 m.
Term	For the duration of dredging activities.
Responsibility	• Contractor to ensure works are conducted in compliance with this PSMF. • Contractor to implement noise management aboard all vessels.

3.9 Marine ecosystems, Marine environmental quality, Light availability

3.9.1 DEPWS Comment

The draft EIS notes that additional work was undertaken as part of the Water Quality baseline study. This program also included two instrument deployments to record turbidity (nephelometric turbidity units [NTU]) and photosynthetically available radiation (PAR) at the South Shell Island site. Turbidity data was analysed as part of setting turbidity trigger values (see above). However, the relationship between turbidity and light availability at the seafloor was not investigated.

Dredging activities and land reclamation may have impacts on marine flora and fauna through increased turbidity from suspended sediments, which can lead to smothering of benthos and reduced light availability for benthic primary producers.

The Flora and Fauna Division recommends that the relationship between turbidity and light availability at the seafloor is analysed and results are incorporated into setting turbidity trigger values.

3.9.2 Proponent Response

3.9.2.1 Turbidity Data

As detailed in Section 3.5.2, the turbidity data collected for the Project were not used for the setting of turbidity trigger levels. Hence an analysis of the relationship between turbidity and light availability would not lead to any change in the turbidity trigger levels. Furthermore, as detailed in Section 2.2, the proposed construction methodologies include the development of a bund wall around the reclaim area, before infilling activates occur. This will prevent sediment plumes by reclamation activities entering the harbour.

It is acknowledged that there is increasing recognition (e.g. through the work of the WAMSI DSN) of the importance of light availability as a key parameter for understanding the potential for impacts to occur upon benthic communities. However, light availability to be used to inform the setting of trigger levels would require determinations of the ‘reduced light’ tolerances of the benthic communities at risk of potential impact. It is noted that laboratory data, and field data from other localities, cannot be used to inform the tolerances of Darwin Harbour benthic communities, as these are most likely to be highly location-specific and often adapted to baseline conditions at these locations.

Further, as turbidity trigger levels are set on the basis of a percentile of baseline turbidity, then these will not be influenced by whatever relationship may be found to exist between turbidity and light availability. Therefore, even if Project turbidity data were to be used to set the trigger levels, then the application of a consistent relationship between turbidity and light availability would not alter the resultant trigger levels.

3.10 Marine ecosystems, Marine communities

3.10.1 DEPWS Comment

The draft EIS discusses the spatial distribution of benthos within a Darwin Harbour and Zone of Influence context. The review predominantly uses references predating 2013 and habitat modelling undertaken in 2019. To supplement existing data the proponent contracted AIMS to undertake additional benthic surveys for the East Arm precinct. Appendix F notes that modelling of pooled habitat data found to have poor predictive ability and AIMS attributed this to an overall low structural complexity and relief, and the low prevalence of key benthic classes. Consequently a refined habitat map could not be created. The Flora and Fauna Division considers the habitat map to be inadequate. The draft EIS has not made use of the latest modelling approaches, nor has it used the latest revised benthic habitat map.

Further, there are questions around the suitability of the surveys undertaken for the purpose of predictive habitat mapping. An outcome of the Galaiduk et al (2019) was that surveys should specifically target rare habitats such as benthic primary producers (seagrass, algal and coral communities). This would require surveying lower intertidal habitats and shallow subtidal habitats, which both seem to be poorly represented by the additional transects undertaken for the draft EIS.

The Flora and Fauna Division recommends that that South Shell Island and Catalina Island are resurveyed to determine the extent and composition of benthic primary producer habitats. This will allow the proponent to design an appropriate monitoring program that can reliably measure the response of these habitats to disturbance from dredging and landfill activities.

3.10.2 Proponent Response

3.10.2.1 Habitat Mapping

The habitat map within the Draft EIS incorporated all information that was available at the time of its preparation. It is recognised that revised habitat modelling outputs were subsequently released; however, these do not materially alter the distribution of verified habitats presented within the habitat map in the Draft EIS. Notwithstanding this, a detailed survey of the shallow intertidal habitats around South Shell Island and Catalina Island (with the exception of the Restricted Works Area designated on the Project's AAPA Certificate) has been undertaken. The survey data will be used to revise the habitat map; this will be included within the Construction Contractor's DDSPMP which will be submitted for approval prior to the commencement of dredging activities.

The proposed monitoring regime for the Catalina Island and South Shell Island benthic communities is included within the Draft DDSPMP (Appendix C: Draft Dredging and Dredge Spoil Placement Management Plan, Section 9.3) and will reflect the predicted level of risk of impact (being cognisant of the water quality monitoring that will be undertaken around the dredging and land reclamation activities).

3.11 Coastal process - sediment transport and plume model

3.11.1 DEPWS Comment

The draft EIS has undertaken sediment transport and plume modelling. The models use a number of approximations, assumptions and limitations that are relevant when interpreting the modelling results. The draft EIS did not undertake field observations to validate the models.

The Flora and Fauna Division recommends that the Dredging and Dredge Spoil Placement Management Plan includes a monitoring program to validate the sediment transport and plume models. This has relevance to assessing the health of sensitive receptors, like benthic primary producers, from sediment deposition.

3.11.2 Proponent Response

As described in Section 2.2. of Appendix I: Sediment Transport Modelling to the Draft EIS, tidal data from a tide gauge close to the Project location (refer Figure 2 of the of Appendix I: Sediment Transport Modelling) was used to validate the model.

The approved Final DDSPMP (Appendix C: Draft Dredging and Dredge Spoil Placement Management Plan) will contain a monitoring regime that will enable validation of the model predictions and will also inform management of the dredging works in such a way that reduces the potential for impacts upon sensitive benthic communities. Further discussion around monitoring is presented in Section 3.4.2 above, including the preliminary WQMF that has been developed for the Project.

3.12 Marine environmental quality, Cumulative impacts

3.12.1 DEPWS Comment

A cumulative impact assessment was undertaken for the draft EIS. The assessment included projects that have commenced construction, projects that have been approved but not commenced and projects that are currently being assessed. The assessment used INPEX's maintenance and dredging and Spoil Management Plan (INPEX 2018) to set triggers for Wet season and Dry season conditions. The assessment concluded that "It is noted that all dredging programs undertaken in the Darwin Harbour require Developmental Consent and an approved Dredging and Dredge Spoil Placement Management Plan and hence the impacts and proposed measures to manage and mitigate these potential cumulative impacts can be further considered and coordinated by regulators".

The Flora and Fauna Division considers this assessment inadequate. The draft EIS did not undertake any plume modelling that included potential sediment discharges from other projects within Darwin Harbour. Nor did it include suspended sediment discharges from its own reclamation activities (infill activities and dredge spoil disposal of coarse sediments). The Flora and Fauna Division recommends that plume modelling should at least include all of the Ship Lift project's activities that impact on suspended sediment (e.g. dredging and land reclamation, see also Zone of Influence comment) and provide the Dredging and Dredge Spoil Placement Management Plan for review by appropriate experts before any dredging commences.

3.12.2 Proponent Response

3.12.2.1 Nominated Trigger Levels

As a point of clarification, it is noted that the turbidity trigger levels adopted for the Project (described in Section 7.4.4.2 of the Draft EIS) were based upon data collected for INPEX's EIS, not for their Maintenance Dredging and Spoil Disposal Management Plan (as stated in DEPWS' comment). The nominated trigger levels are also consistent with those applied during the neighbouring MSB and MUBRF project dredging campaigns, and in Darwin Port's Long Term Dredging Management Plan. An assessment of their applicability is included within Section 7.4.4.2 of the Draft EIS and is also discussed in Section 3.5.2.

3.12.2.2 Cumulative Impacts from Concurrent Dredging Campaigns

The Darwin Ship Lift proponent has been liaising with proponents of other known near-term dredging campaigns within Darwin Harbour (including Santos, INPEX and Defence) to ensure cumulative impacts from concurrent dredging campaigns are negated. Due to the location of other projects, the only potential cumulative impact could occur via INPEX maintenance dredging occurring concurrently with the dredging campaign for the Darwin Ship Lift.

- INPEX has indicated via personal communications that their maintenance dredging campaign will likely be in early 2024, whereas the Darwin Ship Lift dredging campaign is due to be completed by August/September 2023. Therefore, detailed quantitative cumulative modelling between the two projects was not deemed to be necessary.
- Project reclamation activities are unlikely to contribute to the zones of impact/influence from dredging operations, due to
    - The placement of dredged material into the reclamation area will occur behind a bund wall to be constructed prior to the placement of the material.
    - Erosion control and sediment retention measures such as silt curtains and geotextile fabric will be in place to ensure that sediments from the reclamation area do not enter the marine environment.

- Monitoring will be undertaken to manage the effectiveness of the erosion control and sediment retention measures; this is described in Section 3.4.2.

Given that the implementation of these measures will be required through the application of the WQMF within an approved Final DDSPMP (Section 3.4.2) it is considered that the need to remodel turbid plume dispersion to include reclamation works as part of the Supplementary EIS is not proposed.

Dr Paul Erftemeijer (DAMCO Consulting Pty Ltd) has been approached by DIPL to provide an independent review of the dredging contractors final DDSPMP prior to submission to the NT EPA for approval. Dr Erftemeijer has worked extensively on environmental assessment of dredging projects in Darwin Harbour and globally. The scope of this review will be to assess the adequacy of the impact assessment, monitoring and mitigation and management measures proposed, to confirm that they are appropriate for a dredging project in Darwin Harbour.

3.13 EMP: mitigation measures

3.13.1 DEPWS Comment

The draft EIS has identified that marine mammals and turtles occur in East Arm and Darwin Harbour. That there are three species of coastal dolphin (Australian Humpback, Snubfin and Bottlenose) that consistently use the area for foraging and social activities (Brooks et al 2017). Given the occurrence of marine turtles within the footprint and neighbouring areas, turtles are likely to use the filter feeder habitat for foraging.

The draft EIS has noted that these species may potentially be impacted by the Project's activities, such as vessel traffic, dredging operations, pile driving and associated underwater noise, and lighting. Therefore, mitigation of potential impacts is important to reduce the risk to these species.

However, the draft EIS does not mention appropriate mitigation measures. It does note that the project is committed to developing a number of environmental plans (EMP) to mitigate potential impacts and associated risks.

The Flora and Fauna Division recommends that the proponent consider at least the following mitigation measures be incorporated into EMPs in relation to vessel traffic, dredging, pile driving and lighting:

- *Implementation of vessel speed limits during construction and operation phase.*
- *Marine megafauna observation zones and exclusion zones;*
- *Observation period for marine megafauna prior to commencing dredging and pile driving is 20 minutes and the observer is solely dedicated to the task of sighting and recording marine megafauna interactions prior to and during dredging and pile driving operations.*
- *Lighting specifications follow National guidelines*

3.13.2 Proponent Response

The Proponent acknowledges the requirement for mitigation measures to be included for vessel traffic, dredging, pile driving and lighting. These recommended mitigations have been considered below, and will be included, along with a suite of additional measures, within the EMPs (including the DDSPMP) to inform the Construction Contractors environmental management plans which will be developed before the commencement of Project construction.

The mitigation measures recommended by DEPWS are included within the underwater noise PSMFs for piling (Table 10) and dredging (Table 11) (refer to section 3.8.2.4). Measures to reduce the potential for impacts upon protected marine species from vessel interactions are included in the preliminary PSMF in Table 9. During construction light spill into marine environment from vessels and infrastructure will be reduced to as low as practically possible through the implementation of lighting in accordance with the National Light Pollution Guidelines for Wildlife (DEE, 2020). Detailed design of the facility will incorporate lighting in accordance with National guidelines (Department of the Environment and Energy, 2020).An updated EMF has been included to provide further information that has been requested by the NT EPA or management measures that have been identified as part of further investigations in the Supplementary EIS (Appendix E). In addition to the updated EMF, a Draft DDSPMP (Appendix C) has been developed to offer further information about environmental management for the dredge program.

3.14 Environmental management plans

3.14.1 DEPWS Comment

The proponent refers to EMPs throughout the draft EIS. It states that actions formulated within these EMPs will mitigate potential impacts and thus pose a low risk to flora and fauna, and the habitats /environmental conditions they rely on. However, these EMPs are yet to be drafted. As such it is impossible to assess if the proposed mitigating actions are adequate.

The Flora and Fauna Division supports the proponent's commitment to develop detailed EMPs and recommends that these EMPs are reviewed by appropriate external experts before any work is commenced.

3.14.2 Proponent Response

3.14.2.1 Environmental Management Plans

The Proponent recognises the need to develop, and have approved, a suite of EMPs to demonstrate the manner in which the risks of impacts upon all aspects of the environment will be mitigated through the implementation of robust monitoring and management frameworks. The Project is currently in a two party ECI process in which a range of construction management plans have been developed, however due to the active procurement process, these materials are subject to strict probity controls and are not publicly available. The following environmental management plans have been developed for the Project as part of this process:

- Construction Environmental Management Plans (CEMP)
- Construction Management Plan
- Marine Works Management Plan
- Traffic Management Plan
- Stakeholder Management Plan.

These management plans have been informed by the Draft EIS Chapter 13: Environmental Management Framework and have been developed to incorporate the activities identified in each contractors ECI design. To further assist in the final management plans developed following the selection of the preferred Construction Contractor, an updated Environmental Management Framework and Dredging and Dredge Spoil Placement Management Plan have been developed to assist in the progression of these management plans.

The Draft Dredging and Dredge Spoil Placement Management plan can be found in Appendix C, while the updated EMF can be found in Appendix E.

3.14.2.2 Environmental Management Framework

The Environmental Management Framework details the management and mitigation measures required by the Construction Contractor and the Operator which may be reviewed by appropriate experts before construction of the Project begins. The EMF has been designed to be consistent with the AS/NZS ISO 14000 standards for environmental management. The EMF includes:

- roles and responsibilities
- inductions and training requirements
- incident, notification and emergency management requirements
- environmental objectives and performance criteria
- inspections monitoring, auditing and reporting requirements
- processes for dealing with a non-compliance and corrective actions
- complaints management requirements.

This framework includes proposed objectives, performance criteria, management and mitigation measures and monitoring and reporting requirements for impacts associated with the preliminary key

environmental factors and other environmental factors identified in the ToR for the Darwin Ship Lift EIS, or as part of the Project environmental risk assessment, technical studies and stakeholder consultations. These include:

- Marine Environmental Quality
- Marine Flora and Fauna
- Air Quality and Greenhouse Gases
- Terrestrial Environmental Quality
- Terrestrial Flora and Fauna
- Surface Water and Hydrological Processes
- Human Health

The EMF will inform environmental management documents to be prepared by the Construction Contractor; the Proponent will assess the Construction Contractors plans with these EMF before the commencement of Project construction activities. In addition to the EMF, these documents will be further informed by a suite of documents used to guide the delivery of the Project These key documents include:

- Social Impact Management Plan (SIMP)
- Heritage Management Plan (HMP)
- Noise and Vibration Management Plans
- Traffic Management Plans (TMPs)
- Erosion and Sediment Control Plan (ESCP)
- Marine Spill Response Plans
- Biosecurity Management Plan

3.14.2.3 Standard Environmental Management Requirements

DIPL's Standard Specification for Environmental Management (DIPL 2019) details the requirements for environmental management of projects. This includes guidelines for Construction Contractors on preparation of Contractor's Environmental Management Plans and other supporting plans (DIPL 2019). Construction Contractors will be expected to implement the requirements of these specifications where relevant and environmental requirements will be included in contractual documentation.

3.14.2.4 Environmental Management Plan Development

Draft CEMPs have been developed and submitted to the NTG by the two ECI Contractors as part of the ECI submissions. Finalised CEMPs will be developed in advance of relevant Project works. As the Project progresses, objectives, performance criteria and mitigation measures presented in the EMF will be further refined by the successful Construction Contractor, to ensure that an adaptive approach is taken to management of the Project. The CEMPs developed by the Construction Contractor for the Project will be reviewed by the DIPL Project Team, DIPL Environmental Consultant and if required, independent external experts.

3.15 Maps of the Project footprint: AAPA Authority certificate, Project footprint, Proposed activities

3.15.1.1 AAPA Comment

As noted in the Draft EIS, the Authority has issued Authority Certificate C2019/004 for this proposal, in accordance with the Northern Territory Aboriginal Sacred Sites Act 1989.

The outline of the Project footprint shown in Figure 1 appears to align within the bounds of the Subject Land covered by Authority Certificate C2019/004. However, the spatial files for the project area, provided with the Draft EIS, indicate an extent beyond the edge of the Subject Land on the northern side. The Authority clarifies that only activities carried out within the Subject Land are covered by the Authority Certificate.

3.15.2 Proponent Response

3.15.2.1 Project Footprint

It is acknowledged that the Project footprint may extend slightly outside the subject land in the Authority Certificate obtained for this Project (C2019/004). There will be a requirement for some works within the Berrimah Road corridor and adjacent to the Port Access Road in order to tie the Project into the adjacent land and provide services to the Project.

These works are covered under Authority Certificates C2005/031 (Berrimah Road) and C2009/231 (Darwin Port and East Arm).

3.16 Sacred sites, modelling, pre/post monitoring, vessel transit

3.16.1 AAPA Comment

The Draft EIS correctly acknowledges that there are two sacred sites adjacent to the proposal area and there is potential for the proposal to negatively impact on these sites. Modelling for the Draft EIS indicated that any impacts due to hydrological changes are likely to be minor and the two sites are unlikely to be affected.

The proponent has committed to monitor sediment at the sacred sites pre- and post-construction. It is unclear what action would be undertaken if significant changes to sediment are detected.

Conditions within Authority Certificate C2019/004 state that no damage shall occur to the two sacred sites. Any impact considered to be damage would be a contravention of the certificate.

The Terms of Reference for the Draft EIS requested addressing measures to protect sacred sites including 'transit of vessels in the vicinity of sacred sites. The transit of vessels in the vicinity of sacred does not appear to have been addressed in the Draft EIS.

3.16.2 Proponent Response

3.16.2.1 Hydrological Changes and Mitigation

The Proponent acknowledges the AAPA concern over potential impacts to the two sacred sites adjacent to the Project footprint. Conditions within Authority Certificate C2019/004 state that "*no damage shall occur to the two sacred sites and that any impact considered to be damage would be a contravention of the certificate".* The Proponent is aware of the importance of the two sacred sites and the need to ensure they are protected. The Proponent is also aware of the implications (both financial and reputational) of impacting such sites and is committed to ensuring that no impact considered to be damage occurs to these sacred sites.

The key potential risks to the sacred sites were identified in the form of sediment deposition from Project activities during construction and hydrological changes following the Project's construction. Given the distance of these sacred sites from the Project, the event of an impact is considered unlikely and would only occur at a minor and temporary scale.

Risks from sedimentation during and post construction will be further mitigated through following management measures:

Sedimentation during construction

- Installation of silt curtains
- Best practice methods and controls outlined in the DDSPMP including:
  - Monitoring of sediment plume 150 m down-current of the operating dredge.
  - If necessary, reducing or suspending dredging activity during certain tidal periods when the migration of dredge plumes towards South Shell Island or Catalina Island is greatest.
  - If required due to exceedance of turbidity trigger levels at 150 m down-current from sources, assessment of hard coral and filter feeder communities at South Shell Island and / or Catalina Island monitoring sites.

Hydrological changes following construction

- Further modelling of the final Project footprint
- Monitoring of sacred sites.

The adaptive management approach to managing this risk will reduce the impacts of sedimentation to a level that will not damage the sacred sites.

3.16.2.2 Vessel Transit

The two sacred sites are located a sufficient distance away from the Project that the impact of boat wakes have been considered a low risk to their condition. To ensure that no damage occurs to these sites, further mitigation measures include:

- Construction vessels and workers will be prohibited from accessing the sacred sites with No-Go Zones around the sacred sites detailed in the Project's CEMP.
- Vessel movements, both during construction and operation, will be at low speeds within the Darwin Harbours vessel speed limits to ensure the safe manoeuvring within the Project footprint.

With these mitigation measures, Project activities are not anticipated to have an impact on sediment movement outside of the immediate Project area.

3.17 Underwater cultural objects, consistency, sediment dynamics

3.17.1 Heritage Branch Comment

There is an inconsistency in the definition and scope of physical remains associated with the Flying Boat Base (FBB), which may lead to poor mitigation outcomes. While the definition of FBB physical remains in the draft EIS excludes underwater cultural objects, the archaeology report (Appendix M) notes the continuing presence of underwater cultural objects. The underwater deposits are a part of the historical/archaeological remains of the FBB site. Further, although past studies have recorded parts of this deposit, therefore providing some mitigation, that work was either selective or limited by tidal exposure (See item below for further detail and actions).

3.17.2 Proponent Response

The definition of the site and associated discussions regarding the maritime archaeological component of the FBB base has been updated as part of this Supplementary EIS and in the commitment to conduct further heritage surveys for the FBB site.

Changes to the wording presented in the Draft EIS and Appendix M: Cultural Heritage Assessment of the Draft EIS describing the significance of the FBB can be found in Section 6.4. This definition and subsequent recommended work (detailed in Section 3.20 and 6.4) will remove the inconsistency as noted by Heritage Branch. An archaeological survey and additional maritime archaeological work is proposed for the FBB site, including survey and archaeological analysis of remains present. Additional heritage interpretation would also be installed near the site. The Proponent is committed to continue working with the Heritage Branch to ensure the appropriate recording of the Project sites heritage.

3.18 Mitigating loss of FBB, survey area, maritime survey

3.18.1 Heritage Branch Comment

The 2017 Cosmos Archaeology report, commissioned by the Heritage Branch, details a grid and transect survey done in relation to the FBB jetty footprint. The work involved the recording, recovery and analysis of diverse FBB related material, which has significantly informed our understanding of life and operations at that base. The report confirmed that 25% of the jetty area (the deepest part) was not included in the study because it could not be reached by foot. Appendix M of the draft EIS provides a hierarchy of options responding to this unsurveyed area. The Heritage Branch confirms that, considering the rich material deposit recorded elsewhere in the jetty footprint, and that this area will be lost, only the first (highest) option is acceptable. This first option is to conduct a maritime survey to recover, record and analyse the artefact deposit prior to the commencement of work. A commitment to this work should be a condition of environmental approval.

This preconstruction work will greatly reduce the likelihood of discoveries of underwater cultural heritage during the construction and dredging phase. The commitment to a heritage discovery protocols during construction and dredging should remain, as already outlined in the draft EIS and Appendix M.

3.18.2 Proponent Response

The Heritage Branch comment is acknowledged, the Proponent notes that while areas of the FBB infrastructure will be impacted by Project development, the 25% of the unsurveyed section of the FFB jetty falls well outside the western boundary of the Project footprint.

The Proponent is committed to undertaking maritime surveys of the Project footprint, which includes other areas of the former FBB site, to recover, record and analyse any important artefact deposit prior to the commencement of construction works. There have been previous maritime and geophysical surveys conducted within the Project footprint during the development of the MUBRF channel. Future maritime archaeological work would use this data, and new data collected to record any cultural heritage material present on the seabed. These works will be organised in liaison with the Heritage Branch and findings will be incorporated into the Heritage Interpretation Plan.

3.19 Mitigating loss of FBB, LMS

3.19.1 Heritage Branch Comment

Additional site recording measures are required to mitigate loss. The FBB should be recorded at spring low tide using drone and photogrammetric tools to produce a high resolution 3D visual model. This should include the adjacent Z Special Unit Lugger Maintenance Section (LMS) remains which operated concurrently. Bush and low trees at the LMS may need to be trimmed to provide greater visibility and coverage. A commitment to this work should be a condition of environmental approval.

3.19.2 Proponent Response

The Proponent has had preliminary discussions with the Heritage Branch and will continue to work with them to obtain the best visual recording of the FBB prior to the commencement of construction works. Discussions will continue in regards with undertaking appropriate recording as part of the heritage interpretation of the site. Regarding the LMS, this site is outside the footprint of the Darwin Ship Lift Project and on land owned by others. As such, activities such as recording and trimming of vegetation will not be able to be undertaken in this location.

3.20 Mitigating loss of FBB, signage

3.20.1 Heritage Branch Comment

The Draft EIS and Appendix M recommend the installation of signage about the FBB to be installed at the entrance to the ship lift facility as an action to mitigate loss. This measure is supported, but the measure should be extended to include a more public location, such as the East Arm Boat Ramp. The signage should be of a size and level of detail in line with the significance of the site. The scale and level of investment will determine whether this measure stands as a form of mitigation. The integration of LMS history should be considered. The Heritage Branch acknowledges the commitment by the proponent to work with the Heritage Branch on signage (Table 10.5). An interpretation plan and commitment to deliver should be a condition of environmental approval.

3.20.2 Proponent Response

It is understood that a design for interpretive signage for the FBB and LMS has been planned by the Heritage Branch. The Proponent is committed working with the Heritage Branch to ensure that the signage is developed and installed in an appropriate location (likely the East Arm Boat Ramp) in accordance with Heritage Branch direction.

3.21 Loss of FBB, heritage listing, historical significance

3.21.1 Heritage Branch Comment

The consistent reference throughout the draft EIS to the FBB not being heritage listed is true, and this status does remove some impediments from a process point of view. However, the fact it is not heritage listed should not be taken as an assessment that the site is not significant. Heritage listing is a process, which does involve an assessment of significance, but then also involves a series of other steps, including stakeholder and landowner consultation. Strong opposition to heritage listing can suspend the process. This is relevant to measuring the impact of the project and discussing a commitment to mitigation.

3.21.2 Proponent Response

The Proponent understands that while the FBB is not listed under legislation, this is not an assessment of the significance of the FBB. It should be noted that the site is considered to have heritage significance and appropriate management options have been prepared to manage Project impacts to the site. The wording throughout the Draft EIS and Appendix M: Cultural Heritage Assessment of the Draft EIS has been updated to reflect these with changes and can be found in Section 6.4.

3.22 Economic gaps, Economic studies, Data transparency

3.22.1 DCMC Strategic Policy Division Comment

Economic studies have not been included in the draft EIS and workforce numbers, skills and economic impact are quoted from material and studies provided by the Proponent. It is recommended that the materials and briefings that have been relied upon are referenced in the final EIS, and potentially included as an annexure to inform the assessment process and conditioning. This will also assist the Proponent in drafting management plans.

The figures for job numbers and economic opportunity vary widely. If there is any opportunity to refine these numbers, it would be useful.

3.22.2 Proponent Response

In response to the DCMC Strategic Policy Division Comment about economic gaps, studies and data transparency, the Proponent has prepared the following response.

1. The direction from the DCMC Strategic Policy Division is summarised as "*Jobs and economic benefits can be strengthened by including economic analysis and modelling. Indigenous participation goals could also be described and committed to in the EIS text. Benefits can be enforced by attaching conditions to any approvals in relation to procurement, training, local employment and Indigenous employment":*

- The aspect of jobs and economic benefits are addressed by points 2 to 3 below
- The Proponent is the NTG and the Project has been committed to delivering government's indigenous participation goals since the inception of the Project in 2015. The selection of the Construction Contractor to complete the design, construction and commissioning of the Project facilities provides opportunities for indigenous participation and employment and these criteria have been included in the tender and procurement documentation to date, expressed as a minimum threshold for respondents to comply with. Competition between tender respondents will encourage them to maximise indigenous participation as a means of differentiating their offer, where it makes sense to do so. It should be noted that several structural components of the facilities to be delivered by the project are likely to be prefabricated elsewhere, imported and/or require specialist expertise that does not exist within the NT's existing industry to the required standard. Government will continue to apply conditions relating to indigenous participation and employment to the remaining tendering, procurement and construction documentation. The Operator of the completed facilities has already been selected, and opportunities for indigenous participation were addressed through that process.

2. The submission from DCMC Strategic Policy Division states that *"Economic studies have not been included the draft EIS and workforce numbers, skills and economic impact are quoted from material and studies provided by the Proponent. It is recommended that the materials and briefings that have been relied upon are referenced in the final EIS, and potentially included as an annexure to inform the assessment process and conditioning. This will also assist the Proponent in drafting management plans".*

- This comment relates to information attributed in Section 5 of the Social Impact Assessment (Draft EIS Appendix C) to ACIL Allen (2019), or to information supplied by the Proponent (the NT Government) for section 5 of the SIA based upon ACIL Allen (2019):
- The ACIL Allen report is not included in the bibliography of the SIA, but the title of the report is included in the explanatory notes to Table 5.2 (page 64 of Volume 2). The full title of the ACIL Allen report is "*Assessment of SLAMI Complex: Preliminary Market, Financial and Economic analysis, February 2019".*
- The explanatory notes to Table 5.2 explain that this report was commissioned by the NT Department of Trade Business and Innovation in 2018 based on the nature of the proposed Project at that time, and that "*a number of minor adjustments were made to align some ACIL Allen's estimates to the approach assumed for the EIS submission in late 2021*". Between 2018 and late 2021 there were changes in the location of the Project site, and the scale and nature of the facilities to be delivered by the Project, although the associated target market and economic benefits remained broadly consistent but required fine-tuning.
- The ACIL Allen (2019) report and subsequent discussions and analysis Government has undertaken since that time includes information that was commercial-in-confidence at the time, and remain so, which is why the full economic information was not included in the Draft EIS. However, in order to ensure the NT EPA had appropriate information to make an informed decision the Proponent offered to provide a confidential briefing on the market justification underpinning the Project, including up to date discussions on projected usage of the facilities by the Royal Australian Navy and Border Force, which are also commercial-in-confidence. This approach was tested with senior assessment staff prior to lodgement, and was advised to be an acceptable means of providing the NT EPA with the context necessary to make an informed decision. This is why the Proponent did not include the economic studies with its Draft EIS. The Proponent is still prepared to offer the NT EPA a confidential briefing with up to date information.

3. The submission from DCMC also states that *"The figures for job numbers and economic opportunity vary widely. If there is any opportunity to refine these numbers, it would be useful"*. This relates to information included in Table 1.1 and Section 5 of the Social Impact Assessment (Draft EIS Appendix C), including the explanatory notes to Table 5.2 (pages 64 and 65 of Volume 2):

- The significant investment of approximately $400 million in new facilities in Darwin Harbour will establish a pathway for growth of the Darwin-based ship repair and maintenance industry,

and associated industries, attracting business that is currently going elsewhere within the broader region, including work for the Royal Australian Navy and Border Protection. The economic benefits of the Project were estimated over 20 years, even though it is assumed the facilities will be built to a design life of at least 40 years, and regular maintenance and upgrades could see the facilities operating for longer.

- The existing marine repairs and maintenance industry is small and restricted to servicing a local market because that is all existing facilities and industry capability allow. However, the new facilities the Project will provide a pathway for significant growth and capturing business from a much larger market, provided the industry skills and capabilities are available in Darwin and are competitively priced to attract business from competing service providers. There are a number of provisos that will influence how well the local industry will capitalise upon the new facilities, introducing uncertainty around when the benefits in terms of industry growth, new employment opportunities, and money injected into the NT economy will flow.
- This uncertainty was recognised, and addressed by constructing and describing three different scenarios to describe the range of potential outcomes – a low usage, base and high usage case. These three scenarios are the source of the variation in the "*job numbers and economic opportunity*" referred to in DCMCs submission. Scenario analysis is a widely accepted and appropriate tool for recognising the uncertainty associated with projections of future outcomes, make the impact of assumptions transparent, and avoid decision makers becoming overly confident in one set of projected outcomes and less cognisant of the associated uncertainty.
- The Proponent is aware of the uncertainty, and is working with industry to develop a Maritime Industry Development Plan, and with the Royal Australian Navy to progress a commitment and facilities in Darwin to undertake repairs and maintenance facilities for vessels as large as the RAN's new Patrol Boats (Regional Maintenance Centre North). These actions to build industry capability and firm up market demand will progress throughout 2022, and will be well-advanced by the time the facilities are commissioned at the end of the Project. These complementary, industry development strategies will reduce the uncertainty around the timing and scale of the benefits associated with the Project, but they will not eliminate it. The three scenarios are a useful way to understand the uncertainty around job numbers and the economic opportunity at this point in time. Selecting one scenario as the preferred or more likely outcome may narrow the range of projected employment and economic effects, but will understate the underlying uncertainty. A more pragmatic way to reduce the uncertainty is to build the capability of the local industry and firm up demand which from customers with a strong commitment to using local facilities, which Government has already commenced and is committed to delivering.

3.23 ALL EIS: Police, Fire and Emergency Services Response

3.23.1 NTPFES Comment

The NT Fire and Rescue Service will consider the emergency response capability and capacity during construction, completion and general business actives of the project.

3.23.2 Proponent Response

The Proponent commits to working with NT Fire and Rescue Service to ensure all requirements are met during construction, completion and general business activities.

3.24 Traffic impact Assessment: Community and Economy/Human Health, Haulage of material/truck movements

3.24.1 DIPL Transport and Civil Services Division Comment

The Transport and Civil Services Division has identified significant transport planning and safety concerns with regards to the fill material haulage and traffic impacts on the intersections/road network within the study area.

The Division will directly discuss with the Proponent requirement of further safety analysis and required updates to the current version of the traffic impact assessment. Additional measures are recommended to avoid, mitigate or manage the potential significant impacts:

- *alternative route solutions to the proposed fill material haulage plan*
- *other developments/changes within the study area which may impact on the haulage operation*
- *significant safety improvements required in the study area*
- *provision of passing lane along Arnhem Highway haulage route at priority*
- *controlled intersections and active intersections used by other existing extractive industries.*
- *vehicles not to travel in convoy to allow for passing vehicles*

3.24.2 Proponent Response

In response to the DIPL Transport and Civil Services Division comment about additional management measures for traffic impacts, the Proponent has prepared the following response.

As stated in Section 2, there have been changes to the volumes of materials that are required to be transported to site as part of this Project. These changes have been the result of design maturity and the identification of alternate material sources. Additionally, the Traffic Impact Assessment undertaken for the Draft EIS was based on a truck capacity that was significantly less than the legal road limit.

Considering these factors has resulted in a dramatic decrease in the estimated truck movements required for this Project. It is now anticipated that approximately 3,000 individual trips will be required to import fill, rock and pavement material rather than the 13,000 trips reported in the Draft EIS. As well as less import of general fill and rock armour, additional sources of fill closer to the Project site have been identified, including:

- A source of general fill adjacent to the Common User Facility (400 m to the northeast of the Project site) as well as another approximately 5 km to the north of the Project site.
- Approximately 9,600 m^3 of rock material on the Project site can be reused and thereby negating the need to import approximately a quarter of the Project's rock requirements.

DIPL have also invested in, and undertaken trials in conjunction with the Queensland Government and the private sector, and a first for the NT and Australia, Heavy Vehicle priority system at traffic signals. This system, when fitted to heavy vehicles, links between the heavy vehicles and traffic signals to provide priority green light call at the intersection before arrival at traffic signals. This will only be available to construction vehicles at certain times (i.e. outside of both morning and evening peak traffic periods).

The system will provide better flow of these heavy vehicles, reducing travel times and reducing the times they need to decelerate and accelerate at traffic lights, while improving productivity. This will result in decreased emissions from these vehicles (i.e. vehicles produce more emissions during acceleration/deceleration, where if they do not have to stop and start it reduces engine emissions), reduce brake wear associated dust and reduces maintenance costs on both the heavy vehicles and the road network (i.e. more road damage occurs as heavy vehicles accelerate/de-accelerate at traffic lights).

As stated, this system will not operate during the morning and afternoon peak traffic periods. It is anticipated that the Construction Contractor's heavy construction vehicles importing fill, pavement and quarried materials between the Arnhem Highway and the site (largely road trains) will be prevented to

operate in peak commuter periods or in convoys. As a production mitigation, they will instead be provided priority calls for green lights at signalised intersections between the Arnhem Highway and East Arm. It should be noted, as traffic signals are dynamically controlled by a systems logic and in-pavement detections systems, the heavy vehicles will not always get a priority, it will still depend on other priorities and systems logic on the road network. However, if there are no higher priorities, the heavy vehicles will be able to continue unimpeded.

This system will also improve commuter productivity and reduced congestion if interfacing a number of road trains on their twice daily commutes. Further benefits of this system are improvements to transport times leading to transport operators and the Territory's project cost efficiencies, improved road safety by reducing peak commuter and heavy vehicles interfaces and reduced light and heavy vehicle congestion leading to reduced vehicle emissions and improved productivity for heavy vehicle operators and commuters combined.

3.25 All EIS: Zoning

3.25.1 DIPL Comment

The subject land related to the project footprint is Sections 5420, 5163, 6370 & 5167 Hundred of Bagot which is in Zone DV (Development) of the Northern Territory Planning Scheme 2020.

- *A ship lift is a use not defined by the planning scheme and requires planning consent in Zone DV. Ship maintenance areas, garages, and blast and paint facilities would be defined as industry-general and require consent in Zone DV. Reclamation, dredging and works within a storm surge affected area also required consent by overlay. Planning consent is required under the Planning Act 1999 for both the development as described, in addition to the proposed subdivision and consolidation of the land.*
- *The purpose of Zone DV is 'Facilitate the development of major strategic industries that are of importance to the future economic development of the Northern Territory, including gas, road, rail or port related industries. Zone Outcome 1 is 'A range of strategic industry activities, including abattoir, fuel depot, major industrial development, transport terminal, and warehouse uses that benefit from proximity to ports and rail infrastructure and require larger lots due to the scale of activities. The proposal is considered to broadly align with the zone purpose and zone outcome 1, and is generally a type of development expected in this location.*
- *The proponent has liaised separately with Development Assessment Services (DAS) with regard to the information required to form part of the planning application. DAS have no specific comments or requirements for the draft EIS.*

3.25.2 Proponent Response

The submission by Development Assessment Services (DAS) regarding the development consent requirement is acknowledged, and the Proponent will continue to work with DAS to ensure all development requirements are met.

3.26 All EIS: Crown land estates: Crown land act 1992

3.26.1 DIPL Comment

The proponent is liaising with Crown Land Estate in relation to tenure considerations related to the project. Crown Land Estate has no specific comments or requirements for the draft EIS.

3.26.2 Proponent Response

The Proponent acknowledges the submission by Crown Land Estate in relation to tenure considerations related to the Project and will continue to liaise with Crown Land Estate.

3.27 EIS: Objectives and benefits of the Project

3.27.1 DITT Comment

Cruise and expedition shipping plays an important role in the Territory's tourism industry, generating an estimated $60 million in expenditure within the Northern Territory in 2018-19 (i.e. pre-pandemic). The geographic location of the Top End and its close proximity to Asia makes it an ideal Australian gateway port for visiting cruise ships. The cruise sector offers commercial opportunities for local businesses in providing on-shore touring, retail, and servicing/resupplying of the vessel. Importantly, cruise shipping supports visitation in the Northern Territory's traditional low season (that is, over summer).

It is estimated in 2018 Darwin received approximately 60 superyacht visits, the majority of which arrived to undertake maintenance and take on supplies. Darwin has an important geographical advantage in respect this sector, being 700 nautical miles closer to Indonesia than are competitor facilities in Cairns.

Having a world class ship lift, repair and maintenance facility will help attract attention of the superyacht and cruise sectors. Increased visits and economic return to the Territory are anticipated.

For these reasons, the development of this new piece of infrastructure is supported.

3.27.2 Proponent Response

The Proponent acknowledges the submission from DITT supporting the development of the Darwin Ship Lift Project and associated infrastructure.

4.0 Response to Other Submissions

4.1 Darwin Harbour Dredging Strategy

One public submission was received during the exhibition of the Draft EIS. The submission was received from the Environment Centre NT (ECNT) and included comments across several themes including dredging and underwater noise alongside seven recommendations.

The Proponent has responded to these comments and recommendations below. Inputs relating to underwater noise impacts have been provided by specialist underwater noise consultant John Polgaze (FIMarEST FRINA CMarSci) of PGM Environment.

4.1.1 ECNT Comment

Recommendation 1: The proponent delay development of the DDSPMP until the Darwin harbour dredging strategy has been completed.

4.1.2 Proponent Response

The Draft DDSPMP attached to this Supplementary EIS (Appendix C: Draft Dredging and Dredge Placement Management Plan) has been developed in accordance with NT guidelines, and takes account of potential impacts upon the harbour ecosystem. The Dredging Contractor's DDSPMP, which will be aligned with the Draft DDSPMP, will be submitted for approval prior to commencement of dredging.

The Darwin Ship Lift Proponent is working closely with the developers of the Darwin Harbour Dredging Strategy to ensure that aspects of the strategy are incorporated into the Ship Lift Project as they are being developed. Examples of the strategy being adopted by the Project include, adopting best practice dredging methodologies, beneficial reuse of dredge spoil and extensive mitigation measures (as described in the DDSPMP in Appendix C).

The Darwin Harbour Dredge Strategy is being developed following broader concerns that proponents of dredging projects were essentially working independently and were not addressing the potential cumulative impacts of dredging on Darwin Harbour. The Proponent is also liaising with other dredging projects due to be undertaken in the near-term to ensure overlap of programs is avoided and cumulative impacts negated. The volumes of material to be dredged for the Project are not sufficiently great as to pose a risk of significant impacts upon the broader harbour. Cumulative impacts that may occur due to concurrent projects have been considered (Chapter 12: Cumulative Impacts of the Draft EIS and Section 3.12.2.2 of this Supplementary EIS.

4.2 Timing of Dredging

4.2.1 ECNT Comment

Recommendation 2: Dredging operations are only permitted to occur on neap tides in calm conditions when no other dredging operation is taking place to limit dredge plumes as much as possible.

4.2.2 Proponent Response

The suggested approach would extend the duration of dredging considerably; given the predicted low risk of potential impacts upon the harbour ecosystem, such a limitation is considered to be unwarranted. The Draft DDSPMP included with this document (Appendix C: Draft Dredging and Dredge Disposal Management Plan, Section 8.2) includes a monitoring regime to detect the dispersion of turbid plumes during different tidal phases. If the designated trigger levels are exceeded, then corrective actions (up to and including the potential temporary cessation of dredging, if necessary) will be implemented to mitigate the potential for adverse environmental effects to occur (Appendix C: Draft Dredging and Dredge Spoil Placement Management Plan, Section 8.2.3). A preliminary WQMF is included in Section 3.4.2.

It is also noted that, while turbid plumes will disperse over greater distances during spring tides, the concentrations of the sediments suspended within them diminishes more rapidly with distance from the source due to greater hydrodynamic mixing. Further, background turbidity levels are also greater during

spring tides, and under non-calm conditions, so the proportional increase in turbidity due to potential plumes would be less than during calm, neap tide periods.

4.3 Maintenance Dredging

4.3.1 ECNT Comment

Recommendation 3: The DDSPMP includes an investigation into how much maintenance dredging will be required and determines the best way to mitigate ongoing impacts.

4.3.2 Proponent Response

The potential frequency of maintenance dredging is presented in Section 2.5.5 of the Draft EIS. While the frequency, and the volumes of material to be dredged on each occasion, can be estimated, the actual frequency and volumes cannot be determined until the facility is in operation. The rate of accumulation of sediments within dredged areas is influenced by many factors, some of which cannot be accurately modelled. For example, the infrastructure around dredged areas can have fine-scale influences on hydrodynamics; sediments do not settle evenly across dredged areas (preferentially accumulating within the deeper portions); and settled sediments can be re-distributed within dredged areas due to propeller wash from vessels. Even the major natural vectors leading to deposition of sediments into the dredged area (such as tidal currents and storm events) cannot be accurately predicted, especially the latter. Maintenance dredging is only required once a part of the dredged area approaches depths which could impede the safe navigation of vessels within it. As for the capital dredging works, maintenance dredging activities will be conducted in accordance with an approved Final DDSPMP.

4.4 Underwater Noise

Responses to the ECNT comments relating to underwater noise impacts have been provided by underwater noise specialist consultant John Polglaze from PGM Environment in Sections 4.4.2 to 4.4.20 below.

4.4.1 ECNT Comment

Pile driving 485 steel piles with 200 hammer strikes each at 193dB over a period of 240 days will result in a major increase in underwater noise in East Arm over a considerable period of time.

4.4.2 Proponent Response

The nominal pile driving program of 485 piles each averaging 200 hammer strikes with resultant radiated underwater noise exposure level of 193 dB (re 1 µPa2.s at 1 m) for the final stages for each pile (estimated at seven minutes) was adopted as a precautionary upper bound and, in essence, over statement of the actual pile driving program, given that the piling program to be executed will ultimately depend upon the final design and construction plan for the ship lift. It is now evident that less than 300 piles will likely be placed for the ship lift facility. Furthermore, the 193 dB (re 1 µPa2.s at 1 m) sound exposure level adopted for the purposes of modelling for the Draft EIS only represents the final series of hammer strikes at maximum energy for each individual pile (as the pile reaches bedrock); in general terms the earlier strikes, representing 50% or more of the total strikes on any individual pile, would not be at maximum energy, thus limiting the intensity of the resultant radiated underwater noise. In reality, both the duration and intensity of the pile driving program will be significantly less, of the order of around 50% or more, compared with the reasonably expected ‘worst case scenario’ adopted for the purposes of ‘boundary’ setting in the Draft EIS. Significantly, the reduced number of piles now considered likely to be required will have the parallel outcome of limiting the duration of the piling program, given that longevity and persistence of potential noise-induced effects are considered key determinants of any resultant observed behavioural or physical changes in potentially sensitive marine fauna populations (Southall et al. 2021).

Based upon the foregoing text, which was prepared by a specialist subconsultant with nationally and internationally recognised expertise in the assessment of potential underwater noise and vibration impacts, the Proponent:

- Recognises that the revised piling program may be considered by some to still represent a source of major increase in underwater noise in East Arm.

- Understands that, with the implementation of the measures detailed in the PSMF for piling (refer Table 9, Section 3.8.2.4), the exposure of sensitive receptors to increased noise levels will be managed such that the risk of impacts upon sensitive receptors within Darwin Harbour will be reduced to as low as reasonably practicable.

4.4.3 ECNT Comment

International studies of pile driving noise impacts have shown major behavioural changes to fish choruses that are associated with several behavioural functions. Deviation from a regular pattern of fish chorus might affect fish reproductive success, cause migration, augmented predation, or physiological alterations (Siddagangaiah 2021). This is not addressed in the EIS and there is no presented evidence of fish chorus monitoring for the area.

4.4.4 Proponent Response

Siddagangaiah et al. (2021) reported on observed changes to fish choruses in the presence of exposure to pile driving and operational noises associated with the development and use of offshore wind farms. This was on the basis of noted changes in the intensity and duration of two signature patterns of fish chorusing. The study did not examine, and hence did not report on, any consequential changes to fish population dynamics, fitness or processes, but speculated that the observed changes to fish chorusing may have some resultant effects.

It is recognised that the proposed Project pile driving program and underwater noise resulting from this and associated activities may have some effect upon fish chorusing in the immediate vicinity of the ship lift. Whether any such observed change in chorusing activity would have any material effect upon the associated fish populations is subject to debate, but even if assuming some effect is possible several factors ought to mitigate and attenuate the likely significance and severity of any such potential resultant effects. Given the size, scope and location of the Project activities, and their limited duration, any such effects would be confined to a small section of Darwin Harbour and would not extend through any complete annual life cycle process.

In addition, given the complexity of underwater noise propagation characteristics, especially in such a setting as Darwin Harbour, and the conservative assumptions underpinning the acoustic modelling used for the Draft EIS, the spatial and temporal extents of resultant noise exposure of potentially susceptible fish populations would likely be less than forecast. Considering the factors of limited exposures confined to only a proportion of the fish populations in Darwin Harbour for a period not exceeding a full annual cycle, it is difficult to concede that any potential effects upon fish chorusing, and any subsequent effects, would not be essentially transitory in nature and limited to a subset of the total fish populations, and thus unlikely to have any persistent or enduring adverse effects. Furthermore, potential effects will be mitigated by simple expedients such as the substantial periodic breaks in piling activities arising as the pile barge moves from one pile to another.

4.4.5 ECNT Comment

The EIS fails to adequately consider the cumulative noise impacts on Dolphins, Turtles and Dugong. Not only is pile driving occurring for 240 days, but the dredging program extends for a further 161 days and then ongoing vessel noise into the future will more likely result in marine megafauna abandoning the area.

4.4.6 Proponent Response

The actual durations of the piling and dredging campaigns, and the extent to which they overlap, will only be apparent once a Construction Contractor is engaged to undertake detailed design and construction of the Project. Whilst the dredging campaign may commence before, or extend beyond, the piling campaign (or vice versa) it is emphasised that the modelling adopted piling as the ‘worst case’ source of underwater noise. Therefore, the areas within which protected species may be affected by noise generated from the dredging activities (and from vessel movements during Project construction and operation) will be smaller than the areas associated with piling effects.

It is noted that the Project is within an industrialised part of the harbour, located between EAW and the MSB to the west, and the MUBRF to the east. Further, there are no known specific areas of critical foraging, feeding or breeding habitat for protected marine species within the zone of potential effects from the development and operation of the Project. Hence, if marine megafauna were to avoid this area

of East Arm then this would not represent a risk to the viability to their populations, given that there are broad areas of similar habitat present within areas of Darwin Harbour that are far removed from industrialisation.

Based upon comprehensive advice received from specialist underwater noise consultants, PGM Environment, DIPL understands that attempting an evaluation of cumulative underwater noise exposures from Project works (in conjunction with those from simultaneous activities that may be occurring within the harbour) would be unlikely to generate any reliable or meaningful conclusions. The rationale behind this understanding includes consideration of the following:

- Predictions of cumulative noise exposure are exceedingly complex and are not simply additive.
- While noise signals from multiple noise sources may be additive (to varying degrees) under certain circumstances, they may also be antagonistic and partially or completely cancel one another.
- The degree to which the noise signals are additive or antagonistic depends upon aspects such as:
    - The distances between the various sources and the receptor of interest.
    - The propagation pathways between the sources and the receptor
    - The phase differences between the noise signals from each source.

4.4.7 ECNT Comment

When these impacts are combined with adjacent projects like nearby East Arm wharf and the busy Inpex LNG loading facilities across the channel, the underwater soundscape will greatly increase in intensity.

4.4.8 Proponent Response

This comment implies more extensive noise sources in Darwin Harbour while oversimplifying the question of cumulative noise exposures (as discussed in the previous section). For example, the physical location of the EAW precinct in relation to the ship lift area restricts the occurrence of directly additive noise sources in both extent and duration, with the variable, and in places shallow, intervening bathymetry acting to limit noise transmission from the EAW area to that of the ship lift area.

In addition, the noise associated with construction of the Project (primarily piling and dredging) will be of relatively limited duration. While vessel movements in the immediate vicinity of the Project will sporadically increase during vessel entry to, and exit from, the facility, these will be of far lesser frequency than general vessel traffic within East Arm (e.g. vessels traversing East Arm to/from Hudson Creek, recreational craft which pose a greater risk of impact to protected species due to their faster speed and lesser ability to detect individuals and take evasive action). It is also noted that operation of the Project will not substantially increase the number of vessel movements within Darwin Harbour as the facility will essentially be servicing vessels that are usually located within the harbour.

Furthermore, it is difficult to consider the INPEX LNG loading facilities as ‘busy’, given that three to four LNG carriers call into the export terminal in any given week. Thus, activity at the terminal is represented primarily by around eight tanker movements (arrivals and departures) per week, with each typically accompanied by three harbour tugs and small support vessels, with each cycle of a duration of no more than an hour or so within the vicinity of the LNG terminal.

4.4.9 ECNT Comment

The EIS claims that “predicted noise levels that could lead to behavioural disturbance will not extend across the width of East Arm”. This statement is weakly supported by desktop simulations using coefficients developed in the US. Further, the assertion in the EIS that “it is predicted that dredging and piling will not have the potential to disrupt the passage of dugongs, dolphins, turtles or sawfish between Elizabeth River and Darwin Harbour” is contradicted in the Talis consultants’ assessment which details that behavioural disturbance occurs out to 2200m. The width of East Arm near the project site is 2200m, therefore there is major potential for disruption of marine fauna migration up and down East Arm. This could result in the heavily fished Elizabeth River being starved of recruitment from the broader Harbour and a collapse in the most accessible and popular fishing spot for Palmerston locals. The modelling of noise impacts from individual activities becomes meaningless if the cumulative impacts are not thoroughly assessed and this should be rectified.

4.4.10 Proponent Response

The modelling employed for the purposes of the Draft EIS represents a conservative approach and employed parameters which represented 'worst case' in terms of amenable propagation conditions and intensity of noise sources, simultaneous with using some low exposure effects thresholds (*cf* Popper et al. 2014 and Southall et al. 2019). By extension the results of the modelling and subsequent predictions of possible effects overstate potential noise exposures in all but the most infrequent sets of circumstances of tidal state, water column homogeneity and piling hammer impact energy.

In-water acoustic propagation is subject to losses due to factors such as scattering, absorption, reflections, refractions and reduction in energy density as the signal front becomes physically larger as distance from source increases. Propagation characteristics, and hence losses, are influenced by a range of variables, including: temperature (and temperature stratigraphy), depth of water, depth of source and depth of receptor, pressure, salinity, ambient noise, sea state (influenced by swell and wind), turbidity, bottom topography, and bottom composition and uniformity of composition. Varying conditions within these aspects further limit effective propagation by way of imposing inconsistent and variable propagation effects.

Darwin Harbour exhibits great variability in physical characteristics such as water depth, salinity, turbidity, and bottom type, the often sub-optimal nature (in terms of quality of acoustic propagation properties) and variability of these aspects acting to attenuate acoustic propagation ranges. The modelling assumed that all of these factors - with the exception of bathymetry - were constant and adopted other features acting to enhance propagation factors, and hence invariably understate propagation losses and overstate the spatial extent of modelled zones of acoustic influence.

For example, the acoustic modelling conducted for the ship lift assumed:

- Constant salinity and uniform salinity/depth profile.
- Constant water temperature and uniform bathythermal profile.
- Propagation from and through assumed deepest part of water column (in both tidal extremes), furthermore taking account of additional depth expected to be achieved following dredging. This represents an over-statement of water depth in all but a limited number of circumstances.
- Consistent and most reflective bottom type (as opposed to muddy sections which would absorb sound, and heterogenic bottom types which would act to scatter sound energy).
- Maximum hammer strike energy for all hammer strikes, when actually only anticipated to be used for less than 50% of strikes.
- Unweighted marine fauna noise exposures, not allowing for the attenuated received levels which would actually be experienced by any potentially exposed marine fauna due to frequency-dependent hearing acuity factors.

The results of the conservative and precautionary modelling, acting to overstate predicted exposures in all but infrequent sets of circumstances, indicate that likely acoustic influence zones would not extend across the extent of East Arm.

Notwithstanding this, it should also be noted that being within an acoustic zone of influence does not necessarily equate to 'have the potential to disrupt the passage of dugongs, dolphins, turtles or sawfish'. While it is accepted that the acoustic exposure modelling indicates that some of these animals may be deterred or distracted from certain activities in the vicinity of East Arm, this cannot be assumed to be disruption or interference of passage through an affected section of water. Any actual acoustic-induced disruptions may manifest in forms such as changes in speed, direction or perseverance with such passage, or changes in vocalisations or to coincidental foraging or other behaviours, such potential responses are presented the following matrix (Southall 2021):

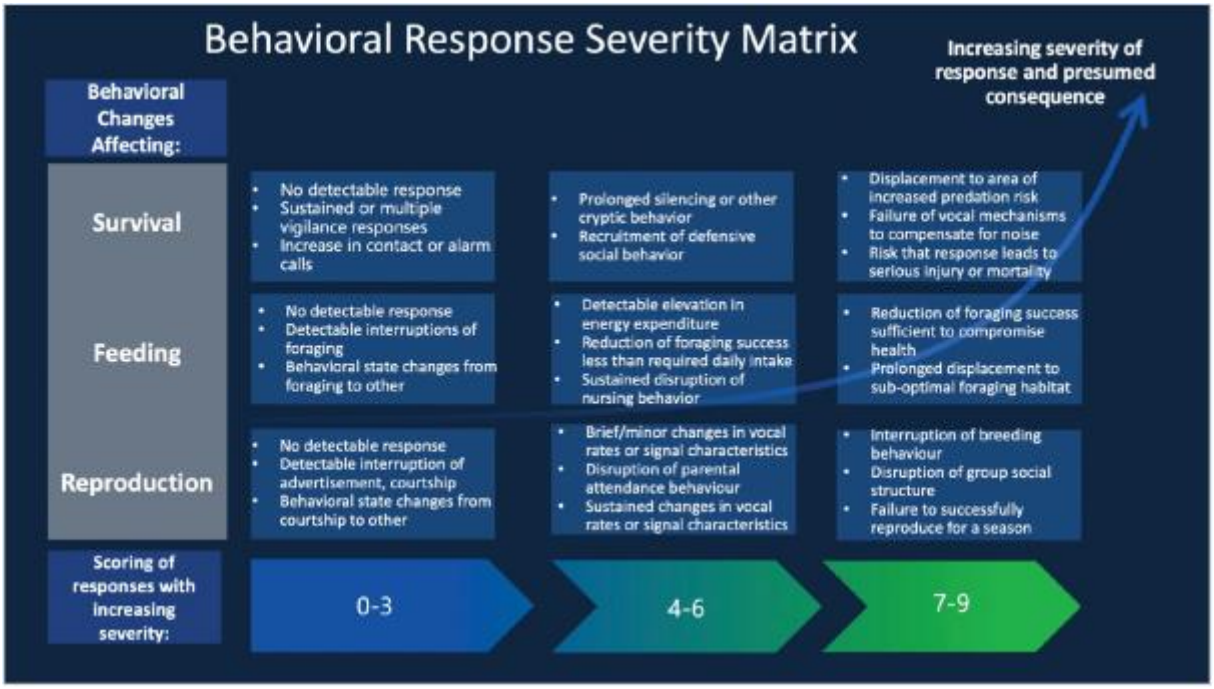


Figure 5 Behavioural response severity matrix (Southall 2021)

Marine fauna responses to anthropogenic noise are also variable and contextual, and influenced by factors such as any degree of habituation, ambient noise, behavioural states and similar. In addition, any such effects arising from the Project development activities would only be in train for a relatively limited period, and less than 12 months. They would thus be unlikely to result in long-term, significant, irreversible outcomes in terms of annual and seasonal population cycles and life histories.

In relation to the use of 'coefficients developed in the US', it is noted that underwater sound propagation adheres to universal principles of physics which do not vary across international boundaries. Further, the vast majority of work pertaining to the assessment of potential noise impacts upon protected marine species (including that referenced by ECNT) is undertaken overseas. However, the country of origin of a sound propagation model, and any associated parameters, does not alter the veracity of its application within Darwin Harbour.

It is reasonable to state, as has the ECNT, that consideration of cumulative noise effects should be taken into account. As noted in Section 4.4.6, however, empirical collation and analysis of cumulative underwater noise sources is difficult, and especially so in the heterogeneous and dynamic acoustic propagation environment characteristic of Darwin Harbour. Any attempts at actually quantifying cumulative noise exposures would be unreliable and at best indicative only, if not misleading.

Nevertheless, cumulative exposures have been considered implicitly in the Draft EIS by dint of the precautionary exposure criteria applied and the conservative modelling approach adopted. Furthermore, the limited duration of the proposed ship lift development works acts to nullify any reasoning underpinning any expressed need for cumulative noise exposure assessments, as would be more justified in the case of a development program extending over several years. In summary, the precautionary and conservative approach adopted for the assessment and the relatively short duration of the envisaged works program mitigate against the significance of potential cumulative noise exposure effects.

4.4.11 ECNT Comment

The evidence presented in the EIS on the abundance of marine fauna present is poor and contradictory. Evidence cited from the Cardno (2014) Dugong and Turtle studies conducted during the development of the Inpex Ichthys LNG project are now 10 years old. Major changes in the distribution and abundance of these iconic species are highly likely due to the vast increase in vessel traffic and ongoing underwater noise impacts in East Arm. New field surveys should be undertaken to ascertain if

changes to Turtle and Dugong distribution and abundance has occurred to better inform management plans.

4.4.12 Proponent Response

It is noted that whilst surveys can be used to confirm the presence of a species at a particular location at a particular point in time, no amount of survey effort can be effective in proving that a species will always be absent from a particular location. That is, a survey may be undertaken at a time of day, or in a season, at which a species is not present at a location, whereas it may be detected if the survey was to be conducted at a different time of day or season. It is noted that the INPEX-funded surveys of turtles, dolphins and dugongs within Darwin Harbour were conducted only during daylight hours; they provided no indication of the distribution of these species at night.

Hence, any field surveys of turtle and dugong distribution would not 'better inform management plans' as these plans are prepared on the assumption that all protected species (including turtles and dugongs) may be present in the vicinity of Project activities. The monitoring and impact mitigation measures within the PSMFs therein are consistent with this assumption (refer Sections 3.8.2, 3.13.2 and 4.4.20).

4.4.13 ECNT Comment

The information presented for fish diversity and abundance is also very limited and contradictory. The URS (2009) survey considered "pelagic fish life within East Arm to be moderate to abundant relative to other areas surveyed within Darwin Harbour", and yet they quote 5 benthic fish species which are not pelagic. The Cardno (2014) studies where more comprehensive, but the angling research technique used should not be the only method of assessment. A comprehensive BRUV survey should be carried out before, during and after the construction of the ship lift to monitor potential changes to fish abundance.

4.4.14 Proponent Response

It is noted that:

- Baited Remote Underwater Video (BRUV) systems only provide data on fish abundance at discrete locations; the data cannot be used to infer fish abundances across regional ecosystems.
- BRUVs only attract a subset of the fish species present at any location - i.e. those that are attracted to the bait that is deployed. Other species (e.g. planktivorous fish) will not be attracted. Whilst carnivorous species (such as barramundi) may be of greater interest to certain sectors of the human community, they are not necessarily the most important species from an ecosystem function standpoint.

  To develop a robust baseline dataset, the deployment of BRUVs over multiple seasons and years would be required to attain a measure of variability in fish abundances within the Project location. Such variability would be in response to both natural and existing anthropogenic influences. As the risk of significant impacts upon regional fish communities occurring due to construction and operation of the Project are sufficiently low, a multi- year comprehensive BRUV survey is not warranted.

  Furthermore, any changes in fish abundance during construction and operation of the Project could not be reliably attributed to the Project due to the many other influences in its immediate vicinity (such as the operation of EAW, including the MSB and MUBRF either side of the Project).

4.4.15 ECNT Comment

Barramundi are the most important recreational species in the Elizabeth River and yet the evidence for Barramundi presented by both URS (2001) and Harrison et al (2009) note there is no supralittoral swamps or suitable nursery habitat in Darwin Harbour for Barramundi. This means recruitment of Barramundi in the Elizabeth River must migrate down East Arm. With the cumulative underwater noise impacts greatly increasing in East Arm and the ongoing removal of mangrove shoreline may result in this migration pathway being cut off. Further research is required to determine how and when Barramundi migrate along East Arm to better inform management plans. A restocking program may have to be introduced to the Elizabeth River to maintain this socially important fishery.

Recommendation 7 - A comprehensive Barramundi movement study is developed to better inform management of the Elizabeth River Recreational fishery.

4.4.16 Proponent Response

The social importance of the recreational barramundi fishery is recognised. However, as detailed in Section 4.4.10 above, even with the conservative and precautionary approach adopted for modelling of underwater noise propagation (which acted to overstate the predicted exposures in all but infrequent sets of circumstances), it was concluded that the likely acoustic influence zones would not extend across the extent of East Arm. Therefore, it follows that there would be no impediment to barramundi moving into the Elizabeth River via East Arm.

It is also noted that the incorporation of the small patch of remnant mangrove into the reclamation area could not possibly be considered to represent a risk of cutting off a migration pathway for barramundi.

Overall, it is considered that the risk of impacts to barramundi movement through East Arm due to construction and operation of the Project is insufficiently great to warrant the need for research into barramundi migration along East Arm.

4.4.17 ECNT Comment

Recommendation 4 - Cumulative underwater noise studies are undertaken that include nearby operations at East Arm wharf, Inpex Ichthys LNG facility and the Middle Arm Sustainable Development Precinct so a comprehensive cumulative underwater noise impact model can be developed.

4.4.18 Proponent Response

Aspects of relevance to the assessment of cumulative noise are discussed above in Sections 4.4.6. The forecast frequency of vessel movements during operation of the Project is described in Section 2.5.1 of the Draft EIS. In the context of the EAW, MSB, MUBRF and Hudson Creek operations, and the INPEX export operations, it is considered that the degree of environmental risk posed by the additional noise and vibration contributed during the construction and operation of the Project will be insufficiently great as to warrant the development of a 'comprehensive underwater noise impact model'.

Furthermore, given their different locations in and around East Arm, it should be recognised that there is little potential for direct coupling between sound sources at EAW, the DSLP, the INPEX LNG facility and the (future) MASDP.

4.4.19 ECNT Comment

Recommendation 5 - Pile driving is only permitted to occur during spring low tides to minimise the disruption of movement of marine fauna between Elizabeth River and the outer harbour.

4.4.20 Proponent Response

From the outcomes of the conservative modelling undertaken as a component of the Draft EIS, (as addressed above in Section 4.4.10) it is not possible to discern any need to restrict pile driving activities to spring low tides in order to minimise any purported disruption of movement of marine fauna between Elizabeth River and the outer harbour.

A program of environmental risk mitigation and response measures, centred upon managing potential underwater noise exposures, will be included within the environmental management plan that will be approved prior to the commencement of piling operations. An example of the EMF to be implemented is provided in Table 12 below.

Table 12 Protected Species Management Framework – underwater noise (piling)

Protected Species Management Framework – underwater noise (piling)	
Element	Impact of underwater noise on protected marine species.
Objectives	• Minimise the risk of disturbance to marine species from underwater noise from piling. • Establish and maintain awareness of the importance of protecting marine species.
Targets	• No avoidable disturbance to protected marine species as a result of noise generated during piling activities. • All personnel associated with piling operations to complete an HSE induction. • At all times that piling barge is operational, at least one crew member is a trained MFO and acting as lookout for protected marine species.
Key Performance Indicators	• Number of audits and incident reports. • Number of reported sightings of live, injured or dead protected marine species. • Number of personnel completing an HSE site induction. • Availability of MFO-trained crew member on operating piling barge.
Management	• Pile driving activities will only be undertaken during daylight hours. • Pile driving will commence each day with the "soft start" procedure, where pile driving impact force will be gradually scaled up over a five minute period. This is considered to provide an opportunity for any sensitive marine animals to leave the area before full hammering energy is realised. • The MFO will undertake assessments of the Observation and Piling Response Zones as follows: • On each occasion that the piling barge has been non-operational for a period exceeding 30 minutes, a visual assessment will be undertaken of the 750 m radius Observation Zone by the MFO for a period of 20 minutes. Piling will not recommence until no protected marine species have been sighted within the 500 m radius Piling Response Zone for a period of 10 minutes. • The assessment of the Observation Zone will be made from an elevated position on the piling barge, where a clear line of sight is achievable to the edge of the zone. • The MFO will not be engaged in any other activities during the 20-minute assessment period. • Every 30 minutes whilst the piling barge is operating, the MFO will dedicate a period of five minutes for scanning (from an elevated position) for protected marine species within the Start-up Exclusion Zone. • Once piling operations have commenced, if protected marine species enter within 500 m of the pile being driven (i.e. the Piling Response Zone), then piling will be temporarily suspended. This is likely a conservative basis as it is noted that a turtle would need to loiter within that immediate location for an extended period, if the suggested noise exposure criteria were to be exceeded (as weighted for hearing acuity and based upon recommendations in Southall et al. [2019]). Piling will not recommence until no protected marine species have been sighted within the 500 m radius Piling Response Zone for a period of 10 minutes. • Piling that commences prior to a period of low visibility (defined as where continuous visual observations to a distance of 1000 m from the piling barge is not possible), will continue unless, within the preceding 12 hours, there have been three or more suspensions of piling due to protected marine species encroaching within the Piling Response Zone. • Pile driving activities commenced prior to a period of low visibility attributable to rainfall may continue, noting the significant in-water noise generated by precipitation, such that this natural noise source would act to diminish the relative perceptibility of pile driving noise. The generation of underwater noise by all vessels will be reduced by ensuring that:

Protected Species Management Framework – underwater noise (piling)	
	• All equipment is maintained in good operating condition (balancing, greasing, etc.) and have proper noise control systems in place. • All noise minimisation measures such as mufflers, special enclosures and sound-insulation mounts are fitted and working. • Revolving equipment such as propellers and drive shafts are balanced to reduce vibration. • Equipment such as thrusters and auxiliary plant are switched off when not in use (i.e. not running in standby mode).
Monitoring	• Turtle observations (as per Management section above). • Watch will be maintained for the presence of stranded, injured or dead protected marine species. If observed, the NT Government Marine Wildwatch line (1800-453-941) will be contacted for retrieval, treatment or post-mortem of the animal(s).
Reporting	• Daily submission of marine fauna observations sheets from Piling Contractor to the Proponent. • Weekly summary reporting to the Proponent of number of sightings of protected marine species. • Monitoring report to the Proponent at the conclusion of piling. • Any suspected noise-related incidents will be reported by the Piling Contractor to the Proponent within 24 hours of the incident occurring. • Any corrective actions implemented in response to suspected noise-related incidents will be detailed in the weekly report to the Proponent.
Corrective Actions	In the event that noise-related impact is suspected, the incident will be investigated to confirm a noise-related impact has occurred and identify the most appropriate action(s) to reduce the potential for further impacts to occur. This may include one or more of the following: • Implementation of additional noise reduction measures (e.g. bubble curtains, if these prove effective within the prevailing tidal current conditions). • Increasing the radius of the Observation Zone to 900 m.
Term	For the duration of pile driving activities.
Responsibility	• Piling Contractor to ensure works are undertaken in compliance with this EMF. • Piling Contractor to implement turtle management and monitoring programs. • Project Manager for Piling Contractor to liaise with Proponent and DEPWS on response to stranded, injured or dead protected marine species and potential recovery, treatment or post-mortem. • Piling Contractor to implement noise management aboard all vessels.

4.5 Marine Fauna

4.5.1 ECNT Comment

Recommendation 6 - The proponent completes a marine fauna (including fish) biodiversity survey of East Arm to establish a comprehensive biodiversity baseline before further development occurs

4.5.2 Proponent Response

Due to its small footprint, location in a historically disturbed environment and short construction timeframe the impacts of the Project on marine fauna populations are considered to be temporary and restricted to the local area around the Project footprint (See Zone of Influence and Zone of Impact in the Draft EIS: Chapter 8). Furthermore, a suite of mitigation measures, including protected species management frameworks and management requirements, (described in the Updated Environmental Framework (Appendix E) and in the DDSPMP (Appendix C)) are considered robust enough to protect marine species while the Project is under construction. Finally, it is considered that such an undertaking could only provide meaningful results if placed within a harbour-wide context, with biodiversity measures monitored on regular basis. This is beyond the scope of the Project and may be more suitable to a Harbour wide plan. As such, a comprehensive biodiversity baseline survey is not considered necessary for the Project.

5.0 NT EPA advice on additional information to be provided in the SEIS

5.1 NT EPA Additional Comments

Additional comments were provided by the NT EPA in their Direction to Prepare a Supplement. This information was requested to ensure that the NT EPA has sufficient information to complete the environmental impact assessment process. The following comments relate to further information required for the original NTG agency submissions and have been addressed within responses to these submissions.

5.2 Land reclamation activities and sediment plumes

5.2.1 NT EPA Requested Information

Provide a discussion of potential impacts of land reclamation, including but not limited to mobilisation of sediment, and discuss proposed controls and their effectiveness.

If there is potential for a sediment plume to result from land reclamation provide an updated plume model.

5.2.2 Proponent response

In response to the NT EPA request for additional information on the potential impacts of land reclamation the following response is provided.

As discussed in Section 3.4 the likelihood of sediment plumes from the reclamation works is improbable due to the construction methodology that will be utilised. A bund wall will separate reclaim activities from the harbour. In addition the following management measures will be implemented that will reduce potential sediment plumes as a result of land reclamation activities.

- The Draft DDSPMP has developed a preliminary WQMF which is provided in Table 8. The approved Final DDSPMP will include an WQMF that is designed to mitigate the potential for the dispersed suspended sediments (from both dredging and dredged material placement [including land reclamation activities]) to reach benthic communities at concentrations, durations and frequencies that are sufficiently high as to pose a risk of causing detectable changes in these communities.
- The approved Final DDSPMP WQMF will include corrective actions that will be implemented in the event that the monitoring indicates that the risk of potential impacts to benthic communities from dredging and dredged material placement (including reclamation) is unacceptably high.
- If corrective actions are triggered, further monitoring will be undertaken to demonstrate that the implemented corrective actions have reduced the risk of impacts to benthic communities to levels that are no greater than those predicted by the modelling undertaken for the Draft EIS.
- As the Project is prepared to accept the risks associated with implementation of the WQMF within the approved Final DDSPMP (such as Project delays and additional costs attendant to implementation of corrective actions), it is considered that remodelling is not required at this juncture.

Given the updated construction methodology, the significantly reduced risk of sediment plumes as a result of reclamation activities as well as the proposed mitigation measures, additional updates to the plume modelling are not proposed as part of this Supplementary EIS.

5.3 Updated plume modelling

5.3.1 NT EPA Requested Information

If an updated plume model is required (see above), reassess the zones of impact and influence for the proposal (including all impact sources of the proposal such as from land reclamation and dredging).

If the plume model is revised and the zones of impact and influence change, potential impacts on benthos and water quality should also be reassessed.

5.3.2 Proponent Response

As discussed above in Section 3.4, it is not believed that an updated sediment plume model is warranted.

The zones of impact and influence will not change from what has been presented in the Draft EIS.

5.4 Sediment management and mitigation measures

5.4.1 NT EPA Requested Information

Provide an assessment of options for managing and mitigating sediment generated through infill, including an assessment of the potential for placing revetments prior to commencement of infill.

5.4.2 Proponent Response

The options for managing and mitigating sediment plumes are discussed in Section 3.4 of this Supplementary EIS. The updated design methodology will incorporate the development of a bund wall prior to the commencement of infill. This has significantly reduced the potential for sediment resuspension interacting with the rest of the harbour as a result of land reclamation activities.

5.5 Habitat modelling of South Shell Island and Catalina Island

5.5.1 NT EPA Requested Information

The Draft EIS discusses the spatial distribution of benthos within a Darwin Harbour and Zone of Influence context. The review predominantly uses references predating 2013 and habitat modelling undertaken in 2019. To supplement existing data the proponent contracted AIMS to undertake additional benthic surveys for the East Arm precinct. Appendix F notes that modelling of pooled habitat data found to have poor predictive ability and AIMS attributed this to an overall low structural complexity and relief, and the low prevalence of key benthic classes. Consequently, a refined habitat map could not be created.

South Shell Island and Catalina Island should be resurveyed using appropriate methods and with sufficient sampling intensity to provide robust understanding of baseline extent and composition of benthic primary producer habitats.

5.5.2 Proponent Response

Habitat modelling and surveying are discussed in Section 3.10 of the Supplementary EIS. An updated habitat map has been developed based on habitat mapping provided by DEPWS. Furthermore, additional surveys have been scoped for late May 2022 which will involve drop video surveys within the vicinity of South Shell Island and Catalina Island. As the interpretation of these surveys will likely occur post submission of this Supplementary EIS, further mitigations methods will be developed based on the outcomes following these benthic habitat surveys and will be used to inform the CEMP and OEMP if required.

5.6 Provision of a Draft Dredge and Dredge Spoil Placement Management Plan

5.6.1 NT EPA Requested Information

Provide a draft Dredging and Dredge Spoil Placement Management Plan (noting that the plan may need to be updated for consistency with the NT EPA's Assessment report and any Environmental Approval) including monitoring and reactive management of water quality.

Provide written validation by an independent qualified person, demonstrating that the monitoring and reactive management measures are sufficiently sensitive to detect and respond to any impact of dredging and dredge spoil placement activities.

5.6.2 Proponent Response

The Draft DDSPMP is included as Appendix C: Draft Dredging and Dredge Spoil Placement Management Plan. The DDSPMP will be finalised by the Construction Contractor and submitted to the NT EPA as part of the dredging approvals documentation. Dr Paul Erftemeijer has been approached by DIPL to provide an independent review of the Dredging Contractors final DDSPMP prior to submission to the NT EPA for approval. Dr Erftemeijer has worked extensively on environmental assessment of dredging projects in Darwin Harbour and globally. The scope of this review will be to assess the adequacy of the impact assessment, monitoring and mitigation and management measures proposed, to confirm that they are appropriate for a dredging project in Darwin Harbour.

5.7 Tailwater test and release locations

5.7.1 NT EPA Requested Information

Provide a map of the tailwater test and release location.

5.7.2 Proponent Response

The tailwater test and release locations are provided in Figure 3 of Section 3.4.2.

5.8 Environmental Management Plans

5.8.1 NT EPA requested information

Where the draft EIS refers to environmental management plans that have not been developed yet, ensure that the supplement describes in sufficient detail, the impact avoidance and mitigation measures that will be implemented to reduce the likelihood or extent of each impact or risk.

5.8.2 Proponent Response

While Draft Construction Environmental Management Plans have been developed for the construction of the Project by the ECI contractors and submitted to the NTG as part of the tender submissions. These environmental management plans were informed by the Environmental Management Framework presented in Chapter 13 of the Draft EIS. However, due to the stringent probity requirements of the two-party ECI process, these plans are unavailable for disclosure.

To ensure that mitigation measures developed in response to the submissions on the Draft EIS, and considering changes to the Project design, the Environmental Management Framework has been updated to further inform the management plans of the successful Construction Contractor. Final environmental management plans will be reviewed by DIPL and if necessary independent experts

For activities with the potential to impact on marine values, additional more detailed guidance has been developed and set out in the Draft Dredging and Dredge Spoil Placement Management Plan, provided as Appendix C.

6.0 Updates to the EIS based on SEIS response

The following section provides updates to the Draft EIS based on Project changes since lodgement in November 2021. This includes further baseline studies and impact assessments in response to stakeholder submissions on the Draft EIS as well as revised impact considerations following design refinement updates, and consideration of Operational Contractor feedback and DIPL input.

6.1 Air Quality

6.1.1 NSW Approved Methods Assessment of Air Toxics (VOCs)

Proposed amendments to the Draft EIS are provided in the paragraphs below to be implemented as Section 9.2.2.3 (a new section) of Chapter 9 and Section 3.1.7 (a new section) of Appendix J of the Draft EIS.

For the assessment of air toxics (e.g. VOCs), the NSW Approved Methods specifies that air quality goals should be assessed:

1. *At and beyond the boundary of the facility*
2. *The incremental impact for each pollutant must be reported in concentration units consistent with the criteria for an averaging period of 1 hour and as the:*
    a. *100th percentile dispersion model predictions for Level 1 impact assessments, or*
    b. *99.9th percentile of dispersion model predictions for Level 2 impact assessments.*

The NSW Approved Methods also states that:

> *"Principal toxic air pollutants must be minimised to the maximum extent achievable through the application of best-practice process design and/or emission controls. Decisions with respect to achievability will have regard to technical, logistical and financial considerations. Technical and logistical considerations include a wide range of issues that will influence the feasibility of an option: for example, whether a particular technology is compatible with an enterprise's production processes.*
>
> *Financial considerations relate to the financial viability of an option. It is not expected that reductions in emissions should be pursued 'at any cost'. Nor does it mean that the preferred option will always be the lowest cost option. However, it is important that the preferred option is cost-effective. The costs need to be affordable in the context of the relevant industry sector within which the enterprise operates. This will need to be considered on a case-by-case basis through discussions with the EPA"*

It is highlighted that final consideration of a Project's viability or compliance is not defined by exceedances outside the Project boundary, only that the inclusion of best practice technologies to control emissions should be considered when evaluating non-compliance beyond a Project's site boundary.

6.1.2 Additional Sensitive Receptors

Proposed amendments to the Draft EIS are provided in the paragraphs below to be implemented in Section 9.6.2 of Chapter 9 and Section 6.2 of Appendix J of the Draft EIS.

Future suburbs of Weddell and Mitchell, and the Elizabeth River boat ramp, are unlikely to be subject to significant air quality impacts from the Project. These locations have not been included in the modelling for the AQIA as these areas are located further away and in a similar direction (south-east) from the Project boundary than receptors which have been included. Due to increased separation distance, predicted concentrations at the future suburbs of Weddell and Mitchell, and the Elizabeth River boat ramp would be lower than the concentrations at modelled sensitive receptors and therefore compliance can be determined without the inclusion of these receptors in the model.

6.1.3 Revised NEPM Criteria Applied to Modelled Results

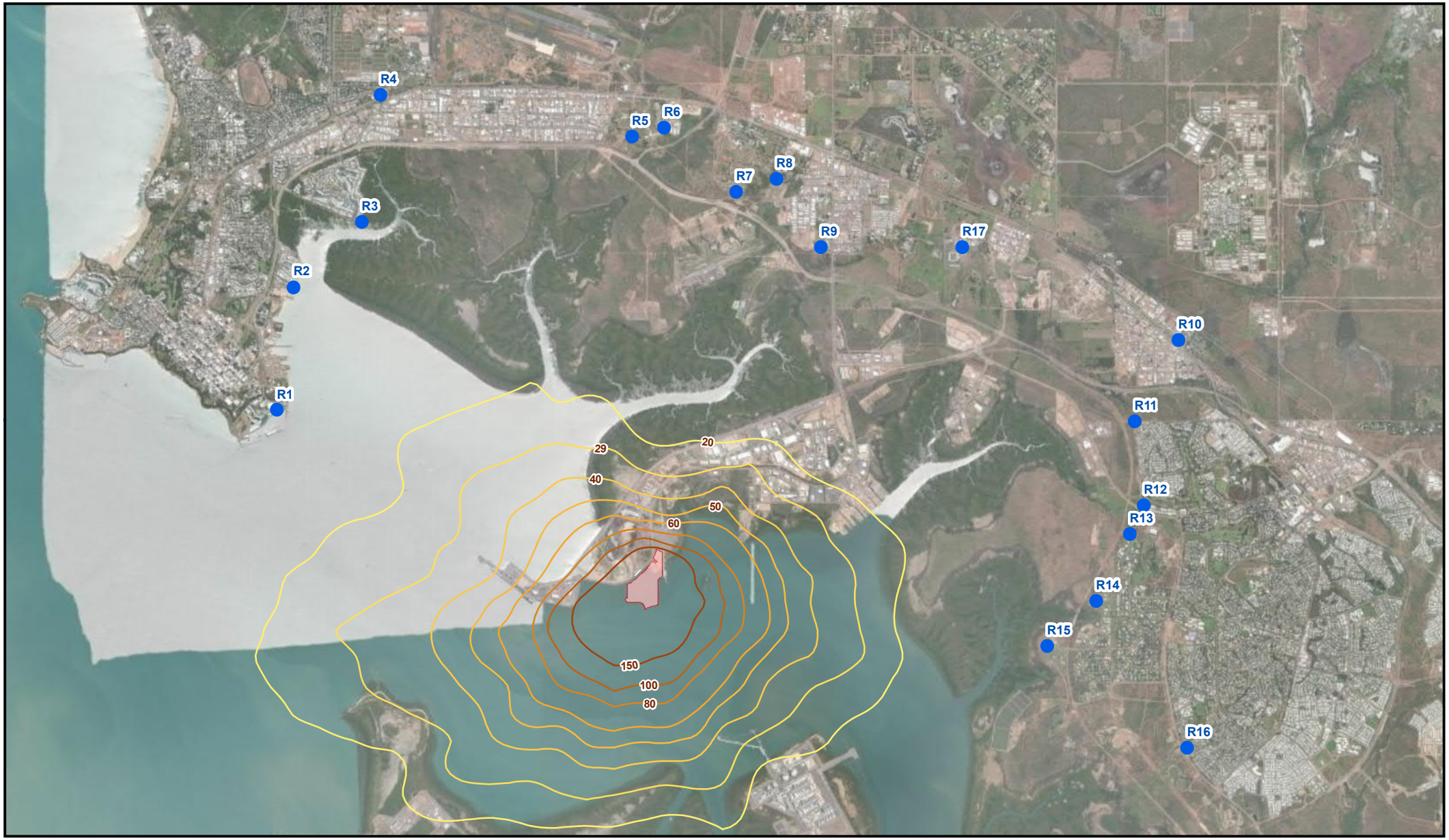
Proposed amendments to the Draft EIS are provided in the paragraphs below to be implemented into Section 9.7.1.1 of Chapter 9 and Section 7.1.1 of Appendix J of the Draft EIS.

Although the Ambient Air Quality NEPM (2021) air quality goals for NO_2 and SO_2 were not adopted for the AQIA, the modelling results for the construction phase show that compliance with the Ambient Air Quality NEPM (2021) would be achieved at the worst affected receptors, and therefore compliance would be achieved at all receptors if the Ambient Air Quality NEPM (2021) goals were to be applied.

6.1.4 Incremental VOC Results and Discussion - Construction Phase

Proposed amendments to the Draft EIS are provided in the paragraphs below to be implemented into Section 9.7.1.1 and Table 9-19 of Chapter 9, and Section 7.1.1 and Section 7.2.1 of Appendix J of the Draft EIS.

In addition, the concentration contour plot in Figure 6 would be implemented as Figure 9.10b in Chapter 9, and Figure A.7 in Appendix J of the Draft EIS.



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LAST MODIFIED 11 APR 2022

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1:75,000 when printed at A4
DATUM GDA 1994, PROJECTION MGA ZONE 52
0 770 1,540 2,310 3,080
Meters

Data sources:
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010).

LEGEND
Project location
Sensitive receptors

1 hour 99.9th percentile total VOC concentration (µg/m³)
20
29
40
50
60
80
100
150

Note:
The layout is indicative only

Total VOC 1 hour 99.9th percentile
Project only for construction phase

NORTHERN TERRITORY GOVERNMENT OF AUSTRALIA
DARWIN SHIP LIFT PROJECT

Figure
6

A4 size

Predicted Project only 1 hour 99.9th percentile total VOC contours for the construction phase are presented in Figure 9.10b/Figure A.7. Project only concentrations of total VOCs are shown to exceed the NSW Approved Methods 1 hour 99.9th percentile goal for benzene (29 µg/m^3) outside the Project boundary. It is important to note that the construction phase of the Project is short-term and temporary and that emissions estimates used in the dispersion model are inherently conservative, resulting in conservative estimate of predicted ground level concentrations. The area where the goal is exceeded is also predominately over water and over heavy use industrial land where expectations relating to air amenity are generally lower than residential areas. Based on the land use of the area where exceedance is predicted, the air quality impact at and outside the boundary is not considered significant. Predicted incremental VOC concentrations at the worst affected receptor are well below the 29 µg/m^3 1 hour 99.9th percentile goal for benzene (10.1 µg/m^3 at R1).

6.1.5 Incremental VOC Results and Discussion - Operation Phase

Proposed amendments to the Draft EIS are provided in the paragraphs below to be implemented in Section 9.7.1.2 and Table 9-20 of Chapter 9, and Section 7.1.2 and Section 7.2.2 of Appendix J of the Draft EIS.

In addition, the concentration contour plot in Figure 7 would be implemented as Figure 9.14 in Chapter 9, and Figure B.4 in Appendix J of the Draft EIS.

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1:65,000 when printed at A4
DATUM GDA 1994, PROJECTION MGA ZONE 52
0 670 1,340 2,010 2,680
Meters

LEGEND

Project location

Sensitive receptors

1 hour 99.9th percentile total VOC concentration (µg/m³)

10

20

29

40

Note:
The layout is indicative only

Total VOC 1 hour 99.9th percentile Project only for operation phase

NORTHERN TERRITORY GOVERNMENT OF AUSTRALIA

DARWIN SHIP LIFT PROJECT

Figure 7

A4 size

Predicted Project only 1 hour 99.9th percentile total VOC contours for the operation phase are presented in Figure 9.14/Figure B.4. Project only concentrations of total VOCs are shown to exceed the NSW Approved Methods 1 hour 99.9th percentile goal for benzene (29 µg/m^3) outside the Project boundary. However, the area where the goal is exceeded is predominately heavy use industrial land or over water. Based on the land use of the area where exceedance is predicted, the air quality impact at and outside the boundary is not considered significant. Predicted incremental VOC concentrations at the worst affected receptor are well below the 29 µg/m^3 1 hour 99.9th percentile goal for benzene (6.30 µg/m^3 at R1).

Significant mitigation is proposed to be included for the blast and paint facility to reduce VOC emissions, specifically the ability to operate the building as a controlled environment (e.g. negative pressure) and the inclusion of carbon filtration to remove VOCs from the air stream. This mitigation is considered the best available technology for the activity. It is also noted that the emissions estimates used to calculate the inputs to the dispersion model are inherently conservative, therefore the resulting predicted concentrations are considered highly conservative.

6.1.6 Errata list

Proposed amendments to the Draft EIS are provided below to be implemented in Section 9.8 of Chapter 9 (in table format, replacing Table 9-23) and Section 9.0 of Appendix J of the Draft EIS in text format.

As a response to DEPWS comments, Project design changes and the opportunity for the Operator to comment on the EMF, additional mitigation measures have been included in this Supplementary EIS to be implemented in the EMP to reduce risk of impacts to air quality from fugitive emissions during the construction and operation phases. The additional recommended mitigation measures (amendments to the Draft EIS) are highlighted in **bold** while superseded changes are shown in ~~strikethrough~~.

Table 13 Additional mitigation measures

Phase	Proposed mitigation measures
Construction phase	• Develop and implement a Construction Air Quality Management Plan (CAQMP) specific to the Project, to be incorporated into the CEMP, prior to the start of construction activity. • **Ensure stockpiles are covered and dust suppression technologies are added to handled material where possible** • Inform adjoining neighbours of intended construction activities. • Limit the intensity of the movement of dusty materials and construction work such as earth moving during periods of high ~~levels of bushfire smoke~~ **wind, or deploy added dust suppression efforts.** • Use a water truck to regularly apply water to unsealed roads or vehicle paths. At minimum, application of water at a rate of up to 2 litres per square metre per hour (L/m^2/h) is required. • Regularly and lightly water dust-prone areas, ensuring not to over-water areas as it can cause damage and erosion. This is recommended for stockpiles and unsealed areas. • Minimise drop heights of materials (e.g., from loaders into tipper trucks). • Removal of topsoil and the importing or storing of soil and other materials must be done with due care to minimise dust. • Seal permanent roads and areas planned to be sealed as soon as practicable. • Cover materials during transport to and from the site. • Limit travel speed on site noting that slower speeds produce less dust. Travel speeds in excess of 10 km/h are not recommended on unsealed areas or paths. Speed limits should be sign-posted. • Operate machinery, equipment, vehicles, dredges and support vessels efficiently to minimise exhaust emissions. • Clean up residues and spills in a timely manner.

Phase	Proposed mitigation measures
Operation phase	• **Ensure containers are sufficiently covered to prevent fugitive emissions from spills and volatilisation of vapours.** • **Avoid the use of open vats and require vessels to be covered and payloads to protected from wind in an effort to limit fugitive emissions.** • All ships berthed at the Project shall make use of the available shore power. Auxiliary engines should not be in use over prolonged time periods when ships are at berth. • Operate machinery, equipment, vehicles, dredges and support vessels efficiently to minimise exhaust emissions. *Blast and paint facility* • **Design and construct blast and paint facility using accepted practice control technologies with the aim to minimise the risk of VOC and particulate matter fugitive emissions as much as practical** • **Install and correctly maintaining particulate and VOC control technologies, plant and equipment** • **Ensure temporary building extension of the blast and paint facility for larger vessels maintains the controlled environment.** • **The operational procedures** shall ~~be~~ **detail the blast and paint facility** maintained ~~under negative pressure~~ **in a controlled environment** to ensure air emissions are only released via the roof vents. • Air released to atmosphere via the roof exhaust stacks shall be passed through particulate, VOC and odour capturing filters (e.g. activated carbon) prior to exhaust to the atmosphere. *Abrasive ~~painting~~ **blasting*** • ~~Test for presence of lead paint before blasting.~~ • **Before blasting the Operator will undertake a risk assessment to determine the likelihood of lead paint presence and confirm through testing where relevant. When removing tough hull stains, minimise the use of stain removers and consider more abrasive rubbing or polishing compounds.** • Place material collected from blasting, sanding and scraping operations in disposal containers to prevent emissions to the atmosphere as soon as practical. *Painting* • Maximise efficiency of antifouling paint by selecting the most appropriate product for a particular vessel. • When spray painting is required to occur partly outdoors (e.g., to accommodate a vessel larger than the **blast and paint** building), fully enclose the vessel (~~sides~~ **ends**, top and floor) or item being painted with temporary screening materials. Weight the edges of the screens to keep them in place. • Use efficient spray equipment (transfer efficiency >65%) such as high-volume spray guns. • Where possible use electrostatic spraying methods. These require less pressure, produce little overspray, and use relatively little paint. • Where appropriate, consider using low-VOC, high solids content and water-based paints or surface preparations instead of traditional paint and primer. • Keep spray guns and lines clean and well maintained to reduce emissions. • Prevent evaporation of solvents by using tight-fitting lids or stoppers. *Greenhouse gases* • Maintain equipment and vehicles to ensure engine efficiency and use fuel efficient equipment where able. • ~~Reduce travel distances off-site by sourcing imported materials from local areas.~~ • ~~Reduce travel distances on-site by planning internal haul roads and staging of related activities efficiently.~~

Phase	Proposed mitigation measures
	• Minimise idling time of plant and equipment and switch engines off when not in use. • ~~Look for opportunities to add vegetation; where possible and plant species selected should be both drought tolerant and fast growing.~~ • Where ~~possible prioritise~~ **practicable prioritise** the selection and use of electric equipment (over fuel combustion engines) • Recycle any waste produced where feasible. • Shore power during the operation phase should be procured from renewable energy suppliers where ~~possible. In addition, look for opportunities to generate power on-site (e.g., solar arrays, etc).~~**practicable**. • Prioritise the selection and use of electric vehicles and equipment (over fuel combustion engines) as much as ~~possible~~ **practicable**. This would include mobile plant such as forklifts and light vehicles for onsite use. • Maintain equipment and vehicles to ensure engine efficiency and use fuel efficient equipment where able.

6.1.6.1 Environmental Factor Management Framework Errata List

The mitigation measures described above have also been applied to the environmental factors identified in Appendix E: Updated Environmental Management Framework with superseded changes are shown in ~~strikethrough~~ while additional or updated changes are shown in **bold**.

Table 14 Additional construction air quality and greenhouse gases construction management measures

Environmental objectives	***Maintain air quality and minimise emissions and their impact so that environmental values are protected.***
Performance criteria	• No activity in breach of the provisions of any environmental legislation and Project environmental approval conditions. • 100% investigation and reporting of any environmental incident at the site. • No complaints from ~~onsite staff~~ **stakeholders** or the community regarding dust or air quality.
Proposed mitigation measures	
Air Quality • Develop and implement a Construction Air Quality Management Plan specific to the Project, to be incorporated into the CEMP, prior to the start of construction activity. • **Ensure stockpiles are covered and dust suppression technologies are added to handled material where required.** • Inform adjoining neighbours of intended construction activities. • Limit the intensity of the movement of dusty materials and construction work such as earth moving during periods of high ~~levels of bushfire smoke~~ **wind, or deploy added dust suppression efforts.** • Use a water truck to regularly apply water to unsealed roads or vehicle paths that are in use. At minimum, application of water at a rate of up to 2 litres per square metre per hour (L/m2/h) is required. • Regularly and lightly water dust-prone areas, ensuring not to over-water areas as it can cause damage and erosion. This is recommended for stockpiles and unsealed areas. • Minimise drop heights of materials (e.g., from loaders into tipper trucks). • Removal of topsoil and the importing or storing of soil and other materials must be done with due care to minimise dust. • Seal permanent roads and areas planned to be sealed as soon as practicable. • Cover materials during transport to and from the Project site. • Limit travel speed on site noting that slower speeds produce less dust. Travel speeds in excess of 10 km/h are not recommended on unsealed areas or paths. Speed limits should be sign-posted. • Operate machinery, equipment, vehicles, dredges and support vessels efficiently to minimise exhaust emission. • Clean up residues and spills in a timely manner.	

Greenhouse gas • Maintain equipment and vehicles to ensure engine efficiency and use fuel efficient equipment where able. • Reduce travel distances off-site by sourcing imported materials from local areas. • Reduce travel distances on-site by planning internal haul roads and staging of related activities efficiently. • Minimise idling time of plant and equipment and switch engines off when not in use. • Look for opportunities to add vegetation; where possible and plant species selected should be both drought tolerant and fast growing. • Where possible prioritise the selection and use of electric equipment (over fuel combustion engines). • Recycle any waste produced where feasible.	
Monitoring and reporting requirements	Air quality impacts at sensitive receptors due to construction and operation of the Project are not predicted to be significant due to the separation distance between the Project and sensitive receptors. Sensitive receptors are well outside the recommended separation distances listed in NT EPA *Guideline: Recommended Land Use Separation Distances* (2017). Based on the result of the assessment, no air quality monitoring is deemed to be required for the construction ~~of operation phases~~ **phase** of the Project.

Table 15 Additional operational air quality and greenhouse gases construction management measures

Environmental objectives	***Maintain air quality and minimise emissions and their impact so that environmental values are protected.***
Performance criteria	• No activity in breach of the provisions of any environmental legislation and Project environmental approval conditions. • 100% investigation and reporting of any environmental incident at the site. • No complaints from onsite staff or the community regarding air quality from operation of facility.
Proposed mitigation measures	
• **Ensure containers are sufficiently covered to prevent fugitive emissions from spills and volatilisation of vapours.** • **Avoid the use of open vats and require vessels to be covered and payloads to protected from wind in an effort to limit fugitive emissions.** • All ships berthed at the Project shall make use of the available shore power. Auxiliary engines should not be in use over prolonged time periods when ships are at berth. • Operate machinery, equipment, vehicles, dredges and support vessels efficiently to minimise exhaust emissions. *Blast and paint facility* • **Design and construct blast and paint facility using accepted practice control technologies with the aim to minimise the risk of VOC and particulate matter fugitive emissions as much as practical** • **Install and correctly maintaining particulate and VOC control technologies, plant and equipment** • **Ensure temporary building extension of the blast and paint facility for larger vessels maintains the controlled environment.** • **The operational procedures** shall ~~be~~ **detail the blast and paint facility** maintained ~~under negative pressure~~ **in a controlled environment** to ensure air emissions are only released via the roof vents. • Air released to atmosphere via the roof exhaust stacks shall be passed through particulate, VOC and odour capturing filters (e.g. activated carbon) prior to exhaust to the atmosphere. *Abrasive ~~painting~~ **blasting*** • ~~Test for presence of lead paint before blasting.~~ • **Before blasting the Operator will undertake a risk assessment to determine the likelihood of lead paint presence and confirm through testing where relevant. When removing tough hull stains, minimise the use of stain removers and consider more abrasive rubbing or polishing compounds.** • Place material collected from blasting, sanding and scraping operations in disposal containers to prevent emissions to the atmosphere as soon as practical. *Painting*	

• Maximise efficiency of antifouling paint by selecting the most appropriate product for a particular vessel. • When spray painting is required to occur partly outdoors (e.g., to accommodate a vessel larger than the **blast and paint** building), fully enclose the vessel (~~sides~~ **ends**, top and floor) or item being painted with temporary screening materials. Weight the edges of the screens to keep them in place. • Use efficient spray equipment (transfer efficiency >65%) such as high-volume spray guns. • Where possible use electrostatic spraying methods. These require less pressure, produce little overspray, and use relatively little paint. • Where appropriate, consider using low-VOC, high solids content and water-based paints or surface preparations instead of traditional paint and primer. • Keep spray guns and lines clean and well maintained to reduce emissions. • Prevent evaporation of solvents by using tight-fitting lids or stoppers. *Greenhouse gases* • Maintain equipment and vehicles to ensure engine efficiency and use fuel efficient equipment where able. • ~~Reduce travel distances off-site by sourcing imported materials from local areas.~~ • ~~Reduce travel distances on-site by planning internal haul roads and staging of related activities efficiently.~~ • Minimise idling time of plant and equipment and switch engines off when not in use. • ~~Look for opportunities to add vegetation; where possible and plant species selected should be both drought tolerant and fast growing.~~ • Where ~~possible prioritise~~ **practicable prioritise** the selection and use of electric equipment (over fuel combustion engines) • Recycle any waste produced where feasible. • Shore power during the operation phase should be procured from renewable energy suppliers where ~~possible. In addition, look for opportunities to generate power on-site (e.g., solar arrays, etc).~~**practicable**. • Prioritise the selection and use of electric vehicles and equipment (over fuel combustion engines) as much as ~~possible~~ **practicable**. This would include mobile plant such as forklifts and light vehicles for onsite use. • Maintain equipment and vehicles to ensure engine efficiency and use fuel efficient equipment where able.	
Monitoring and reporting requirements	Air quality impacts at sensitive receptors due to construction and operation of the Project are not predicted to be significant due to the separation distance between the Project and sensitive receptors. Sensitive receptors are well outside the recommended separation distances listed in NT EPA *Guideline: Recommended Land Use Separation Distances* (2017). Based on the result of the assessment, no air quality monitoring is deemed to be required for the construction of operation phases of the Project.

6.1.6.2 Minor Errata List

Corrections to the Draft EIS are provided in Table 16 below. These corrections are minor in nature and do not have a material bearing on the outcomes of the impact assessment.

Table 16 Table of corrections to the Draft EIS

Source location	Original text	Correction	Outcome
Table 5.11 in Section 5.22 of Appendix J of Draft EIS	Benzene annual average air quality goal presented as 5.4 µg/m^3	Benzene annual average air quality goal corrected to 6.4 µg/m^3	Minor: no background exceedances for measured VOC
Table 9-14 in Section 9.4.3 of Chapter 9 and Table 5.14 in Section 5.3 of Appendix J of Draft EIS	Total VOC species annual benzene air quality goal presented as 5.1 µg/m^3	Total VOC species annual benzene air quality goal corrected to 6.4 µg/m^3	Minor: updated assimilative capacity
	Total VOC species annual benzene assimilative capacity presented as 0.5 µg/m^3 and 9.8 %	Total VOC species annual benzene assimilative capacity presented as 1.8 µg/m^3 and 28.1 %	Minor: outcome of assessment does not change

Source location	Original text	Correction	Outcome
Table 9-17 in Section 9.7.1.1 of Chapter 9 of the Draft EIS	PM_{10} 24 hour maximum concentration at worst affect receptor: Worst affected receptor “R1”	PM_{10} 24 hour maximum concentration at worst affect receptor: Worst affected receptor “R15”	Minor: concentrations at worst affected receptor updated
	PM_{10} 24 hour maximum concentration at worst affected receptor: cumulative concentration 3.04 µg/m^3 and Project only 32.5 µg/m^3	PM_{10} 24 hour maximum concentration at worst affected receptor: cumulative concentration 33.1 µg/m^3 and Project only concentration 3.57 µg/m^3	Minor: concentrations at worst affected receptor are well below adopted criteria
	PM_{10} annual average concentration at worst affected receptor: cumulative concentration 0.18 µg/m^3 and Project only 23.2 µg/m^3	PM_{10} annual average concentration at worst affected receptor: cumulative concentration 23.2 µg/m^3 and Project only concentration 0.18 µg/m^3	Minor: formatting correction
	$PM_{2.5}$ 24 hour maximum concentration at worst affected receptor: cumulative concentration 1.30 µg/m^3 and Project only 13.2 µg/m^3	$PM_{2.5}$ 24 hour maximum concentration at worst affected receptor: cumulative concentration 13.2 µg/m^3 and Project only concentration 1.30 µg/m^3	Minor: formatting correction
	$PM_{2.5}$ 24 hour maximum concentration at worst affected receptor: cumulative concentration 0.18 µg/m^3 and Project only 10.0 µg/m^3	$PM_{2.5}$ 24 hour maximum concentration at worst affected receptor: cumulative concentration 10.0 µg/m^3 and Project only concentration 0.18 µg/m^3	Minor: formatting correction
	Total VOC benzene annual average concentration at worst affected receptor: cumulative concentration 0.19 µg/m^3 and Project only 4.79 µg/m^3	Total VOC benzene annual average concentration at worst affected receptor: cumulative concentration 4.79 µg/m^3 and Project only concentration 0.19 µg/m^3	Minor: formatting correction

6.2 Terrestrial Noise

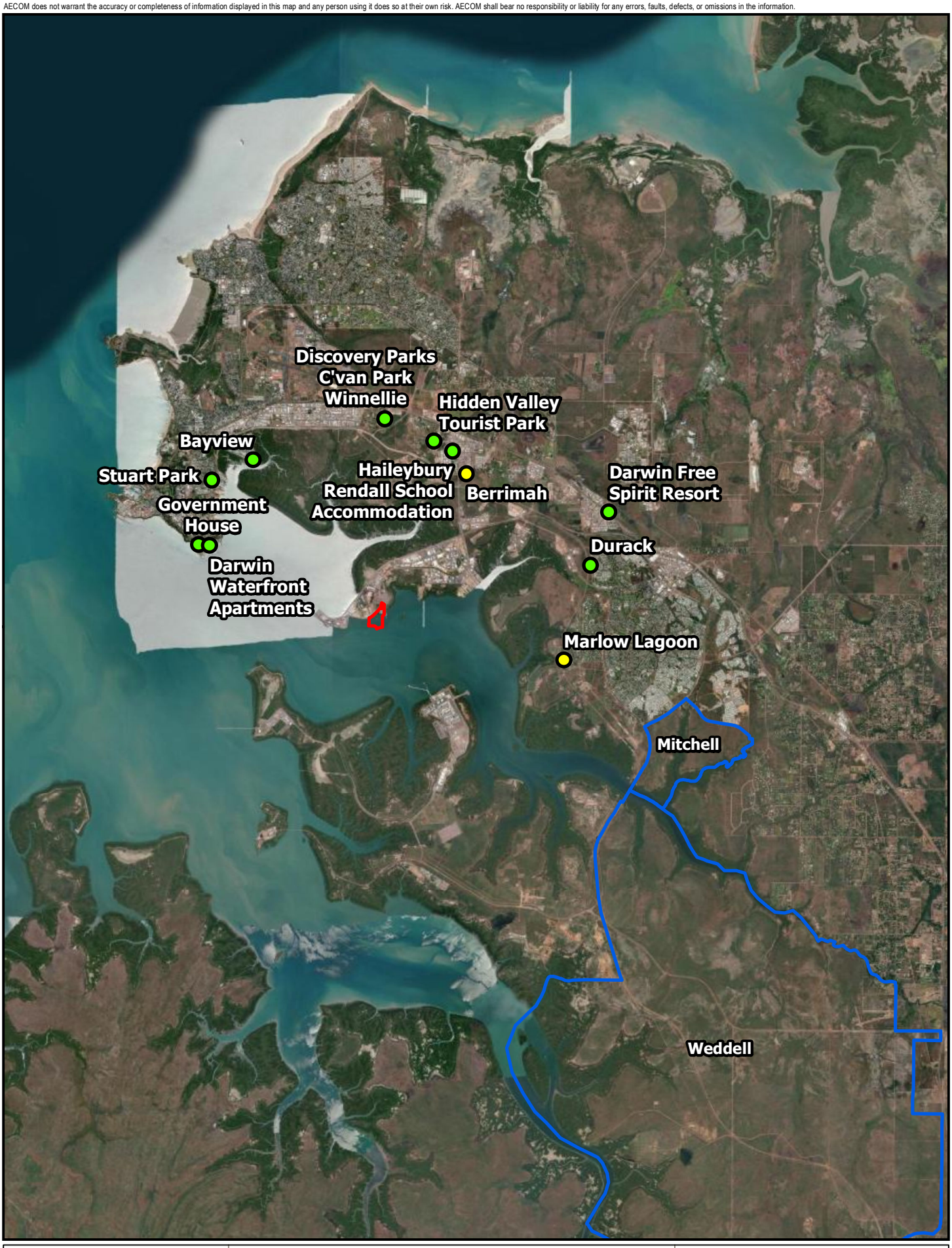
6.2.1 Purpose of this Addendum

This section of the Supplementary EIS presents an addendum to Appendix K: Terrestrial Noise Impact Assessment to consider the additional background noise measurements and to include abrasive blasting in the Proposed activities. This section should be read in conjunction with Appendix K of the Draft EIS.

6.2.2 Amendments

6.2.2.1 Noise Measurements

Proposed amendments to the Draft EIS are provided in the paragraph below to be included in Section 3.1 of Appendix K of the Draft EIS. Figure 4 in the Appendix K to the Draft EIS should be replaced with Figure 8 below.



PROJECT ID 60633505
CREATED BY OLIVIA.LLOYD
APPROVED BY LK
LAST MODIFIED 30 MAY 2022

AECOM
www.aecom.com

1:165,403 when printed at A4
DATUM GDA 1994, PROJECTION MGA ZONE 52
0 1,700 3,400 5,100 6,800
Meters

Data sources:
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2021).

Legend

- Updated Receivers
- Receivers
- Project footprint
- Future Suburbs

Note:
The layout is indicative only

Noise sensitive recievers

NORTHERN TERRITORY GOVERNMENT OF AUSTRALIA
DARWIN SHIP LIFT PROJECT

Figure
8

A4 size

In addition to background noise level data taken from other studies, noise monitoring was undertaken at two locations between 12 and 26 April 2022. These locations are considered to be representative of the closest noise sensitive receivers to the Project.

Details of these measurements are included in Table 17.

Table 17 Noise logging details

Address	Logger type	Logger serial number	Location	Façade/Free Field
16 Packsaddle Road, Marlow Lagoon	*NGARA*	*8780EA*	*Close to Boundary Fence*	*Free field*
5/13 Marlow Road, Berrimah	*NGARA*	*878005*	*At boundary fence*	*Free field*

Results of the noise monitoring is presented in Table 18.

Table 18 Noise monitoring results, dB(A)

Address	$L_{Aeq, day}$ 7am – 6pm, dB(A)	$L_{Aeq, evening}$ 6pm – 10pm, dB(A)	$L_{Aeq, night}$ 10pm – 7am, dB(A)	RBL Day 7am – 6pm, dB(A)	RBL Eve 6pm – 10am, dB(A)	RBL Night 10pm – 7am, dB(A)
16 Packsaddle Road, Marlow Lagoon	*47*	*44*	*42*	*34*	*34*	*34*
5/13 Marlow Road, Berrimah	*57*	*53*	*50*	*41*	*40*	*40*

Table 2 in the TNIA would be updated as shown in Table 19.

Table 19 Summary of adopted existing L_{A90} background noise levels

Location	Background noise level L_{A90}, dB(A)		
	Day	Evening	Night
2 - Darwin (Waterfront Precinct)	*45*	*45*	*40*
3- East Darwin, Stuart Park	*35[3]*	*32*	*32[2]*
4 – Bayview	*35[3]*	*32*	*32[2]*
6 - Berrimah	*41*	*40*	*40*
7 – Haileybury Rendall School	*45*	*45[1]*	*39*
8 – Marlow Lagoon	*34[4]*	*34[4]*	*34[4]*

Notes:
Day is defined as 7 am to 6 pm Monday to Saturday and 8 am to 6 pm on Sundays and Public Holidays.
Evening is defined as 6 pm to 10 pm Monday to Sunday.
Night is defined as the remaining periods.

1. *Where the evening background noise level has been reported as higher than daytime background noise level, the daytime level (the lower of the two reported levels) has been adopted for the purposes of this assessment.*
2. *Where the night-time background noise level has been reported as higher than evening background noise level, the evening level (the lower of the two reported levels) has been adopted for the purposes of this assessment.*
3. *The measured background noise level is below the minimum assumed rating background noise level. The minimum assumed level as per Table 3.4 of the NT Noise Guideline has been adopted.*
4. *Used to establish criteria for 8 – Durack and 9 – Marlow Lagoon.*

6.2.2.2 Project Specific Assigned Noise Levels

Proposed amendments to the EIS are provided in the paragraphs below to be included in Section 4.1.1 and Section 4.1.3 of Appendix K of the Draft EIS.

Table 3 in Section 4.1.1of the TNIA would be updated as shown in Table 20. Table 5 in Section 4.1.3 of the TNIA would be updated as shown in Table 21.

Table 20 Recommended $L_{Aeq,15\ minute}$ intrusiveness noise levels from industrial noise sources

Receptor	Period	RBL (L_{A90}) dB(A)	Project Intrusiveness Noise Level ($L_{Aeq,\ 15min}$) dB(A)
2 - Darwin Waterfront Apartments	*Day*	*45*	*50*
	Evening	*45*	*50*
	Night	*40*	*45*
3 - Stuart Park	*Day*	*35*	*40*
	Evening	*32*	*37*
	Night	*32*	*37*
4 - Bayview	*Day*	*35*	*40*
	Evening	*32*	*37*
	Night	*32*	*37*
6 - Berrimah	*Day*	*41*	*46*
	Evening	*40*	*45*
	Night	*40*	*45*
7 – Haileybury Rendall School Accommodation	*Day*	*41*	*46*
	Evening	*40*	*45*
	Night	*40*	*45*
8 - Durack	*Day*	*34*	*39*
	Evening	*34*	*39*
	Night	*34*	*39*
9 - Marlow Lagoon (Palmerston)	*Day*	*34*	*39*
	Evening	*34*	*39*
	Night	*34*	*39*

Table 21 Project specific assigned noise levels

Receptor	Time of Day	Project Intrusiveness Noise Level ($L_{Aeq, 15\ min}$), dB(A)	Project Amenity Level ($L_{Aeq, 15\ min}$), dB(A)	Assigned Project Specific Assigned Noise Level ($L_{Aeq\ 15\ min}$), dB(A)
1 - Government House	*When in Use*	*-*	*63*	***63***
2 - Darwin Waterfront Apartments	*Day*	*50*	*58*	***50***
	Evening	*50*	*48*	***50***
	Night	*45*	*43*	***43***
3 - Stuart Park	*Day*	*40*	*53*	***40***
	Evening	*37*	*43*	***37***
	Night	*37*	*38*	***37***
4 - Bayview	*Day*	*40*	*53*	***40***
	Evening	*37*	*43*	***37***
	Night	*37*	*38*	***37***
5 - Winnellie – Discovery Parks caravan park	*Day*	*-*	*58*	***58***
	Evening	*-*	*48*	***48***
	Night	*-*	*43*	***43***
6 - Berrimah	*Day*	*46*	*53*	***46***
	Evening	*45*	*43*	***43***
	Night	*45*	*38*	***38***
7 – Haileybury Rendall School Accommodation	*Day*	*46*	*53*	***46***
	Evening	*45*	*43*	***43***
	Night	*45*	*38*	***38***
8 - Durack	*Day*	*39*	*53*	***39***
	Evening	*39*	*43*	***39***
	Night	*39*	*38*	***38***
9 - Marlow Lagoon	*Day*	*39*	*53*	***39***
	Evening	*39*	*43*	***39***
	Night	*39*	*38*	***38***
10 - Hidden Valley Tourist Park	*Day*	*-*	*58*	***58***
	Evening	*-*	*48*	***48***
	Night	*-*	*43*	***43***
11 - Darwin Free Spirit Resort	*Day*	*-*	*58*	***58***
	Evening	*-*	*48*	***48***
	Night	*-*	*43*	***43***

6.2.2.3 Project specific assigned construction noise levels

Proposed amendments to the EIS are provided in the paragraphs below to be included in Section 5.2.4 of Appendix K of the Draft EIS.

Table 9 in the TNIA would be updated as shown in *Table 20*.

Table 22 Project specific assigned noise levels

Receptor	*Recommended Standard Hours Assigned Construction Noise Level, $L_{Aeq,15\ min}$, dB(A)*	*Outside Recommended Standard Hours Assigned Construction Noise Level, $L_{Aeq,15\ min}$, dB(A)*
1 - Government House	*70*	*70*
2 - Darwin Waterfront Apartments	*55*	*45*
3 - Stuart Park	*45*	*37*
4 - Bayview	*45*	*37*
5 - Winnellie – Discovery Parks caravan park[1]	*55*	*44*
6 - Berrimah	*51*	*45*
7 – Haileybury Rendall School Accommodation	*51*	*45*
8 - Durack	*44*	*39*
9 - Marlow Lagoon	*44*	*39*
10 - Hidden Valley Tourist Park[1]	*51*	*45*
11 - Darwin Free Spirit Resort[2]	*44*	*39*

Notes:

1. *Based on background noise levels at Berrimah*
2. *Based on background noise levels at Marlow Lagoon.*

6.2.2.4 Operational noise impact assessment

Proposed amendments to the EIS are provided in the paragraph below to be included in Section 7.0 of Appendix K of the Draft EIS.

Table 13 in the TNIA would be updated as shown in Table 23 below. This is to include Abrasive blasting involved with the blast cleaning and surface preparation of ships. Appendix C to the TNIA would be updated as shown in Appendix C of this Supplementary EIS.

Table 23 Operational equipment and associated noise levels

Operational Aspect	Equipment	Number	Size/Power Output	Sound Power Level, L_{Aeq}, dB(A)
Ship Lift	*Hydraulic Winch Pairs*	*12*	*-*	*100*
Vessel Transfer	*Self-propelled modular transporter*	*1*	*5,000 t capacity*	*116*
Washdown	*High Pressure Washers*	*4*	*-*	*109*
Water Treatment Plant	*Pumps*	*4*	*-*	*96*
Abrasive Blasting	*Abrasive Blaster*	*1*	*-*	*104*
Dry Berth Maintenance	*Elevated Work Platforms (EWPs)*	*4*	*-*	*98*
	Grinders	*4*	*-*	*105*
	Welders	*4*	*-*	*101*
Loading / Unloading	*Crawler Crane*	*1*	*500 t*	*103*
	Mobile Crane	*1*	*84 t*	*98*
	Forklift Truck	*1*	*40 t*	*108*
	Forklift Truck	*1*	*20 t*	*103*
Generators		*5*	*10 kV*	*96*

6.3 Traffic Impact Assessment

6.3.1 Traffic Impact Assessment Errata List

Errors in cross referencing within the Draft EIS Appendix L: Traffic Impact Assessment have been noted, where some in-text figure references are absent. Updates to these references should be read in conjunction with the Traffic Impact Assessment and can be found in ***bold*** below.

Source location	Original text	Correction	Outcome
Section 1.1, Page 1	*"The location of the Project is shown in ."*	*"The location of the Project is shown in **Figure 1**."*	Minor: formatting correction
Section 4.0, Page 9	*"The location of these roads in relation to the Project site are illustrated in ."*	*"The location of these roads in relation to the Project site are illustrated in **Figure 3**."*	Minor: formatting correction
Section 5.2.2, Page 11	*"A typical cross section of Stuart Highway in the vicinity of the study area is presented in ."*	*"A typical cross section of Stuart Highway in the vicinity of the study area is presented in **Figure 4**."*	Minor: formatting correction
Section 5.2.3, Page 12	*"This can be seen in ."*	*"This can be seen in **Figure 5**."*	Minor: formatting correction
Section 5.2.4, Page 13	*"A typical cross section in the vicinity of the study area is presented in and that shows a cross section."*	*"A typical cross section in the vicinity of the study area is presented in **Figure 6** and **Figure 7** that shows a cross section."*	Minor: formatting correction
Section 5.2.5, Page 14	*"A typical cross section in the vicinity of the study area is presented in and that show a cross section of Wishart Road between Berrimah Road and Kirkland Road."*	*"A typical cross section in the vicinity of the study area is presented in **Figure 8** and **Figure 9** that show a cross section of Wishart Road between Berrimah Road and Kirkland Road."*	Minor: formatting correction
Section 5.2.6, Page 15	*"Presented in is a typical cross section of Kirkland Avenue illustrating the single carriageway capacity in both directions."*	*"Presented in **Figure 10** is a typical cross section of Kirkland Avenue illustrating the single carriageway capacity in both directions."*	Minor: formatting correction
Section 5.3, Page 16	*"Highlighted in are the intersections that are expected to be impacted most by the additional trip generation proposed as part of the Project and have therefore been identified as critical intersections that require further study."*	*"Highlighted in **Figure 11** are the intersections that are expected to be impacted most by the additional trip generation proposed as part of the Project and have therefore been identified as critical intersections that require further study."*	Minor: formatting correction
Section 5.3.1, Page 17	*"Presented in is the signalised "T" intersection that includes Berrimah Road*	*"Presented in **Figure 12** is the signalised "T" intersection that includes Berrimah Road and*	Minor: formatting correction

Source location	Original text	Correction	Outcome
	and Wishart Road. This shows that on the approach to the intersection along Berrimah Road south, a total of three lanes are provided."	*Wishart Road. This shows that on the approach to the intersection along Berrimah Road south, a total of three lanes are provided."*	
Section 5.3.2, Page 18	*"Presented in is the signalised four-way intersection that includes Berrimah Road and Tiger Brennan Drive."*	*"Presented in **Figure 13** is the signalised four-way intersection that includes Berrimah Road and Tiger Brennan Drive."*	Minor: formatting correction
Section 5.3.3, Page 19	*"Presented in is the signalised four-way intersection that includes Wishart Road / Kirkland Road and Distribution Drive."*	*"Presented in **Figure 14** is the signalised four-way intersection that includes Wishart Road / Kirkland Road and Distribution Drive."*	Minor: formatting correction
Section 5.3.4, Page 20	*"Presented in is the four-way intersection that includes Wishart Road, Tiger Brennan Drive and Tivendale Road."*	*"Presented in **Figure 15** is the four-way intersection that includes Wishart Road, Tiger Brennan Drive and Tivendale Road."*	Minor: formatting correction
Section 6.1, Page 21	*"Presented in and are the locations of the traffic counts that have been extracted from the traffic volume data provided by the Department of Infrastructure, Planning and Logistics (DIPL)."*	*"Presented in **Figure 16** and **Figure 17** are the locations of the traffic counts that have been extracted from the traffic volume data provided by the Department of Infrastructure, Planning and Logistics (DIPL)."*	Minor: formatting correction
Section 8.2.2.1, Page 35	*"The site location and assumed route is presented in ."*	*"The site location and assumed route is presented in **Figure 18**."*	Minor: formatting correction
Section 8.2.2.2, Page 36	*"The site location and assumed route is presented in ."*	*"The site location and assumed route is presented in **Figure 19**."*	Minor: formatting correction
Section 8.2.2.2, Page 36	*"the roundabout is approximately 47 m in diameter and offers a 10.5 m wide circulating carriageway meaning that a triple road train is expected to be able to perform the required turn (illustrated in)."*	*"the roundabout is approximately 47 m in diameter and offers a 10.5 m wide circulating carriageway meaning that a triple road train is expected to be able to perform the required turn (illustrated in **Figure 20**)."*	Minor: formatting correction
Section 8.2.2.3, Page 38	*"A summary map has been presented in to illustrate on the network the proposed haulage routes for all of the key material sites associated with the land reclamation."*	*"A summary map has been presented in **Figure 21** to illustrate on the network the proposed haulage routes for all of the key material sites*	Minor: formatting correction

Source location	Original text	Correction	Outcome
		associated with the land reclamation."	
Section 9.2.1, Page 42	*to give an indication of the typical operation of the intersection during the day between the peak periods indicated in.*	*to give an indication of the typical operation of the intersection during the day between the peak periods indicated in* ***Figure 23****.*	Minor: formatting correction
Section 9.2.2, Page 43	*"The existing intersection layout and SIDRA assessed layout is presented in ."*	*"The existing intersection layout and SIDRA assessed layout is presented in* ***Figure 24****.*	Minor: formatting correction

6.4 Social, Cultural and Economic Surrounds

Proposed amendments to the Draft EIS are provided in the paragraphs below to be implemented within Chapter 10 and Appendix M: Cultural Heritage Assessment of the Draft EIS. These changes have been made based on Heritage Branch comments in Section 3.21. The additional recommended mitigation measures are highlighted in **bold** while superseded changes are shown in ~~strikethrough~~.

Source location	Original text	Correction	Outcome
Executive Summary: Environmental Setting	*Most of the FBB has been demolished to make way for industrial development. The surviving features as of 2015 were the Catalina ramp, crash boat slip way, a mooring pile and some fragments of a fuel pipeline. In 2015, the Minister for the Environment decided not to grant the FBB heritage status under the NT Heritage Act 2011. The Project construction phase will extend over the remaining FBB area. It is proposed that interpretative signage close to the Project be installed in a public place to indicate that the area was once the location of FBB and the LMS and its significance during World War II.*	*Most of the FBB has been demolished to make way for industrial development. The surviving features as of 2015 were the Catalina ramp, crash boat slip way, a mooring pile and some fragments of a fuel pipeline. In 2015, the Minister for the Environment decided not to grant the FBB heritage status under the NT Heritage Act 2011****. It should be noted that the site is considered to have heritage significance, and, appropriate management options have been prepared to manage the Project impacts to the site.*** *The Project construction phase will extend over the remaining FBB area. It is proposed that interpretative signage close to the Project be installed in a public place to indicate that the area was once the location of*	Amendments based on Heritage Branch comments

Source location	Original text	Correction	Outcome
		FBB and the LMS and its significance during World War II.	
Executive Summary: Conclusion	*Consultation found that the loss of World War II historical remnants was a concern to one stakeholder, despite their lack of formal heritage status. It is suggested that these areas be acknowledged with interpretative signage installed in nearby public areas.*	*Consultation found that the loss of World War II historical remnants was a concern to one stakeholder, despite their lack of formal heritage status.* ***The site is still considered to have heritage significance, and the Project has included appropriate mitigation strategies, including undertaking condition assessment recording of the site, and install*** *interpretative signage in nearby public areas.*	Amendments based on Heritage Branch comments
Chapter 10 10.4.4.2 European Heritage	*Most of the FBB has been demolished to make way for industrial development. The surviving features as of 2015 were the Catalina ramp, crash boat slip way, a mooring pile and some fragments of a fuel pipeline (Earthsea, 2021). The Project construction phase will cover the remaining FBB with fill and concrete. 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 FBB and the LMS and its significance as a base for Allied operations in the South-West Pacific Area during World War II.*	*Most of the FBB has been demolished to make way for industrial development. The surviving features as of 2015 were the Catalina ramp, crash boat slip way, a mooring pile and some fragments of a fuel pipeline (Earthsea, 2021). The Project construction phase will cover the remaining FBB with fill and concrete.* ***Management measures have been prepared for the FBB site. These have been prepared based on the inherent heritage significance associated with the site; including to undertake addition maritime archaeological work and recording the FBB remains. In addition, heritage interpretation would also be installed close to the Project area detailing the significance*** *of the FBB and the LMS sites as part of the Allied operations in*	Amendments based on Heritage Branch comments

Source location	Original text	Correction	Outcome
		the South-West Pacific Area during World War II.	
Chapter 14: Social Economic and Cultural Surrounds (Section 14.4 Social Economic and Cultural Surrounds)	*The stakeholder consultation found that the loss of World War II historical remnants is a probable impact of concern, despite their lack of formal heritage status. The recommendations propose interpretative signage close to the Project to indicate that the area was once the location of FBB and the LMS and its significance as a base for Allied operations in the South-West Pacific Area during World War II.*	*The stakeholder consultation found that the loss of World War II historical remnants is a probable impact of concern.* ***The FBB site is not heritage listed, however, the Project has included appropriate management measures to adequately research and record the remains prior to their removal. These include additional maritime archaeological and photographic recording, and the installation of additional heritage interpretation signage detailing*** *the location of FBB and the LMS and its significance as a base for Allied operations in the South-West Pacific Area during World War II.*	Amendments based on Heritage Branch comments
Draft EIS Appendix M: Cultural Heritage Assessment			
Executive summary	*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 Boat Base and its~~*	*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.* ***Despite this, appropriate management measures have been prepared for the site, based on the inherent heritage significance the FBB sites. These include additional maritime archaeological and***	Amendments based on Heritage Branch comments

Source location	Original text	Correction	Outcome
	~~*significance as a base for Allied operations in the South West Pacific Area during WWII.*~~	***photographic recording, and the installation of additional heritage interpretation signage detailing the location of FBB and the LMS and its significance as a base for Allied operations in the South-West Pacific Area during World War II.***	
Visual Recording of Project Area (Section 6.1)	*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.~~*	*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 to* ***appropriately record the remains of the FBB site, and its relationship with and to the LMS building as part of heritage interpretation of the site****.*	Amendments based on Heritage Branch comments
Historic Heritage Significance (Section 8.1)	*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.*	*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.* ***The Project has, however, prepared appropriate management measures for the FBB site based on its inherent heritage significance.***	Amendments based on Heritage Branch comments
Heritage Impact Risk Assessment	*The risk assessment process notes potential risks to the heritage*	*The risk assessment process notes potential risks to the heritage*	Amendments based on

Source location	Original text	Correction	Outcome
Methodology (Section 9.1)	*values of listed sites, rates them using the tables below, suggests mitigation strategies and assesses the residual risk to heritage values. Note 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.*	*values of listed sites, rates them using the tables below, suggests mitigation strategies and assesses the residual risk to heritage values. Note 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* **not** 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.*	Heritage Branch comments
Catalina Flying Boat Base (Section 9.2.3)	*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.*	*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.* ***Despite this, appropriate management measures have been prepared for the FBB site, based on the inherent heritage significance the FBB sites. These include additional maritime***	Amendments based on Heritage Branch comments

Source location	Original text	Correction	Outcome
		archaeological and photographic recording, and the installation of additional heritage interpretation signage detailing the location of FBB and the LMS and its significance as a base for Allied operations in the South-West Pacific Area during World War II.	

6.5 Marine Environmental Quality

6.5.1 Environmental Factor Management Framework Errata List

Proposed amendments to the Draft EIS are provided below to be implemented in Section 13.4 of Chapter 13.

As a response to DEPWS comments and the finalisation of the Draft Dredging and Dredge Spoil Placement Management Plan, additional mitigation measures have been included in this Supplementary EIS to be implemented in the EMP to reduce risk of impacts to marine environmental quality during the Project's construction. The additional recommended mitigation measures (amendments to the Draft EIS) are highlighted in **bold** while superseded mitigations of changed are shown in ~~strikethrough~~.

Table 24 Construction marine environmental quality construction management measures

Environmental objectives	***Protect the quality and productivity of water, sediment and biota so that environmental values are maintained.***
Performance criteria	• No activity in breach of the provisions of any environmental legislation and Project environmental approval conditions. • 100% investigation and reporting of any environmental incident at the site. • ~~No exceedances of dredging trigger levels~~ • Audit score of 100% compliance on any audits of hazardous goods storage and handling requirements. **DDSPMP performance criteria - Dredging** • **Number of instances of exceedance of water quality monitoring criteria (trigger levels) at the sampling locations 150 m down-current from the sources that require corrective actions to be implemented to return water quality in East Arm to an acceptable level.** • **Number of instances in which monitoring of hard coral and filter feeder communities at South Shell Island and Catalina Islands monitoring sites is triggered.** **DDSPMP performance criteria - EAW settling ponds** • **Number of instances when pH or bioavailable toxicant concentrations are outside of acceptable guidelines (pH <6.0; bioavailable toxicant concentrations >ANZG DGVs) in Pond E (north), prior to discharge into Pond E (south).** • **Number of instances when SSC at the weir box between Pond E (north) and Pond E (south) is >100 mg/L (measured as turbidity).** • **Number of instances when target criteria 4 (a)-(d) are not met.**
Proposed mitigation measures	
• **Preparation and implementation of DDSPMP, approved by regulatory bodies, which includes a tiered response plan that is based on monitoring water quality in the vicinity of the operating dredge. Specific management measures relate to the two options (Option 1 and Option 2) of dredging for the Project are discussed further in Section 8.2 of the Draft DDSPMP for the Project and include:** ***Cutter Suction Dredge*** • **Cutter head and pump speeds managed to minimise dispersion of fine sediments from the cutter head.** • **Pipeline integrity maintained to reduce the potential for spoil leakage from joints between sections.** ***Back Hoe Dredge*** • **Speed of bucket movement through water column managed to minimise loss of sediments into the water column.** • **Minimal overflow from barges.** • **Silt curtains along seaward edge of reclamation area.** • **Management of runoff from reclamation area.** ***Corrective Actions***	

- **Slowing the CSD cutter head speed or slew speed of the dredge, reducing the rate of disturbance at the cutter head (Option 1).**
- **Repairing pipeline joints to eliminate leakage of spoil (Option1).**
- **Slowing the speed of raising the BHD bucket through the water column (Options 1 & 2).**
- **If necessary, reducing or suspending dredging activity during certain tidal periods when the migration of dredge plumes towards South Shell Island and Catalina Island is greatest.**
- **Relocating the dredge to an alternate dredge face.**
  ~~repairing pipeline joints to eliminate leakage of spoil~~
- **Temporary cessation of dredging.**
- **Use of silt curtains during reclamation activities to remove silt from runoff prior to, and within, the marine environment.**
- ~~**deployment of silt curtains.**~~

Tailwater

- **Tailwater mitigation measures are detailed in Section 8.0 of the Draft DDSPMP and in Section 3.6.2 of the Supplementary EIS. The process to mitigate supernatant tailwater involves the use of the dredge settlement ponds at East Arm Wharf.**
  - **Tailwater will flow from the dredge spoil that has been deposited in Pond K towards Pond E (north). Larger sediment particles will drop out as the tailwater progresses.**
  - **The flow of tailwater into Pond E (north) is via a weir box. At this location, the flow of tailwater can be regulated. Monitoring of water quality will also be undertaken at this point.**
  - **Tailwater in Pond E (north) can be controlled via the weir box leading to Pond E (south). Additionally, a series of silt curtains can be placed across Pond E (north) to ensure sufficient deposition of finer particles occurs prior to tailwater moving to Pond E (south).**
  - **Tailwater can be monitored at the weir box before it enters Pond E (south). Additional silt curtains can be placed within Pond E (south) to further improve the quality and ensure compliance of any tailwater exiting Pond E (south) into Darwin Harbour. Should an exceedance be detected at the weir box between Pond E (north) and Pond E (south), flow of tailwater into Pond E (south) will be stopped at the weir, halting discharge of the tailwater into Darwin Harbour. If required further silt curtains will be installed within Pond E (south) to ensure the water exiting the pond is at an acceptable quality.**
  - **Tailwater discharge from Pond E (south) is via a permeable section of the permeable bund wall which is layered with a geotextile fabric providing an additional filtration point of water entering Darwin Harbour.**

ASS

- Preparation and implementation of a CEMP including:
  - ASS management plan reflecting national standards and current best practice
  - ESCP.
- Adoption of suitable construction methodologies to minimise mud waving. ASS management associated with placement of dredged material will be incorporated into the DDSPMP, with management based on National ASS Guidelines.
- ~~Design considering water sensitive urban design.~~

Other mitigation measures

- Construction methodologies developed to contain reclamation material.
- Soil contamination investigations completed during preparation of the Draft EIS to determine level of contamination and remediation (refer to Draft EIS Appendix N: Preliminary Site Investigation)
- Unexpected finds protocol (ASS and contamination).
- Engaging with Port of Darwin regarding the Port Environmental Protection Plan.
- Preparation and implementation of a Marine Spill Response Plan in line with the existing Darwin Port Oil Spill Contingency Plan. The plan will also reference the NT (DIPL Marine) OSCP.
- Compliance with AS1940-2004 (Storage and handling of flammable and combustible liquids).
- Preparation and implementation of a refuelling management plan.
- Spill kits to be located at suitable locations on site during construction and operation and appropriate personnel trained in use.

Monitoring and reporting requirements	***DDSPMP requirements – Dredging*** • **Monitoring** ~~will be undertaken:~~ ~~surrounding the dredge when the dredge is operating~~

	~~within the dredged material placement ponds (where ponds are being used) prior to the discharge of tailwater~~ ~~in the vicinity of reclamation works where dredged material is being placed onshore to assess the effectiveness of sediment and turbidity control measures to manage runoff~~ ~~at any stormwater discharge locations into Darwin Harbour where surface water is collected from the Project site during construction~~ ~~at appropriate reference sites sufficiently distant from the works to not be impacted by dredging and/or reclamation works~~ ~~at sensitive receptor sites such as South Shell Island, if water quality trigger levels (set out in the DDSPMP) are exceeded.~~ - **Following a visual assessment, if required, water quality monitoring 150 m down-current of the operating dredge, the pipeline (under Option 1; if a plume is emanating from it) and the reclamation area.** - **Review of daily satellite images.** - **Baseline and post-dredging assessments of proportions of live hard corals and filter feeders within benthic communities at South Shell Island and Catalina Island monitoring sites.** - **If required due to exceedance of turbidity trigger levels at 150 m down-current from sources, assessment of hard coral and filter feeder communities at South Shell Island and Catalina Island monitoring sites.** • **Reporting** - **Daily reporting of monitoring data by Dredging Contractor to the Proponent.** - **Monitoring report to the NT EPA at the conclusion of dredging.** - **Trigger level exceedances 150 m down-current of any sources of turbid plumes from the dredging and reclamation activities will be reported by the Dredging Contractor to the Proponent within 24 hours of the exceedance occurring.** - **A report on corrective actions implemented to address the cause of the exceedance will be submitted by Dredging Contractor to the Proponent within two business days of the notification.** - **Dredging Contractor will notify the Proponent of the outcome of their investigation into attributability of the exceedance to dredging within three business days of the notification.** - **Dredging Contractor will notify the Proponent of the outcomes of any monitoring of the South Shell Island and Catalina Island benthic communities that is triggered by turbidity level exceedances; this will be provided within five business days of completion of the monitoring.** ***DDSPMP monitoring and reporting requirements – EAW settling ponds*** • **Monitoring** - **Water quality monitoring within ponds – pH, toxicants, NTU as detailed in Section 9.4 of the DDSPMP.** - **Visual monitoring of target criteria 4 (a)-(d) outside the permeable section of railway bund (during the water quality monitoring events).** • **Reporting** - **Weekly reporting of data to the Proponent.** - **Monitoring report to the Proponent at conclusion of dredging and reclamation.** - **Trigger levels are detailed in Section 9.6 of the DDSPMP. Trigger level exceedances at any monitoring location will be reported to the Proponent within 24 hours of the exceedance occurring.** - **Should a trigger level exceedance occur in Pond E (north) at the weir into Pond E (south), this will be reported by Dredging Contractor to the Proponent within 24 hours of the exceedance occurring and a report on corrective actions implemented to address the cause of the exceedance provided within five business days of the notification** ***Other monitoring and reporting requirements***

	• **Event triggered** ~~reactive~~ sediment and water quality sampling frameworks will be implemented in the event of an unplanned release of a pollutant. • All routine reporting will be reported in daily site environmental reports. Where an exceedance is detected, this will be communicated by the Construction Contractor to the proponent within 24 hours and an attributability assessment undertaken. A report on the attributability will be provided to the Proponent within a suitable timeframe to be determined in the DDSPMP and CEMP. • Any incidents that have caused environmental harm, or that have the potential to cause environmental harm, will also be reported to the designated DIPL representative and to NT EPA Pollution Hotline (1800-064-567) within 24 hours.

Table 25 Operational marine environmental quality operational management measures

Environmental objectives	***Protect the quality and productivity of water, sediment and biota so that environmental values are maintained.***
Performance criteria	• No activity in breach of the provisions of any environmental legislation and Project environmental approval conditions. • 100% investigation and reporting of any environmental incident at the site. • Audit score of 100% compliance on any audits of hazardous goods storage and handling requirements.
Proposed mitigation measures	
• Stormwater treatment system to be maintained. • OEMP to include mitigation to reduce build-up of contaminants on hardstand areas. • Engaging with Port of Darwin regarding the Port Environmental Protection Plan. • Preparation and implementation of a Marine Spill Response Plan in line with the existing Darwin Port Oil Spill Contingency Plan. The plan will also reference the NT (DIPL Marine) OSCP. • Compliance with AS1940-2004 (Storage and handling of flammable and combustible liquids). • Preparation and implementation of a **defueling**/refuelling management plan. • Spill kits to be located at suitable locations on site during construction and operation and appropriate personnel trained in use.	
Monitoring and reporting requirements	• ~~Reactive~~ **Event triggered** sediment and water quality sampling frameworks will be implemented in the event of an unplanned release of a pollutant. • Any incidents that have caused environmental harm, or that have the potential to cause environmental harm, will also be reported to the designated NTG representative and to NT EPA Pollution Hotline (1800-064-567) within 24 hours.

6.6 Marine Flora and Fauna

Proposed amendments to the Draft EIS are provided in the paragraphs below to be implemented as within Chapter 8 of the Draft EIS. These changes have been made based on NT EPA comments in Section 3.10.1.

6.6.1 Benthic Habitats

The Draft EIS included modelled benthic habitats predicted by Galaiduk (2019), updated with habitat surveys undertaken as part of the Draft EIS process (Case et al 2021). Subsequent to the presentation of the Draft EIS, updated habitat mapping was completed by the Australian Institute of Marine Science (AIMS 2021).

This habitat modelling built on the 2019 modelling by incorporating additional field observation data and new and higher resolution datasets. The resultant benthic habitat predictions were presented at a 1 m x 1 m resolution and showed habitat suitability for six biological communities in Darwin Harbour: Filter Feeders / Octocorals, Hard Corals, Macro Algae, Seagrasses, Sponges and Bare Ground.

The modelling presented by AIMS (2021) presents a distribution of suitable areas for benthic habitats based on a number of model parameters and is not a depiction of the actual distribution of benthic habitats in the region. It is, however, the most recent work undertaken to predict where benthic habitats may be likely to occur.

It is intended that Figure 9 below replaces Figure 8-1 in the Draft EIS.

The map presented by AIMS (2021) showed predicted habitat suitability for each community type, with the following interpretations provided by AIMS (2021):

- Bare ground having the most extensive coverage across the southern Darwin Harbour region.
- Filter feeder/octocoral habitats were predicted to occur in deeper waters of the outer harbour, with some small patches of suitable habitat also predicted south of EAW for both habitat types.
- Small patches of habitat suitable for filter feeders/octocorals were predicted south-west of Channel Island.
- Hard coral habitats were far more restricted within Darwin Harbour, but were predicted to occur in shallower regions of the outer and mid-harbour, as well as an area to the south of EAW.
- The area surrounding South Shell Island and Catalina Islands in East Arm were identified as potentially suitable habitats for hard corals.
- Macro Algae habitats were typically predicted in shallower habitats, with the thresholded model predicting extensive patches throughout the mid-harbour and within East Arm.
- Suitable habitat for seagrasses was not predicted to occur within East Arm; however, they were predicted in patches throughout the mid-harbour, with the largest patch predicted within Fannie Bay, and smaller patches predicted lining the top of the Middle Arm channel.
- Overall, areas adjacent to Fannie Bay and the mouth of East Arm were identified as areas with substantial benthic habitat coverage.

Within the northern East Arm region in the vicinity of the Project, mapping by AIMS (2021) shows:

- Suitable hard coral habitat is predicted to occur surrounding South Shell Island and shallow waters west of Catalina Island and encroaching into the Project footprint.
- Suitable filter feeder habitat within the offshore extremity of the project footprint, extending offshore into the main channel of East Arm. Further areas are identified as suitable filter feeder habitat to the east and west of South Shell Island.
- No suitable habitat was identified for seagrass in the vicinity of the Project area.
- Large areas of potentially suitable habitat for macro algae and sponges were identified across wide areas of the northern East Arm region, including within the Project footprint.

For the Draft EIS and this Supplementary EIS, benthic habitat surveys were undertaken to assess the accuracy of the modelled predictions in areas of direct and potential indirect disturbance from the construction and operation of the Project. The first of these surveys was undertaken by AIMS in November 2020 (Case et al 2021). A review of all of the video records from the AIMS November 2020 survey transects within the area of direct disturbance from the Project was conducted. This review suggested that the seabed in this area was predominantly bare substrate, with only scattered filter feeders and no visible hard corals or seagrasses.

The second survey was conducted by SLR Australia in May 2022 and focussed on collecting data in the vicinity of South Shell Island and Catalina island, the closest sponge and hard coral communities previously verified to the Project location. The results of this survey are under review at the time of finalising the Supplementary EIS.

PROJECT ID 60633505
CREATED BY PK
APPROVED BY HS
LAST MODIFIED 03 JUN 2022

AECOM
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1:40,000 when printed at A4
DATUM GDA 1994, PROJECTION MGA ZONE 52
0 410 820 1,230 1,640
Meters

Data sources:

Base Data:
Benthic Habitat Mapping: NT AIMS 2021

LEGEND
Project footprint
Benthic Habitat
Filter Feeders/Octocorals
Hard Corals
MacroAlgae
Seagrasses
Sponges

Modelled Benthic Habitat Suitability of East Arm (AIMS, 2021)

NORTHERN TERRITORY GOVERNMENT OF AUSTRALIA
DARWIN SHIP LIFT PROJECT

Figure
9

A4 size

6.6.2 Environmental Factor Management Framework Errata List

Proposed amendments to the Draft EIS are provided below to be implemented in Section 13.4 of Chapter 13.

As a response to DEPWS comments and the finalisation of the Draft Dredging and Dredge Spoil Placement Management Plan, additional mitigation measures have been included in this Supplementary EIS to be implemented in the EMP to reduce risk of impacts to marine flora and fauna during the construction phases. The additional recommended mitigation measures (amendments to the Draft EIS) are highlighted in **bold** while superseded mitigations of changed are shown in ~~strikethrough~~.

Table 26 Construction marine flora and fauna construction management measures

Environmental objectives	***Protect marine flora and fauna so that biological diversity and ecological integrity are maintained.***
Performance criteria	• No activity in breach of the provisions of any environmental legislation and Project environmental approval conditions. • 100% investigation and reporting of any environmental incident at the site.
Proposed mitigation measures	
Dredging and Dredge Spoil Disposal • **Preparation and implementation of DDSPMP, including monitoring and adaptive management protocols to reduce risk of impacts to:** - **benthic communities from turbidity and sedimentation** - **protected marine species from physical interaction and underwater noise** • **It is considered that the South Shell Island and Catalina Island benthic communities are sufficiently distant from the predicted Zones of Impact and Influence from the dredging and reclamation activities and that the mitigation measures to reduce the dredge plume provided in the Marine Environmental Quality section above are appropriate to reduce the potential impacts on benthic communities at South Shell Island and Catalina Island, however monitoring of these islands benthic communities is included within the DDSPMP to meet the expectations of the regulators responsible for approval of the DDSPMP.** ***Protected Species Management Frameworks*** **A series of Protected Species Management Frameworks (PSMF) have been developed in Section 9.0 of the Draft DDSPMP for physical vessel interactions, and underwater noise. Species specific PSMFs developed for species identified as part of the EPBC referral are discussed in Section 3 of the Updated Environmental Management Framework.** • **Physical interactions** - **Training of Vessel Masters in interaction procedures** - **During movements of Project vessels, if protected marine species are sighted within 50 m of a vessel then avoidance actions will be taken by the vessel (e.g. change of direction or slowing to less than 6 knots) until the individuals are no longer within this distance.** - **Vessels will adhere to Darwin Port speed restrictions.** - **Vessels will not approach, circle or wait in front of protected marine species for the purposes of casual viewing.** - **Support vessels will not approach, circle or wait in front of wildlife for the purposes of casual viewing.** • **Underwater noise** - **Marine Fauna Observer (MFO) to undertake assessments of the Observation, Start-up Exclusion and Dredging Response Zones as follows.** - **On each occasion that the dredge has been non-operational for a period exceeding 30 minutes, a visual assessment will be undertaken of the 750 m radius Observation Zone by the MFO for a period of 20 minutes. Dredging will not recommence until no protected marine species have been sighted within the 500 m radius Start-up Exclusion Zone for a period of 10 minutes.** - **The assessment of the Observation Zone will be made from an elevated position on the dredge, where a clear line of sight is achievable to the edge of the zone.** - **The MFO will not be engaged in any other activities during the 20-minute assessment period.**	

	- **Every 30 minutes whilst the dredge is operating, the MFO will dedicate a period of five minutes for scanning (from an elevated position) for protected marine species within the Observation Zone.** - **Once dredging operations have commenced, if protected marine species enter within 50 m of the dredge, or a dolphin with calf enter within 150 m of the dredge (i.e. the Dredging Response Zones), then dredging will be temporarily suspended. Dredging will not recommence until no protected marine species have been sighted within the 500 m radius Start-up Exclusion Zone for a period of 30 minutes.** - **Dredging that commences prior to sunset, or prior to a period of low visibility (defined as where continuous visual observations to a distance of 1000 m from the dredge are not possible), will continue unless, within the preceding 12 hours, there have been three or more suspensions of dredging due to protected marine species encroaching within the Dredging Response Zone.** - **The generation of underwater noise by all vessels will be reduced by ensuring that:** ▪ **All equipment is maintained in good operating condition (balancing, greasing, etc.) and have proper noise control systems in place.** ▪ **All noise minimisation measures such as mufflers, special enclosures and sound-insulation mounts are fitted and working.** ▪ **Revolving equipment such as propellers and drive shafts are balanced to reduce vibration.** ▪ **Equipment such as thrusters and auxiliary plant are switched off when not in use (i.e. not running in standby mode).** • Implementation of no-go zones around the AAPA restricted areas of South Shell Island and Catalina Island. • Preparation and implementation of a Marine Noise and Vibration Management Plan, incorporating marine fauna observations and ~~reactive~~ adaptive management protocols. • Preparation and implementation of a CEMP containing an Erosion and Sediment Control Plan, and a stormwater management plan and spill response measures. • Compliance with AS1940-2004 (Storage and handling of flammable and combustible liquids). • Preparation and implementation of a CEMP containing an ASS Management Plan. • ~~Adoption of construction methodologies that reduce potential for mud waving to as low as practically possible.~~ • Preparation and implementation of a Marine Spill Response Plan aligned with the NT (DIPL, Marine Safety Branch) and Darwin Port Oil Spill Contingency Plan. • Implementation of vessel speed limitations aligned with Darwin Port Harbourmaster requirements. • Implementation of standard navigational procedures and navigation aids. • Stormwater retention and treatment systems incorporated into ~~Ship Lift facility~~ Project design. • **Reduction of light spill into marine environment from vessels and infrastructure to as low as practically possible through the implementation of lighting in accordance with the National Light Pollution Guidelines for Wildlife (DEE, 2020).** • Preparation and implementation of a Biosecurity Management Plan, including vessel risk assessment and inspection protocols. • Consultation with the Aquatic Biosecurity Unit within the NT Department of Industry, Tourism and Trade to ensure consistency with existing quarantine arrangements for Darwin Harbour facilities.
Monitoring and reporting requirements	***Draft DDSPMP Benthic Habitats - South Shell Island and Catalina Island*** • **Fortnightly monitoring of the benthic communities at the South Shell Island, Catalina Island and Channel Island sites will be initiated.** • **Monitoring will continue over four fortnightly periods following the positive attributability assessment. It is recognised that elevated turbidity levels at the South Shell Island and Catalina Island sites are unlikely to result in immediate changes to benthic community health, but that indications of reduced health may become evident over time.** • **If the monitoring does not indicate any trend in decreasing health of the benthic communities at the monitoring sites (as indicated by increasing stress or mortality of hard corals or filter feeders), and there have been no further positive attributability assessments over the monitoring period, then monitoring will be suspended.**

	Draft DDSPMP* PSMF – *Dredging • **Monitoring** - **Watch will be maintained for stranded, injured or dead protected marine fauna; if observed, the NT Government Marine Wildwatch line (1800-453-941) will be contacted for retrieval, treatment or post-mortem of the fauna.** • **Reporting** - **Daily submission of marine fauna observations sheets by Dredging Contractor to the Proponent** - **Weekly summary reporting by Dredging Contractor to the Proponent of number of sightings, incidents and corrective actions.** - **Monitoring report to the Proponent at the conclusion of dredging.** - **Any vessel interaction incidents and protected species injury or mortality will be reported to the Proponent within 24 hours of the incident occurring. The Contractor and/or Proponent will also notify the NT EPA and DCCEEW.** ***Draft DDSPMP PSMF – Underwater noise*** • **Monitoring** - **Watch will be maintained for the presence of stranded, injured or dead protected marine species. If observed, the NT Government Marine Wildwatch line (1800-453-941) will be contacted for retrieval, treatment or post-mortem of the animal(s).** • **Reporting** - **Daily submission of marine fauna observations sheets from Contractor to the Proponent.** - **Weekly summary reporting to Proponent of number of sightings of protected marine species.** - **Monitoring report to the Proponent at the conclusion of dredging.** - **Any suspected noise-related incidents will be reported by Contractor to Proponent within 24 hours of the incident occurring.** - **Any corrective actions implemented in response to suspected noise related incidents will be detailed in the weekly report to Proponent.** • **Monitoring of Observation and Shut-down zones around dredging and piling operations, to mitigate the potential for impacts upon protected marine species.** • **Reporting of protected marine species observed during dredging and piling operations.** • Vessel risk assessment and inspection protocols as per requirements of Biosecurity Management Plan. • Any incidents that have caused environmental harm, or that have the potential to cause environmental harm, will also be reported to the designated DIPL representative and to NT EPA Pollution Hotline (1800-064-567) or, for marine fauna incidents, Marine Wildwatch line (1800-453-941) within 24 hours.

Table 27 Operational marine flora and fauna operational management measures

Environmental objectives	***Protect marine flora and fauna so that biological diversity and ecological integrity are maintained.***
Performance criteria	• No activity in breach of the provisions of any environmental legislation and Project environmental approval conditions. • 100% investigation and reporting of any environmental incident at the Project site.
Proposed mitigation measures	

	• Stormwater retention and treatment systems constructed on site to be maintained. • Incorporate spill response measures into OEMP. • Reduction of light spill into marine environment from vessels and infrastructure to as low as practically possible **through the implementation of lighting in accordance with the National Light Pollution Guidelines for Wildlife (DEE, 2020).** • Preparation and implementation of a Biosecurity Management Plan, including vessel risk assessment and inspection protocols. • Implementation of vessel speed limitations aligned with Darwin Port Harbourmaster requirements. • Implementation of standard navigational procedures and navigation aids. • ~~Waste~~ **Contractors operational management measures should incorporate waste** management procedures to capture biofouling removed from vessels on the hardstand areas. • Consultation with the Aquatic Biosecurity Unit within the NT Department of Industry, Tourism and Trade to ensure consistency with existing quarantine arrangements for Darwin Harbour facilities.
Monitoring and reporting requirements	• Vessel risk assessment and inspection protocols as per requirements of Biosecurity Management Plan. • Any incidents that have caused environmental harm, or that have the potential to cause environmental harm, be reported to the designated NTG representative and to NT EPA Pollution Hotline (1800-064-567) or, for marine fauna incidents, Marine Wildwatch line (1800-453-941) within 24 hours.

6.7 Environmental Management Framework

The Environmental Management Framework Chapter of the Draft EIS has been updated based on design refinements, revised impact assessments, updates based on submissions on the Draft EIS and inputs from the Operational Contractor. The EMF has been reformatted as a standalone document to allow easier distribution to relevant stakeholders for implementation.

The updated EMF is provided as Appendix E: Updated Environmental Management Framework and supersedes Chapter 13 of the Draft EIS. The key changes to the EMF are captured within the proposed factor management measures (Section 2.0 and Section 4.0 of the EMF) for the construction and operation of the Project.

Changes to factors that have been further assessed in this Supplementary EIS are captured in their respective environmental factor specific errata lists (see sections 6.1.6, 6.5.1 and 6.6.2 above), while changes to factors not specifically discussed in these sections are documented below. The updated EMF (including all sections) is provided in full as Appendix E.

Superseded changes are shown in ~~strikethrough~~ while additional or updated changes are shown in **bold**.

6.7.1 Section 2.0 of the Environmental Management Framework: Construction Environmental Management

2.3.4 Terrestrial environmental quality

Table 28 Terrestrial environmental quality construction management measures

Environmental objectives	***Maintain the quality of land and soils so that the environmental values are maintained.***
Performance criteria	• No activity in breach of the provisions of any environmental legislation and Project environmental approval conditions. • 100% investigation and reporting of any environmental incident at the site. • Audit score of 100% compliance on any audits of hazardous goods storage and handling requirements.
Proposed mitigation measures	
• ~~Engineering design to capture all hazardous waste and wastewater runoff.~~ • ~~A water treatment system(including first flush stormwater treatment) installed during Project construction.~~ • **Water runoff and infiltration to be aided by designed drainage. Appropriate filtering of gross pollutants before discharging from the site.** • **Wastewater to be appropriately treated and managed prior to release.** Waste management programs which includes a routine waste management program for all waste management systems. • An unexpected finds procedure to identify and manage contaminated materials and ASS that may be encountered during construction. • ASS Management Plan reflecting national standards and current best practice. • ~~The mangrove area will be filled without the removal of tress to ensure there is no exposure of PASS~~ • **Clearing of the mangrove area will be undertaken by cutting the trees at the base and then removing the vegetation for mulching and reuse on the site for erosion and sediment control. The root ball of the mangroves will not be disturbed during this process.** • Materials will be recycled wherever possible. • Waste will be segregated by type on site and collected on a regular basis by a suitably licenced contractor and disposed of at a licenced landfill **and recycling facilities where applicable.** • Waste oil will be stored in an appropriate fuel storage bund prior to transportation for appropriate disposal. • Littering on site is prohibited and work and office sites are to be kept clean and tidy. • Rubbish containers are to be ~~carried in all vehicles and~~ provided at all work sites. • Waste management requirements will be addressed in site inductions.	

• Routine maintenance program will be developed for all waste management systems including wastewater management systems. • All hazardous and dangerous goods will be handled and stored according to the Australian Standards. • Minimise use of hazardous materials where possible and use alternatives where feasible. • Delivery of hazardous materials will be in line with site use to avoid the need to store significant quantities. • Contaminated runoff and contaminated soil will be collected and remediated or transported to a suitable facility for disposal.	
Monitoring and reporting requirements	• Weekly inspections of the site will be conducted. • Inspections of waste and wastewater management systems will be undertaken as per manufacturer requirements. • Volumes of waste material and recycled material will be reported via the Annual Report to DIPL. • Inappropriate waste disposal will be reportable as an incident as per the Construction ~~and Operational~~ Contractors incident reporting processes. • Inspections of storage tanks and bulk containers and the integrity of bunded areas, pavement and associated containment systems will be conducted on a monthly basis. • Regular review of handling, storage and use will be undertaken and alternatives will be identified where feasible. • The results of the hydrocarbon and hazardous management program will be documented by the ~~Operational~~ **Construction** Contractor in the sites Annual Report to DIPL. • Any incidents that have caused environmental harm, or that have the potential to cause environmental harm, will also be reported to the designated DIPL representative and to NT EPA Pollution Hotline (1800-064-567) within 24 hours.

2.3.5 Terrestrial flora and fauna

Table 29 Terrestrial flora and fauna construction management measures

Environmental objectives	***Protect the NTs flora and fauna so that biological diversity and ecological integrity are maintained.***
Performance criteria	• No activity in breach of the provisions of any environmental legislation and Project environmental approval conditions. • 100% investigation and reporting of any environmental incident at the site.
Proposed mitigation measures	
• Management practices to prevent the introduction and spread of weeds and pests during construction will be managed through mitigation measures administered under the CEMP. This will be linked to the Biosecurity Management Plan as appropriate to prevent the introduction of weed or feral/pest species via vessels as appropriate. • Adoption of suitable construction methodologies to minimise impacts from pile driving noise, including monitoring and ~~reactive~~ **adaptive** management protocols to reduce risk of impacts to protect fauna from noise impacts during construction. • Develop and implement a CNVMP to support the CEMP. • **Develop and implement species specific environmental management measures to ensure that impacts to identified EPBC Act listed species are avoided or mitigated (Section 3.0).**	

Monitoring and reporting requirements	• Weekly site inspections. • Reporting on environmental incidents including incursions of weed, pest and feral species. • Weed and pest monitoring as required in CEMP and Biosecurity Management Plan.

2.3.6 Surface water and hydrological processes

Table 30 Surface water and hydrological processes construction management measures

Environmental objectives	***Maintain the quality of groundwater and surface water so that environmental values including ecological health, land uses, and the welfare and amenity of people are protected.*** ***Maintain the hydrological regimes of groundwater and surface water so that environmental values are protected.***
Performance criteria	• No activity in breach of the provisions of any environmental legislation and Project environmental approval conditions. • 100% investigation and reporting of any environmental incident at the site.
Proposed mitigation measures	
• Project design to incorporate stormwater outfall structures with appropriate low velocity minimisation and energy dissipation measures. • Adopt suitable construction methodologies to contain reclamation material. • Ensure that on-site activities are carried out by such practicable means necessary to minimise the contact of incidental rainfall and stormwater runoff with wastes or other contaminants. • Develop and implement an ESCP for areas to be disturbed during construction ~~and operation.~~ • Develop and implement a **Final** DDSPMP. • Install operate and maintain stormwater drainage system and stormwater treatment devices • Implement spill and leak prevention and control techniques for land-based activities. • Ensure appropriate spill kits are available and provide training on kit use. • Ensure spillage of wastes, contaminants or other materials are cleaned up as quickly as practicable using procedures that prevent contaminants or material being transferred to the stormwater drainage system. • Implement bunded areas and drainage lines separate from the stormwater drainage in chemical storage and handling areas to reduce the likelihood of chemical contamination of stormwater.	
Monitoring and reporting requirements	• Weekly inspection of stormwater system and drains. • Monitor and manage surface water from within the reclamation and material handling areas to meet appropriate water quality criteria before it is allowed to discharge to the marine environment. • Any incidents that have caused environmental harm, or that have the potential to cause environmental harm, will also be reported to the designated DIPL representative and to NT EPA Pollution Hotline (1800-064-567) or, within 24 hours.

2.3.7 Human health

Table 31 Human health construction management measures

Environmental objectives	***Ensure that risks to human health are identified, understood and adequately avoided and/or mitigated.***
Performance criteria	• 100% investigation and reporting of any environmental incident at the site. • No **noticeable** increase in biting insect populations ~~No~~ **and no Project related** complaints ~~from onsite staff or the community~~ regarding biting insects. • No observed ponding/breeding sites within the Project footprint.
Proposed mitigation measures	
• Designs and stormwater management plans to include a drainage strategy that prevents water from ponding and becoming a breeding site. • Develop and implement a Biting Insect Management Plan in accordance with NT Department of Health Guidelines. • Monitor impacts associated with disposal of dredge spoil to land (if required). • Ensure Biosecurity Management Plan includes requirements in relation to mosquitoes and international health regulations. • Cultural Heritage Assessment (**Draft EIS** Appendix M: Cultural Heritage Assessment) including liaison with NT Heritage Branch regarding UXO surveys undertaken to date. • UXO risk assessment ~~to~~ **will** be undertaken prior to construction works. • UXO to be incorporated into the unexpected finds procedure.	
Monitoring and reporting requirements	• If Darwin Port settlement ponds are utilised during construction, a biting insect surveillance program will be developed and implemented as part of the dredge management program ~~if residual ponding for greater than four days is required for sediment settlement~~ to ensure mosquito breeding is detected and controlled ~~until such time that residual ponding is no longer present.~~ Results of the biting insects management and surveillance program will be ~~documented in the Annual Report~~ reported to DIPL. • Site inspections to identify potential breeding sites. • Any significant mosquito activity will also be reported to DIPL and/or the Medical Entomology Branch and monitored if risks to human health are identified. • If UXO are found in the Project area DIPL and the NT Police should be contacted as per the unexpected finds procedure.

6.7.2 Section 3.0 of the Environmental Management Framework: Detailed Protected Species Management Framework

As part of the EPBC Referral a Request for Further Information was received from the Department of Agriculture Water and the Environment (DAWE) to detail avoidance and management measures for the following identified matters of national environmental significance (MNES):

- Threatened and migratory shorebirds
- Flatback turtle
- Migratory dolphins.

These detailed Protected Species Management Frameworks (PSMF) are presented below and ordered to respond to potential impacts identified through the Draft EIS. These PSMFs will be used to further inform construction environmental management plans to mitigate and avoid impacts on MNES.

3.1 Noise, Light and Vibration

The following PSMF relates to managing the potential impacts resulting from terrestrial noise, light and vibration during the construction and operation of the Project potentially impacting on threatened and migratory shorebirds, flatback turtle, and migratory dolphins (Table 32).

Table 32 Protected Species Management Framework - Noise, Light and Vibration

Protected Species Management Framework – Noise, Light and Vibration	
Element	**Impacts on protected marine species from construction activities.**
Objectives	• **Minimise the risk of disturbance to protected marine species from construction noise, light and vibration.** • **Establish and maintain awareness of the importance of protecting listed species.**
Targets	• **Compliance with the mitigation measures identified in the Construction Noise and Vibration Management Plan, Dredging and Dredge Spoil Placement Management Plan and Piling Management Plan.** • **Light spill into the marine and terrestrial environment in accordance with *National Light Pollution Guidelines for Wildlife* (DEE, 2020).** • **All construction personnel to complete an HSE induction that details responsibilities to minimise light, noise and vibration impacts** • **Investigate all environmental incidents at the site relating to excess lighting, noise, or vibration**
Key Performance Indicators	• **Number of audits and incident reports.** • **Number of reported sightings of live, injured or dead protected marine species including shorebirds, turtles and dolphins.** • **Number of personnel completing an HSE site induction.**
Management	• **Development of a Construction Noise and Vibration Management Plan identifying:** - **nearest residences, other sensitive land uses and ecological receptors such as, migratory birds** - **approved hours of work and requirements for site specific noise risk assessments for proposed activities outside standard work hours** - **all construction activities, including work areas, equipment and duration** - **what work practices (generic and specific) would be applied to minimise noise and vibrations.** • **Development of a Piling Management Plan including Commencing pile driving (any time when pile driving has ceased for a certain period) with the "soft start" procedure, where pile driving impact force will be gradually scaled up over a five-minute period.**

Protected Species Management Framework – Noise, Light and Vibration	
	• Reduction of light spill into marine and terrestrial environment from vessels and infrastructure to as low as practically possible in accordance with the *National Light Pollution Guidelines for Wildlife* (DEE, 2020).
Monitoring	• Weekly site inspections.
Reporting	• Reporting on environmental incidents including incursions of weed, pest and feral species and any harm to listed species.
Corrective Actions	In the event that noise-related impact is suspected, the incident will be investigated to confirm a noise-related impact has occurred and identify the most appropriate action(s) to reduce the impact. This may include one or more of the following: • Implementation of further noise reduction measures. • Restriction on vessel movements/activities.
Term	For the duration of construction activities.
Responsibility	• Piling and Construction Contractors to ensure works are conducted in compliance with this EMF. • Piling and dredging Contractors to implement noise management aboard all vessels. • Construction Contractor to implement the Construction Noise and Vibration Management Plan.

3.2 Underwater noise

The following PSMF relates to managing the potential impacts resulting from underwater noise impacts during piling (Table 33) and dredging (Table 34) for the Project potentially impacting on threatened and migratory marine species.

Table 33 Protected Species Management Framework – underwater noise (piling)

Protected Species Management Framework – underwater noise (piling)	
Element	Impact of underwater noise on protected marine species.
Objectives	• Minimise the risk of disturbance to marine species from underwater noise from piling. • Establish and maintain awareness of the importance of protecting marine species.
Targets	• No avoidable disturbance to protected marine species as a result of noise generated during piling activities. • All personnel associated with piling operations to complete an HSE induction. • At all times that piling barge is operational, at least one crew member is a trained MFO and acting as lookout for protected marine species.
Key Performance Indicators	• Number of audits and incident reports. • Number of reported sightings of live, injured or dead protected marine species. • Number of personnel completing an HSE site induction. • Availability of MFO-trained crew member on operating piling barge.
Management	• Pile driving activities will only be undertaken during daylight hours. • Pile driving will commence each day with the "soft start" procedure, where pile driving impact force will be gradually scaled up over a five minute period. This is considered to provide an opportunity for any sensitive marine animals to leave the area before full hammering energy is realised. • The MFO will undertake assessments of the Observation and Piling Response Zones as follows:

Protected Species Management Framework – underwater noise (piling)	
	• **On each occasion that the piling barge has been non-operational for a period exceeding 30 minutes, a visual assessment will be undertaken of the 750 m radius Observation Zone by the MFO for a period of 20 minutes. Piling will not recommence until no protected marine species have been sighted within the 500 m radius Piling Response Zone for a period of 10 minutes.** • **The assessment of the Observation Zone will be made from an elevated position on the piling barge, where a clear line of sight is achievable to the edge of the zone.** • **The MFO will not be engaged in any other activities during the 20-minute assessment period.** • **Every 30 minutes whilst the piling barge is operating, the MFO will dedicate a period of five minutes for scanning (from an elevated position) for protected marine species within the Start-up Exclusion Zone.** • **Once piling operations have commenced, if protected marine species enter within 500 m of the pile being driven (i.e. the Piling Response Zone), then piling will be temporarily suspended. This is likely a conservative basis as it is noted that a turtle would need to loiter within that immediate location for an extended period, if the suggested noise exposure criteria were to be exceeded (as weighted for hearing acuity and based upon recommendations in Southall et al. [2019]). Piling will not recommence until no protected marine species have been sighted within the 500 m radius Piling Response Zone for a period of 10 minutes.** • **Piling that commences prior to a period of low visibility (defined as where continuous visual observations to a distance of 1000 m from the piling barge is not possible), will continue unless, within the preceding 12 hours, there have been three or more suspensions of piling due to protected marine species encroaching within the Piling Response Zone.** • **Pile driving activities commenced prior to a period of low visibility attributable to rainfall may continue, noting the significant in-water noise generated by precipitation, such that this natural noise source would act to diminish the relative perceptibility of pile driving noise.** **The generation of underwater noise by all vessels will be reduced by ensuring that:** • **All equipment is maintained in good operating condition (balancing, greasing, etc.) and have proper noise control systems in place.** • **All noise minimisation measures such as mufflers, special enclosures and sound-insulation mounts are fitted and working.** • **Revolving equipment such as propellers and drive shafts are balanced to reduce vibration.** • **Equipment such as thrusters and auxiliary plant are switched off when not in use (i.e. not running in standby mode).**
Monitoring	• **Turtle observations (as per Management section above).** • **Watch will be maintained for the presence of stranded, injured or dead protected marine species. If observed, the NT Government Marine Wildwatch line (1800-453-941) will be contacted for retrieval, treatment or post-mortem of the animal(s).**
Reporting	• **Daily submission of marine fauna observations sheets from Piling Contractor to the Proponent.** • **Weekly summary reporting to the Proponent of number of sightings of protected marine species.** • **Monitoring report to the Proponent at the conclusion of piling.** • **Any suspected noise-related incidents will be reported by the Piling Contractor to the Proponent within 24 hours of the incident occurring.**

Protected Species Management Framework – underwater noise (piling)	
	• Any corrective actions implemented in response to suspected noise-related incidents will be detailed in the weekly report to the Proponent.
Corrective Actions	In the event that noise-related impact is suspected, the incident will be investigated to confirm a noise-related impact has occurred and identify the most appropriate action(s) to reduce the potential for further impacts to occur. This may include one or more of the following: • Implementation of additional noise reduction measures (e.g. bubble curtains, if these prove effective within the prevailing tidal current conditions). • Increasing the radius of the Observation Zone to 900 m.
Term	For the duration of pile driving activities.
Responsibility	• Piling Contractor to ensure works are undertaken in compliance with this EMF. • Piling Contractor to implement turtle management and monitoring programs. • Project Manager for Piling Contractor to liaise with Proponent and DEPWS on response to stranded, injured or dead protected marine species and potential recovery, treatment or post-mortem. • Piling Contractor to implement noise management aboard all vessels.

Table 34 Protected Species Management Framework – underwater noise (dredging)

Protected Species Management Framework – underwater noise (dredging)	
Element	Impact of underwater noise from dredging on protected marine species.
Objectives	• Minimise the risk of disturbance to protected marine species from underwater noise from dredging. • Establish and maintain awareness of the importance of reducing impacts upon protected marine species
Targets	• No avoidable disturbance to protected marine species as a result of noise generated during dredging activities. • All dredging personnel to complete a Health, Safety & Environment (HSE) induction. • At all times that dredge is operational, at least one crew member is a trained MFO and acting as lookout for protected marine species.
Key Performance Indicators	• Number of audits and incident reports. • Number of reported sightings of live, injured or dead protected marine species. • Number of personnel completing an HSE site induction. • Availability of MFO-trained crew member on operating dredge.
Management	• MFO to undertake assessments of the Observation, Start-up Exclusion and Dredging Response Zones as follows. • On each occasion that the dredge has been non-operational for a period exceeding 30 minutes, a visual assessment will be undertaken of the 750 m radius Observation Zone by the MFO for a period of 20 minutes. Dredging will not recommence until no protected marine species have been sighted within the 500 m radius Start-up Exclusion Zone for a period of 10 minutes. • The assessment of the Observation Zone will be made from an elevated position on the dredge, where a clear line of sight is achievable to the edge of the zone. • The MFO will not be engaged in any other activities during the 20-minute assessment period. • Every 30 minutes whilst the dredge is operating, the MFO will dedicate a period of five minutes for scanning (from an elevated position) for protected marine species within the Start-up Exclusion Zone.

Protected Species Management Framework – underwater noise (dredging)	
	• **Once dredging operations have commenced, if protected marine species enter within 50 m of the dredge, or a dolphin with calf enter within 150 m of the dredge (i.e. the Dredging Response Zones), then dredging will be temporarily suspended. Dredging will not recommence until no protected marine species have been sighted within the 500 m radius Start-up Exclusion Zone for a period of 10 minutes.** • **Dredging that commences prior to sunset, or prior to a period of low visibility (defined as where continuous visual observations to a distance of 1000 m from the dredge are not possible), will continue unless, within the preceding 12 hours, there have been three or more suspensions of dredging due to protected marine species encroaching within the Dredging Response Zone.** • **The generation of underwater noise by all vessels will be reduced by ensuring that:** - **All equipment is maintained in good operating condition (balancing, greasing, etc.) and have proper noise control systems in place.** - **All noise minimisation measures such as mufflers, special enclosures and sound-insulation mounts are fitted and working.** - **Revolving equipment such as propellers and drive shafts are balanced to reduce vibration.** - **Equipment such as thrusters and auxiliary plant are switched off when not in use (i.e. not running in standby mode).**
Monitoring	• **Protected marine species observations (as per Management section above).** • **Watch will be maintained for the presence of stranded, injured or dead protected marine species. If observed, the NT Government Marine Wildwatch line (1800-453-941) will be contacted for retrieval, treatment or post-mortem of the animal(s).**
Reporting	• **Daily submission of marine fauna observations sheets from Contractor to the Proponent.** • **Weekly summary reporting to Proponent of number of sightings of protected marine species.** • **Monitoring report to the Proponent at the conclusion of dredging.** • **Any suspected noise-related incidents will be reported by Contractor to Proponent within 24 hours of the incident occurring.** • **Any corrective actions implemented in response to suspected noise related incidents will be detailed in the weekly report to Proponent.**
Corrective Actions	**In the event that noise-related impact is suspected, the incident will be investigated to confirm a noise-related impact has occurred and identify the most appropriate action(s) to reduce the impact. This may include one or more of the following:** • **Implementation of further noise reduction measures.** • **Restriction on vessel movements/activities.** • **Increase in the radius of the Observation Zone to 900 m.**
Term	**For the duration of dredging activities**
Responsibility	• **Contractor to ensure works are conducted in compliance with this PSMF.** • **Contractor to implement noise management aboard all vessels.**

6.7.3 Section 4.0 of the Environmental Management Framework: Operational Environmental Management

4.3.4 Terrestrial environmental quality

Table 35 Terrestrial environmental quality operational management measures

Environmental objectives	***Maintain the quality of land and soils so that the environmental values are maintained.***
Performance criteria	• No activity in breach of the provisions of any environmental legislation and Project environmental approval conditions. • 100% investigation and reporting of any environmental incident at the site. • Audit score of 100% compliance on any audits of hazardous goods storage and handling requirements.
Proposed mitigation measures	
• Routine maintenance for all waste management systems. • Routine maintenance of wastewater and water treatment systems with links to Biosecurity Management Plan. • Routine maintenance of stormwater management systems. • Materials will be recycled wherever possible. • Segregation of waste by type on site and collected on a regular basis by a suitably licenced contractor and disposed of at a licenced landfill. • Waste oil will be stored in an appropriate fuel storage bund prior to transportation for appropriate disposal. • Littering on site is prohibited and work and office sites are to be kept clean and tidy. • Rubbish containers are to be carried in all vehicles and provided at all work sites. • Waste management requirements will be addressed in site inductions. • Routine maintenance program will be developed for all waste management systems including wastewater management systems. • All hazardous and dangerous goods will be handled and stored according to the Australian Standards. • Minimise use of hazardous materials where possible and use alternatives where feasible. • Delivery of hazardous materials will be in line with site use to avoid the need to store significant quantities. • Contaminated runoff and contaminated soil will be collected and remediated or transported to a suitable facility for disposal.	
Monitoring and reporting requirements	• ~~Weekly~~ **Operational procedures will detail the frequency of site** inspections ~~of the site will~~ **to** be conducted. • Inspections of waste and wastewater management systems will be undertaken ~~as per~~ **in accordance with** manufacturer requirements **and the Contractors operational procedures.** • Volumes of **listed** waste material **being stored or disposed of** ~~and recycled material~~ **will** ~~be reported via the Annual Report~~ **in accordance with** ~~to NTG~~ **NT EPA requirements**. • Inappropriate waste disposal will be reportable as an incident ~~as per~~ **in accordance with** the ~~Operational Contractors~~ **Operators** incident reporting processes. • Inspections of storage tanks and bulk containers and the integrity of bunded areas, pavement and associated containment systems will be conducted ~~on a monthly basis~~ **as per the Contractors operational procedures.** • ~~Regular review of handling, storage and use will be undertaken and alternatives will be identified where feasible.~~ • ~~The results of the hydrocarbon and hazardous management program will be documented by the operator in the sites Annual Report to NTG.~~ • Any incidents that have caused environmental harm, or that have the potential to cause environmental harm, will also be reported to the designated NTG representative and to NT EPA Pollution Hotline (1800-064-567) ~~or,~~ within 24 hours.	

4.3.5 Terrestrial flora and fauna

Table 36 Terrestrial flora and fauna operational management measures

Environmental objectives	***Protect the NTs flora and fauna so that biological diversity and ecological integrity are maintained.***
Performance criteria	• No activity in breach of the provisions of any environmental legislation and Project environmental approval conditions. • 100% investigation and reporting of any environmental incident at the site.
Proposed mitigation measures	
• Management practices to prevent the introduction and spread of weeds and feral animal species will be included in the OEMP. This will be linked to the Biosecurity Management Plan as appropriate to prevent the introduction of weed or feral/pest species via vessels as appropriate.	
Monitoring and reporting requirements	• ~~Weekly~~ **Periodic (at least quarterly)** site inspections. • Reporting on environmental incidents including incursions of weed, pest and feral species. • Weed and pest monitoring as required in ~~CEMP and~~ **the OEMP informed by the** Biosecurity Management Plan.

4.3.6 Surface water and hydrological processes

Table 37 Surface water and hydrological processes operational management measures

Environmental objectives	***Maintain the quality of groundwater and surface water so that environmental values including ecological health, land uses, and the welfare and amenity of people are protected.*** ***Maintain the hydrological regimes of groundwater and surface water so that environmental values are protected.***
Performance criteria	• No activity in breach of the provisions of any environmental legislation and Project environmental approval conditions. • 100% investigation and reporting of any environmental incident at the site.
Proposed mitigation measures	
• Ensure rainfall runoff from the washdown, blast and paint bays is captured and treated ~~consistent with~~ • **Operational procedures to detail** the ~~principles of WSUD~~ **Contain containment**, and where possible treat and reuse wastewater from wash down and blast and paint bays. • Undertake 'at source' mechanical clean-up of solid waste material to minimise entry to the wastewater system. • Operate and maintain wastewater treatment system and stormwater drainage system and stormwater treatment devices as intended. • ~~Inspect~~ **Operational procedures to detail the frequency of** wastewater and stormwater system ~~for the Project weekly~~ **inspections** to identify any failures and, if necessary, undertake repairs. • Ensure treated wastewater in excess of what can be re-used will be disposed ~~to sewer under a trade waste agreement~~ **of appropriately**. • Implement spill and leak prevention and control techniques for land-based activities. • Ensure appropriate spill kits are available and provide training on kit use. • Any spillage of wastes, contaminants or other materials shall be cleaned up as quickly as practicable using procedures that prevent contaminants or material being transferred to the stormwater drainage system. • Install bunded areas and drainage lines separate from the stormwater drainage in chemical storage and handling areas to reduce the likelihood of chemical contamination of stormwater. • Delivery of hazardous materials will be in line with site use to avoid the need to store significant quantities.	

Monitoring and reporting requirements	• ~~Weekly inspection~~ **Operational procedures to identify the frequency** of stormwater system and ~~drains~~ **drain inspections.** • ~~Monitor~~ **Operational procedures to outline the monitoring** and ~~manage~~ **management of** surface water from within the ~~reclamation~~ **hardstand area** and material handling areas to meet appropriate water quality criteria before it is allowed to discharge to the marine environment. • Any incidents that have caused environmental harm, or that have the potential to cause environmental harm, will also be reported to the designated NTG representative and to NT EPA Pollution Hotline (1800-064-567) ~~or,~~ within 24 hours.

4.3.7 Human health

Table 38 Human health operational management measures

Environmental objectives	***Ensure that risks to human health are identified, understood and adequately avoided and/or mitigated.***
Performance criteria	• No activity in breach of the provisions of any environmental legislation and Project environmental approval conditions. • ~~100% investigation and reporting of any environmental incident at the site.~~ • No **noticeable** increase in biting insect populations ~~No~~ **and no Project related** complaints from ~~onsite staff or the community regarding~~ biting insects. • **No observed ponding/breeding sites within the Project footprint.**
Proposed mitigation measures	
• Implement a Biting Insect Management Plan in accordance with NT Department of Health Guidelines **and the WHS Act.** • Ensure Biosecurity Management Plan includes requirements in relation to mosquitoes and international health regulations.	
Monitoring and reporting requirements	• Site inspections to identify potential breeding sites. • Any significant mosquito activity will also be reported to NTG and/or the Medical Entomology Branch and monitored if risks to human health are identified.

7.0 Impact Assessment Update Considerations

The following section considers the impacts of Project design refinements since the Draft EIS was submitted. Where an impact as a result of the design refinement has been identified in Section 2.1, it has been assessed by the Project's technical specialists. These assessments have considered the impacts of the design change on the key environmental factors identified by the ToR, and other environmental impacts as a result of design refinements. Following this, the risk register (Appendix D: Risk Register) has been updated to ensure that these design changes have been captured and where necessary, mitigated.

7.1 Air Quality

Changes to the Project design and proposed construction methods since the Draft EIS have been summarised in Table 2. The impact of the changes to the outcomes of the assessment to air quality are discussed in the following sections.

7.1.1 Decrease in Piles Required

A reduced number of piles is required during the construction phase. Reduction in the number of piles required will reduce combustion gas emissions from piling equipment. The outcomes of the assessment of air quality impacts as per the Draft EIS remains accurate and a minor improvement is expected from this Project change.

7.1.2 Decrease in Fill, Rock and Pavement Import

Import fill volumes and import rock volumes required are significantly reduced. This reduction will reduce construction phase fugitive dust emissions and reduce the potential for air quality impacts during construction. The outcomes of the assessment of air quality impacts as per the Draft EIS are considered to be a conservative over-estimate based on the changes to import volumes as such the proposed updates present a substantial improvement to the potential emissions modelling.

7.1.3 Decrease in Material Transport

Required truck movements have reduced significantly in accordance with the reduction to import quantities. Similarly to import quantities, the outcomes of the assessment of air quality impacts as per the Draft EIS are considered to be a conservative over-estimate based on the reduced truck movements required for the construction of the Project. The reduction in truck movements are considered to be a substantial improvement to air quality and greenhouse gas emissions for the Project.

7.1.4 Increase in Hardstand Area

Additional hardstand area will briefly provide a larger area for wind erosion and fugitive dust generation while this area is unsealed. Although a larger hardstand area is required, construction phase fugitive dust emissions overall are not expected to increase due to the reduction in import fill and rock quantities which offsets the minor increase in hardstand area. Ass the impact of increased hardstand area is considered minor, the outcomes of the assessment of air quality impacts as per the Draft EIS remains accurate with the altered hardstand area.

7.1.5 Minor Increase in Dredge Volume

The dredge volume has increased marginally (20,000 m^3) indicating that additional dredging will be required to win this volume of material. Additional dredging will result in additional combustion gas emissions. However, due to the relatively small increase (approximately 4%), the outcomes of the assessment of air quality and greenhouse gas impacts are considered a minor impact, and as per the Draft EIS, remains accurate and no significant change is expected from this Project change.

7.2 Marine Flora and Fauna

Changes to the Project design and proposed construction methods since the Draft EIS have been summarised in Table 2. As a result, the environmental risk and impact assessment presented in the Draft EIS for the Marine Flora and Fauna factor have been updated to consider these design

refinements. The following sections outline the changes identified and where these design changes may update the impact assessment presented in the Draft EIS.

7.2.1 Refined Method of Reclamation Works

Changes to the proposed construction methodology whereby a bund wall will be constructed prior to reclamation will reduce the risk of sediment impact of reclamation activities on water quality and thereby decrease the likelihood of resultant sediment plume impacts on marine flora and fauna.

This change in Project design has been identified as a substantial mitigation towards managing the reclaim works, as compared to the original Draft EIS which proposed progressively filling from the shoreline in a seaward direction until the extent of the proposed reclamation is reached.

While the revised design is considered to reduce this risk and therefore a project improvement, the level of impact predicted within the Draft EIS remain unchanged, as the sediment plume modelling undertaken to support the impact assessment at that time was based on highly conservative assumptions.

7.2.2 Decrease in Piles Required

A substantial reduction in the number of piles to be driven by the Project is currently considered likely with the latest designs including approximately 300 piles to be driven, compared to over 480 piles as considered in the Draft EIS. The size, types and piling methods have not yet been specified but it is anticipated that these will be the same as those considered in the Draft EIS.

The substantial reduction in the number of piles to be driven will decrease the duration for which piling will be carried out. The same mitigation measures will be implemented as identified in the Draft EIS, including the application of watch and exclusion zones for marine fauna, and monitored by trained marine fauna observers.

The significant reduction in the number of piles is seen to provide a substantial improvement in the outcome for underwater noise impacts on marine fauna associated with the Project.

7.2.3 Increased in Hardstand Area

Additional hardstand area proposed during the detailed design would result in the reclamation of a larger area of intertidal and shallow subtidal benthic habitat. The additional area of approximately 1.7 ha is expected to comprise the same benthic habitats as those identified across the area assessed as part of the Draft EIS. The impact assessment presented in the Draft EIS highlights that these intertidal habitats are:

- Not considered to be critical habitats for protected marine fauna or bird populations
- Are well represented elsewhere in Darwin harbour, including areas nearby to the Project site.

While this Project design development presents a slightly larger area of impact and additional loss of intertidal and shallow subtidal benthic habitat, the overall impact to marine flora and fauna is considered a minor impact, contained within the original disturbance area, and does not materially worsen the impact assessment presented in the Draft EIS.

7.2.4 Minor Increase in Dredge Volume

A potential increase to the volume of material to be dredged has been identified during further design work since the Draft EIS was submitted with the potential dredging of an additional 20,000 m^3 of material. While this increase in dredge volume is likely to have a minor increase in impact, it is not anticipated to alter the impact assessment undertaken for the Draft EIS, representing only a 4% increase to what was considered at that time.

The impact assessment presented in the Draft EIS considers the benthic habitats in the Project region, within and surrounding the zone of influence, as determined by sediment transport modelling. Benthic habitats have been identified based on habitat mapping provided by the Department of Environment, Parks and Water Security as presented in Section 3.10 of this Supplementary EIS.

As discussed above, no critical habitats have been identified within the zone of moderate impact identified in the Draft EIS. Noting the discussion around the appropriateness of the modelling and potential impacts to water quality (and secondary impacts to benthic habitats) associated with

reclamation activities, it is considered that the mitigation measures proposed, both in the Draft EIS and this Supplementary EIS, will result in no greater impact to the nearest sensitive benthic habitats at South Shell Island and Catalina Island.

As outlined in the draft Dredging and Dredged Spoil Placement Management Plan (to be finalised by the dredging contractor and approved by the EPA prior to commencement of works), monitoring will be undertaken in the vicinity of the operating dredge and management measures will be implemented to avoid suspended sediment concentrations exceeding tolerance levels of sensitive coral and filter feeder habitats.

It is noted that the sediment transport modelling undertaken for the Draft EIS considered a greater volume of unconsolidated material (324,800 m^3) than is presently being considered. As the amount of increased unconsolidated fill is still under refinement, the amount has been conservatively estimated between estimated 180,000m^3 to 200,000 m^3, this figure is still significantly lower than modelled for sediment transport modelling. Given this, the possible increase to the volume to be dredged does not materially alter the outcome of the impact assessment presented in the Draft EIS and the monitoring and implementation of management measures in the final approved Dredging and Dredged Spoil Placement Management Plan will be implemented during construction to mitigate against impacts to sensitive receptors, regardless of the volume dredged.

The increase in dredge volume will likely have a minor impact on Marine Flora and Fauna, as the duration of works are extended, however due to the conservative modelling for the Project and the implementation of the DDSPMP management measures, no material change to the impact assessment has been identified.

7.3 Marine Environmental Quality

Changes to the Project design and proposed construction methods since the Draft EIS have been summarised in Table 2. As a result, the environmental risk and impact assessment presented in the Draft EIS for the Marine Environmental Quality factor have been updated to consider these design refinements. The following sections outline the changes identified and where these design changes may update the impact assessment presented in the Draft EIS.

7.3.1 Refined Method of Reclamation Works

Changes to the proposed construction methodology whereby a bund wall will be constructed prior to reclamation will reduce the risk of impact of reclamation activities on water quality. The creation of a bund wall will reduce the risk of plume impacts from reclamation activities as suspended sediment is stopped from reaching the marine environment.

This change in Project design has been identified as a substantial improvement for marine environmental quality as compared to the original Draft EIS which proposed progressively filling from the shoreline in a seaward direction until the extent of the proposed reclamation is reached.

7.3.2 Increased in Hardstand Area

Additional hardstand area has been proposed during the detailed design undertaken since the Draft EIS was finalised. An additional 1.7 ha of hardstand may result in reclamation activities taking slightly longer than anticipated.

As discussed in the Draft EIS and in this Supplementary EIS, the final Project design and construction methods, including those for dredging and land reclamation will be subject to the approval of a DDSPMP containing management and mitigation measures to reduce potential impacts to water quality as far as practical and within the tolerance limits of sensitive marine receptors in the region.

The increase in hardstand area will likely have only a minor impact on Marine Environmental Quality, as the duration of works are extended, however no material change to the impact assessment has been identified.

7.3.3 Minor Increase in Dredge Volume

A potential increase to the volume of material to be dredged has been identified during further design work since the Draft EIS was submitted. The exact breakdown of the volume of additional material between consolidated and unconsolidated material has not yet been determined.

To account for this a conservative estimate of 20,000 m^3 of additional unconsolidated material has been used as the upper-bound of what could be dredged. The predicted zones of impact and influence determined by sediment transport modelling to inform the Draft EIS were based on a dredge volume of 324,800 m^3 of unconsolidated material, substantially more than the 180,000 m^3 of unconsolidated material proposed to be dredged in the Draft EIS reference design, or the conservative estimate of 200,000 m^3 proposed by the design updates. Given this, and the previously discussed construction method which will see a bund wall constructed and back filled to achieve the land reclamation for the Project, it is considered that the small increase in dredged material will not materially change the impact assessment presented in the Draft EIS.

Further to this, the Dredging Contractor will be required to undertake sediment transport modelling of the final Project design during the development of the final DDSPMP to predict the potential zones of impact and influence.

It is considered that the geochemical assessment carried out prior to the submission of the Draft EIS has sufficiently assessed the sediment quality of the Project area, including that of the additional material to be dredged. The assessment of potential impacts to water quality associated with the liberation of contaminants within sediments during dredging presented in the Draft EIS is considered to sufficiently address the risks associated with an increase of dredge volume in the same Project vicinity by 20,000 m^3.

The increase in dredge volume will likely have a minor impact on Marine Environmental Quality, as the duration of works are extended, however due to the conservative modelling for the Project, no change to the impact assessment has been identified.

7.4 Social, Cultural and Economic Surrounds

Changes to the Project design and proposed construction methods since the Draft EIS have been summarised in Table 2. As a result, the environmental risk and impact assessment presented in the Draft EIS for the Social, Cultural and Economic factors relating to cultural heritage, and traffic have been updated to consider these design refinements. The following sections outline the changes identified and where these design changes may update the impact assessment presented in the Draft EIS.

7.4.1 Cultural Heritage

7.4.1.1 Refined Method of Reclamation Works

Changes to the proposed construction methodology whereby a bund wall will be constructed prior to reclamation will reduce the risk of impact of reclamation activities on water quality. The creation of a bund wall will reduce the risk of plume impacts from reclamation activities as suspended sediment is stopped from reaching the marine environment.

This change in Project design has been identified as a substantial improvement to the design compared to the original Draft EIS reference design which proposed progressively filling from the shoreline in a seaward direction until the extent of the proposed reclamation is reached. This change in methodology has been identified to reduce the risk potential impacts of sedimentation to the cultural heritage sites of South Shell Island and Catalina Island.

7.4.2 Traffic

7.4.2.1 Reduced Fill, Rock and Pavement Import

Import fill volumes and import rock volumes required are significantly reduced. This reduction will reduce net truck movements during construction. Furthermore, the addition of a Heavy Vehicle priority system will allow for reduced road traffic outside of the peak construction hours. The reduction in fill requirements is a substantial improvement compared to the figures presented in the Draft EIS.

7.4.2.2 Decrease in Material Transport

Required truck movements have reduced significantly in accordance with the reduction to import quantities to 3,000 trips. This reduction will have benefits on the risks identified as part of the Draft EIS Appendix C: Social Impact Assessment which identified stakeholder perceptions of increased traffic

during construction and the associated safety implications as a risk to the Project. The reduction in trips is a substantial improvement on the risks identified during the Draft EIS.

7.5 Other

7.5.1 Noise

Changes to the Project design and proposed construction methods since the Draft EIS have been summarised in Table 2. The impact of these changes to the outcomes of the assessment on terrestrial noise and vibration are discussed in the following sections, where relevant:

7.5.1.1 Decrease in Piles Required

A reduced number of piles is required during the construction phase. Reduction in the number of piles required will in turn reduce the duration of terrestrial noise and vibration impacts as the piling program will be shorter. This is a substantial improvement compared to the figures presented in the Draft EIS.

7.5.1.2 Reduced Fill, Rock and Pavement Import and Material Transport

The significantly reduced material and associated reduction in truck movements required for the construction of the Project is expected to provide a substantial improvement to the duration of terrestrial noise and vibration impacts.

7.5.1.3 Minor Increase in Dredge Volume

The dredge volume has increased marginally (20,000 m^3) indicating that additional dredging will be required for a longer period of time. While identified as a minor impact, this will contribute a negligent amount to the duration of terrestrial noise and vibration throughout the dredging program. Noise emissions from dredging are still unlikely to exceed worst case construction scenarios presented in the Draft EIS (Appendix K: Terrestrial Noise and Vibration Impact Assessment) as no change to the dredging method is proposed.

8.0 Conclusions

Since the submission and public exhibition of the Draft Environmental Impact Statement in November 2021, the Darwin Ship Lift Project has received public and government advisory agency comments. Parallel to the Northern Territory Environment Protection Agency approvals process, a two-party ECI process has further progressed the Project design.

This Supplementary EIS has been developed to address comments from stakeholders and government agencies on the Draft EIS while also providing updates based on the design refinements made to date. As the Project design has been further refined, impact assessments of key changes to the Project design have been considered and relevant mitigation strategies updated.

The outcomes of these updated impact assessments have not materially changed the nature or level of impact identified in the Draft EIS, with an overall net improvement expected as a result of ECI design refinements. Ongoing design refinements are likely to continue as part of finalising the detailed design, however these are anticipated to be minor, and within the impacts predicted by the EIS, and therefore able to be appropriately managed through the updated Environmental Management Framework, and resultant Construction and Operational Contractors EMPs.

Secondary approvals will be required to be obtained for the Project, and this will include the approval of a Dredging and Dredge Spoil Placement Management Plan which will form the basis of marine based impact management. The Project will also benefit from the use of the East Arm dredge ponds, the efficacy of which is well established through previous dredging campaigns in East Arm.

The Proponent at the NTG is committed to the adoption and implementation of appropriate management and mitigation measures to ensure that risks to the environment are appropriately managed throughout the construction and operational phases of the Darwin Ship Lift Project.

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