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27 June 2025

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Mr Clinton Howe MLA
Chair
Public Accounts Committee
Legislative Assembly of the Northern Territory

File reference
29-MIN25-366

Dear Mr Howe

Re: Public Accounts Committee Inquiry into the Darwin Ship Lift Project

Thank you for your invitation to provide a submission in relation to the Parliamentary Accounts Committee Inquiry into the Darwin Ship Lift Project, dated 23 May 2025.

Please find attached a summary report that provides general background information for consideration by the Committee. This information is an overview of the history and evolution of the Darwin Ship Lift Project and does not contain specific contractual or commercial information.

The volume of information available is considerable and there are confidentiality and commercial sensitivities to be considered. The Committee may request specific information or documents relevant to its inquiry and DLI stands ready to comply with such a formal request.

Please advise if there is specific information or documents required by the Committee and DLI would be happy to provide further particulars.

Yours sincerely

[REDACTED]

Louise McCormick
Chief Executive Officer

Public Accounts Committee

Darwin Ship Lift

Overview

1. The Northern Territory (NT) Government is delivering the Darwin Ship Lift Project, which includes:
 - a) the Darwin Ship Lift Facility (Ship Lift Facility) as identified in red in Attachment A;
 - b) additional hardstand and wet berths as identified in blue in Attachment A; and
 - c) East Arm utilities upgrades to support the Project and broader developments in the East Arm precinct.
2. The use of the term 'Project' throughout this submission, refers to the above description (including the Ship Lift Facility, additional hardstand and wet berths and service upgrades) and not to earlier iterations of the initiatives taken by the NT Government to deliver a ship lift for Darwin.
3. The NT Government owned Ship Lift Facility will be common user infrastructure, managed by a private operator and with capacity to lift vessels from the defence, energy, pearling, fishing and coastal cruising industries (being the area shown in red at Attachment A).
4. The Ship Lift Facility will include:
 - a) a ship lift 26 metres wide, 103 metres long and with a vessel lifting capability of 5,500 tonnes;
 - b) wet berths allowing for in-water maintenance;
 - c) 10.3 hectares of hard stand areas for ship repair and maintenance works;
 - d) self-propelled modular transporter (SPMT) units to transport the ships around the Facility; and
 - e) an administration building, SPMT shed, wash down bay and Blast and Paint facilities.
5. The Project is funded through a concessional loan from the Northern Australian Infrastructure Facility (NAIF) of up to \$300M, with the remainder (currently \$520M) to be met by the NT Government.

Ship Lift History

6. The NT Government's efforts to construct a ship lift in Darwin commenced over ten years ago. Throughout the ten years, the key elements and characteristics of the ship lift project have evolved significantly, stemming primarily from industry, Defence and stakeholder inputs. The Project (as it is defined for the purposes of this submission) has been underway since 2019, and the scope of the Project and subsequent designs has evolved markedly, as you would expect of a project of this size, through design revision and project phases. It is important to understand the full chronology of the NT Government's efforts to deliver a

ship lift. A timeline for the ship lift, designs and associated procurement activities is set out in Attachment B and summarised below.

7. Initial planning and scoping for a ship lifting facility was undertaken by the Land Development Corporation, this work is not covered by this submission.
8. The NT Government's effort to deliver a ship lift facility commenced in October 2015 when the then Chief Minister, the Hon Adam Giles MLA, announced that the NT Government would contribute \$100M towards the development of a common user ship lift facility at the Marine Industry Park.
9. This announcement resulted in an open, competitive process for the private design, development and operation of a common user Ship Lift and Marine Industries (SLAMI) precinct at East Arm.

Private Owner and Operator

10. In February 2016, the Department of the Chief Minister and Cabinet released a call for Expressions of Interest for the development of a common user SLAMI precinct at East Arm.
11. The call for Expressions of Interest sought to identify a private sector proponent to identify a site and develop a construction and operational solution for the SLAMI.
12. To facilitate the project the Territory would:
 - a) contribute up to \$100M towards the project costs;
 - b) assist the successful proponent in applying for the Commonwealth Northern Australia Infrastructure Facility (NAIF) loan; and
 - c) consider managing commercial risk where such risk could not be fully addressed by the private sector.
13. The SLAMI facility was required to include hard stand, multiple dry berths, buildings for office space, training and logistics support and utilities services and security.
14. The final specifications were expected to be driven by the market to enable a commercial return for the private owner/operator.
15. The successful proponent would charge for the operation of the infrastructure, including the common user ship lift in line with the following principles:
 - a) proponent to receive an appropriate return on investment in the SLAMI;
 - b) stimulating development of prospective maintenance and maritime services operations; and
 - c) a competitive service cost for customers.
16. It was anticipated that the successful proponent would reach contractual and financial close before the end of 2016, with construction to commence in 2017-18.
17. There were 13 responses received. Five were shortlisted to participate in a Request for Proposals stage and one (Pearl Marine Engineering, delivered through Northern Ship Support Pty Ltd, a Paspaley Group subsidiary) progressed to preferred proponent status to progress to negotiations and Front-End Engineering Design work (FEED).
18. The work undertaken during FEED resulted in a ship lift 85m in length, with a lift capacity of 4,000 tonnes.

19. This competitive process ran until 2018 and resulted in the selection of a preferred developer, design and site. This process did not result in a contract award.
20. In August 2019, the then Chief Minister, the Hon Michael Gunner MLA, announced that the NT Government would develop the Facility, in partnership with the Paspaley Group. The Facility would be NT Government owned and operated by Paspaley under a 10-year renewable agreement.

The Project – 2019 to current

Head Contractor Design and Construction

21. In 2020, the NT Government commenced a three-stage competitive process to select a head contractor for the design and construction of the Facility including additional hardstand and wet berths.
22. This competitive process sought a ship lift 26 metres wide, 103 metres long and 6 metres deep with a vessel lifting capability of 5,500 tonnes, six wet berths, a SPMT transfer system, 15 hectares of hardstand and ancillary facilities such as vessel wash bay, administration and storage buildings and a blast and paint facility.
23. Merit Partners were engaged as Probitry Advisor for the competitive process, providing advice on all stages of procurement planning, release to market, shortlisting and assessments through to award.
24. The first stage, a call for Expressions of Interest, attracted 20 responses (including partial responses for portions of the works). These responses were shortlisted, with 5 invited to undertake the second phase, a Request for Proposal (RFP). One of the 5 respondents, Sitzler, withdrew from the RFP phase due to other contracts awarded to them at the time. Two participants, Clough Projects Australia Pty Ltd and Territoria Civil, were subsequently taken through to the Request for Final Detailed Design phase.
25. It was anticipated that this 3 stage procurement process would be completed by mid-2021, with construction to be completed and the site operational by 2024.
26. Significant negotiations and design work was undertaken with the final 2 final participants, resulting in the selection of the Clough-BMD Joint Venture (CBJV) as the preferred contractor in July 2022.
27. In December 2022, during contract finalisation, Clough entered itself into voluntary administration, which was resolved by May 2023 with the acquisition of the Clough Group of companies by Webuild SP, an international construction company based in Italy.
28. To ensure that works continued during the 6 month period of voluntary administration, the NT Government novated the design works (Wallbridge Gilbert Aztec) contract from the CBJV, and also elected to source critical, long lead items such as the Ship Lift & SPMT components to minimise delay impact of the Clough voluntary administration period.
29. In September 2023, CBJV was awarded the Project works and in April 2024 the joint venture was granted site access to proceed with the works.
30. The construction of the Ship Lift Facility is contracted to be completed by March 2027.

Ship Lift and SPMT

31. In order to mitigate the risks associated with a key component of the Project, the NT Government elected to directly procure the Ship Lift and associated SPMT design, manufacture, delivery and commissioning.
32. Multiple workshops were held with the participants in the final Detailed Design phase and in consultation with the future operator, to define the scope of these works and technical design requirements.
33. In August 2023, 3 international manufacturers of ship lift systems and two SPMT companies were invited to present in Darwin and then submit a tender for these works with the Pearlson ShipLift Corporation being awarded the contract to supply the ship lift operating system, steel trestles and the design and supply an integrated SPMT system in May 2024.

Project Agreements

SLAMI Development and Land Deed

34. In 2019, negotiations commenced in respect of the land required for the construction of the Ship Lift Facility. Negotiations were completed in 2020, with the NT Government entering into an agreement for the transfer of land and subsequent developments on the land.
35. The specific terms of this agreement are subject to confidentiality obligations contained in the SLAMI Development and Land Deed (DLD) between the Northern Territory Government and Northern Ship Support Pty Ltd (NSS) and Paspaley Pearls Properties Pty Ltd (both Paspaley companies).
36. The NT Government became the owner of the site of the Ship Lift Facility in April 2024.

Ship Lift Facility Operation and Maintenance Deed

37. In 2021, the NT Government appointed NSS as the operator of the Ship Lift Facility for a minimum 40 year term from when the Ship Lift Facility is commissioned. This was formalised upon the execution of the Ship Lift Facility Operation and Maintenance Deed (OMD) between the NT Government and NSS.
38. As operator, NSS will control the site and undertake the following services at the Ship Lift Facility:
 - a) site management, berth leasing, including booking and operating systems and procedures, site access and security and environmental controls and management;
 - b) ship lift and SMPT operations;
 - c) washdown bay equipment hire and waste management; and
 - d) connections to and supply of utilities.
39. The Ship Lift Facility will be a common user facility, with vessel operators responsible for engaging service providers to access the Ship Lift Facility and carry out repairs and maintenance works on vessels.

40. NSS will set the pricing for access to the Facility, including use of wet berth, hardstands, wash bay and paint and blast infrastructure and site access. Fees will also be collected for services provided, including the ship lift and SPMT system. NSS will retain all revenue from the Ship Lift Facility.
41. Access and pricing for this Ship Lift Facility will be subject to a regulatory scheme, a draft of this scheme is outlined in the OMD.
42. Under the operating agreement, the NT Government has retained responsibility for capital replacement and upgrade works at the Ship Lift Facility, as well as significant maintenance obligations, largely for assets that have a design life of greater than 5 years.

Project Governance

43. In 2015, the ship lift project was granted Major Project status and the Department of the Chief Minister and Cabinet, through the former Office of Major Projects, Infrastructure and Investment was appointed as project lead.
44. The ship lift project was then transferred to the former Department of Trade, Business and Innovation in 2016 (which subsequently became the Department of Industry, Tourism and Trade) and then back to the Department of the Chief Minister and Cabinet in 2020.
45. As major enabling infrastructure for the Territory, this Project has been overseen by a number of executive steering groups over its 10 years, in particular during contract negotiations with the relevant land holders, operator, NAIF and head contractor for the Project.
46. The Project has also been subject to 2 audits by the Auditor General, in 2018 (Attachment C) and 2024 (Attachment D).
47. Through the various contractual arrangements there are also project reporting groups to manage the scope, cost and delivery of the Project.
48. The former Department of Infrastructure, Planning and Logistics became the Project lead in 2022, standing up a dedicated project team within the Darwin Harbour Infrastructure Projects unit in order to finalise the Project designs, negotiate terms to appoint a head contractor to undertake development and to oversee construction. This responsibility was transferred to Department of Logistics and Infrastructure on its creation in 2024.
49. The Agency leads are outlined in Attachment B.

Regulatory and Legislative Settings

50. There will be a legislated access and pricing regime to ensure fair and equal use of the Ship Lift Facility for all users and service providers. This regime will be overseen by the independent Utilities Commission of the Northern Territory.
51. The Utilities Commission is the independent industry regulator, established to, in the absence of a competitive market, ensure competitive market conduct and prevent the misuse of monopoly power.
52. The Utilities Commission is currently the independent regulator for the Port of Darwin, the electricity supply industry and water and sewerage industry.
53. Initial terms for the access and pricing regime have been developed in conjunction with key stakeholders, including the operator and the Utilities Commission.

Cost Escalation

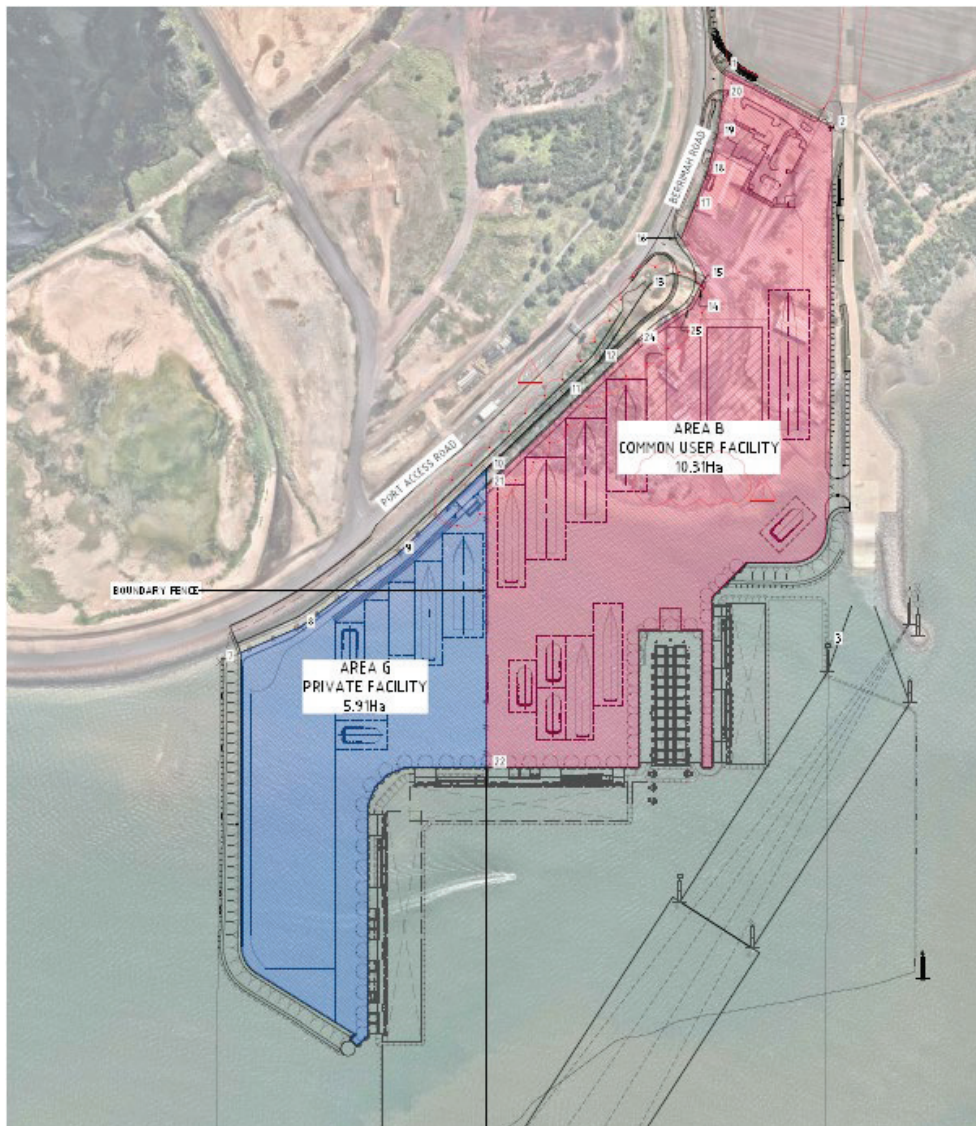
Design Development

54. In 2015, the NT Government's commitment of \$100M was a contribution towards private development of a ship lifting facility. The specifications and scope at this time were limited, however following FEED, it was anticipated a ship lift with a lifting capability of 4,000 tonnes, 85 metres length, 24 metres wide and 6 metres deep with a provision for two wet berths and much smaller supporting hardstand areas.
55. In 2019, the NT Government secured \$300M in NAIF funding to supplement the original \$100M contribution. This brought the Project budget to \$400M for the design and construction of an NT Government owned ship lifting facility.
56. Following a demand analysis undertaken by Acil Allen (Attachment E) and engagement with Defence, the specifications for the ship lift evolved to align with projected maritime sector demand, this increased the scope of works to a ship lift over 100 meters in length, 26 meters wide and a 5,500 tonnes capacity along with additional wet berths to capture the anticipated vessels and maintenance works and frequencies which could occur in Darwin if the facility was built.
57. These specifications were further supplemented through contractual negotiations with the operator. The resulting scope of works and specifications were released to the shortlisted participants during the Request for Proposals and further developed through the Detailed Design phase.
58. The subsequent design submitted by the CBJV is contained in Attachment F.
59. Following contract award in September 2023, there was further redesign work undertaken in conjunction with the future operator, Defence, adjacent landholders and CBJV. The resulting design is contained in Attachment G.
60. All of the above revisions and changes have been undertaken in accordance with contractual obligations set out in the DLD and OMD.
61. An updated demand analysis and revenue study has been undertaken based on the current design of the Facility and is contained in Attachment H.

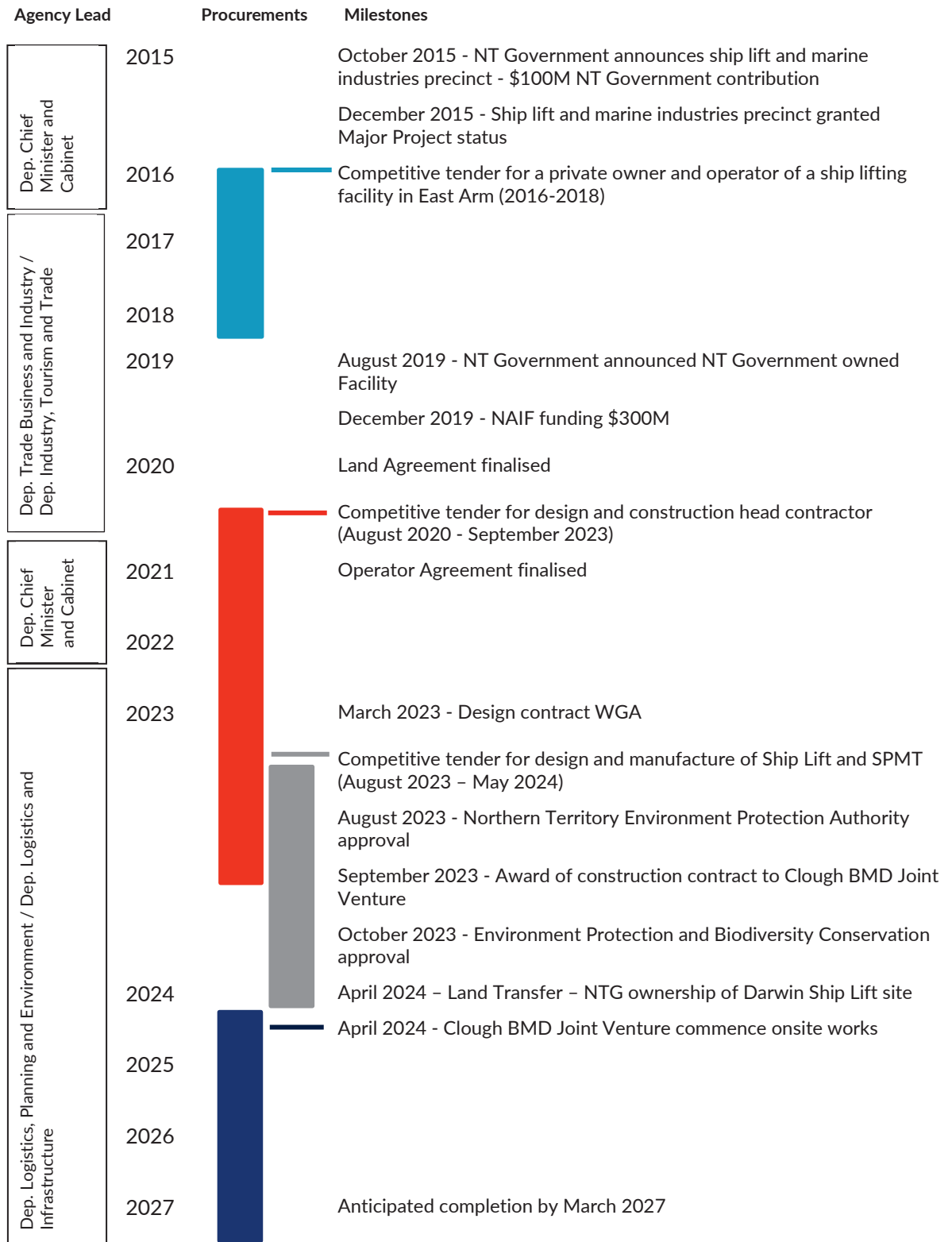
Cost Escalation

62. There have been a number of increases to the overall costs, including direct construction costs and indirect project costs. These have included:
 - a) the impact of the COVID pandemic which occurred during the procurement and negotiation of the head design and construction contractor;
 - b) market costs including supply chain disruptions, rising material costs, labour shortages, international shipping challenges and availability of specialist workforces, plant and equipment; and
 - c) Layout and scope changes (as outlined above), design evolution, and program changes.

Attachment A – Darwin Ship Lift Project – Layout Plan



Attachment B – Darwin Ship Lift Project Timeline



Attachment C – Auditor General’s Report to the Legislative Assembly, 2018

Darwin Ship Lift Project, pages 100 - 122

Department of Trade, Business and Innovation

Darwin Ship Lift and Marine Maintenance Project

Scope and Objective

The objective of the Ship Lift and Marine Maintenance Project (the Project) audit was to assess the performance management system/s in place at the Department of Trade, Business and Innovation (DTBI) that enable it to manage the Project.

The audit covers the period from the announcement of the Project in October 2015 through to 31 January 2018. The fieldwork supporting this audit was conducted between January 2018 and June 2018.

This audit covers the performance management system in place for the Project as managed by SIP. It does not extend to the greater Marine Industry Park or to the work performed by the Land Development Corporation (LDC).

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In addressing the objective, my Authorised Auditors reviewed the documentation and controls in place at DTBI and tested the processes and procedures in place that applied to the Project. My report on this audit is structured as follows:

Background	Refer page 101
Conclusion	Refer page 104
Recommendation	Refer page 104
Audit Observations	Refer page 106
Conceptual and planning phases	Refer page 106
Major Project: Ship Lift and Marine Maintenance Precinct	Refer page 110
Procurement Process	Refer page 112
Contracts and agreements	Refer page 117
Governance and Oversight Groups	Refer page 118
Probity Process	Refer page 120
Management and Record Keeping	Refer page 121

Department of Trade, Business and Innovation cont...

Background

Since 2009, the NT Government has been exploring the development of a Marine Industry Park. The Marine Industry Park is part of the wider East Arm Logistics Precinct. From 2012 to 2015, LDC continued to plan and develop the park and in 2015, finalised the Marine Industry Park's master plan. The Marine Industry Park is made up of a number of areas, each with different intended uses. The key areas include:

- Common User Area
- Multi-User Barge Ramp
- Marine Maintenance Area
- Marine Services Area
- Marine Logistics Area
- Marine-related Development
- Strategic Industrial Land

Developing the Marine Industry Park is estimated to cost in the vicinity of \$1 billion and the geographical footprint is over 150 hectares. LDC commissioned the Common User Area including the Multi-User Barge Ramp in September 2016.

The Marine Maintenance Area is intended to provide key infrastructure for ship building and maintenance. As part of the development of the Marine Maintenance Area, it is intended that a ship lift will be built. A ship lift is a platform structure that is able to lift a vessel in or out of the water and is considered by those involved in the development of the Marine Industry Park as an essential piece of infrastructure to support the function of the Marine Industry Park, enabling repairs and maintenance to be undertaken on large vessels in dry dock.

In October 2015, the NT Government announced the development of the Ship Lift and Marine Maintenance Infrastructure (the Project). A media release on 28 October 2015 announced that the NT Government would invest in a *“ship lift as part of the early stages of development of the Marine Industry Park if the Federal Government commit to ship servicing of its naval and border protection fleet in Darwin. If supported by Canberra, the Northern Territory Government could go to market seeking commercial partners early next year with construction to commence as early as 2017.”*³

³ NTG Media Release. (28 October 2015). *New ship lift facility could position Darwin as marine*. Adam Giles (Chief Minister of the Northern Territory).

Department of Trade, Business and Innovation cont...

The development of the ship lift and associated park is anticipated to drive local industry, create local jobs and promote Darwin's position as a hub for marine maintenance and servicing. Darwin already has a number of ship lift facilities, however none are designed to accommodate and lift large vessels and they are not strategically located at East Arm which has been determined through planning undertaken by LDC as the best location for supporting this industry.

In December 2015 the NT Government announced the new Darwin Ship Lift facility had been granted major project status. In the same report it was announced that *"the facility will be designed to accommodate boats more than 90 metres in length, including the new fleet of patrol vessels currently being procured by the Defence Force"*⁴. As a major project, the facility development was planned to be overseen by the Office of Major Projects, Infrastructure and Investments (OMPII) with investment from the Department of Chief Minister through an open market process.

Following Machinery of Government changes in September 2016, OMPPI was transferred to the newly created DTBI and the division was renamed Strategic Infrastructure and Projects (SIP).

On 6 February 2016 a request for Expressions of Interest (EOI) was sought for the development of the Ship Lift and Marine Maintenance Precinct. It called for all private sector proponents to lodge proposals by 29 February 2016.

On 15 March 2016 the NT Government announced that evaluation of the Expressions of Interest resulted in a shortlisting of five proponents. The five shortlisted proponents were invited to proceed to the detailed Request for Proposal (RFP) phase.

On 15 August 2016 the then Chief Minister announced the preferred proponent had been chosen and negotiations would begin with the preferred proponent.

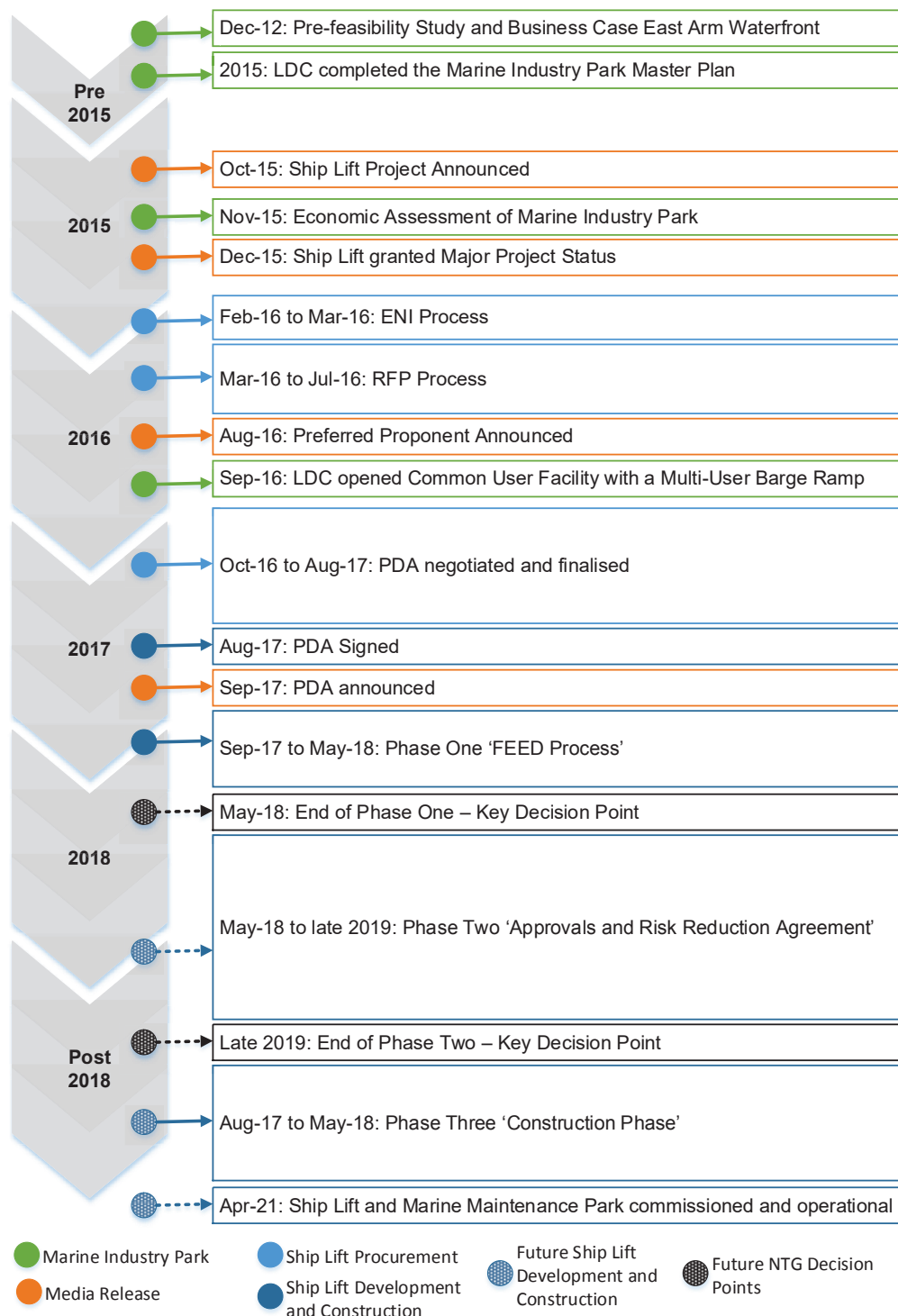
A Project Development Agreement (PDA) to deliver the Project was announced on 21 September 2017 between the Territory, the preferred proponent and its parent entity as guarantor. The PDA was signed on 1 August 2017. Based on the PDA, the proposed multi-user Ship Lift will:

- be capable of lifting vessels out of the water for dry docking and maintenance works;
- have a common user area, being a hardstand area available for ship repair and maintenance works; and
- have the capacity to lift the Defence new fleet, the offshore patrol vessels.

⁴ NTG Media Release. (4 December 2015). New Darwin ship lift facility granted major project status. Adam Giles (Chief Minister of the Northern Territory).

Department of Trade, Business and Innovation cont...

Figure 1: Marine Maintenance and Ship Lift Development Timeline



Department of Trade, Business and Innovation cont...

Conclusion

The objective of the audit was to assess the performance management system in place at the Agency that enable it to manage the Project.

It is my opinion that a robust competitive process was undertaken by DTBI to seek and evaluate the responses from private sector proponents at each stage of the competitive process. The governance documents, assessments, reports and documentation maintained by the evaluation committee were comprehensive.

My opinion in relation to my assessment of the performance management system at the Agency that enable it to manage the Project should not be interpreted as a conclusion related to the probity of the processes leading to the announcement of the preferred proponent.

Systems and processes are in place at the Agency to manage the Project.

The audit identified that the Agency has some opportunities to enhance processes and systems relating to the Project.

Recommendations

Recommendations to enhance the effectiveness of the performance management system have been reported below.

Enhance financial analysis

Two cost benefit analyses were sought by LDC in relation to the Marine Industry Park as a whole. At the time of audit fieldwork, no cost benefit analysis had been performed by the Territory to determine the effects of increasing the Territory's investment to \$100 million or the risks and benefits associated with accepting terms proposed by the preferred proponent that were not consistent with those terms initially established prior to issuing the Request for Proposals.

It would be prudent for the Territory to recalculate the net present value and undertake an updated cost benefit calculation to reflect key decisions including, but not limited to, levels of NT Government funding, variations to the length of the lease periods relevant to the Project and transactions relation to the contribution of land within the Marine Industry Precinct.

I recommended the Agency consider updating the assessment of the cost benefit analysis attributable to the development of the Marine Maintenance Precinct including the Ship Lift in order to inform the decision to proceed or not to proceed with the Project at the conclusion of Phase One.

Department of Trade, Business and Innovation cont...

Competitive process could be enhanced to enable a more robust outcome

The Evaluation Committee documented a range of concerns regarding the adequacy of responses in addressing the requirements of the Project during the EOI and RFP phases. This indicates that information provided to the market may not have been sufficient and/or that the timeframes allowed for proponents to respond to the competitive process were too short.

I recommended the Agency consider the reasons why there were shortcomings in responses and whether future processes could/should be adjusted as a result.

Review the location of the Ship Lift and Marine Maintenance Precinct

The location of the ship lift proposed by the preferred proponent presents a risk that the Territory's objectives may not be realised in an effective or efficient manner.

I recommended the operational and related financial implications of the proposed location of the ship lift be evaluated to ensure the ultimate location enables the Territory's objectives to be realised in an effective or efficient manner.

Clarify the terms and scope when engaging a Probity Advisor

The role of the Probity Advisor as defined in the Probity Plan was to ensure that fairness and impartiality was observed throughout the competitive process and that the criteria were consistently applied to all proposals.

A probity report, referenced as the Final Probity Report, was signed on 14 July 2014 in line with the RFP recommendation from the Executive Committee. A subsequent probity letter detailing the end of the competitive process was subsequently issued on 21 June 2017.

The Final Probity Report was issued up to the date of the Evaluation Committee's report.

Representatives of DTBI have clearly stated that the conclusion of the Probity Advisor cannot be extended beyond the conclusion of the evaluation process however the correspondence received from the Probity Advisor on 21 June 2017 causes confusion in this regard as it suggests the Probity Advisor was involved beyond the evaluation process and during the negotiation process.

I recommended the scope of work to be undertaken by the Probity Advisor together with the applicable criteria for evaluation and the level of assurance sought be clearly defined in the letter of engagement with the Probity Advisor and reiterated in the final opinion / report of the Probity Advisor to avoid confusion.

Adequate time required for decision making

The competitive process commenced on 6 February 2016 and concluded on 16 July 2016. The EOI was open for 21 working days. The RFP was open for 111 days. For both the EOI and RFP, the Evaluation Committee assessed the responses from proponents, documented the evaluation processes and results and produced a final evaluation report within ten working days.

Department of Trade, Business and Innovation cont...

The time taken to review the proposals could result in a perception that the assessment of proposals was not undertaken in a sufficiently robust manner. I acknowledge the advice from management that the time taken was sufficient to support the RFP Evaluation Committee's recommendation. Additional time may have allowed for deficiencies in submissions from proponents to be further investigated with the proponents.

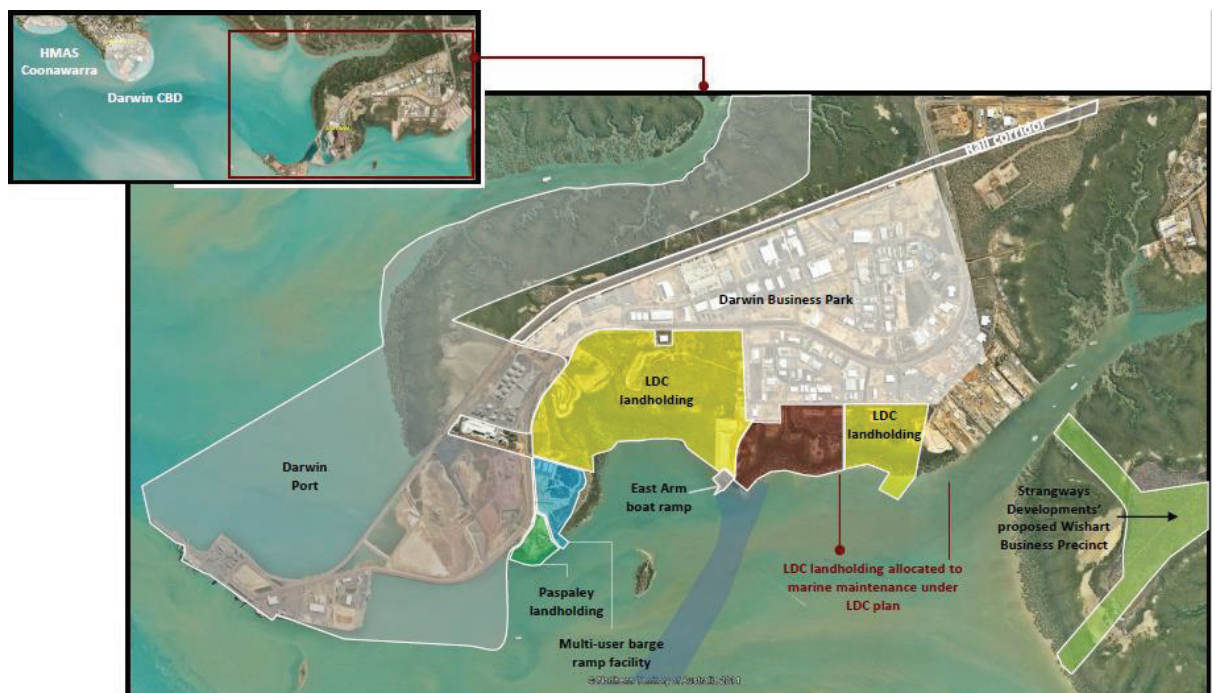
I recommended sufficient time be provided for the evaluation process enabling the NT Government to undertake any clarification steps necessary to achieve optimal results for the Territory.

Audit Observations

Conceptual and planning phases

The Project, being the construction of Ship Lift and Marine Maintenance Infrastructure, is a part of a larger project being the Marine Industry Park Project. The Marine Industry Park Project was initiated through work performed by LDC. LDC is the Northern Territory Government's strategic land developer. LDC's primary role is to provide commercial land and investment opportunities to the market to boost growth and development. LDC is working to establish an entire waterfront precinct at East Arm Peninsula.

Figure 2: East Arm Area Map



Source: DTBI Internal Documentation

Department of Trade, Business and Innovation cont...

Development of the East Arm Peninsula began in early 2010 when LDC commissioned a multi-national advisory and design consultancy firm which specialises in transport, property, utilities and environmental sectors to perform a pre-feasibility study into the East Arm Waterfront Precinct. The study included an initial market assessment, detailed engineering assessment and detailed economic and financial assessment.

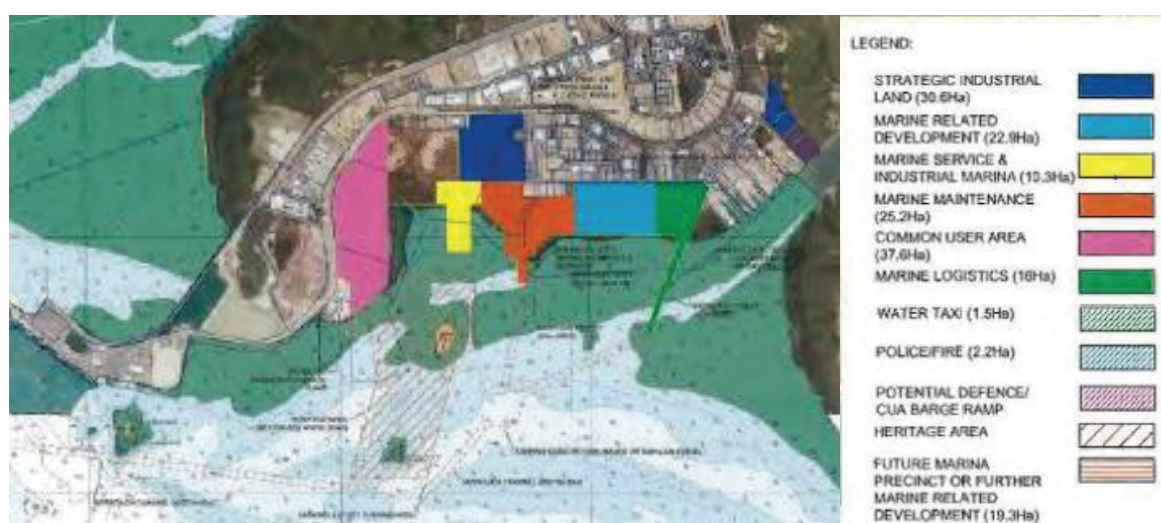
The resultant report (the Pre-feasibility Report) is comprehensive and provides multiple modelled simulations. The report identifies a preferred model that includes seven Sub-Precincts, being:

- *“Marine Maintenance: A large land area required by the key foundation customers also requiring major wharf infrastructure, and likely to generate significant benefits for the Precinct as a whole in the form of higher land prices through their demand for services, making the Precinct attractive for service organisations.*
- *Strategic Industrial Land: This is land similar in characteristics to the land the Corporation sells and leases now. It is not at the waterline and thus requires less development cost before it can be sold.*
- *Common User Area: This is the large hardstand area adjacent to the Marine Supply Base to be used on a short-term basis for storage, preparation, and other similar tasks.*
- *Marine Services: This is a marine development, providing storage and services for two companies who have expressed an interest in the Precinct as a base for their commercial fleet of vessels serving the offshore oil and gas industry.*
- *Marine Related Development: This is essentially the same as Strategic Industrial Land above, except that it is positioned along the waterfront, and thus requires partial land reclamation and coastal defence, making it more costly.*
- *Marine Logistics: This is a purpose-built sub-precinct aimed at an intermodal facility similar to that operated by Toll in Frances Bay.*
- *Area C: This is a small parcel of land in Hudson Creek which has limited commercial use due to the high costs of any dredging to the site and the highly limited amount of available land.”⁵*

⁵ Pre-feasibility Report

Department of Trade, Business and Innovation cont...

Figure 3: Preferred Marine Industry Park Layout based on Pre-feasibility Report



Source: Pre-feasibility Report

For the preferred option the Pre-feasibility Report included basic cost information for each precinct and suggestions as to whether the NT Government or a private sector proponent would be best positioned to fund the development.

The Pre-feasibility Report anticipated that a ship lift would form part of the Marine Maintenance precinct, this is in line with the outcomes of the Project. The economic analysis for the Project in isolation has not been modelled, as on its own it is not viable, however coupled with the downstream activities of ship building, repairs and maintenance provided by planned participants located at the Marine Industry Park, the economic modelling presented within the Pre-feasibility Report is positive.

The report included a cost benefit ratio considering only direct economic benefits. This resulted in a cost benefit ratio less than one. Where the cost benefit ratio is less than one, the costs of a project outweigh the benefits from investing in the project. In this instance, the Territory was estimated to generate a financial return of 65 cents for every dollar spent.

Department of Trade, Business and Innovation cont...

Whilst a commercial approach would generally see investment only in projects with a direct cost benefit ratio exceeding one, the public sector also takes into consideration the expected social and broader economic returns. It is not always possible to attribute a monetary value to anticipated social and broader economic returns. The Pre-feasibility Report highlights that, once second round economic impacts were considered, the ratio would improve.

The Pre-feasibility report predicted two key economic impacts to occur:

- *“Firstly, the Precinct makes the oil and gas industry more efficient, as service vessels no longer need to steam as far for maintenance and repairs. This is a relatively small effect.*
- *The second effect is through bringing into the market a large chunk of new industrial land, which attracts relatively high-value industries to Darwin. Most importantly, this attracts large numbers of new, skilled workers.”*

A revised ratio with the second round economic impacts was not provided within the report.

The Pre-feasibility Report provided key requirements for the development to ensure the success of the Marine Industry Park. The requirements were to:

- develop the Marine Maintenance precinct first, noting this should only go ahead when a Marine Maintenance private sector proponent is willing fund the development of the precinct;
- identify foundation customers; and
- not sell or lease (except on a short-term basis) land within the precinct, because of the opportunity costs involved.

In response to the economic decline in the shipping and marine industry globally, another Economic Assessment of the Marine Industry Park was commissioned by LDC and completed by a professional services firm in November 2015. The Economic Assessment presented the economic value of the Marine Industry Park in two parts: an Economic Impact Analysis and a Cost Benefit Analysis. The focus of the Economic Assessment applied to the entire Marine Industry Park and not the Project alone and the results were consistent with those presented in the Pre-feasibility Report from 2012 with a cost benefit ratio less than one that can be improved by including secondary economic activity.

Department of Trade, Business and Innovation cont...

Major Project: Ship Lift and Marine Maintenance Precinct

The ship lift itself is infrastructure that is pivotal to the success of the Marine Industry Park. Existing ship lifts in Darwin are not large enough to service vessels in excess of 62.5 metres. There is a Defence owned ship lift based at HMAS Coonawarra, Larrakeyah. The two Darwin-based privately owned ship lifts are located in Frances Bay and East Point, rather than at East Arm. The largest existing ship lift is situated at Frances Bay. The longer term development of the East Arm Precinct would see the relocation of marine activities from Frances Bay to East Arm. There are also two privately owned light dry dock facilities supported by slipways, located at Frances Bay and Cullen Bay.

In late 2015, the NT Government announced funding for the construction of the Project at the Marine Industry Park with the then Chief Minister approving the Project to be granted major project status. As a major project, the control and management of the Project shifted from LDC to OMPH (now SIP). The role of SIP is to facilitate the delivery of major private sector projects that are supported by the NT Government. Despite this being an NT Government initiated project, the NT Government and DTBI agreed to classify construction of the Project as a Major Project. LDC continues to be responsible for the delivery of the Marine Industry Park in its entirety.

The proceeds of the Port of Darwin lease transaction in late 2015 enabled the Territory to offer up to \$100 million to support the Project. Post this announcement, as part of the evaluation process, the NT Government's external technical advisor undertook a high level desktop assessment into the costing of the Project. It was estimated that if the Territory were to design and deliver the project, the estimated costs would be in the vicinity of \$240 million to \$270 million. Annual ongoing operating costs are estimated to be approximately \$8 million.

The Pre-feasibility Report recommended the development of the Marine Maintenance precinct should not proceed if private sector proponents willing to meet the development cost were unable to be identified. No valuation basis was provided to support the value of \$100 million available for the Project as announced by the Chief Minister in 2015 as the decision to offer up to \$100 million was premised upon the availability of funds rather than the cost of the project. No cost benefit modelling was performed, before or after the announcement, to determine the effect on return that would result from the decision to invest up to \$100 million.

Department of Trade, Business and Innovation cont...

From the time SIP took ownership of the Project, Agency representatives have been in communication with Defence to determine and understand their marine maintenance requirements. The existing ship lifts in Darwin are not of adequate size and functionality to accommodate Defence vessels. Currently Defence vessels are being serviced in southern states which entails a minimum five day voyage for vessels operating North of Australia at the time servicing is required. The market analysis had scoped the size and functionality of the ship lift to accommodate existing naval vessels however it subsequently became apparent that Defence was likely to acquire larger offshore processing vessels hence the size and functionality of the ship lift changed to accommodate the large vessels.

I note that both Defence and Australian Border Force are reluctant to provide any commitment in writing to Darwin-based servicing prior to the Ship Lift Facility being constructed, an operator being identified and a pricing structure put in place. Originally the NT Government stated that the Territory would invest in a *“ship lift as part of the early stages of development of the Marine Industry Park if the Federal Government commit to ship servicing of its naval and border protection fleet in Darwin.”*³

My Authorised Auditors were advised that the NT Government had agreed to remove the requirement to obtain Defence and Australian Border Force support and to proceed with the Front-End Engineering and Design (FEED) process, irrespective of having no written commitment. I view the removal of the requirement as reasonable.

Department of Trade, Business and Innovation cont...

Procurement Process

The SIP used a competitive process involving EOI, RFP and Binding Agreement Phases (competitive process) to select a proponent for development of the Project on the basis that such an approach would enable the Territory to benefit from private sector knowledge and capabilities to optimise development of the Project.

An Evaluation Committee was formed to oversee the process. The terms of reference for the EOI and the RFP required the Evaluation Committee members to be free from conflicts of interest. The Final Probity Report stated that potential conflicts of interests were dealt with appropriately and none of the proponents raised any probity concerns with regard to the Project.

To ensure the competitive process was handled appropriately, an evaluation plan was developed to ensure all EOI's and RFP's were assessed objectively and without bias. The Evaluation Committee received input from an Advisory Committee including specialists in defence, commerce and law. The EOI and RFP evaluations were undertaken with an independent Probity Advisor attending all meetings.

The NT Government announced on 4 February 2016 that the EOI phase would be open to the public from 6 February 2016 to 29 February 2016.

The EOI outlined that the Project is *"intended to include delivery of the common user ship lift, landside infrastructure and dredging services to support the creation of a new major industry dedicated to marine services at East Arm (Ship Lift and Marine Maintenance Precinct). Landside infrastructure is expected to include:*

- *hard stand for fabrication and maintenance facilities, warehouses, offices, car parking;*
- *multiple dry berths for short term and long term visitation;*
- *buildings for office space, training and logistics support; and*
- *utilities services and security.*"⁶

The EOI did not include specific requirements for the ship lift (e.g. length and weight capacity) or the Marine Maintenance Precinct (e.g. number of dry and wet berths) despite prior research being conducted to identify the needs of key defence and local customers. I acknowledge that the decision not to include specific requirements was a deliberate decision by DTBI intended to encourage innovative responses to the EOI.

6 . DTBI Internal Documentation

Department of Trade, Business and Innovation cont...

The following evaluation criteria were established:

Table 1: EOI Evaluation Criteria

Weighting	Evaluation Criteria
30%	a clear understanding of the Territory's objectives, the ability to achieve the Territory's objective and development vision for the Project
5%	financial capacity to undertake the Project
5%	experience, capability and capacity to plan, design, construct and commission infrastructure of comparable scale and complexity of the Project
5%	experience, capability and capacity to operate and maintain the Project to the highest standards and deliver services at a competitive price
5%	capability to bring design and innovation which maximises opportunities presented by the Project and development
5%	a plan for committing appropriate personnel and resources to the Project to meet the Project timetable
20%	the strategy to minimise the Territory's exposure to risk and its contribution to the Project
5%	proponent's commitment to working with stakeholders
20%	a commitment to maximising NT industry participation throughout the life of the Project for a range of local developers, contractors, suppliers and workers (including Indigenous participation)

Source: DTBI Internal Documentation

Members of the Evaluation Committee independently scored each proponent's submission to the EOI with a rating between one and ten for each criterion. The Evaluation Committee then met and consolidated the scores with the Evaluation Committee reaching consensus following discussion over the relative merits of the EOI Submissions.

Of the 13 expressions of interest received, five proponents were shortlisted by the Evaluation Committee. There was no predetermined number of proponents who could be shortlisted however the Evaluation Committee records demonstrate the five highest scoring proponents all scored 50% or higher against the total available 100% score. The highest four scores were within 1.5% of each other, the fifth had a score of 50%.

On 14 March 2016, the then Chief Minister announced five shortlisted proponents would be invited to participate the in RFP.

Department of Trade, Business and Innovation cont...

The RFP was released to the five shortlisted proponents on 16 March 2016 with binding proposals due to be lodged on 4 July 2016.

In the first two weeks following release of the RFP:

- Proponent 1 withdrew from the RFP Phase with one party to Proponent 1's consortium joining the Proponent 7 consortium as a member; and
- Proponent 4 withdrew from the RFP Phase with one party to Proponent 4's consortium joining the Proponent 7 consortium as a subcontractor.

The withdrawal of two proponents left only three proponents to bid.

The RFP evaluation process occurred using four equally weighted criteria.

Members of the Evaluation Committee independently scored each proponent's submission to the RFP with a rating between one and ten for each criterion. The Evaluation Committee then met and consolidated the scores based on the committee reaching a consensus following discussion over the relative merits of the RFP submissions.

Each proposal was very different in what it proposed to be delivered, how the Project would be financed and the proposed costing. Of the submissions, development costs for the site ranged from \$100 million (excluding the construction of a ship lift of sufficient size and functionality) to \$443 million (excluding the construction of a ship lift of sufficient size and functionality) notwithstanding the NT Government had publically announced that total contributions would be capped at \$100 million.

A copy of the signed evaluation report was provided to me for inspection and was signed by five of the six members of the Evaluation Committee and dated 14 July 2016. The sixth member was unavailable to physically sign the final report as the sixth member was on leave however an email from the sixth member at the conclusion of the RFP evaluation was produced and accepted as evidence of agreement with the content of the recommendation.

The evaluation and decision making timeframe relating to the EOI occurred within ten working days and within seven days for the RFP. I was advised that there was a concentrated effort by the Evaluation Committee and the advisors to conclude the evaluation process efficiently. Whilst acknowledging that both evaluation committees were assisted by an advisory panel, the timeframe for evaluation appears relatively short. Notwithstanding the timeframe, the recommendation reports completed by each evaluation committee were comprehensive and identified the key features, benefits and shortcomings of each response.

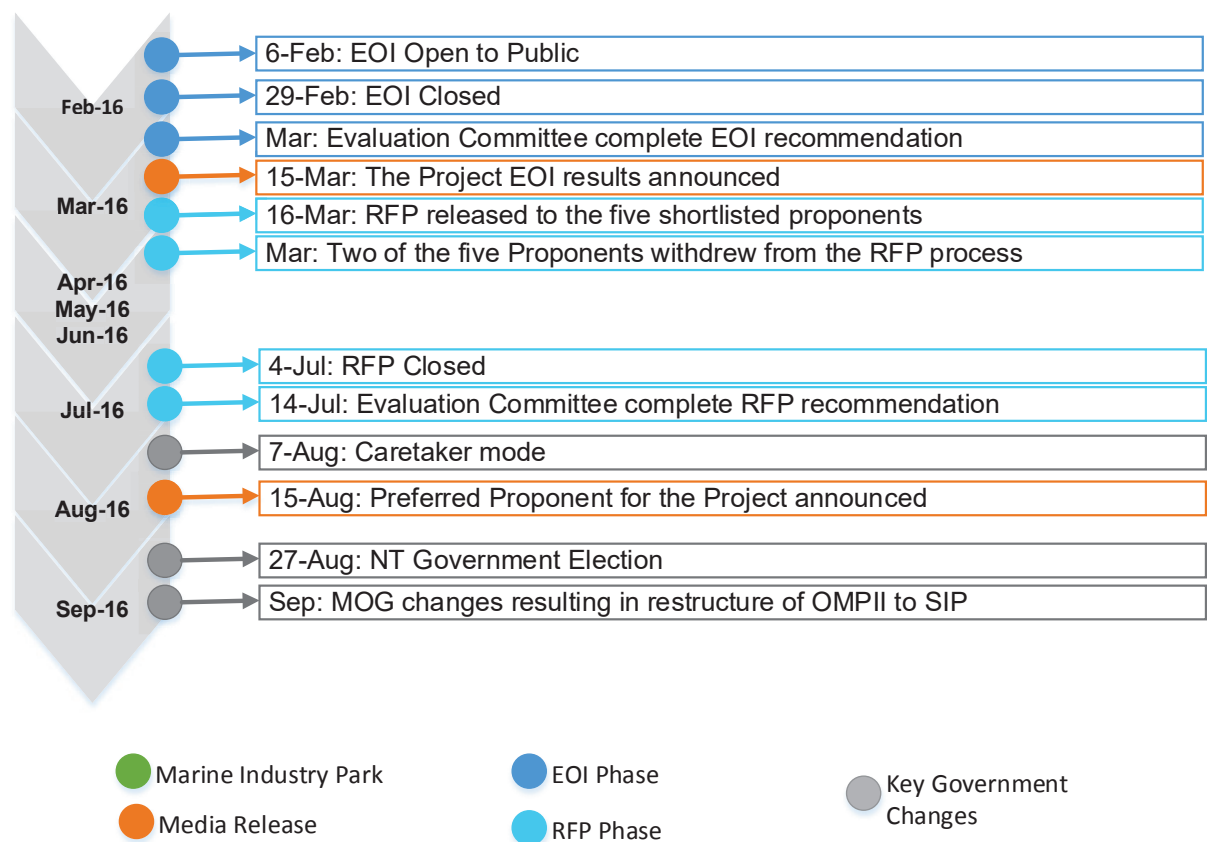
On 15 August 2016 the NT Government announced through a media release that a preferred proponent had been selected and negotiations would commence.

Department of Trade, Business and Innovation cont...

To date no valuation has been performed to determine the value of the land involved in the Project. Representatives of DTBI have advised that the decision to make available (through sale or lease) any land will be a decision for the Minister responsible for Planning at the time the decision is required to be made. I have further been advised by representatives of DTBI that decisions relating to the timeframe for returning the infrastructure to the preferred proponent will not be made until the conclusion of Phase One.

Evidence-based evaluation of the costs and benefits to the Territory as well as future business modelling will need to be undertaken by the NT Government during Phase One to demonstrate that the critical areas are adequately addressed prior to any decision to proceed with the Project. The chronology of the decision making process is presented below.

Figure 4: Detailed Procurement Timeline



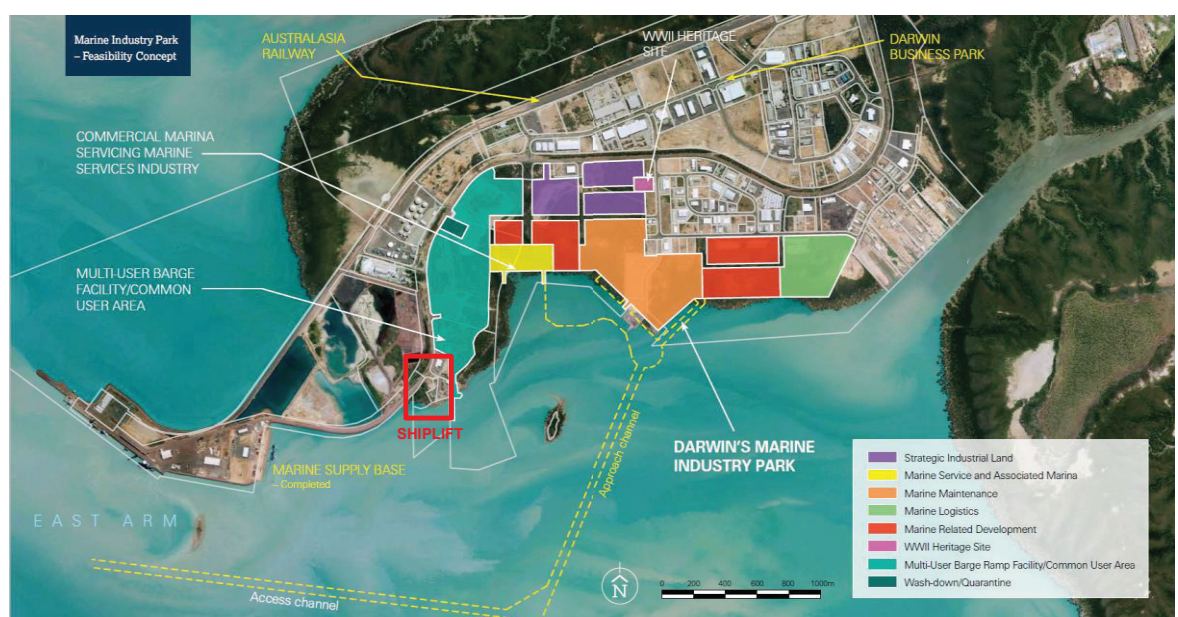
Department of Trade, Business and Innovation cont...

The project is currently in Phase One. During Phase Two, should it proceed, I have been advised DTBI will undertake more robust modelling of the financial and economic impacts of the project and determine an appropriate financial structure to support the project.

Any allocation of freehold or leasehold land and the accounting treatment for leases providing a right of access will need to be considered in determining the value associated with the Project as the cost to the Territory of transferring land to a successful proponent was not included in the earlier cost benefit analysis. I was advised by representatives of DTBI that no value related to land transactions has been provided for as part of the \$100 million contribution announced by the then Chief Minister.

The Pre-feasibility Report explored six different options for the location of the Marine Industry Park. Each entailed different positioning of key strategic areas to assess the overall impact of each to determine which model would provide the largest overall benefit. The Pre-feasibility Report emphasised that access to common user infrastructure and similarly grouped services being located in close proximity to each other was critical to the success of the Marine Park. Consequently the position common to all options was that the ship lift would be surrounded by key Marine Service providers to best utilise the infrastructure. The preferred option in the Pre-feasibility Report is demonstrated in Figure 5 which locates the ship lift within the Marine Maintenance precinct (orange area).

Figure 5: LDC Marine Industry Park Master Plan



Source: DTBI Internal Documentation

Department of Trade, Business and Innovation cont...

The Pre-feasibility Report outlined the importance of the Marine Maintenance (orange shaded area) Industry having direct access to the Ship Lift and identified the Common User Area (aqua shaded region) to be considered fixed and unlikely to be repurposed due to its desirable location close to the Marine Supply Base and also because LDC has commenced developing the area as a common user hardstand.

The area outlined in red is the ship lift location presently identified on the '*InvestNT*' site sponsored by the NT Government. As this location is not consistent with the position presented in the preferred option, there is a risk that the Territory's objectives may not be realised in an effective or efficient manner.

Contracts and agreements

In August 2017, the PDA was signed between the NT Government and the preferred proponent. The legal parties that this agreement relates to are the Territory, the preferred proponent and a related party guarantor. The PDA relates only to Phase One of the Project. Review of the PDA did not identify any escalation clauses.

The Project is structured in three phases. The signing of the PDA initiated the first phase of the Project. Phase One incorporates the FEED process. This process was expected to be a nine month process beginning on 1 September 2017 and concluding on 30 May 2018. I note that Phase One had not been completed at the date of drafting this report. The objective of Phase One is to:

- develop an appropriate project design;
- develop a cost estimate of the Project; and
- perform the appropriate site due diligence works.

Following completion of Phase One, a decision will be made whether or not to proceed with Phase Two. Phase Two represents the Approvals and Risk Reduction Agreement process. Should Phase Two proceed, it is expected to take between 12 and 18 months to complete. The objective of Phase Two is to prepare a robust Project budget, reduce any potential risks and finalise the design, including undertaking and concluding environmental impact studies.

Phase Three represents the construction phase of the Project. It is envisaged by DTBI that a decision to enter or cease Phase Three will occur in late 2019. This phase, should it proceed, is expected to begin in December 2019 with construction expected to take between 12 and 18 months. Should Phase Three proceed, the commission and operation of the Ship Lift and Marine Maintenance Park is anticipated to occur in April 2021.

Department of Trade, Business and Innovation cont...

The total financial risk to the Territory constitutes the contribution of \$100 million, the value of any land contributed by the Territory (unquantified) and the costs incurred by the Territory during Phase One, Phase Two and Phase Three (unquantified).

It would be prudent for the Territory to recalculate the net present value and undertake an updated comprehensive cost benefit analysis and risk assessment at the conclusion of each of these phases to appropriately inform any decision to proceed with or withdraw from the Project.

The preferred proponent's Project Manager provides weekly and monthly reporting to SIP and overall financial performance is discussed in detail during the joint Project Control Group (PCG) meetings held between SIP and the preferred proponent. SIP is not utilising any internal technology based project management system to coordinate delivery of the Project. The Project Manager is responsible for maintaining all project management related documentation. SIP maintains electronic document filing where all Project related data and information is compiled and stored including reporting provided by the Project Manager.

Copies of all invoices and FEED expenses are provided to SIP with all FEED related expenses paid equally by both parties. SIP assesses the expense information and the Financial Data and Project Management System Reports provided by the Project Manager. Costs are checked by three DTBI staff members and the Agency's Technical Advisor to ensure they are appropriate and relevant. DTBI has ten business days to undertake this review and to raise any queries with the preferred proponent. The Agency delegate will then approve the monthly payment on behalf of the Territory. The consideration of how best the funding should be spent to deliver the required outcomes occurs during the PCG meetings, as both parties have access to the financial data.

Governance and Oversight Groups

During the early stages of the Project, (the EOI and RFP phases), a project specific Steering Committee was established. The primary focus of the Steering Committee was to oversee the delivery of the Project through a competitive public process. The Steering Committee has responsibility for approving the probity plans and evaluation plans and making policy decisions on key matters. The Steering Committee reported to the Major Project Sub-Committee.

Committees that reported directly to the Steering Committee during the competitive process of the Project included the:

- Evaluation Committee whose role was to evaluate and recommend proponents for advancement to the subsequent phases in the competitive process; and the
- Advisory Committee whose role was to evaluate responses from proponents and provide observations to the Evaluation Committee.

Department of Trade, Business and Innovation cont...

The Major Project Sub-Committee exists to provide oversight for all major projects in the Northern Territory. This allows the committee to have a holistic view of all active and planned major projects and understand how projects potentially interact with each other. This single committee approach is intended to better align to the government's strategic priorities of fostering economic development and creating jobs.

Following the signing of the PDA with the selected preferred proponent, two PCGs were formed.

The first PCG is an internal government group that first met in October 2017. It includes representatives from the Department of Chief Minister, Department of Treasury and Finance, Department of Infrastructure, Planning and Logistics, Department of Environment and Natural Resources and DTBI. The purpose of this PCG is to meet and discuss identified risks and identify potential actions to be taken to fully or partially mitigate these risks. As at 31 January 2018, this PCG had met twice being in October 2017 and November 2017.

The second PCG group involves representatives from DTBI and the preferred proponent. It has met every month since it was established in September 2017. The PCG is comprised of the General Manager of SIP and the Chair representing the preferred proponent. Where it is deemed appropriate, additional representatives from DTBI and the preferred proponent are invited to attend meetings. The purpose of this PCG is to discuss, in detail, the progress of the Project and related budgeting in addition to considering any potential issues and or risks that have arisen throughout the FEED process. As at 31 January 2018, this PCG had met four times to discuss the progress throughout the early stages of the FEED.

Both PCGs have associated terms of reference. The terms of reference for the internal PCG is a standalone document. The terms of reference from the Agency and the preferred proponent are established within the PDA.

Department of Trade, Business and Innovation cont...

Probity Process

A Probity Advisor from a local professional services firm was appointed. A probity plan was developed for both the EOI stage (February 2016) and the RFP stage (June 2016). The role of the Probity Advisor, as defined in the Probity Plan, was to evaluate whether fairness and impartiality was observed throughout the competitive procurement that the criteria were consistently applied to all proposals and to provide assurance that the competitive process:

- ensured conformity to processes;
- provided accountability;
- ensured that the interests of proponents are protected by an ethical and fair process;
- ensured that all proposals were assessed using the same criteria;
- preserved public and proponent confidence in Territory processes; and
- improved defensibility of decision to potential legal challenge.

The Probity Advisor was involved in all stages of the competitive process. As part of the probity process, a Final Probity Report was issued on 14 July 2016 (the day the Evaluation Committee signed the RFP Evaluation report) following the conclusion of the RFP phase.

The findings within the Final Probity Report are that the level of compliance with regard to the approved probity plans was adequate; that the Evaluation Committee followed the evaluation procedures as described in the EOI and RFP Evaluation Plans; and that potential conflicts of interests were dealt with appropriately. The Final Probity Report noted that *“The NTG project team and the NTG’s Commercial Advisors had regular informal contact with Proponents and potential Proponents. We did not have visibility over this contact and cannot attest to the probity of this contact.”*⁷ The Probity Advisor noted this as a limitation on the scope of the probity work performed as the overall conclusion can be formed only on what is known, observed by or verified by the Probity Advisor.

The overall conclusion drawn by the Probity Advisor was that, subject to the limitations outlined in the report, nothing came to Probity Advisor’s attention that would cause the Probity Advisor to believe that that the Evaluation Committee had undertaken the process to assess the proponents who responded to the EOI and RFP other than with due regard to probity.

⁷ Merit Partners, 14 July 2016, Report of Probity Advisory Service provided for the Ship Lift and Maritime Industries Project

Department of Trade, Business and Innovation cont...

The conclusion in the Final Probity Report references the recommendation made by the Evaluation Committee. My Authorised Auditors were advised that the appointment and responsibility of the Probity Advisor ceased at the conclusion of the evaluation process. Any subsequent negotiations and decisions are outside the scope of engagement of the Probity Advisor. Consequently the conclusion of the Probity Advisor cannot be extended to the ultimate decision to enter negotiations with the preferred proponent.

In addition to the Final Probity Report dated 14 July 2016, a letter detailing the end of the competitive process was subsequently issued on 21 June 2017. The letter clarifies that the Territory and the preferred proponent had been in negotiations since July 2016 and that the negotiations had been concluded as at 21 June 2017. The letter did not provide an opinion.

Management and Record Keeping

DTBI has not established any specific management or record keeping systems or processes to support the Project. If there are amendments or updates to contracts or agreements, the updated versions are stored electronically and communicated to appropriate parties. A single hard copy of each contract and agreement is retained securely at DTBI.

The data security processes in place, both electronic and physical appear reasonable and appropriate. From observations made during the audit, data management appears consistent with other government agencies and all confidential data was password protected.

Department of Trade, Business and Innovation cont...

The Department of Trade, Business and Innovation has commented:

DTBI notes that with the FEED stage of the project nearing conclusion, there is now greater clarity on design specifications and associated costs. Given this, more detailed market, economic and financial analysis of the ship lift project and Government's potential \$100M commitment can be undertaken.

DTBI will consider recommendations relating to information provided to the market and timeframes provided for response to market processes. DTBI also notes the recommendation on clearer scoping of the probity advisor role and level of assurances sought. The outcomes of these considerations will be reflected in future market process documentation.

The Auditor-General recommends that the operational and related financial implications of the proposed location of the Ship Lift be evaluated to ensure that the ultimate location enables the Territory's objectives to be realised in an effective and efficient manner. DTBI notes this recommendation and will build consideration of possible alternative siting options into the market, economic and financial analysis process.

The Auditor-General recommends that more time be allocated to evaluating submissions to enable clarification steps necessary to achieve optimal results to be undertaken.

DTBI is conscious of the need to balance timely responses to submissions and ensuring that every opportunity is afforded proponents to clarify submissions. However, it is also mindful of the fine line between clarification of matters outlined in a submission and the raising of new matters not already covered in the submission, the latter being contrary to probity and transparency principles. DTBI's position is that sufficient time is always provided to the evaluation process and, as the Report notes, there is no evidence to indicate that evaluation timeframes for the project resulted in deficiencies to Government competitive processes.

Attachment D – Auditor General’s Report to the Legislative Assembly, 2024

Darwin Ship Lift Project, pages 70 - 86

Ship Lift Facility

The Department of the Chief Minister and Cabinet The Department of Infrastructure, Planning and Logistics

Index

The report on this audit is structured as follows:

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Background

Since 2009, the Northern Territory Government (NTG) has been exploring the development of a Marine Industry Park. In 2015, the Government of the day announced that *‘once at full capacity, it’s estimated the Marine Industry Park will support up to 4,500 full time jobs and inject around \$3.5 billion into the Territory economy.’*¹

The Land Development Corporation (LDC) commenced planning for the Marine Industry Park in 2012 and released the Marine Industry Park master plan in 2015. The Marine Industry Park was intended to include a ship lift and supporting marine maintenance infrastructure. A ship lift is an essential piece of infrastructure to support the function of the Marine Industry Park, enabling repairs and maintenance to be undertaken on large vessels in dry dock.

As part of the planning phase, a pre-feasibility study was undertaken in 2012 and an economic assessment was undertaken in 2015. The pre-feasibility report presented key requirements for the development to ensure the success of the Marine Industry Park. The requirements included:

- Develop the Marine Maintenance precinct first, noting this should only go ahead when a Marine Maintenance private sector proponent is willing to cover the costs allocated to this precinct.
- Identify foundation customers.
- Not sell or lease (except on a short-term basis) land within the precinct, because of the opportunity costs involved.

¹ NTG Media Release, 4 December 2015

Ship Lift Facility cont...

In October 2015, the Ship Lift Facility was announced as a project. The Ship Lift Facility comprises the ship lift, wet berths, hard stand areas for ship repair and maintenance, transporter units and associated buildings (collectively referred to as the Ship Lift Facility).

As a major project, the control and management of the Ship Lift Facility was transferred from LDC to the Strategic Infrastructure and Projects business unit within the then Department of Trade, Business and Innovation (DTBI). Responsibility for delivery of the Ship Lift Facility was then moved to the Department of the Chief Minister and Cabinet (DCMC). At the time of this audit, responsibility for delivery of the Ship Lift Facility resided with Infrastructure NT at the Department of Infrastructure, Planning and Logistics (DIPL).

While the management of the construction of the Ship Lift Facility has been moved to DIPL, LDC continues to hold responsibility for the delivery of the Marine Industry Park in its entirety.

Following the receipt of the proceeds from the Port of Darwin lease transaction in late 2015, the Government of the day proposed that the Territory would contribute up to \$100 million from the proceeds to support the construction of the Ship Lift Facility.

In August 2016, the NTG announced the preferred proponent to lead the development, construction and operation of the Ship Lift Facility (the Project). It was intended that this approach would enable the Territory to benefit from private sector knowledge and capabilities to optimise development of the Project.

In August 2017, the NTG entered into a Project Development Agreement with the preferred proponent. The Project Development Agreement required the preferred proponent to develop an appropriate project design; develop a cost estimate of the Project; oversee the construction; and operate the Ship Lift Facility.

The Project involved three phases. The objectives of Phase One were to:

- Develop an appropriate project design;
- Develop a cost estimate of the Project; and
- Perform the appropriate site due diligence works.

Phase Two involved preparing a robust Project budget, reducing any potential risks and finalising the design, including undertaking and concluding environmental impact studies.

Phase Three represents the construction phase of the Project.

At the time the parties entered into the Project Development Agreement, the Ship Lift Facility and Marine Maintenance Park were expected to be commissioned and operational in April 2021.

Prior to 2018, no cost/benefit modelling had been performed to determine the impact or return on the \$100 million investment by the Territory.

In 2018, my Office undertook a performance management system audit on the systems and processes to manage the development of the Ship Lift Facility. At the time of the audit, the Project was in Phase One. The results from that audit were reported in the August 2018 Northern Territory Auditor-General's Report to the Legislative Assembly.

Scope and objectives

The objective of this performance management system audit was to assess the performance management systems in place at DCMC and DIPL (collectively referred to as the Agencies) that enable management to assess whether the Project is being delivered effectively, efficiently and with regard to economy.

Ship Lift Facility cont...

The audit assessed if the Agencies' performance management systems apply the Northern Territory Government (NTG) Procurement Framework and Treasurer's Direction Infrastructure.

When reviewing the performance management systems in place at the Agencies, the audit assessed the systems and processes in place to support:

- Effective project planning including defining clear outcomes, developing governance structures and mitigating risk;
- Effective, fair and transparent procurement including compliance with the NTG Procurement Framework;
- Effective project management including probity services and contract management;
- Effective financial management including robust budget and cost management; and
- The delivery of the Project and related outcomes.

The audit covered the period from the conclusion of the 2018 audit to 31 August 2023.

The team responsible for delivering the project includes personnel from both DIPL and DCMC. Collectively they have been referred to in this report as the Project Management Team.

Limitation of scope

During the audit, I was informed that key decisions affecting delivery of the Project were made at a Cabinet level and the Agencies were unable to provide evidence to demonstrate that each decision had been accurately and adequately informed by facts and evidence such that, on balance, each decision would achieve the most effective, efficient and economical outcome for the Territory.

Accordingly, and consistent with past practice, I submitted two requests to the Cabinet Office to sight information supporting the decisions. The requests were solely to sight the supporting documentation provided by the Agencies and not to sight evidence of deliberations, discussions and decisions within Cabinet. Both requests were declined. As evidence to support these key decisions was not provided for audit scrutiny, I was unable to assess and conclude that the performance management systems in place at the Agencies are adequate or have been effectively designed and implemented to enable management to assess whether the Project is being delivered efficiently, effectively and with economy.

There was no documented evidence-based analysis, modelling, risk assessments and/or cost and benefit analysis provided to support the decisions to:

- Terminate the Project Development Agreement
- Change the financing and construction approach regarding the Ship Lift Facility from being externally funded and constructed to being NTG financed and constructed
- Enter into a land transfer arrangement
- Enter into an operating agreement with a private sector operator
- Create and execute the Minimum Output Specifications
- Award the Head Agreement for the construction of the Ship Lift.

Ship Lift Facility cont...

Audit opinion

As detailed in the section of this report entitled *Limitation of scope*, evidence to support key decisions made surrounding the Project was not provided for audit scrutiny. As such I am unable to conclude that the Agencies have adequate systems and processes in place to support:

- Effective project planning including defining clear outcomes, developing governance structures and mitigating risk;
- Effective, fair and transparent procurement including compliance with the NTG Procurement Framework; and
- Effective financial management including robust budget and cost management.

Recommendations

Opportunities to improve the existing performance management systems are presented below as recommendations.

- Identify key documentation required for each project consistent with established better practice and develop and implement processes to record and retain the following information pertaining to each significant project:
 - Project's purpose/agency needs
 - Options, including non-infrastructure options, to achieve the purpose/needs
 - Rationale and evidence-base for the selected option
 - Prioritisation of the project
 - Specifications relevant to the project
 - Estimated costs and cost/benefit analysis
 - Business case (or equivalent) to source funding
 - Approvals.
- Design and implement processes to ensure information demonstrating evidence-based decision-making is documented, retained and, if necessary, captured in a format that can be provided for audit scrutiny.
- For large projects undertaken over an extended period of time, develop and implement a process which requires periodic re-evaluation of costs and scope, particularly when extensive time has passed between the original project analysis and commencement of the actual project or when there are significant economic changes during that time.
- Document the impact on project plans and risk assessments of any re-evaluation of, or changes to, project requirements with revisions to key documentation undertaken promptly. This may require additional processes to support version control.
- Align project planning, management and delivery with established better practice project management frameworks, such as the NT Project Development Framework to support efficient, effective and economical project delivery.
- Review both the Project risk register and the construction specific risk register to ensure both are complete, accurate and consistent and develop a process for escalating risks rated as high/extreme to the Project Sponsor and affected stakeholders.

Ship Lift Facility cont...

- Undertake an assessment of the cost/benefit analysis attributable to the development of the Marine Maintenance Precinct including the Ship Lift premised upon the maximum contribution by the Territory of \$215 million.
- Implement processes to record the full costs of the Project and regularly report to key decision-makers and stakeholders.
- Seek accounting advice from the Department of Treasury and Finance in relation to recognition of the costs and obligations associated with the Project and the contractual arrangements with the operator of the Ship Lift Facility including accounting for the fair value of exchanged land and leasing arrangements, the transfer of the constructed private marine facility assets and any resulting service concession arrangements to which the NTG is a party.

Audit observations

Project planning

Market analysis

In 2018, DTBI commissioned a market, financial and economic analysis of the proposed facility. The resultant report was finalised in February 2019. The analysis was based on a Ship Lift Facility using the following assumptions:

- 2 site locations considered (proposed site and an unspecified alternative site)
- Prices charged by the Ship Lift Facility would be in line with those charged by the Australian Marine Complex at Henderson
- The Ship Lift Facility would have:
 - a lifting capability of 4,000 tonnes
 - dimensions of 85 metres x 24 metres x 6 metres draught
 - 2 wet berths
 - hardstand areas.

The report concluded that a Ship Lift Facility with the above design parameters would be too small to accommodate intended stakeholders as it contained too little wet-berth space. The report proposed an increased capacity including:

- 2 additional wet berths adjacent to the ship lift
- 5,500 tonnes lifting capability
- 120 metres x 24 metres x 8.5 metres draught.

Three scenarios had been presented (reflecting a range of low, base and high scenarios) within the report. The report assumed that an NTG contribution of \$100 million would be needed for the Ship Lift Facility to be economical in any of the three scenarios proposed in the report.

The report cited limitations on the use of the report including the results for all three scenarios, acknowledging the considerable uncertainty inherent in the market for the services of the SLAMI [Ship Lift and Marine Industries] facilities and significant uncertainty regarding costs.

At the time of audit fieldwork, no subsequent market analysis had been conducted.

Ship Lift Facility cont...

Project plan

Members of the Project Management Team advised that the Project Development Agreement to design, construct and operate the Ship Lift Facility was terminated by the NTG in 2018. The NTG remained interested in using the site proposed by the preferred proponent, and negotiations relating to use of the site continued. There was no evidence provided to demonstrate appropriate due diligence procedures or a cost/benefit analysis had been performed over the site selection.

An overarching Ship Lift Project Plan (the Plan) was developed by DTBI in June 2020, with an updated version being released the following year by DCMC. This version has not been updated since 2021 to reflect revised deliverable dates, including changes to the Project Phases and timeframes.

The Plan provides a high-level overview of the project's scope, predicted outcomes, key performance indicators, expected timeframes, perceived risks, and governance arrangements. The Plan also prescribes the four key project aspects, being:

1. Establishing access pricing legislation for the Ship Lift Facility (regulated by the Utilities Commission).
2. Contract management obligations under the land transfer arrangement and operating agreement.
3. Regulatory approvals – environmental (NT Environmental Impact Statement), development and other approvals.
4. Procurement of design and construction contractor and other separate work packages (e.g., ship lift technology and self-propelled modular transporters).

The focus of this audit was on the fourth key aspect relating to '*Procurement of design and construction contractor and other separate work packages*'.

A Procurement Plan – Construction Contractor, was developed by DTBI in July 2020, detailing the scope, procurement stages, generic risk assessments and assessment panel requirements. The staged method of procurement is discussed in greater detail within the section of this report entitled *Procurement process*.

By 2023, it was intended that the Ship Lift Facility, when constructed, would be capable of lifting vessels up to 5,500 tonnes, enabling vessels in the defence, energy, pearling, fishing and coastal cruising industries to be serviced in Darwin.

The Ship Lift Facility is now to be a government funded, owned and constructed asset. A new agreement was entered into for the operation of the Ship Lift Facility. No evidence was provided to demonstrate the rationale or impacts of the change in approach.

Ship Lift Facility cont...

Key milestones that have been observed since the conduct of the 2018 audit include:

- The operator of the Ship Lift Facility has been engaged (July 2020)
- The Pricing and Access Legislation has been drafted (May 2021) yet is still to be finalised
- A direct design consultancy contract was executed (February 2023)
- The contract for construction of the Ship Lift Facility has been executed (September 2023).

A summary of key milestones is presented at the conclusion of this report.

With the awarding of the design and construction contracts, the Ship Lift is currently in the design stage with the anticipated commission and operation of the Ship Lift Facility, now revised from April 2021 to sometime in the 2025-26 financial year, with components of the Ship Lift Facility being expected to be completed by the end of 2025.

Project management policies and framework

The revised NTG Project Development Framework was effective from October 2019 and the Treasurer's Direction Infrastructure from July 2021. These documents provide guidance to support effective project management including specifying minimum requirements and approvals. Neither were considered by the Project Management Team, on the basis that the Project was already underway before these came into effect. There was no framework in place to support structured and systemic planning and management of the Project.

Project outcomes and minimum output specifications

During the lifecycle of the Project, the overall project outcome has remained consistent, being the delivery of an operational 'common user' ship lift and marine industries facility for NTG at East Arm.

The Project scope changed in 2019, after the market analysis, with the required vessel lifting capacity increased.

In summary, the Project, as it currently stands, is intended to deliver the following desired outputs:

- A ship lift that is 26 metres wide, 103 metres long, with a vessel lifting capability of 5,500 tonnes.
- Wet berths to allow vessels to undertake in-water maintenance.
- Hard stand area for ship repair and maintenance works.
- Self-propelled modular transporter (SPMT) units that transport vessels around the Ship Lift Facility once they are out of the water.
- An administration building, SPMT shed and blast and paint facility.
- East Arm utilities upgrades to support the ship lift and broader marine industry park development.

As a large portion of the Ship Lift Facility is to be constructed on land currently controlled by a private party, a land transfer arrangement was entered into in July 2020 to facilitate a land exchange between the private party and the NTG.

Ship Lift Facility cont...

To secure this land for the Ship Lift Facility, a 'land exchange' was agreed upon. In exchange for four land parcels transferred from a private party, the NTG is required to:

1. Transfer 15.1ha of land and sea to the private party. This overwater area includes the access to the Ship Lift Facility.
2. Lease a further land parcel from the private party at a nominal value, in order to construct a private marine facility, adjacent to the Ship Lift Facility, to be owned by the private party.

A cost/benefit analysis of this exchange had not been undertaken and values of the individual land packages had not been determined at the time of this audit. As at 31 August 2023 (the conclusion of the period within the audit scope), accounting advice had not been sought on the appropriate financial recognition and measurement of the arrangements.

In June 2021, Minimum Output Specifications were established detailing the Preliminary Works and Developed Design of both the Ship Lift and new private facilities. The Minimum Output Specifications acknowledge changes to the initial conceptual design may occur where alternatives promote innovation, flexibility and efficiency. Where such design changes are negotiated and approved, they are recorded within the Design Register maintained by DIPL.

At the time of the audit fieldwork, the Ship Lift Facility Design was being developed, prior to construction commencing. A summary of the new facility composition and asset ownership is provided in Table 1 below followed by a diagram depicting the concept design and layout as reported in the executive summary of the draft environmental impact statement prepared by the Northern Territory Environment Protection Authority.

Table 1: Infrastructure components

NTG Assets	Private Assets
Access channel and dredged manoeuvring areas	Hardstand areas
Ship lift	Wet berths
Self-propelled modular transport system (SPMT) vessel transfer system	Site service and utilities
Vessel transfer area (with SPMT pavements)	Security assets
Hardstand areas	
Wet berths	
Wharf assets	
Vessel wash bay	
Site services and utilities	
Security assets	
Ancillary facilities	
▪ Ship lift control room	
▪ SPMT garage	
▪ Blasting and painting facility	
▪ Ablution facilities	

Source: NTAGO prepared based on information in existence at June 2021

Ship Lift Facility cont...

Figure 1: Concept Design and Layout



Source: Northern Territory Environment Protection Authority

Accessed 19 April 2024: https://ntepa.nt.gov.au/_data/assets/pdf_file/0007/1069135/Executive-Summary.pdf

Ship Lift Facility cont...

Roles and responsibilities

The Project is currently being managed by the Ship Lift Project Management Team, with the design and construction phase being delivered by DIPL, due to the construction expertise within DIPL. The Project Sponsor is the Chief Executive Officer of DCMC, with DCMC effectively responsible for all non-construction related elements of the Project.

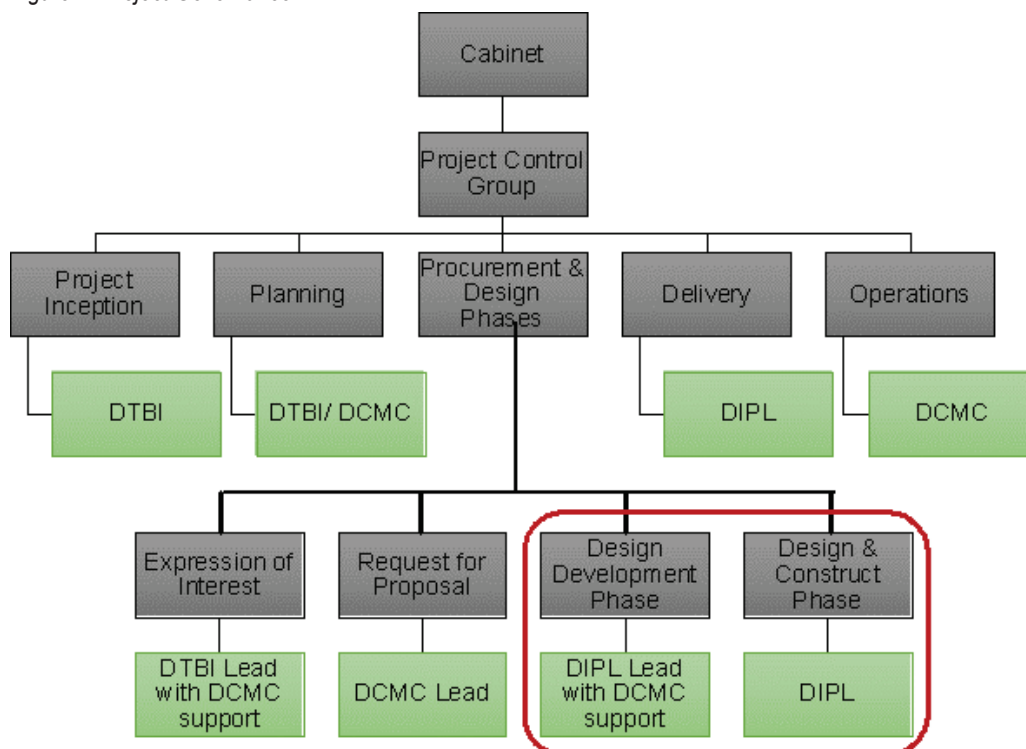
A 'Darwin Ship Lift Project Delivery Group Terms of Reference' was drafted in February 2022 by the DIPL Project Delivery Group. This document:

- Clarified the roles and responsibilities of both Agencies
- Clarified the scope of the Project Management Team and its membership
- Included an updated project governance structure for the design and construction phase
- Prescribed reporting obligations.

Although currently in use as a live document, a finalised, endorsed copy was unable to be provided for audit scrutiny.

The current governance structure is detailed below in Figure 2. Figure 2 also demonstrates the agency with responsibility (highlighted in green) for delivering key phases and elements of the Project.

Figure 2: Project Governance



Source: Draft Darwin Ship Lift Project Delivery Group Terms of Reference (February 2022)

DTBI and DCMC were responsible for coordinating the initial Expression of Interest and Request for Proposals for the design and development of the Project. The Project Management Team (PMT) (demonstrated within the red boundary in Figure 2) was established in 2022 by DIPL to oversee the Design Development and Design and Construct Phases of the Project, make Project related decisions, and escalate issues to the Project Control Group. The PMT meets at a minimum, monthly or on a 'as needs' basis. Its members include personnel from DIPL and DCMC.

Ship Lift Facility cont...

Risk assessments

During the project planning phase, key risks were identified during the Expression of Interest, Request for Proposals and Request for Detailed Design stages. In addition, risk workshops were conducted by an external consulting firm in August 2020, to identify risks and establish mitigation strategies.

In September 2020, the identified risks were collated into a Risk and Issues Register and mitigation strategies were established for each risk. At this date, a total of 82 risks were identified, with nine risks having been closed and 14 being deemed as high after mitigation. Two risks were rated as extreme and had no identified mitigating strategies. This overall risk register has not been updated since establishment and it is understood to no longer be actively monitored.

Upon the transfer of the design and construction phase to DIPL, a new risk register was developed in 2022, specifically relating to the design and construction phase of the Project. This register is updated on an 'as needs basis'.

Of the 37 open risks listed in the register, three remain listed as very high after the application of mitigation strategies. Agency staff advised these risks are actively monitored and reported upon during monthly meetings.

Procurement process

A staged approach

An engineering firm was engaged in July 2020 to provide information on the Project and potential approaches to procurement. The options presented expressly excluded models involving private sector funding and asset ownership, on the basis that the NTG intended to fund its own asset and separately appoint an operator.

The procurement was a 'design and construct' procurement for a managing construction contractor to undertake the final design and approval and construction phase of the Ship Lift Facility.

The NTG proceeded with a staged procurement strategy, as follows:

- Stage 1 – Expression of Interest
- Stage 2 – Request for Proposals
- Stage 3 – Request for Detailed Design

Throughout each of the three stages, an assessment panel of three to four members was utilised, supported by external advisors providing legal, engineering and probity expertise.

During the third stage, 'the Request for Detailed Design', Clough BMD joint venture was announced as the preferred participant in July 2022.

A financial due diligence report was produced in June 2022 by an external legal firm providing advisory services to the procurement assessment panel identified a probable failure risk of less than 1% in the near term. In December 2022, Clough Projects Australia Pty Ltd (Clough) was placed in Voluntary Administration.

Ship Lift Facility cont...

To maintain progress of the Project, the Agency awarded a design consultancy contract to Wallbridge Gilbert Aztec Pty Ltd (WGAWA), the design consultancy firm who had submitted an interim proposal accompanying the original proposal from the Clough BMD joint venture. The contract was awarded in February 2023 with a value of \$10.951 million.

An Italian construction company, WeBuild Group, acquired a 100% interest in Clough in February 2023. Final negotiations with the Clough BMD joint venture, resulted in a Head Construction Contract being awarded in September 2023 for \$420 million.

The three stages of the procurement process are summarised below.

Table 2: Procurement process summary

Stage	Lead Agency	Procurement	Timeframe	Outcome
1	DTBI	Expression of Interest	11 August 2020 to 13 November 2020	20 respondents, of which 5 were recommended.
2	DCMC	Request for Proposals	31 March 2021 to 25 November 2021	4 respondents of which 2 were recommended.
3	DIPL	Request for Detailed Design / Design and Development	6 December 2021 to 8 September 2023	Final negotiations continued with the preferred participant, Clough BMD joint venture, from July 2022. A separate direct contract was entered into with Wallbridge Gilbert Aztec in February 2023 for design. Head Construction contract awarded to Clough BMD joint venture in September 2023.

Source: NTAGO Developed

Procurement exemptions

Procurement within the NTG is governed by the NTG Procurement Framework. The procurement for the design and construction, using the above 3-stage approach, is not a procurement approach that is regularly used by the NTG.

Under Section 5(1) of the *Procurement Act 1995* (the Act), the Minister may provide an exemption to an Agency from complying with a provision of the Act. This section provides:

'The Minister may, in writing, exempt an accountable officer from the need to comply with a provision of this Act and, while the exemption remains in force, the accountable officer is not required to comply with the provision'.

From 2020, Ministerial exemptions have been provided to DTBI, DCMC and DIPL (as agency responsibilities changed) from the need to comply with section 11(2) of the Act in relation to the procurement activity associated with the design and construction of the Darwin Ship Lift Facility and the engagement of the operator of the Ship Lift Facility. The wording of the exemptions remained consistent throughout with each agency provided the exemption by their relevant Minister.

Ship Lift Facility cont...

Probity process

A probity advisor was engaged in March 2020 and a probity plan developed in July 2020. The probity advisor issued a probity report in November 2020 relating to the Expression of Interest phase and a further report in July 2022 relating to the Request for Detailed Design phase activities. Neither report contained any adverse findings or significant recommendations.

Project management

Systems

As with all construction projects run by DIPL, the Asset Information System has been used for the monitoring of the Project and payments of contractors.

Due to the size of the Project, there are no existing NTG systems that will facilitate the effective contract management of the Design and Construction Agreement. The DIPL Project Management Team are in the process of trialling external project management software, however at the time of audit fieldwork, it has not been approved for use.

At the time of audit fieldwork, the Collaborative Construction Contract had been recently finalised, with a Contract Management Plan yet to be created.

Financial management

Financial implications

In 2018, the Ship Lift Facility was to be owned and constructed by an independent contractor. The contractor was to fund the Project directly with the NTG providing financial support to the value of \$100 million and assisting the contractor to apply for finance through the Commonwealth Northern Australian Infrastructure Facility (NAIF).

In August 2019, the NTG committed to pursue Commonwealth funding for the Ship Lift Facility as well as exploring other financing options. In 2019, the \$400 million project cost estimate did not include the cost of upgrades for headworks at East Arm required to support the development of the Marine Industry Park including the Ship Lift site.

A quantity surveyor's report prepared in August 2020 estimated total costs of construction of the Ship Lift Facility as ranging between \$383 million and \$478 million after risk adjustments. This estimate was based on the Project being completed within 36 months (by July 2023).

The Ship Lift Facility has now moved to a government owned and constructed asset. The project is currently budgeted to cost \$515 million, with the NTG contributing \$215 million and funding the remaining \$300 million through a loan from NAIF, secured in July 2020. At the time of audit fieldwork, no funds had been drawn down from the NAIF loan.

The NAIF website records that the \$300 million loan is to be repaid over 28 years. The NTG is responsible for repayment of the loan and associated costs.

Review of the investment proposal submitted to the NAIF identified some inaccuracies in the information provided however I was unable to determine the impact these inaccuracies may have had on those approving the investment proposal.

The final NAIF agreement was signed in 2020. At the time of signing the agreement, industry bodies anticipated construction of the Ship Lift Facility was to commence in 2021 and be operating from 2023.

Ship Lift Facility cont...

Capital costs

The current Design and Construction phase is being delivered by DIPL, with the costs for the project being captured in the Asset Information System. As at 31 August 2023, the actual design and construction costs incurred to date totalled \$19 million. This total does not include other Project related costs incurred to 31 August 2023.

There is no report provided that lists the full costs associated with the Project since its inception including the costs of engineering, probity, legal and modelling consultancies.

The NTG is responsible for the costs of any asset replacement and upgrade costs related to the Ship Lift Facility.

Future operational costs

The main operating costs associated with the Project will be:

- wages and salaries;
- maintenance and sustaining capital expenditure associated with onshore and offshore structures (e.g., general hardstand; site roads; transfer and heavy hardstand areas; utilities; washdown bay; workshops and offices; self-propelled modular transporter and ship lift) and dredging;
- interest charges associated with the NAIF debt facility;
- utilities costs including electricity, sewer, security, communications and water charges; and
- plant, equipment, general small tools, vehicles, ICT, consumables and fuel costs.

These costs will be apportioned between the NTG and outsourced operator in accordance with the operating agreement.

The approach to accounting for the contractual arrangements associated with the Ship Lift Facility is yet to be determined. The value of an asset is recognised only when *'it is probable that future economic benefits associated with the item will flow'*². As demonstrated earlier, a portion of the assets will be built on land owned by a private party. Agency staff confirmed that accounting advice is being sought from the Department of Treasury and Finance in relation to recognition of the asset now that the Head Contract with the final agreed details has been awarded (September 2023).

Revenue from the commercial operations

In June 2021, an operating agreement was entered into with the operator, as a direct procurement. As established above, procurement of the operations and maintenance services under this deed was exempted from complying with the requirements of the Act. There was no evidence to support the decision for the direct appointment.

The operating agreement is a 10-year renewable agreement. The operator has exclusive control of the Ship Lift Facility with all revenue generated to be retained by the operator. The 2019 Preliminary Market, Financial and Economic Analysis financial assessment projected between \$7 million and \$16 million in operational revenue in the first year of operation.

There has been no accounting advice sought in relation to accounting for any service concession arrangements arising from the operating agreement.

² AABS 116 Property, Plant and Equipment

Ship Lift Facility cont...

Project outcomes

Reporting

In accordance with the draft Terms of Reference, the Project Management Team is to meet monthly or as determined by the Infrastructure Commissioner and has the following responsibilities:

- Monitoring the project budget;
- The provision of ministerial briefings;
- Reporting on NAIF loan obligations; and
- Management of the land transfer arrangement.

Monthly status reports are to be produced however no evidence of regular reporting was provided in response to audit requests.

Regular stakeholder communications are emailed to stakeholders (as established in the Communication Plan for the Project) and posted on the Infrastructure NT website. Traditional Owner groups are included on the email list. The Project Management Team advised engagement with Traditional Owners is to occur once construction commences.

Evaluations

At the time of audit fieldwork, no evaluation plan or benefit realisation report had been prepared. It is anticipated by the Project Management Team that these reports will be prepared closer to the completion of the Project.

Ship Lift Facility cont...

Ship Lift Facility timeline

Pre 2015		⇒ Feasibility studies undertaken.
2015		⇒ The NTG announced commencement of the Project.
		⇒ The Ship Lift Facility was granted major project status.
2016		⇒ LDC opened the common user facility barge ramp.
		⇒ Preferred proponent selected for development of the ship lift.
		⇒ NTG selected preferred ship lift site.
2017		⇒ A Project Development Agreement to deliver the ship lift was announced.
2018	Dec	⇒ Project Development Agreement was terminated.
2019	May	⇒ Preliminary Market, Financial and Economic Analysis undertaken.
		⇒ Change to an NTG owned and operated facility on privately controlled site.
	Dec	⇒ The Northern Australia Infrastructure Facility approved a \$300 million loan to the NTG for construction of the ship lift.
2020	June	⇒ Overarching Project Plan developed.
	Jul	⇒ NTG entered a land transfer arrangement.
	Aug-Nov	⇒ Construction Procurement – 1st stage – Expression of interest advertised (August) and 5 respondents selected.
2021	Mar-Nov	⇒ Construction Procurement – 2nd stage – Shortlist advertised (March) and 2 respondents selected.
	Jun	⇒ NTG entered into an operating agreement.
		⇒ Minimum Output Specifications executed.
	Dec	⇒ Construction Procurement – 3rd stage – Detailed design.
2022	May	⇒ Clough directors sought safe harbour protection from claims against insolvency.
	Jul	⇒ Construction Procurement - Clough–BMD joint venture announced as preferred contractor for construction of the ship lift.
	Dec	⇒ Clough entered voluntary administration.
2023	Feb	⇒ WeBuild completed its acquisition of Clough.
		⇒ NTG entered into a Technical Design Agreement.
	Sept	⇒ Construction Procurement – NTG entered into a Head Agreement for the construction of the Ship Lift.
2025-26		⇒ Expected construction completion.

Source: NTAGO Developed

Ship Lift Facility cont...

The Department of Infrastructure, Planning and Logistics has commented:

The Project's management, procurement and governance processes are well established. Likewise, the Project's purpose and agency needs are well understood, as are options analysis, rationale and evidence in support of the selected option. Documentation evidencing these matters that was requested during the audit was provided where permitted, noting that commercial and Cabinet confidentiality attached to a number of those documents, as you would expect for a significant commercial infrastructure project. The Department acknowledges that this impacted the auditor's scope and subsequent findings.

Documentation including project specifications, approvals and records have been maintained by the Department in accordance with the project management principles, procurement and administrative requirements, but were not requested during the audit. In addition, regulatory approvals (e.g. NT Environment Protection Agency, Environment Protection and Biodiversity Conservation Agency and Development Approvals) are public information and are readily accessible on the regulators' websites in accordance with standard practice.

The Project's parameters have evolved as detailed design has progressed and consequently changes have and will occur through the project life cycle. The Department conducts regular reviews of costs, risks, designs, scope and evolution with a value for money, benefit and efficiency perspective. Documentation of the various reviews, estimates, draft plans and risks have and will continue to be re-evaluated through to, and beyond, the operational phases.

The Project has recently progressed to its delivery phase, with all significant procurement for specialised long lead items and land arrangements completed, with construction underway since April. The Department acknowledges the findings of the audit and remains dedicated to continuous improvements in services, programs and projects

The Department of the Chief Minister and Cabinet has commented:

The Department of the Chief Minister and Cabinet acknowledges the findings of the audit and remains dedicated to ongoing self-assessment and commitment to robust performance management practices.

Attachment E -Assessment of SLAMI Complex:

Preliminary Market, Financial and Economic Analysis, Acil Allen

REPORT TO
DEPARTMENT OF TRADE BUSINESS AND INNOVATION
28 FEBRUARY 2019

ASSESSMENT OF SLAMI COMPLEX:



PRELIMINARY MARKET, FINANCIAL AND
ECONOMIC ANALYSIS



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ACIL ALLEN ASSESSMENT OF SLAM COMPLEX PRELIMINARY MARKET FINANCIAL AND ECONOMIC ANALYSIS FEBRUARY 2019

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EXECUTIVE SUMMARY

The Northern Territory Department of Trade, Business and Innovation (DTBI) commissioned ACIL Allen Consulting Pty Ltd (ACIL Allen) to undertake market, financial and economic analysis of a proposed Ship Lift and Marine Industries (SLAMI) complex in the East Arm precinct of Darwin Harbour. This report presents the results of the analysis.

The SLAMI complex ACIL Allen was asked to assess is centred on a synchrolift, and self-propelled modular transporter (SPMT) capable of handling vessels with a displacement up to 4,000 tonnes (light, not fully loaded), and dimensions up to a length of 85 metres, beam of 24 metres and draught of 6 metres. The complex also includes two wet berths and hardstand areas for maintenance and repair of vessels, and other landside and waterside infrastructure, including land reclamation, dredging, navigational aids, and shore protection features.

ACIL Allen was also asked to provide high-level views on the scale and configuration of the SLAMI infrastructure. The context was DTBI's advice that elements of the SLAMI facilities may be modified in response to outcomes of various studies, including the analysis in this report.

The analysis has indicated a wide range of possible outcomes. It reflects the considerable uncertainty inherent in the market for services of the SLAMI facilities, and significant uncertainty regarding costs. The estimated financial and economic outcomes depend critically on the assumptions underpinning the scenarios that have been formulated and modelled.

While the analysis has provided useful information regarding the likely market, financial and economic outcomes of establishment of the SLAMI complex, it has not reduced uncertainty sufficiently to be regarded as a solid basis for an investment decision by government, private sector equity investors, and debt financiers. In other words, the analysis should not be regarded as equivalent to a final, definitive or bankable feasibility study.

Market Analysis

Market analysis was based on research of publicly available material, review of documents provided by DTBI and its engineering advisers, and discussions with stakeholders. Potential users of the facilities and competing facilities were investigated. Important considerations were locational issues, facilities, and capabilities. The analysis targeted quantification of the potential market for the SLAMI complex and providers of complementary vessel repair-and-maintenance services to provide data for the financial and economic analysis.

The research was hampered by a severe lack of suitable, credible information from published and government sources. Stakeholder consultations yielded information that fell far short of expectations. Stakeholders were unwilling to engage with ACIL Allen's team and/or provide useful information, because of contractual requirements or concerns that their interests as potential users or competitors of the SLAMI facilities would be compromised.

A picture of the relevant market had to be pieced together forensically from various sources. The market analysis involved very considerable work and painstaking research. Nevertheless, much more time and resources would have been required to achieve results that could have been presented with a high degree of confidence in their accuracy. ACIL Allen did not have enough time and assignment budget to pursue all stakeholders relentlessly, and to wait for, and continue to interact with stakeholders to obtain the necessary information.

To deal with considerable uncertainty regarding the market, ACIL Allen formulated low, base (middle of the road) and high scenarios to provide a view of the plausible range of market outcomes. These scenarios were based on assumptions informed by the market research and consultations. In addition, in the high scenario, it was assumed that the synchrolift and SPMT could handle vessels about 40 percent larger than the originally proposed in order to test the effect of larger facilities on the size of the market for the services of the SLAMI complex. Market estimates were derived by vessel category for each scenario. A summary of results is provided in **Table 1.1**.

TABLE 1.1 MARKET FOR SERVICES OF SLAMI FACILITIES

Vessel Category and Operator	Conceivable Market – Vessels	Potential Market – Vessels	Annual Dry Dockings – Low	Annual Dry Dockings - Base	Annual Dry Dockings - High
Patrol vessels, ANZAC frigates, landing craft – RAN	30	21	3	4.5	7
Patrol vessels – Aust. Border Force	10	10	0	3	3.5
Foreign navies	Uncertain, min. 2	4	0	1	1.5
Offshore petroleum support – Solstad, DOF, MMA, Swire, Guardian, Bhagwan, Siem, Polarcus, etc	78	48	1	4	12
Towage tugs – Svitzer, Westug, Rivotow, Kotug, Riverwijs, Bhagwan	64	39	5	6.5	8
Coastal shipping – Sea Swift, Bhagwan, Barge Express, Shorebarge	34	24	4	12	17
Pearling – Paspaley, Ellies, Willie Ck., Clipper Bay, Cygnet Bay, etc	71	22	9	11	14
Fishing/prawning – Austfish, Tasmanian Seafoods, Austral, etc	242	93	25	47	62
Research – AIMS	2	2	0	0.5	1
Other Work Boats – Bhagwan, Guardian, etc	47	27	2.5	6	9.5

Vessel Category and Operator	Conceivable Market – Vessels	Potential Market – Vessels	Annual Dry Dockings – Low	Annual Dry Dockings - Base	Annual Dry Dockings - High
Recreational Vessels – Kimberley Expeditions, Darwin Harbour Cruises, Discovery One, private owners, etc	484	50	7	14	20
Total	1062+	340	56.5	109.5	155.5

SOURCE: ACIL ALLEN RESEARCH AND ANALYSIS

Vessel and lift estimates provided bases for estimating SLAMI revenues in the financial analysis. These estimates were inputs to the financial analysis, and ultimately the economic analysis.

Vessel and lift estimates also provided a basis for estimating additional repair-and-maintenance expenditures (out of water and in water) in Darwin resulting from provision of the SLAMI facilities. The expenditures exclude outlays on services of the SLAMI facilities. The results are shown in **Table 1.2**. These results were inputs to the economic analysis.

TABLE 1.2 INDICATIVE ADDITIONAL ANNUAL VESSEL REPAIR-AND-MAINTENANCE EXPENDITURES IN DARWIN

Vessel Category	Dry-Docking (DD) R&M	In-Water Only (IW) R&M	Dry-Docking (DD) R&M	In-Water Only (IW) R&M	Dry-Docking (DD) R&M	In-Water Only (IW) R&M
	Low Scenario	Low Scenario	Base Scenario	Base Scenario	High Scenario	High Scenario
	\$ m	\$ m	\$ m	\$ m	\$ m	\$ m
Navy	11.3	0	26.2	22.1	50	38
Aust. Border Force	0	0	7.5	7.5	10.5	10
Offshore Petroleum Support	2.1	2	10	8.5	36	28.2
Tugs	4	4	6.5	6.3	9.6	9
Coastal Shipping	3.75	0.8	18.4	4	32.6	7
Pearling	1.2	0.1	2.5	0.4	4.8	0.8
Fishing/Prawning	1.4	0.4	7.25	1.4	13.2	2.8
Research	0	0	0.2	0	0.5	0.1
Other Workboats	0	0	0.4	0	1.75	0.2
Recreation	0.6	0.4	2.5	1.1	4.8	2.1
Sub-Total	24.4	7.7	81.5	51.3	154.8	107.2
Total	Low R&M →	32.1	Base R&M →	132.8	High R&M →	262

SOURCE: ACIL ALLEN ANALYSIS

Financial Assessment

This section presents the underlying assumptions and results of financial analysis of the proposed SLAMI facilities in Darwin.

The analysis considered two separate sites for the proposed facility: one at the originally-proposed Northern Ship Support Pty Ltd (NSS) site, and an alternative site. The analysis includes three separate scenarios, covering low, base and high vessel demand outcomes.

The analysis was conducted in real terms for a period of 22 years. Construction of the facility was expected to take approximately two years, after which 20 years of operations are included.

The Northern Territory Government has pledged to contribute \$100 million towards the construction of the SLAMI facility. ACIL Allen has been directed to treat this contribution as a grant rather than a

loan. In the analysis, the grant is used to partially offset the upfront capital expenditures of the project. ACIL Allen has assumed that the remaining capital requirements are funded 30 per cent by debt and 70 per cent by equity.

A 20 per cent contingency has been added to the initial capital expenditure (capex) estimates to factor in unforeseen up-front project risks. For the NSS site, projected capital expenditure (including the contingency) required to build the facility was estimated by the Government's engineering advisers to be \$191.9 million, while for the alternative site it was \$211.0 million. The additional capital expenditure required for the alternative site was attributable mainly to higher land reclamation costs associated with the alternative site.

A further premium of 20 per cent was added to capital expenditure under the high scenario to allow for the fact that, under the high scenario, a ship lift with considerably larger capacity was assumed to be constructed. The revised dimensions are: length 120 metres, beam 24 metres, draught 8.5 metres and lightship displacement of 5,500 tonnes. The larger facilities would be able to lift and transfer larger defence vessels and offshore petroleum support vessels with dimensions well outside the specifications of the currently proposed facility.

Under the high scenario, total capex (including the contingency) has been assumed to be \$230.3 million for the NSS site and \$253.2 million for the alternative site. The indicative premium for the larger facilities requires verification by engineers.

A weighted average cost of capital (WACC) was estimated in accordance with the widely-used Capital Asset Pricing Model. An equity risk premium of 6 per cent and a beta of 1.34 have been assumed for the calculation. The cost of debt was determined using the spread between a BBB-rated non-financial corporate bond and the 10-year Australian Government bond rate. As at December 2018, this spread stood at 231.3 basis points, which was added to the risk-free rate to obtain the cost of debt of 4.64 per cent. The resulting real pre-tax WACC applied under the low, base and high scenarios was 6.15 per cent per annum.

The financial analysis used vessel lift estimates derived from the market analysis. The estimated lifts have been assumed to be the same for the two sites, because of unavailability of information that might indicate more lifts at the alternative site than the NSS site.

It has been assumed that the SLAMI facilities collect revenue using the same pricing model as the common-user facility in the Australian Marine Complex (AMC) at Henderson in Western Australia. The main sources of revenue of the SLAMI facility are:

- daily charges for lifting (and lowering) the vessel from the water
- daily charges for the use of the wet berths
- weekly charges for the use of the dry-dock or hard-stand area
- charges for transferring the vessel between the ship lift and the hardstand that include
 - trailer lines
 - self-propelled modular transporter (SPMT) set-up charges
 - SPMT axle lines
 - SPMT power packs.

Under the low scenario, revenue of the SLAMI complex has been projected to be \$7.08 million in the first year of operation, before rising slowly to \$7.87 million in 2040. This is equivalent to an average annual rate of growth of 0.56 per cent per annum over the operating period.

Under the base scenario, operating revenue is projected to be \$11.32 million in the first year of operation before increasing steadily to \$14.12 million in 2040, equivalent to an average annual growth rate of 1.17 per cent.

Under the high scenario, operating revenue is projected to be \$16.51 million in the first year of operation before increasing steadily to \$20.77 million in 2040, equivalent to an average annual growth rate of 1.22 per cent.

The main operating costs associated with the operation of the ship lift are:

- wages and salaries
- maintenance and sustaining capex of onshore and offshore structures including:

- dredging
- navigational aids
- general hardstand
- land reclamation
- site establishment and site roads
- transfer area and heavy hardstand
- utilities
- washdown bay
- workshops and offices
- PVC covered area
- SPMTs
- synchrolift
- interest charges associated with the debt facility
- electricity charges
- SPMT fuel costs.

The nett present values (NPVs) of the separate scenarios and proposed sites are shown below.

For the NSS site, with a capital cost contingency of 20 per cent:

- under the base scenario, the project produces a positive NPV of \$12.9 million
- under the low scenario, the project produces a negative NPV of -\$33.6 million
- under the high case, the project produces a positive NPV of \$25.7 million.

For the alternative site, with a capital cost contingency of 20 per cent:

- under the base scenario, the project produces a small negative NPV of -\$6.4 million
- under the low scenario, the project produces a negative NPV of -\$52.9 million
- under the high scenario, the project produces a positive NPV of \$2.5 million.

The results show that based on the inputs and assumptions made as part of the financial analysis, the SLAMI facilities would be able to generate returns in excess of the required cost of capital for both the base case and high case for the NSS site. For the alternative site, returns in excess of the required cost of capital would be exceeded only in the high scenario. This is due to the alternative site requiring additional capital expenditures without any additional offsetting revenues.

A key contributor to the positive NPVs obtained is the Government contribution of \$100 million to the project as a tied grant. Without this grant, all scenarios would generate negative NPVs over the 22-year time horizon.

Social Benefit-Cost Analysis

A social benefit-cost analysis (SBCA) of the SLAMI initiative has been undertaken. SBCA is an analytical framework for assessing the economic effects of a disturbance or shock on the efficiency of resource allocation in an economy (economic efficiency). An economic disturbance could include a policy change or initiative, a new project, or some other activity.

This framework considers gains and losses to all affected parties. These include social gains and losses that may not be apparent in financial analysis or a business case. The financial analysis in this report estimated net benefits to the owner of the proposed SLAMI facilities. In addition to potential financial outcomes for the owner, the SBCA has considered net benefits to a wider range of entities. For example, the SBCA includes the additional direct economic benefits to vessel operators that use the facilities in terms of lower fuel and crew costs, and the environmental benefits associated with the lower transport distance of vessels. It also includes the full capital cost of the SLAMI complex, in contrast to the financial analysis, which included only the capital cost net of a grant from the Northern Territory Government.

The anticipated future flows of costs and benefits of the SLAMI complex in low, base and high scenarios have been discounted and then aggregated to arrive at a 'present value' of the project. The discounting procedure has implicitly included the opportunity cost of capital in the calculation.

Four real discount rates were applied: 2.5 per cent, 4 per cent, 7 per cent and 10 per cent. SBCA guidelines issued by governments in Australia typically have proposed a central real rate of 7 per cent and sensitivity analysis using higher and lower rates. This report has explained that a real rate of 4 per cent is more appropriate.

The NPV is a dollar estimate of how much would be gained, or lost, by going ahead with the SLAMI initiative. A positive NPV means the initiative has economic merit – it improves the efficiency of resource allocation/use in the economy. A negative NPV indicates that the initiative is economically unattractive.

An excess of discounted benefits over discounted costs in a SBCA does not imply that everyone in the relevant economy has been made better off. It simply indicates that potentially everyone could be made better off. The government still would have to decide how much weight to place on the distributional consequences (who are the winners and losers) of an initiative or other economic disturbance. It would also have to decide on the extent to which losers should be compensated, and how this should be accomplished.

The SBCA undertaken to assess the proposed SLAMI complex (based on capital cost estimates for the NSS site with a 20 per cent contingency allowance) has indicated net benefits (positive NPVs) to the Northern Territory in the base and high scenarios with all four discount rates. In the low scenario, net costs (negative NPVs) have been indicated for each of the discount rates. Results of the SBCA are summarised in **Table 1.3**.

TABLE 1.3 TOTAL ESTIMATED NET BENEFITS TO NORTHERN TERRITORY, NSS SITE WITH 20 PER CENT CAPITAL COST CONTINGENCY ALLOWANCE

	Undiscounted	Discounted			
	\$A million	\$A million			
		NPV 2.5%	NPV 4%	NPV 7%	NPV 10%
Low scenario	56.0	(1.8)	(26.3)	(60.1)	(80.6)
Base scenario	908.1	625.0	501.9	325.2	209.8
High scenario	1,970.5	1,397.6	1,147.8	788.1	551.7

SOURCE: ACIL ALLEN ESTIMATES

Using a real discount rate of 4 per cent per annum, estimated discounted net benefits (NPV) to the Northern Territory over 22 years starting in 2019 range between minus \$26.3 million and plus \$1,147.8 million. The base scenario NPV from a Northern Territory economic perspective has been estimated to be \$501.9 million.

Economic Impact Assessment

Computable general equilibrium (CGE) economic modelling of the SLAMI initiative was undertaken to complement and extend the SBCA. This modelling relied on outputs of the market and financial analysis that were also used in the SBCA.

In general, the changes in real economic output under each scenario occur broadly in line with the projected value of production of services by the SLAMI complex. This is not surprising as the operations phase is where the key benefits of the project will be realised for the Northern Territory.

However, the additional construction activity associated with the project has a noticeable effect on the real income of residents in the Northern Territory, as it would increase demand for labour and goods and services, and this boosts local incomes.

Over the period 2021 to 2040, the SLAMI project is projected to increase the **real economic output** of the Northern Territory, represented by Gross Territory Product (GTP), under the:

- *Low Scenario* by a cumulative total of \$321 million relative to the business-as-usual or reference case (with a net present value of \$215 million, using a 4 per cent real discount rate)
- *Base Scenario* by a cumulative total of \$1,105 million relative to the reference case (with a net present value of \$719 million, using a 4 per cent real discount rate)

- *High Scenario* by a cumulative total of \$2,272 million relative to the reference case (with a net present value of \$1,473 million, using a 4 per cent real discount rate).

To place the projected changes in economic output estimates in perspective, the discounted present value (using a 4 per cent discount rate) under the low, base and high scenarios is equivalent to approximately 0.8, 2.6 and 5.4 per cent of the Northern Territory's current GTP, respectively.

The corresponding increases in **real incomes** have been estimated to be:

- *Low Scenario*, a cumulative total of \$519 million relative to the Reference Case (with a net present value of \$352 million, using a 4 per cent real discount rate)
- *Base Scenario*, a cumulative total of \$1,612 million relative to the Reference Case (with a net present value of \$1,057 million, using a 4 per cent real discount rate)
- *High Scenario*, a cumulative total of \$3,089 million relative to the Reference Case (with a net present value of \$2,011 million, using a 4 per cent real discount rate).

To place these projected changes in income in perspective, the discounted present values (using a 4 per cent discount rate) are equivalent to a one-off increase in the average real income of all current residents of Northern Territory residents under the:

- *Low Scenario* by approximately \$1,400 per person
- *Base Scenario* by approximately \$4,300 per person
- *High Scenario* by approximately \$8,100 per person.

In terms of **employment**, it is projected that, over the period 2019 to 2040, the SLAMI project will increase full-time equivalent (FTE) direct and indirect employment in the Northern Territory under the:

- *Low Scenario* by 1,251 employee years¹ (or approximately 57 FTE jobs a year)
- *Base Scenario* by 4,110 employee years (or approximately 187 FTE jobs a year)
- *High Scenario* by 7,903 employee years (or approximately 359 FTE jobs a year).

The greatest increases in net employment are projected to occur in the Technicians & Trades and Professionals categories, reflecting the nature of the employment generated by the facilities. Other jobs are stimulated in response to consumer's consumption patterns and their higher incomes.

Refining Scale and Configuration of SLAMI Facilities

ACIL Allen has been requested to provide high-level views on the scale and configuration of the SLAMI facilities, on the basis of its market analysis. That analysis has indicated that the synchrolift would be too small for a high proportion of the anchor handling tug supply vessels, platform supply vessels and multi-purpose support vessels providing services to the petroleum exploration and extraction sector off the north-western Australian coast. Also, it would not be able to accommodate the Royal Australian Navy's ANZAC-class frigates and the largest Australian Border Force vessel. In addition, the market and financial analysis suggested that the SLAMI facilities included too little wet-berth space relative to estimates of demand for the base and high cases.

Provision of more and larger wet berths and a higher capacity synchrolift and SPMT package are highly complementary, particularly if wet-berth space is already scarce, as suggested by several stakeholders. An increase in capacity of the synchrolift would attract more vessels, increasing demand for wet berths. An increase in the number of wet berths and the size of some wet berths would facilitate attraction of more vessels that would not be deterred by a scarcity of wet berths.

The financial and economic viability of larger SLAMI facilities has been analysed. The increased capacity analysed by ACIL Allen included two wet berths additional to the two adjacent to the synchrolift, plus a larger synchrolift and SPMT with the following maximum limiting vessel characteristics:

- | | |
|------------------------|--------------|
| – docking displacement | 5,500 tonnes |
| – length | 120 metres |
| – beam | 24 metres |
| – draught | 8.5 metres. |

¹ An employee year is equivalent to the employment of 1 FTE person for one year. Alternatively, it can represent employment of, say, two full-time people for half a year each, or one 0.5 FTE person for two years.

The revised specifications were based on market analysis, not on an optimisation exercise. The latter would require market, financial, and economic analysis and costings of a range of SLAMI specifications on an iterative, interactive basis involving ACIL Allen's economists and specialist engineering advisers. It would be beyond the scope of the "scope of requirement" for the assignment.

Nevertheless, more limited analysis may not detract greatly from the value of the insights obtainable by optimisation analysis, because it has been observed that incremental changes above and below the revised specifications selected for testing would result in only small absolute changes in numbers of vessels that could be accommodated by the SLAMI complex.

The analysis has found that if the larger synchrolift and SPMT and two extra wet berths could be provided for extra outlays with a present value less than \$66.8 million, provision of the extra capacity would be financially justifiable from the perspective of the owner of the SLAMI complex. ACIL Allen has not been provided with estimated capital costs of any expansion of the facilities.

An expansion of the facilities as indicated above would be more attractive from the perspective of the Northern Territory economy, than from the narrow financial perspective of the owner of facilities (assuming the owner funds the expansion). This is because the amount of activity induced by provision of the SLAMI complex should be increased by their expansion.

The analysis has shown that the increase in the SLAMI complex's market resulting from the illustrative increase in capacity of the facilities would add about \$36.2 million per year to vessel repair-and-maintenance expenditures in Darwin (excluding SLAMI wet berth charges). At SBCA real discount rates of 4 per cent and 7 per cent, these expenditures would have present (2019) values of \$453.4 million and \$383.5 million, respectively. After deducting estimated opportunity costs, residual economic benefits of expansion of the SLAMI facilities have present value of \$190.4 million and \$161 million, at real discount rates of 4 per cent and 7 per cent, respectively.

To this should be added the present value of extra SLAMI cash flows resulting from expansion of the facilities. Using real discount rates of 4 per cent and 7 per cent, the present value of extra SLAMI operating cash flows is estimated to be \$83.5 million and \$61.1 million, respectively. The combined economic gains associated with extra repair-and-maintenance activity in Darwin amount to \$273.9 million and \$222 million, at real discount rates of 4 per cent and 7 per cent, respectively. This estimate does not include some relatively small benefits from reduction of greenhouse-gas emissions. Benefits to owners and operators of large (defence and offshore petroleum support) vessels that could be accommodated only with the expanded facilities are not relevant because those benefits would accrue largely to people who are not domiciled in the Northern Territory.

The package of operating benefits needs to be compared with the present value of the capital cost of the expansion of the SLAMI complex. The latter needs to be deducted from the former to arrive at a net present value.

The analysis has suggested that there is a solid economic case for expansion of the capacity of the synchrolift and the SPMT by 40 percent, and doubling of the number of wet berths from two to four. There would also be a financial case for the expansion if the present value of the extra capital cost borne by the developer is less than \$66.8 million. However, as explained previously, the analysis has not reduced uncertainty sufficiently to be regarded as a solid basis for an investment decision by government, private sector equity investors, and debt financiers, because of lack of suitable, available market and cost information.

Policy Considerations

The SLAMI project is not financially viable in the low scenario, even with the proposed government contribution of \$100 million. It is not financially viable under any of the scenarios considered without a government grant. It would require a much larger government grant to be financially viable in the low case, but could be financially viable with a significantly smaller grant in the base and high scenarios.

The SBCA undertaken to assess the proposed SLAMI complex has indicated that the SLAMI project would be economically viable, providing positive NPVs to the Northern Territory, in the base and high

scenarios. In the low scenario, the NPV is negative. These results prevailed regardless of the real discount rate applied in the range of 2.5 per cent to 10 per cent per annum.

These results from the financial analysis and the SBCA highlight the importance of the substantial uncertainties underlying the market analysis resulting from a dearth of high-quality information. These uncertainties have been reflected in the widely differing market outcomes indicated in the low, base and high scenarios.

The most important threat to expansion of vessel repair-and-maintenance activities in Darwin is a possible gap in quality and scope of services compared to the Henderson and Singapore-Batam hubs. A SLAMI capability shortfall would deter some vessel operators. It would also increase the difficulty of attracting complementary service providers to set up or expand their presence in Darwin. This could further deter vessel operators.

A temporary gap in respect of complementary services may not be self-correcting. If the gap deters vessel operators in the short term, it would be more difficult to attract service providers to close the gap later.

These network interdependencies could provide a case for government action. Intervention could take two forms.

First, the Northern Territory Government could ensure the capacity of the facilities is increased, provided the economic benefits exceed the cost. It has been found that economic benefits exceed costs.

Second, the Government could seek to attract complementary service providers through a concerted marketing campaign, and could target closure of skills gaps. This will help address the impediment of network interdependencies, and thereby support investment in larger SLAMI facilities.



1

INTRODUCTION

The Northern Territory Department of Trade, Business and Innovation commissioned ACIL Allen to undertake market, financial and economic analysis of a proposed Ship Lift and Marine Industries (SLAMI) complex in the East Arm precinct of Darwin Harbour. This report presents the results of the analysis undertaken by ACIL Allen.

The site of the complex is to the east of the East Arm wharf, at the western end of a Marine Industry Park (covering 150 hectares of waterfront land) being developed by the Land Development Corporation. The site of the SLAMI complex is approximately 4 hectares above high astronomical tide within four parcels of land (covering nearly 10.7 hectares) held by the Paspaley Group under freehold, Crown term-lease, and Crown perpetual-lease titles.

The centrepieces of the SLAMI complex are a synchrolift, and land transport/transfer equipment (a self-propelled modular transporter) capable of handling vessels with a displacement up to 4,000 tonnes (light, not fully loaded), and dimensions up to a length of 85 metres, beam of 24 metres and draught of 6 metres. The SLAMI complex also includes wet berths and hardstand areas for maintenance and repair of vessels, and other landside and waterside infrastructure, including navigational aids, dredging, land reclamation, and shore protection features. Specific aspects of the SLAMI facilities may be modified in response to outcomes of various studies, including the analysis in this report.

The Northern Territory Government intends and expects that provision of the SLAMI facilities will induce and support further development of Darwin as a service centre for marine industries. To facilitate development of the SLAMI complex, the Northern Territory Government has advised that it is prepared to invest \$100 million in the complex through a tied grant to the entity that develops the project.

In September 2017, the Northern Territory Government announced that it had entered into an agreement with the Paspaley Group to advance the project through activities of a wholly-owned Paspaley subsidiary, Northern Ship Support Pty Ltd (NSS). Various studies were commissioned by NSS to complete front-end engineering design for the SLAMI project. This work, which was completed in 2018, has provided specifications and capital cost estimates for the SLAMI facilities. It did not provide operating cost estimates or bases for calculating operating costs for the SLAMI facilities.

Previous market analysis undertaken for the Land Development Corporation in 2012 and 2016 provided a broad overview of the market for the Marine Industry Park. This previous work provided some useful information, but it did not focus intensively on the market for ship-lift and related services, and it also needed to be updated.

Similarly, previous financial and economic analysis related to the Marine Industry Park, not specifically to the SLAMI concept. Deloitte Access Economics (2015, 2016) avoided the issue of inadequate

market information by assuming that the Marine Industry Park would be fully utilised, even though market sounding had indicated that interest was low.

The analysis in this report has provided useful information regarding the likely financial and economic outcomes of establishment of the SLAMI complex. However, it has not reduced uncertainty sufficiently to be regarded as a solid basis for an investment decision by government, private sector equity investors, and debt financiers. In other words, the analysis should not be regarded as equivalent to a final, definitive or bankable feasibility study.

The market, financial and economic analysis components of the assignment were severely handicapped by lack of suitable, credible information from published and government sources. The problem was greatly exacerbated by the unwillingness of stakeholders to engage with ACIL Allen's team and/or provide useful information, because of contractual requirements or concerns that their interests as potential users or competitors of the SLAMI facilities would be compromised. The inadequacy of information on the potential market for vessel repair-and-maintenance services in the context of establishment of the SLAMI complex was particularly troublesome.

A picture of the relevant market had to be pieced together forensically from various sources. The market analysis undertaken by ACIL Allen involved very considerable work and painstaking research. Nevertheless, much more time and resources would have been required to achieve results that could have been presented with a high degree of confidence in their accuracy. ACIL Allen did not have enough time and budget to pursue all stakeholders relentlessly, and to wait for, and continue to interact with stakeholders to obtain the necessary information.

In addition, higher quality market, financial and economic results would have required an iterative process of adjustment of specifications and estimated costs of the facilities, revision of market and financial estimates of the SLAMI business, refinement of the government contribution, and then further adjustments to these interdependent determinants of performance from financial and economic perspectives. Arrangements for such an approach were not available for this assignment.

Chapter 2 has presented a detailed account of **market analysis** undertaken by ACIL Allen, and results derived from this analysis. This work provided quantitative information for use in financial and economic analysis. Estimates of potential use of the SLAMI facilities and flow on work to complementary service providers have been provided for three scenarios: low, base and high. The market analysis chapter has also highlighted issues relating to the capacity of the SLAMI facilities that require further consideration by government.

Chapter 3 has presented the approach to, and results of **financial analysis** undertaken by ACIL Allen. The financial assessment drew on results of the market analysis. The analysis and results have covered low, base, and high scenarios. In addition, analytical results for two sites for the synchrolift, and sensitivity analysis in respect of the weighted average cost of capital and the potential Northern Territory Government contribution have been provided in chapter 3.

Chapter 4 has provided information on a **social benefit-cost analysis** (SBCA) of the proposed SLAMI facilities. It has assessed the viability of the complex from an economic perspective. This analysis used material generated by the market review and the financial analysis of the project. It has covered low, base and high scenarios as for the market and financial analysis, but has covered a wider range of benefits and costs than those relevant to a private sector owner of the facilities. The focus has been the Northern Territory and Australian communities.

Chapter 5 covers an **assessment of the broad economic impact** of the SLAMI complex using computable general equilibrium (CGE) economic modelling. It covers low, base and high scenarios. The CGE analysis uses information drawn from the SBCA in chapter 4 and ultimately from the market analysis in chapter 2 and the financial analysis in chapter 3.

Both SBCA and CGE analysis are tools for investigating how an economic shock such as a new project or a policy initiative affects the efficiency of allocation/use of resources in the economy. The underlying economic concepts are consistent between the techniques. However, the techniques overlap only partly. Together, they provide a wider range of economic insights than each does separately.



2.1 SLAMI Facilities

The proposed SLAMI facilities will comprise a ship lift, vessel transfer equipment, wet berths and hardstand areas for maintenance and repair of vessels, and other landside and waterside infrastructure, including navigational aids, dredging, land reclamation, and shore protection investments. The SLAMI facilities are intended and expected to induce and support further development of Darwin as a service centre for marine industries.

Specific aspects of the SLAMI facilities may be modified in response to outcomes of various studies. However, the current package has the following key elements (SMEC Australia, 2018).

2.1.1 Ship Lift

The centrepiece of the SLAMI project will be a ship lift taking the form of a mechanical lift dock or synchrolift (or syncrolift). It is currently planned that the maximum limiting vessel characteristics for the ship lift will be (SMEC Australia, 2018):

- docking displacement 4,000 tonnes
- length 85 metres
- beam 24 metres
- draught 6 metres.

According to SMEC Australia (2018), the synchrolift's maximum distributed load is to be of the order of 70 tonnes/metre. This allows for the weight of blocking, trestles and a self-propelled modular transporter, as well as a vessel of 4,000 tonnes displacement.

The critical constraints on expansion of the synchrolift are the initial width, depth, and lifting capacity (tonnes per metre). Width and depth cannot be increased in later stages of development without major disruption and capital expenditure. Lifting capacity desirably should be determined and designed up front, but upgrades are possible with some operational disruption (Mott MacDonald, 2018).

The length of the platform can be increased at any time, but there would probably be some operational disruption, particularly when the platform extension is being installed. Also, construction equipment would take up some space, which may limit work on vessels in water and on land. However, the length of platforms has in some cases been increased during the first few years of operation. For example, the platform of a synchrolift operated by ST Marine in Singapore was increased from 60 metres to 90 metres and then to 110 metres (Mott MacDonald, 2018).

Several stakeholders consulted by ACIL Allen argued that the capacity of the mechanical lift dock was inadequate for two reasons. First, it was too small for some vessels in targeted market segments. Second, the capacity issue is likely to be exacerbated by a trend to larger vessels in targeted market segments.

2.1.2 Vessel Transfer System

The currently preferred equipment for transferring vessels between the ship lift and landside maintenance sites is a self-propelled modular transporter (SPMT). This equipment will be able to move vessels that are within the maximum limiting characteristics for the ship lift.

2.1.3 Hardstand

The current intention is that the minimum hardstand area will be sufficiently large to replace Pearl Marine Engineering's operations at Frances Bay (6 hectares including 6 dry berths) and to provide adequate room for common users, supporting facilities, and accommodation and movement of the SPMT and other vehicles. Dry berthing is expected to account for at least 50 per cent of the hardstand area and to accommodate various types and sizes of vessels. At least two bays are to be large enough to accommodate vessels up to the maximum limiting characteristics of the ship lift (SMEC, 2018).

Allowance is to be made for accommodation of larger vessels and expansion of the hardstand area in the future.

2.1.4 Covered Work Area

The SLAMI facilities described in the SLAMI FEED Study: Basis of Design did not include a covered work area for drydocked vessels. Mott MacDonald has advised that it was always intended to provide a covered work area, but during value engineering in FEED process, it was identified as a cost-saving item. However, investigations are underway in relation to a covered work area within the area set aside for hardstand. The concept under investigation is a domed structure comprising a truss system and PVC cover. It would be 80 metres long and 40 metres wide, covering an area of 3,200 square metres. It would be 31 metres high. The structure would be built to withstand winds up to 275 km/hour, with potential of being upgraded to survive winds up to 330 km/hour. This concept is a variant of structures deployed successfully in the Pilbara.

The dome structure would have a shorter lifespan than a conventional work building. However, the former provides greater flexibility in the event that dimensional requirements change in future. It is perceived to be a highly cost-effective alternative to provision of a large conventional work building.

The dome structure would facilitate continuation of work during rain and heat events. However, it would not be climate-controlled to deal with the humidity issue that interferes with painting. However, Pearl Marine Engineering has claimed that it can paint during 80 per cent of the wet season without a covered area. Bespoke climate-controlled environments could be and have been created as needed to deal with humidity that would disrupt work.

Several potential users of the SLAMI facilities – both vessel operators and service providers – stressed the importance of providing a covered work area, and climate-controlled areas for painting.

2.1.5 Wet Berths

Wet berths for in-water maintenance and provisioning activities are to be provided adjacent to the ship lift finger pier structures. The berth pockets are to be sufficiently long, wide and deep to be able to accommodate vessels that can be handled by the ship lift and SPMT.

Various stakeholders consulted by ACIL Allen claimed that the SLAMI design provided too little quay line for the quantum and relatively high proportion of repair and maintenance work that can be undertaken in-water. Again, the quay-line issue is likely to be exacerbated by a trend towards larger vessels in targeted market segments.

2.1.6 Supporting Facilities

Additional landside area is to be available for buildings and other enclosures for workshops, blasting and painting, garaging and maintaining the SPMT, controlling the ship lift, administration activity, and car parking.

2.1.7 Dredging

It is planned to ensure dredge levels are sufficient to allow considerable flexibility in timing of marine access to the SLAMI facilities by targeted vessels and adequate to accommodate those vessels in wet berths at all times.

2.2 Vessel Types Targeted by SLAMI

The current SLAMI design features were selected to accommodate a range of vessels that currently operate in the vicinity of northern Australia. Specifically-targeted vessels include (SMEC Australia, 2018):

- offshore oil and gas exploration, construction, and extraction support vessels
- tugs
- barges and landing craft supporting remote coastal (including island) settlements
- pearling vessels
- fishing/prawning boats
- navigation/maritime support vessels
- research vessels
- recreational craft
- Australian navy patrol vessels, including future patrol vessels (Lürssen OPV 80)
- foreign navy vessels of similar size to targeted Australian navy vessels
- Australian Border Force patrol vessels.

2.3 Business Model for SLAMI

The Northern Territory Government intends to provide a grant of \$100 million to facilitate establishment of the SLAMI facilities. The business model for SLAMI has not been settled.

During market sounding discussions, potential providers of complementary services stressed that their interest in doing so would depend critically on the business model adopted. Some parties expressed concern that the government's partner in the SLAMI facilities might be able to control access in a way that makes it difficult for providers of services complementary to SLAMI's services to compete with complementary services offered by the government's partner. It was pointed out that the business model adopted by the Northern Territory Government must allow other service providers to operate profitably. It must also allow vessel owners to bring in their own personnel or preferred contractors to perform repair and maintenance activities.

Dr Sam Buchanan, the Paspaley Group's Chief Operating Officer, expressed the view that the SLAMI complex should operate like the common-user facility operated by the Western Australian Government at Henderson, south of Fremantle in Western Australia. He argued that the cost of using the facilities had to be kept to a minimum and the SLAMI operator should not provide complementary services. This would induce and make room for provision of complementary services by other entities with appropriate skills. This would also allow vessel owners to undertake or manage repair and maintenance work themselves.

2.4 Darwin Facilities Potentially to be Replaced by SLAMI

There are two synchrolifts in Darwin that potentially could be replaced by the proposed new synchrolift at East Arm. However, there is a possibility that at least one could remain or be replaced by another new facility and become a competitor to SLAMI.

2.4.1 Synchrolift at HMAS Coonawarra

HMAS Coonawarra in Larrakeyah is the home port for the Royal Australian Navy's Armadale-class patrol boats. The base includes a small synchrolift with a capacity of 750 tonnes. It can handle vessels 42 metres long, 14 metres wide, and with a draught of 2 metres at any tide. It is used to dry dock Armadale-class patrol boats operated by the Navy (Royal Australian Navy, 2018b).

The shiplift is too small to accommodate the Cape-class patrol vessels operated by the Australian Border Force and Royal Australian Navy. It will not be able to handle the Navy's new Lürssen's SEA 1180 Phase 1 OPV 80 offshore patrol vessels, which are larger than the Navy's Armadale-class patrol vessels and the Cape-class patrol boats (Mott MacDonald, 2016a).

It is understood that the synchrolift at HMAS Coonawarra is to be de-commissioned and removed to free up space to upgrade the wharf and berths to accommodate the Navy's new, larger offshore patrol vessels when they go into service. After the ship-lift is decommissioned, ship-lifting services required for the Armadale-class patrol boats and their replacements (OPV 80s) will need to be obtained elsewhere. The Larrakeyah synchrolift does not provide services to private-sector vessels.

2.4.2 Pearl Marine Engineering's Synchrolift and Other Facilities, Frances Bay

Pearl Marine Engineering is a subsidiary of the Paspaley Group. It operates a marine support, ship repair and maintenance complex at Frances Bay on a 6-hectare site.

Pearl Marine Engineering developed from a shipyard (Darwin Ship Maintenance Services) established by John Holland in 1978 and acquired by the Paspaley Group in 1989. The enterprise was renamed Darwin Ship Repair and Engineering Pty Ltd and later became Pearl Marine Engineering Pty Ltd.

The Frances Bay facilities operated by Pearl Marine Engineering include a mechanical-lift dock, which has a lifting capacity of 2,028 tonnes² and a platform that is 62.75 metres long and 22.2 metres wide. The maximum distributed load is 39.9 tonnes per metre. This synchrolift is complemented by six dry berths, three wet berths, and landside fabrication, workshop and abrasive blasting and painting facilities (Mott MacDonald, 2016a; Paspaley Group, 2018; Pearl Marine Engineering, 2018). Dr Sam Buchanan, Chief Operating Officer of the Paspaley Pearls Group advised that the synchrolift's lifted weight typically did not exceed 1,200 tonnes. Over the period, 2013-2017, vessels with lifted weights in excess of 1,000 tonnes were relatively few.

FIGURE 2.1 PEARL MARINE ENGINEERING – SYNCHROLIFT AND SHIPYARD



SOURCE: [HTTP://WWW.PEARLMARINEENGINEERING.COM.AU/INDEX.ASP](http://www.pearlmarineengineering.com.au/index.asp)

Sam Buchanan described the shiplift as "quite old". According to the Historical Society of the Northern Territory (2018), it commenced operation in 1982.

² The lifting capacity mentioned in several publications is 2,550 tonnes. However, Paspaley's Sam Buchanan advised that it is 2,028 tonnes.

Pearl Marine Engineering has three wet berths and six dry-berth or hardstand bays (Paspaley Group, 2016).

Pearl Marine Engineering provides a wide range of repair, maintenance, and refit services to vessels. It has built several vessels in Darwin.

The shipyard target market includes tugs, barges, offshore support craft, pearling vessels, fishing boats, work boats and naval vessels (Paspaley Group, 2018).

The Frances Bay complex is constrained (Mott MacDonald, 2016). Paspaley Group has nominated three key impediments to growth of Pearl Marine Engineering's business. First, there is currently a lack of covered workspace. Second, it is difficult to attract staff because of inability to offer consistent work to personnel seeking long-term employment. Third, the existing and future customer base is limited by the lifting capacity and geometry of the existing ship lift at Frances Bay. Paspaley has pointed out that there is a trend to larger and heavier vessels. The chief executive of Port of Darwin made a similar observation.

The impediments to growth nominated by Paspaley Group appear to be logically-based. They also appear to be consistent with comments about the desirable capacity of facilities, the size and composition of the market, and vessel-size trends offered by other parties consulted (discussed below). However, some parties consulted also commented negatively regarding pricing and responsiveness of Pearl Marine Engineering, but did not provide information to support their assertions.

Paspaley Group has advised that it is intended that much of the activities of Pearl Marine Engineering will be transferred from its Frances Bay complex to the Marine Industry Park to take advantage of SLAMI facilities. This will depend on availability of land adjacent to the SLAMI facilities that would be suitable for provision of complementary services.

Paspaley Group has advised that if SLAMI facilities are built, there is potential for Pearl Marine Engineering to extend its capability to provide services to the scale of vessels that would use the SLAMI facilities, and to otherwise increase its range of service products.

2.5 Small Complementary or Competing Facilities in Darwin

Paspaley considered that it was likely that operators of vessels less than 150 tonnes and service providers to those vessels would access lifting facilities in small shipyards in Darwin. Some operators of smaller vessels indicated that they were using small shipyards to lift relatively small vessels. For example, Bhagwan Marine advised that it used Spot On Marine to lift vessels up to 50 tonnes displacement and 25 metres length.

Tasmanian Seafoods' NT Marine Facility, which was opened in mid-2018, has a 150-tonne travel lift. It can handle vessels up to 40 metres long, with beams up to 10.2 metres. The NT Marine Facility is at Dinah Beach/Frances Bay. It provides services to commercial and recreational vessels, as well as to Tasmanian Seafoods' fleet of three vessels that support divers who catch sea cucumbers.

Spot On Marine at East Point, Fannie Bay has a travel lift with a capacity of 50 tonnes. The travel lift can handle vessels up to 25 metres in length.

Perkins Shipping Group (Coringle Slipways) has 500-tonne and 60-tonne capacity slipways at Frances Bay.

Darwin Shipstores has a 40-tonne capacity slipway at Cullen Bay Marina.

2.6 SLAMI's Competitors in Other Australian States

2.6.1 Australian Marine Complex, Henderson, WA

The Australian Marine Complex is located in Henderson, in the Fremantle outer harbour, 13 kilometres south of Fremantle and 23 kilometres south of Perth in Western Australia. The Port of Fremantle is about 2,258 nautical miles from Darwin or 9.4 days of travel time at 10 knots (Ports.com, 2018). The Port of Fremantle is 992 nautical miles and 4.1 days at sea from the Port of Dampier.

Darwin is 1,266 nautical miles and 5.3 days of sea travel from the Port of Dampier. Port Hedland is about 100 nautical miles closer to Darwin and further from Port of Fremantle than Port of Dampier.

Civmec –Shipbuilding and Steel Fabrication

Lürssen, the selected designer and prime contractor for new, steel-hulled offshore patrol vessels for the Royal Australian Navy, will build most of these vessels at the Australian Marine Complex in facilities provided by Civmec subsidiary Forgacs Marine and Defence (the first and second will be built at Techport's Osborne complex by ASC, commencing in November 2018).

Civmec will undertake specific steel fabrication and construction tasks in respect of the offshore patrol 80 vessels to be built at its Henderson complex. Civmec will supply and process steel for all of the vessels (Civmec, 2018a). Lürssen's other partners are Saab for the situation awareness system, and L3 for communications throughout the vessels.

The original plan was to build a total of 12 vessels. However, the number may increase because the Navy recently (15 November) advised that it intended to substitute the new Lürssen-designed patrol vessels for minehunter and survey vessels and Cape-class patrol boats, as well as Armidale-class patrol vessels. Through the use of two changeable, containerised mission systems, the new patrol boats will be able to undertake the secondary roles of minehunting, unmanned aerial-system missions, and hydrographic surveys. (Royal Australian Navy, 2018d).

Civmec has commenced construction of Australia's biggest undercover shipbuilding, maintenance and fabrication hall at a cost of \$80 million at the Australian Marine Complex. First steel was erected in October 2018. The hall is scheduled to be completed in late-2019. The undercover shipbuilding, maintenance and fabrication hall will be 70 metres high and cover an area of 53,000 square metres at Civmec's waterfront site of 120,000 square metres. The hall/workshop has high, wide bays designed for the assembly of large modules. It will be able to house complete air warfare destroyers, frigates and Arafura-class offshore patrol vessels, for construction or maintenance (Civmec, 2018b).

Civmec also has plans to invest in extra wharf space, and a large ship-lift facility. It has not publicly released details of these plans.

In the meantime, Civmec envisages using infrastructure in the nearby Henderson common-user facility, such as the floating dock, load-out wharves, high-bay assembly hall and self-propelled modular transporters (see Figure 2.2 and note thereto).

Civmec has a physical presence in Darwin that potentially could complement the SLAMI facilities. This is discussed in a subsequent sub-section.

Austal – Shipbuilding and Maintenance

Austal built the Royal Australian Navy's aluminium-hulled Armidale class patrol boats (delivered 2005-2008), eight aluminium-hulled Cape Class patrol vessels (delivered 2013-2015) for the Australian Border Force, and then two for the Navy (delivered 2017) at Henderson. At the same site, Austal is currently building 21 steel-hulled Guardian-class patrol boats (Pacific Patrol Boats) commissioned by the Australian Government for Pacific island countries (19) and Timor Leste (2). The first of these vessels is to be delivered late in 2018.

Austal's Henderson complex is located on a site of nearly 8 hectares. Austal has a slipway with a capacity of 2,000 tonnes, 4 building hall bays, 4,320 square metres of pre-fabrication space, 7 gantry cranes and other craneage, and a 290-metre commissioning berth (Austal, 2018a).

Austal has been contracted to undertake hull remediation, configuration changes, and corrective and planned maintenance work on up to seven of the Armidale-class patrol boats, commencing in October 2016. Austal also provides in-service support to the Cape-class patrol boats. Austal explained during an interview that the vessels are being drydocked every two years, but Austal is working to reduce the frequency of scheduled repairs and maintenance to every five years. However, emergency repairs requiring drydocking may still be necessary occasionally.

After the Pacific Patrol Boats commence operations, Austal will provide in-service support services.

Austal has been promoting its northern Australian capability (Austal, 2018b). It has facilities in Darwin and Cairns, as well as at Henderson in Western Australia. Activities of Austal Cairns are discussed below. Austal Darwin is discussed in a subsequent sub-section.

WA Government's Common User Facility

The maritime (shipbuilding) precinct of the Australian Marine Complex includes a Common-User Facility owned by the Western Australian Government. It features (Australian Marine Complex, 2018):

- a floating dock with vessel-lifting capacity of 12,000 tonnes, length of 102.3 metres and width between sidewalls of 44 metres
- self-propelled modular transporters with transfer capacity of 4,600 tonnes
- 40-hectare laydown assembly area
- workshops and warehouse facilities
- six wharves/wet berths
 - AMC 1 maintenance and load-out berth – vessels up to 200 metres long
 - AMC 2 maintenance berth – vessels up to 60 metres long
 - AMC 3 maintenance berth – vessels up to 132 metres long
 - AMC 4 maintenance and heavy-lift berth – vessels up to 300 metres long
 - AMC 5 roll-on, roll-off and heavy lift berth
 - AMC 6 roll-on, roll-off berth.

FIGURE 2.2 AMC COMMON-USER FACILITY, HENDERSON, W.A.



Note: Image shows floating dock in centre backing on to the transfer wharf. Maintenance wet berths AMC 1, 2, and 3 (warship berthed) are located to the left of the floating dock, and AMC 4 (offshore petroleum support vessel and flat-topped barge berthed) is seaward of the floating dock. The fabrication hall is shown behind AMC 1 and 2. There is a total of 40 ha laydown and hardstand area near the fabrication hall, and peninsula adjacent to AMC 4 and floating dock and further to the right on the base of peninsula. Roll-on, roll-off wharfs AMC 5 and AMC 6 are shown on the right side of peninsula and on the base of the peninsula, respectively. BAE System's synchrolift is located to the left of AMC 1 and the fabrication hall in the common-user facility. Civmec's existing fabrication complex is located behind the common-user facility. Its new assembly hall is being built on land to the right of existing Civmec buildings and behind the AMC 6 wet berth and adjacent hardstand area near the right-hand margin of the image.

SOURCE: AUSTRALIANMARINECOMPLEX.COM.AU

BAE System's Marine Support Facility

BAE Systems has a Marine Support Facility comprising commercial ship repair and maintenance facilities and fabrication facilities within the maritime (shipbuilding) precinct of the Australian Marine Complex. The facilities include (BAE Systems, 2014; Australian Marine Complex, 2018):

- a synchrolift with maximum limiting vessel characteristics of
 - docking displacement 8,065 tonnes
 - length 150 metres
 - beam 24.5 metres
 - draught 9.4 metres
- rail transfer between the synchrolift and a 50-metre dry berth leading by rail to a rotary turntable providing rail access to a 150-metre dry berth and a 100-metre dry berth
- two other vessel dry berths
- a total of five dry-berths with aggregate linear capacity of 640 metres
- wet berths (two) of 140 metres and 110 metres with depths of 11.5 metres
- a roll-on/roll-off-load-in/load-out wharf with a capacity of 500 tonnes, allowing loading of equipment and fabricated modules and structures onto barges or heavy lift vessels.

The location of BAE Systems' synchrolift and shipyard are shown in the preceding figure. They are adjacent to the Henderson common-user facility. Vessels drydocked in the hardstand area in BAE Systems' Henderson complex are shown in the next figure.

FIGURE 2.3 BAE SYSTEM'S HENDERSON SHIPYARD – COMMERCIAL SHIP REPAIR



SOURCE: [HTTPS://WWW.BAESYSTEMS.COM/EN-AUS/OUR-COMPANY-RAU/COMMERCIAL-SOLUTIONS/COMMERCIAL-SHIP-REPAIR](https://www.baesystems.com/en-aus/our-company-rau/commercial-solutions/commercial-ship-repair)

The target market of BAE Systems' Henderson marine repair, maintenance and refit facilities includes (BAE Systems, 2014; Australian Maritime Complex, 2018):

- offshore oil and gas exploration, construction, and extraction support vessels (including infield supply vessels)
- anchor handling and towing vessels
- survey and seismic vessels
- dive support vessels
- tugs
- barges
- recreational vessels

- Royal Australian Navy's Collins-class submarines and surface vessels, including guided missile and ANZAC-class frigates (the submarines and more than half of the navy's surface fleet are stationed nearby at HMAS Stirling's Fleet Base West on Garden Island)
- border security vessels
- foreign navy vessels.

BAE Systems has claimed that it is the largest naval sustainment service provider in Australia.

Naval Ship Management

Naval Ship Management (Australia) Pty Limited (NSM) is a 50-50 joint venture between Babcock International Group PLC and UGL Pty Ltd. The latter is a subsidiary of CIMIC Group Limited.

In 2012, NSM was the successful bidder for the Group Maintenance Contract for the repair and maintenance of the Royal Australian Navy's ANZAC-class frigates. NSM was responsible for scheduling and logistical work previously undertaken by the Commonwealth. In 2016, NSM entered into a strategic partnership with BAE Systems, Saab, and the Commonwealth Government for the sustainment of the ANZAC-class frigates – the Warship Asset Management Agreement. This brought together and rationalised pre-existing contracts. The initial 18-month programme ended in December 2017. The programme was extended for 5 years from 1 January 2018.

The aggregate value of the contract for the service providers for whole-of-life support of the ANZAC-class frigates over 8 years is in excess of \$2 billion. NSM's share over the five-year period commencing on 1 January 2018 is \$400 million. To provide context, BAE's share during the same period is \$780 million.

In a market-sounding discussion, Chris Hyde of NSM explained that NSM was at a competitive disadvantage at Henderson compared to some other service providers. It pointed out that NSM's alliance partner, BAE Systems has a Marine Support Facility at Henderson that includes a large synchrolift, allowing it to price incrementally when pursuing work. BAE Systems is located close to the common-user facility. Other service providers without in-house own ship-lifting capability and not adjacent to a common-user facility with adequate ship-lift capacity are disadvantaged.

ASC

ASC Pty Ltd, which built the Collins-class submarines for the Royal Australian Navy, is now the design authority and platform systems integrator for sustainment and upgrades of those vessels. ASC has amalgamated three previous service facilities into one state-of-the-art submarine support and repair complex, known as ASC West, at the Australian Marine complex in Henderson, Western Australia.

ASC West's facilities include a large maintenance hall used for submarine work. The hall covers 2,600 square metres.

ASC West uses the floating dock, self-propelled modular transporters, and eastern wharf in the Henderson common-user facility owned by the Western Australian Government.

2.6.2 Dampier Slipway and Associated Repair and Maintenance Facilities

A marine supply base at Dampier includes a slipway and associated repair and maintenance facilities. The slipway can accommodate vessels up to a displacement of 2,500 tonnes and draught of 5.5 metres. The Toll Dampier Supply Base Port Facility Handbook did not specify the maximum length of vessels that could be accommodated by the slipway (Toll Energy and Marine Logistics, 2017). Slipway and repair and maintenance services are provided to multiple users.

The Port of Dampier is 1,267 nautical miles by sea from Port of Darwin. At a speed of 10 knots, the travel time is 5.3 days each way. The sea trip from Port of Dampier to Henderson in the Fremantle outer harbour is 992 nautical miles. The travel time is 4.1 days each way at a speed of 10 knots. Dampier and Port Hedland are about 100 nautical miles apart by sea (Ports.com, 2018). It is obvious that Toll's Dampier slipway has a locational advantage over Darwin and Henderson/Fremantle that would translate into savings in respect of fuel, wages, and foregone vessel income.

In June 2017, MMA Offshore completed the sale of the Dampier marine supply base and adjacent slipway and associated repair and maintenance facilities to Toll Energy and Marine Logistics for \$44.1

million.³ MMA continued to operate the slipway and associated repair and maintenance facilities under licence until the end of June 2018 (MMA Offshore, 2017). MMA did not exercise an option to extend the slipway licence arrangement to 30 June 2019 (MMA Offshore, 2018a).

Mott MacDonald (2016a, p. 43) reported:

“Information obtained from market soundings suggests that a significant proportion of marine services vessels deployed on the North West Shelf utilise the facility for scheduled maintenance. Feedback does however suggest that charges are high and the facility is highly utilised, resulting in limited availability when it comes to emergency/unscheduled maintenance.”

Svitzer advised during market-sounding discussions on 4 October 2018 that the Dampier facilities were now of little use. Toll will lift a vessel, but does not offer service support. Moreover, maintenance work is needed on the slipway.

FIGURE 2.4 TOLL DAMPIER MARINE SUPPLY BASE SLIPWAY



Note: Slipway shown on right. Roll-on-roll-off barge ramp shown at left of image.

SOURCE: TOLL ENERGY AND MARINE (2017), LOGISTICS TEM DOP 706 TOLL DAMPIER SUPPLY BASE PORT FACILITY HANDBOOK, 27 JUNE.

2.6.3 Norship Marine Shipyards, Cairns and Port Hinchinbrook

Norship Marine's Cairns shipyard, which is located on the northern bank of Smith's Creek, provides vessel refit, repair, maintenance and storage services. It provides such services for mono- and multi-hull vessels up to 400 tonnes.

Cairns is 1,287 nautical miles by sea from Darwin. At a speed of 10 knots, sea travel would take 5.4 days. Sea travel from Groote Eylandt to Cairns is 1,089 nautical miles, requiring 4.5 days of travel at 10 knots. In contrast, Groote Eylandt is 678 nautical miles from Darwin, which would involve sea travel for 2.8 days at 10 knots (Ports.com, 2018). Cairns is 941 nautical miles (3.9 days) from Karumba in the south-eastern Gulf of Carpentaria, compared to a distance of 977 nautical miles (4.1 days) from Karumba to Darwin, and 800 nautical miles (3.3 days) from Karumba to Port Moresby.

³ Toll Energy and Marine Logistics also purchased MMA Offshore's 50% interest in the Toll Mermaid Logistics Broome Supply Base for \$8.7 million.

Norship Marine uses travel-lift machines with lifting capacities of 160 tonnes and 400 tonnes. Norship can lift and haul vessels up to lengths and beams of 60 metres and 10.8 metres, respectively.

Norship's 5.6-hectare complex in Cairns has 50 fully-serviced hardstand bays, engineering, fabrication, electrical and shipwright workshops, 27-metre blast and paint sheds, and two wharves, each 60 metres in length. In addition, Norship also operates an engine and driveline remanufacturing facility in Cairns (Norship Marine, 2018).

Norship Marine provides services to tourism, fishing, recreational, Royal Australian Navy Armadale-class patrol boats, Australian Border Force Cape-class patrol vessels, and Pacific-class patrol boats operated by Pacific island nations.

Mott MacDonald (2016a, p. 48) observed:

"Whilst the existing channel to the Norship site is capable of handling larger vessels than those currently utilising the facility, further expansion of the facility appears physically constrained. Specifically, the site is constrained by a creek and existing industrial facilities which limit the expansion of new hardstand area and waterfront access. Increasing the capability of the existing facility to service larger vessels would require significant upgrades and expenditure."

FIGURE 2.5 NORSHIP MARINE SHIPYARD – CAIRNS



SOURCE: [HTTP://WWW.NORSHIP.COM.AU/NORSHIP-MARINE-SHIPYARD-CAIRNS/](http://www.norship.com.au/norship-marine-shipyard-cairns/)

Norship Marine also has facilities at Port Hinchinbrook in Cardwell, north Queensland. They include a travel lift that can handle vessels up to 80 tonnes and a beam width of 6.8 metres. Most multihull vessels up to 12 metres length overall can be lifted by the travel lift. A haul-out crane for wider beam boats can be organised.

2.6.4 Tropical Reef Shipyard, Cairns

Tropical Reef Shipyard in Cairns has a 100-metre, 3,000-tonne capacity slipway catering for a wide variety of vessel types. The shipyard also has a floating-dock facility capable of lifting/docking vessels up to 350 tonnes. These facilities are supported by deep-water berths and outfit/repair wharves. Therefore, drydock and in-water repair and maintenance activities can be undertaken.

The yard is equipped with a full machine workshop, two cranes up to 100 tonnes, three elevated work platforms, commercial spray machines, water blasters, three workboats to assist with vessel movements, and other relevant specialised equipment. A range of repairs can be carried out in-house. An onsite store carries essential stock items.

Skilled staff and a wide contractor base provide expertise to support a wide range of services to a variety of vessel types and sizes.

Tropical Reef Shipyard provides services to defence, commercial, research, and recreational vessels. Services have been provided to the Royal Australian Navy, and defence forces of other countries. It is the preferred facility for the maintenance and refit of hydrographic ships operated by

the Royal Australian Navy. These vessels are to be replaced by Lürssen-designed, Arafura-class offshore patrol vessels, which will be delivered to the Royal Australian Navy, starting in 2021. The shipyard's slipway is large enough to accommodate these new vessels.

2.6.5 Austal Cairns

Austal Cairns provides engineering governance and depot-level maintenance project management for in-service support for Cape-class patrol boats operated by the Australian Border Force and the Royal Australian Navy. It oversees locally contracted teams of engineers and technicians servicing those vessels.

When delivery of Guardian-class Pacific patrol boats to Pacific island nations commences from 2018 (through to 2023), Austal Cairns will coordinate support for the vessels in Cairns, including engagement of Cairns-based engineering and ship-lift service providers.

2.6.6 BSE Maritime Solutions, Cairns, Brisbane

BSE Maritime Solutions provides vessel repair and maintenance services at shipyards in Brisbane and Cairns. It has slipways in Brisbane and Cairns. In addition, it utilises travel lifts at The Yard Brisbane.

BSE Maritime Solutions' slipway at Colmslie in Brisbane can handle vessels up to 2,500 tonnes, length overall of 100 metres, and beam of 21 metres. A graving drydock can handle vessels up to 18,000 tonnes. The associated shipyard includes large laydown and hardstand areas, serviced wharf space, and facilities for hull and structural repairs, blasting, painting, engineering, fabrication, and mechanical and electrical overhauls.

The slipway and associated shipyard operated by BSE Maritime Solutions in Cairns can handle vessels up to 1,200 tonnes, length overall of 80 metres, and beam of 22 metres. A graving drydock is 60 metres in length and can handle vessels up to 2,500 tonnes.

The associated shipyard includes fully enclosed maintenance halls, large laydown and hardstand areas, and 360 metres of serviced wharf space. Like the Brisbane shipyard, it also has facilities for hull and structural repairs, blasting and painting, engineering, fabrication, and mechanical and electrical overhauls (BSE Maritime Solutions, 2018).

Defence support is provided at the Cairns slipway and shipyard, which are located near the HMAS Cairns naval base (Mott MacDonald, 2016a).

BSE Maritime Solutions has pointed out that offers prompt in-water repair and maintenance services at locations other than its Cairns and Brisbane facilities. It has nominated Darwin as such a location. Such services are supported by fabrication and material supply services from the Cairns and Brisbane sites (BSE Maritime Solutions, 2018).

2.6.7 The Yard, Hemmant, Brisbane

The Yard is a shipyard at Hemmant on the southern bank of the Brisbane River. It has multiple users. The Yard's users provide refit, repair and maintenance, and new construction services for commercial, government, and recreational vessels.

Facilities include a 600-tonne travel lift with a beam of 13 metres that can handle vessels up to 80 metres long (claimed to be the largest in the southern hemisphere). In addition, there are 65-tonne, 300-tonne marine straddle carriers, giving The Yard the ability to lift and relocate multiple vessels simultaneously. The Yard's owner is planning to install a 1,500-tonne travel lift.

The Yard has a wet dock, from which vessels are lifted, and barge, work, and marina berths. It also has over 24,000 square metres of sealed hardstand rated at 1,000 tonnes and a further 75,000 square metres of unsealed hardstand that can be used for project work or as laydown area, within a complex occupying 29.9 hectares and having 1,000 metres of river frontage (The Yard Brisbane, 2018; Australian Commercial Marine Group, 2018).

The complex includes purpose-built refit, repair and project sheds with up to 25-metre high ceilings with 4 x 10-tonne overhead gantry cranes. The Yard also has multiple workshops and bays for pressure washing, blasting and coating (The Yard Brisbane, 2018).

A former user of The Yard, Aluminium Boats Australia, provided such services mainly to high performance vessels that provided defence, police, coast guard, commercial, and recreational services. In late-2014, the company went into voluntary administration after an Armidale class patrol boat caught fire while in the covered area for maintenance, and its defence contract was lost. Subsequently, the company was liquidated. The intellectual property and business name were acquired by Wildcat Marine. The Yard and other users of its facilities (including Wildcat Marine and BSE Maritime Solutions) have remained in operation.

2.6.8 Thales, Sydney and Newcastle

Thales operates the Royal Australian Navy's major east-coast repair, maintenance and refit facilities at Garden Island in Sydney, and provides repair and maintenance services to RAN vessels at Garden Island, including 11 major RAN ships that are home-ported in Sydney. Services are also provided to cruise ships and other private-sector vessels.

The Garden Island facilities include a 365-metre long, 100,000-tonne graving dock. There is also an 800-tonne capacity floating drydock.

Thales is also the leading provider of communication systems to the RAN. Thales' capabilities include provision of complete warships, supply and integration of naval equipment (radar, sonar, communications, optronic and electronic warfare), combat management systems, and support services.

Thales and the New South Wales Government are investing in a ship repair and maintenance complex in the Carrington Marine Services Precinct at the Port of Newcastle. Phase 1 will include renewal of a slipway at the Fitzroy Street shipyard. It will cater for vessels up to 55 metres long and up to 1,000 tonne displacement. A feasibility study for Phase 2, which includes a large-capacity floating dry-dock and further marine precinct expansion, is currently underway.

Thales was appointed as prime contractor for in-service support of the Armidale-class patrol boats from 1 July 2017. The five-year contract contains possible rolling-wave term extensions out to the time the vessels are taken out of service. Thales plans to undertake sustainment activities on Armidale-class vessels in Cairns and Darwin, rather than Sydney and Newcastle.

Thales submitted a proposal in response to the Northern Territory Government's call for private sector proponents to advance the SLAMI project. Issues it raised in a market-sounding discussion are discussed in a subsequent sub-section.

2.6.9 Techport Shipbuilding and Maintenance Complex, Osborne, South Australia

Techport Australia's shipbuilding and marine maintenance complex provides services to naval and commercial entities. It is based at Osborne, about 15 kilometres from the Adelaide central business district. In 2017, the Commonwealth Government purchased Techport Australia from the South Australian Government.

Techport's Osborne complex has built air warfare destroyers for the Royal Australian Navy and is the site for construction of the Navy's Hunter-class guided missile frigates (9), and next generation submarines (12).

The centrepiece of Techport's Osborne complex precinct is a "common-user facility", which includes a ship lift, runway, dry berths, and wharf. The common-user facility occupies an area of 8 hectares.

Techport's shiplift is the largest in the southern hemisphere. It is a synchrolift with a lifting capacity of 9,300 tonnes. It is 156 metres long, 34 metres wide, and is capable of operating at a water depth of 18 metres.

A rail-based transfer system moves vessels between the ship lift and the 300-metre runway and dry berth area. The runway and dry berth area can accommodate two air warfare destroyers simultaneously.

The wharf is 213 metres long and 25m wide. It can handle cranes and other heavy vehicles weighing up to 864 tonnes. The wharf is used for activities such as final outfitting, test and activation, harbour trials, sea trials, and maintenance and repair.

The ship lift and wharf at Techport's Osborne complex were designed to permit future expansions. The ship lift can be expanded to a lifting capacity of 20,000 tonnes and length of 210 metres. The wharf can be expanded to accommodate ships 200 metres long.

ASC also has a synchrolift at its ASC North complex at Osborne. It has a lifting capacity of 5,200 tonnes. A heavy duty rail-based transfer system connects the ship lift, two large, side-by-side construction halls, a building for painting, and a large, fully-sealed hardstand area. The transfer system is fitted with self-contained hydraulic jacking systems to raise or lower the cradles which support the vessel. The transfer system has a swivel-head mechanism permitting 90-degree rotation and affording a high level of manoeuvrability.

ASC will build the first and second Lürssen-designed offshore patrol vessels for the Royal Australian Navy at Osborne, commencing in November 2018. Lürssen is the prime contractor, as well as being the designer, for delivery of the vessels. From 2020, ASC will build nine Hunter-class guided missile frigates (designed by BAE Systems) at Osborne. They will enter service late in the 2020s.

2.7 SLAMI's Overseas Competitors

There are many shipyards in countries relatively close to the north and north-west of Australia that would be potential competitors to the proposed SLAMI facilities and complementary service providers. While shipyards in the important Singapore maritime hub are generally perceived to be the most formidable competitor, there are other potential foreign competitors in Malaysia, Indonesia and Papua New Guinea. For vessels operating around the north-western coastline of Australia, Darwin ship-lifting and vessel repair, maintenance, and refit services have a substantial distance advantage over foreign shipyards that translates into a monetary advantage because of the opportunity cost of travel. This would be taken into account along with the cost and quality of services and the available range of required services.

Brief outlines of service offerings of a sample of the closer, potentially-competing foreign shipyards are provided below. More distant shipyards were not considered, because of the high opportunity cost of travel to those shipyards from northern Australia.

2.7.1 Papua New Guinea

Curtain Brothers' Papua New Guinea Dockyard is located in Port Moresby's Fairfax Harbour. Its facilities include a slipway with a capacity of 5,000 tonnes, a 150-metre repair wharf, a 100-metre lay-up berth, and cranes for major heavy-duty lifts.

The shipyard undertakes shipbuilding, and ship repair, maintenance and refit activities for a variety of vessels.

Papua New Guinea dockyard is 1,137 nautical miles from Darwin. Travel time between the two locations is 4.7 days at a speed of 10 knots.

Darwin is 678 nautical miles by sea from Groote Eylandt in the Gulf of Carpentaria, requiring 2.8 days at sea at a speed of 10 knots. In contrast, Port Moresby is 949 nautical miles from Groote Eylandt, requiring travel time of 4 days at 10 knots (Ports.com, 2018).

Port Moresby is 800 nautical miles from the prawn fishing port of Karumba in the south-eastern Gulf of Carpentaria. At a speed of 10 knots, the travel time is 3.3 days. Darwin is 977 nautical miles from Karumba, and the travel time is 4.1 days at 10 knots.

2.7.2 Singapore

Singapore is a globally important ship repair/maintenance/refit centre. It hosts multiple shipyards. Examples of shipyards in Singapore are provided below.

These shipyards are about 2,359 nautical miles from Darwin, involving 9.8 days of sea travel at 10 knots each way. Major ports in the north-west of Western Australia are much closer to Darwin and Henderson (Western Australia) than to Singapore. For example, Port of Dampier is 2,132 nautical miles and 8.9 days of sea travel each at 10 knots from Singapore, 1,267 nautical miles and 5.3 days each way from Darwin, and 992 nautical miles and 4.1 days each way from Port of Fremantle (Ports.com, 2018). Consequently, keeping a large, Darwin-based platform supply or anchor handling tug supply vessel in Darwin for repairs and maintenance, rather than taking it to the Singapore maritime hub would save return vessel travel costs of around \$A520,000 (fuel \$10,000 per day, wages \$16,500 per day) and avoid loss of income from the vessel during the return travel period of 19.6 days. Taking such a vessel from Dampier to Darwin (or Henderson), rather than the Singapore hub would save travel costs of \$190,800 (\$254,500) and free-up 7.2 days (9.6 days) for income-generating activities.

Jurong Shipyard has four graving drydocks with capacities of 100,000 tonnes, 200,000 tonnes, 300,000 tonnes, and 500,000 tonnes. It offers shipbuilding, repair, maintenance, conversion, and other refit services. Offshore engineering and construction services are also provided. The shipyard caters for a wide variety of vessels.

Keppel Shipyards has facilities in Tuas, Benoi and Gui. It has five graving drydocks, and three floating dry docks. Capacities of the drydocks range from 5,000 tonnes to 400,000 tonnes. Services include repairs and maintenance, ship conversions, and offshore fabrication. Keppel Shipyards supports vessels ranging from small to large.

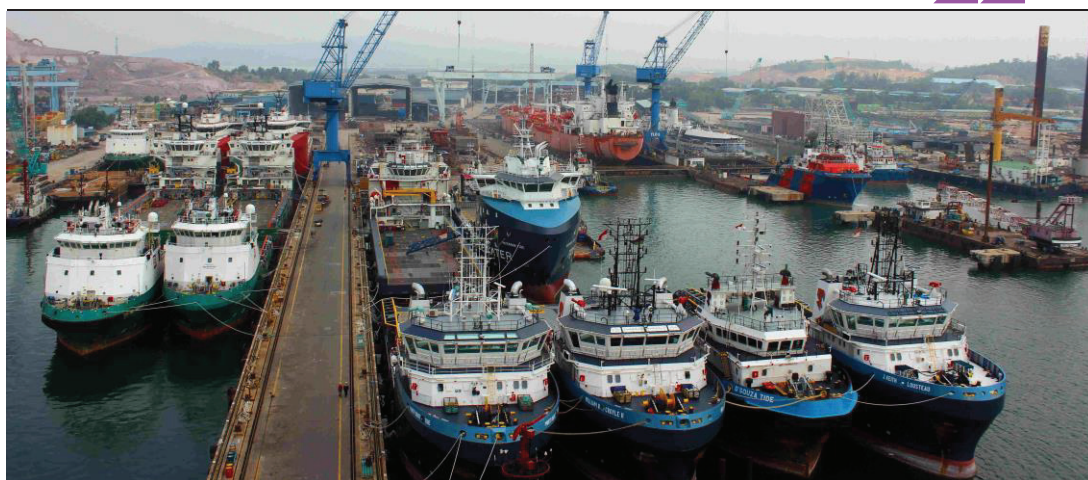
Singapore Technologies Marine has two synchrolifts with capacities of 6,000 tonnes and 12,500 tonnes, and two graving drydocks able to take vessels of 40,000 and 70,000 tonnes. It offers repair, maintenance and refit services to navy and commercial; vessels.

MMA Offshore, which operates offshore supply vessels off Australia's north-western coast, has its own repair and maintenance facility in the Tuas area in Singapore. It covers 2.5 hectares and has 130 metres of water frontage. It undertakes vessel repair, maintenance, modifications, mobilisation and demobilisation activities, light fabrication, and provides a staging area for offshore projects.

2.7.3 Indonesia

There are multiple shipyards in Indonesia that could be competitors to the proposed SLAMI facilities. They are a little closer to north-western Australia than shipyards in Singapore. Shipyards on the island of Batam are close to Singapore and effectively part of the Singapore maritime hub. Examples of these shipyards follow.

FIGURE 2.6 ASL MARINE'S BATAM SHIPYARD



SOURCE: [HTTP://WWW.ASLMARINE.COM/](http://www.aslmarine.com/)

The PT. ASL Shipyard on Batam Island near Singapore has graving drydocks able to take vessels of 60,000, and 300,000 deadweight tonnes, and a floating dock that can handle 20,000 deadweight-tonne ships. The shipyards offer shipbuilding, conversion/retro-fitting, and repair and maintenance services for a variety of commercial vessels, including offshore petroleum support vessels and drilling rigs. ASL's Batam Shipyard is supported by ASL's Singapore facilities that provide technical, engineering, logistics and procurement support with respect to the sourcing of raw materials, equipment and parts. The PT. Batamac Shipyard on Batam Island has a synchrolift with a capacity of 3,400 tonnes and a graving drydock with a capacity of 10,000 tonnes. The complex provides ship repair, maintenance and conversion services. It also supports offshore construction work provides design engineering and fabrication services. It provides services to a range of clients.

The PT. Marco Polo Shipyard, which is located on Batam Island, has three graving dry docks. The largest has a 40,000-tonne capacity. The yard offers shipbuilding, repair, maintenance and conversion services. It also supports fabrication and offshore installation activities. It caters for a variety of commercial vessels.

The PT. Pal Shipyard is in the port city of Surabaya on the island of Java. It is the closest of the Indonesian shipyards to Darwin and major ports in the north-west of Western Australia. In respect of vessels operating in the vicinity of north-western Australia, it has a substantial distance-related advantage over shipyards in Singapore, Indonesian and Malaysian shipyards clustered nearby. The PT. Pal Shipyard has a ship lift with a capacity of 1,500 tonnes. It also has two floating docks and two graving drydocks with capacities up to 50,000 tonnes. In addition, the shipyard has a 20,000-tonne side-launching facility. It undertakes shipbuilding, and ship repair, maintenance, and refit work. It provides services to commercial and naval clients.

MMA Offshore acquired a shipyard on the Indonesian island of Batam near Singapore in 2014. It is located on a site of 18.1 hectares. It undertakes vessel repair, maintenance, and modification tasks. It is used for vessel mobilisation and demobilisation activities. The Batam shipyard has built many commercial vessels and offshore support vessels over the past 20 years. The yard has five construction berths.

Shipyards in Batam are effectively the same distance and sea travel time from Darwin and Port of Dampier as the Singapore shipyards (2,359 nautical miles or 9.8 days at 10 knots, and 2,132 nautical miles or 8.9 days of sea travel at 10 knots, respectively). Port of Dampier is 1,266 nautical miles or 5.3 days from Darwin, and 992 nautical miles and 4.1 days from Port of Fremantle (Ports.com, 2018).

The Port of Darwin is only 103 nautical miles or 0.4 of a day closer to the PT. Pal Shipyard in Surabaya than to Singapore. The trip from Surabaya to Port of Dampier is 2,030 nautical miles or 8.5 days by sea, compared to 1,266 nautical miles or 5.3 days between Darwin and Port of Dampier (Ports.com, 2018).

2.7.4 Malaysia

There are multiple shipyards in Malaysia that could be competitors to the proposed SLAMI facilities. One entity operates shipyards close to Singapore, and is effectively part of the Singapore maritime hub. Others are further from north-western Australia than shipyards in Singapore and Indonesia. A sample of these shipyards is provided below.

Malaysia Marine and Heavy Engineering (MMHE) operates two shipyards (East and West) at the southern end of the Malay Peninsula near Singapore. It has a 50,000-tonne capacity shiplift, and two graving drydocks up to a capacity of 450,000 tonnes. MMHE undertakes shipbuilding, conversions, repair and maintenance, and fabrication activities. It has a particular focus on energy-related vessels and structures.

Labuan Shipyard and Engineering in East Malaysia (Malaysian Borneo) has a synchrolift with a lifting capacity of 7,000 tonnes. It also has a slipway that can handle vessels up to 12,000 tonnes. Core activities of the shipyard are commercial shipbuilding, repairs, maintenance and overhauls for commercial, naval and paramilitary vessels, and major and minor fabrication work for the oil and gas exploration and extraction sector.

Boustead Naval Shipyard, which is located on the western side of the Malay Peninsula, has two shiplifts with capacities of 3000 tonnes and 450 tonnes. Supporting facilities include multiple quayside

cranes of various capacities, and a 400-metre long berth via a floating pontoon. The shipyard's activities include shipbuilding, ship repair, maintenance and refit work for naval and commercial clients.

Grade One Marine Shipyard is also on the western side of the Malay Peninsula. It has a travel lift with a capacity of 700 tonnes. It offers shipbuilding and repair and maintenance services for a variety of vessels. It also undertakes oil and gas sector work.

2.7.5 Philippines

Keppel Philippines Marine has shipyards at Batangas and Subic on the western side of the main island of Luzon. Facilities include two graving dry docks with capacities of 550,000 tonnes (Subic) and 50,000 tonnes (Batangas). In addition, a large mechanical lift dock (synchrolift) and transfer system operate at the Batangas shipyard. Services provided at the two yards include shipbuilding, and ship conversion, repair and maintenance activities. The yards cater for a wide variety of vessels up to super tankers. They also undertake fabrication work for offshore structures.

The distance by sea from Darwin to Subic (Batanagas) is 2,266 (2,230) nautical miles, involving sea travel of 9.4 (9.3) days at 10 knots. Darwin is closer to Subic and Batangas in the Philippines than to the Singapore maritime hub by 93 and 129 nautical miles, respectively.

2.8 SLAMI's Competitive Position

The competitive position of the SLAMI complex is dependent on a wide range of considerations. They include the requirements of potential customers, the service offerings and pricing of competitors, the service offerings and pricing of the SLAMI facilities, and the service offerings and pricing of complementary service providers.

The requirements of vessel owners and operators extend beyond the pricing and service offerings of service providers. They are also keenly interested in the cost of taking vessels from their areas of operation to repair-and-maintenance centres and the opportunity cost of the time vessels are unavailable for operations – collectively, the cost of sailing for service.

A Darwin maritime repair-and-maintenance service hub would have a substantial sailing-for-service advantage over the Singapore-Batam, Henderson and Cairns hubs for vessels operating off the Northern Territory and Kimberley coasts. Henderson would have a small sailing-for-service advantage over Darwin for vessels operating off the Pilbara coast. However, Henderson's advantage would be small enough for a Darwin hub to be competitive, with only a small discount relative to service charges at Henderson. Cairns would have a very small sailing-for-service advantage over Darwin for vessels operating in the south-eastern Gulf of Carpentaria. However, Port Moresby has a locational advantage relative to Cairns and Darwin for vessels operating in the south-eastern Gulf of Carpentaria.

Consideration of relative sailing-for-service costs was crucial in identification of vessels that could be expected to use the SLAMI facilities, and in formulation of estimates of use of the SLAMI facilities by various types of vessels. This market is discussed in depth in section 2.10 below.

SLAMI's potential customers fall into two categories:

- vessel operators or owners who might contract to use the facilities to position vessels for repair and maintenance activities by in-house or contracted service providers
- complementary service providers who might contract use of the facilities to position vessels to allow provision of other repair and maintenance services to vessel owners or operators.

In both cases, the benefits of SLAMI services and the cost of providing them will accrue ultimately to vessel operators or owners. For the first category of customers, benefits and costs of SLAMI services accrue directly to vessel owners or operators. They accrue indirectly to vessel owners and operators through the second category of customers, complementary service providers.

Also, in both cases, services of the SLAMI complex and services requiring dry docking are complementary. An increase in demand for the latter will result in an increase in demand for the former. Moreover, demand for SLAMI services will depend on availability of complementary services,

and demand for those complementary services will depend on availability of services of SLAMI or other means of drydocking vessels.

Additional availability of complementary service providers would improve SLAMI's competitive position compared to established repair-and-maintenance service hubs in Singapore-Batam and Henderson and to the developing hub in Cairns. Potential service providers that could complement the SLAMI facilities are discussed in section 2.9 below.

The SLAMI facilities will compete with, and partly substitute for synchrolift, travel lift, floating dock and slipway facilities in various other locations. However, the SLAMI facilities will provide opportunities for marine service providers to expand the range of other marine industry services they can provide in Darwin. This might involve expanding their businesses overall and/or protecting their existing markets, by offering services in Darwin to cut costs of vessel owners or operators through reduction of the value of vessel availability foregone as a result of having to travel a longer distance for repairs and maintenance (opportunity cost of travel time).

Darwin's locational advantage or neutral location in respect of various types of vessels operating off north-western and northern Australia could be offset by higher pricing and by inferior quality and scope of Darwin's service offering. Services provided by the SLAMI facilities and services provided by complementary entities should be considered together when considering the quality and scope of Darwin's service offering.

Darwin's pricing of services will need to be at least competitive with Henderson's pricing to allow Darwin to contest the market for vessels operating off the Pilbara coast. For the purposes of this report, it has been assumed that Darwin's pricing is competitive with Henderson pricing. Darwin's pricing could be significantly higher than pricing in Singapore-Batam without being uncompetitive, because of Darwin's sailing-for-service advantage in respect of vessels operating off north-western and northern Australia.

The most important threat to expansion of vessel repair-and-maintenance activities in Darwin is a possible gap in quality and scope of services compared to the Henderson and Singapore-Batam hubs. This gap might be real or perceived, and might be temporary or long-lived.

A SLAMI capability shortfall would deter some vessel operators. It would also increase the difficulty of attracting complementary service providers to set up or expand their presence in Darwin. This could further deter vessel operators.

A temporary gap in respect of complementary services may not be self-correcting. If the gap deters vessel operators in the short term, it would be more difficult to attract service providers to close the gap later.

These network interdependencies could provide a case for government action. Intervention could take two forms.

First, the government could ensure the capacity of the facilities is increased, provided the economic benefits exceed the cost. Such an assessment has been undertaken in chapter 6.

Second, government could seek to attract complementary service providers and target closure of skills gaps. This will help address the impediment of network interdependencies, and thereby support investment in larger SLAMI facilities.

2.9 SLAMI's Potential Complementary Service Providers

2.9.1 Austal Darwin

Austal Darwin is located in the East Arm Logistics Precinct, adjacent to the Darwin Marine Industry Park and close to new berthing facilities at East Arm Wharf. Austal has an engineering workshop and claims to offer northern Australia's most experienced maritime capability support team, which includes 35-40 technicians, engineers, mechanics, fabricators and electricians. Many of these are mobile. Austal has capacity and capability to complete component or structural fabrication, and plant or equipment repairs or refits on-site and remotely. Austal also operates at HMAS Coonawarra.

Austal Darwin is delivering in-service support to the Australian Border Force's eight Cape-class patrol boats and the Royal Australian Navy's two Cape-class vessels. At HMAS Coonawarra, Austal provides on-site support to the Royal Australian Navy's Armidale-class patrol boats and ad hoc service and support to visiting foreign naval ships. Delivery of Austal's services in respect of the patrol boats takes place in Darwin, Cairns and Henderson. Only in-water work is done in Darwin.

Austal was contracted from October 2016 to undertake hull-remediation work, configuration changes, and corrective and planned maintenance work on up to seven of the Armidale-class patrol boats.

Austal explained during an interview that the Cape-class and Armidale-class vessels are being drydocked every two years, but Austal is working to reduce the frequency of scheduled repairs and maintenance to every five years. However, emergency repairs requiring drydocking may still be necessary occasionally.

At the Port of Darwin, Austal provides maintenance and repair services to visiting commercial ships. This includes passenger ferries, cruise liners, and offshore support vessels. However, naval and border force work is Austal's core business in Darwin.

Austal claims that it has an extensive Darwin inventory of marine spare parts, components and equipment, facilitating fast turnaround of repair or replacement tasks, and that it has an established, reliable supply chain that ensures less downtime and greater vessel availability.

Austal has explained that it has expansion plans for Darwin aligned with the anticipated development of new ship-lift and common-user facilities at the Darwin Marine Industry Park (Austal, 2018). During a market-sounding discussion, Rob Jackson, Austal's Head of Sustainment, confirmed that the firm was always looking to expand.

Rob Jackson observed that Darwin was well located and had good growth potential. Opportunities were perceived in activities associated with oil and gas activity, and repairs and maintenance for United States naval vessels, particularly those built by Austal – the Littoral Combat Ship (LCS) and the Expeditionary Fast Transport (EPF) vessel. However, US Navy work was limited by a preference to have most repair and maintenance activities undertaken in home ports. Typically, the nearest port would be used only for basic repairs that would allow the vessel to sail to its home port.

Rob Jackson explained that the skills base in Darwin and supply chain were currently sound. However, if Austal expanded its service offering, the skills base in particular would need to be strengthened.

He argued that more quayline should be provided with the SLAMI facilities to facilitate in-water repairs and maintenance, as much repair and maintenance work was done in-water, and the proportion of in-water work could increase. He explained that with Armidale patrol boats, the aim was to reduce the frequency of dry-docking from every two years to five-year intervals.

Rob Jackson asserted that the cost of using the floating dock, transfer facilities at the Henderson common-user facility was \$60,000 to \$80,000, about double the cost elsewhere. Austal uses BAE Systems' synchrolift at Henderson.

He said that Austal did not use Paspaley's (Pearl Marine Engineering's) ship lift in Darwin, because it is too expensive to do so.

2.9.2 Naval Ship Management

During market-sounding discussions, Chris Hyde of Naval Ship Management (NSM) indicated that NSM would like to win sustainment work on new offshore patrol vessels, as well as its current sustainment contract in respect of the ANZAC-class frigates. If it did so, it would be interested in moving some or all of its sustainment activities to Darwin.

NSM has managed some urgent in-water repairs for ANZAC-class frigates in Darwin at HMAS Coonawarra and Stokes Hill Wharf.

Chris Hyde pointed out that it made more sense to undertake major sustainment work on the frigates in Darwin than in Henderson, because most of the officers are based in Darwin and Cairns.

He pointed out that the proposed shiplift in Darwin would be able to handle the weight (3,600 tonnes displacement), beam (14.8 metres) and draught (4.5 metres) of the ANZAC-class frigates, but was unsure whether or not the configuration of the shiplift would provide sufficient overhang space to allow the length (118 metres overall, 109 metres waterline) of the vessels to be accommodated.

Chris Hyde explained that NSM was at a competitive disadvantage at Henderson because it did not have its own shiplift and was not located adjacent to the common-user facility, which included a floating dock. He pointed out that BAE Systems had a big advantage over other service providers at Henderson, because it had its own large synchrolift in its Maritime Support Facility, and because that complex is located near the common-user facility.

Chris Hyde suggested that there are lessons that can be learned from experience at Henderson. It is important that the Northern Territory Government does not allow the private-sector operator of the SLAMI facilities to exercise market power through pricing of services or through a locational advantage for its own shipyard. Another issue with regard to pricing, is that the incremental cost of lifting a ship is low relative to the average cost, which includes the relatively large capital cost of providing the facilities. Pricing on an average cost basis could deter usage of the SLAMI facilities.

2.9.3 Civmec Darwin

Civmec gained a presence in Darwin by acquiring the name and assets of Darwin Offshore Logistics Base. The assets include a 38,000-square metre operational support base and offsite storage capacity. There is 36,000 square metres of external hardstand lay-down area and more than 30 sets of racks (mobile and permanently fixed). Also, there is 2,500 square metres of fully cyclone-coded under cover storage space including over 1000 pallet bays with dimensions of 1.5m × 1.5m × 1.5m, and 800 square metres of undercover lay-down floor space.

Civmec potentially could provide services that complement the SLAMI facilities.

2.9.4 Norship Darwin

Norship Marine has a presence in Darwin. It has an office and workshop in Hickman Street, Winnellie. It also has mobile workshops. Norship Darwin specialises in on-site repair and maintenance of commercial and defence vessels (Norship Marine, 2018).

SLAMI facilities in Darwin would compete with Norship's facilities in Cairns. However, SLAMI would facilitate a (partial to more than) compensatory expansion of Norship's business in Darwin. During a market-sounding discussion on 18 October, Anthony Bellottie of Norship indicated his enterprise's interest in providing services to larger vessels in Darwin than it currently did, and in expanding the range of services provided by the firm in Darwin.

Norship considered that an important omission from the SLAMI facilities that had been described in public documents was a paint shed with climate-controlled chambers to deal with time lost because of wet weather and high humidity. Without these facilities, only 100 days per year would be available for painting. The time suitable for painting should be raised to 270-280 days per year. The absence of such facilities could cause vessel operators to take their vessels elsewhere. Norship indicated it would consider building blasting and painting facilities if they were not provided by the Government and its partner. However, this would raise costs, because vessels would have to be transported to and from Norship's paint shed.

Anthony Bellottie expressed concern about lack of information regarding the business model for the SLAMI facilities. A particular concern regarding the business model is that the Government's potential partner in the facilities could be a competitor to service providers such as Norship. The Government's partner might be able to locate its facilities in an advantageous position relative to other service providers, and may be able to exercise market power to the detriment of others.

2.9.5 Thales – Darwin

Thales has a presence in Darwin as a result of its role as prime contractor for in-service support of the Armidale-class patrol boats from 1 July 2017. Thales undertakes work on Armidale-class vessels in Darwin and Cairns.

Max Kufner, Thales' Deputy Vice President and Director Asset Management Services, advised in response to a questionnaire that it could provide a full suite of ship repair, maintenance, and upgrade services in Darwin. He also said that Thales presently had 50 registered services providers that provide a range of trade, technician, and professional services.

Thales submitted a proposal in response to the Northern Territory Government's call for proponents to lead development of the SLAMI facilities, identify the best commercial model for the project, the best location in East Arm, and an appropriate design for the SLAMI facilities. Thales was not selected.

During a market-sounding discussion, Max Kufner, Thales' Deputy Vice President and Director Asset Management Services, explained that Thales' interest in using the SLAMI facilities would depend critically on the facilities included in the project, accessibility of the facilities under the chosen business model, and where vessel owners want to have repair, maintenance and refit work done.

Thales suggested that investment in the facilities would need to be about four times the size of the Government's proposed investment to provide the scale and scope of services required to justify the investment. Thales said that an important omission from the proposed facilities was a large, covered, climate-controlled area that would allow painting and other work to proceed at all times. This was required to minimise the time for which vessels were not available for operations.

Thales argued that the facilities needed to be undertake both defence and other work. Otherwise, the SLAMI project would not be viable.

Thales observed that there was considerable uncertainty regarding the business model and regarding where vessel operators would want to take their craft for repair, maintenance and refit work.

2.9.6 Bhagwan Marine – Darwin

Bhagwan Marine undertakes in-water out-of-water repair work on its own vessels in Darwin. For out-of-water repair and maintenance tasks, it undertakes the work itself for vessels no bigger than 50 tonnes displacement and overall length of 25 metres.

Bhagwan Marine has also undertaken or project-managed vessel repair and maintenance work for other entities operating in northern Australian waters. For example, it has assisted ASL Shipyard with commissioning and warranty works on new harbour towage tugs, assisted Programmed Marine Services with repairs and maintenance activities in respect of offshore petroleum support vessels operating from Darwin, and undertook refit packages on Armidale-class patrol boats for SERCO when it was prime contractor for sustainment of the vessels.

According to Bhagwan, it provides services to about 48 vessels under 25 metres, 25 vessels between 25 and 50 metres, 20 vessels between 50 and 80 metres, three vessels from 80 to 120 metres with beams up to 30 metres. These include 60-80 of Bhagwan's own vessels and 15-30 vessels operated by other entities.

Bhagwan indicated that it would consider undertaking all out-of-water and in-water repair and maintenance activities in respect of its own vessels in Darwin if it was cost-effective compared to other locations. It explained that the SLAMI facilities would be attractive to Bhagwan if the firm to undertake its own repair and maintenance activities on larger vessels. If this was the case, Bhagwan would also be able to increase provision of repair and maintenance services to other vessel operators.

2.9.7 BSE Maritime Solutions

BSE Maritime Solutions offers prompt in-water repair and maintenance services at locations other than its Cairns and Brisbane facilities. It has nominated Darwin as such a location. Such services are supported by fabrication and material supply services from the Cairns and Brisbane sites (BSE Maritime Solutions, 2018).

Mott MacDonald (2016a) nominated BSE Maritime Solutions as a potential tenant of the Darwin East Arm Marine Industry Park. BSE Maritime Solutions advised during a market-sounding discussion on 5 October 2018 that it previously had premises in Darwin, but found this presence "did not work".

SLAMI facilities in Darwin would compete with BSE Maritime Solutions' facilities in Queensland, particularly its Cairns facilities. However, SLAMI would facilitate a (partial to more than) compensatory

expansion of the firm's activities in Darwin and a potential permanent presence. During a market-sounding discussion, the owner of BSE Maritime Solutions expressed interest in using SLAMI facilities, but said that its usage would depend critically on the business model adopted by the Northern Territory Government and its partner in the facilities. Concern was expressed that the Government's partner might want to exclude competing service providers from the SLAMI facilities.

2.9.8 BAE Systems – Darwin Potential?

BAE Systems is the largest naval sustainment service provider in Australia. Mott MacDonald (2016) recommended that discussions be held with BAE Systems "as soon as practicable, given the significance of a BAE-sized facility to the overall development of the Marine Maintenance Area". Mott MacDonald noted that discussions were held with BAE Systems as part of earlier work on a business case for a marine industry park. At the time BAE Systems was contemplating investment of \$250 million to \$300 million in a facility on a 25-hectare northern Australian site and was undertaking internal analysis regarding the potential facility and an appropriate site. The outcome of BAE Systems' deliberations was not known. ACIL Allen made several attempts to arrange discussions with BAE Systems, without success.

2.10 Vessel Operators

2.10.1 Defence

Royal Australian Navy

The Royal Australian Navy (RAN or Navy) currently operates about 50 vessels. The fleet comprises (Royal Australian Navy, 2018a):

- two Canberra-class amphibious assault or landing helicopter dock ships (length 230.82 metres; beam 32 metres; draught at fully-loaded displacement 7.08 metres; fully-loaded displacement 27,500 tonnes) – home port Fleet Base East (HMAS Kattabul), Sydney
- one Bay-class landing-craft dock ship (length 176 metres; beam 26.4 metres; draught 5.8 metres; displacement 16,190 tonnes) – home port Fleet Base East
- two replenishment-oiler ships
 - Sirius-class (length 191.3 metres; beam 32 metres; draught 11 metres; displacement 25,016.53 tonnes; fully-loaded displacement 46,755 tonnes) – home port Fleet Base West
 - Durance-class (length 157.2 metres; beam 21.2 metres; draught 8.6 metres; fully loaded displacement 18,000 tonnes) – home port Fleet Base East
- three Hobart-class air warfare destroyers (length 146.7 metres; beam 18.6 metres; draught 7.2 metres; fully-loaded displacement 7,000 tonnes) – home port Fleet Base East
- two Adelaide-class guided missile frigates (length 138.1 metres; beam 13.7 metres; draught 4.5 metres; fully-loaded displacement 4,267 tonnes) – home port Fleet Base East
- eight ANZAC-class helicopter frigates (length 118 metres; beam 14.8 metres; draught 4.5 metres; fully-loaded displacement 3,600 tonnes) – home port Fleet Base West 5 ships; Fleet Base East 3 ships
- six Collins-class submarines (length 77.8 metres; beam 7.8 metres; draught 7 metres; surfaced displacement 3,100 tonnes) – home port Fleet Base West (HMAS Stirling)
- two Leeuwin-class hydrographic survey vessels (length 71.2 metres; beam 15.2 metres; draught 4.3 metres; displacement 2,205 tonnes) – home port Cairns
- four Paluma-class hydrographic survey vessels (length 36.6 metres; beam 12.8 metres; draught 2.65 metres; displacement 325 tonnes) – home port Cairns
- four Huon-class minesweepers in service and two in reserve (length 52.5 metres; beam 9.9 metres; draught 3 metres; displacement 732 tonnes) – home port HMAS Waterhen, Waverton, Sydney
- 13 Armidale-class patrol boats (length 56.8 metres; beam 9.7 metres; draught 2.7 metres; displacement 300 tonnes) – home ports Darwin 12 and Cairns 1
- two Cape-class patrol boats (length 58.1 metres; beam 10.6 metres; draught 3.1 metres; displacement 350 tonnes) – home port Cairns.

The Royal Australian Navy also uses some ancillary vessels, such as mechanised landing craft for landing helicopter dock ships (LHD landing craft). Each LHD landing craft has a length of 23.3 metres, a beam of 6.4 metres and displacement of 56.6 tonnes light and 110 tonnes fully loaded.

The Royal Australian Navy's future ships programme includes (Royal Australian Navy, 2018a):

- two Supply-class, double-hulled, auxiliary oiler replenishment ships (length 173.9 metres; beam 23 metres; draught 8 metres; displacement 19,500, 29,300 fully loaded) to be built by Spanish shipbuilder, Navantia, to be delivered from 2021 to replace the replenishment-oiler ships currently in service
- at least 12 Lürssen-designed, Arafura-class offshore patrol vessels to replace Armidale and Cape-class patrol boats, minehunters, and survey vessels, with the first new vessel to be delivered in 2021
- nine Hunter-class guided missile frigates (length 149.9 metres; beam 20.8 metres; draught not published; fully-loaded displacement 8,800 tonnes) to replace the eight ANZAC-class frigates, beginning in the late-2020s
- new Attack-class submarines to replace the Collins-class vessels currently in service.

The Navy's 15 current patrol boats, and its future fleet of Arafura-class offshore patrol vessels are an important target market for the SLAMI. There are four reasons for this. First, most of the current fleet is based in Darwin, and it is planned to base at least six of the new Arafura-class vessels there. Second, the ship lift at HMAS Coonawarra in Darwin is too small for the Cape-class and Arafura-class patrol vessels and is to be removed to free-up space to accommodate the larger Arafura-class vessels. Third, taking Darwin-based vessels to distant locations such as Henderson or Cairns has a high opportunity cost in terms of fuel and wage outlays and extra time out of service. Fourth, the proposed SLAMI facilities will be able to accommodate the Arafura-class vessels.

The Navy's Armidale-class patrol boats were commissioned in the period 2005-2008. Its two Cape-class patrol boats were commissioned in 2017.

HMAS Coonawarra in Darwin is the home base for 12 of the Armidale-class vessels, with the remaining Armidale-class patrol boat based at HMAS Cairns in Cairns. Up to two of the vessels home-ported in Darwin can be forward-based at Dampier to facilitate patrols of oil and gas producing areas of the north-western coast of Australia.

The Navy's two Cape-class patrol boats were added to the fleet of patrol boats after one of the original 14 Armidale-class vessels was destroyed by a fire while drydocked for maintenance in Brisbane, and following identification of a need for hull-remediation work on the others. The Navy's Cape-class vessels are home-based at HMAS Cairns.

The Armidale-class patrol boats have aluminium hulls. Each has a length of 56.8 metres, a beam of 9.7 metres, a draught of 2.7 metres, and a standard displacement of 300 tonnes. They were commissioned in the period 2005-2008 (Royal Australian Navy, 2018 a,b,c,e).

As the Armidale-class patrol boats move into the last five years of their operating lives before replacement, retired Rear Admiral Mark Purcell expected that their maintenance requirements and costs would rise because of cumulative wear and tear on hulls, mechanical parts, and electrical systems. The replacement schedule has not been revealed by the Navy, but could commence incrementally as early as 2021 and may not be finalised until 2030.

Thales was appointed as prime contractor for in-service support of the Armidale-class patrol boats from 1 July 2017. The five-year contract contains possible rolling-wave term extensions out to the time the vessels are taken out of service. Thales undertakes sustainment activities on Armidale-class vessels in Cairns and Darwin. It would not reveal how the work was split between Darwin and Cairns.

Thales is working with Austal (the builder of the Armidale-class vessels), which was contracted from October 2016 to undertake hull remediation, configuration changes, and corrective and planned maintenance work on up to seven of the Armidale-class patrol boats. Austal also manages sustainment activities in Cairns and Darwin in respect of the two aluminium-hulled Cape-class patrol boats operated by the navy, in addition to the eight vessels of that type operated by the Australian Border Force. Austal revealed that only in-water work was undertaken by Austal in Darwin.

During the period 2021-2030, the Armadale-class vessels will be replaced by larger, more capable, much more complex, steel-hulled offshore patrol vessels designed by Lürssen and based on Lürssen's PV 80 design.⁴ The Navy has designated them the Arafura-class. This class of vessels will also replace the Navy's Cape-class patrol boats, Huon-class coastal minehunters, Leeuwin-class survey ships, and Paluma-class coastal survey vessels. Through the use of two changeable, containerised mission systems, the new patrol boats will be able to undertake the secondary roles of mine hunting, unmanned aerial-system missions, and hydrographic surveys, as well as the primary patrol role involving constabulary, patrol and response duties.

FIGURE 2.7 LÜRSEN OPV 80 – NEW ARAFURA-CLASS PATROL VESSEL



SOURCE: [HTTP://WWW.NAVY.GOV.AU/OFFSHORE-PATROL-VESSEL-OPV](http://www.navy.gov.au/offshore-patrol-vessel-opv)

The dimensions of the Arafura-class offshore patrol vessels are considerably larger than those of the Armadale- and Cape-class patrol boats. Each new vessel has a length of 80 metres, a beam of 13 metres, a draught of 4 metres, and a displacement of 1,640 tonnes (Royal Australian Navy, 2018d).

Originally, the Commonwealth Government intended that 12 Arafura-class vessels would be built to replace the Navy's Armadale-class and Cape-class patrol boats. However, it is not clear if additional vessels will be built in the context of more recent plans to have Arafura-class vessels also undertake tasks previously undertaken by the Navy's four mine-hunting and six hydrographic survey vessels.

It is understood that six of the originally-announced 12 Arafura-class offshore patrol vessels will be based in Darwin. It is anticipated by Mark Purcell that one of these vessels will operate from Darwin from 2021-22. However, the Arafura-class vessels are not likely to require major out-of-water work and the services of a ship lift until the late-2020s. In the meantime, they will still require in-water logistical support and maintenance.

The ship lift at HMAS Coonawarra is used to dry dock Armadale-class vessels (Royal Australian Navy, 2018b). However, it is too small to accommodate Cape-class patrol vessels operated by the Navy (two) and the Australian Border Force (eight). It will not be able to handle the Navy's new Arafura-class vessels, which are larger than the Armadale-class and Cape-class patrol boats.

⁴ The first and second Lürssen-designed offshore patrol vessels are being built by ASC at Techport's Osborne complex in South Australia. Construction commenced in November 2018. The remaining Arafura-class vessels will be built at the Australian Maritime Complex, in Henderson, Western Australia, in facilities provided by Cimtec's subsidiary Forgas Marine and Defence.

It is understood that the HMAS Coonawarra synchrolift is to be removed to create space to upgrade the wharf and berths that can accommodate the navy's new, larger offshore patrol vessels. After the existing ship-lift is decommissioned, ship-lifting services for the Armidale-class patrol boats and their replacements will need to be obtained elsewhere. The synchrolift proposed as part of the SLAMI project would be a logical replacement ship-lift service provider, based on the high opportunity cost of taking Darwin-based vessels elsewhere. It would be able to accommodate the Arafura-class offshore patrol vessels, as well as the existing Cape-class and Armidale-class patrol boats.

Pearl Marine Engineering's records indicate that every second year it has dry docked some of the Navy's landing craft. Typically, it has dry docked three.

Mark Purcell (retired Rear Admiral, Royal Australian Navy) pointed out that other Royal Australian Navy vessels, such as frigates and destroyers, visit Darwin occasionally – probably a total of 3-4 missions a year. He explained that vessels that are based elsewhere tend to use Darwin as first and last stop in Australia on their way to and from Asian waters. Mark Purcell considered it likely that they would take in basic supplies (food, fuel, etc) in Darwin, but unlikely that decisions would be taken to drydock them in Darwin. However, if the SLAMI facilities allowed adequate wharf-side access they might have some in-water work done in Darwin.

Chris Hyde of Naval Ship Management (NSM) indicated during market-sounding discussions that it made more sense to undertake sustainment work on Royal Australian Navy frigates in Darwin than in Henderson, because most of the officers are based in Darwin and Cairns. He observed that the shiplift included in the SLAMI project would be able to handle the weight (3,600 tonnes displacement), beam (14.8 metres) and draught (4.5 metres) of the ANZAC-class frigates, but indicated there was uncertainty whether or not the configuration of the shiplift would provide sufficient overhang space to allow the length of the vessels (118 metres) to be accommodated. Mott MacDonald observed that the ANZAC-class frigates were substantially longer than the maximum vessel length of 85 metres that the proposed synchrolift was designed to handle, but observed that the ANZAC-class vessels could be accommodated if the platform was lengthened sufficiently in future. However, it is noteworthy that the nine Hunter-class guided missile frigates that will replace the ANZAC-class frigates, beginning in the late-2020s will be much larger (length 149.9 metres; beam 20.8 metres; draught not published; fully-loaded displacement 8,800 tonnes) than the ANZAC-class frigates.

Darwin receives visits from foreign naval vessels. In particular, Exercise Kakadu, which is held over a two-week period every two years, typically involves multiple navies and many ships that visit Darwin. In 2018, the exercise involved 23 ships (including submarines).

Mark Purcell pointed out that foreign naval vessels are unlikely to seek "deep maintenance" requiring drydocking, but may require minor or basic repairs to allow them to steam to their home ports for major repair and maintenance work.

Rob Jackson, Austal's Head of Sustainment perceived opportunities for repair and maintenance work on United States naval vessels, particularly those built by Austal – the Littoral Combat Ship (LCS) and the Expeditionary Fast Transport (EPF) vessel. However, he noted that in the past US Navy work had been limited by a preference to have most repair and maintenance activities undertaken in home ports. This meant that the nearest port typically would be used only for basic repairs that would allow the vessel to sail to its home port. He suggested that more quay line be provided as part of the SLAMI project to accommodate more in-water repairs and maintenance.

Australian Border Force

The Department of Home Affairs' Australian Border Force (ABF) operates eight Cape-class patrol boats. They were commissioned in the period 2013-2015, replacing eight smaller Bay-class patrol boats that entered service in the late-1990s and early-2000s. The Cape-class vessels are home-ported in Darwin and berthed at facilities at East Arm Wharf that were commissioned in December 2015.

The aluminium-hulled Cape-class patrol boats have a length overall of 58.1 metres, a beam of 10.6 metres, a draught of 3.1 metres, and a standard displacement of 350 tonnes (Royal Australian Navy, 2018e). According to Mott MacDonald (2016), the synchrolift at HMAS Coonawarra is not able to handle the Cape-class patrol boats.

Austal is the prime contractor for sustainment of the Cape-class vessels operated by the Australian Border Force and the Royal Australian Navy. It provides sustainment services in Henderson, Cairns and Darwin. Austal provides engineering governance and depot-level maintenance project management for in-service support in Cairns and Darwin. It oversees locally contracted teams of engineers and technicians servicing those vessels.

Most of the “deep maintenance” on the Cape-class patrol boats is undertaken in Henderson and Cairns. Austal uses Darwin as its forward base. Only in-water work is done in Darwin.

Mark Purcell observed that Austal has a couple of pontoons at East Arm Wharf that are used for short servicing activities, but considered that it had insufficient berthing capacity as it could not service more than two vessels at the same time without accessing space controlled by others. The expected operating/service life for the Cape-class patrol boats is 20 years. The replacement strategy for the Cape-class patrol boats is not publicly available. It is likely to depend on the broad strategic position about 8-10 years from now, and on the specific issue of how the Australian Border Force vessels should operate in conjunction with the Lürssen-designed, Arafura-class offshore patrol vessels.

The Australian Border Force operates other vessels. One operates only in north-western waters. The other vessel patrols in northern waters and the Southern Ocean (Australian Border Force, 2018).

The *Thaiyak* operates for 300 days continuously a year in the environmentally-sensitive and internationally-significant Ashmore Reef and Cartier Island area about 320 km off the Kimberley coast of Western Australia and 770-840 km west of Darwin. The *Thaiyak* is 40 metres long, has a beam of 11.5 metres, and its gross tonnage is 585. It travels to Henderson for drydock repairs and maintenance.

FIGURE 2.8 THAIYAK – PATROLS ASHMORE REEF AND CARTIER ISLAND AREA



SOURCE: AUSTRALIAN BORDER FORCE

The *Ocean Shield* was acquired from DOF Subsea in 2015. It was formerly named the *Skandi Protector*, which was deployed as a multi-purpose offshore petroleum support vessel. It is available for operations 300 days a year in northern-Australian waters and the ecologically-fragile sub-Antarctic waters of the Southern Ocean. It operates mainly in northern waters. The *Ocean Shield* is the largest vessel in the fleet operated by the Australian Border Force. It has a length of 110.9 metres, beam of 22 metres, draught of 6.6 metres, and gross tonnage of 8,368. Currently, it is sent to Sydney for repairs and maintenance requiring dry docking.

The Australian Border Force's Cape-class patrol boats and the *Thaiyak* are potential targets for the SLAMI facilities. There are four reasons for this. First, these vessels operate off Australia's north-

western coast. Second, the ship lift at HMAS Coonawarra in Darwin is too small for the Cape-class vessels and the *Thaiyak*, and in any event the ship lift is to be removed to free-up space to accommodate the larger Arafura-class vessels. Third, taking vessels operating within Darwin's catchment to distant locations such as Henderson or Cairns for repair and maintenance work has a high opportunity cost in terms of fuel and wage outlays and extra time out of service. Fourth, the proposed SLAMI facilities will be able to accommodate the Cape-class vessels and the *Thaiyak*.

Estimated SLAMI Market – Defence

On the basis of the preceding analysis, three scenarios have been formulated for drydocking of defence (RAN and ABF) vessels in Darwin. Scenarios reflecting a range of plausible circumstances have been adopted, because of a high degree of uncertainty regarding future Commonwealth Government policy regarding location of repair and maintenance activities revolving around drydocking.

The scenario-formulation process has been complicated by the phased replacement of the Navy's Armidale-class and Cape-class patrol boats over the period 2021 to 2030. The process was further complicated by uncertainty regarding the number of vessels required to replace the Navy's current six survey and four minehunter vessels, as well as its patrol boat fleet.

The three scenarios have been labelled low, base and high. They have been defined by assumptions derived from circumstances discussed above.

In the low scenario, it has been assumed that:

- all of the Navy's patrol, survey, and minehunter vessels are replaced by 12 Arafura-class vessels, with two delivered each year commencing in 2021
- six of the new vessels are based in Darwin, and six are based elsewhere, most probably in Cairns, which currently hosts one Armidale-class patrol boat, two Cape-class patrol boats, and six survey vessels
- Arafura-class vessels 1 to 6 are allocated to Darwin to replace the 12-Armidale class patrol boats currently based there, because of hull issues with the Armidale-class vessels and because the Cape-class vessels are newer
- Armidale-class vessels and the RAN's and ABF's Cape-class vessels continue to be drydocked in Cairns or Henderson, in accordance with current practice
- the ABF's *Thaiyak* and *Ocean Shield* are not drydocked in Darwin after the SLAMI facilities have been commissioned
- the Arafura-class patrol vessels to be based in Darwin are dry-docked there after construction of the SLAMI facilities
- RAN vessels that are too big for the proposed SLAMI facilities (helicopter landing docks, landing craft dock ship, current and future oiler/replenishment ships, destroyers, and current and future frigates), and current and future submarines, existing survey vessels, and existing minehunters continue to be drydocked at locations other than Darwin, in accordance with current practice
- 21 Guardian-class patrol boats being built by Austal at Henderson and to be supported by Austal for Pacific island nations and Timor Leste (two) will be drydocked in Cairns
- defence vessels of other foreign countries will not be dry docked in Darwin, and any emergency repairs will be confined to in-water work.

In the base (middle of the road) scenario, it has been assumed that:

- all of the Navy's patrol, survey, and minehunter vessels are replaced by 16 Arafura-class vessels, with two delivered each year commencing in 2021
- eight Arafura-class patrol boats are based in Darwin, and eight are based elsewhere to replace the Navy's patrol, survey and minehunter vessels
- Darwin-based Navy patrol boats (12 Armidale-class vessels) are replaced by eight Arafura-class vessels, before the Navy's Cairns-based patrol boats and survey vessels, and the Navy's minehunters are replaced
- the Armidale-class, Cape-class, and Arafura-class vessels based in Darwin are drydocked there after the SLAMI facilities have been commissioned
- the ABF's *Thaiyak* is drydocked in Darwin after the SLAMI facilities have been commissioned, but the ABF's *Ocean Shield*, which is too big for the proposed synchrolift, will be drydocked elsewhere

- RAN vessels that are too big for the proposed SLAMI facilities, and submarines, survey vessels, and minehunters continue to be drydocked at locations other than Darwin, in accordance with current practice
- two Guardian-class patrol boats to be built for Timor Leste by Austal and delivered in 2023 will be dry docked at four-year intervals in Darwin using the SLAMI facilities
- defence vessels of other foreign countries typically will not be dry docked in Darwin, but emergency dry docking of one vessel every two years in Darwin using the SLAMI facilities is plausible.

In the high scenario, it has been assumed that:

- all of the Navy's patrol, survey, and minehunter vessels are replaced by 20 Arafura-class vessels, with 2 delivered each year from 2021
- 12 Arafura-class patrol boats are based in Darwin, and eight are based elsewhere to replace the Navy's patrol, survey and minehunter vessels
- Darwin-based Navy patrol boats are replaced before the Navy's Cairns-based patrol boats and survey vessels and the Navy's minehunters
- the Armidale-class, Cape-class, and Arafura-class vessels based in Darwin are drydocked there after the SLAMI facilities have been commissioned
- the ABF's *Thaiyak* and *Ocean Shield* are drydocked in Darwin after the SLAMI facilities large enough to take the *Ocean Shield* (and ANZAC-class frigates)⁵ have been commissioned
- half (four) of the ANZAC-class frigates are drydocked in Darwin using a larger synchrolift than the one originally planned (the Hunter-class frigates that will progressively replace the ANZAC-class ships in the late 2020s and 2030s will be too large)
- RAN vessels that are too big for the proposed SLAMI facilities, and submarines, survey vessels, and minehunters continue to be drydocked at locations other than Darwin, in accordance with current practice
- two Guardian-class (Pacific) patrol boats to be built for Timor Leste by Austal and delivered in 2023 will be dry docked at four-year intervals in Darwin using the SLAMI facilities
- two foreign defence vessels will be dry docked for repairs in Darwin every second year or on average one is dry docked each year.

TABLE 2.1 DEFENCE VESSELS – BROAD TARGET MARKET FOR SLAMI

Vessel Class & User	Low Scenario vessel no. by year	Base Scenario vessel no. by year	High Scenario vessel no. by year
Armidale-class, RAN	0	10 ('21) 6 ('23) 2 ('25) 0 ('26)	10 ('21) 6 ('23) 2 ('25) 0 ('26)
Cape-class – RAN	0	0	0
Arafura-class – RAN	2 ('21) 6 ('23) 6 ('30)	2 ('21) 6 ('23) 8 ('24)	2 ('21) 6 ('23) 10 ('25) 12 ('26)
ANZAC-class – RAN	0	0	5
LCM-1e LHD landing craft	2	3	4
Cape-class – ABF	0	8	8
<i>Thaiyak</i> – ABF	0	1	1
<i>Ocean Shield</i> – ABF	0	0	1
Other – RAN, ABF	0	0	0
Guardian-class - Timor Leste	0	2	2
Other foreign defence vessels	0	Smaller visiting vessels, eg, for Kakadu exercise	Smaller visiting vessels, eg, for Kakadu exercise

SOURCE: ACIL ALLEN ANALYSIS

⁵ In the high scenario, it is assumed the limiting vessel characteristics of the synchrolift will be length 120 metres, beam 24 metres, draught 8.5 metres and lightweight displacement 5,500 tonnes.

The broad target vessel market for the SLAMI facilities is shown in **Table 2.1** above. This indicates the numbers of vessels in each vessel class that could potentially use the SLAMI facilities. However, the summary of the target defence-vessel market for the proposed SLAMI facilities is coarse. It needs to be translated into vessel lifts or dry dockings within the broad target market.

Discussions with stakeholders indicated that the Armidale- and Cape-class patrol boats have been lifted from the water every two years, but Austal is working to reduce the frequency of scheduled drydocking to once every five years, the normal frequency for vessels of this size. However, the frequency of dry dockings is expected to increase as vessels approach the end of their service lives.

Allowing for uncertain unscheduled repairs and maintenance, as well scheduled activities, it has been assumed that:

- Armidale-class vessels are drydocked every two years
- Cape-class vessels are drydocked on average every four years from the time of completion of the SLAMI facilities to 2028-30 and then every two years until they are replaced
- the ABF's *Thaiyak* and *Ocean Shield* are drydocked on average every four years
- Arafura-class patrol vessels are drydocked on average every four years
- Guardian-class (Pacific) patrol boats are dry docked on average every four years.

Application of these assumptions to the broad defence vessel target market for the SLAMI facilities indicated in the previous table has yielded estimates of dry docking of defence vessels in **Table 2.2**.

TABLE 2.2 DEFENCE VESSELS – DRY DOCKINGS USING SLAMI FACILITIES

Vessel Class & User	Vessel Dimensions metres, tonnes	Low Scenario drydockings by year	Base Scenario drydockings by year	High Scenario drydockings by year
Armidale-class, RAN	length 56.8 m, beam 9.7 m, draught 2.7 m, displ. 300 t	0	5 (yr 1) 3 (yr 3) 1 (yr 5) 0 (yr 6)	5 (yr 1) 3 (yr 3) 1 (yr 5) 0 (yr 6)
Cape-class – RAN	length 58.1 m, beam 10.6 m, draught 3.1 m, displ. 350 t	0	0	0
Arafura-class – RAN	length 80 m, beam 13 m, draught 4 m, displ. 1,640 t	0 ('21) 0 ('23) 2 ('25) 2 ('27) 2 ('29)	0 (yr 1) 0 (yr 3) 2 (yr 5) 2 (yr 7) 2 (yr 9) 4 (yr 10) 2 (yr 12) 2 (yr 14)	0 (yr 1) 0 (yr 3) 2 (yr 5) 2 (yr 7) 4 (yr 9) 4 (yr 10) 4 (yr 13) 4 (yr 14)
LCM-1e LHD landing craft	length 23.3 m, beam 6.4 m, displ. 56.6 t	2 every second year	3 every second year	4 every second year
ANZAC-class – RAN	length 118 m, beam 14.8 m, draught 4.5 m, fully-loaded displ. 3,600 t	0	0	1 each year
Cape-class – ABF	length 58.1 m, beam 10.6 m, draught 3.1 m, displ. 350 t	0	2 each year until 2028, and then 4 each year until replacement	2 each year until 2028, and then 4 each year until replacement
<i>Thaiyak</i> – ABF	length 40 m, beam 11.5 m, gross tonnage 585	0	1 (yr 1) 0 (yr 2-4) 1 (yr 5) 0 (yr 6-8) 1 (yr 9) 0 (yr 10-12) 1 (yr 13)	1 (yr 1) 0 (yr 2-4) 1 (yr 5) 0 (yr 6-yr 8) 1 (yr 9) 0 (yr 10-12) 1 (yr 13)
<i>Ocean Shield</i> – ABF	Length 110.9 m, beam 22 m, draught 6.6 m, gross tonnage 8,368	0	0	1 (yr 2) 0 (yr 3-5) 1 (yr 6) 0 (yr 7-9) 1 (yr 10) 0 (yr 11-13) 1 (yr 14)
Other RAN, ABF		0	0	0
Guardian-class - Timor Leste	length 39.5 m, beam 8 m, draught 2.5 m, displacement ??t	0	0 (yr 3) 2 (yr 7) 2 (yr 11)	0 (yr 3) 2 (yr 7) 2 (yr 11)
Other foreign defence		0	1 every second year	2 every second year
Indicative Annual Total		3	8.5	12

Note: Displacement of the *Thaiyak*, *Ocean Shield*, and Guardian-class vessels could not be found in published sources.

SOURCE: ACIL ALLEN ANALYSIS

Dry-docking periods for defence vessels are not published and contractors did not want to reveal this and other information regarding repairs and maintenance to defence vessels. Based on what could be pieced together from various sources, it has been assumed that each dry-docking occurs at frequencies indicated above for a period of eight weeks on each occasion.

2.10.2 Offshore Petroleum Support Vessels

Bhagwan Marine

Bhagwan Marine has a fleet of more than 150 vessels providing services to the offshore oil and gas sector, the mining industry, ports, the marine logistics industry, and construction activities. Most of these vessels operate in Northern Territory, northern Queensland and northern Western Australian waters. It has a small, expanding presence in the United Kingdom. The company's head office is in Perth, Western Australia.

Specifications of all vessels currently in Bhagwan's Australian fleet are within the maximum limiting vessel characteristics of the synchrolift proposed for Darwin. However, Bhagwan expects that the size of its vessels will increase over time.

Bhagwan vessels supporting the offshore oil and gas sector off north-western Australia include:

- dive support vessels
- vessels supporting remotely-operated vehicles for underwater survey and observation activities
- crew transfer vessels
- an anchor handling tug supply vessel
- landing craft transport (LCT) vessels
- multi cats (multi-purpose work boats)
- flat top dumb barges
- ASD and coastal towage tugs
- other utility vessels.

FIGURE 2.9 BHAGWAN DRYDEN – SUPPORTS AIR DIVING AND REMOTELY OPERATED VEHICLES



SOURCE: [HTTP://WWW.BHAGWANMARINE.COM/FLEET/FLEET-DIVE-SUPPORT-VESSEL/BHAGWAN-DRYDEN](http://www.bhagwanmarine.com/fleet/fleet-dive-support-vessel/bhagwan-dryden)

Vessels comprising half of Bhagwan's Australian fleet have lengths under 25 metres and displacements under 50 tonnes. Bhagwan's largest craft is the *CMV Athos*, an anchor handling tug supply vessel. The *CMV Athos* is 65 metres long, has a beam of 16 metres, and a designed draught of 5 metres. Its gross tonnage is 2,237. It has been deployed to support a drilling programme by Jadestone Energy in respect of the Stag oilfield in the Carnarvon Basin.

Two smaller, but still relatively large Bhagwan vessels that are currently engaged in supporting offshore petroleum exploration activity are the Bhagwan Dryden and *DP2 Seamaster*. Both are versatile vessels.

The *Bhagwan Dryden* (see **Figure 2.9**) supports air diving activities and remotely operated vehicles on the sea floor. Its length overall is 56.8 metres, beam is 16 metres, designed draught is 3.3 metres, and gross tonnage is 1475. It was based in Darwin as at 1 October 2018.

The *DP2 Seamaster* supports diving activities, remotely operated vehicles, survey activities and light construction work. It is currently supporting activities to maintain oil production from the Wandoo field off the Pilbara coast of Western Australia. The *DP2 Seamaster* has an overall length of 40 metres, a beam of 15 metres, and designed draught of 2.8 metres. Its gross tonnage is 489.

Bhagwan advised that 60 to 80 of the vessels in its diverse Australian fleet of 148 vessels operate in the vicinity of northern Australia. About 50 of Bhagwan's vessels are usually drydocked in Darwin for repair and maintenance services. There, Bhagwan has used ship-lift and other services provided by Pearl Marine Engineering (synchrolift with a capacity of 2,028 tonnes displacement and platform length of 62.75 metres) and Spot On Marine (travel lift with a capacity of 50 tonnes displacement and length of 25 metres). Bhagwan has also accessed services in Fremantle/Henderson, Singapore and Batam. In those distant locations, ships have been taken from the water through operation of travel lifts, slipways and graving docks.

Bhagwan indicated that it would consider having all out-of-water and in-water repair and maintenance activities undertaken in Darwin, if the overall cost (including cost of delays) compares favourably with combined cost of getting them to Singapore, Batam and Cairns and paying for services in those locations. It was emphasised that the ultimate criterion was lowest overall cost.

The SLAMI facilities would be attractive to Bhagwan if they allow it to undertake its own repair and maintenance activities on larger vessels. Bhagwan prefers to use its own tradesmen and preferred contractors, because it helps with quality control and cost budgeting. In the past, it has undertaken out-of-water repair and maintenance work itself on its vessels under 25 metres and 50-60 tonnes. For larger vessels, out-of-water work has been undertaken by entities that have taken the vessels from the water – Pearl Marine Engineering and its contractors for repair and maintenance work in Darwin.

Scheduled out-of-water repair and maintenance work on 50-75 of Bhagwan vessels (including barges) occurs at intervals of 2-5 years coinciding with hull and shaft surveys/inspections.

MMA Offshore

MMA Offshore operates 32 offshore petroleum support vessels. The fleet comprises anchor handling tugs, and anchor handling tug supply vessels, platform support vessels, and multi-purpose work and supply vessels. They have been deployed in Australia, South-East Asia, India, Africa and the Middle East. The company's head office is Fremantle, Western Australia (MMA Offshore, 2018b).

MMA has published specifications of its offshore petroleum support vessels. However, this information did not include lightship (empty) and maximum (fully loaded) displacement of its MMA's various vessels. Gross tonnages have been published instead. While MMA published information on draught of each vessel, it did not indicate whether draught was on an empty (lightship), fully-loaded or some other basis.

MMA has a strong position in the market for vessel services in support of offshore petroleum exploration and extraction activity in waters of the north-western coast of Australia. For example, it operates six of 14 offshore petroleum support vessels based in Darwin as at 1 October 2018.

Five of MMA's six Darwin-based vessels have published lengths (MMA *Inscription*, 87.07 metres) or draughts (MMA *Brewster*, 6.7-7.0 metres; MMA *Leeuwin*, 6.4 metres; MMA *Responder*, 6.5 metres; MMA *Plover*, 6.86-7.15 metres) that exceed the maximum limiting vessel characteristics for the

synchrolift. The five vessels are platform supply vessels that support Icthis in the Browse Basin (*Brewster* and *Plover*) or Bayu Undan in the Bonaparte Basin within the joint development area with East Timor (*Inscription*, *Leeuwin*, and *Responder*). The gross tonnages of these five vessels are: *Inscription* 3,708, *Brewster* 3,804, *Leeuwin* 3,464, *Responder* 3,564, and *Plover* 3,804.

The sixth Darwin-based vessel (*MMA Vantage*) is an anchor handling tug supply vessel that has been supporting exploration or production activity for three separate companies (including appraisal drilling of PTTEP's Cash Maple gas/condensate field 680 km west of Darwin in the Ashmore-Cartier area within the Vulcan Sub-Basin of the Bonaparte Basin). Its dimensions are: length 59.25 metres, beam 14.95 metres, draught 4.95 metres, and gross tonnage 1678. It could be accommodated by the proposed Darwin synchrolift.

MMA's fleet includes five anchor handling tugs that are used to position and secure platforms and mobile offshore drilling units. All of MMA's vessels in this category could use the SLAMI facilities.

Twelve anchor handling tug supply vessels are deployed by MMA. They are stretched versions of anchor handling tugs that also provide provisioning services. Eight (including the *MMA Vantage* mentioned above) have specifications within the maximum limiting vessel characteristics for the synchrolift. Three are borderline in respect of draught (6.1 metres), and could use the synchrolift if lightship draughts are less than 6 metres. One anchor handling tug supply vessel has a draught that is likely to be too deep (6.6 metres) (MMA Offshore, 2018b).

MMA operates eight platform supply vessels. Five were based in Darwin, as at 1 October 2018. All five had lengths or draughts in excess of the maximum limiting vessel characteristics for the synchrolift. The other three platform supply vessels included two with draughts (7.4 and 6.37 metres) apparently in excess of the maximum the synchrolift can accommodate, and one vessel having specifications within the maximum limiting vessel characteristics for the synchrolift (MMA Offshore, 2018b).

Six multi-purpose work and supply vessels are operated by MMA. Three of the six vessels have lengths overall that exceed 85 metres. Their gross tonnages, which range from 4,268 to 6,363 (four between 5,138 and 6,363) also suggest that lightship displacements of at least four of these vessels may be too high for the synchrolift.

MMA has two barges. One is longer than the maximum vessel length for the synchrolift. The other one has specifications within the maximum limiting vessel characteristics for the synchrolift.

FIGURE 2.10 MMA INSCRIPTION – DARWIN-BASED PLATFORM SUPPLY VESSEL



SOURCE: [HTTPS://WWW.MMAOFFSHORE.COM/VESSEL-FLEET/MMA-INSCRIPTION](https://www.mmaoffshore.com/vessel-fleet/mma-inscription)

MMA also owns shipyards in Batam and Singapore. MMA's Singapore shipyard undertakes vessel repair, maintenance, modifications, mobilisation and demobilisation activities, light fabrication, and provides a staging area for offshore projects. MMA's shipyard on the Indonesian island of Batam near Singapore undertakes vessel repair, maintenance, and modification tasks. It is used for vessel mobilisation and demobilisation activities. The Batam shipyard has built many commercial vessels and offshore support vessels over the past 20 years (MMA Offshore, 2018b).

Until June 2017, MMA Offshore also owned the Dampier marine supply base and adjacent slipway and associated repair and maintenance facilities. It sold them to Toll Energy and Marine Logistics.⁶ MMA continued to operate the slipway and associated repair and maintenance facilities under licence until the end of June 2018, but did not exercise an option to extend the slipway licence arrangement to 30 June 2019 (MMA Offshore, 2017, 2018a).

As a result of the sunk costs of MMA's facilities in Singapore and Batam, it appears unlikely that MMA would send its vessels to Darwin following installation of SLAMI facilities. A reinforcing issue is that about 40-50 per cent of MMA's fleet would be too big for the proposed synchrolift in Darwin.

However, MMA's interest in using the proposed SLAMI facilities requires further investigation. ACIL Allen was unable to find a representative of MMA who would discuss the firm's position on the facilities.

Swire Pacific Offshore

Swire Pacific Offshore, which is headquartered in Singapore, operates 85 vessels. Most of these are engaged in offshore petroleum support activities. Swire also supports offshore windfarm installation.

Swire's fleet includes 49 anchor handling tug supply vessels, 22 platform support vessels, two seismic survey vessels, three multi-purpose (including sub-sea construction) offshore support vessels, two offshore construction ships, one crew transfer catamaran, and two accommodation barges.

Three of Swire's platform supply vessels were based in Darwin as at 1 October 2018. They service Shell's Prelude Floating LNG project in the Browse Basin.

Swire's Darwin-based platform supply vessels either exceed the length (*Pacific Hornbill*, 88.1 metres) or the draught (*Pacific Greylag* and *Pacific Grackle*, both with maximum draught of 6.43 metres) in the maximum limiting vessel characteristics for the synchrolift. Swire did not indicate what the draught of each vessel would be on a lightship basis. The vessels with draughts in excess of the maximum have lengths of 84.65 metres, barely under the maximum length.

Swire Pacific Offshore has not published lightweight displacements of its vessels. Published gross tonnages of the *Pacific Hornbill*, *Pacific Greylag* and *Pacific Grackle* are 4059, 3585 and 3585, respectively. It is plausible that the corresponding lightweight displacements would make all three too heavy for the proposed synchrolift.

Only a few vessels in Swire's fleet of anchor handling tug supply vessels and platform supply vessels have specifications within the maximum limiting vessel characteristics for the synchrolift. Its two seismic survey vessels fit within those characteristics (Swire Pacific Offshore, 2018).

Siem Offshore

Norwegian company Siem Offshore has 43 offshore petroleum support vessels. Siem has offices in Norway, Germany, the Netherlands, Australia (Perth), Canada, United States, Brazil, and Ghana.

Siem's fleet comprises a variety of specialised vessels. It includes 15 anchor handling tug supply vessels, 17 platform supply vessels, six multi-purpose (including construction and installation) offshore support vessels, three well intervention or stimulation craft, a "scientific core drilling vessel", cable-laying vessel, and two other uncategorised craft (Siem Offshore, 2018).

Specifications have been published for most of its vessels. Only a few of Siem's vessels for which specifications are publicly available have lengths of 85 metres or less. All of Siem's vessels have draughts in excess of 6.4 metres. Examples of Siem's vessels that exceed the maximum limiting vessel characteristics for the synchrolift are the *Siem Amethyst* and *Siem Thiima* that provide services

⁶ Toll Energy and Marine Logistics also purchased MMA Offshore's 50% interest in the Toll Mermaid Logistics Broome Supply Base.

to Woodside in respect of North West Shelf (Carnarvon Basin) activities. The *Amethyst* is an anchor handling tug supply vessel built in 2011. It has a length overall of 91 metres, a beam of 22 metres and a draught of 7.95 metres. The *Thiima* is a platform supply vessel built in 2016 and is Australia's first dual-fuel (LNG and diesel) offshore petroleum support vessel.⁷ It has a length overall of 89.2 metres, a beam of 19 metres, and a draught of 7.4 metres (Siem Offshore, 2018).

Siem has not explained if published draughts relate to lightship or fully loaded vessels. It has not published lightship and maximum displacement of its vessels. Also, it has not published gross tonnages. However, according to Marine Traffic (2018), the gross tonnage of the *Siem Amethyst* and *Siem Thiima* is 7,473 and 4,768, respectively.

Go Offshore

Until late 2017, Go Offshore operated 13 offshore petroleum support vessels. Go Offshore Pty Ltd and an associated entity, Go Marine Pty Ltd, went into voluntary administration on 20 October 2017. They continued to trade. Following an international sale process, the entities were purchased by Hong Kong investors in January 2018.

Prior to administration and sale of Go Offshore Pty Ltd, its fleet comprise 9 anchor handling tug supply vessels, one platform support vessel, two multi-purpose vessels providing remotely operated vehicle and other support, and a safety vessel. Two of these vessels – an anchor handling tug supply vessel, and a multi-purpose vessel - had lengths overall in excess of 85 metres. An additional six vessels had maximum loaded draughts greater than six metres, four of which were in excess of 7.5 metres. Go Offshore did not publish information on draughts of vessels on a lightship basis.

Mott MacDonald (2018a) reported that eight vessels – all anchor handling tug supply vessels – in Go Offshore's fleet entered Port of Darwin between December 2012 and December 2017. One of these vessels, the *Go Pheonix*, has a length overall in excess of 85 metres. Two other vessels, the *Go Spica* and *Go Antares* had maximum loaded draughts in excess of 7.5 metres. The lightship displacement of the *Go Pheonix* and *Go Antares* was reported by Mott MacDonald (2018a) to be 5,500 tonnes, while it was 3,603 tonnes for the *Go Spica*.

The fleet has been subjected to a rationalisation process to trim it to six vessels. Current ownership of individual vessels in the fleet of 13 in 2017 has not yet been fully ascertained. However, it is known that the *Sea Triumph*, a platform support vessel, is now in Solstad Offshore's fleet (Solstad Offshore, 2018).

Solstad Offshore

Solstad Offshore ASA is a Norwegian company engaged in activities relating mainly to the offshore petroleum exploration and extraction sector. Solstad has a fleet of around 140 vessels. They operate in the waters of Europe, Brazil, Australia, and Asia (Solstad Offshore, 2018).

Solstad's *Far Sword* (see Figure 2.11) was based in Darwin as at 1 October 2018. It has been involved in supporting offshore petroleum exploration. It is an anchor handling tug supply vessel with gross tonnage of 3,068. It is 78.3 metres long and has a maximum draught of 8.02 metres. The draught is too deep for the proposed Darwin synchrolift.

In January 2018, Solstad commenced a contract with Woodside to provide two platform supply vessels to support the Greater Enfield drilling campaign in the Carnarvon Basin. The contract is firm for 12 months and provides options to extend the term for up to an additional 14 months. The contracted vessels are the *Far Seeker* and the *Far Skimmer*. The *Far Seeker* has a length overall of 93.9 metres, a beam of 21 metres, a maximum draught of 6.6 metres, and 4,755 gross tonnage. The *Far Skimmer* has an overall length of 81.7 metres, a beam of 18 metres, a maximum draught of 6.5 metres, and 3,527 gross tonnage.

The *Far Stream* was contracted separately to support pipe-laying work off the Western Australian coast. It is an anchor handling tug supply vessel, with an overall length of 78.3 metres, a beam of 17.2 metres, a maximum draught of 8.02 metres, and gross tonnage of 3,100.

⁷ Woodside plans to transition all offshore petroleum support vessels providing services to its North West Shelf activities to dual-fuel configuration.

Solstad's *Sea Triumph* is a platform supply vessel supporting Chevron's Wheatstone project in the Carnarvon Basin. It has an overall length of 82 metres, a beam of 17.03 metres, and a maximum draught of 6.3 metres. Its gross tonnage is 3,455.

FIGURE 2.11 SOLSTAD FAR SWORD – AHTS



SOURCE: [HTTPS://WWW.SOLSTAD.COM/FLEET/AHTS-VESSELS//FAR-SWORD](https://www.solstad.com/fleet/ahts-vessels/far-sword)

Solstad also has vessels operating in Bass Strait. For example, the *Far Saracen* and *Far Senator* are anchor handling tug supply vessels, each with an overall length of 87.4 metres, a beam of 21 metres, a maximum draught of 8.7 metres, and 6,107 gross tonnage. According to research by Mott McDonald (2018a), the lightship displacement of these vessels is 4,833 tonnes. The *Far Saracen* and *Far Senator* were in Bass Strait in the first quarter of 2018.

All of the Solstad vessels described above would be too big or at best marginal on the basis of length or draught or both for the proposed synchrolift in Darwin. Solstad Offshore did not publish information on lightship draughts and lightship and fully loaded displacements of its vessels. Instead, it published gross tonnage.

DOF Subsea

DOF Subsea ASA is a Norwegian company operating 26 purpose-built offshore support vessels. This fleet includes anchor handling tug supply vessels, diving support vessels, and construction and pipelaying support vessels, and multi-purpose support vessels (DOF Subsea, 2018).

For example, the *Skandi Darwin* (see **Figure 2.12**) is a multi-purpose support vessel, providing inspection, repair and maintenance services to Shell's Prelude Floating LNG Project, under a 5-year contract that commenced on 26 November 2017. It was based in Darwin as at 1 October 2018. Its length overall is 93.8 metres, its beam is 20 metres and its draught is 6.5 metres. The vessel's gross tonnage is 6,555. The *Skandi Darwin* is too large for the proposed synchrolift.

Another example is the *Skandi Skansen*, which is a multi-purpose support vessel, providing inspection, repair and maintenance services to Chevron's Gorgon and Wheatstone projects in the Carnarvon Basin off the Pilbara coast of Western Australia. The original contract commenced in February 2015 and an extension was announced on 29 November 2018. The length of the extension was not announced. The *Skandi Skansen* has an overall length of 107.2 metres, a beam 24 metres, and a draught of 7.8 metres. Its gross tonnage is 8,222. The vessel is too large for the proposed synchrolift.

Typically, the draught or length or both of vessels in DOF's fleet exceeds the specifications of the synchrolift proposed for Darwin (DOF Subsea, 2018).

Guardian Offshore Au

Guardian Offshore Au is an Australian-owned company that provides services to marine and other offshore industries. It operates a fleet of 12 vessels that provide services mainly to the offshore petroleum exploration and extraction sector. The fleet includes vessels involved in dive support, offshore supply, surveys, support for remotely operated vehicles, crew transfers, and construction-support.

Guardian's largest craft is the *Offshore Solution*, a multi-purpose vessel, with a length overall of 53.86 metres, a beam of 11.3 metres, and minimum and maximum draughts of 2.8 and 3.5 metres. Its gross tonnage is 902.

The second biggest vessel, the *Offshore Supplier*, has a length of 37.69 metres, a beam of 10.36 metres, and a maximum draught of 2.72 metres. This vessel's gross tonnage is 468.

An example of a current deployment of a Guardian Offshore vessel is the *Offshore Guardian* (length 34 metres, beam 11 metres, maximum draught 2.2 metres, gross tonnage 316), which is being leased by Neptune Marine Services to collect survey and geotechnical data in relation to work on gas pipeline options for the Bonaparte Basin's Cash Maple gas-condensate field, which is controlled by PTTEP.

Five vessels range in length from 26.48 metres to 34 metres. Five vessels are less than 25 metres long (Guardian Offshore, 2018).

During market-sounding discussions, Darren Kolln of Guardian Offshore said that the company used Pearl Marine Engineering, by necessity, to lift vessels operating in the area. He said the Guardian was very keen that ship-lift facilities be established in Darwin to provide competition on the supply side.

He said that Guardian would like to see installation of a travel lift with a capacity of 600 tonnes. He suggested that if only a synchrolift was provided, its use would have to be priced very flexibly to cater for a wide range of vessel sizes. He did not mention existing Darwin facilities (other than those of Pearl Marine Engineering) such as those operated by Spot On Marine, Tasmanian Seafoods, and Perkins Marine that could be used to drydock vessels of 50, 150, and 500 tonnes displacement, respectively.

Darren Kolln emphasised the importance of the business model selected for the SLAMI facilities. He expressed concern about the ownership structure of the synchrolift potentially including a provider of other marine services. He suggested ownership by a provider of other services could impede competition among service providers, thereby raising prices of services and discouraging usage (For example, vessel owners might be penalised through loadings if they bring in their own technical personnel or preferred contractors, as occurred at BAE's Henderson facilities.). In addition, if service providers are focussed particularly on defence work, access could be more difficult and expensive for commercial vessel operators than it otherwise would be (For example, he said that this was a problem at Henderson.).

Darren Kolln explained that shipyards in Singapore and Batam were formidable competitors to the proposed SLAMI facilities, because Singapore/Batam offered sharp pricing (based on low rates for skilled labour), a full range of expertise and services (including the big engine manufacturers), and experience gained over a long period. On the other hand, Darwin had a locational advantage over Singapore/Batam, which provided travel cost savings to vessel owners operating craft off the north-western coast of Australia. He provided an example of an anchor handling tug supply vessel (such as one operated by MMA or Swire) travelling an extra 9.8 days each way to Singapore/Batam, with wages costs of \$A16,500 per day and fuel costs of \$A10,000. This locational advantage of about \$A520,000 had to be sufficient to offset the extra cost of services in Darwin during a large dry docking costing \$A1-2 million in Singapore.

Other Offshore Petroleum Support Vessels

There are other vessel operators providing support to petroleum exploration and extraction activities off the north-western coast of Australia. They are less prominent in the Australian market than Bhagwan Marine, MMA Offshore, Swire Pacific Offshore, Solstad Offshore, Siem Offshore, and DOF Subsea.

For example, the *Polarcus Naila*, which is a seismic vessel, was based in Darwin as at 1 October 2018. It has been undertaking a three-dimensional seismic survey for multiple clients in the Vulcan Sub-Basin of the Bonaparte Basin in the Ashmore-Cartier area west of Darwin. Work will continue during 2019. The length (91 metres) and maximum draught (7.5 metres) of the *Polarcus Naila* are outside the maximum limiting vessel characteristics for the synchrolift. Its gross tonnage of 6,667 means it is also likely to be too heavy.

A further example is Marco Polo Marine's *OMS Endurance* (length 49 metres; beam 13 metres, maximum draught 4.5 metres, and gross tonnage 1025), which the synchrolift could handle. It was based in Darwin to support offshore petroleum exploration activities as at 1 October 2018.

Estimated SLAMI Market – Offshore Petroleum Support Vessels

On the basis of the preceding analysis, three scenarios have been formulated for drydocking of offshore petroleum support vessels in Darwin. Scenarios reflecting a range of plausible circumstances have been adopted, because of a high degree of uncertainty regarding the share of the market for ship-lift and related services that SLAMI could capture. The uncertainties derive from various sources.

First, while Darwin's SLAMI facilities have a substantial locational (and consequent opportunity cost of travel) advantage over Fremantle/Henderson and overseas sites, particularly the Singapore maritime hub, for attraction of vessels servicing offshore petroleum activities in the Browse and Bonaparte Basins, this advantage must be weighed against the established, wide-ranging service offerings and reputations of competing sites.

Second, ship lift pricing was available for the Henderson common-user facility, but not the BAE Systems complex at Henderson, and shipyards in the Singapore hub.

Third, Fremantle/Henderson's travel advantage of about 1.2 days over Darwin for attraction of Dampier-based servicing offshore petroleum activities in the Carnarvon Basin has to be weighed against concerns about access to facilities for commercial vessels sometimes being delayed by priority for defence vessels.

Fourth, the synchrolift proposed for Darwin will not be able to take longer and/or deeper draught vessels servicing offshore petroleum exploration and extraction activities. Most of the vessels in fleets operated by major international providers of support vessels for offshore petroleum activities (Siem Offshore, DOF Subsea, Swire Pacific Offshore, and Solstad Offshore) are unequivocally too large for the proposed Darwin synchrolift, but a few are borderline on the basis of published draughts or gross tonnages. The vessels supplied by major international providers typically are anchor handling tug supply, platform supply, or multipurpose (including construction) support vessels. The largest provider of such vessels for petroleum support off the north-western Australian coast, MMA Offshore, which is an Australian company, has a higher proportion of vessels, around 50-60 per cent, that could use the proposed Darwin synchrolift. However, five (about 16 per cent) of MMA's vessels are borderline, having published draughts of 6.1 to 6.5 metres. If lightship draughts are 6 metres or below, the percentage of MMA's vessels that could use the SLAMI facilities would be around the top of the range.

Fifth, there is some uncertainty regarding the adequacy of facilities for painting during humid and wet weather, although an interim, low-cost solution is under consideration.

Sixth, there is little published information available regarding smaller vessels providing offshore petroleum support services, such as crew transfers, air diving support, and support for remotely operated subsea vehicles.

Seventh, there is a trend towards larger offshore petroleum support vessels. Moreover, large multi-purpose vessels have increasingly been taking on activities previously supported by smaller vessels,

including support for diving and remotely operated subsea vehicles. However, it is not clear how quickly this will raise the proportion of vessels that are too big for the SLAMI facilities.

Eighth, MMA, has its own ship repair and maintenance facilities in the Singapore maritime hub. It seems reasonably likely that MMA would choose to continue to prefer to use those facilities rather than SLAMI-centred facilities in Darwin. However, they might choose to sell them to free-up capital in the context of subdued and highly uncertain petroleum exploration and development activity.

Research regarding deployment of vessels in support of offshore petroleum exploration indicated that there is a reasonable degree of consistency in the types and numbers of vessels deployed in various stages of offshore petroleum exploration. Joseph (2016a,b) and ConocoPhillips (2018, p. 125) have provided useful summaries of types of vessels deployed on a stage by stage basis. This was refined and validated by reviewing available information on specific vessels actually deployed in offshore exploration in the Carnarvon, Browse and Bonaparte Basins off north-western Australia.

Consistent with the preceding research and discussion, for all three scenarios it has been assumed that:

- each exploration programme includes deployment of a vessel for seismic, gravity, and magnetic surveys (eg, *Polarcus Naila* undertaking a three-dimensional (3D) seismic study for multiple clients in the Vulcan Sub-Basin of the Bonaparte Basin)
- drilling programmes for exploration or appraisal require a mobile offshore drilling unit (MODU), which is supported by an anchor handling tug supply vessel to assist with positioning, securing and removal of the MODU and provisioning of the drilling operation, a platform supply vessel to provision the facilities (or an anchor handling tug plus two platform supply vessels), a dive and remotely operated vehicle support vessel
- establishment of each new production platform requires a heavy lift/transport vessel, an accommodation barge, a large multi-purpose vessel to support survey (diving and remotely operated vehicle support) work and platform positioning and erection, an anchor handling tug supply vessel to support positioning, securing and provisioning, a pipelaying vessel, and a pipe supply vessel or tug and barge combination
- each major offshore petroleum production project is supported by at least two platform supply vessels, and typically three for long hauls (for example, *MMA Inscription*, *Mermaid Leeuwin*, and *MMA Responder* support Bayu Undan gas production for the Darwin LNG plant)
- each small production project is supported by one platform supply vessel
- each multi-project operator (eg, Chevron with Gorgon and Wheatstone, and Woodside with the North West Shelf and Pluto) deploys at least one large multi-purpose vessel for inspection, repair and maintenance activities (currently *Skandi Skansen* for Gorgon and Wheatstone)
- each production facility is serviced by a vessel supporting diving and remotely operated vehicles – either a large multi-purpose vessel that also handles various other tasks or much smaller vessels focussed only on support of diving and remotely operated vehicles
- in the case of Prelude gas extraction and floating LNG facilities in the Browse Basin, Shell deploys a large multi-purpose vessel (currently *Skandi Darwin*) for inspection, repair and maintenance activities, and three platform support vessels (currently *Pacific Greylag*, *Pacific Grackle* and *Pacific Hornbill*)
- crews of MODUs, and offshore extraction and processing facilities are changed by helicopter transfers, as for the *Ichthys* (Inpex) and *Prelude* (Shell) facilities, rather than by fast crew vessels
- decommissioning of production facilities is supported by a heavy lift and transport vessel, a large multi-purpose vessel to support survey (diving and remotely operated vehicle support) work and platform positioning and erection, an anchor handling tug supply or anchor handling tug to support removal of facilities.

Application of these assumptions to identified production and exploration ventures off north-western Australia indicates the types and numbers of offshore petroleum support vessels that could potentially be dry docked in Darwin if the SLAMI facilities are suitable. This information has been shown in **Table 2.3**.

TABLE 2.3 OFFSHORE PETROLEUM SUPPORT VESSELS – ESTIMATES FOR BONAPARTE, BROWSE AND CARNARVON BASINS, 2019

Basin, Field, Operator	Petroleum Activity	Geophysical Survey Vessel	Large Multi-Purpose Vessel	Anchor Hand. Tug Supply Vessel	Platform Supply Vessel	Small Survey, Dive, ROV Support Vessel	Pipelaying, Pipe Supply Vessel
Bonaparte Basin Production							
Bayu Undan ConocoPhillips	gas, cond.; CPF on 2 plat., unmanned wellhead plat., cond. FSO, pipeline to Darwin LNG		1		3		
Montara Jadestone Energy	oil; platform, FPSO				1	1	
Blacktip ENI	gas; platform, pipeline				1	1	
Laminaria-Corallina Northern Oil & Gas	oil; FPSO				1	1	
Advanced Exploration							
Barossa-Caldita ConocoPhillips	Targeting gas, condensate; appraisal drilling 2018- 2019, if positive outcome then prod'n drilling			1	1	1	
Greater Sunrise Woodside (33.4%) operator, but Timor Leste Gov't recently obtained 56% by acquiring Shell and ConocoPhillips interests	Targeting gas, condensate; hypothetical appraisal drilling after Timor Leste's acquisition of majority interest			1	1	1	
Cash Maple PTTEP	Targeting gas, condensate; geotechnical, survey work underway, appraisal drilling planned			1	1	1	
Petrel-Tern-Frigate Neptune Energy	Targeting gas, cond.	future appraisal drilling		1	1	1	
Early-Stage Exploration							
Vulcan Sub-Basin multiple entities	3D seismic survey		1				

Basin, Field, Operator	Petroleum Activity	Geophysical Survey Vessel	Large Multi-Purpose Vessel	Anchor Hand. Tug Supply Vessel	Platform Supply Vessel	Small Survey, Dive, ROV Support Vessel	Pipelaying, Pipe Supply Vessel
Browse Basin		Production					
Icthys	gas, cond.;		1		3		
Inpex	CPF on semi-submersible platform, cond. FPSO, pipeline to LNG plant in Darwin						
Prelude	LNG, LPG, cond.: FLNG plant		1		3		
Shell							
		Advanced Exploration					
Crown-Lasseter Santos	Targeting gas, condensate	future appraisal drilling		1	1	1	
Carnarvon Basin		Production					
North Rankin A, B Woodside	gas, cond.; 2 plat. Pipelines		1 shared with other NWS facilities		2		
Goodwyn Alpha and Gr. Western Flank Woodside	Gas, cond.; plat., cond. FPSO, pipeline to North Rankin, then to Karratha LNG		1 shared with other NWS facilities				
Cossack, Wanaea, Lambert, Hermes Woodside	oil, gas; OKHA FPSO for oil, Cossack, Wanaea gas piped to Nth Rankin		shared with other NWS facilities		2		
Angel Woodside	gas; unmanned plat., gas piped to Nth Rankin		shared with other NWS facilities				
Vincent Woodside	oil; Ngujima-Yin FPSO		shared with other NWS facilities		1		
Enfield Woodside	oil; Nganhurra FPSO; scheduled removal by end 2018		shared with other NWS facilities	1			

Basin, Field, Operator	Petroleum Activity	Geophysical Survey Vessel	Large Multi-Purpose Vessel	Anchor Hand. Tug Supply Vessel	Platform Supply Vessel	Small Survey, Dive, ROV Support Vessel	Pipelaying, Pipe Supply Vessel
Pluto-Zena Woodside	gas; platform, pipe to Pluto LNG, domgas plants near Karratha		1 shared with NWS facilities		2		
Gorgon-Jansz lo Chevron	gas, subsea completions; pipeline to LNG, domgas plants on Barrow Is.		1 shared with Wheatstone		2		
Wheatstone Chevron	gas; wells, platform, pipe to Onslow LNG, domgas plants		shared with Gorgon		2		
Macedon BHP Billiton	gas; subsea completions, pipe to domgas plant, Onslow		1 shared with Pyrenees fields				
Ravenswood, Crosby, Stickle BHP Billiton	Oil; subsea completions, Pyrenees FPSO		shared with Macedon		2		
Wandoo Vermilion Energy	Oil; 2 platforms (1 manned), oil loading buoy				1	1	
Stag Jadestone Energy	Oil; CPF plat., FSO				1	1	
Van Gogh, Coniston, Novara in Exmouth Sub-Basin Quadrant Energy	oil; Ningaloo Vision FPSO		1		2		
John Brooks, Harriet, East Spar Quadrant Energy	gas, cond., oil; 3 plat., Varanus Is. proc. plant, domgas piped to Dampier-Bunbury line		1		2		
Reindeer Quadrant Energy	Gas; platform, pipeline to Devil Creek domgas plant				1	1	
	Advanced Exploration, Development						

Basin, Field, Operator	Petroleum Activity	Geophysical Survey Vessel	Large Multi-Purpose Vessel	Anchor Hand. Tug Supply Vessel	Platform Supply Vessel	Small Survey, Dive, ROV Support Vessel	Pipelaying, Pipe Supply Vessel
Greater Enfield - Laverda Canyon, Norton over Laverda, Cimatti Woodside	oil; to be linked to Ngujima-Yin FPSO; finalise drilling early in 2020; first oil mid-2019		1	1	2	1	2
Stag Jadestone Energy	Infill drilling in Stag oilfield, 2 wells 2019, 2 wells 2020			1	1	1	1
Advanced Exploration							
Gorgon Stage 2 Chevron	7 Gorgon wells, 4 Janz lo wells starting 2019			1	1	1	
Subtotal Bonaparte and Browse Basins		1	3	5	10	7	0
Subtotal Carnarvon Basin		0	7	4	24	6	3

Note: conden. = condensate; plat. = platform; CPF = central processing facility; FPSO = floating production, storage and offloading; FSO = floating storage and offloading; FLNG = floating liquefied natural gas; domgas = domestic gas – gas for use in WA, rather converted to LNG for export; 3D = three-dimensional

SOURCE: ACIL ALLEN RESEARCH

The estimated numbers of vessel of various types in the table above is conservative. There may be other exploration and production drilling activities and supporting vessels in the Bonaparte, Browse and Carnarvon Basins in 2019. In addition, the table does not include vessels required to support development activity that might follow from positive outcomes from advanced exploration activities.

Over the past 12 months, the next wave of offshore petroleum projects has emerged. There are six major offshore petroleum projects which are already well advanced and could to move into production over the next three to five years. They have been presented in approximate probability order. It is considered likely that the first four will proceed to Final Investment Decision and eventual production under the current outlook for the global economy and energy markets.

These are summarised below.

- Chevron's "Gorgon Stage 2" project will involve the establishment of 11 new wells, three new subsea gathering stations, associated subsea tieback to two existing FPSOs, to maintain raw gas output that will feed its existing three LNG trains. The project may also result in additional domestic gas supply to the Western Australian market. Drilling is expected to begin in 2019, as indicated in the table above.
- Woodside's Browse project was originally conceived as a Floating LNG development but has now been reimagined as a project to backfill the North West Shelf LNG Plant (which is expected to require new feed gas in the middle of the decade). The project will see three fields gathered to a single major subsea transmission pipeline, coming onshore at the Karratha Gas Plant. The final Investment Decision is targeted for 2021.
- Woodside's Scarborough project in the Carnarvon Basin will involve a new LNG train established at the company's Pluto facility near the Karratha Gas Plant. Scarborough is a single field development with a dozen wells, targeting Final Investment Decision in 2020.
- The Barossa Caldita Joint Venture in the Bonaparte Basin, which is led by ConocoPhillips, has been under investigation for some time, but has come into focus recently because of the need to find feed gas to keep the Darwin LNG Plant operating. The initial project is believed to centre on

the Barossa field, with the Caldita field an expansion option for the future. It entered Front End Engineering and Design in early 2018, with Final Investment Decision to come in 2020, and a target production date of 2023.

- The prospective Dorado oil discovery in the Bedout Basin is now owned by Santos, but was discovered by Quadrant Energy and Carnarvon Petroleum in early 2018. The discovery is the first major find in the Bedout Basin (located east of the Carnarvon Basin, and north of Port Hedland). The project remains in appraisal, but has been described as “staggering” by participants,⁸ while the recent acquisition of Quadrant by Santos is considered a strong signal of the field’s potential.
- Development of the Greater Sunrise project in the Bonaparte Basin (Timor Sea) is subject to considerable uncertainty. However, Timor-Leste’s acquisition of Shell’s and ConocoPhillips’ interest to give Timor Leste a majority position in the project was planned to help accelerate development of the gas fields and a LNG plant in Timor Leste.

Each offshore petroleum development will bring with it a substantial short-term uplift in vessel activity off the coast of Western Australia and the Northern Territory. For example, the Gorgon stage 2 development would require a large multi-purpose vessel to support survey (diving and remotely operated vehicle support) work and subsea completions, an anchor handling tug supply vessel to support positioning, securing and provisioning, a pipelaying vessel, and a pipe supply vessel or tug and barge combination.

Ongoing vessel activity will not rise by as much as the activity associated with new production, because some projects will have the role of replace gas from other fields in existing LNG plants. To provide an indication of the likely ongoing increase in vessel numbers, **Table 2.4** below shows estimated vessel numbers during production from three of the potential new developments. The backfill projects and the least likely of the projects have been excluded to be conservative.

TABLE 2.4 OFFSHORE PETROLEUM SUPPORT VESSELS – ESTIMATES FOR NEW PRODUCTION ACTIVITIES IN THE NEAR-TERM FUTURE

Basin, Field, Operator	Petroleum Activity	Geophysical Survey Vessel	Large Multi-Purpose Vessel	Anchor Hand. Tug Supply Vessel	Platform Supply Vessel	Small Survey, Dive, ROV Support Vessel	Pipelaying, Pipe Supply Vessel
Carnarvon Basin New Production							
Gorgon-Jansz lo Stage 2 Chevron	gas, subsea completions; pipeline to LNG, domgas plants on Barrow Is.		1 shared with Gorgon Stage 1 and Wheatstone		2		
Scarborough Woodside	gas; semi-submersible floating prod’n and processing unit, ~430 km pipeline to Pluto LNG plant		shared with Gorgon		2		
Bedout Basin New Production							
Dorado Santos	Oil; subsea completions, FPSO		1		2		

⁸ Wood Mackenzie, *Dorado: Australia’s Biggest Oil Discovery This Century*, 16 August 2018. Accessed online at <http://www.mining.com/>

Basin, Field, Operator	Petroleum Activity	Geophysical Survey Vessel	Large Multi-Purpose Vessel	Anchor Hand. Tug Supply Vessel	Platform Supply Vessel	Small Survey, Dive, ROV Support Vessel	Pipelaying, Pipe Supply Vessel
Additional Vessels – Carnarvon and Bedout Basins		0	2	0	6	0	0
Total All Activity (includes numbers from Table 2.3)		1	12	9	40	13	3

Note: FPSO = floating production, storage and offloading; domgas = domestic gas – gas for use in WA, rather converted to LNG for export
SOURCE: ACIL ALLEN RESEARCH

On the other hand, there is likely to be leakage to other repair and maintenance facilities from the potential numbers of offshore petroleum support vessels that could be dry docked in Darwin. There are two reasons for this that arise from the uncertainties discussed above. First, vessels supporting operations in the Bonaparte and Browse Basins are more likely to be taken to Darwin for dry docking than vessels supporting offshore petroleum activities in the Carnarvon Basin. The main reasons are that Dampier is closer to Henderson than to Darwin, and Henderson is an established, well-resourced drydocking location. Another reason is that the distance from Dampier to the Singapore maritime hub is less than the distance from Darwin to Singapore. Second, many offshore petroleum support vessels are too large for the proposed synchrolift, while smaller vessels may be drawn away to other facilities in Darwin that specialise in smaller craft.

The likelihood of leakage is reflected in the three scenarios – labelled low, base and high. They have been defined by plausible assumptions regarding different degrees of capture of (leakage from) the relevant potential market under uncertainty.

The **low** scenario reflects a relatively pessimistic view of the degree of market capture by the SLAMI facilities, having regard to uncertainties outlined above. The **base** (middle-of-the-road) scenario reflects an arguably balanced or reasonable view of the degree of market capture. The **high** scenario is based on a more optimistic view of market penetration by SLAMI.

In the **low** scenario, it has been assumed that:

- the Darwin SLAMI facilities do not provide services to any of the vessels operated by MMA Offshore, which has its own repair and maintenance facilities in Batam and Singapore
- vessels longer than 85 metres or having published draught in excess of 6 metres are not able to use the facilities
- vessels less than 150 tonnes displacement use other facilities that specialise in small craft
- 60 per cent of other vessels operating in the Bonaparte and Browse Basins (off the NT and Kimberley, WA coasts) use the SLAMI facilities
- 30 per cent of offshore petroleum support vessels operated by entities other than MMA Offshore in the Carnarvon and Bedout Basins use the SLAMI facilities to drydock their craft, with the remaining 70 per cent continuing to use facilities such as those at Henderson or the Singapore maritime hub.

The MMA assumption and the maximum vessel size criteria would eliminate about half of the vessels in the table above. The number is cut further by the assumption of differential market capture according to the petroleum basin in which vessels provide services. The estimated number of vessels that would use the SLAMI facilities in this scenario is five. These would be weighted towards vessels supporting diving and remotely operated vehicles (say 3), rather than anchor handling tug supply or platform supply vessels (say a total of two). An indicative vessel in the former category would be Guardian Offshore's *DP2 Seamaster* with a length of 40 metres, beam of 15 metres, draught of 2.8 metres and gross tonnage of 489. An indicative vessel in the latter category would be Bhagwan Marine's anchor handling tug supply vessel *CMV Athos* with a length of 65 metres, beam of 16 metres, draught of 5 metres and gross tonnage of 2,237.

In the **base** (middle-of-the-road) scenario, it has been assumed that:

- vessels longer than 85 metres or having published draught in excess of 6.5 metres are not able to use the facilities
- 70 per cent of other vessels (including MMA vessels) operating in the Bonaparte and Browse Basins (off the NT and Kimberley, WA coasts) use the SLAMI facilities
- 40 per cent of offshore petroleum support vessels (including MMA vessels) other than those outside the range defined above that operating in the Carnarvon Basin use the SLAMI facilities to drydock their craft, with the remaining 60 per cent continuing to use other facilities, such as those at Henderson or the Singapore maritime hub.

Adjustment of the draught criterion for the base scenario, relaxation of the assumption that MMA vessels necessarily go to the Singapore hub, and assumption of greater market penetration by the SLAMI facilities increase the estimated number of vessels that would use the SLAMI facilities to 17. These would be weighted towards platform supply vessels and anchor handling tugs (say a total of 11), rather smaller vessels supporting diving and remotely operated vehicles. An indicative vessel in the latter category would be Guardian's *DP2 Seamaster* (see above). An indicative vessel in the former category could be MMA Offshore's platform supply vessel, the *MMA Leveque* with a length of 74.87 metres, beam of 16.4 metres, draught of 6.37 metres and gross tonnage of 2,874.

In the **high** scenario, it has been assumed that:

- the synchrolift is expanded to accommodate vessels up to 120 metres with a draught of 8.5 metres and lightweight displacement of 5,500 tonnes
- vessels less than 50 tonnes displacement use other facilities that specialise in small craft
- 80 per cent of other offshore petroleum support vessels (including MMA vessels) operating in the Bonaparte and Browse Basins (off the NT and Kimberley, WA coasts) that fall within the size range described above actually use the SLAMI facilities
- 50 per cent of offshore petroleum support vessels (including MMA vessels) operating in the Carnarvon Basin that fall within the size range described above actually use the SLAMI facilities to drydock their craft, with the remaining 50 per cent continuing to use facilities such as those at Henderson or the Singapore maritime support hub.

In the high scenario, further relaxation of the size constraint on use of the SLAMI facilities, and the assumption of still greater market penetration by those facilities, increases the estimated number of vessels that would use the SLAMI facilities to 47. An indicative vessel in this category would be DOF Subsea's *Skandi Darwin*, which is a multi-purpose support vessel with a length of 93.8 metres, beam of 20 metres, draught of 6.5 metres, and gross tonnage of 6,555. Another would be the *Siem Thiima*, which is a platform supply vessel with a length overall of 89.2 metres, beam of 19 metres, draught of 7.4 metres, and gross tonnage of 4,768.

The increase in the number of vessels over the base case was attributable mainly to the lifting of the vessel size constraint. That added 21 vessels, while the assumption of greater market penetration added nine vessels. Most of the vessels added would be anchor handling tug supply vessels, platform supply vessels and multi-purpose support vessels (say 20 of 21 added) that would be excluded by the proposed synchrolift's size restrictions. An indicative vessel among those added by lifting the size constraint would be the *Siem Amethyst*, an anchor handling tug supply vessel with a length of 91 metres, beam of 22 metres, draught of 7.95 metres, and gross tonnage of 7,473.

It is assumed that offshore petroleum support vessels are drydocked every four years on average. This allows for five-yearly out-of-water surveys required by the Australian Maritime Safety Authority (2018a) and coincident scheduled maintenance activities, and unscheduled repairs as necessary at other times. It follows that there would be an average of one-two lifts per year in the low scenario, four per year in the base scenario, and 12 per year in the high scenario. Each dry docking has been assumed to last for eight weeks.

Growth or decline of offshore petroleum activity off the coast of north-western Australia is likely to depend on oil prices. This applies to gas exploration as well as oil exploration, as LNG prices typically are linked to oil prices. As oil prices are highly uncertain, it has been assumed that the level of activity reflected in the scenarios remains unchanged over time. This involves an implicit assumption that completion of exploration programmes planned in 2019 will be replaced either by development activity or exploration in respect of other targets.

2.10.3 Tugs

Tug boats ('tugs') are a utility class of vessel with no standard size, shape or weight, but share a common large power-to-weight ratio on account of their primary use. Tugs are predominately used to:

- guide larger vessels around difficult to navigate waters
- move large vessels or facilities without their own propulsion systems
- facilitate entry to and exit from ports.

Highly specialised tugs known as anchor handling tugs and anchor handling supply tugs are used in the offshore petroleum exploration and extraction industry. They tow offshore structures, modules and barges, as well as provide anchor handling services. Anchor handling tug supply vessels also deliver supplies to offshore platforms. These highly specialised tugs are discussed above under the heading Offshore Petroleum Support Vessels.

In northern Australia, more conventional tugs are used to assist bulk ore carriers, and LNG tankers access and exit major bulk commodity ports, such as Port Hedland, Dampier, and Darwin. They also assist ships importing refined petroleum products (all three ports), containers, and motor vehicles (Darwin). Generally, tugs are used because access to these ports requires precise movement through narrow and shallow channels (Sexton, 2017). In the petroleum extraction industry, tugs are used to assist the movement of tankers to and from floating production, storage and offloading vessels moored offshore.

Given the prevalence of the bulk mineral and petroleum export industries in northern Australia, tugs are an important part of the bulk export supply chain and regional economies. This importance was underscored in a 2014 labour dispute, in which unionised tug operators used their leverage in respect of port operations in Port Hedland to the advantage of labour.

Currently, there are three primary tug operators in the major bulk export ports across northern Australia. In addition, diversified vessel providers (eg, Bhagwan Marine) have tugs in their fleets (underscoring their prevalence, importance and multiple uses).

At **Port Hedland**, there are two licenced tug operators: BHP Billiton (Towage Services) Pty Ltd (a subsidiary of BHP Ltd), and Pilbara Marine Pty Ltd (a subsidiary of Fortescue Metals Group (FMG)).

BHP Billiton (Towage Services) owns 18 tugs based at Port Hedland, and has contracted the operation of towage services to Rivtow Marine. BHP Billiton expanded its tug fleet when it switched its contract to Rivtow from Teekay. Rivtow operates in a "partnership" model rather than a traditional principal-agent model, effectively converting each of the tugs it manages on BHP's behalf into individual businesses. Rivtow also provides towage services at the Hay Point coal terminal in Queensland, as discussed below (BHP Billiton, 2015).

Pilbara Marine was awarded its licence in 2016, breaking BHP's previously regulated monopoly on tug operations at Port Hedland. It subcontracts the provision of tug services to Kotug Australia Pty Ltd, which in turn has subcontracted the operations to Westug Pty Ltd, which performs towing services under the Pilbara Marine licence. Pilbara Marine owns six tugs, while Kotug owns three. All of these vessels are based at Port Hedland. Westug also provides towage services at the Port of Dampier (see below).

Tug operations are more competitive at the other major bulk export terminal in Western Australia, the **Port of Dampier** (and adjacent ports like Cape Lambert which are managed together). There are three providers operating at Dampier: Riverwijs, Westug and Bhagwan Marine.

Riverwijs is a joint venture between an Australian firm, Riverside Marine, and Swiss-owned Svitser (which is a major player at the Port of Darwin). The company provides harbour towage services at Dampier, and more specialised LNG terminal towage services to the North West Shelf's Withnell Bay export terminal and Woodside's Pluto export terminal. Riverwijs and Svitser have four tugs at Dampier harbour and two based at the Burrup Bulk Export Facility (part of the broader Port of Dampier).

Westug is the provider of towage services for Rio Tinto (the major bulk iron ore exporter out of Dampier). It manages and operates 11 Rio Tinto-owned tugs (plus four smaller craft) on a five-year

contract signed in 2018 and reportedly valued at \$200 million (Hastie, 2018). Westug has been Rio Tinto's tug services provider for more than 20 years.

FIGURE 2.12 SVITZER PALMERSTON, WITH SKANDI DARWIN IN BACKGROUND, DARWIN



SOURCE: [HTTPS://WWW.MARINETRAFFIC.COM/EN/AIS/DETAILS/SHIPS/SHIPID:4893654/MMSI:503053420/IMO:9803857/VESSEL:SVITZER_PALMERSTON](https://www.marinetraffic.com/EN/AIS/DETAILS/SHIPS/SHIPID:4893654/MMSI:503053420/IMO:9803857/VESSEL:SVITZER_PALMERSTON)

With respect to **LNG terminal towage in Western Australia**, Svitzer provides services to the Chevron Australia-owned Gorgon and Wheatstone LNG projects (in addition to its role in the Riverwijs JV's contract with the North West Shelf and Pluto plants). Svitzer has provided eight tugs plus one pilot vessel as part of each of its contracts with Chevron. Four of these tugs are based at Barrow Island and four at Onslow (Svitzer also has an older tug at Onslow for the salt terminal). Kotug

provides tug services to Shell's Prelude Floating LNG (FLNG) project, with three vessels based at the Port of Broome.

At the **Port of Darwin** there are two main towage providers: Svitzer and Coastal Tug & Barge Pty Ltd. While both are listed independently in the Port of Darwin handbook, Coastal Tug & Barge states that it works in partnership with Svitzer.

Svitzer is one of the largest vessel service providers in Australia, providing a range of services and vessels across a range of industries and locations. Overall it has 93 vessels based in Australian ports, plus two at Port Moresby in Papua New Guinea. Svitzer provides predominately towage-related services at Port of Darwin. Svitzer holds a contract with Japanese energy company INPEX, which operates the Icythys LNG project (production facility off the Kimberley coast of Western Australia, and LNG plant and terminal in the Port of Darwin). Svitzer advised that it has 10 tugs in Darwin, six of its own vessels, and four under a charter-party agreement. Coastal Tug & Barge owns three tug vessels, which are all based at the Port of Darwin. Bhagwan also had a tug in Darwin as at 1 October 2018.

Bhagwan Marine is one of the major diversified vessel services providers in northern Australia. It has up to 80 vessels operating in Australia, drawn from its Australian fleet of 148 vessels. Bhagwan has 17 tugs in its Australian fleet, but it is not clear how many of these are based at Pilbara ports. Rather than provide mainstream services to iron ore and LNG carriers, Bhagwan's tug services typically relate to difficult, higher-risk tasks mainly in support of offshore petroleum activity, and construction activity. Bhagwan is discussed in more detail in sub-section 2.9.2 above.

Towage services are also required at various **Queensland Ports**, which rely on bulk carriers for the export of coal and LNG. However, there is already adequate ship-lifting and vessel services providers much closer to Queensland's bulk export ports, and so this element of the industry has not been explored in great detail. The major players in the Queensland bulk export towage market are Svitzer (16 vessels based at Bowen, Cairns, Lucinda and Mourilyan Ports), Rivotow (monopoly tug provider at Hay Point), and Smit Lamnalco Towage (four tugs at Weipa and Mackay ports). There is a reduced need for tugs at most Queensland ports as they are generally natural deep water ports (compared to the shallower ports off Western Australia). ACIL Allen was unable to secure specialist tug providers (such as Kotug, Westug or Rivotow) for consultation.

Svitzer and Bhagwan were available for consultation. Both provide towage services as part of their overall service offering range. Both indicated a willingness to consider use of the SLAMI facilities if they are developed. They indicated that the proposed synchrolift was large enough to cater for all vessels in their fleets. Both operators suggested the proposed ship lift facility would prove useful for 2-5-yearly hull and shaft surveys, and unscheduled hull repairs, prop repairs and change-outs. Sand blasting and painting could also be undertaken when vessels are out of the water.

During consultation, Kelly Kruger (Marine Technical Services Manager) from Svitzer commented that the proposed synchrolift at the Port of Darwin would be an option for "quite a few of Svitzer's tugs on the West Coast." She stated, "when you view the sailing time, it's great having two options for docking and tendering [between Darwin and the Henderson facility in the Port of Fremantle Outer Harbour], which creates a more competitive market for us."⁹ She said that the Barrow Island location of four of Svitzer's tugs was borderline between Darwin and Henderson in respect of travel time and consequent opportunity cost.

Emil Tastula (NT Regional Manager) of Bhagwan Marine said in a written response to ACIL Allen's questionnaire that costs, including the opportunity cost of travel, always dictate where Bhagwan decides to dock a vessel. To the extent a ship lift at Darwin could reduce the total cost of sustaining a vessel it will be utilised by the industry.

Kelly Kruger identified potential obstacles to use of the SLAMI facilities. One was the potential unavailability of very specialised equipment and clean, covered workspace for thruster overhauls by specialists who would be flown in. Henderson has the required facilities. Another obstacle was the potential unavailability of covered and climate-controlled workspace for painting, because wet and humid weather could otherwise cause long delays with high opportunity cost.

⁹ Kruger, K. 2018. *Svitzer Consultation Notes*, prepared by ACIL Allen Consulting from stakeholder consultation session held 4 October 2018

Rob Jackson (Head of Sustainment) from Austal suggested tugs observed that there are few maintenance or repair activities in this vessel class that require a vessel to be taken out of the water. He suggested that it was only at five-yearly survey intervals that a vessel would need to be dry docked, with most ad hoc repairs and maintenance able to be completed with a vessel alongside the tug.¹⁰

Estimated SLAMI Market – Tugs

Table 2.5 below summarises the market analysis for towage tug vessels based in Northern Australia. Analysis of more specialist tugs, such as anchor handling tugs or anchor handling tug supply vessels, is included in sub-section 2.10.2.

Tug dimensions have not been included in the summary table as it is assumed all tugs are capable of being lifted by SLAMI under any configuration (as tug class vessels are generally <50m in length and are well within proposed SLAMI limits for weight, breadth and draught).

TABLE 2.5 VESSEL MARKET ANALYSIS – TOWAGE TUGS

Vessel Operating Area and Home Port*	Vessel Owner	Vessel Manager	Number of Vessels	Primary Activities
Port of Port Hedland	BHP	Rivtow	11	Towage services to bulk ore carriers entering, manoeuvring within, and exiting Port Hedland
	BHP	Rivtow	7	Towage services to bulk ore carriers entering, manoeuvring within, and exiting Port Hedland
	Pilbara Marine (FMG)	Westug	6	Towage services to bulk ore carriers entering, manoeuvring within, and exiting Port Hedland
	Kotug	Westug	3	Towage services to bulk ore carriers entering, manoeuvring within, and exiting Port Hedland
Port of Dampier	RiverWijs	RiverWijs	4	Towage services to bulk ore carriers and LNG tankers within the Port of Dampier area, and emergency support to AMSA
	RiverWijs	RiverWijs	2	Towage services to bulk ore carriers and LNG tankers within the Port of Dampier area, and emergency support to AMSA
	Rio Tinto	Westug	8	Towage services to bulk ore carriers entering, manoeuvring within, and exiting the Port of Dampier
	Rio Tinto	Westug	1	Towage services to Dampier Salt
	Rio Tinto	Westug	2	Towage services to bulk ore carriers entering, manoeuvring within, and exiting the Port of Dampier
Gorgon Gas Plant Barrow Island	Svitzer	Svitzer	4	Towage services to Gorgon Gas Plant LNG Terminals
Wheatstone Gas Plant Port of Onslow	Svitzer	Svitzer	4	Towage services to Wheatstone Gas Plant
Prelude LNG Project Port of Broome	Kotug	Kotug	3	Towage of petroleum tankers at Prelude FLNG project
INPEX LNG Project Port of Darwin	Svitzer	Svitzer	4	Towage of petroleum tankers within Port of Darwin for Icythys LNG Project onshore facilities

¹⁰ Jackson, R. 2018. *Austal Consultation Notes*, prepared by ACIL Allen Consulting from stakeholder consultation session held 19 October 2018.

Vessel Operating Area and Home Port*	Vessel Owner	Vessel Manager	Number of Vessels	Primary Activities
Port of Darwin	Svizter	Coastal Tug & Barge	3	General harbour towage
Port of Broome	Broome Marine	Broome Marine	2	Towage at Port of Broome
Bayu Undan Unknown home port	Kotug	Kotug	1	Towage at Bayu Undan
Total Tugs – Pilbara-based			52	
Total Tugs – Kimberley-based			5	
Total Tugs – NT-based			7	

SOURCE: ACIL ALLEN CONSULTING FROM VARIOUS SOURCES

* WHERE ONE LOCATION IS LISTED, THIS SHOULD BE INTERPRETED AS THE VESSELS OPERATE IN AND ARE BASED AT THE SAME PORT.

In addition to the vessels listed in the table above, ACIL Allen has identified that Mt Gibson Iron's Koolan Island iron ore mine will resume operations in the first quarter of 2019, following reconstruction of a seawall which collapsed in 2014. Like most Western Australian iron ore projects, Koolan Island is a Direct Ship Ore (DSO) operation, with ore loaded on to bulk carriers docked at a natural deep-water port on the island. Based on the proposed scale of Mt Gibson's operations, it is likely the company will seek the services of two to three towage tugs, which are likely to be based at a purpose-built tug pen on the island. These vessels will fall in the scope of SLAMI, given Koolan Island's location (250 kilometres north east of Broome, approximately 1,000 kilometres from Darwin).

The numbers above represent a conservative but realistic estimate of towage tugs based at various ports in Northern Australia. The numbers at each port have been identified using publicly available information regarding long term contracts and other announcements by the companies identified in the table (for instance, Svitzer indicated to ACIL Allen that it had 10 tug vessels based at the Port of Darwin, but ACIL Allen could only identify seven, which included three vessels operated by Coastal Tug & Barge under charter party arrangement).

In keeping with the scenarios for offshore support vessels, ACIL Allen's scenarios for towage tugs are presented on the basis of an assumed market penetration by geographic region. There are no material restrictions on the potential use of the facility by towage tugs, and so scenarios are presented on the basis of vessel location only. The scenarios have been summarised below

Under the **low** scenario, between 24 and 26 towage tugs would utilise SLAMI as their base for repairs and maintenance requiring dry docking, based on an assumption that:

- 100 per cent of Darwin-based tugs use SLAMI (7 tugs)
- 60 per cent of Kimberley-based tugs use SLAMI (2-3 tugs)
- 30 per cent of Pilbara-based tugs use SLAMI (15-16 tugs).

Under the **base** scenario, between 30 and 33 towage tugs would utilise SLAMI as their base for repairs and maintenance requiring dry docking, based on an assumption that:

- 100 per cent of Darwin-based tugs use SLAMI (7 tugs)
- 70 per cent of Kimberley-based tugs use SLAMI (3-4 tugs)
- 40 per cent of Pilbara-based tugs use SLAMI (20-22 tugs).

Under the **high** scenario, between 36 and 39 towage tugs would utilise SLAMI as their base for repairs and maintenance requiring dry docking, based on an assumption that:

- 100 per cent of Darwin-based tugs use SLAMI (7 tugs)
- 80 per cent of Kimberley-based tugs use SLAMI (4-5 tugs)
- 50 per cent of Pilbara-based tugs use SLAMI (25-27 tugs).

The high variance between the low case (24) and high case (39) represents the uncertainty regarding the potential penetration of SLAMI into the market for vessel services in the Pilbara region, which is located in between both the Henderson facility and the proposed SLAMI.

According to stakeholders, towage tugs do not undergo high volume regular servicing which requires the vessel to be drydocked. Instead, vessels can be inspected and serviced while at port (discussed earlier in this section). Most tugs operating in the identified waters are relatively new vessels, with those operating under charter party agreement with BHP, Rio Tinto, FMG, Chevron, Shell and INPEX having been specially commissioned for their respective contracts. Given this, it is considered likely most tugs are operating on service cycles at the longer end (5 years) of the range offered by stakeholders. This is consistent with five-yearly out-of-water surveys required by the Australian Maritime Safety Authority (2018a) and coincident scheduled maintenance activities. In addition, towage tugs operate in relatively calm waters with highly regulated vessel movements. For these reasons, the prospect of unscheduled repairs and maintenance in this segment of the market is limited.

Consequently, towage tugs are projected to account for between five (low case) and eight (high case) lifts per annum, although actual demand may be more lumpy, depending on the precise service schedule and availability for servicing of each vessel operating in the market. The estimated number of lifts in the base scenario is an average of 6.5 per annum. Each dry docking has been assumed to last for five weeks.

Dimensions for a potentially typical towage tug, based on the *Svitzer Stockton* that operates in Darwin, are:

- length 33 metres
- beam 14 metres
- draught: 5.1 metres
- gross tonnes 630 (deadweight tonnes 487).

Some tugs are smaller than this, but these dimensions are a good view of the future. The length, beam and draught (couldn't find displacement) are fairly similar to FMG's six new tugs which have just moved into full operation in Port Hedland, although these tugs have a slightly larger draught.

2.10.4 Coastal/Remote Shipping/Logistics Service Vessels

There are multiple operators involved in coastal shipping in northern Australia. They provide important transport services to remote communities and industries.

Sea Swift

Sea Swift is the largest mover of inshore freight in Australia. They provide services to the oil and gas sector, Power and Water Corporation and remote communities.

Their services include:

- general cargo (regular service freight)
- project and charter (tug and barge capability)
- mother shipping (prawn trawler fleet)
- adventure cruises.

Sea Swift provides regular scheduled services to remote coastal and island communities across northern Australia from Darwin to Cairns, as well as servicing large national and international corporations such as Rio Tinto, South 32, Bechtel, and Woolworths. Sea Swift describes itself as a one-stop-shop for all shipping transport and logistics needs across coastal and island northern Australia.

Sea Swift currently operates 25 vessels across northern Australia:

- two linehaul vessels, the *MV Trinity Bay* and *MV Newcastle Bay*
- 12 landing craft (LCTs)
- five tug and barge sets (10 vessels)
- one mother ship, the *MV Kestrel Bay* (providing supplies and transferring crews and catches) for prawn trawlers in the Gulf of Carpentaria.

Sea Swift's largest vessels are:

- *MV Trinity Bay* – length 81 metres, beam 15 metres, draught 5.74 metres, gross tonnes 1,594
- *MV Newcastle Bay* – length 83.2 metres, beam 13 metres, draught 5.39 metres, gross tonnes 1,694
- *LCT Territorian* – length 68 metres, beam 14 metres, draught 3.65 metres, gross tonnes 1,107
- *LCT Karema Chief* – length 64 metres, beam 14.63 metres, draught 3.2 metres, gross tonnes 1,350
- *LCT Biquele Bay* – length 63 metres, beam 14.6 metres, draught 3 metres, gross tonnes 1,064.

All of Sea Swift's vessels are currently within the limiting vessel characteristics for the proposed shiplift. However, Terry O'Connor, the Chief Executive Officer of Port of Darwin, indicated that Sea Swift was considering a transition to larger ships as it expands and replaces existing vessels.

Terry O'Connor advised that five LCTs were based in Darwin as at 1 October 2018. They were the *Territorian*, *Arnhem Trader*, *Karema Chief*, *Malu Chief* and *Cygnnet*.

Gary Scott, the Head Engineer at Sea Swift, indicated that the outlook for Sea Swift's business was positive but was not prepared to elaborate on or quantify any expansion plans. However, Terry O'Connor commented that Sea Swift was considering expansion of its service area to include northern coastal locations in Western Australia.

Because Sea Swift's vessels operate in shallow tropical waters, damage occurs most commonly to hulls and propellers. This requires scheduled and unscheduled dry dockings of vessels.

Sea Swift advised that it has a planned maintenance schedule of twice-a-year-drydocking for a period of four weeks each time. Any unscheduled maintenance happens approximately three times a year for a period of 4 to 5 days. Currently, Sea Swift does not use any maintenance services in Darwin. Pearl Marine Engineering was considered to be expensive and unresponsive.

Sea Swift advised that the key factors that will determine whether it shifts its repair and maintenance work from Port Moresby and Cairns to the proposed facility are:

- commercial considerations, particularly overall cost
- competitive rates under a common-user-facility model
- confidence that Sea Swift would not be deprioritised in favour of the Royal Australian Navy or other bigger clients
- *an operating model that is flexible enough to have three or four vessels out of the water at the same time.*

Mott MacDonald (2016) reported that the cost of a major maintenance event in Port Moresby for a Sea Swift vessel was less than half the cost of equivalent work in Darwin.

Gary Scott observed that Norship, Thales, and BSE are important vessel-service providers, the presence of which would be key to the commercial success of the SLAMI facilities.

Gary Scott expressed some scepticism that the necessary skills were available in Darwin for the facility. He believes it is hard to get qualified people and that such people don't want to work in Darwin because of the high cost of living, high property prices and an unattractive lifestyle relative to places like Cairns. This contradicted views expressed by others.

Bhagwan Marine

Bhagwan Marine operates four landing craft transport (LCT) barges in northern Australia. Three of these vessels are owned by Bhagwan Marine and the fourth LCT barge has been chartered.

The *Bhagwan Mover* has a length overall of 48 metres, a beam of 12.8 metres, and a draught of 2.4 metres. The *Bhagwan Rocker* (Figure 2.13) has an overall length of 38 metres, a beam of 10.6 metres, and a draught of 2 metres. The corresponding dimensions for the *Bhagwan Shaker* are 48.5 metres, 12.8 metres, and 2.4 metres (Bhagwan Marine, 2018).

The LCT barge chartered by Bhagwan Marine (from Terrace Maritime) is the *Lauren Hansen*. It is similar to the three other LCT barges operated by Bhagwan Marine. The *Lauren Hansen* has a length overall of 45.5 metres, a beam of 11 metres, and a draught of 2.2 metres. It was previously chartered by Shorebarge (covered below).

FIGURE 2.13 BHAGWAN ROCKER - LCT BARGE

SOURCE: [HTTP://WWW.BHAGWANMARINE.COM/FLEET/FLEET-MULTI-CAT/BHAGWAN-ROCKER](http://www.bhagwanmarine.com/fleet/fleet-multi-cat/bhagwan-rocker)

The specifications of the Bhagwan Marine's LCT barges fall within the maximum limiting vessel characteristics for the proposed synchrolift. This also applies to the wide range of other Bhagwan Marine vessels that provide other services, including provision of support to offshore petroleum activities, towage activities, and assisting with construction activities, as described in other sub-sections.

Bhagwan Marine's position on repair and maintenance services for its vessels operating in northern Australia was outlined above in a sub-section on offshore petroleum support vessels. Bhagwan advised that scheduled repairs and maintenance requiring dry docking was undertaken no more frequently than every two years. The frequency of drydocking could be increased by unscheduled dry docking for repair and maintenance activities.

Barge Express

Barge Express is a Darwin-based enterprise providing shipping services to remote Top End and northern Western Australian locations. They have provided:

- oil, gas and seismic vessel support services
- navigation aid and mooring placement and extraction services
- support to commercial diving operations
- general barge/landing craft charter services – inshore and offshore
- vessel crane services
- roll-on, roll-off services
- bulk fuel carriage and transfer.

Barge Express operates three vessels:

- *Sealink Express*, a roll-on, roll-off landing barge
- *Bima Express*, a deck-ship landing barge
- *Trader Express*, a cargo vessel.

The specifications of the vessels are comfortably within the maximum limiting vessel characteristics for the synchrolift.

Barge Express' vessels are supported by a yard area with 50-metre wharf face and a dedicated roll-on, roll-off ramp. In addition, Barge Express has a range of supporting equipment for use in the yard or on the vessels.

Shorebarge

Shorebarge is part of the Shorelands Group, which is based at East Arm in Darwin. The Group provides barge services, purpose-designed containers, crane and truck hire services, and a range of other services.

Shorebarge owns and operates two landing-craft-style barges – the 45-metre *MV Jane Virgo* and the 35-metre *MV Cooma Cooma*. The specifications of the vessels are comfortably within the maximum limiting vessel characteristics for the proposed synchrolift.

The barges provide transport services along the northern Western Australian coast and the Top End coast. They are very versatile vessels, being able to accommodate various types of cargo, including dry, frozen, and chilled goods, containerised goods, and fuel.

Shorebarge's operations are supported by its own secure port facilities, and extensive crane-lifting capability.

Estimated SLAMI Market – Coastal Shipping

On the basis of the preceding analysis, three scenarios have been formulated for drydocking of coastal and remote shipping/logistics service vessels in Darwin. Scenarios reflecting a range of plausible circumstances have been adopted, because of a high degree of uncertainty regarding future demand for the services of the ship lift facility in Darwin.

Table 2.6 below indicates that there are 34 vessels operating in the coastal shipping sector across Australia's northern waters.¹¹ The majority of these vessels are operated by Sea Swift.

The table also shows that 11 vessels are registered in Darwin, 18 in Cairns, 4 in Fremantle and 1 in Dampier. Sea Swift's Dampier-registered vessel (LCT Cygnet) and one of its Cairns-based landing craft (LCT Malu Chief) were based in Darwin as at 1 October 2018.

TABLE 2.6 NUMBER OF COASTAL/REMOTE SHIPPING AND LOGISTICS VESSELS OPERATING IN NORTHERN AUSTRALIA

Vessel name	Operator	Vessel dimensions	Vessel type	Registered port
<i>MV Kestrel Bay</i>	Sea Swift	length 55.5 m, beam 11.6 m, draught 3.46 m, gross tonnes 851	supply, catch transfer for prawn trawlers	Cairns
<i>MV Trinity Bay</i>	Sea Swift	length 81 m, beam 15m, draught 5.74 m, gross tonnes 1,594	Cargo	Cairns
<i>MV Newcastle Bay</i>	Sea Swift	length 83.2 m, beam 13 m, draught 5.39 m, gross tonnes 1,964	Containers	Cairns
<i>LCT Arnhem Trader</i>	Sea Swift	length 49.45 m, beam 16 m, draught 2.6 m, gross tonnes 902	landing craft	Fremantle
<i>LCT Biquele Bay</i>	Sea Swift	length 63 m, beam 14.6 m, draught 3 m, gross tonnes 1,064	landing craft	Darwin
<i>LCT Coral Bay</i>	Sea Swift	length 37.2 m, beam 11.6 m, draught 2.4 m, gross tonnes 355	landing barge	Darwin
<i>LCT Cygnet</i>	Sea Swift	length 59.6 m, beam 15m, draught 3 m, gross tonnes 1,136	Landing craft	Dampier

¹¹ While there are only 29 vessels listed in **Table 2.6**, there are five tug and barge sets operated by Sea Swift that have been counted as two vessels.

Vessel name	Operator	Vessel dimensions	Vessel type	Registered port
<i>LCT Fourcroy</i>	Sea Swift	length 49.85 m, beam 10.9 m, draught 2.19 m, gross tonnes 486	landing barge	Darwin
<i>LCT Malu Titan</i>	Sea Swift	length 49.85 m, beam 10.9 m, draught 2.19 m, gross tonnes 486	landing barge	Cairns
<i>LCT Malu Chief</i>	Sea Swift	length 42 m, beam 9 m, draught 1.9 m, gross tonnes 290	landing craft	Cairns
<i>LCT Malu Explorer</i>	Sea Swift	length 45.12 m, beam 13.2 m, draught 2.38 m, gross tonnes not published	landing craft	Cairns
<i>LCT Kerema Chief</i>	Sea Swift	length 64 m, beam 14.63 m, draught 3.2 m, gross tonnes 1350	landing barge	Darwin
<i>LCT Malu Warrior</i>	Sea Swift	length 36.23 m, beam 8.98 m, draught 1.94 m, gross tonnes 250	landing craft	Cairns
<i>LCT Malu Trojan</i>	Sea Swift	length 38 m, beam 9 m, draught 2.14 m, gross tonnes 343.24	landing craft	Cairns
<i>LCT Territorian</i>	Sea Swift	length 68 m, beam 14 m, draught 3.65 m, gross tonnes 1,107	landing craft	Darwin
<i>MT Arion</i>	Sea Swift	length 28.61 m, beam 9.14 m, draught 3.35 m, gross tonnes 299	tug and barge set	Cairns
<i>MT Argos</i>	Sea Swift	length 24.24 m, beam 8 m, draught 3 m, gross tonnes 192	tug and barge set	Cairns
<i>MT Norman River</i>	Sea Swift	length 24.45 m, beam 7.32 m, draught 3 m, gross tonnes 158	tug and barge set	Cairns
<i>MT Staaten River</i>	Sea Swift	length 21.98 m, beam 7.32 m, draught 2.7 m, gross tonnes 143	tug and barge set	Cairns
<i>MT Cossack</i>	Sea Swift	length 15.24 m, beam 4.57 m, draught 2.2 m, gross tonnes not published	tug and barge set	Cairns
<i>Bhagwan Mover</i>	Bhagwan Marine	length 48m, beam 12.8, draught 2.4 m, gross tonnes 619	landing craft	Fremantle
<i>Bhagwan Rocker</i>	Bhagwan Marine	length 38 m, beam 10.6 m, draught 2 m, gross tonnes 372	landing craft	Fremantle
<i>Bhagwan Shaker</i>	Bhagwan Marine	length 48.5 m, beam 12.8 m, draught 2.4 m, gross tonnes 625	landing craft	Fremantle
<i>Lauren Hansen</i>	Bhagwan Marine	length 45.5 m, beam 11 m, draught 2.2 m, gross tonnes 490	landing craft	Darwin
<i>Sealink Express</i>	Barge Express	length 46.02 m, beam 10.9 m, draught not published, gross tonnage 479	landing craft	Darwin
<i>Bima Express</i>	Barge Express	length 45.5 m, beam 10.9, draught not published, gross tonnes 489	landing craft	Darwin
<i>Trader Express</i>	Barge Express	length 47 m, beam 9 m, draught 2.2 m, gross tonnes not published	landing barge	Darwin
<i>MV Jane Virgo</i>	Shorebarge	length 45.5 m, other specs not published	landing craft	Darwin
<i>MV Cooma Cooma</i>	Shorebarge	length 34.38 m, other specs not published	landing barge	Darwin

SOURCE: ACIL ALLEN RESEARCH

Advice from operators of coastal shipping vessels on the frequency of repair and maintenance activities requiring dry docking was not uniform. Advice from one operator indicated that scheduled

repair and maintenance activities requiring dry docking occurred twice a year. Information provided by others suggested that such activities were undertaken no more frequently than every two years. In addition, it appears that unscheduled dry dockings occur from time to time, as the vessels operated in shallow water, increasing the vulnerability of hulls, shafts, and propellers. This information indicated that dry dockings occur more frequently than for five-yearly out-of-water surveys required by the Australian Maritime Safety Authority (2018a). It has been assumed that more frequent dry docking occurs as indicated by advice from vessel operators.

Three scenarios have been formulated as low, base and high. Each has been defined below.

Under the base scenario, ACIL Allen assumed:

- a significant uptake of the service offering at the new Darwin facilities to the extent that all the Darwin registered vessels, a third of the Cairns registered vessels and the single vessel registered at Dampier use the SLAMI facilities
- 18 of the 34 vessels or close to 53 per cent of the possible market is captured by the facility
- the number of vessels grows in line with the 10-year historical annual average Northern Territory Gross Territory Product growth rate of 3.4 per cent per annum
- the vessels are dry-docked on average every 18 months to reflect planned maintenance every two years for four weeks and occasional unplanned maintenance for the same period.

Under the high scenario, ACIL Allen assumed:

- a high uptake of the service offering at the new Darwin facilities such that all the Darwin registered vessels, two thirds of the Cairns based vessels, one quarter of the Fremantle registered vessels and the single vessel registered at Dampier use the SLAMI facilities
- 25 of the 34 vessels or close to 75 per cent of the potential market is captured by the facility
- the number of vessels grows in line with the 20-year historical annual average Northern Territory Gross Territory Product growth rate of 3.8 per cent per annum
- the vessels are dry-docked on average every 18 months to reflect planned maintenance every two years for four weeks and occasional unplanned maintenance for the same period.
- coastal ships are dry-docked on average every 18 months to reflect planned maintenance every two years for four weeks and occasional unplanned maintenance for the same period.

Under the low scenario, ACIL Allen assumed:

- a low uptake of the service offering at the new Darwin facility such that only just over half of the Darwin registered vessels use the facility, and vessels registered outside Darwin do not use the SLAMI facilities
- six of the 29 vessels or just under 20 per cent of the possible market is captured by the SLAMI facilities
- the number of vessels grows in line with the 5-year historical annual average Northern Territory Gross State Product growth rate of 2.1 per cent per annum
- identified coastal transport vessels are dry-docked on average every 18 months to reflect planned maintenance every two years for four weeks and occasional unplanned maintenance for the same period.

TABLE 2.7 NUMBER OF VESSELS ASSUMED TO BE SERVICED BY THE SHIP LIFT FACILITY UNDER EACH SCENARIO

Registered Port	Number of Vessels (total)	Low Scenario (number)	Base Scenario (number)	High Scenario (number)
Darwin	11	6	11	11
Cairns	18	0	6	12
Fremantle	4	0	0	1
Dampier	1	0	1	1
Total	34	6	18	25
Market share		17.6%	52.9%	73.5%

SOURCE: ACIL ALLEN

The numbers of vessels assumed to be serviced by the new ship lift facility under the three scenarios are shown in **Table 2.7**. Estimates of dry dockings under the three scenarios follow from the contents of the table and the assumptions underlying the scenarios. The estimated number of lifts per year for dry docking are:

- base scenario 12
- high scenario 17
- low scenario 4.

Each dry docking has been assumed to continue for four weeks.

2.10.5 Pearling Boats

Paspaley Pearling Company

Paspaley Pearling Company (PPC) currently has 64 vessels. Its fleet comprises a range of vessel types performing various tasks. The vessels operate mainly in the region between Darwin and Port Hedland. The fleet's smallest vessels are pearl farm workboats of 3 tonnes displacement and the largest is the *Paspaley 4* (Figure 2.14), which is 51 metres long and over 1,000 tonnes displacement.

Only 11 of PPC's vessels have displacements of 150 tonnes or greater and lengths of 20 metres or more. There is only one vessel with a displacement of 50-149 tonnes and a length in excess of 20 metres. Three pontoons have a displacement of 50 tonnes and length of 17.6 metres. PPC has 49 smaller vessels.

FIGURE 2.14 PASPALLEY 4



SOURCE: [HTTPS://WWW.SKIPSTEKNISK.NO/DELIVERED-SHIPS/PASPALLEY-4/29/198/](https://www.skipsteknisk.no/delivered-ships/paspaley-4/29/198/)

PPC's vessels are currently serviced mainly by PPC's Pearl Fleet Engineering (PFE) division, and by a related entity Pearl Marine Engineering. This work is undertaken at Pearl Marine Engineering's Frances Bay shipyard in Darwin. Other specialised service providers are used as required.

None of PPC's vessels is too large for Pearl Marine Engineering's current synchrolift. They are subjected to scheduled out of water maintenance on a periodic basis ranging from 1 to 6 years, depending on vessel type. The historical data provided by Paspaley suggest that on average four vessels are out of water at any one time, involving 198 vessel weeks of out-of-water work a year. For larger vessels over 20 metres in length, the average is just over one vessel out of water at any one time, involving 59 vessel weeks of out of water work a year.

Paspaley's pearling fleet is home ported in Darwin. The fleet has a very high operating efficiency and minimising time allocated to repair, maintenance and refit work is desirable. Travel cost savings,

including the opportunity cost of travel time saved, have been important in deciding to build the necessary capability and capacity to provide high quality services in Darwin. Local enterprises and skilled personnel can supply the services required, and servicing of vessels in Darwin is a more cost-effective option than utilising facilities in other ports in Australia. Alternatives such as Singapore and Fremantle/Henderson are not attractive because of distance.

Currently, vessels in the Paspaley pearling fleet are worked on at Pearl Marine Engineering's facilities. PPC indicated that if the proposed SLAMI facilities were provided at East Arm, all of the out-of-water repair and maintenance work and a high proportion of in-water work by Pearl Fleet Engineering would be undertaken there. Nearby, PFE would require supporting facilities, including facilities for tooling, minor fabrication, and machining.

PPC indicated that not more than 10 per cent of unscheduled maintenance would require out-of-water repairs. Generally, repairs are done in water due to the cost of utilising a ship lift. However, if the cost of lifting a vessel was moderate, it would be convenient to repair vessels out of water.

Other Pearling Enterprises

Paspaley has several competitors. As at November 2018, there were 7 other members of the Pearl Producers Association. The combined fleet of these other members is several 30- to 50-metre (mid-sized) vessels.

Ellies Pearling operates from Darwin or Gove using a mid-sized, twin-hulled, aluminium vessel, the *Aracat*, as a mother ship. It is 32 metres long, has a beam of 10.8 metres, a draught of 1.8 metres, and a lightship displacement of 120 tonnes. It has been serviced by Pearl Marine Engineering, and was out of the water for 4 days in 2013 and 7 days in 2016.

Other competitors generally operate around Broome. In the early 2000s, 17 independent pearl producers operated off the Kimberley coast. However, the Global Financial Crisis devastated wholesale pearl prices and within a few years only three pearl producers were left in Western Australia, Cygnet Bay Pearls, Paspaley and Clipper Pearls.

When Willie Creek Pearls bought a pearling licence and quota and entered the industry in 2015, it was the first new entrant to the Western Australian pearl industry in decades. Willie Creek Pearls farms at multiple sites in the Broome area. Willie Creek Pearls operates the *Trident Aurora*, a 31-metre long vessel. It was built in 1971, but has received several refits, most recently in 2017.

Clipper Bay Pearls, part of the Autore Group, has a pearl farm 5 km off Quandong Point, 50 km north of Broome. It operates from a single mothership. Details of this vessel are not known. It is puzzling that the Autore website features a photograph of the *Trident Aurora*, which is operated by Willie Creek Pearls, according to that enterprise.

Typically, pearling industry participants operating around Broome have taken their vessels south to be serviced by Kailis in Fremantle or BAE Systems at Henderson.

Estimated SLAMI Market – Pearling

Only 11 of PPC's 64 vessels have displacements of 150 tonnes or greater and lengths of 20 metres or more. PPC has only one vessel with a displacement in the range 50-149 tonnes (85 tonnes) and a length in excess of 20 metres. PPC has three pontoons with a displacement of 50 tonnes and length of 17.6 metres. PPC has 49 smaller vessels.

Other pearling industry operators in northern Australia utilise a total of around 7 other vessels with lengths in the 30- to 50-metre range. Displacements of these vessels could not be ascertained.

It has been conservatively assumed that only the larger vessels operated by PPC and other pearling enterprises potentially would be lifted by the proposed synchrolift. There are about 22 of these vessels. Smaller vessels could use other facilities that are more suited to and specialise in such craft.

It is noted that the Darwin SLAMI facilities would have a large travel cost advantage over competing facilities at Fremantle or Henderson. The distance by sea from Broome to Darwin is 889 nautical miles, requiring travel time of 3.7 days at a speed of 10 knots. The distance from Broome to Fremantle is 1,406 nautical miles, involving travel time of 5.9 days at 10 knots.

PPC has expressed a strong preference to use the SLAMI facilities if they are built. This would occur because of Pearl Marine Engineering's intention to relocate to be near the SLAMI facilities, and Darwin's strong locational advantage. One other pearling operator was already using Pearl Marine Engineering's facilities and could be expected to access the SLAMI facilities.

Based on the preceding analysis, three scenarios have been formulated for pearling vessels. Scenarios reflecting a range of plausible circumstances have been adopted, because of uncertainties regarding location of repair and maintenance activities revolving around drydocking and wet docking repairs of pearling industry vessels. The three scenarios have been labelled low, base and high. They have been defined by assumptions derived from circumstances discussed above.

In the low scenario, it has been assumed that:

- 10 of PPC's 15 larger vessels would use the SLAMI facilities
- three of seven other pearling industry vessels operating in northern Australia would access the SLAMI facilities.

In the base (middle-of-the-road) scenario, it has been assumed that:

- 12 of PPC's 15 larger vessels would use the SLAMI facilities
- five of seven other pearling industry vessels operating in northern Australia would access the SLAMI facilities.

In the high scenario, it has been assumed that:

- all of PPC's 15 larger vessels would use the SLAMI facilities
- six of seven other pearling industry vessels operating in northern Australia would access the SLAMI facilities.

The number of pearling vessels that could represent the potential market for the SLAMI facilities, and the numbers that could be expected to use those facilities under the three scenarios are shown in the next table.

TABLE 2.8 PEARLING VESSELS – POTENTIAL USERS OF SLAMI FACILITIES

Vessel Ownership	No. Larger Vessels Potential Market	Low Scenario Users	Base Scenario Users	High Scenario Users
PPC	15	10	12	15
Other	7	3	5	6
Total	22	13	17	21

SOURCE: ACIL ALLEN ANALYSIS

Advice provided by PPC indicates that the larger vessels would come out of the water for inspections, repairs and maintenance either every year or every second year. About half of those vessels fall into each frequency category. Therefore, it has been assumed that on average they are dry docked every 18 months. Actual dry-dockings occur more frequently than for five-yearly out-of-water surveys required by the Australian Maritime Safety Authority (2018a).

It follows that the lifts or dry dockings of larger pearling vessels per year under the three scenarios are: low 9, base 11, high 14. An indicative average larger pearling vessel is the Paspaley III, which has a length of 45 metres, beam of 9 metres, draught of 4.2 metres, and displacement of 320 tonnes.

Typically, these vessels would be subjected to repairs and maintenance for eight weeks each time. Only one of Paspaley's vessels is scheduled to be subjected to such activity for a longer period (10 weeks). A third of Paspaley's larger vessels spend half of their repair and maintenance time drydocked and the rest in wet berths.

2.10.6 Fishing (including Prawn) Vessels

Commercial fishing of the coast of the Northern Territory is focussed on fish, sea cucumbers (trepang), and prawns. The first and second categories of resources are regulated by the Northern Territory Government. The third category is regulated by the Commonwealth Government.

The Northern Territory commercial fishing (excluding prawning and pearling) industry has around 190 registered vessels and is subject to about 200 licences. Commercial fishing is managed by the Northern Territory Department of Primary Industry and Resources, which has limited the number of licences to operate in each wild harvest fishery. The licencing system controls who is allowed to fish commercially, when and where commercial fishing is permitted, what and how much can be caught, and the gear that can be used (Department of Primary Industry and Resources, 2018).

There is commercial activity in 15 inshore (near the coast) and offshore (to the boundary of the Australian fishing zone) wild harvest fisheries. The total annual harvest averages around 5,500 tonnes.

The offshore snapper fisheries provide the largest harvested quantity and value. This includes snapper caught in the demersal (or bottom-dwelling) and Timor Reef fisheries (Department of Primary Industry and Resources, 2018). Australian Bay Seafoods, which operates the Territory Leader and Ocean Harvest out of Darwin, is Australia's larger producer and quota holder of tropical snapper species.

Australian Fisheries Management Authority manages the Northern Prawn Fishery in the Gulf of Carpentaria, Bonaparte Gulf, and Timor Sea to the boundary line established under international treaty arrangements. The harvest in the Northern Prawn Fishery is controlled through various regulatory devices. They include limits on the number of boats and amount of net that can be deployed, seasonal closures (5.5 months), and prohibition of daylight trawling for a period of 4 months out of 6.5 open months. The fishery has two fishing seasons – the banana prawn season which runs from late-March to mid-June and the tiger prawn season, which extends from August to the end of November. There are only 52 boat prawn fishing rights and 52 active boats (Australian Fisheries Management Authority, 2018).

White banana prawns are caught mainly during the day on the eastern side of the Gulf of Carpentaria, while red-legged banana prawns are caught mainly in Joseph Bonaparte Gulf. The highest catches are taken offshore from mangrove forests, which are juvenile nursery areas. Tiger prawns are taken primarily at night (daytime trawling has been prohibited in some areas during the tiger prawn season). Most catches come from the southern and western Gulf of Carpentaria, and along the Arnhem Land coast. Tiger prawn fishing grounds may be close to those of banana prawns, but the highest catches come from areas near coastal seagrass beds, the nursery habitat for tiger prawns. Endeavour prawns are mainly a by-product, caught when fishing for tiger prawns (Larcombe, Marton and Curtotti, 2018).

In the 2017, the Northern Prawn Fishery catch totalled 6,602 tonnes, comprising banana prawns 5,045 tonnes, tiger prawns, 1,080 tonnes, endeavour prawns 380 tonnes, other prawns 7 tonnes, and other catch (mainly scampi, bugs and saucer scallops) 90 tonnes. White banana prawns and two species of tiger prawns (brown and grooved) account for around 80 per cent of the landed catch. Primary landing points for the northern prawn catch are Darwin, Karumba (south-eastern Gulf of Carpentaria, Queensland) and Cairns. Much of the catch is offloaded onto motherships at sea for transfer to ports (Larcombe, Marton and Curtotti, 2018).

Pearl Marine Engineering has provided drydocking and complementary services to many fishing – including prawning – vessels over the past few years.

Over the five-year period 2013-2017, Pearl Marine Engineering drydocked 44 different fishing vessels at least once. Nearly 100 other vessels (licensed by the Northern Territory Government or the Australian Fisheries Management Authority) would have been drydocked elsewhere or were not in service.

The majority of the fishing/prawning boats drydocked by Pearl Marine Engineering exceeded 130 tonnes displacement. A significant number of vessels in the 40 to 60-tonne range were drydocked by Pearl Marine Engineering before 2016. However, in 2016 and 2017, only two of 36 dry dockings of fishing vessels by Pearl Marine Engineering (2 of 24 vessels for which displacement was reported) were less than 60 tonnes displacement and only two other fishing vessels drydocked were less than 150 tonnes displacement.

The range of sizes of fishing/prawning vessels drydocked by Pearl Marine Engineering in the period 2013-2017 is very wide. The heaviest had a lightship displacement of 307 tonnes (Territory Leader) and the lightest was 42 tonnes. The longest was 29.8 metres (Innovator), and the shortest was 18

metres. The widest was 11.1 metres (Innovator), and the narrowest was 5.8 metres. The deepest and shallowest draughts were 3.8 metres (Territory Spirit) and 1.7 metres, respectively.

FIGURE 2.15 TRAWLER – NORTHERN PRAWN FISHERY



SOURCE: <https://www.afma.gov.au/fisheries/northern-prawn-fishery>

Details of vessels drydocked by Pearl Marine Engineering are shown in **Table 2.9** below. All of the fishing/prawning vessels in the table would comfortably fit within the maximum limiting characteristics of the proposed Darwin synchrolift.

Austral Fisheries is a prominent operator in the Northern Prawn Fishery. It has a fleet of 10 refrigerated prawning vessels. Lengths of most of these vessels range from 22 metres to 25 metres (Austral Fisheries, 2018). Austral Fisheries' newest and largest vessel, the *Austral Hunter*, was put into service in 2018. It is significantly larger than other vessels in Austral's fleet. It has an overall length is 31.5 metres, beam of 8.4 metres, draught of 3.5 metres, and displacement of 430 tonnes (gross tonnes 311). It was the first new prawn trawler used in the Northern Prawn Fishery for 12 years.

Austral Fisheries' prawning fleet is based in Cairns. None of Austral's prawning vessels has been drydocked by Pearl Marine Engineering over the past five years.

Austfish has seven freezer vessels operating in the Northern Prawn Fishery out of Darwin. They include the *Territory Force*, *Territory Spirit*, *Vulcan*, and *Voltaire*. The vessels named have been drydocked by Pearl Marine Engineering in recent years, and their dimensions have been set out in **Table 2.9** below.

Austral Fisheries and Austfish together account for nearly one third of the prawn fishing rights and active boats (52) in the Northern Prawn Fishery.

TABLE 2.9 PEARL MARINE ENGINEERING – WORK ON FISHING (INCLUDING PRAWNING) VESSELS

Year	Stand	Vessel name	Length (m)	Beam (m)	Draught (m)	Time (d)	Lightship displ. (t)
2013	Hardstand	<i>Aleatha T</i>	18	5.8	2.8	33	61
2013	Hardstand	<i>Eubalena</i>	24.6	7.2	2.8	8	131
2013	Hardstand	<i>Exodus</i>	24	6	2.2	3	49
2013	Hardstand	<i>Innovator</i>	29.8	11.1	2	19	171

Year	Stand	Vessel name	Length (m)	Beam (m)	Draught (m)	Time (d)	Lightship displac. (t)
2013	Hardstand	<i>La Trobe</i>	26	8	4	37	251
2013	Hardstand	<i>Lady Serene</i>	24	6.8	3	22	140
2013	Hardstand	<i>Libertine</i>	23	6.8	3	17	161
2013	Hardstand	<i>Northern Odyssey</i>	24	6	2	1	53
2013	Hardstand	<i>Ocean Raider</i>	22.75	7.25	2.5	65	150
2013	Hardstand	<i>Sandpiper</i>	24	6.5	3	1	206
2013	Hardstand	<i>Sea Pearl III</i>	24	6	2	19	42
2013	Hardstand	<i>Senhora De Fatima</i>	24	6.9	3.2	2	222
2013	Hardstand	??	?	?	?	73	201
2013	Hardstand	<i>Spartan</i>	19.2	6.1	2.8	13	89
2013	Hardstand	<i>Territory Force</i>	28	8	3.5	9	253
2013	Hardstand	<i>Vulcan</i>	24	7.5	3	7	211
2013	Inwater	<i>Innovator</i>	29.8	11.1	2	2	171
2014	Hardstand	<i>Cannon</i>	23	6	2.2	6	61
2014	Hardstand	<i>R.V Walcott</i>	23.9	6.5	1.8	7	47
2014	Hardstand	<i>Bountiful Lady</i>	23	7.4	3.7	6	242
2014	Hardstand	<i>Brampton</i>	23	6.1	3	20	131
2014	Hardstand	<i>Four Seasons</i>	23	6.3	3	14	151
2014	Hardstand	<i>Gulf Viking</i>	24	6.3	2.8	16	135
2014	Hardstand	<i>Moonstriker II</i>	22	6.1	2	6	67
2014	Hardstand	??	?	?	?	18	62
2014	Hardstand	<i>Northern Odyssey</i>	21	6.2	2.2	3	54
2014	Hardstand	<i>Ocean Exporter</i>	23.4	6.8	3	18	160
2014	Hardstand	<i>Ocean Producer</i>	23.4	6.8	3	18	176
2014	Hardstand	<i>Territory Chief</i>	23	6.5	3	11	148
2014	Hardstand	<i>Territory Force</i>	28	8	3.5	104	248
2014	Hardstand	<i>Territory Leader</i>	28	8	3.5	30	289
2014	Hardstand	<i>Territory Spirit</i>	28.5	8	3.8	8	253
2014	Hardstand	??	28	8	3.5	3	319
2014	Hardstand	<i>Voltaire</i>	25	7.1	3.4	15	177
2014	Hardstand	<i>Whalesong II</i>	24	6.25	1.7	2	57
2014	Hardstand	<i>Xanadu I</i>	23	6.5	3.2	10	173
2015	Hardstand	<i>Aleatha T</i>	18	5.8	2.8	43	60
2015	Hardstand	<i>Eubalena</i>	24.6	7.2	2.8	2	125
2015	Hardstand	<i>Eubalena</i>	24.6	7.2	2.8	13	129
2015	Hardstand	<i>Exodus</i>	24	6	2.2	1	57
2015	Hardstand	<i>Exodus</i>	24	6	2.2	15	57
2015	Hardstand	<i>Innovator</i>	29.8	11.1	2	22	193
2015	Hardstand	<i>Megan M</i>	28.3	6	2.2	20	71
2015	Hardstand	<i>Senhora De Fatima</i>	24	6.9	3.2	16	196
2015	Hardstand	<i>Territory Chief</i>	23	6.5	3	2	152
2015	Hardstand	<i>Territory Leader</i>	28	8	3.5	7	307
2015	Hardstand	<i>Territory Spirit</i>	28.5	8	3.8	73	263
2015	Hardstand	<i>Voltaire</i>	25	7.1	3.4	32	180
2015	Hardstand	<i>Vulcan</i>	24	7.5	3	19	205
2016	Hardstand	<i>Alcyone II</i>	24.3	7.2	3	7	172
2016	Hardstand	<i>Brampton</i>	23	6.1	3	15	135
2016	Hardstand	<i>Elizabeth Bay</i>	??	??	??	46	?
2016	Hardstand	<i>Exodus</i>	24	6	2.2	25	53

Year	Stand	Vessel name	Length (m)	Beam (m)	Draught (m)	Time (d)	Lightship displac. (t)
2016	Hardstand	<i>Invincible II</i>	??	??	??	4	?
2016	Hardstand	<i>Libertine</i>	23	6.8	3	84	163
2016	Hardstand	<i>Megan M</i>	28.3	6	2.2	17	71
2016	Hardstand	<i>Moonstricker II</i>	22	6.1	2	21	62
2016	Hardstand	<i>Ocean Exporter</i>	23.4	6.8	3	21	152
2016	Hardstand	<i>Ocean Producer</i>	23.4	6.8	3	16	176
2016	Hardstand	<i>Territory Leader</i>	28	8	3.5	44	289
2016	Hardstand	<i>Territory Chief</i>	23	6.5	3	2	187
2016	Hardstand	<i>Territory Spirit</i>	28.5	8	3.8	7	263
2016	Hardstand	<i>Vulcan</i>	24	7.5	3	21	205
2016	Hardstand	<i>Australia Bay II</i>	??	??	??	18	?
2016	Hardstand	<i>Candence</i>	??	??	??	4	?
2016	Hardstand	<i>Territory Force</i>	28	8	3.5	55	248
2017	Hardstand	<i>Moccasin</i>	??	??	??	17	?
2017	Hardstand	<i>Omaha</i>	??	??	??	11	?
2017	Hardstand	<i>Pamelia K</i>	??	??	??	20	?
2017	Hardstand	<i>Ashburton Road</i>	??	??	??	6	?
2017	Hardstand	<i>Innovator</i>	29.8	11.1	2	26	193
2017	Hardstand	<i>Ocean Myst</i>	??	??	??	26	?
2017	Hardstand	<i>Ocean Raider</i>	22.75	7.25	2.5	57	150
2017	Hardstand	<i>Sea Pearl III</i>	24	6	2	37	42
2017	Hardstand	<i>Territory Leader</i>	28	8	3.5	28	307
2017	Hardstand	<i>Territory Spirit</i>	28.5	8	3.8	18	263
2017	Hardstand	<i>Eubalanea</i>	??	??	??	13	?
2017	Hardstand	<i>Innovator</i>	29.8	11.1	2	26	171
2017	Hardstand	<i>Newfish 1</i>	??	??	??	5	?
2017	Hardstand	<i>Ocean Exporter</i>	23.4	6.8	3	10	160
2017	Hardstand	<i>Ocean Myst</i>	??	??	??	1	?
2017	Hardstand	<i>Ocean Raider</i>	22.75	7.25	2.5	57	150
2017	Hardstand	<i>Omaha</i>	??	??	??	11	?
2017	Hardstand	<i>Senhora De Fatima</i>	24	6.9	3.2	30	196
2017	Hardstand	<i>Territory Spirit</i>	28.5	8	3.8	16	263
2017	Hardstand	<i>Vulcan</i>	24	7.5	3	30	205

Note: d = days; m = metres; t = tonnes (displacement)

SOURCE: MOTT MACDONALD AND PEARL MARINE ENGINEERING

Various shipyards in Darwin, other than Pearl Marine Engineering, have drydocking facilities that can handle smaller fishing and prawning vessels (see sub-sections 2.4.2 and 2.5). For example, Tasmanian Seafoods opened its NT Marine Facility at Dinah Beach/Frances Bay in mid-2018. It has a 150-tonne travel lift and can accommodate vessels up to 40 metres long, and with beams up to 10.2 metres. The NT Marine Facility provides services to Tasmanian Seafoods' fleet of three sea cucumber fishing boats, other commercial vessels, and recreational vessels. Paspaley considered that it was likely that operators of vessels less than 150 tonnes and service providers to those vessels would access lifting facilities in small shipyards in Darwin, such as the NT Marine Facility, rather than use the proposed new Darwin synchrolift.

Darren Kolln of Guardian Offshore pointed out that some of the vessels involved in the Northern Prawn Fishery go to Port Moresby, rather than Darwin or Cairns, for repair and maintenance work, because costs of drydocking and complementary services are significantly cheaper. He explained that although Port Moresby did not have a trades base as good as in Darwin and Cairns, the service range was adequate for simple work, such as that on fishing boats.

Papua New Guinea dockyard in Port Moresby is 800 nautical miles from the prawn fishing port of Karumba in the south-eastern Gulf of Carpentaria. At a speed of 10 knots, the travel time is 3.3 days. Darwin is 977 nautical miles from Karumba, and the travel time is 4.1 days at 10 knots. Cairns is just 36 nautical miles closer to Karumba than Darwin, but Port Moresby is 177 nautical miles closer to Karumba than Darwin and 141 nautical miles closer than Cairns (Ports.com, 2018).

Port Moresby is 949 nautical miles from Groote Eylandt in the western Gulf, requiring travel time of 4 days at 10 knots. Darwin is 678 nautical miles by sea from Groote Eylandt in the Gulf of Carpentaria, requiring 2.8 days at sea at a speed of 10 knots. Cairns is 1,089 nautical miles or 4.5 days from Groote Eylandt (Ports.com, 2018).

Estimated SLAMI Market – Fishing/Prawning

The regulated Northern Territory commercial fishing (excluding prawning and pearling) industry has around 190 registered vessels and is subject to about 200 licences, while there are only 52 boat prawn fishing rights and 52 active boats in the regulated Northern Prawn Fishery. In contrast, only 48 vessels are registered in Darwin as fishing, prawning or trawling vessels. Only a few fishing vessels are registered in Dampier, Port Hedland, Broome, and Gove. These vessel numbers are very small relative to the numbers of registered fishing vessels in Cairns (185) and Fremantle (329). It appears likely that a majority of vessels operating in northern Australia is registered in Cairns or Fremantle. That could influence where fishing/prawning vessels operating in northern Australia are drydocked, particularly as the regulatory regimes enforce considerable downtime.

Pearl Marine Engineering's records on drydocking of fishing vessels using its synchrolift provide important insights on the size and composition of the relevant market.

Most of the commercial fishing/prawning boats drydocked by Pearl Marine Engineering in 2016 and 2017 exceeded 130 tonnes displacement. In those years, only two of 36 dry dockings of fishing vessels by Pearl Marine Engineering (2 of 24 vessels for which displacement was reported) were less than 60 tonnes displacement, and only two other fishing vessels drydocked were less than 150 tonnes displacement. It appears to be reasonable to assume, based on Pearl Marine Engineering's recent experience, that use of the proposed synchrolift to dry dock fishing/prawning vessels would typically be confined to those with displacements in excess of 150 tonnes, and that smaller vessels typically would be drydocked at facilities that specialise in such vessels.

Pearl Marine Engineering's records indicate that fishing vessels typically are dry docked either annually or every second year. A typical dry-docking period appears to be in the range of two to four weeks, with some shorter and longer periods.

Actual dry dockings apparently occur more frequently than required by the Australian Maritime Safety Authority (2018a) for out-of-water surveys. The maximum permitted period between such surveys is five years.

A drydocking frequency of once every two years suggests that Pearl Marine Engineering is lifting vessels representing only about 15 per cent of the available market for lifting and associated services for commercial fishing vessels. The remaining 85 per cent of vessels operating off the coast of the Northern Territory must be receiving services mainly from smaller shipyards in Darwin or from shipyards in other ports.

The SLAMI facilities would face competition from Papua New Guinea Shipyard in Port Moresby and shipyards in Cairns, as well as from small shipyards in Darwin. Darwin has a locational advantage over other repair and maintenance centres in respect of shipping/prawning vessels operating off the Northern Territory and far northern Western Australian coastline. Darwin has a small locational disadvantage relative to Port Moresby, and a minute disadvantage relative to the Cairns in respect of vessels operating in the eastern Gulf of Carpentaria. Price and quality of services will be particularly important if the repair and maintenance business of vessels operating in the eastern Gulf vessels is to be attracted to Darwin. However, even if Darwin offers a superior package, vessels based in Cairns are still likely to utilise services in their home port, as in any event, they would be berthed in Cairns in the off season. Fishing vessel registrations in Cairns and Fremantle combined outnumber registrations in Darwin by more than ten to one, suggesting the home-port advantage for Fremantle and Cairns is potentially important.

There is considerable uncertainty regarding the share of the market for ship-lift and related services for fishing/prawning vessels that could be captured by the SLAMI facilities. The uncertainty arises from multiple sources, including lack of information regarding home ports of many vessels operating in northern waters, the numbers of vessels in various size ranges, and the locations and providers of repair and maintenance services to much of the fishing and prawning fleets. In view of this uncertainty, three scenarios – low, base, and high – have been formulated to reflect a plausible range of circumstances.

In the low scenario, it has been assumed that:

- about 20 per cent of licenced fishing and prawning vessels operating around the Northern Territory coastline could be attracted to use the SLAMI facilities, with the remaining 65 per cent leaking to small shipyards in Darwin and to ship yards in Port Moresby, Cairns, and Fremantle
- the composition of this business is the current 15 per cent of dry dockings of fishing vessels by Pearl Marine Engineering that is assumed to be transferred to the SLAMI facilities, plus an increase of about one third above Pearl Marine Engineering's current business
- vessels are drydocked at two-year intervals for four weeks.

In the base scenario, it has been assumed that:

- about 30 per cent of licenced fishing and prawning vessels operating around the Northern Territory coastline could be attracted to use the SLAMI facilities, with the remaining 70 per cent leaking to small shipyards in Darwin and to ship yards in Port Moresby, Cairns, and Fremantle
- vessels are dry docked on average every 18 months for four weeks.

In the high scenario, it has been assumed that:

- around 38 per cent of licenced fishing and prawning vessels operating around the Northern Territory coastline could be attracted to use the SLAMI facilities, with the remaining 62 per cent leaking to small shipyards in Darwin and to ship yards in Port Moresby, Cairns, and Fremantle
- vessels are dry docked on average every 18 months for four weeks.

The vessel numbers using the SLAMI facilities that arise from these scenarios are set out in **Table 2.10** below. An indicative average vessel would be the *Vulcan* operated by Austfish in the Northern Prawn Fishery. The dimensions of this vessel are: length 24 metres, beam 7.5 metres, draught 3 metres, displacement 205 tonnes.

TABLE 2.10 ESTIMATED MARKET FOR SLAMI FACILITIES – FISHING AND PRAWNING VESSELS

Market	Vessels Registered Darwin	Licensed Vessels offshore NT	Low Scenario	Base Scenario	High Scenario
Nominal Vessels	48	242			
Vessels Using SLAMI Facilities			50	71	92.5
Dry Dockings at SLAMI Facilities Each Year			25	47	62

SOURCE: ACIL ALLEN ANALYSIS

It is not expected that this market will grow, because fishing and prawning activities are highly regulated to sustain the resource.

2.10.7 Research Vessels – Australian Institute of Marine Science

The Australian Institute of Marine Science (AIMS) was established in 1972 and is Australia's tropical marine research agency. It is based in Townsville, and also has offices in Perth and Darwin. AIMS provides large-scale and long-term research, enabling government, industry and the wider community to make informed decisions about Australia's marine estate, particularly with respect to the Great Barrier Reef.

According to AIMS' website, its work is focussed on:

- conducting strategic and applied research into marine life, from microbes to whole-of-ecosystems, and the processes that sustain them
- monitoring the condition and trends in health of the marine environment
- building models and decision-support tools to assist interpretation of the data collected
- developing a broad spectrum of enabling technologies, from molecular sciences to ocean technologies.

AIMS operates two major research vessels, *Research Vessel (RV) Cape Ferguson* and *RV Solander* (Figure 2.16). *RV Cape Ferguson* has a length of 23.9 metres, beam of 7.8 metres, draught of 2.5 metres and displacement of 212 tonnes. *RV Solander* has a length of 34.9 metres, beam of 8.6 metres, draught of 2.8 metres and displacement of 415 tonnes. AIMS also operates smaller vessels.

RV Cape Ferguson operates from Cairns and *RV Solander* operates from Darwin. These research vessels are equipped with winches, on-board laboratories, flow-through aquaria and computing facilities. Their equipment allows scientists to sample the physical and biological characteristics of various habitats and conduct experiments at sea. Inflatable tenders and on-board compressors support diving operations.

FIGURE 2.16 RV SOLANDER – DARWIN-BASED



SOURCE: AUSTRALIAN INSTITUTE OF MARINE SCIENCE

The key services utilised by the *RV Cape Ferguson* and *RV Solander* are:

- docking
- engineering
- electrical
- blasting and painting
- ship supplies and provisioning.

Their current scheduled maintenance requirement is for 4 weeks every year alternating between dry and wet docking. The location at which repair-and-maintenance activities are conducted depends on the area of operations.

AIMS' future growth depends on Government funding. If funding became available, AIMS would consider adding another research vessel with a length of up to 45 metres, to its existing fleet. All of these vessels could be accommodated by the proposed synchrolift.

Patrick Bunday, the Operations Manager at AIMS expressed a number of concerns with the new facility:

- the absence of a shed to facilitate blasting and painting, given the rainfall and humidity issues associated with the Darwin climate
- potentially being forced to move further away from the university
- uncertainty regarding the availability of space for AIMS to store equipment and have a workshop.

The Potential Market for Research Vessels

Based on the preceding analysis, three scenarios have been formulated for drydocking of research vessels in Darwin. Scenarios reflecting a range of plausible circumstances have been adopted, because of a high degree of uncertainty regarding future demand for the services of the SLAMI facilities in Darwin.

Table 2.11 below provides details of the two vessels operating in the sector across Australia's northern waters.

TABLE 2.11 NUMBER OF RESEARCH VESSELS OPERATING IN NORTHERN AUSTRALIA

Vessel name	Operator	Vessel dimensions	Vessel type	Registered port
<i>RV Cape Ferguson</i>	AIMS	length 23.9 m, beam 7.8 m, draught 2.5 m, displacement 212 tonnes	Research vessel	Townsville
<i>RV Solander</i>	AIMS	length 34.9 m, beam 8.6 m, draught 2.8 m, displacement 415 tonnes	Research vessel	Townsville

SOURCE: ACIL ALLEN RESEARCH

Both vessels are operated by the Australian Institute of Marine Science (AIMS). While both vessels are registered at the Port of Townsville, *RV Cape Ferguson* operates from Cairns while *RV Solander* operates from Darwin.

The three scenarios have been labelled low, base and high. The number of vessels assumed to be serviced by the new ship lift facility under each of the scenarios is shown in **Table 2.12** below.

TABLE 2.12 NUMBER OF RESEARCH VESSELS ASSUMED TO BE SERVICED BY THE SLAMI FACILITIES UNDER EACH SCENARIO

Region of Operation	Number of Vessels (total)	Low Scenario (number)	Base Scenario (number)	High Scenario (number)
Darwin	1	0	1	1
Cairns	1	0	0	1
Total	2	0	1	2
Market share		0%	50%	100%

SOURCE: ACIL ALLEN ANALYSIS

Under the base scenario, it was assumed that:

- the Darwin-based vessel uses the SLAMI facility while the Cairns based vessel does not, so that 50 per cent of the potential market is captured by the facility
- the vessels are dry-docked every two years for planned maintenance of 4 weeks.

Under the base scenario, it has been estimated that there would be only one lift every second year for dry docking.

Under the high scenario, it was assumed that:

- both the Cairns- and Darwin-based vessels use the SLAMI facilities, so that 100 per cent of the possible market is captured by the facility
- the vessels are dry-docked every two years for planned maintenance of 4 weeks

Under the base scenario, it has been estimated that there would be one lift every year for dry docking.

Under the low scenario, it was assumed that:

- no vessels use the SLAMI facility and therefore, zero per cent of the potential market is captured by the facility
- the vessels are dry-docked every two years for planned maintenance of 4 weeks.

Under the base scenario, it has been estimated that there would be no lifts of research vessels for dry docking.

2.10.8 Pilot Boats

Most port authorities require movement of ships into and out of their ports to be managed with the assistance of a local pilot (pilotage requirement). Such professionals have deep knowledge of important port access considerations (such as hazard locations, tidal conditions and channel depths) which masters of visiting vessels generally lack (as they move from port to port). In Australia, pilotage is a legal requirement under state or territory legislation for vessels above a nominated threshold size. Regulations typically set a length threshold – vessels over 35 metres in length generally require a pilot). Pilots usually access ships visiting ships by boat. These boats are typically small (less than 20 metres in length) and relatively light, reflecting their simple task of transferring an individual from a base at port to an anchored vessel at sea. In northern Australia, some port authorities request that pilots access ships vessels by helicopter to keep port traffic to a minimum.

Port of Darwin

Darwin Port Pilotage Pty Ltd provides pilotage services to users of the Port of Darwin. It operates two purpose-built pilot boats, the *Lamaroo* commissioned in 2012, and the *Delirra* commissioned 2016. In addition to pilot transfer duties, the boats also carry out security duties and assist with the maintenance of navigation aids. Pilotage is compulsory for all ships of 35 metres overall length or greater unless a valid pilotage exemption certificate is held by the ship's master under the Ports Management Act.

The *Lamaroo* is 15 metres long and has a beam of 5 metres. The *Delirra* has a length of 12 metres and beam of 4 metres. Toby Wharton of Darwin Port Pilotage advised that the *Delirra* and *Lamaroo* have displacements of 15-20 tonnes.

Toby Wharton advised that pilot boats are re-engined fairly frequently, because of the amount of work they do. In the past, Port of Darwin pilot boats have been sent to Brisbane for refits, including engine installation. However, the most recent one was done by Norship in Darwin.

Terry O'Connor, the Darwin Port Chief Executive Officer advised that the Port preferred to have its pilot boats repaired, maintained and refitted in Darwin.

The Darwin pilot boats could be lifted at facilities smaller than the Pearl Marine Engineering synchrolift and the proposed synchrolift that is the centrepiece of the SLAMI facilities. Examples of these alternative, smaller facilities include Tasmanian Seafoods' NT Marine Facility and Spot On Marine's shipyard, which have travel lifts capable of lifting vessels of 150 tonnes and 50 tonnes displacement, respectively.

Port Hedland

Pilotage is compulsory for all vessels (with some mostly size-based exclusions by regulation) operating in Port Hedland port limits and an area extending 20 nautical miles from port limits, given the difficult tidal conditions at the Port. Pilots are required to transfer to vessels via helicopter where facilities are available. Almost all bulk ore carriers have helipad facilities and can meet this requirement. However, there are some vessels where helicopter transfers are not feasible, in which case pilots access vessels via pilot boat.

Pilotage services are provided by Port Hedland Pilots Pty Ltd, which has been providing pilotage at Port Hedland since the privatisation of the service by the WA Government in 1995. According to port tracking data, Port Hedland Pilots operates two pilot vessels, with lengths of 17 and 18 metres. No displacement data were available.

That there are only two pilot vessels at Port Hedland underscores the role of helicopters in the transfer of pilots to and from ships.

Port of Dampier

Pilotage is also compulsory at the Port of Dampier, except for vessels under 35 metres in length and Royal Australian Navy vessels. Helicopters are also the preferred mode of pilot access at Dampier, but pilot boats are also in use. There are three companies providing pilotage services to the various berths and channels: Marine Services Western Australia, Woodside, and Argonaut Marine Group. It is not clear from publicly available information how many vessels these companies run in the region, but it appears Marine Services Western Australia is involved with Rio Tinto only, while Woodside's pilotage service is limited to its LNG operations at Dampier.

By contrast, Argonaut Marine Group provides a range of services at Dampier, as well as Cape Preston, Shell's Prelude FPSO, and at Port Melville in the Northern Territory. Pilbara Ports Authority data suggest Argonaut Marine Group has three pilot vessels based at the Port of Dampier, the *Incentive*, the *Interceptor*, and the *Winyama*. These vessels are typical of pilot vessels insofar as they are less than 20 metres long.

Port of Ashburton

Pilotage at the Port of Ashburton is required for all vessels greater than 35 metres in length, with certain exemptions available. Pilotage is provided by Chevron Australia under licence by Pilbara Ports. Ashburton is a relatively small port with a single LNG terminal berth and a 250-metre long land-backed wharf available. It is understood that Chevron Australia operates one pilot vessel (provided by Svitser) from Ashburton.

2.10.9 Other Work Boats

All of the vessel types discussed above could be included under a general heading, "workboats". However, the term is often used to refer to vessels used for tasks such as port maintenance and construction, lifting, buoy laying, pollution control, and fire fighting.

FIGURE 2.17 BHAGWAN JACKAL – DAMEN 1908 MULTI-CAT



SOURCE: [HTTP://WWW.BHAGWANMARINE.COM/FLEET/FLEET-MULTI-CAT/BHAGWAN-JACKAL](http://www.bhagwanmarine.com/fleet/fleet-multi-cat/bhagwan-jackal)

Some work boats may be used for multiple tasks. Examples of multi-purpose vessels include Damen multi-cats (see **Figure 2.17**) and shoalbusters that have lifting capabilities as well as being able to perform other tasks. Other workboats include dumb barges that have to be towed to transport equipment and materials or to be positioned to support construction and lifting activities.

Bhagwan's versatile fleet of 148 vessels includes 10 multi-cats, six shoalbusters, and seven dumb barges. Guardian Offshore's fleet of 12 vessels includes three shoalbuster (or similar) and two multi-cat (or similar) vessels. The 23 Bhagwan and five Guardian vessels could be accommodated by the proposed Darwin synchrolift. However, typically they move according to availability of work.

Potential Market for Pilot Vessels and Other Work Boats

On the basis of the preceding analysis, three scenarios – base, high, and low – have been formulated for drydocking of pilot vessels and work boats in Darwin. Three scenarios reflecting a range of plausible circumstances have been adopted, because of a high degree of uncertainty regarding future demand for the services of the proposed synchrolift in Darwin.

Table 2.13 below indicates that there are 47 registered pilot vessels and work boats operating across Australia's northern waters. The table shows that 15 vessels are registered in Darwin, 20 in Cairns and 12 in Dampier.

TABLE 2.13 NUMBER OF REGISTERED PILOT VESSELS AND WORK BOATS OPERATING IN NORTHERN AUSTRALIA

Vessel Name	Vessel Dimensions	Vessel Type	Registered Port
<i>Cobus</i>	length 14.2 m	Work Boat	Cairns
<i>Dabai</i>	length 14.3 m	Work Boat	Cairns
<i>Deepstar</i>	length 15.8 m	Work Boat	Cairns
<i>Dhuwa</i>	length 9.44 m	Work Boat	Cairns
<i>Haendel</i>	length 14.2 m	Work Boat	Cairns
<i>Mantis</i>	length 9.5 m	Work Boat	Cairns
<i>Pacific Ranger</i>	length 17.45 m	Work Boat	Cairns
<i>Salina</i>	length 11 m	Work Boat	Cairns
<i>Sara 1</i>	length 9.44 m	Work Boat	Cairns
<i>Strait Shooter i</i>	length 28 m	Work Boat	Cairns
<i>Waiben 1</i>	length 11.45 m	Work Boat	Cairns
<i>Borru</i>	length 15.8 m	Pilot	Cairns
<i>Melville</i>	length 14.96 m	Pilot	Cairns
<i>Tribulation</i>	length 14.96 m	Pilot	Cairns
<i>Alpha</i>	length 13.2 m	Pilot Launch	Cairns
<i>Arden</i>	length 13.21 m	Pilot Launch	Cairns
<i>John Snelgrove</i>	length 14 m	Pilot Launch	Cairns
<i>Malu Bau</i>	length 18 m	Pilot Launch	Cairns
<i>Embley</i>	length 15.62 m	Pilot vessel	Cairns
<i>Malu Mai</i>	length 14.2 m	Pilot vessel	Cairns
<i>A.M.S. Nova</i>	length 16.6 m, draught 2.6 m, beam 5.5 m, GT 91	Work Boat	Dampier
<i>A.M.S. Orion</i>	length 16.6 m, draught 2.6 m, beam 5.5 m, GT 91	Work Boat	Dampier
<i>A.M.S. Shine</i>	length 28 m, GT 876	Work Boat	Dampier
<i>A.M.S. Swissco</i>	length 28 m, GT 247	Work Boat	Dampier

Vessel Name	Vessel Dimensions	Vessel Type	Registered Port
<i>Arabella</i>	length 23.7 m, beam 9 m, draught 1.8m, GT 295.5	Work Boat	Dampier
<i>Bhagwan Houtman</i>	length 27 m, beam 9.1 m, draught 2.6 m, GT 221 t	Work Boat	Dampier
<i>Bhagwan Hyde</i>	length 18.7 m, beam 8.1 m, draught 2.3 m, GT 99	Work Boat	Dampier
<i>Bhagwan Jackal</i>	length 18.7 m, beam 8.1 m, draught 1.7 m, deadweight 66 tonnes	Work Boat	Dampier
<i>Loligo</i>	length 22.6 m, beam 8.1 m, draught 1.1 m, deadweight 28 tonnes	Work Boat	Dampier
<i>Titan</i>	length 14.3 m	Work Boat	Dampier
<i>Pilbara Skirmish</i>	length 15.84 m	Pilot	Dampier
<i>Riverside</i>	length 16.8 m	Pilot vessel	Dampier
<i>Adrenalin Sprint</i>	length 17.5m, beam 5.9m, draught 0.6m	Work Boat	Darwin
<i>Fiona F</i>	length 26.48 m, beam 11 m, draught 2.5 m, displacement 396 t	Work Boat	Darwin
<i>Franjo</i>	length 11.9 m, beam 5 m, draught 0.5m	Work Boat	Darwin
<i>Hama Pearl II</i>	length 18.1 m	Work Boat	Darwin
<i>Iluka II</i>	length 15 m, beam 6 m, draught 1.3 m	Work Boat	Darwin
<i>Iona M</i>	length 24 m, beam 9.5 m, draught 2 m	Work Boat	Darwin
<i>Mirin</i>	length 9.4 m, beam 3.2 m, draught 1 m	Work Boat	Darwin
<i>Mystified</i>	length 18.29 m	Work Boat	Darwin
<i>Narrah</i>	length 9.4 m, beam 3.2 m, draught 1 m	Work Boat	Darwin
<i>Serious Fun</i>	length 15.29 m	Work Boat	Darwin
<i>Warrigal II</i>	length 16 m, beam 6 m, draught 0.5 m	Work Boat	Darwin
<i>Whale Song II</i>	length 23.9 m	Work Boat	Darwin
<i>Larrakia</i>	length 16.09 m	Pilot	Darwin
<i>Lamaroo</i>	length 15 m, beam 5 m	Pilot	Darwin
<i>Delirra</i>	length 12m, beam 4 m	Pilot	Darwin

SOURCE: ACIL ALLEN RESEARCH

For the purposes of the scenarios, all vessels that are smaller than 15 metres in length were excluded on the basis that these are almost certainly too small to be serviced by the ship lift and will be accommodated elsewhere. When this is done, 27 eligible vessels remain, of which 10 are registered in Darwin, 6 in Cairns, and 11 in Dampier.

Under the base scenario, it was assumed that:

- eight out of 10 eligible Darwin-registered vessels, zero Cairns-registered vessels and four out of 11 Dampier-registered vessels use the SLAMI facility
- 12 of the 27 vessels registered in Darwin or Dampier or close to 45 per cent of the potential eligible market is captured by the SLAMI facilities
- the number of vessels grows in line with the 10-year historical annual average Gross Territory Product growth rate of 3.4 per cent per annum
- the vessels are dry-docked once every 2 years for planned maintenance of 4 weeks
- a total number of 6 lifts per annum for dry-docking.

Under the high scenario, it was assumed that:

- 10 out of 10 Darwin registered vessels, one Cairns-registered vessel, and eight out of 11 Dampier-registered vessels use the SLAMI facility
- 19 of the 27 vessels eligible or approximately 70 per cent of the potential market is captured by the SLAMI facilities
- the number of vessels grows in line with the 20-year historical annual average Gross Territory Product growth rate of 3.8 per cent per annum
- the vessels are dry-docked once every 2 years for planned maintenance of 4 weeks
- a total number of 9.5 lifts per annum for dry-docking.

Under the low scenario, it was assumed that:

- five out of 10 Darwin-registered vessels, zero Cairns-registered vessels and zero out of 11 Dampier-registered vessels use the SLAMI facility
- five of the 27 vessels or just under 19 per cent of the possible market is captured by the facility
- the number of vessels grows in line with the 5-year historical annual average Gross Territory Product growth rate of 2.1 per cent per annum
- the vessels are dry-docked every 2 years for planned maintenance of 4 weeks
- a total number of 2.5 lifts per annum for dry-docking.

The number of vessels assumed to be serviced by the new ship lift facility under each of the scenarios are shown in **Table 2.14** below.

TABLE 2.14 NUMBER OF ELIGIBLE WORK BOATS ASSUMED TO BE SERVICED BY THE SYNCHROLIFT UNDER EACH SCENARIO

Registered Port	Number of Vessels (total)	Low Scenario (number)	Base Scenario (number)	High Scenario (number)
Darwin	10	5	8	10
Cairns	6	0	0	1
Dampier	11	0	4	8
Total	27	5	12	19
Market Share		18.5%	44.4%	70.4%

SOURCE: ACIL ALLEN

Table 2.15 shows the number of lifts assumed to be carried out by the proposed synchrolift under the three scenarios. The assumed dry-docking frequency – every two years – is consistent with advice from operators. The maximum period between out-of-water surveys required by the Australian Maritime Safety Authority is five years.

TABLE 2.15 NUMBER OF ANNUAL WORK BOAT LIFTS ASSUMED TO BE CARRIED OUT BY THE PROPOSED DARWIN SHIP-LIFT FACILITY UNDER EACH SCENARIO

Registered Port	Number of Vessels (total)	Low Scenario (number of lifts)	Base Scenario (number of lifts)	High Scenario (number of lifts)
Darwin	10	2.5	4	5
Cairns	6	0	0	0.5
Dampier	11	0	2	4
Total	27	2.5	6	9.5

SOURCE: ACIL ALLEN

An indicative vessel would be Bhagwan Marine's *Arabella* (mulicat), which has the following dimensions: length 23.7 metres, beam 9 metres, draught 1.8 metres and gross tonnes 295.5.

2.10.10 Recreational Vessels

There are various categories of recreational vessels. They include boats used for the owners' pleasure, and vessels chartered out for the pleasure of others (eg, Darwin harbour cruise vessels, the *Charles Darwin* and *Tumlaren*, and Kimberley cruise vessels, *Discovery One* and *Reef Prince*).

About 450 recreational vessels are registered in the Port of Darwin. Most are relatively small, being clustered between 10 metres and 15 metres long. Only 16 recreational vessels registered in the Port of Darwin are longer than 20 metres, and only one of those is over 30 metres (just over). Only four others are between 18 and 20 metres long.

A Darwin harbour cruise vessel, the *Charles Darwin*, sits in the middle of the range of 18 metres to 30-plus metres. It has length of 25.5 metres, beam of 10.5 metres, draught of 1.8 metres, and displacement of 125 tonnes. The *Charles Darwin* has been drydocked by Pearl Marine Engineering.

There are other recreational vessels that could be targeted by the SLAMI facilities that are not registered in Darwin. They include the Kimberley cruise vessels, *Discovery One* (length 25 metres, beam 9 metres, draught 2 metres, and displacement 123 tonnes) and *Reef Prince*. The former has been dry docked by Pearl Marine Engineering in Darwin. Others are SeaLink's *Mandorah* and Tiwi Islands cruise/ferry catamarans, the *Tiwi Mantawi* (length 24 metres, beam 8.5 metres, draught 1.7 metres, and displacement 57 tonnes) and *Tommy Lyons*. Both the *Tiwi Mantawi* (**Figure 2.18**) and *Tommy Lyons* have been drydocked by Pearl Marine Engineering, and the vessel replaced by the latter was too. The largest vessel identified in the recreation category that could be targeted by the SLAMI Facilities was the Kimberley cruise vessel, the *Reef Prince*, which is based in Broome. It is a catamaran 38 metres long with a draught of 1.8 metres.

FIGURE 2.18 TIWI MANTAWI – DARWIN-MANDORAH-TIWI ISLANDS CRUISE/FERRY CATAMARAN



SOURCE: [HTTPS://WWW.SEALINKNT.COM.AU/ABOUT-US](https://www.sealinknt.com.au/about-us)

Vessels shorter than 18 metres could be expected to use other facilities that specialise in and are more suited to such vessels. This could also apply to some vessels up to 25 metres.

North Australia Yacht Support, which provides advisory services to visiting recreational vessels, reported a large spike in requests for advice in 2017-18 compared to previous years. Typically, around five requests for advice had been received each year, but in 2017-18, North Australia Yacht Support responded to about 30 requests for advice. The Managing Director, Ayla Wharton, explained that yacht agents in Cairns, Brisbane and Sydney have provided advice to other owners of recreational vessels that have visited Darwin. Visiting recreational vessels typically were around or above the top of the size-scale of recreational vessels registered in Darwin.

Ayla Wharton provided an example of a visiting vessel. It was a sailing catamaran with a length of 35 metres and beam of 14 metres. The owner wanted to have work undertaken by Pearl Marine Engineering, even though North Australia Yacht Support advised the owners to take the vessel elsewhere.

Ayla Wharton advised that Darwin's potential to provide repair and maintenance services to recreational vessels was impeded by a scarcity of high-quality shipwrights and businesses able to provide high-quality paint finishes. These deficiencies were not problems for other types of vessels.

According to Ayla Wharton, the number of visiting recreational vessels was likely to continue to grow. She also suggested that the likelihood of vessel owners purchasing dry-docking services in Darwin was dependent on the quality of services available.

It is noted that Pearl Marine Engineering drydocked only four recreational vessels in 2016 and two in 2017. Only one of these vessels was a private vessel. The others were deployed in provision of recreational/tourism services on a commercial basis.

There is substantial uncertainty regarding the share of the market for ship-lift and related services for recreational vessels that could be captured by the SLAMI facilities. The uncertainty arises from multiple sources, including locations and providers of repair and maintenance services to much of the recreational vessels registered in Darwin, and the sizes and numbers of visiting recreational vessels and the probability of their owners choosing to have scheduled repair and maintenance activities undertaken in Darwin, rather than in the vessels' home ports. In view of this uncertainty, three scenarios – low, base, and high – have been formulated to reflect a plausible range of circumstances.

In the low scenario, it has been assumed that:

- the SLAMI facilities will be able to capture half of the market for Darwin-registered and other identified recreational vessels with a length of 18 metres or more, while the remaining vessels are drydocked at other facilities
- recreational vessels are dry docked every two years for four weeks
- 10 recreational vessels in excess of 18 metres in length from other ports visit Darwin each year
- only 10 per cent of vessels visiting from other ports would be dry docked in Darwin

In the base (middle-of-the-road) scenario, it has been assumed that:

- the SLAMI facilities will be able to capture two thirds of the market for Darwin-registered and other identified recreational vessels with a length of 18 metres or more, while the remaining vessels are drydocked at other facilities
- recreational vessels are dry docked every 1-2 years (average every 18 months) for four weeks
- 20 recreational vessels in excess of 18 metres in length from other ports visit Darwin each year
- only 15 per cent of vessels visiting from other ports would be dry docked in Darwin.

In the high scenario, it has been assumed that:

- the SLAMI facilities will be able to capture 85 per cent of the market for Darwin-registered and other identified recreational vessels with a length of 18 metres or more, while the remaining vessels are drydocked at other facilities
- recreational vessels are dry docked every 1-2 years (average every 18 months) for four weeks
- 30 recreational vessels from other ports visit Darwin each year
- only 20 per cent of vessels visiting from other ports would be dry docked in Darwin.

The assumed frequency of dry dockings is consistent with the out-of-water survey requirements of the Australian Maritime Safety Authority (2018a) for passenger-carrying commercial vessels.

Estimates of dry dockings of recreational vessels by the SLAMI facilities under the three scenarios are set out in **Table 2.16**. The Charles Darwin and Discovery One could be indicative average recreational vessels that might be lifted by the proposed synchrolift. Dimensions for the Charles Darwin are: length 25.5 metres, beam 10.5 metres, draught 1.8 metres, displacement 125 tonnes.

TABLE 2.16 MARKET FOR SLAMI FACILITIES – RECREATIONAL VESSELS

Market	Vessels Registered Darwin	Other Vessels Identified	Low Scenario	Base Scenario	High Scenario
Vessels ≥18 m based in n-w Australia	20	4			
Local Vessels Using SLAMI Facilities			12	16	20

Market	Vessels Registered Darwin	Other Vessels Identified	Low Scenario	Base Scenario	High Scenario
Visiting Vessels			10	20	30
Local Vessels Dry Docked by SLAMI Facilities Each Year			6	11	14
Visiting Vessels Dry Docked at SLAMI Facilities Each Year			1	3	6
Total Dry Dockings at SLAMI Facilities Each Year			7	14	20

SOURCE: ACIL ALLEN RESEARCH

This market is likely to grow with aggregate income in the Northern Territory, nationally and internationally. The growth of Gross Territory Product could be used as a guide.

2.11 Aggregate Annual Dry-Docking Estimates for SLAMI Facilities

A summary of dry-docking estimates for the proposed SLAMI facilities based on the analysis of each category of relevant vessel in preceding sub-sections is set out in **Table 2.17** below.

TABLE 2.17 ANNUAL DRY DOCKING ESTIMATES – SLAMI FACILITIES

Vessel Category	Indicative Vessel	Low Scenario	Base Scenario	High Scenario
Royal Australian Navy	Arafura-class patrol vessel 80 m, b 13 m, dr 4 m, dis 1,640 t (Arafura)	3	4.5	7
Australian Border Force	Cape-class patrol vessel 58.1 m, b 9.7 m, dr 3.1 m, dis 350 t	0	3	3.5
Foreign Navies	Guardian-class patrol boats (Timor Leste) 39.5 m, b 8 m, dr 2.5 m, dis ?	0	1	1.5
Offshore Petroleum Support	low: <i>CMV Athos</i> 65 m, b 16 m, d 5 m, gt 2,237 base: <i>MMA Leveque</i> 74.9 m, b 16.4 m, dr 6.37 m, gt 2,874 high: <i>Skandi Darwin</i> 93.8 m, b 20 m, dr 6.5 m, gt 6,555	1	4	12
Towage Tugs	<i>Svitzer Stockton</i> 33 m, b 14 m, dr 5.1m, gt 630	5	6.5	8
Coastal Shipping	<i>LCT Arnhem Trader</i> 49.45 m, b 16 m, dr 2.6 m, gt 902	4	12	17
Pearling	<i>Paspaley III</i> 45 m, b 9 m, dr 4.2 m, dis 320 t	9	11	14
Fishing (incl prawns, trepang)	<i>Vulcan</i> 24 m, b 7.5 m, dr 3 m, dis 205 t	25	47	62

Vessel Category	Indicative Vessel	Low Scenario	Base Scenario	High Scenario
Research	<i>RV Solander</i> 34.9 m, b 8.6 m, dr 2.8 m, dis 415 t	0	0.5	1
Other Work Boats	<i>Arabella</i> 23.7 m, b 9 m, dr 1.8 m, gt 295.5	2.5	6	9.5
Recreational Vessels	<i>Charles Darwin</i> 25.5 m, b 10.5 m, dr 1.8 m, dis 125 t	7	14	20
Total Lifts Annually		56.5	109.5	155.5

Note: l = length, b = beam, dr = draught, m = metres, dis = displacement, t = tonnes, gt = gross tonnage
SOURCE: ACIL ALLEN RESEARCH

The indicative vessels in the table are simply representative vessels. They are actual vessels that could plausibly use the SLAMI facilities. They do not purport to be average vessels or the most common vessels in each vessel category.

The estimated vessel-lift numbers include those already in Pearl Marine Engineering's market. In 2017, Pearl Marine Engineering performed 46 vessel lifts. In 2016, the number was 43. Details of vessels lifted were provided by the Paspaley Group.

The differences between estimates for the low scenario, base scenario, and high scenario are substantial. This reflects the considerable uncertainty surrounding the market for the SLAMI facilities.

The dry-docking periods assumed in preceding sub-sections for various categories of vessels are:

- defence eight weeks
- offshore petroleum support, eight weeks
- tugs, five weeks
- coastal shipping, four weeks
- pearling, four weeks
- fishing, four weeks
- research vessels, four weeks
- work boats, four weeks
- recreational vessels, four weeks.

The dry-docking estimates have important implications for the proposed scale of the facilities. These implications are discussed below.

2.12 Aggregate Annual Wet-Berth Usage Estimates Arising from Provision of SLAMI Facilities

Demand for the wet berths incorporated in the SLAMI facilities could be expected to derive from two sources:

- demand for in-water services auxiliary or complementary to services utilised during dry docking and/or are sought for convenience immediately before or after dry docking
- demand for in-water services not linked to dry docking that is attracted by enhancements to service capabilities in Darwin induced by the establishment of the SLAMI facilities.

Some of the demand for in-water services in both categories might be satisfied at other facilities in Port of Darwin. In-water services provided at other facilities in the Port of Darwin that result from the presence of the SLAMI facilities are relevant to an economic assessment of those facilities, but not a financial assessment.

Information on demand for in-water services that is derived from the establishment of the SLAMI facilities is extremely limited. Useful insights could not be gleaned from publicly available information and were not forthcoming from discussions with vessel operators and service providers, other than numerous observations that some such derived demand was anticipated.

In view of the dearth of information on this matter, different assumptions on wet-berth demand have been included in the high, base and low scenarios to provide some indication of the implications of the

considerable prevailing uncertainty. It has been assumed that in the low scenario, seven days of wet-berth use associated with SLAMI dry docking for each four weeks of vessel dry docking would be demanded. In addition, four days of wet-berth use per year per dry docking (not each four weeks of dry docking) for other reasons would be demanded in Darwin. In the base scenario, ten days of wet-berth use associated with SLAMI synchrolift and hardstand activities for each four weeks of dry docking of a vessel have been assumed. Also, seven days of other Darwin wet-berth use per dry docking for repairs and maintenance in other circumstances have been assumed to be demanded. In the high scenario, the assumed demand is two weeks of berth occupancy associated with dry docking for each four weeks of dry docking of a vessel, and two weeks of use of other Darwin wet berths per dry docking for repairs and maintenance in other circumstances.

It is not suggested that one vessel uses more than one wet-berth around the time of each dry docking. Instead, it is anticipated that while some vessels are in the port for drydocking and complementary in-water work at the SLAMI facilities, others want to access wet berths only utilise other services already in place or attracted by the SLAMI initiative. It is assumed that if SLAMI wet berths are not available for vessels that utilise the SLAMI dry docking facilities either around the time of dry docking or in between dry dockings, demand spills over to other wet berths in Darwin.

If SLAMI wet-berth availability was unconstrained, the differing assumptions would widen gaps between the scenarios. However, wet-berth availability is relatively constrained as the SLAMI facilities detailed by SMEC (2018) include just two wet berths – one on each side of the synchrolift. The estimated lifts each year by the synchrolift would allow the following average wet-berth periods for each vessel lifted under the three scenarios:

- low scenario 12.9 days
- base scenario 6.6 days
- high scenario 4.7 days.

This suggests that SLAMI wet berths would not be fully utilised in the low case, but in the base and high scenario, there would be excess demand spilling over to other facilities. Potentially, provision of additional wet berths by other service providers could be induced by the establishment of the SLAMI facilities.

2.13 Vessel Repair and Maintenance Expenditures

The available information regarding out-of-water and in-water repair-and-maintenance expenditures for various vessel types in the potential market for the SLAMI facilities was very sparse. Very little information was publicly available or derivable from material provided by government and its other advisers. Only limited, and typically, unverifiable information was provided by stakeholders consulted by ACIL Allen. Some information provided by stakeholders conflicted with information provided by other parties. Most stakeholders declined requests for information about repair-and-maintenance costs on commercial grounds, pointing out that they were potentially direct or indirect customers of, or competitors to the SLAMI facilities. Defence contractors explained that they could not provide information sought because it was not permitted under their contracts. Consequently, ACIL Allen had to piece information together forensically, and to extrapolate from that.

Further uncertainty regarding repair-and-maintenance expenditures results from the unknown extent of inducement of in-water repair-and-maintenance expenses in Darwin between dry-docking events. In effect, these activities result from a service agglomeration response – development of an enhanced repair-and-maintenance service hub – triggered by the availability of the synchrolift and associated facilities.

Because of the dearth of information and consequent uncertainty regarding relevant expenditures, a range was compiled. Indicative expenditures have been presented in low, base and high scenarios in **Table 2.18**. When the differences between the expenditure numbers in these scenarios interact with differences between target vessel market scenarios and lift scenarios, it is inevitable that the range of outcomes represented by the scenarios widens.

Repair-and-maintenance expenditures per drydocking are not confined to out-of-water expenditures. They include in-water expenses immediately before or after dry docking. Dry dockings by means of the SLAMI facilities have been estimated in section 2.10 and aggregated in section 2.11.

Other in-water repair-and-maintenance expenses have been set out on a per-vessel-per-year basis to reflect scheduled and unscheduled in-water work between dry dockings.¹² These expenses include charges for use of wet berths. The repair-and-maintenance expenditures (incorporating wet-berth usage charges) were assumed to have a consistent relationship with repair-and-maintenance expenses associated with dry-docking events for each type of vessel. The assumed ratio was one third for defence vessels (intensive maintenance and upgrades), one fifth for offshore petroleum support vessels and tugs (relatively infrequent dry dockings), and 0.15 for other vessels (relatively frequent dry dockings). The vessels to which the expenditures relate are those considered likely in section 2.10 to be part of the SLAMI facilities' market and are dry docked periodically by these facilities. The number of these vessels exceeds dry dockings each year, because dry dockings usually occur less frequently than annually.

TABLE 2.18 INDICATIVE REPAIR-AND-MAINTENANCE EXPENDITURES PER R&M EVENT

Vessel Category	Dry-Docking (DD) R&M	In-Water Only (IW) R&M	Dry-Docking (DD) R&M	In-Water Only (IW) R&M	Dry-Docking (DD) R&M	In-Water Only (IW) R&M
	Low Scenario	Low Scenario	Base Scenario	Base Scenario	High Scenario	High Scenario
	\$ m/DD	\$ m/vessel/yr	\$ m/DD	\$ m/vessel/yr	\$ m/DD	\$ m/vessel/yr
Navy	4.2	1.4	5	1.7	6	2
Aust. Border Force	2.1	0.7	2.5	0.83	3	1
Offshore Petroleum Support	2.1	0.4	2.5	0.5	3	0.6
Tugs	0.8	0.16	1	0.2	1.2	0.24
Coastal Shipping	1.5	0.23	1.75	0.27	2.1	0.32
Pearling	0.4	0.06	0.5	0.08	0.6	0.09
Fishing/Prawning	0.2	0.03	0.25	0.04	0.3	0.05
Research	0.35	0.05	0.4	0.06	0.5	0.08
Other Workboats	0.35	0.05	0.4	0.06	0.5	0.08
Recreation	0.2	0.03	0.25	0.04	0.3	0.05

SOURCE: ACIL ALLEN ANALYSIS

Only additional expenditure resulting from installation of the SLAMI facilities should be considered when undertaking an economic assessment of this initiative. Expenditure that would have occurred in any event is not relevant in an economic assessment of the initiative. Such expenditure is associated with business captured or transferred from other entities providing vessel repair-and-maintenance services in the Northern Territory.

An obvious example is the package of ship-lifting, land-transfer, wet-berth and dry-berth occupancy services, and in-water and out-of-water work on vessels that otherwise would be provided by Pearl Marine Engineering at its Frances Bay complex. The Paspaley Group plans to use the SLAMI facilities to lift and transfer vessels to a new Pearl Marine Engineering complex adjacent to the SLAMI site.

Another example is in-water and out-of-water work on, and wet-berth occupancy by vessels at HMAS Coonawarra. However, the example excludes ship-lift use and dry-berth occupancy services currently provided at HMAS Coonawarra, because the ship-lift facilities there will not be able to handle the Arafura-class patrol vessels, and the Navy intends to remove the facilities to provide berthing space for the new larger vessels.

The indicative repair-and-maintenance expenditures per repair-and-maintenance event have been applied to dry-docking and vessel estimates derived in section 2.10, after removing the parts of those estimates not considered to be new business for the Darwin marine repair-and-maintenance sector. Repair-and-maintenance services assumed to be provided by Pearl Marine Engineering in the

¹² These expenses are likely to be incurred mainly in years in which dry docking does not take place, but for convenience they are shown on a per year basis averaged over all years.

absence of the SLAMI facilities were based on actual dry dockings and vessels lifted over the past two years. In-water services and out-of-water work at HMAS Coonawarra that could be picked up by service providers utilising the SLAMI facilities have been represented by an indicative deduction of 10 per cent of estimated low scenario Navy expenditures in each scenario.

The results of these calculations are shown in **Table 2.19**. The numbers shown are indicative additional annual vessel repair-and-maintenance expenditures in Darwin under low, base and high scenarios following commissioning of the SLAMI facilities.

TABLE 2.19 INDICATIVE ANNUAL VESSEL REPAIR-AND-MAINTENANCE EXPENDITURES

Vessel Category	Dry-Docking (DD) R&M	In-Water Only (IW) R&M	Dry-Docking (DD) R&M	In-Water Only (IW) R&M	Dry-Docking (DD) R&M	In-Water Only (IW) R&M
	Low Scenario \$ m	Low Scenario \$ m	Base Scenario \$ m	Base Scenario \$ m	High Scenario \$ m	High Scenario \$ m
Navy	11.3	0	26.2	22.1	50	38
Aust. Border Force	0	0	7.5	7.5	10.5	10
Offshore Petroleum Support	2.1	2	10	8.5	36	28.2
Tugs	4	4	6.5	6.3	9.6	9
Coastal Shipping	3.75	0.8	18.4	4	32.6	7
Pearling	1.2	0.1	2.5	0.4	4.8	0.8
Fishing/Prawning	1.4	0.4	7.25	1.4	13.2	2.8
Research	0	0	0.2	0	0.5	0.1
Other Workboats	0	0	0.4	0	1.75	0.2
Recreation	0.6	0.4	2.5	1.1	4.8	2.1
Sub-Total	24.4	7.7	81.5	51.3	154.8	107.2
Total	Low R&M →	32.1	Base R&M →	132.8	High R&M →	262

SOURCE: ACIL ALLEN ANALYSIS

The expenditures in **Table 2.19** exclude outlays on services of the SLAMI facilities. SLAMI revenues have been presented in chapter 3. For the purposes of economic analysis, SLAMI revenues should be added to repair-and-maintenance estimates above, but only after they have been adjusted by deducting revenue from ship-lifting services that would have been provided by Pearl Marine Engineering in the absence of the SLAMI facilities.

A review of actual lifts by Pearl Marine engineering in recent years revealed that they are heavily weighted towards the lower end of the lifting range (and therefore, the revenue range) for the synchrolift and SPMT in the SLAMI complex. Having regard to the historical number of lifts and their size distribution, and the indicative numbers and distributions of SLAMI lifts under the three scenarios, it was considered appropriate to include the following proportions of revenues of the SLAMI complex (see sub-section 3.6.3 in chapter 3) as additional revenue for the purposes of the economic analysis:

- 0.3 in low scenario
- 0.65 in base scenario
- 0.77 in high scenario.

2.14 Local Capabilities and Skills

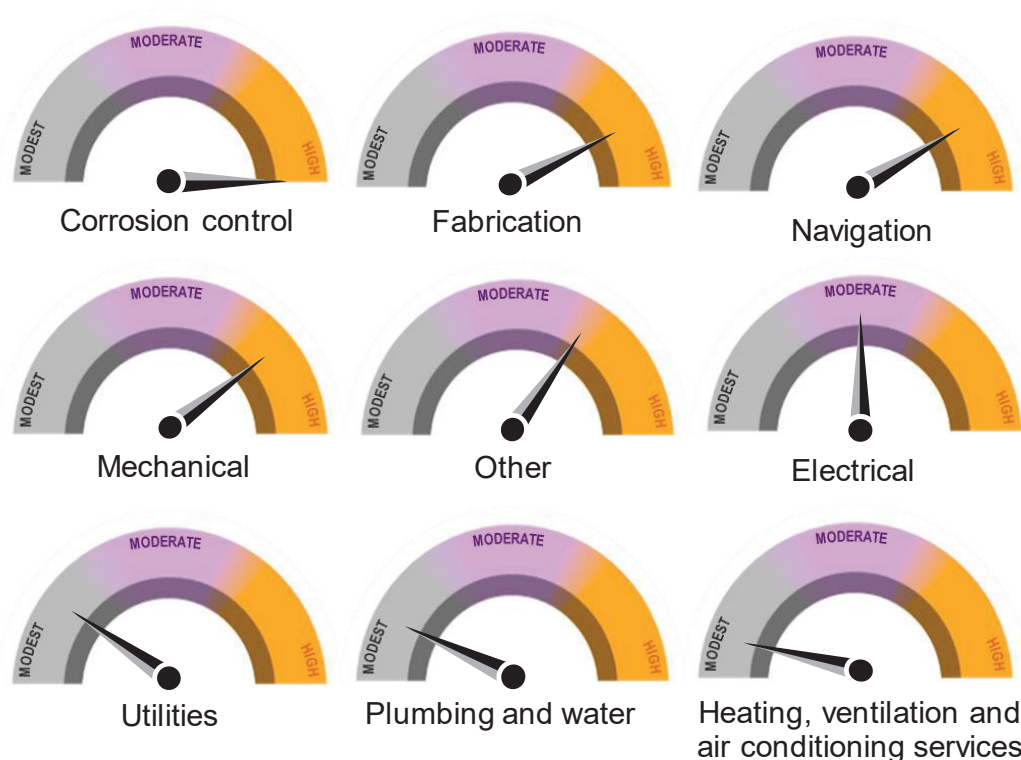
Achievement of the market outcomes indicated in the three scenarios, particularly the base and high scenarios, is dependent on service provision in Darwin not being constrained by deficiencies in local capabilities and skills. Results of research on relevant capabilities and skills commissioned by the Northern Territory Government are discussed below.

2.14.1 General Capabilities

The Industry Capability Network (ICN) (2017, 2018) analysed the capacity of the marine services industry in the greater-Darwin region. The study identified 505 unique businesses with capacity to provide marine services with a large number having proven experience and holding relevant accreditations in respect of 74 discrete scopes of work. The study demonstrated that the marine services industry in Darwin has strong capabilities to service the repair, maintenance and supply requirements of a range of vessels operating in the vicinity of the Northern Territory. This capability was expected to grow to support growth in the total number of vessels.

In total, of the 505 unique, relevant businesses identified considered, 120 were categorised as full capacity businesses, having relevant proven experience and accreditations. A further 207 businesses were found to have the potential capacity to undertake marine services work, but in most cases were lacking in direct experience or formal accreditations. The remaining 178 businesses were identified as being capable suppliers that would be able to support the servicing of vessels through the sale of parts, tools or consumables.

FIGURE 2.19 OVERVIEW OF CAPABILITY OF THE GREATER DARWIN MARINE SERVICES INDUSTRY



Note: Capability is based on the depth of the NT market as measured by the number of active businesses within the sector with proven experience and who hold relevant industry recognised accreditations.

SOURCE: ACIL ALLEN CONSULTING BASED ON INDUSTRY CAPABILITY NETWORK (2018), STATEMENT OF CAPACITY: MARINE SERVICES INDUSTRY IN THE NORTHERN TERRITORY.

Figure 2.19 provides a simple summary of the depth of the capability of the Darwin marine services industry to provide the range of required services. ICN (2018) summarised the capability based on the number of active businesses within the sector with proven experience and relevant industry-recognised accreditations. According to ICN (2018), eleven of more active businesses with the relevant accreditations classified Darwin as having “high capability”, six to ten was deemed to provide “moderate capability” and one to five indicated “modest capability”. Each overarching category of services (eg, corrosion control, fabrication, navigation, etc.) is comprised of a detailed scope of works relative to which the businesses were assessed. For example, the navigation service category comprises services related to autopilot systems, gyrocompass and instruments, radar systems, radio communications, and satellite navigation systems. More than eleven active businesses (comprising

majority or several small businesses) were found to be capable in gyrocompass and instruments, radar systems, and satellite navigation systems, while nine (mainly small) businesses had capabilities in autopilot systems, and radio communications. Consequently, the marine services industry was classed as having “high capability” across three scopes of work within the navigation services category and moderate capability across two.

As can be seen from **Figure 2.19**, the marine services industry in Darwin has been categorised as having high capabilities across many market categories including corrosion control, fabrication, navigation, and mechanical services. Modest capability was found in services related to utilities, plumbing and water and HVAC systems. As noted in previous sub-sections of chapter 2, any capability gap Darwin may have with respect to key services availability, could be overcome by flying in specialists as required (albeit, at a cost).

A key caveat to ICN’s methodology is that the overarching value or availability of services in greater Darwin has not been assessed compared to competitors elsewhere in Australia or overseas. In a competitive market, however, the existence of more businesses in a region is often a sign that good capability and value is being provided. Limiting the analysis to active businesses working to recognised standards means that a wide range of capable but non-accredited or relatively inexperienced businesses may not have been counted. These businesses represent a potential future pool of service providers if the SLAMI complex induces an increase in the total number of vessels being serviced in Darwin.

2.14.2 Defence Servicing Capabilities

While much repair-and-maintenance work associated with the maritime defence sector vessels is the same or similar to such work for other vessels, there are various additional skills and other requirements that pose challenges to the SLAMI facilities in successfully competing for maritime defence work. In light of this, the Industry Skills Advisory Council, Northern Territory (ISACNT) (2017) undertook a study focussed on understanding the Northern Territory’s maritime defence maintenance skilling capacity, and providing recommendations to help eliminate identified gaps.

The workforce skilling capacity survey and consultations undertaken by ISACNT indicated that defence contracts had embedded obligations requiring employees to have specific technical skills and experience. Further, it was identified that NT businesses vying for contracts often did not have the necessary range of skills at the appropriate levels and that they often could not fill their vacant positions. The survey indicated that there was some resistance on both supply and demand sides of the market for skilled personnel to investment in workforce development, training and upskilling. Firms advised that their primary commitment to training was compliance driven rather than upskilling for work-force and firm development. Further, many businesses are small to medium enterprises and Darwin has a fairly transitory workforce. These matters lead to financial and logistical barriers to upskilling. In essence, the ISACNT analysis identified a classic “chicken-and-egg” problem, with Darwin having a potential market for servicing defence vessels, but not a strong enough market to underpin local capacity in certain areas, and this presented a barrier to access to the market by local businesses. A skilled and accessible workforce is essential for building and maintaining business capability and such a workforce happens when there is a large pool of workers with the appropriate skills and experience. Historically, the availability of fly-in-fly-out workers has made the Northern Territory competitive, but compounds challenges surrounding local workforce development, especially in the advanced trades skills area, as local contractors/employers do not seem to have the time, resources or will to invest in developing their workers’ skills beyond immediate project demands.

As acknowledged in the ISACNT (2017) report, the defence, oil and gas, and maritime industries are competing in a tight labour market for a limited pool of workers with the appropriate skills and experience. As the population of Darwin and the Northern Territory grow over time, a deeper pool of career opportunities will develop, and with the addition of key infrastructure items such as the SLAMI facilities, more marine service occupations associated with defence sustainment will become sustainable. In the near term, however, the greater Darwin market will be able to provide many, if not all services to defence vessels, with key skill gaps being met through fly in-fly out workers.

ACIL Allen’s consultations with various stakeholders and subsequent analysis have indicated that attraction of major defence contractors to Darwin through provision of the SLAMI facilities and other

means would help to fill skills gaps. These firms will be able to transfer suitably skilled personnel to Darwin or be better placed than local firms to recruit staff for work in Darwin because of the attraction of subsequent career opportunities. In addition, these firms will be able to transfer knowledge to local personnel or to individuals who remain as locals.

In addition, the Northern Territory Government has an important role to play as an education services provider. It is noted that ISACNT made recommendations regarding Government initiatives to help address maritime defence maintenance skills gaps. It is expected that the Government will take such action to support its investment in the SLAMI facilities.

2.15 Key Messages from Market Analysis

Several important themes have emerged from the market analysis. Some were suggested in market sounding discussions and then investigated further by ACIL Allen. Others were identified by ACIL Allen.

Locational Advantage

The proposal to establish a synchrolift and supporting facilities in Darwin is widely perceived by stakeholders as providing Darwin with an opportunity to capitalise on a strong locational advantage over competing vessel repair and maintenance complexes in Australia and south-east Asia in respect of vessels based in Darwin and/or operating in waters of the north-western coast of Australia. This includes vessels supporting petroleum exploration and extraction offshore in the Browse and Bonaparte Basins.

The locational advantage derives from the opportunity cost of taking vessels to Henderson (south of Fremantle in Western Australia) or to the Singapore maritime support hub (including shipyards close to Singapore in Malaysia and on Batam Island in Indonesia). This opportunity cost comprises fuel costs, wage costs, and income lost because of unavailability of a vessel for payable work while travelling repair and maintenance activities. The foregone income component of opportunity cost would tend to rise as demand for services of vessels rise and spare capacity falls. The opportunity cost is high because the sea trip from Darwin to Singapore is around 9.8 days each way, Dampier to Singapore is about 8.9 days each way, Darwin to Fremantle/Henderson is approximately 9.4 days each way, and Dampier to Darwin is 5.3 days each way (Ports.com). While Dampier is half a day closer to Fremantle/Henderson than to Darwin (the gap is smaller for Port Hedland), the gap is small enough to make servicing of suitable-sized vessels operating in the vicinity of Pilbara ports a contestable market for the SLAMI facilities.

Newcomer's Disadvantage

Darwin's locational advantage should be weighed against the lower cost of services and higher degree of prompt availability of parts and a full range specialised services in the Singapore vessel-servicing hub. It also needs to be weighed against the range of services and parts available at Henderson. Unavailability of a full range of services that can be provided promptly in Darwin could be a deterrent to use of services that are available. However, it has been noted that the range of relevant services available for vessel repair and maintenance work in Darwin is reasonably good. Darwin's disadvantage in respect of prompt service and parts availability could be reduced, at a cost, by flying in specialists and parts.

Capacity of Synchrolift

An important source of the difference between the annual lifts under the base scenario and the high scenario is the assumed capacity of the synchrolift. The difference between the original limiting vessel characteristics and the assumed less constrained specifications in the high scenario are:

- length of 85 metres increased to 120 metres
- beam unchanged at 24 metres
- draught increased from 6 metres to 8.5 metres
- lightweight displacement increased from 4,000 tonnes to 5,500 tonnes.

This change in specifications would account for an estimated difference of 26 vessels in the target market, resulting in around seven additional vessel lifts in the high scenario relative to the base scenario. Offshore petroleum support vessels would account for 5.5 extra lifts each year. Defence vessels would contribute the other 1.5 extra lifts each year. The estimated relative increase in lifts (over the base scenario) resulting from the assumed increase in capacity of the synchrolift would be around 6.4 per cent. Over time, the difference in absolute and relative terms could widen as a result of a widely-observed trend towards larger vessels.

To illustrate the point, of 14 offshore petroleum support vessels (11 platform supply, one anchor handling tug supply, one seismic, one dive and remotely operated vehicle support) based in Darwin as at 1 October 2018, 11 vessels had published length overall or draught or both that exceeded the maximum limiting vessel characteristics for the synchrolift. Indeed, a high proportion of platform supply and anchor handling tug supply vessels in fleets operated by major suppliers of services of such vessels, such as Swire Pacific, Solstad Offshore, Siem Offshore, DOF Offshore, and MMA Offshore, are too large for the shiplift.

Increasing the capacity of the synchrolift would have implications for wet and dry berth requirements. It would increase both the dimensions and number of berths required. This is discussed below.

Wet Berths

The proposed SLAMI facilities would provide two wet berths – one on each side of the synchrolift – each capable of accommodating a vessel that can be lifted by the proposed synchrolift. This would apply at all tides with sufficient under-keel clearance. The purpose of the wet berths is to allow in-water repairs and maintenance and provisioning of vessels, and general mooring and berthing (SMEC, 2018).

The wet berths included in the SLAMI facilities package (2 berths, each able to accommodate a vessel up to 85 metres long) are fewer than Pearl Marine engineering currently has available at its complex. The proposed provision of two SLAMI wet berths also appears to be meagre compared to wet-berth space forming part of the Henderson common-user complex. The latter includes considerably more wet berths and longer wet berths. The Henderson common-user complex includes six wharves/wet berths (see **Figure 2.2** in sub-section 2.6.1):

- AMC 1, maintenance and load-out berth – vessels up to 200 metres long
- AMC 2, maintenance berth – vessels up to 60 metres long
- AMC 3, maintenance berth – vessels up to 132 metres long
- AMC 4, maintenance and heavy-lift berth – vessels up to 300 metres long
- AMC 5, roll-on, roll-off and heavy lift berth
- AMC 6, roll-on, roll-off berth.

The estimated lifts each year by the SLAMI facilities described by SMEC (2018) would allow the following average SLAMI wet-berth periods for each vessel lifted under each scenario:

- low scenario 12.9 days
- base scenario 6.6 days
- high scenario 4.7 days

It appears that these periods would be inadequate for much in-water repair and maintenance work accompanying other activities undertaken during dry-docking, particularly in the base and high scenarios. If the wet berths are also used for general mooring and berthing as suggested by SMEC (2018), the inadequacy of available wet-berth time before or after vessels are dry docked could be exacerbated. This observation tends to reinforce claims by the CEO of the Port of Darwin, representatives of the Chamber of Commerce NT and its Manufacturers' Council, and various operators and repair and maintenance service providers that quay-line or wet-berth provision in the SLAMI facilities was inadequate for the likely quantum and high proportion of repair and maintenance work required in-water.

Because an increase in the capacity of the synchrolift would increase the maximum size and number of vessels lifted, it would require an increase in the capacity of some wet berths and the number of wet berths provided. An increase in the length of the synchrolift would also provide a corresponding increase in the length of the two wet berths adjacent to the synchrolift's platform. However, this would

not increase the number of wet berths, except to the extent that longer berths might allow the SLAMI complex to accommodate more small or medium-sized vessels at each berth if a berth is not occupied by a large vessel.

A consequence of the inadequacy of wet berth space is that wet berths would have to be secured elsewhere in Port of Darwin at suitable times or vessel operators would send their vessels to other repair and maintenance centres. It is pertinent that the current Pearl Marine Engineering facilities include three wet berths. Retention of these wet berths or provision of new wet berths at Pearl's proposed new complex adjacent to the SLAMI facilities would alleviate a potential wet-berth shortage.

If the wet-berth constraint is not relieved, the shortage would tend to reduce dry-docking estimates below those set out in **Table 2.17** above. This is most likely to occur in the base and high scenarios in which wet berth space would be very scarce.

Dry Berths

The *SLAMI FEED Study: Basis of Design* undertaken by SMEC (2018) did not clearly specify how many dry berths would be included in the hardstand area and how big the dry berths would be. However, it said that at least two bays should be large enough to accommodate vessels of the size of the Arafura-class offshore patrol vessels, with sufficient perimeter clearances to provide temporary or permanent enclosures. Unfortunately, such bays (and the complementary synchrolift) would not be large enough to accommodate many of the platform supply vessels, anchor handling tug supply vessels, and multi-purpose offshore petroleum support vessels operated by prominent specialised vessel service providers, such as DOF Subsea, Siem Offshore, Swire Pacific, and Solstad Offshore.

An increase in the capacity of the synchrolift, as assumed in the high scenario, would increase the maximum size and number of vessels lifted. Therefore, it would require an increase in the size of some dry berths and the number of such berths included as part of the SLAMI facilities. However, it is noted that the Land Development Corporation has a common-user hard-stand area near the site of the SLAMI complex that could supplement dry berths provided within the SLAMI site.

The absence of undercover repair and maintenance space was perceived by many of the parties consulted to be an important omission from the proposed SLAMI facilities. This could adversely affect productivity.

Also, the absence of covered and ideally, climate-controlled facilities for blasting and painting was regarded as a serious deficiency of the proposed SLAMI facilities. It was considered that, in the wet season, and periods of high humidity this could cause substantial loss of vessel operating time.

Skills Gaps

Conflicting views were expressed by vessel operators and repair-and-maintenance service providers regarding local capabilities and skills to for work on private sector vessels. While local capability and skills to undertake such work appear to be reasonably good, there appear to be some weaknesses and some difficulties in attracting suitable staff.

In relation to maritime defence vessels, skills deficiencies appear to be more widely recognised. The problem was highlighted by ISACNT (2017).

It could be expected that attraction of major service providers to Darwin through provision of the SLAMI facilities and other means would help to fill capability and skills gaps. These firms will be able to bring in capabilities supported by suitably skilled personnel. In addition, these firms and the personnel they bring to Darwin will be able to transfer knowledge to current and future locals.

In addition, the Northern Territory Government has an important role to play as an education services provider. ISACNT (2017) recommended Government initiatives to help address maritime defence maintenance skills gaps. It is expected that the Government will take such action and broader educational initiatives to support its investment in the SLAMI facilities.

Business Model

Concern has been expressed regarding lack of clarity regarding the business model to be adopted for the SLAMI facilities. It was considered important that the Northern Territory Government does not

allow the private-sector operator of the SLAMI facilities to exercise market power through pricing of services or through a locational advantage for its own shipyard. It was also deemed important that complementary service providers not be impeded from competing and that vessel owners be able to undertake or project manage their own repair and maintenance activities.

Another issue with implications for pricing of services is that the incremental cost of lifting a ship was considered to be low relative to the average cost, which includes the relatively large capital cost of providing the facilities. Pricing on an average cost basis could discourage patronage of the SLAMI facilities.



3.1 Introduction

This section presents the underlying assumptions and results of a financial analysis of the proposed SLAMI facility in Darwin.

The analysis considers two separate sites for the proposed facility: one at the originally-proposed Northern Ship Support Pty Ltd (NSS) site, and an alternative site. The analysis includes three separate scenarios, covering low, base and high vessel demand outcomes.

The analysis is conducted in real terms for a period of 20 years from commencement of operations. Construction of the facility is expected to take approximately two years, after which operations commence.

The following sections detail each of the components of the financial analysis, namely:

- project financing
- weighted average cost of capital (WACC) calculations
- capital expenditure
- demand for the SLAMI facility
- operating revenues
- operating costs
- net cash flows and
- a sensitivity analysis around the WACC and the Northern Territory Government's contribution to the project.

3.2 Financing

3.2.1 Grant

The Northern Territory Government has pledged to contribute \$100 million towards the construction of the SLAMI facility. ACIL Allen has been directed to treat this contribution as a grant rather than a loan. In the analysis, the grant is used to partially offset the upfront capital expenditures of the project.

3.2.2 Debt and Equity

For the purposes of the analysis, ACIL Allen has assumed that the remaining capital requirements are funded 30 per cent by debt and 70 per cent by equity. Given the absence of information concerning how the private sector's contribution is to be funded, ACIL Allen considers that for a project of such a significant size, it is likely that some debt funding will be required, with 30 per cent debt funding being reasonable.

3.3 Weighted Average Cost of Capital (WACC)

Table 3.1 shows the underlying assumptions of the WACC calculation for the financial analysis. The analysis is conducted on a pre-tax basis in real terms. The cost of equity is derived using the standard capital asset pricing model (CAPM) formula, with the risk-free rate corresponding to the 10-year Australian Government bond rate as at 9 January 2019.

An equity risk premium of 6 per cent and a beta of 1.34 have been assumed for the analysis. The estimate of beta is a global measure of beta for the shipbuilding and marine industries and was obtained from an online finance data archive¹³ provided by New York University.

The cost of debt is determined using the spread between a BBB-rated non-financial corporate bond and the 10-year Australian Government bond rate. As at December 2018, this spread stood at 231.3 basis points, which is added to the risk-free rate to obtain the cost of debt of 4.64 per cent.

The real pre-tax WACC applied under the low, base and high scenarios is 6.15 per cent.

TABLE 3.1 COMPONENTS OF THE WEIGHTED AVERAGE COST OF CAPITAL (WACC)

Variable	Value
Risk-free rate (nominal)	2.33%
Equity premium	6.00%
Beta	1.34
Cost of equity (nominal)	10.37%
Tax rate (analysis uses a pre-tax WACC)	0%
Cost of debt (nominal)	4.64%
Debt ratio	30.0%
WACC (nominal) (pre tax)	8.65%
Inflation rate	2.5%
WACC (real) (pre tax)	6.15%

SOURCE: ACIL ALLEN

3.4 Capital Expenditures

Table 3.2 shows a breakdown of the required capital expenditures (capex) to construct the SLAMI facilities for both the NSS and alternative sites. A 20 per cent contingency is added to the initial capex estimates to factor in unforeseen up-front project risks. Estimates are presented in the table with and without the contingency. The capex estimates including the contingency were those applied in the financial analysis.

TABLE 3.2 SLAMI CAPITAL EXPENDITURES BY LOCATION AND TYPE

Category	NSS	NSS (with contingency)	Alternative site	Alternative site (with contingency)
Indirect Costs - Contractors (BCJV) Design Services	\$4,445,000	\$5,334,000	\$4,445,000	\$5,334,000
Indirect Costs - Contractors (BCJV) Indirect Costs	\$44,947,037	\$53,936,444	\$44,947,037	\$53,936,444

¹³ <http://pages.stern.nyu.edu/~adamodar/>

Category	NSS	NSS (with contingency)	Alternative site	Alternative site (with contingency)
Indirect Costs - Design Services	\$3,998,401	\$4,798,081	\$3,998,401	\$4,798,081
Indirect Costs - Insurances	\$1,496,529	\$1,795,835	\$1,496,529	\$1,795,835
Indirect Costs - Owners Costs	\$2,000,000	\$2,400,000	\$2,000,000	\$2,400,000
Indirect Costs - PMC Services	\$4,500,000	\$5,400,000	\$4,500,000	\$5,400,000
Offshore - Dredging	\$14,075,948	\$16,891,138	\$14,497,545	\$17,397,055
Offshore - Navigational Aids	\$295,078	\$354,093	\$295,078	\$354,093
Onshore - Blast & Paint Bay	\$2,201,359	\$2,641,630	\$2,201,359	\$2,641,630
Onshore - General Hardstand	\$1,955,536	\$2,346,644	\$1,749,717	\$2,099,660
Onshore - Land Reclamation Area and Bulk Civil	\$12,245,785	\$14,694,942	\$29,597,755	\$35,517,306
Onshore - Site Establishment/Prep	\$100,000	\$120,000	\$100,000	\$120,000
Onshore - Site roads	\$135,756	\$162,907	\$109,908	\$131,890
Onshore - Transfer Area and Heavy Hardstand	\$7,012,983	\$8,415,580	\$5,384,113	\$6,460,936
Onshore - Utilities	\$5,803,923	\$6,964,708	\$5,803,923	\$6,964,708
Onshore - Washdown Bay	\$1,617,992	\$1,941,590	\$1,617,992	\$1,941,590
Onshore - Workshops and Offices	\$3,358,528	\$4,030,233	\$3,358,528	\$4,030,233
Covered area- PVC	\$3,000,000	\$3,600,000	\$3,000,000	\$3,600,000
Ship Lift - Equipment, Materials	\$12,469,373	\$14,963,247	\$12,469,373	\$14,963,247
Ship Lift - Synchrolift	\$23,401,859	\$28,082,231	\$23,401,859	\$28,082,231
Ship Lift - SPMT and Trestles	\$10,886,350	\$13,063,620	\$10,886,350	\$13,063,620
Total	\$159,947,437	\$191,936,924	\$175,860,467	\$211,032,560

SOURCE: MOTT MACDONALD FOR CAPITAL COSTS OTHER THAN COVERED AREA, WITHOUT CONTINGENCY; DTBI FOR CAPITAL COST OF THE COVERED AREA; CONTINGENCY ALLOWANCE OF 20 PER CENT APPLIED BY ACIL ALLEN.

For the NSS site, projected capital expenditure (including the contingency) required to build the facility is \$191.9 million, while for the alternative site it is \$211.0 million. The additional capital expenditure required for the alternative site is mostly due to significantly higher land reclamation costs associated with the alternative site.

A further premium of 20 per cent has been added to capital expenditure under the high scenario to allow for the fact that, under the high scenario, a ship lift with considerably larger capacity is constructed that is able to lift larger defence vessels and offshore petroleum support vessels with dimensions well outside the specifications of the currently proposed facility. The revised dimensions are: length 120 metres, beam 24 metres, draught 8.5 metres and lightship displacement of 5,500 tonnes. This indicative premium requires verification by engineers.

Under the high scenario, total capex (including the contingency) rises to \$230.3 million for the NSS site and \$253.2 million for the alternative site.

3.5 Demand for Synchrolift

The number of lifts demanded at the facility under the three scenarios is presented in **Table 3.3**. These indicative numbers were derived in sub-sections 2.10.1 to 2.10.10 and aggregated in sub-section 2.11 in chapter 2.

TABLE 3.3 NUMBER OF ANNUALISED LIFTS BY VESSEL CATEGORY

Heading	Low case	Base case	High case
Royal Australian Navy	3	4.5	7
Australian Border Force	0	3	3.5
Foreign navies	0	1	1.5
Offshore Petroleum support	1	4	12
Towage tugs	5	6.5	8
Coastal shipping	4	12	17
Pearling	9	11	14
Fishing	25	47	62
Research	0	0.5	1
Other work boats	2.5	6	9.5
Recreational vessels	7	14	20
Total	56.5	109.5	155.5

SOURCE: ACIL ALLEN ANALYSIS

Coastal shipping vessels, other work boats and recreational vessels are assumed to grow in line with Gross Territory Product. Other vessel categories are assumed to be constant over time, for reasons discussed in chapter 2.

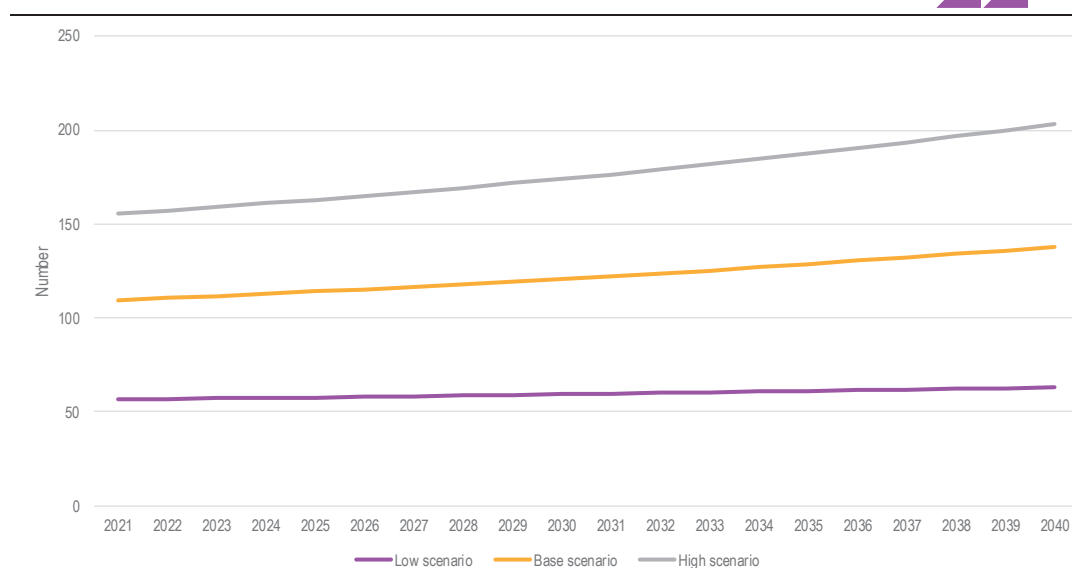
Based on these growth assumptions, and indicative annualised lifts in **Table 3.3**, the trajectory of projected lifts at the SLAMI facilities was calculated under the three scenarios. The results are shown in **Figure 3.1**.

Under the low scenario, the total number of lifts annually increases from 56.5 to 63.0 in 2040. This is equivalent to a growth rate of 0.6 per cent per annum over the period.

Under the base scenario, the number of lifts is projected to reach 137.9 in 2040, increasing from 109.5 in the first year of operation. This is equivalent to a growth rate of 1.2 per cent per annum over the period.

Under the high scenario, the number of lifts is projected to reach 203.5 in 2040, increasing from 155.5 in the first year of operation. This is equivalent to a growth rate of 1.4 per cent per annum over the period.

The estimated lifts have been assumed to be the same for the two sites, because of unavailability of information that might indicate more lifts at the alternative site than the NSS site.

FIGURE 3.1 PROJECTED ANNUALISED NUMBER OF LIFTS, SLAMI, LOW, BASE AND HIGH SCENARIOS

SOURCE: ACIL ALLEN ANALYSIS

3.6 Operating Revenues

3.6.1 Sources of Revenue

For the purposes of the analysis, the SLAMI facility is assumed to collect revenue using the same pricing model as the common-user facility in the Australian Marine Complex (AMC) at Henderson in Western Australia.

The main sources of revenue of the SLAMI facility are:

- daily charges for lifting (and lowering) the vessel from the water
- daily charges for the use of the wet berths
- weekly charges for the use of the dry-dock or hard-stand area
- charges for transferring the vessel between the ship lift and the hardstand that include
 - trailer lines
 - self-propelled modular transporter (SPMT) set-up charges
 - SPMT axle lines
 - SPMT power packs.

After consultation with the Northern Territory Government's technical adviser, Mott Macdonald, it was determined that each lift would require 2 trailer lines. The total number of axle lines required would depend on the total vessel displacement, with each axle capable of lifting 40.4 tonnes. The number of SPMT power packs would depend on the number of axles, with each power pack having a capacity of 40 axles.

The demand for the number of days of wet berthing was calculated on the basis set out in sub-section 2.12 in the market analysis chapter of the report. The wet berth requirements differed between scenarios.

Because SLAMI has only two wet berths available, there are only 730 days available for wet berthing of vessels in any given year. While this constraint isn't hit under the low scenario, where the total wet-berth time demanded is less than the available capacity, this isn't true in the base and high cases. The wet-berth demanded was adjusted to fit within the capacity constraint.

Under the low case, the wet-berth time demanded is 658.3 days which is less than the constraint of 730 days. Under the base case, unconstrained demand for wet berths is 1303.4 days, 78.5 per cent

higher than available capacity. In the high scenario this increases to 1892.5 days, 159 per cent higher than available capacity.

On this basis, it appears that the small number of wet berths available at SLAMI may limit the full revenue generating potential of the facility. Based on a daily wet-berth charge of \$5,000, \$2.9 million in annual revenue would be foregone under the base case and \$5.8 million in annual revenue would be lost under the high scenario.

3.6.2 SLAMI Pricing

Prices charged by the SLAMI facilities are assumed to be in line with those charged by the AMC facility at Henderson. The AMC has published its schedule of rates on its website¹⁴ covering the period from 1 July 2018 to 30 June 2019. These were adopted in the financial analysis of the proposed SLAMI facility and are shown in **Table 3.4**.

TABLE 3.4 SLAMI PRICING ASSUMPTIONS

Pricing	Charge
Dry-docking pricing	
Synchrolift (day of docking and undocking) (\$ per day)	\$13,500
Wet berths (days at berth) (\$ per day)	\$5,000
Dry berths (hardstand area) \$/m ² /week	\$1.30
Vessel transfer between dock and hardstand	
2 X trailer lines	\$10,000
SPMT (\$ per per axle line)	\$350
SPMT (during setup) \$/hour/axle line	\$25
SPMT power pack (\$/day/unit)	\$700

SOURCE: AUSTRALIAN MARINE COMPLEX, WESTERN AUSTRALIA

3.6.3 Operating Revenues

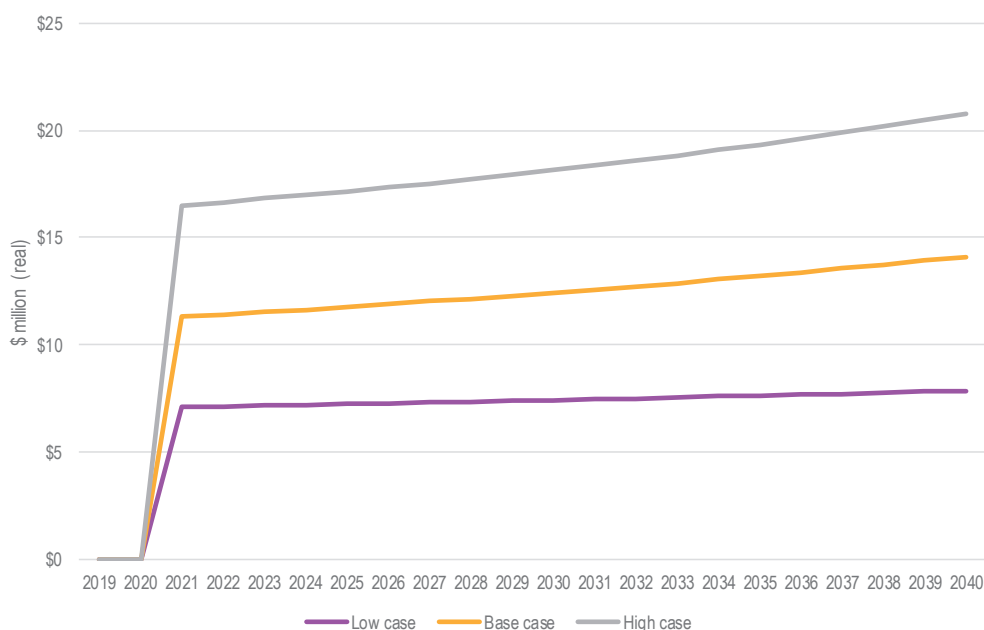
Figure 3.2 shows the total operating revenue generated by the SLAMI facilities under the three separate demand scenarios. Under the low scenario, SLAMI revenue is projected to be \$7.08 million in the first year of operation, before rising slowly to \$7.87 million in 2040. This is equivalent to an average annual rate of growth of 0.56 per cent per annum over the operating period.

Under the base scenario, operating revenue is projected to be \$11.32 million in the first year of operation before increasing steadily to \$14.12 million in 2040, equivalent to an average annual growth rate of 1.17 per cent.

Under the high scenario, operating revenue is projected to be \$16.51 million in the first year of operation before increasing steadily to \$20.77 million in 2040, equivalent to an average annual growth rate of 1.22 per cent.

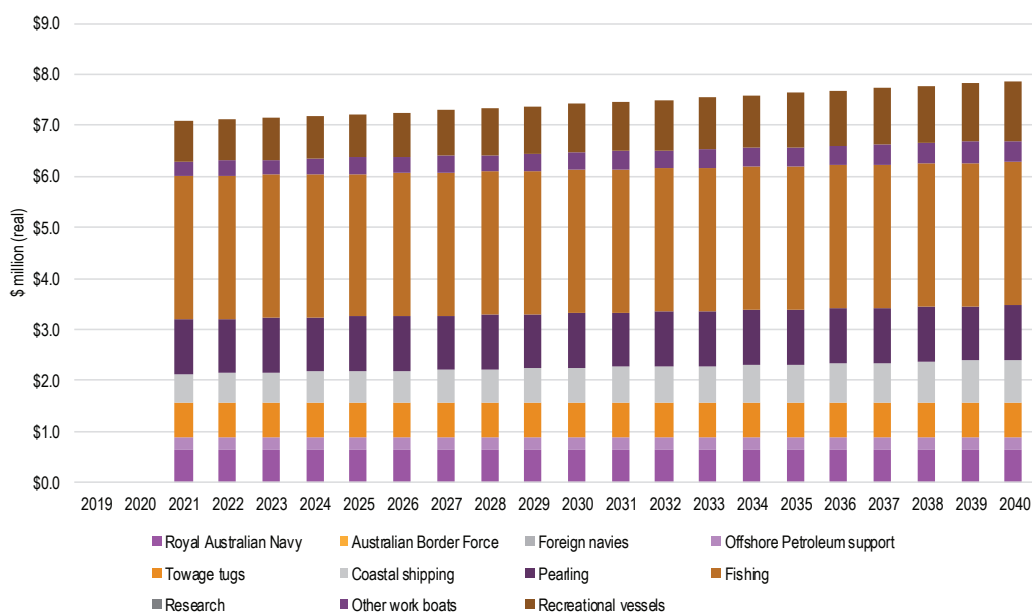
The estimated revenue has been assumed to be the same for the NSS and alternative sites, because of unavailability of information that might indicate higher revenue at the alternative site.

¹⁴ Please see <https://www.australianmarinecomplex.com.au/sites/default/files/inline-files/CFM-SOR-Schedule%20of%20Rates%20-%20Common%20User%20Facility.pdf>

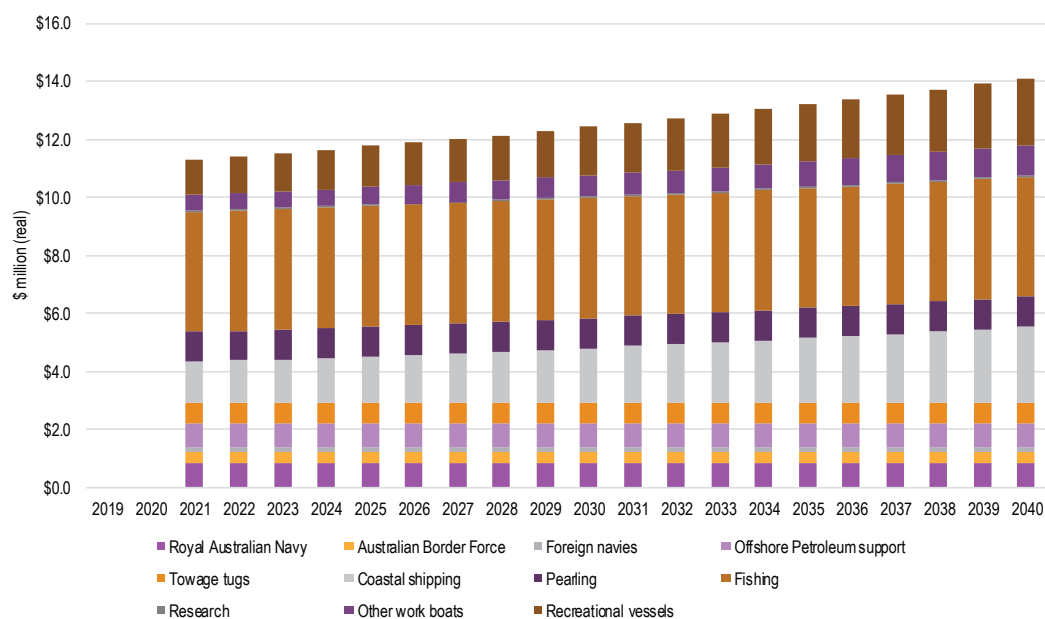
FIGURE 3.2 TOTAL REVENUE GENERATED BY SLAMI, LOW, BASE AND HIGH SCENARIOS

SOURCE: ACIL ALLEN ANALYSIS

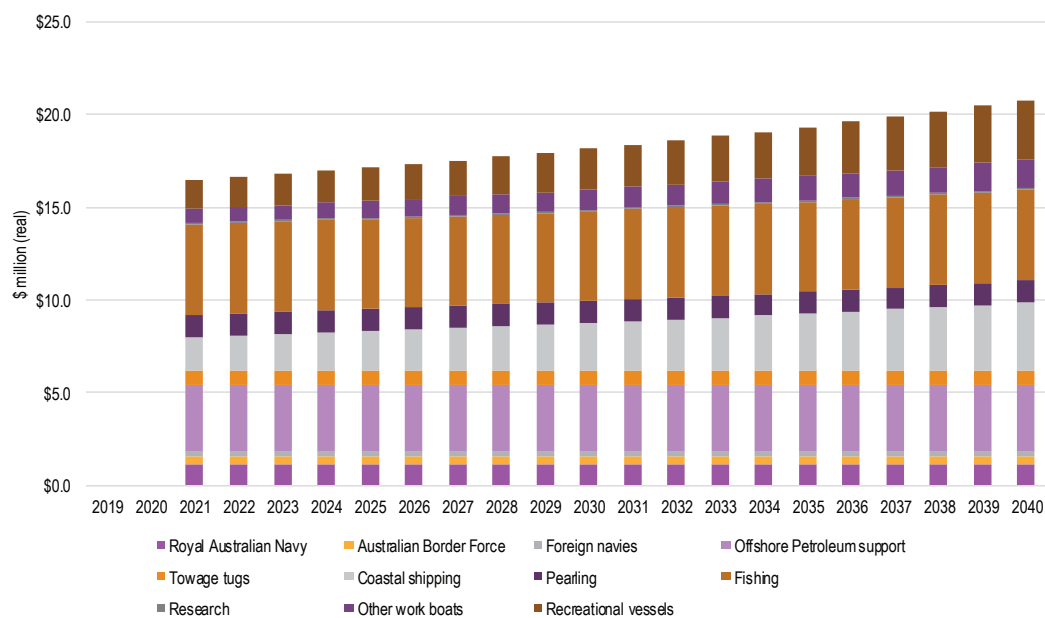
Figure 3.3, Figure 3.4 and Figure 3.5 present SLAMI's operating revenue by vessel category for the low, base and high scenarios, respectively.

FIGURE 3.3 TOTAL REVENUE GENERATED BY SLAMI BY VESSEL CATEGORY, LOW SCENARIO

SOURCE: ACIL ALLEN ANALYSIS

FIGURE 3.4 TOTAL REVENUE GENERATED BY SLAMI BY VESSEL CATEGORY, BASE SCENARIO

SOURCE: ACIL ALLEN ANALYSIS

FIGURE 3.5 TOTAL REVENUE GENERATED BY SLAMI BY VESSEL CATEGORY, HIGH SCENARIO

SOURCE: ACIL ALLEN ANALYSIS

3.7 Operating Costs

The main operating costs associated with the operation of the ship lift are:

- Wages and salaries
- Maintenance and sustaining capex of onshore and offshore structures including:
 - dredging
 - navigational aids
 - general hardstand
 - land reclamation
 - site establishment and site roads
 - transfer area and heavy hardstand
 - utilities
 - washdown bay
 - workshops and offices
 - PVC covered area
 - SPMTs
 - synchrolift
- interest charges associated with the debt facility
- electricity charges
- SPMT fuel costs.

3.7.1 Wages and Salaries

Wages and salaries expenses are incurred for the provision of dock operations personnel, specifically:

- dock operator
- dock master
- chief engineer
- dock technician.

Dock personnel are assumed to be charged out to the client on an hourly basis using the rates charged by the AMC common-user facility at Henderson. These rates are shown in **Table 3.5** below. It has been assumed that there is a wages premium of 50 per cent associated with the charging out of dock personnel.

TABLE 3.5 DOCK OPERATIONS PERSONNEL

Personnel	\$ per hour
Dock operator	\$180
Dock master	\$160
Chief engineer	\$160
Dock technician	\$110

SOURCE: AUSTRALIAN MARINE COMPLEX, WESTERN AUSTRALIA

3.7.2 Maintenance and Sustaining Capex

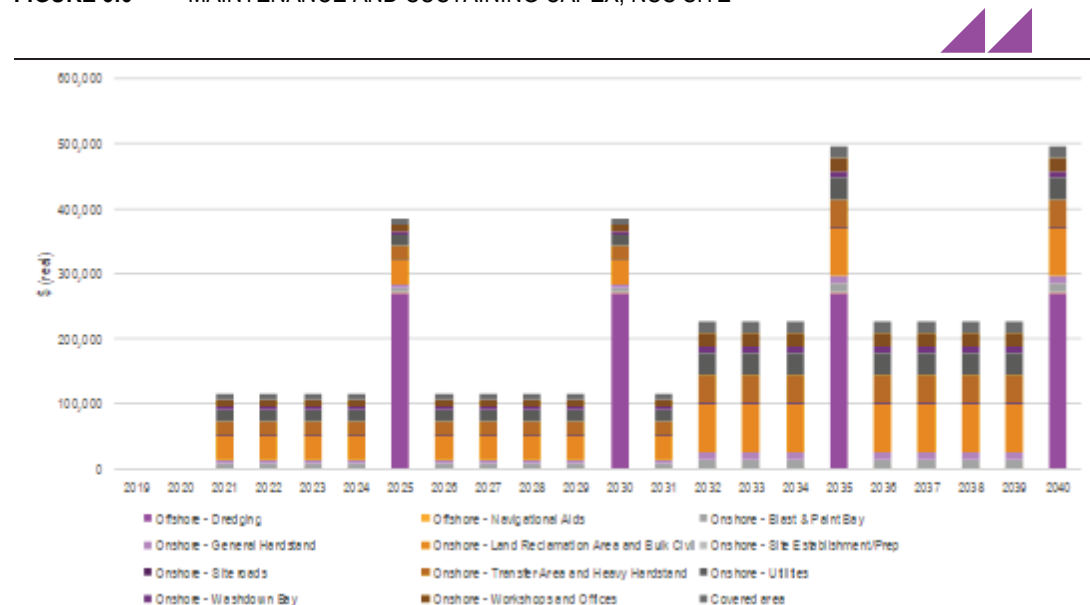
In order to calculate ongoing maintenance and sustaining capex over the 20-year operational horizon of the SLAMI facilities, ACIL Allen was advised to apply a set of multipliers on the up-front capital expenditure by Mott Macdonald. These multipliers were provided by Mott Macdonald and are shown in **Table 3.6**.

TABLE 3.6 MAINTENANCE AND SUSTAINING CAPEX MULTIPLIERS

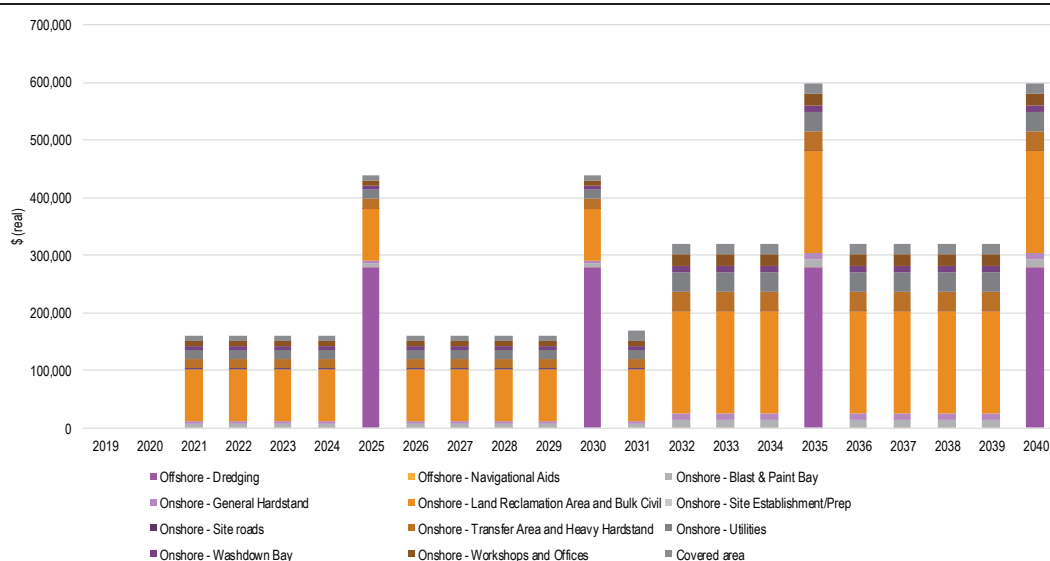
Asset Description	Minor CAPEX Multiplier (%) (0-10years)	Minor CAPEX Multiplier (%) (10-20years)	Minor CAPEX Interval (Years)
DREDGING	1.60%	1.60%	5
QUAYLINE STRUCTURES	0.25%	0.50%	1
BARGE RAMPS	0.25%	0.50%	1
SLIPWAYS	0.25%	0.50%	1
MARINAS	0.25%	0.50%	1
TERMINAL WORKS	0.25%	0.50%	1
ROADS	1.00%	1.00%	1
SERVICES	0.25%	0.50%	1
NAVIGATIONAL AIDS	0.25%	0.25%	1

SOURCE: MOTT MACDONALD

Figure 3.6 and **Figure 3.7** show the annual maintenance and sustaining capex expenditures for both the NSS and alternative sites respectively. Expenditures spike every 5 years as a result of required periodic dredging. Moreover, maintenance and sustaining capex expenditures increase after 2031 relative to the first decade of operations, because several of the multipliers double.

FIGURE 3.6 MAINTENANCE AND SUSTAINING CAPEX, NSS SITE

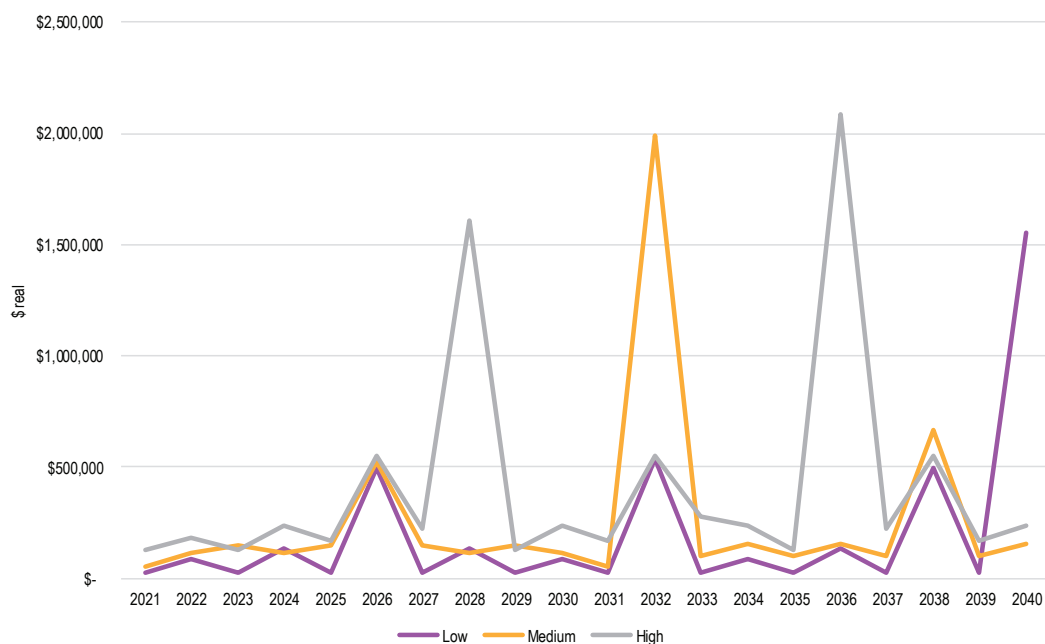
SOURCE: ACIL ALLEN ANALYSIS

FIGURE 3.7 MAINTENANCE AND SUSTAINING CAPEX, ALTERNATIVE SITE

SOURCE: ACIL ALLEN ANALYSIS

The multipliers were applied to all onshore and off-shore structures except for the SPMTs and the synchrolift. The previous figures also exclude SPMT and synchrolift maintenance costs.

A SPMT repairs and maintenance calculator was provided by Mott Macdonald in the form of a spreadsheet. Based on the expected hours of operations of the SPMT, the spreadsheet provided estimates of forecasts repairs and maintenance costs over a 20-year time horizon. Projected SPMT maintenance costs for the three scenarios are shown in **Figure 3.8**.

FIGURE 3.8 SPMT REPAIRS AND MAINTENANCE COSTS

SOURCE: ACIL ALLEN CALCULATIONS

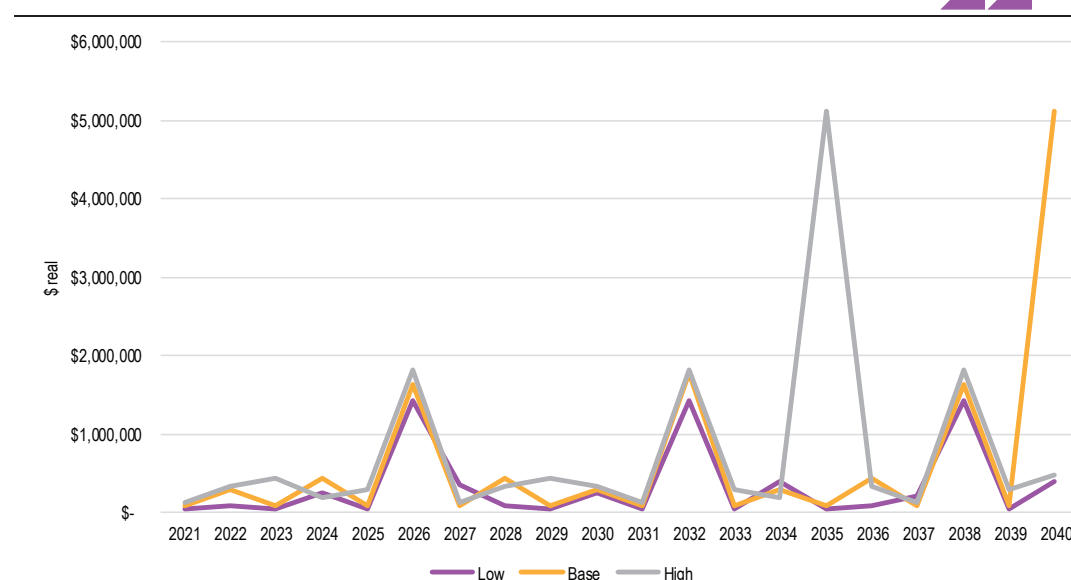
The forecast hours of operation under the three separate scenarios of the SPMT were calculated by assuming a travel speed of one kilometre per hour and a maximum travel distance of two kilometres.

Under the low scenario, the SPMTs are expected to operate for approximately 250 hours, increasing to 450 hours in the base scenario and 650 hours under the high scenario.

In order to calculate repairs and maintenance costs for the synchrolift, ACIL Allen was advised by Mott Macdonald to apply a set of multipliers based on the proportional share of maintenance costs to up-front capex for the SPMTs. The hours of operation of the synchrolift were calculated using an assumed speed of 13.8 metres per hour, with the required travel distance being 14.6 metres.

Figure 3.9 shows the projected maintenance and sustaining capex expenses for the synchrolift under the three separate demand scenarios.

FIGURE 3.9 SYNCHROLIFT MAINTENANCE AND SUSTAINING CAPEX COSTS



SOURCE: ACIL ALLEN CALCULATIONS

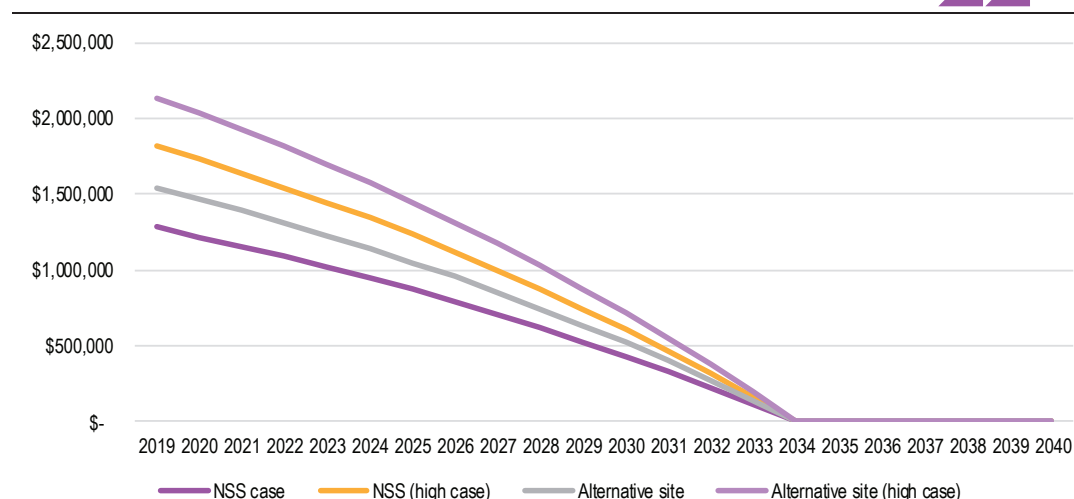
3.7.3 Interest Charges

The assumption of partial debt financing and debt-financing ratio independently of the scenario and site is artificial. In practice, lenders would use financial analysis to test if a project is “bankable” and how much debt it could support.

In this case, ACIL Allen has assumed partial debt funding and a debt-financing ratio in advance of the financial analysis for illustrative purposes. The assumption of debt in the financing mix does not suggest that the project would be “bankable” or could carry the assumed amount of debt.

The assumed debt-financing ratio of 30 per cent has been applied after deducting the Government grant from total capital expenditures and independently of the scenarios and sites. Financing requirements would differ by site, with the alternative site requiring additional debt funding to cover higher capital expenditure. Also, the high scenario would involve additional debt, because it requires a higher up-front capital cost to enable construction of a larger synchrolift and other accommodation of larger vessels.

ACIL Allen assumed a principal and interest loan with a fixed term of 15 years. The trajectories of interest payments for the two sites and the low/base and high scenarios (cases) are shown in **Figure 3.10**.

FIGURE 3.10 INTEREST EXPENSES FOR THE NSS AND ALTERNATIVE SITES

SOURCE: ACIL ALLEN

3.7.4 SPMT Fuel Costs and Electricity Charges

A relatively small component of total operating expenses is made up of SPMT fuel costs and electricity expenses.

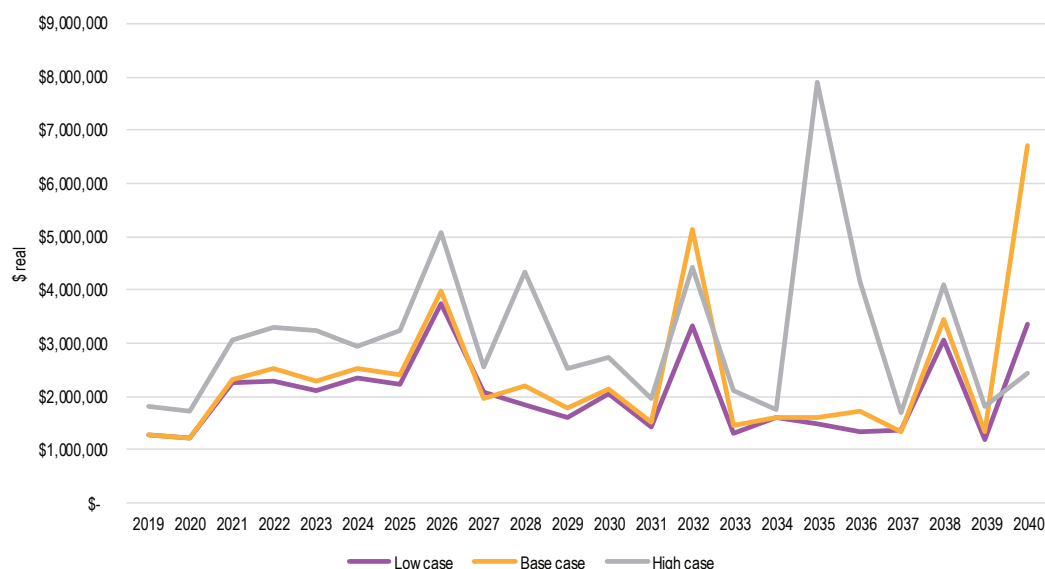
SPMT fuel consumption per power pack is calculated based on a minimum fuel consumption of 10 litres per hour and a maximum of 84 litres per hour. The number of power packs required for the SPMT is based on the assumption that each power pack has a capacity of 40 axles. The assumed diesel price is \$1.60 per litre.

In the case of electricity charges, the synchrolift is assumed to have a maximum continuous electrical load of 800 kVA. The power required is proportional to the weight of the vessel being lifted and the energy consumed is a function of the power and the time required to lift the vessel.

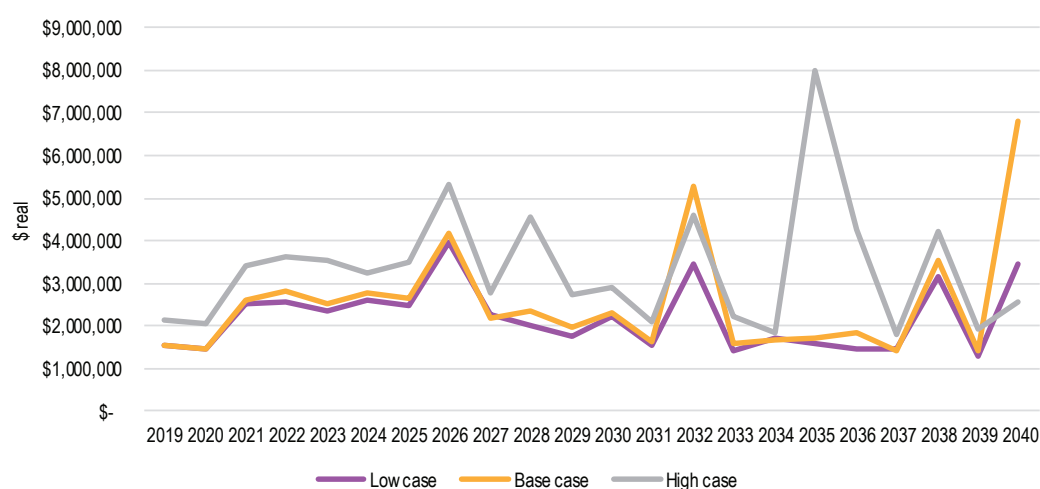
ACIL Allen assumed an electricity price of 30.2 cents per kWh for electricity required for the ship lift.

3.7.5 Total Operating Costs

Figure 3.11 and **Figure 3.12** respectively show the operating costs for each of the scenarios for both the NSS and alternative sites. Operating costs show significant variation over time, largely driven by the SPMT and synchrolift maintenance schedules.

FIGURE 3.11 TOTAL OPERATING COSTS, NSS SITE, LOW, BASE AND HIGH SCENARIOS

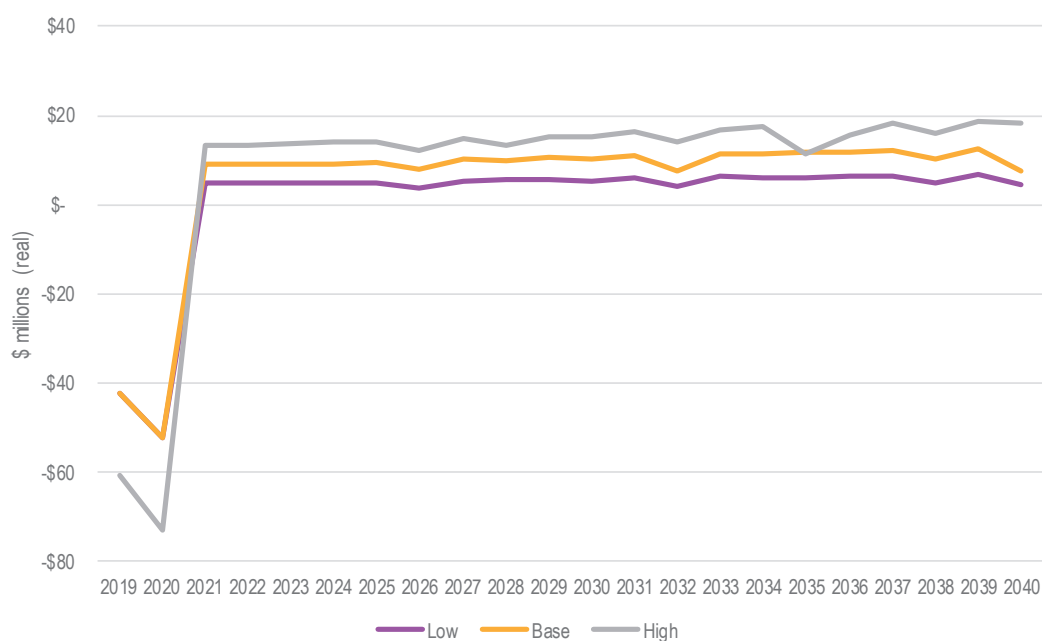
SOURCE: ACIL ALLEN

FIGURE 3.12 TOTAL OPERATING COSTS, ALTERNATIVE SITE, LOW, BASE AND HIGH SCENARIOS

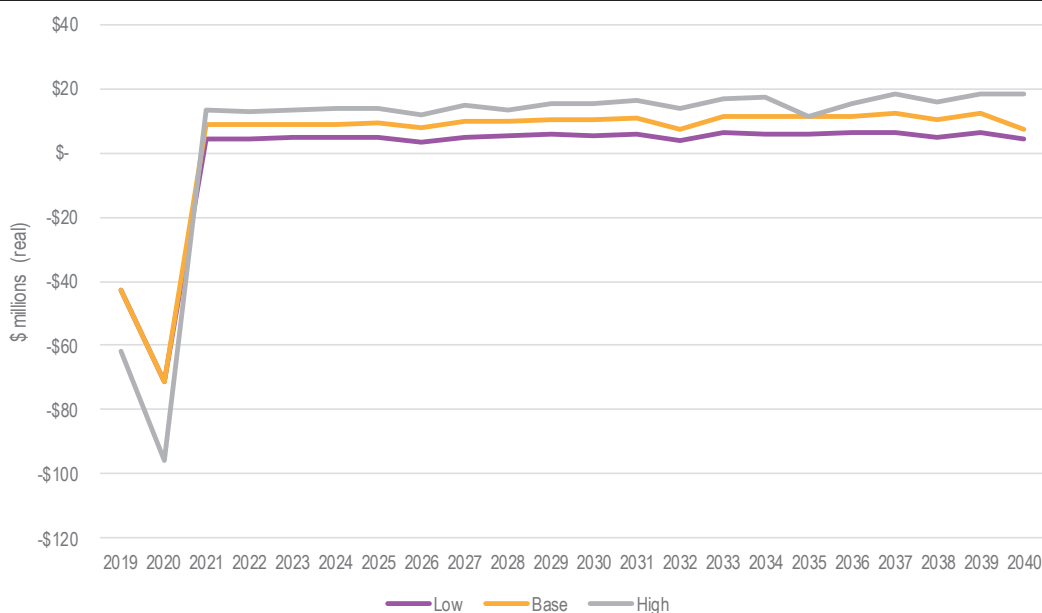
SOURCE: ACIL ALLEN

3.8 Net Cash Flows

Figure 3.13 and **Figure 3.14** present the net cash flows for the SLAMI facilities for both the NSS and alternative sites, respectively. The first two years are characterised by large capital outflows associated with the project's design and construction, followed by a stream of relatively stable positive operating cash flows over a 20-year time horizon. The capital costs in the cash flows include an allowance of 20 per cent for contingencies.

FIGURE 3.13 NET CASH FLOWS OF SLAMI FACILITY, NSS SITE, LOW, BASE AND HIGH SCENARIOS

SOURCE: ACIL ALLEN ANALYSIS

FIGURE 3.14 NET CASH FLOWS OF SLAMI FACILITY, ALTERNATIVE SITE, LOW, BASE AND HIGH SCENARIOS

SOURCE: ACIL ALLEN ANALYSIS

3.9 Net Present Value (NPV)

Based on the assumptions presented in the previous sections of this chapter, the NPVs of the separate scenarios and proposed sites are shown below.

For the NSS site, with a capital cost contingency of 20 per cent:

- under the base scenario, the project produces a positive NPV of \$12.9 million
- under the low scenario, the project produces a negative NPV of –\$33.6 million
- under the high case, the project produces a positive NPV of \$25.7 million.

For the alternative site, with a capital cost contingency of 20 per cent:

- under the base scenario, the project produces a small negative NPV of –\$6.4 million
- under the low scenario, the project produces a negative NPV of –\$52.9 million
- under the high scenario, the project produces a positive NPV of \$2.5 million.

The results show that based on the inputs and assumptions made as part of the financial analysis, the SLAMI facilities would be able to generate returns in excess of the required cost of capital for both the base case and high case for the NSS site. For the alternative site, returns in excess of the required cost of capital will be exceeded only in the high scenario. This is due to the alternative site requiring additional capital expenditures without any additional offsetting revenues. If a higher contingency allowance is applied to capital expenditures for the alternative site, on the grounds that less work has been done on refining estimates for that site than for the NSS site, the alternative site would be even less attractive than indicated by the NPV calculations above.

A key contributor to the positive NPVs obtained is the Northern Territory Government contribution of \$100 million to the SLAMI project, without which all scenarios would generate negative NPVs over the 22-year time horizon. In the absence of the grant, the net present value of the project is:

- base scenario, NSS site –\$87.5 million; alternative site –\$106.7 million
- low scenario, NSS site –\$133.9 million; alternative site –\$153.2 million
- high scenario, NSS site –\$74.6 million; alternative site –\$97.8 million.

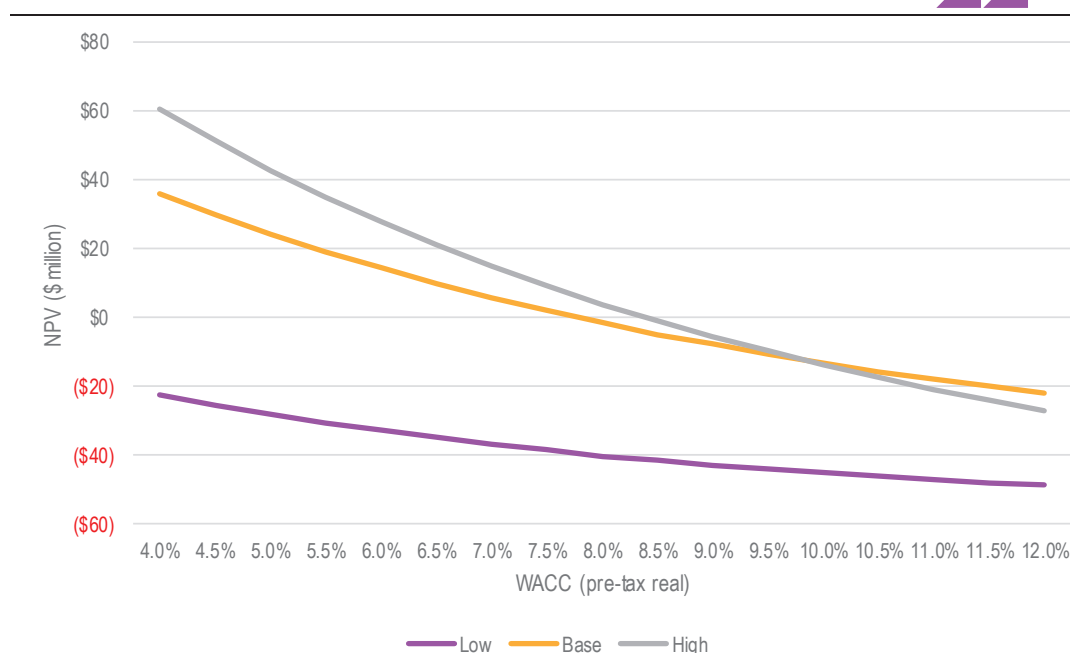
3.10 Sensitivity Analysis

This section presents results of a sensitivity analysis conducted for the size of the WACC and Government contribution to the project.

3.10.1 WACC

Figure 3.15 and **Figure 3.16** show the impact of changing the WACC on the project's NPV for the three separate scenarios, for the NSS and alternative sites respectively.

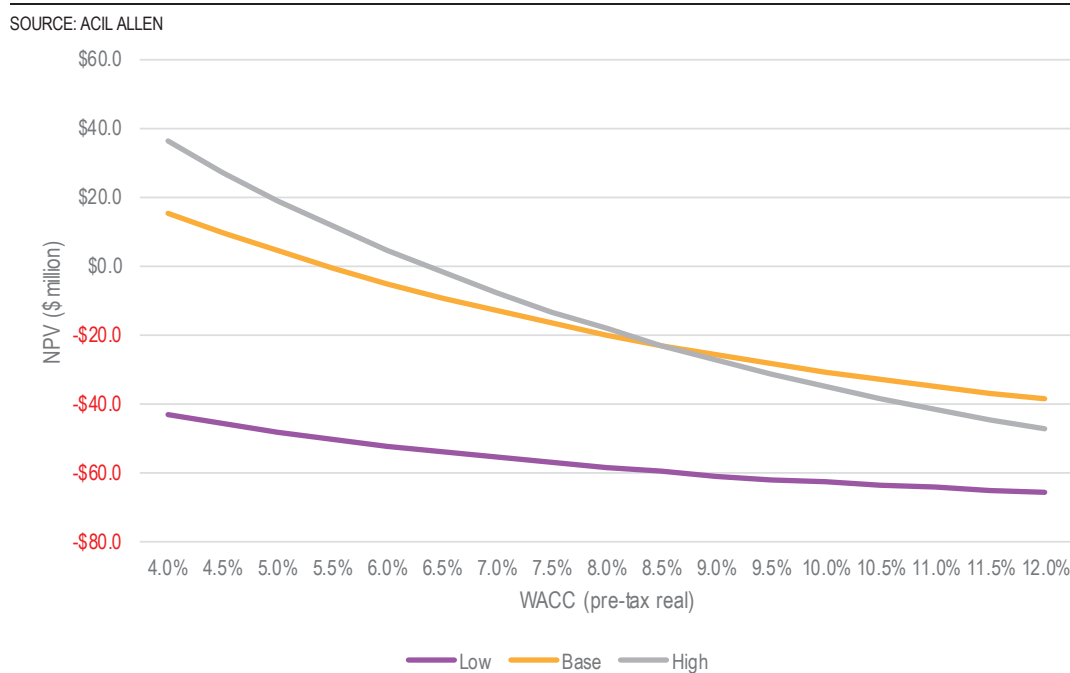
FIGURE 3.15 NPV SENSITIVITY TO CHANGING WACC ASSUMPTIONS, NSS SITE, LOW, BASE AND HIGH SCENARIOS



SOURCE: ACIL ALLEN

For the NSS site, the sensitivity analysis shows that the project's NPV will become negative once the real pre-tax WACC increases to about 8 per cent for the base scenario and 8.5 per cent in the high scenario. This is substantially higher than the analysis' assumed WACC of 6.15 per cent. In the low scenario, the project fails to produce a positive NPV across the entire WACC range.

FIGURE 3.16 NPV SENSITIVITY TO CHANGING WACC ASSUMPTIONS, ALTERNATIVE SITE, LOW, BASE AND HIGH SCENARIOS



SOURCE: ACIL ALLEN

In the case of the alternative site, the base scenario will generate a positive NPV once the WACC declines to about 5.5 per cent.

3.10.2 Government Contribution

A key element of the viability or otherwise of the SLAMI project is the size of the Government's contribution to the cost of the facility. **Figure 3.17** and **Figure 3.18** show how the project's NPV changes in response to different levels of Government assistance for the NSS and alternative sites, respectively.

The figures show that for the NSS site (capital cost including a contingency allowance of 20 per cent) to produce a positive NPV for the low scenario, the Government contribution would need to increase to at least \$135 million. It would not be financially attractive to a private sector investor at the original level of Government contribution of \$100 million, as the required cost of capital would not be achieved.

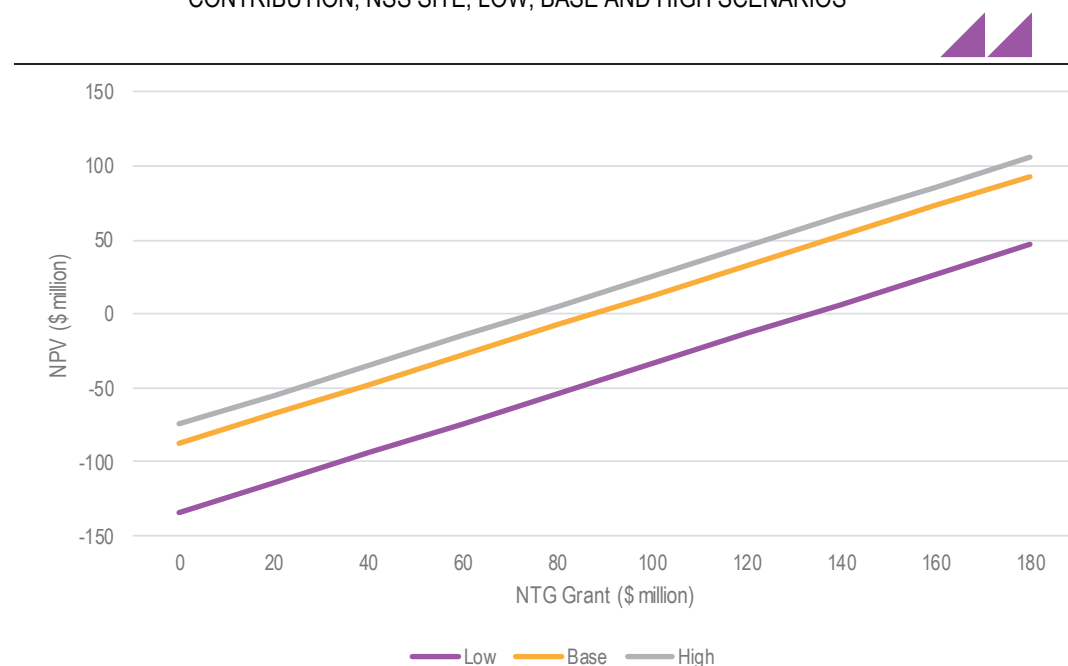
For the base scenario, the Government contribution could fall to around \$90 million and the project would still achieve the required cost of capital.

Under the high scenario, the Government contribution could fall to around \$75 million and the project would still achieve the required cost of capital.

For the alternative site (capital cost including a contingency allowance of 20 per cent), a small increase in the Government grant of approximately \$7 million could help tip the project over to a positive NPV in the base scenario. To achieve a positive NPV in the low scenario, a significant increase in the NTG contribution to at least \$150 million would be required. In the high scenario, a relatively small positive NPV could be achieved with the original government contribution of \$100 million.

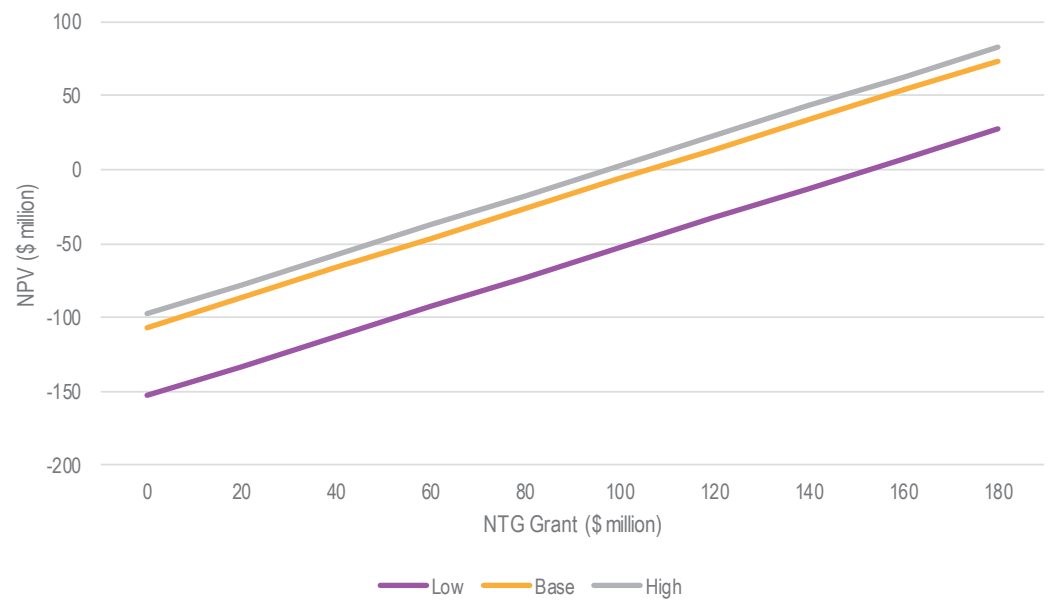
Of course, it is important to note that the threshold Government contributions nominated above do not allow for the high degree of risk/uncertainty regarding project revenues. A risk-averse investor would seek a higher Government contribution than the threshold to allow for considerable risk/uncertainty. The higher is the risk-aversion and the higher is the perceived risk/uncertainty, the greater the compensation an investor would want to obtain before agreeing to participate in a venture.

FIGURE 3.17 NPV SENSITIVITY TO CHANGING NORTHERN TERRITORY GOVERNMENT (NTG) CONTRIBUTION, NSS SITE, LOW, BASE AND HIGH SCENARIOS



SOURCE: ACIL ALLEN

FIGURE 3.18 NPV SENSITIVITY TO CHANGING NORTHERN TERRITORY GOVERNMENT (NTG) CONTRIBUTION, ALTERNATIVE SITE, LOW, BASE AND HIGH SCENARIOS



SOURCE: ACIL ALLEN



4.1 Introduction

This chapter has outlined the approach to, and results of a social benefit-cost analysis (SBCA) of the proposed SLAMI complex. It compares the economic costs and benefits of the proposed facilities. It has a much wider focus than costs and benefits to the owner of the facilities.

Investment in ship-lift infrastructure can affect the economy in various ways. First, it can create employment and generate income during the construction and operating phases of the facilities. Second, it may lower the full cost of accessing vessel repair and maintenance services. Third, the new infrastructure may act as a catalyst to the development of new and larger marine service industries.

Two siting and investment options were considered. One at the Northern Ship Support Pty Ltd (NSS) site and the other at an alternative site.

Consistent with the financial analysis presented in the previous chapter, the SBCA has considered three separate scenarios. They cover low, base and high vessel-demand outcomes.

The analysis presented in this chapter has considered who would potentially receive the benefits or incur the costs resulting from building, maintaining and using a new ship lift facility at Port of Darwin. It also has aggregated of benefits and costs.

Generally, the direct capital costs of the facilities and associated infrastructure and operational costs will be borne primarily by investors in, and operators of the ship lift facility. Northern Territory residents, through their Government, will bear \$100 million of capital costs.

The direct monetary benefits will accrue mostly to the commercial operator of the SLAMI facilities, operators of vessels that use it, other users of the facilities, and providers of goods and services to those entities. Benefits to vessel operators would take the form of lower costs compared to use of other facilities that involve substantial travel costs and loss of valuable operating time.

There would also be a range of indirect benefits and costs as a result of the new ship-lift facilities. Indirect impacts are considered in the next chapter using computable general equilibrium (CGE) economic modelling. For example, the additional output and employment generated by the SLAMI facilities would have an impact on Gross Territory Product (GTP). Similarly, governments would benefit from higher tax revenues generated by additional economic activity.

Chapter 5 has set out the approach to, and results of an economic impact assessment of the complex using ACIL Allen's computable general equilibrium (CGE) economic model. A comparison of this analytical technique and SBCA is discussed in the next section.

4.2 Comparison of SBCA and CGE Analysis

Both SBCA and CGE analysis are tools for investigating how an economic shock such as a new project or a policy change affects the efficiency of allocation/use of resources in the economy. The underlying economic concepts are consistent between the techniques. However, the techniques are not perfect substitutes. Together, they provide a wider range of economic insights than each does separately.

SBCA is used to assess the viability of projects and policy initiatives from an economic perspective. CGE modelling is used to estimate the broad economic impact of such economic shocks.

These techniques do not specify disaggregated distributional consequences of economic shocks. However, CGE analysis with regional, state and national modules can provide broad insights regarding inter-regional and interstate distributional consequences of economic shocks. The technique of SBCA is typically accompanied by a distributional statement to give decision makers an understanding of the distribution of benefits and costs.

In SBCA, comparative static analysis is applied. It is static in the sense that it does not capture all consequences of activity induced by the package of projects assessed. The CGE analysis discussed in the next sub-section is dynamic in the sense that it covers all induced activity. This is an advantage of CGE modelling over SBCA.

On the other hand, SBCA has two advantages over CGE analysis. First, SBCA presents benefits and costs in a disaggregated format. Second, the SBCA framework offers opportunities to target the capture of benefits and costs not priced in markets, as a result of market and policy failures.

CGE analysis is a useful complement to SBCA, because of the former's dynamic element, its provision of results that can be benchmarked against commonly-cited economic indicators, such as Gross Territory Product (GTP), income, and employment, and its capacity for providing distributional insights. Meanwhile, SBCA is a helpful complement to CGE analysis, because it provides greater disaggregation of benefits and costs, a framework for including benefits and costs delivered outside market mechanisms, and a means of assessing the viability of projects and policy initiatives from an economic or social perspective.

4.3 SBCA Methodology

SBCA is a framework for analysing the effects of an economic disturbance or shock on the efficiency of resource allocation in an economy (economic efficiency). An economic disturbance could include a policy change or initiative, a new project, or some other activity.

This framework considers gains and losses to all affected parties. These include social gains and losses that may not be apparent in financial analysis or a business case.

The anticipated future flows of costs and benefits of the economic disturbance are discounted to arrive at a 'present value' for each annual flow. By adding up the present values of the future flows of costs and benefits, a net present value (NPV) is calculated for the economic disturbance. The NPV is a dollar estimate of how much would be gained, or lost, by going ahead with an initiative. A positive NPV means the initiative has economic merit – it improves the efficiency of resource allocation/use in the relevant economy.

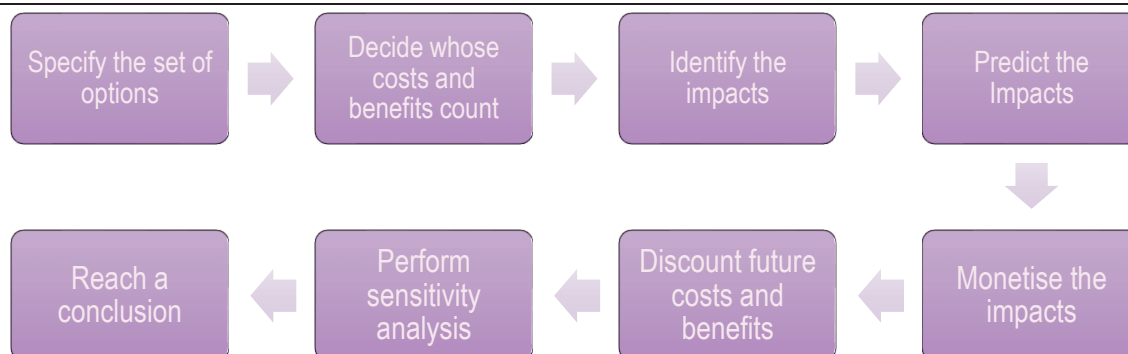
An excess of benefits over costs in a SBCA does not imply that everyone in the relevant economy has been made better off. It simply indicates that potentially everyone could be made better off. The government still would have to decide how much weight to place on the distributional consequences (who are the winners and losers) of an initiative or other economic disturbance. It would also have to decide on the extent to which losers should be compensated, and how this should be accomplished.

The financial analysis provided in chapter 3 estimated the proposed SLAMI net benefits to the owner of the facilities at two locations under three demand scenarios. In addition to potential financial outcomes for the owner, the SBCA considers net benefits to a wider range of entities. For example, the additional direct economic benefits to vessel operators that use the facilities in terms of lower fuel

and crew costs, and the environmental benefits associated with the lower transport distance of vessels are included in the SBCA.

The broad approach used for the SBCA is summarised in **Figure 4.1**. These steps are detailed in subsequent sections of this chapter.

FIGURE 4.1 KEY STEPS IN SBCA APPROACH



SOURCE: ACIL ALLEN CONSULTING BASED ON COMMONWEALTH OF AUSTRALIA (2016), COST-BENEFIT ANALYSIS GUIDANCE NOTE, P. 2.

4.4 Options

The market and financial analysis covered various options and scenarios. Drawing on these, two locations – NSS site and alternative site – with and without capital cost contingencies, and three demand scenarios – low, base and high – have been assessed in the SBCA.

4.5 Directly Affected Parties

The SLAMI facilities will potentially affect the following groups and individuals:

- owners and operators of SLAMI facilities
- the Northern Territory Government and its constituents
- vessel owners and operators
- repair-and-maintenance and other service providers to vessels
- entities contributing services to the construction and operation of the SLAMI facilities
- owners and other participants in competing facilities that lose business to the SLAMI facilities and to complementary service providers.

It has been assumed that parties in the last of these categories would be located outside of the Northern Territory. Some are based in other Australian sub-national jurisdictions, and others are based overseas in locations such as the Singapore-Batam marine hub and Port Moresby.

Darwin-based Pearl Marine Engineering won't lose business to the SLAMI facilities. Instead, it will use those facilities as a replacement for its old facilities at Frances Bay with the aim of enhancing its business. Smaller commercial providers of ship-lift and complementary services in Darwin are not expected to be adversely affected as they cater to relatively small vessels for which their facilities are better suited than the large synchrolift that is the centrepiece of the SLAMI complex. They may benefit from a SLAMI-induced improvement to the range of skills available in Darwin.

4.6 Identification of Relevant Effects and Measurement Indicators

Establishing the range of effects to be included in the assessment is a crucial step in the SBCA.

Only benefits and costs that would not have arisen in the absence of the SLAMI facilities are relevant to an economic assessment of the initiative. Benefits and costs that would have flowed in any event are not relevant. It is only additional economic costs and benefits resulting from the SLAMI facilities that should be included.

For example, it is not appropriate to include in the economic analysis the package of ship-lifting, land-transfer, wet-berth and dry-berth occupancy services, and in-water and out-of-water work on vessels that otherwise would be provided by Pearl Marine Engineering at its Frances Bay complex. The Paspaley Group plans to use the SLAMI facilities to lift and transfer vessels to a new Pearl Marine Engineering complex adjacent to the SLAMI site. While transfer of Pearl Marine Engineering business to the SLAMI facilities improves the financial performance of the SLAMI complex, it does not represent a net economic gain.

The proposed \$100 million Northern Territory Government tied grant to support the SLAMI complex is a cost to the Government's constituents who are required to forgo other things, and a benefit to the owners of the SLAMI facilities. However, from an economic perspective, the grant is a transfer from some Territorians to other Territorians.

The SBCA has included quantifiable benefits costs, including only on those that are additional or incremental, and excluding transfers. The excluded amounts are irrelevant for assessing if the SLAMI facilities yield an economic gain. However, they are relevant for assessing how benefits and costs are distributed.

Only the direct costs and benefits arising from the two locational options and three scenarios are considered in this chapter. High-level broader economic impacts at state and national levels are considered in chapter 5 on economic impacts. Potential socio-economic impacts at regional level, and implications for individuals and groups are not assessed separately.

Most of the relevant economic effects are monetised and included in the SBCA. Key inclusions are:

- incremental costs and benefits incurred by ship lift builders and owners as a result of reduced travel distances for repair-and-maintenance activities
- fuel and wage cost savings and time gains by vessel operators (benefits)
- additional services provided by other parties
- the environmental benefits associated with the avoided greenhouse gas emissions due to the reduced travel distance
- the opportunity cost of land used by the SLAMI complex
- the opportunity cost of labour/skills and other inputs to vessel repair-and-maintenance activities.

4.7 SLAMI Development and Operation

An indicative schedule for planning and construction of the SLAMI facility is provided in chapter 3. It will take around 1-3 years to complete the planning and construction of the SLAMI facility from initial consultation to the commencement of operations. SLAMI facilities include:

- a synchrolift
- vessel transfer system
- hardstand area
- covered work area
- wet berths
- supporting facilities
- a dredged channel
- navigational aids.

4.7.1 Capital Expenditure

Aggregate SLAMI capital expenditures by category are provided in **Table 3.2** in chapter 3. Two sites have been covered. Building the SLAMI facilities at the NSS site is estimated to cost \$160 million and with a 20 per cent contingency, the facilities would cost around \$191.9 million at current prices. To build the SLAMI facilities at an alternative site, the cost is estimated to be around \$175.9 million. With a 20 per cent contingency, the cost would be around \$211 million at current prices.

Ship-lift and vessel transfer costs (materials, synchrolift, SPMT, other equipment, and trestles) are 29 per cent of total capex at the NSS site and 27 per cent at the alternative site. The ship lift machinery itself would be imported from overseas, since there are no manufacturers in Australia currently able to make a ship lift with the required specifications.

Indirect costs are a large component of capex at about 38 per cent. They include contractors for design services, insurances, owners' costs and PMC services.

Estimated capital expenditure under three demand scenarios are summarised in **Table 4.1**.

TABLE 4.1 ESTIMATED SLAMI CAPITAL EXPENDITURE UNDER THREE SCENARIOS (\$ MILLION)

Site	Low scenario	Base scenario	High scenario
NSS	159.9	159.9	191.9
NSS (with contingency)	191.9	191.9	230.3
Alternative	175.9	175.9	211.0
Alternative (with contingency)	211.0	211.0	253.2

Note: An additional 20 per cent capital expenditure under the high scenario was assumed to allow for accommodation of larger vessels. This premium should be treated as indicative only. It needs to be verified by engineering work. All values are in current prices

SOURCE: MOTT MACDONALD FOR CAPITAL COSTS OTHER THAN COVERED AREA, WITHOUT CONTINGENCY; DTBI FOR CAPITAL COST OF THE COVERED AREA; CONTINGENCY ALLOWANCE OF 20 PER CENT APPLIED BY ACIL ALLEN.

4.7.2 Operating Expenditure

The SLAMI facilities are assumed to operate between 2021 and 2040. Total operating costs in that period would total around \$44.5 million in the low scenario, \$52.4 million in the base scenario, and \$68.8 million in the high scenario over a 20-year period at the NSS site. Operating costs are higher at the alternative site, mainly because of higher interest charges associated with higher capital costs.

The estimates have been based on those formulated for the financial analysis in chapter 3. The figures derived there have been adjusted down in the same way as SLAMI revenues have been lowered to avoid double counting activities that would have continued in Darwin in the absence of the SLAMI facilities. This is explained in section 2.13 of chapter 2.

Aggregates of the adjusted operating costs for both sites under three scenarios are shown in **Table 4.2**.

TABLE 4.2 ESTIMATED TOTAL UNDISCOUNTED SLAMI OPERATING EXPENDITURE, 2021 – 2040 UNDER THREE SCENARIOS (\$ MILLION)

Site	Low scenario	Base scenario	High scenario
NSS	44.5	52.4	68.8
Alternative	48.2	56.2	73.2

Note: Total operational expenditure includes interest payments. All values are in current prices.

SOURCE: ACIL ALLEN ANALYSIS

Total estimated capital and operational expenditure in current prices at the NSS site would be around \$212.4 million without contingency, and \$244.4 million with contingency in the base scenario (see **Table 4.3**). These estimates have not been discounted to allow for the economic implications of differences in timing of costs.

TABLE 4.3 ESTIMATED TOTAL SLAMI UNDISCOUNTED CAPITAL AND OPERATIONAL EXPENDITURE, 2019 – 2040 UNDER THREE SCENARIOS (\$ MILLION)

Site	Low scenario	Base scenario	High scenario
NSS	204.4	212.4	260.7
NSS (with contingency)	236.4	244.4	299.1
Alternative	224.1	232.0	284.3
Alternative (with contingency)	259.2	267.2	326.5

Note: An additional 20 per cent capital expenditure under high scenario is included to accommodate larger vessels. All values are in current prices

SOURCE: ACIL ALLEN ANALYSIS

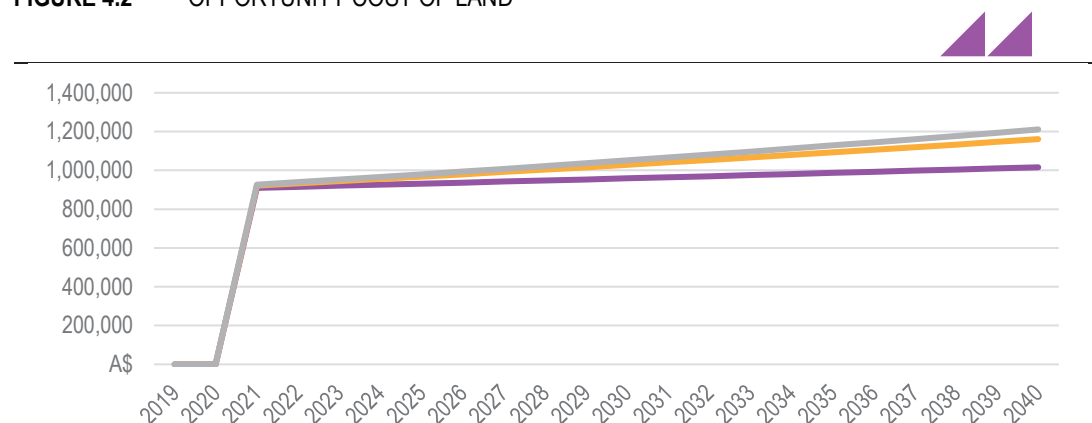
4.7.3 Opportunity Cost of Land

The land to be used by the SLAMI complex has an opportunity cost – its value in its best alternative use. This should be deducted when calculating the net economic benefits of the initiative.

Land Development Corporation owns adjacent land occupied by a common-user facility. Its charges for use of hardstand area range from \$20 to \$30 per square metre per year. As the SLAMI site is undeveloped, the bottom of the range charge has been assumed to be indicative of the opportunity cost of land at that site.

There is some uncertainty regarding the area of the site. Kellogg Brown and Root said the area of the SLAMI site above highest astronomical tide is approximately 4 hectares. SMEC referred to a site area of about 4.93 hectares. If the SLAMI site is assumed to occupy 4.5 hectares, its opportunity cost would be \$900,000 per year. It could be expected to grow with vessel numbers, because demand for the land in alternative uses could increase. This is depicted in **Figure 4.2**.

FIGURE 4.2 OPPORTUNITY COST OF LAND



SOURCE: ACIL ALLEN

4.7.4 SLAMI Revenue

The SLAMI complex would receive revenue from provision of services to different types of vessels as discussed in chapters 2 and 3. The estimated annual average gross revenue under three scenarios has been derived in those previous chapters. The annual revenue grows with the projected number of vessels serviced at the facility.

As explained in detail in section 2.13 of chapter 2, revenue estimated for the financial analysis has been adjusted down to allow for revenue that would have accrued to other facilities in Darwin in the absence of the SLAMI complex. Operating costs have been adjusted down in the same way to be consistent.

A summary of estimated total undiscounted gross revenue is provided in **Table 4.4**. The estimated revenue has been assumed to be the same for the two sites, because of unavailability of information that might indicate different revenue at the alternative site.

TABLE 4.4 ESTIMATED TOTAL REVENUE, 2021 – 2040 UNDER THREE SCENARIOS (\$ MILLION)

Site	Low scenario	Base scenario	High scenario
NSS or alternative site – total revenue	149.0	251.6	368.1
NSS or alternative site – additional revenue from economic perspective	44.7	163.5	283.4

Notes: 1. All values are in current prices. 2. As explained in section 2.14, only revenue that would not otherwise have been earned should be included in an economic assessment. Having regard to the historical number of lifts and their size distribution, and the indicative numbers and distributions of SLAMI lifts under the three scenarios, only the following proportions of revenues of the SLAMI complex were deemed to be additional for the purposes of the economic analysis: 0.3 in low scenario, 0.65 in base scenario, and 0.77 in high scenario.

SOURCE: ACIL ALLEN ANALYSIS

4.8 Benefits to Vessel Owners and Operators

Assuming there is no change in current pricing arrangements, the vessel operators in the region would benefit mainly through fuel and wage cost savings, and time savings that would free up vessels to provide valuable services. These additional benefits are included in the SBCA.

Fuel and wage cost savings are covered in the next sub-section. Time savings are discussed in a subsequent sub-section.

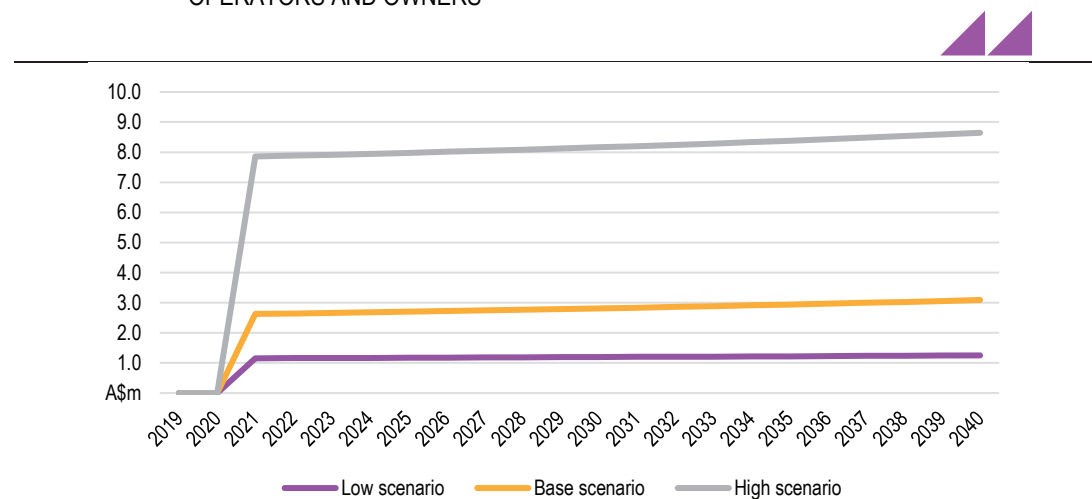
4.8.1 Fuel and Wage Cost Savings (Benefits) to Vessel Owners and Operators

It is assumed that 20 per cent of fuel and wage cost savings will accrue to Northern Territory-based vessel owners and operators, 60 per cent of savings will accrue to vessel owners and operators based elsewhere in Australia, and the remaining 20 per cent will be captured by overseas operators. This is consistent with the ownership of vessels assessed for this study.

Fuel and wage cost savings were estimated by reference to extra distances to likely alternative repair-and-maintenance facilities. These distances vary with vessels types, and the areas in which they operate.

Available information on fuel and wages costs for specific vessel types was used as a benchmark for estimating costs for other vessels having regard to variations in vessel displacements. The resulting estimates are depicted in **Figure 4.3**.

FIGURE 4.3 ESTIMATED TOTAL UNDISCOUNTED FUEL AND WAGE COST SAVINGS TO VESSEL OPERATORS AND OWNERS



SOURCE: ACIL ALLEN ANALYSIS

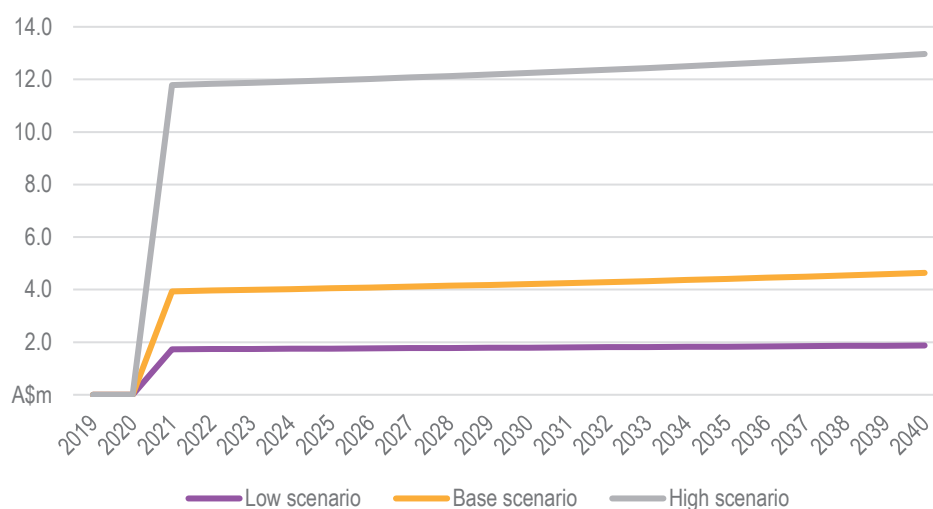
4.8.2 Time Savings

The time spent travelling to distant locations for repair-and-maintenance activities means forgoing provision of valuable services during that time. Such lost opportunities are economic costs known as opportunity costs.

The value of the time saved is the opportunity cost avoided by not having to spend unnecessary time travelling. The value of time saved is the value of additional services a vessel could provide in the time released for income-earning activities.

To represent the value of travel time saved by vessel operators, a value that is 50 per cent higher than fuel and wage cost savings (incremental vessel usage costs) has been assumed. The values of travel time savings, like fuel and wage costs saved, are linked the extra distances to alternative repair-and-maintenance facilities. These distances vary with vessels types and the areas in which they operate.

The estimated total undiscounted savings are summarised in **Figure 4.3**.

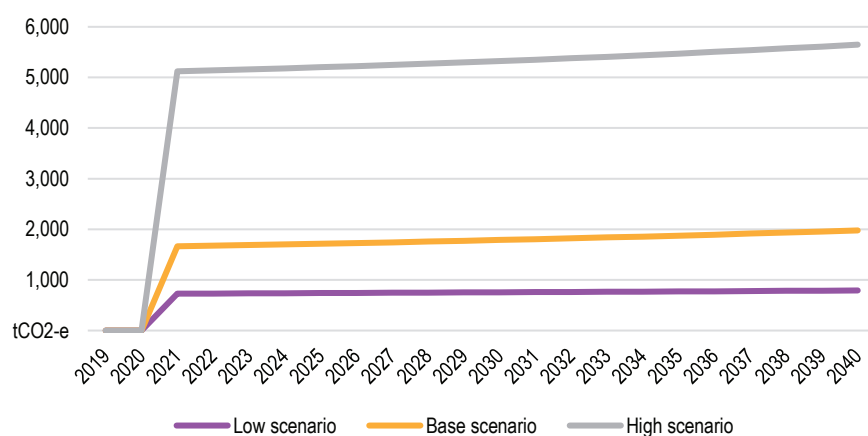
FIGURE 4.4 OPPORTUNITY COST OF TIME LOST

SOURCE: ACIL ALLEN ANALYSIS

4.9 Emissions Avoided (Benefit)

Reductions of fuel usage because of establishment of the proposed SLAMI facilities will also lead to lower greenhouse gas emissions. The estimated emissions avoided are shown in **Figure 4.5**.

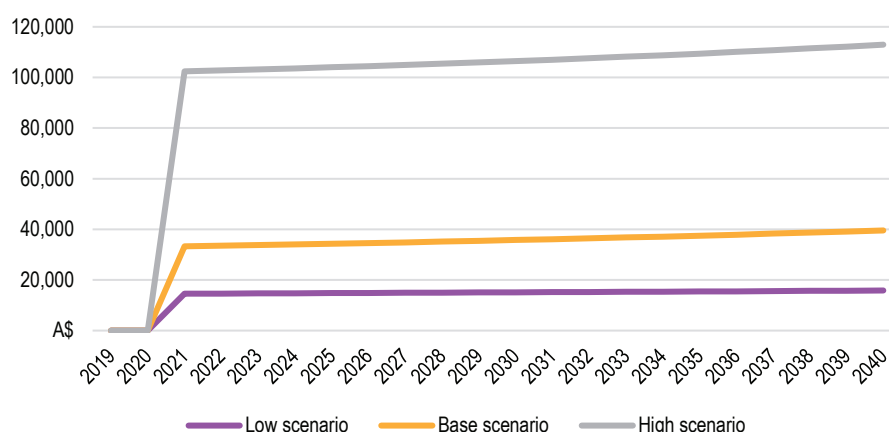
Lower emissions would have a climate change abatement effect. The benefits of the emissions reductions will apply globally, not solely to the Northern Territory or Australia. The reductions will contribute to meeting Australia's emissions reduction commitment to the international community.

FIGURE 4.5 EMISSIONS AVOIDED

SOURCE: ACIL ALLEN ANALYSIS

The average traded carbon price of \$A20/t CO₂-e under the European Union's scheme was used to estimate the benefits of emissions avoided. This price provides an indication of the incremental benefits of mitigating climate change through emissions reductions.

The resulting estimated benefits are shown in **Figure 4.6**.

FIGURE 4.6 VALUE OF EMISSIONS AVOIDED

SOURCE: ACIL ALLEN ANALYSIS

4.10 Benefits from Induced Vessel Service Activity

Provision of the SLAMI complex will induce out-of-water and in-water vessel repair-and-maintenance activity in addition to SLAMI services. In-water services could be expected to be provided in between dry dockings, as well as immediately before or after dry-docking. This inducement effect would result from the attraction of lower costs (including time) associated with travel, and the enhancement of service capabilities in response to commissioning of the SLAMI facilities.

Estimates of revenue from additional repair-and-maintenance activity have been formulated in section 2.13 of chapter 2 and incorporated in the SBCA. These estimates are gross benefits of extra activity.

To derive net benefits, the opportunity costs of inputs necessarily incurred to undertake the additional activity need to be deducted.

In the case of labour/skills, only a small proportion is likely to be drawn from the ranks of the unemployed. Those workers will have an opportunity cost of zero.

Some skilled people will be recruited or transferred from interstate or overseas locations. From a Northern Territory perspective, their opportunity cost is zero. From an Australian perspective, the opportunity cost of workers drawn from other locations in Australia is the wage/salary earned elsewhere, and in the case of overseas recruits, their opportunity cost to Australia is zero.

Other skilled people will already be employed in Darwin. They may be fully utilised or have some spare capacity. In some cases, the availability of additional vessel repair-and-maintenance work will enable their skill levels to be raised.

For the purposes of the analysis, the following labour/skills assumptions have been made.

- Two per cent of workers in the expanded vessel repair-and-maintenance sector would otherwise be unemployed.
- Other states/territories in Australia provide 25 per cent of the extra workers in the upscaled vessel repair-and-maintenance sector in Darwin.
- Eight per cent are drawn from overseas.
- Skills of 30 per cent of additional workers in the sector in Darwin that are already employed in Darwin (65 per cent) will have their skill levels and/or utilisation raised by an average of 20 per cent in the vessel-repair-and maintenance sector.
- Labour/skills account for 70 per cent of costs of vessel repair-and-maintenance activities.

The effect of these assumptions is that the opportunity cost of labour/skills to the Northern Territory is 43 per cent of additional vessel repair-and-maintenance expenditures in Darwin. For Australia as a

whole (including the Northern Territory), the opportunity cost of labour/skills is 60 per cent of those expenditures, and globally it is 66 per cent.

The contribution of inputs, other than labour/skills and capital, has been assumed to be 20 per cent of additional vessel repair-and-maintenance revenue. The opportunity cost component is likely to be less than 20 per cent of revenue, because of use of some otherwise underutilised local resources being used in provision of inputs. To allow for this, the opportunity cost of these inputs is assumed to be 15 per cent of additional revenue.

The opportunity cost of capital is implicitly recognised by discounting of benefits and costs.

4.11 Undiscounted Benefits and Costs

The estimated undiscounted costs and benefits for various affected parties are summarised in this section. They are shown in **Table 4.5** for the NSS site with a 20 per cent contingency allowance for capital.

Total undiscounted net benefits by affected party vary according to scenarios. For example, vessel operators would benefit between \$60 million (low) and \$410.3 million (high scenario), and service providers other than the SLAMI complex would benefit between \$231.9 million (low scenario) and \$2,121.3 million (high scenario) over the period to 2040.

Total estimated undiscounted net benefits will be between \$131.6 million (low scenario) and 2,533.9 million (high scenario).

TABLE 4.5 TOTAL UNDISCOUNTED COSTS AND BENEFITS (2019–2040), NSS SITE

Undiscounted	Costs			Benefits			Net benefits		
	\$A million			\$A million			\$A million		
	Low	Base	High	Low	Base	High	Low	Base	High
SLAMI developers and operators	(105.3)	(126.0)	(183.3)	44.7	163.5	283.4	(60.6)	37.5	100.1
Vessel owners and operators				60.0	141.8	410.3	60.0	141.8	410.3
Emissions avoided				0.3	0.7	2.1	0.3	0.7	2.1
Other service providers	(19.2)	(20.7)	(21.3)	251.2	1,080.5	2,142.6	231.9	1,059.7	2,121.3
NT Government	(100.0)	(100.0)	(100.0)				(100.0)	(100.0)	(100.0)
TOTAL	(224.5)	(246.8)	(304.5)	356.2	1,386.5	2,838.4	131.6	1,139.7	2,533.9

SOURCE: ACIL ALLEN ESTIMATES BASED ON MARKET, FINANCIAL AND ECONOMIC ANALYSIS

The estimated undiscounted impacts do not provide enough information to ascertain whether the proposed SLAMI project is beneficial. Undiscounted flows do not consider the time-value of monetised benefits and costs. It is important to do so.

4.12 Discounted Future Costs and Benefits

4.12.1 Importance of Discounting

To compare the future costs with the future benefits, the future flows need to be discounted and brought into present value terms. Discounting appropriately makes monetary values in different periods comparable and amenable to meaningful aggregation.

The need to discount future cash flows can be viewed from two perspectives. Both focus on the opportunity cost of the flows implied by an initiative, but they measure opportunity cost in different terms.

The first perspective is the general observation that individuals prefer money or consumption today to money or consumption in the future. This general preference for current consumption is reflected by

the 'rate of time preference' and relates to all economic benefits (and costs), not just those that are financial in nature. Since individuals are not indifferent between cash flows from different periods, those flows cannot be directly compared. For monetised flows to be directly comparable in a SBCA, costs or benefits incurred in the future need to be discounted back to current dollar terms by reference to the 'rate of time preference'.

The second perspective is that an investment such as that proposed in the SLAMI complex has an opportunity cost in the form of returns foregone in an alternative use. The explicit or implicit rate of return foregone in the best alternative use of the funds is the opportunity cost rate for discounting flows of benefits and costs from the investment under consideration.

The SLAMI complex would therefore only be beneficial from a social perspective if it provides a return in excess of the cost to society of deferring consumption, or in excess of the return that could have been earned on the best alternative use of the funds. By applying a discount rate to future cash flows, the required rate of return is explicitly taken into account in the net present value calculation.

Either approach demonstrates that the need to discount future cash flows can be viewed in terms of the opportunity cost of the cash flows, whether this is the cost of delaying consumption or the alternative investment opportunities forgone. Since most of the costs and benefits of SLAMI are spread out over time, and their value depends on when and by whom they are received, discounting is crucial to the analysis.

The two approaches could be reconciled by converting all benefit and cost flows into consumption equivalents using shadow prices for investments, and then discounting using a social time preference rate. Alternatively, benefit and cost flows could be converted into investment equivalents using shadow prices for consumption, and then discounting using a social opportunity cost rate. A compromise approach is to use a rate that is a weighted average of the social time preference and social opportunity cost rates. The weight would have to be determined by reference to the composition of the flows of benefits and costs.

A further complexity in selecting discount rates is introduced by risk and uncertainty. Kenneth Arrow and Robert Lind¹⁵ explained that it may be inappropriate to use a single discount rate for all benefits and costs. They argued that different discount rates should be used depending on the nature of the benefits and costs, including risk and uncertainty, and depending on who is affected. For example, if all costs and benefits are spread across the whole community it could be appropriate to use a risk-free rate. However, if sizeable benefits and costs accrue directly to particular people or groups, they also bear the cost of bearing risk and uncertainty, which may be significant. Then, the discount rate should be consistent with the preferences and attitudes of the relevant people. Therefore, different streams of benefits and costs should be discounted differently, according to whether they accrue publicly or privately. The real options literature has also made a strong case for use of multiple discount rates for different streams of costs and benefits, with different risk and uncertainty attributes.

Application of the insights of Arrow and Lind to an assessment of the proposed SLAMI would suggest using a risk-free discount rate for public benefits, such as those arising from inducement of additional opportunities for providers of goods and services in Darwin, emissions reductions, and defence efficiencies. On the other hand, those insights suggest application of a risk-inclusive discount rate for discounting concentrated private benefits, such as those accruing to the SLAMI complex owner and vessel operators.

Typically, SBCA work undertaken by and for governments in Australia has ignored the issues relating to discounting outlined above, because of the complexity involved in matching the discount rate with flows of benefits and costs. Typically, government guidelines for assessment of project and policy initiatives require the calculation of net present values at an annual real discount rate of 7 per cent applied to all benefits and costs. However, they recognise that, as with any uncertain variable, sensitivity analysis should be conducted. So, in addition to the central discount rate, government guidelines require net present to be calculated with lower and higher real discount rates, such as 3 or 4 per cent and 10 or 11 per cent.

¹⁵ K. J. Arrow and R. C. Lind, "Uncertainty and the Evaluation of Public Investment Decisions," *American Economic Review*, 60, June 1970, pp., 364-78

Typically, governments in Australia nominated these rates more than a decade ago when interest rates were significantly higher than they are now. The low rate in the government-nominated range is too high to be reasonably regarded as a social time preference rate or a risk-free rate. The high rate in the range is too high to be considered a reasonable representation of a social opportunity cost rate. The real WACC calculated in the financial analysis chapter was 6.15 per cent per annum. It is an estimate of a social opportunity cost rate and is risk-inclusive.

In this SBCA, real discount rates of 2.5 per cent, 4 per cent, 7 per cent, and 10 per cent have been applied. The lowest rate could be regarded as a proxy for a social time preference rate. The rate of 7 per cent, which is the middle rate nominated by governments, could be regarded as a proxy for the social opportunity cost rate. Use of a real discount rate of 4 per cent could be regarded as a crude proxy for the compromise economic approach to discount rate selection outlined above, as that rate lies between a social-time-preference rate and a social-opportunity-cost rate, and between a risk-free rate and a risk-inclusive rate.

4.12.2 NPV and IRR

The net present value (NPV) of the SLAMI initiative expresses the difference between the discounted present value of future benefits and discounted present value of future costs. A positive NPV indicates that project benefits are greater than costs. Since the SLAMI capital costs occur at the start of the project and most of the expected benefits accrue later, it is reasonable to expect that the difference between discounted benefits and costs will be smaller than the difference between the undiscounted flows. In general, the higher the discount rate, the lower the present value of future benefits, because the value of the future stream of benefits is reduced relative to the up-front costs.

The internal rate of return (IRR) is based on the same principles as the NPV. The IRR can be viewed as the rate of return on investment in the SLAMI facilities. When the IRR equates to the discount rate, the NPV is zero. A positive NPV indicates that the IRR is higher than the discount rate.

4.12.3 Discounted Net Benefits

Aggregate discounted economic effects in the case of the NSS site without a contingency allowance are summarised and compared with undiscounted total effects in **Table 4.6**. Real discount rates of 2.5 per cent, 4 per cent, 7 per cent and 10 per cent have been used to calculate NPVs under low, base and high scenarios. Undiscounted total net benefits for the NSS site with a contingency allowance range between \$131.6 million (low scenario) and \$2,533.9 million (high scenario) over a 22-year period. Using a real discount rate of 4 per cent per year, the NPV ranges from \$21 million (low scenario) to \$1,499 million (high scenario). If a real discount rate of 7 per cent per year is applied, the NPV ranges from negative \$25.4 million (low scenario) to positive \$1,045 million (high scenario).

TABLE 4.6 TOTAL ESTIMATED NET BENEFITS, NSS SITE WITH CONTINGENCY

	Undiscounted	Discounted			
	\$A million	\$A million			
		NPV 2.5%	NPV 4%	NPV 7%	NPV 10%
Low scenario	131.6	54.1	21.0	(25.4)	(54.4)
Base scenario	1,139.7	795.6	645.8	430.4	289.2
High scenario	2,533.9	1,813.2	1,498.7	1,045.0	746.0

SOURCE: ACIL ALLEN ESTIMATES

Around 78 per cent and 76 per cent of net benefits accrue to the Northern Territory in the base scenario with real discount rates of 4 per cent and 7 per cent, respectively. The results for three scenarios and four discount rates for the NSS site with a contingency allowance are shown in **Table 4.7**.

TABLE 4.7 TOTAL ESTIMATED NET BENEFITS TO NORTHERN TERRITORY, NSS SITE WITH CONTINGENCY

	Undiscounted	Discounted			
	\$A million	\$A million			
		NPV 2.5%	NPV 4%	NPV 7%	NPV 10%
Low scenario	56.0	(1.8)	(26.3)	(60.1)	(80.6)
Base scenario	908.1	625.0	501.9	325.2	209.8
High scenario	1,970.5	1,397.6	1,147.8	788.1	551.7

SOURCE: ACIL ALLEN ESTIMATES

About 11.6 per cent and 12.8 per cent of net benefits accrue to the rest of Australia, excluding the Northern Territory, in the base scenario with real discount rates of 4 per cent and 7 per cent, respectively. The figures for low, base and high scenarios with three different real discount rates are set out in **Table 4.8**.

TABLE 4.8 TOTAL ESTIMATED NET BENEFITS TO REST OF AUSTRALIA, NSS SITE WITH CONTINGENCY

	Undiscounted	Discounted			
	\$A million	\$A million			
		NPV 2.5%	NPV 4%	NPV 7%	NPV 10%
Low scenario	44.3	32.8	27.7	20.3	15.4
Base scenario	120.9	89.1	75.1	54.9	41.5
High scenario	317.3	234.3	197.8	144.9	109.7

SOURCE: ACIL ALLEN ESTIMATES

About 10.6 per cent and 11.6 per cent of net benefits accrue to the rest of the world in the base scenario with real discount rates of 4 and 7 per cent, respectively. The figures under the three scenarios with different discount rates are presented in **Table 4.9**.

TABLE 4.9 TOTAL ESTIMATED NET BENEFITS TO REST OF WORLD, NSS SITE WITH CONTINGENCY

	Undiscounted	Discounted			
	\$A million	\$A million			
		NPV 2.5%	NPV 4%	NPV 7%	NPV 10%
Low scenario	31.3	23.1	19.5	14.3	10.9
Base scenario	110.1	81.1	68.4	50.0	37.7
High scenario	246.1	181.4	153.1	111.9	84.6

SOURCE: ACIL ALLEN ESTIMATES

4.13 Conclusion

The social benefit-cost analysis undertaken to assess the proposed SLAMI complex has indicated a net benefit to the Northern Territory in the base and high scenarios. For the NSS site with a contingency allowance for capital expenditure, the estimated total discounted net benefits over a 22-year period range between minus \$26.3 million and plus \$1,147.8 million, if a real discount rate of 4 per cent is applied, and between minus \$60.1 million and plus \$788.1 million if a real discount rate of 7 per cent per year is used. The base scenario NPVs from a Northern Territory perspective, at real discount rates of 4 per cent and 7 per cent, were estimated to be \$501.9 million and \$325.2 million, respectively.

On an annualised basis, the estimated net benefits to the Northern Territory under the base scenario for the NSS site with a contingency allowance would range between \$1.2 million and \$52.2 million using a real 4 per cent discount rate, and between \$2.7 million and \$35.8 million per year with a 7 per cent real discount rate.

The wide range of possible outcomes indicated by the three scenarios reflects the considerable uncertainty inherent in the market for the services of the SLAMI facilities. There is also significant uncertainty regarding costs. The estimated outcomes depend critically on the assumptions underpinning the scenarios.



This chapter provides an overview of the approach used to model the broader economic impact of the SLAMI facilities using CGE modelling and presents the projected impacts. Further detail regarding the model is provided in Appendix A.

5.1 Introduction

To provide information on the broader economic impacts on the Northern Territory potentially arising from the construction and operation of the SLAMI complex, ACIL Allen has undertaken computable general equilibrium (CGE) modelling. For this analysis, ACIL Allen used its own CGE model, *Tasman Global*. It is a multi-sector dynamic model of the Australian and world economy that has been used for many similar modelling projects including development of the Darwin Marine Supply Base, the Darwin Business Park, and market and economic due diligence in relation to leasing of the Port of Darwin. An overview of the model is provided in Appendix A.

The estimated capital and operating expenses underlying the SLAMI complex along with the projected supporting marine services sector, travel savings and ownership assumptions used to inform the financial model and benefit-cost analysis were also used to inform the *Tasman Global* Reference Case and policy scenarios. The differences between the economic projections with and without the SLAMI facilities provide a forecast of its total economic impacts. These include the wider economic impacts associated with the construction and ongoing operation of the facilities and supporting services, as well as the impact of changes in the travel costs for vessel operators, as relevant.

CGE models produce a wide variety of economic metrics. The metrics reported in this case are as follows.

- **Real economic output** (as measured by real Gross Regional Product (GRP) and real Gross State Product (GSP) or Gross Territory Product (GTP), the sub-national versions of gross domestic product or GDP) is defined as the sum of value added by all producers who are within the region/state, plus any product taxes (minus subsidies) not included in output. A positive deviation (i.e. increase) of real economic output from the Reference Case implies that the proposed investment will enable the economy to produce more real goods and services potentially available for consumption.
- **Real income** change in CGE models, such as *Tasman Global*, is a measure of the change in economic welfare of the residents of the region, state or country. The change in real income is equal to the change in real economic output plus the change in net foreign income transfers plus the change in terms of trade. In contrast to measures such as real economic output, real income accounts for any impacts of foreign ownership and debt repayments, as well as changes in the purchasing power of residents as a result of a project or policy.
- **Employment and real wages** impacts of the construction and operations of a major project are produced by *Tasman Global*.

5.2 Assessment Methodology

The macroeconomic impacts of a policy, project or other activity can be estimated using a variety of economic analysis tools. The most common methods utilised are input-output (I-O) multiplier analysis and computable general equilibrium (CGE) modelling. The selection of the right tool is critical to the accuracy of the estimated impacts and depends upon the characteristics of the project/industry. Sometimes multiple tools are required.

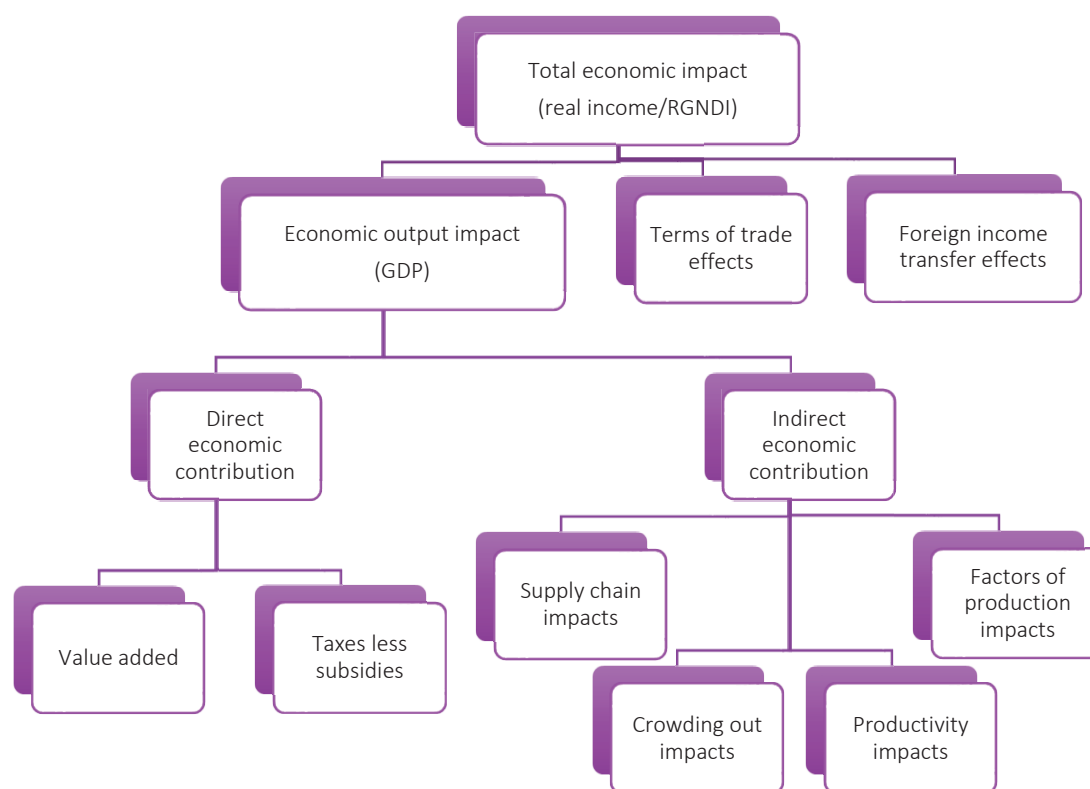
By their nature, input-output multipliers and CGE models focus on 'market impacts' across the economy (that is, impacts on activities with observed market prices). Analysis of various 'non-market impacts', such as property-right infringements, potential loss of biodiversity, changes in air quality, social justice implications and so forth may also be relevant in assessing the full implications of a project or policy.

Fundamentally, although various aspects of a policy or project — such as the number of jobs or the size of the investment expenditure — are of relevance to certain stakeholders, the key aggregate measure of the macroeconomic impact of a project is the extent to which the total income of the economy changes as a result of the policy or project. Typically, this is measured by real gross national disposable income (RGNDI), although real GDP and consumer surplus (among others) can also be important aggregate measures depending on the nature of the policy or project being analysed.

The main factors that need to be considered when analysing the macroeconomic impacts of a project or policy include:

- the direct and indirect contribution to the economy as a result of the activities associated with the project
- any crowding-out implications as resources are potentially diverted from other productive activities to undertake the project being analysed
- any productivity effects generated as a direct result of the policy or project activities – particularly any enduring productivity changes or productivity impacts on other activities not directly associated with the project or policy
- any changes to the factors of production in the economy
- any implications associated with changes in terms of trade or foreign income transfers
- whether there is a dynamic element to the size of any of the above effects (due to different phases of the project for example).

Figure 5.1 shows these components graphically. Some of these effects may be negligible, while others may be very significant, and an understanding of the effects helps determine the most appropriate tool(s) for the analysis.

FIGURE 5.1 ESTIMATING THE MACROECONOMIC IMPACT OF A PROJECT OR POLICY

SOURCE: ACIL ALLEN CONSULTING

For many projects, static estimates of the direct economic contribution and supply chain implications can be obtained by using I-O multipliers. Estimating the size of other components using multiplier techniques is either not possible or very complex, as is estimating the economic impacts through time. In contrast, most CGE models can estimate all of the components shown in Figure 5.1, and dynamic CGE models are able to estimate the impacts through time.

A project of this size will have productivity effects, the potential for some crowding out effects, and terms of trade effects. Consequently, CGE modelling has been used for this economic impact assessment.

For this analysis, ACIL Allen's CGE model, *Tasman Global*, was used to estimate the impacts of the construction activities and ongoing operations of the new facility.

5.3 The *Tasman Global* CGE Model

Tasman Global is a large scale, dynamic CGE model of the world economy that has been developed in-house by ACIL Allen. *Tasman Global* is a powerful tool for undertaking economic analysis at the regional, state, national and global levels.

CGE models mimic the workings of the economy through a system of interdependent behavioural and accounting equations which are linked to an input-output database. These models provide a representation of the whole economy, set in a national and international trading context, starting with individual markets, producers and consumers, and building up the system via demands and production from each component. When an economic shock or disturbance is applied to the model, each of the markets adjusts according to a set of behavioural parameters which are underpinned by economic theory. The generalised nature of CGE models enables a much broader range of analysis to be undertaken (generally in a more robust manner) compared to I-O multiplier techniques, which are also often applied in economic impact assessments.

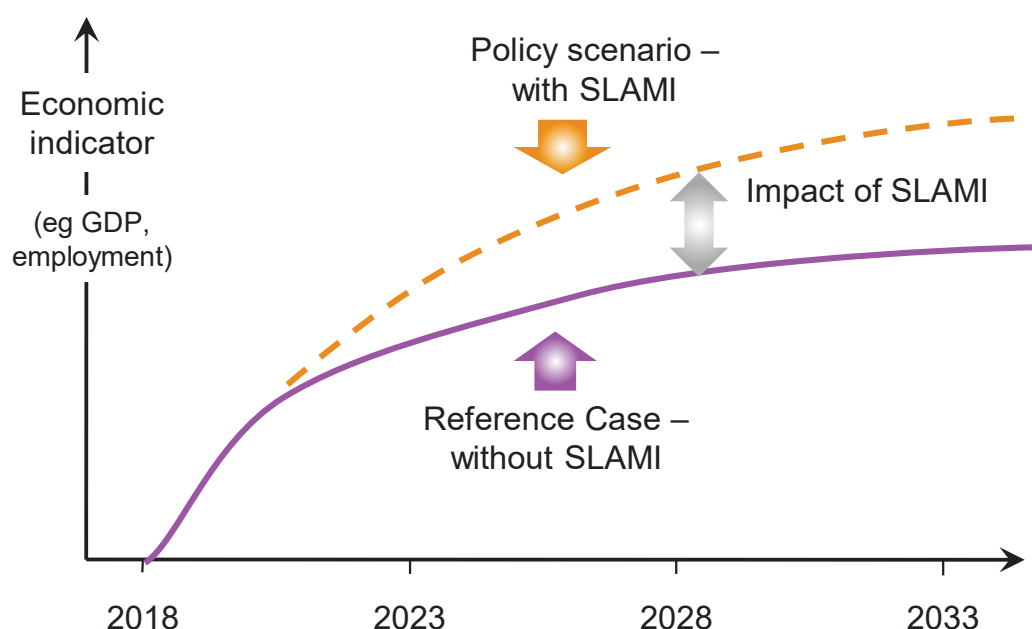
More detail on the *Tasman Global* model is provided in Appendix A of this report.

5.3.1 A Dynamic Model

Tasman Global is a model that estimates relationships between variables at different points in time. This is different from comparative static models, which compare two equilibriums (one before a policy change and one following). A dynamic model such as *Tasman Global* is useful when analysing issues where both the timing of economic impacts and the adjustment path that economies follow are relevant in the analysis.

In applications of the *Tasman Global* model, a Reference Case simulation forms a 'business-as-usual' basis with which to compare the results of various simulations. The Reference Case provides projections of growth in the absence of the project (such as GDP, population, labour supply, industry output, etc.). It also provides projections of endogenous variables such as productivity changes and consumer tastes. The Policy Case assumes all productivity improvements, tax rates and consumer preferences change as per the Reference Case projections, but also includes the proposed project. The two cases give two projections of the economy and the net impact of the project is then calculated as deviations from the Reference Case (see Figure 5.2).

FIGURE 5.2 ILLUSTRATIVE SCENARIO ANALYSIS USING TASMAN GLOBAL



Note: Indicative only. In reality, the projected impacts of a project or policy can be positive, negative, neutral or mixed.

SOURCE: ACIL ALLEN CONSULTING

5.3.2 Database Aggregation

The database which underpins the model contains a wealth of sectoral detail. The foundation of this information is the set of input-output tables that underpin the database. Industries in the model can be aggregated or disaggregated as required for a specific project. For this project, the industries have been aggregated to 48 industries/commodities as presented in Table 5.1. The aggregation was chosen to provide the detail relevant for this analysis.

Tasman Global contains a detailed representation of many relevant sectors.

TABLE 5.1 INDUSTRY/COMMODITY AGGREGATION USED FOR TASMAN GLOBAL MODELLING

Industry/commodity		Industry/commodity	
1	Vegetables, fruit and nuts	25	Wood and paper products; publishing and printing (excluding furniture)
2	Other crops	26	Fabricated metal products
3	Cattle	27	Motor vehicle and parts
4	Other livestock	28	Other transport equipment
5	Fishing	29	Electronic equipment
6	Forestry	30	Other machinery and equipment
7	Meat products	31	Other manufacturing
8	Other processed food and beverages	32	Water
9	Coal	33	Gas distribution
10	Oil	34	Electricity distribution
11	Gas	35	Construction
12	LNG	36	Trade services (includes all retail and wholesale trade, hotels and restaurants)
13	Iron ore	37	Road transport
14	Bauxite	38	Rail and pipeline transport
15	Other mining	39	Water transport
16	Iron & steel	40	Air transport
17	Alumina	41	Other transport services
18	Primary aluminium	42	Communications services
19	Petroleum & coal products	43	Insurance services
20	Electricity	44	Other financial services
21	Other nonferrous metals	45	Other business services
22	Non-metallic minerals (including cement, plaster, lime, gravel)	46	Recreational and other services
23	Chemicals, rubber, plastics	47	Government services (including public administration and defence)
24	Textiles, clothing and footwear	48	Dwellings

Note: Excludes micro industries developed specifically for this analysis.

SOURCE: ACIL ALLEN CONSULTING

5.3.3 Micro-Industry Approach

To accurately assess the economic impacts or economic contribution of a major project such as the SLAMI complex, the project must be accurately represented in *Tasman Global's* database. An accurate representation can be guaranteed by establishing the proposed project as a new 'micro' industry in the database.

The micro-industry approach is so called because it involves the creation of one or more new, initially very small, industries in the *Tasman Global* database. The specifications of each of the micro-industry's costs and sales structures are directly derived from the financial data for the project to be analysed. At the outset, the new industry is necessarily very small so that its existence in the *Tasman Global* database does not affect the database balance or the "business-as-usual" Reference Case outcomes.

Besides having a separate cost structure for the project of interest, a further challenge is to faithfully represent the time profile of the individual cost items. This is particularly important for the investment

phase where there are typically large changes in demands for machinery, labour and imported components year on year. This challenge is met in *Tasman Global* through incorporating detailed year on year, input-specific changes by source.

Using the micro-industry approach for project evaluations is the most accurate way to capture the detailed economic linkages between the project and the other industries in the economy. This approach has been developed by ACIL Allen, because each project is unique relative to the more aggregated industries in the *Tasman Global* database.

Consequently, in addition to the 48 industries identified in Table 5.1, the database also identifies the construction and operation phases of the project as separate industries with their own input cost structure, sales, employment, tax revenues, and emissions based on detailed information generated as part of this analysis.

Another important aspect in the CGE modelling approach used for this analysis is to have separate identification of the capital stock created as part of the project's investment phase and isolating it until the capital is available for use, thereby preventing the economy gaining false benefits from, say, half a bridge. In the past, some CGE models potentially overstated the impact of an investment, because investment in one period was automatically added to capital stock in the next period and was made available to the rest of the economy, thereby spuriously increasing GDP.

5.4 Measures of Macroeconomic Impacts

One of the most commonly quoted macroeconomic variables at a national level is real GDP, which is a measure of the aggregate output generated by an economy over a given period (typically a year). From the expenditure side, GDP is calculated by adding together total private and government consumption, investment and net trade. From the income side, GDP can be calculated as the sum of returns to the primary factors (labour, capital and natural resources) employed in the national economy plus indirect tax revenue. The regional level equivalent to GDP is Gross Regional Product (GRP) – at the state or territory level it is called Gross State Product (GSP) or Gross Territory Product (GTP), respectively. To reduce the potential confusion with the various acronyms, the term **economic output** has been used in the discussion of the results presented in this report.

These measures of the real economic output of an economy should be distinguished from measures of the economy's real income, which provide a better indication of the economic welfare of the residents of a region. It is possible for real economic output to increase (that is, for GDP to rise) while at the same time real income (economic welfare) declines. In such circumstances, people and households would be worse off despite economic growth.

In *Tasman Global*, the relevant measure of real income at the national level is real gross national disposable income or RGNDI as reported by the Australian Bureau of Statistics (ABS).

The change in a region's real income as a result of a new project is the change in real economic output plus the change in net external income transfers plus the change in the region's terms of trade (which measure the change in the purchasing power of the region's exports relative to its imports). As Australians have experienced first-hand in recent years, changes in the terms of trade can have a substantial impact on residents' welfare independently of changes in real economic output.

In global CGE models such as *Tasman Global*, the change in real income is equivalent to the change in consumer welfare using the equivalent variation measure of welfare change resulting from exogenous shocks. Hence, it is valid to say that the projected change in real income (from *Tasman Global*) is also the projected change in consumer welfare.

5.5 Economic Modelling Results – NSS Option

5.5.1 Real Economic Output and Real Income – NSS Option

As discussed in section 5.1, real economic output is the sum of value added by all producers in the relevant region/state, plus any product taxes (minus subsidies) not included in output. When calculated at a national level, this is referred to as GDP, and as GSP/GTP at the State/Territory level.

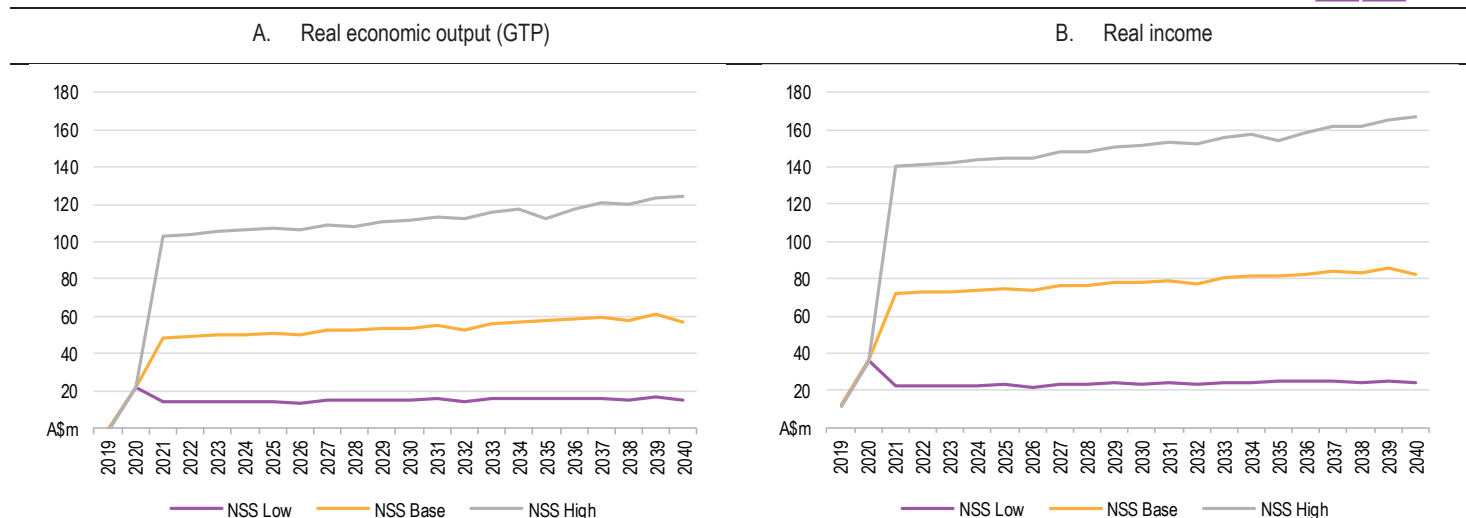
In contrast, the change in real income is:

- the change in real economic output
- plus the change in net foreign income transfers
- plus the change in terms of trade.

While real output is a useful indicator, real income provides a better measure of the welfare impact that changes in these aggregates have on people living in a region.¹⁶

Figure 5.3 shows the estimated change in both real economic output and real income in the Northern Territory, due to the construction and operations of the SLAMI complex under the NSS case with the capital cost including a 20 per cent contingency allowance. A summary of the aggregate projected impacts is presented in **Table 5.2**.

FIGURE 5.3 CHANGE IN NT REAL ECONOMIC OUTPUT AND REAL INCOME AS A RESULT OF THE SLAMI PROJECT (NSS OPTION), RELATIVE TO THE REFERENCE CASE (IN 2019 TERMS)



SOURCE: ACIL ALLEN CONSULTING

In general, the changes in real economic output occur broadly in line with the projected value of production (see Figure 5.3A). This is not surprising as the operations phase is where the key benefits of the project will be realised for the Northern Territory — namely, through the increased value of production obtained from the application of current resources. In contrast, the construction phase is largely increasing demand for scarce factors of production, and so has a smaller effect on economic output compared to the size of the investment.

However, the additional construction activity associated with the project has a noticeable effect on the real income of residents in the Northern Territory, as there is increased demand for labour and goods and services and this boosts local incomes relative to the Reference Case (see Figure 5.3B).

¹⁶ In CGE models with the same framework as *Tasman Global*, it can be shown that the change in real income is equal to the 'equivalent variation' measure of welfare change. Hence, it is valid to say that the projected change in state or national real income is the projected change in consumer welfare at the state or national level.

TABLE 5.2 PROJECTED CUMULATIVE CHANGE IN REAL ECONOMIC OUTPUT AND REAL INCOME IN THE NORTHERN TERRITORY AS A RESULT OF THE SLAMI PROJECT (NSS OPTION), RELATIVE TO THE REFERENCE CASE (IN 2019 TERMS)

Heading	Total (2019 to 2040)	NPV (2.5% real discount rate)	NPV (4% real discount rate)	NPV (7% real discount rate)	NPV (10% real discount rate)
	2019 \$A m	2019 \$A m	2019 \$A m	2019 \$A m	2019 \$A m
Real economic output (GTP)					
Low	321	247	215	166	133
Base	1,105	838	719	544	425
High	2,272	1,719	1,473	1,111	866
Real income					
Low	519	403	352	276	224
Base	1,612	1,228	1,057	805	634
High	3,089	2,343	2,011	1,522	1,190

Note: NPV = net present value

SOURCE: ACIL ALLEN ANALYSIS

Real Economic Output

Over the period 2021 to 2040, the SLAMI project is projected to increase the real economic output (or GTP) of the Northern Territory under the:

- *Low Scenario* by a cumulative total of \$321 million relative to the Reference Case (with a net present value of \$215 million, using a 4 per cent real discount rate)
- *Base Scenario* by a cumulative total of \$1,105 million relative to the Reference Case (with a net present value of \$719 million, using a 4 per cent real discount rate)
- *High Scenario* by a cumulative total of \$2,272 million relative to the Reference Case (with a net present value of \$1,473 million, using a 4 per cent real discount rate).

To place the projected changes in economic output estimates in perspective, the discounted present value (using a 4 per cent discount rate) under the Low, Base and High Scenarios is equivalent to approximately 0.8, 2.6 and 5.4 per cent of the Northern Territory's current GTP, respectively.

Real Income

Real income is a measure of the ability to purchase goods and services, adjusted for inflation. A rise in real income indicates a rise in the capacity for current consumption, but also an increased ability to accumulate wealth in the form of financial and other assets. The change in real income from a development is a measure of the change in welfare of an economy.

The extent to which local residents will benefit from the additional economic output depends on the level of ownership of the capital (including the natural resources) utilised in the business as well as any wealth transfers undertaken by Australian governments as a result of the taxation revenues generated by the project.

Unlike analyses for many other large projects in the Northern Territory where revenues primarily flow through the books of the project owner who is generally interstate or foreign owned, the economic benefits associated with SLAMI are dispersed widely throughout a range of businesses and vessel operators, many of which are likely to be locally owned. This means that the ownership situation of the project is less important than in other comparable analyses.

The Northern Territory Government will receive some additional taxes (such as payroll taxes) because of the project, while the Australian Government will receive higher taxes through higher personal income and company tax receipts. Where this additional income will be spent is unknown, but for this study we have assumed that it will be spent proportionately to the population in each region of Australia.

Over the period 2019 to 2040, the project is projected to increase the real income of the Northern Territory under the:

- *Low Scenario* by a cumulative total of \$519 million relative to the Reference Case (with a net present value of \$352 million, using a 4 per cent real discount rate)
- *Base Scenario* by a cumulative total of \$1,612 million relative to the Reference Case (with a net present value of \$1,057 million, using a 4 per cent real discount rate)
- *High Scenario* by a cumulative total of \$3,089 million relative to the Reference Case (with a net present value of \$2,011 million, using a 4 per cent real discount rate).

To place these projected changes in income in perspective, the discounted present values (using a 4 per cent discount rate) are equivalent to a one-off increase in the average real income of all current residents of Northern Territory residents under the:

- *Low Scenario* by approximately \$1,400 per person
- *Base Scenario* by approximately \$4,300 per person
- *High Scenario* by approximately \$8,100 per person.

5.5.2 Employment

As well as creating ongoing employment in the Northern Territory, the project will generate jobs during the construction phase of the project. In addition to the direct jobs generated on-site, the construction and installation, and production phases will require a range of locally-sourced goods and services. Production of these inputs will further increase the demand for labour across the Northern Territory.

A key issue when estimating the impact of a project is determining how the labour market will clear.¹⁷ For this analysis, increases in the demand for labour can be met by three mechanisms: increasing migration from elsewhere in Australia; increasing participation rates and/or average hours worked; and by reducing the unemployment rate. In the model framework, the first two mechanisms are driven by changes in the real wages paid to workers in the local region while the third is a function of the additional labour demand relative to the Reference Case. Given the moderate unemployment rate assumed throughout the projection period, changes in the real wage rate account for the majority of the additional labour supply in the policy scenarios relative to the Reference Case.

It should be noted that this analysis does not assume any change in net foreign migration as a result of the Project.

Employment Creation

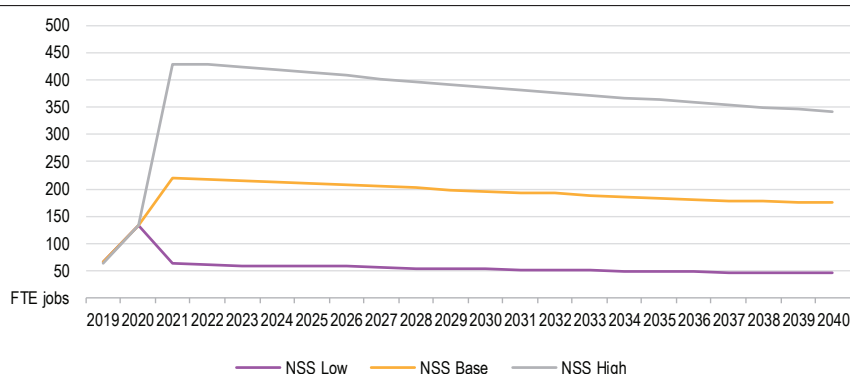
More specifically, as shown in **Figure 5.4**, it is projected that, over the period 2019 to 2040, the SLAMI project will increase full-time equivalent (FTE) direct and indirect employment in the Northern Territory under the:

- *Low Scenario* by 1,251 employee years¹⁸ (or approximately 57 FTE jobs a year)
- *Base Scenario* by 4,110 employee years (or approximately 187 FTE jobs a year)
- *High Scenario* by 7,903 employee years (or approximately 359 FTE jobs a year).

¹⁷ As with other CGE models, the standard assumption within *Tasman Global* is that all markets clear (i.e. demand equals supply) at the start and end of each time period, including the labour market. CGE models place explicit limits on the availability of factors and the nature of the constraints can greatly change the magnitude and nature of the results. In contrast, most other tools used to assess economic impacts, including I-O multiplier analysis, do not place constraints on the availability of factors. Consequently, these tools tend to overestimate the impacts of a project or policy.

¹⁸ An employee year is equivalent to the employment of one FTE person for one year. Alternatively, it can represent employment of, say, two full-time people for half a year each, or one 0.5 FTE person for two years.

FIGURE 5.4 PROJECTED CHANGE IN TOTAL NT EMPLOYMENT AS A RESULT OF THE PROJECT (NSS OPTION), RELATIVE TO THE REFERENCE CASE (FULL-TIME EQUIVALENT JOBS)



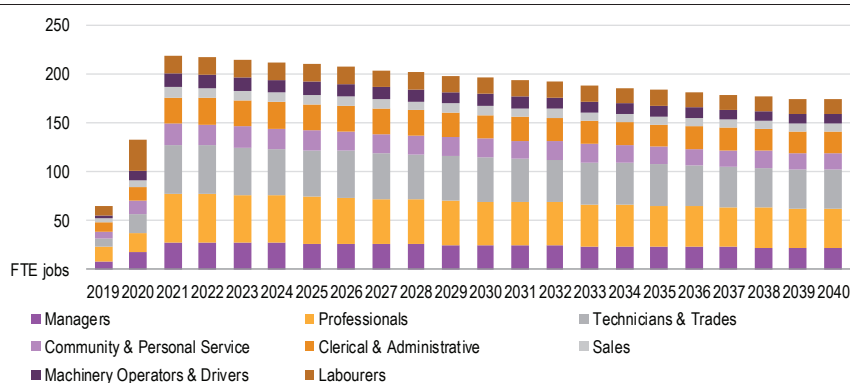
Note: FTE = full-time equivalent.

SOURCE: ACIL ALLEN ANALYSIS

The projected decline in the total employment effect over time, is due to the projected ongoing labour productivity improvements over time, whereby an additional unit of real economic output requires less additional units of labour over time.

Under each scenario, there will be a change in employment across a range of different skills. **Figure 5.5** shows the broad classifications and numbers of employees stimulated across the Northern Territory by the SLAMI project under the Base Scenario projection. As can be seen, the greatest increases in net employment are projected to occur in the Technicians & Trades and Professionals categories, reflecting the nature of the employment generated by the facilities. Other jobs are stimulated in response to consumer's consumption patterns and their higher incomes, relative to the Reference Case.

FIGURE 5.5 PROJECTED ADDITIONAL NORTHERN TERRITORY EMPLOYMENT BY OCCUPATION AS A RESULT OF THE PROJECT (NSS OPTION), RELATIVE TO THE REFERENCE CASE (FULL-TIME EQUIVALENT JOBS)



Note: FTE = full-time equivalent.

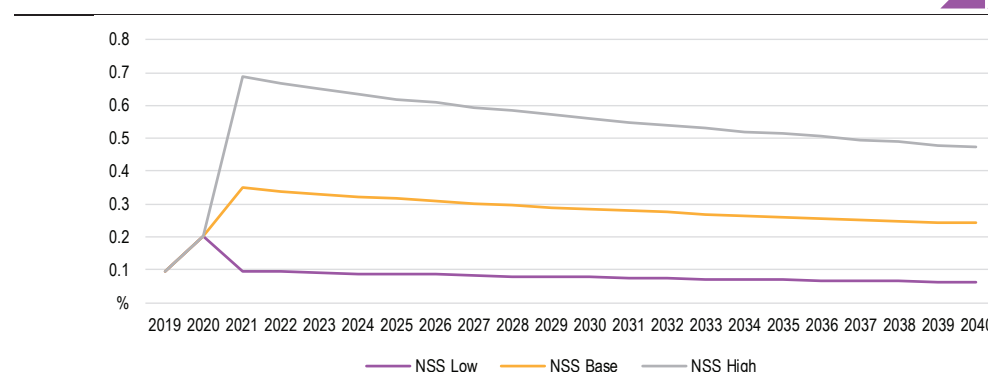
SOURCE: ACIL ALLEN ANALYSIS

5.5.3 Real Wages

Figure 5.6 shows the projected changes in average real wages in the Northern Territory under each case as a result of the construction and operation of the SLAMI project (NSS option). The projected changes in real wages follow the changes in labour demand, with wages in each region acting to balance demand and supply in each year. In addition, the magnitude of the projected changes in real wages is a function of the relative size of the demand and supply imbalance with respect to the overall

size of the labour market (that is, large percentage increases in labour demand relative to the Reference Case will tend to result in large percentage increases in real wages relative to the Reference Case). In the context of the project, average real wages are also affected by higher average wages (including allowances) paid to direct employees compared to many other industries.

FIGURE 5.6 PROJECTED CHANGE IN REAL WAGES AS A RESULT OF SLAMI (NSS OPTION), RELATIVE TO THE REFERENCE CASE



SOURCE: ACIL ALLEN ANALYSIS

As can be seen from the figures above, the peak increase in real wages in each region occurs during the years when labour demand is the highest.

On average, real wages in the Northern Territory are projected to increase by an average of 0.1, 0.3 and 0.5 per cent under the Low, Base and High Scenarios, respectively (**Figure 5.6**). In the context of the size of the entire Northern Territory labour market, this is a significant increase.

5.6 Labour Market Sensitivity Analysis

This section examines the sensitivity of the projected economic impacts of the Base Case (NSS option) to two extreme labour market environments, namely:

- fully constrained labour market in which no additional jobs in Australia are allowed relative to the Reference Case (but people are allowed to move between regions)
- unconstrained labour market in which the supply of labour (at the Reference Case wage rates) is fully responsive to demand.

In the fully constrained labour market scenario, it is assumed that there will not be any additional people employed as a result of the additional labour demand generated by the SLAMI complex, and no workers will choose to work longer hours in response to increasing wages relative to the Reference Case. This is deemed to be an extreme and unrealistic assumption, but one that the authors believe generates a floor to the projected economic impacts of the SLAMI complex (all else equal).

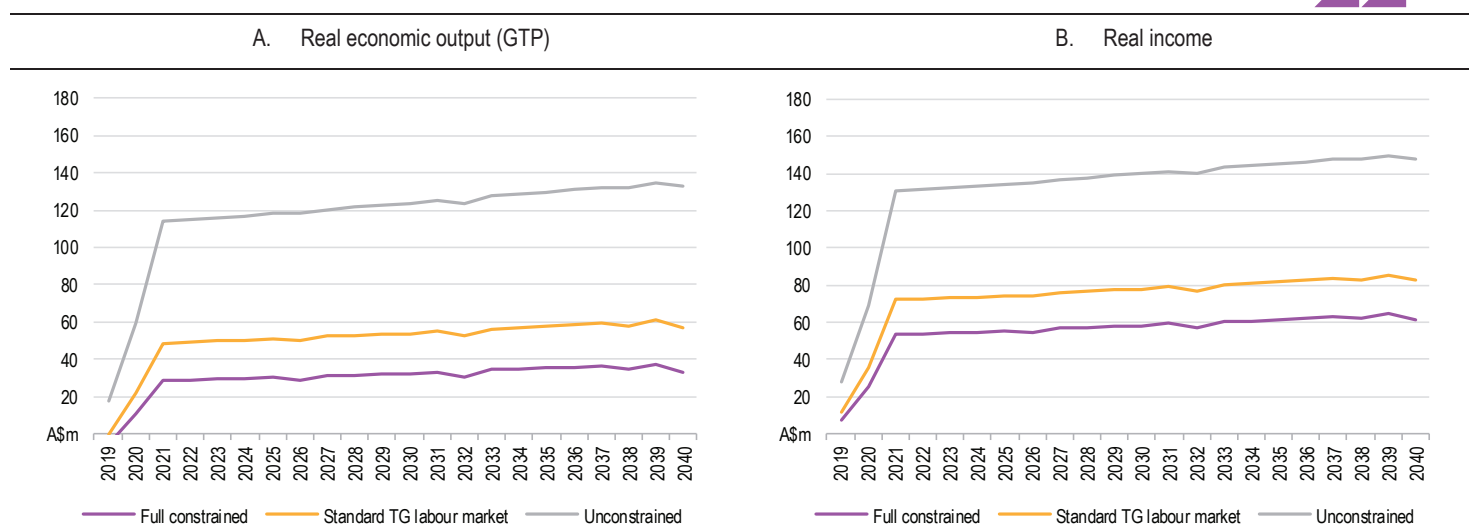
The opposite extreme is modelled in the Unconstrained Scenario in which it is assumed that there is an “unlimited” pool of labour available to meet any additional labour demand generated by the SLAMI complex, relative to the Reference Case. Note, that this does not mean that there is an infinite supply of labour, rather that all *additional* labour demands generated by the SLAMI complex (at the Reference Case wage rates) can be met without needing to crowd out employment from other industries. Except for the availability of other factors of production, this assumption is the same as those obtained from using the upper level estimates from input-output employment multipliers.¹⁹

As can be seen from **Figure 5.7**, **Figure 5.8** and **Table 5.3**, the projected change in employment is more sensitive to the labour market assumptions than the projected change in real GTP or real income. This is because, although the labour market is less flexible, other factors of production are

¹⁹ More specifically, the Type 2A employment multipliers which include the direct, production induced and consumption induced effects.

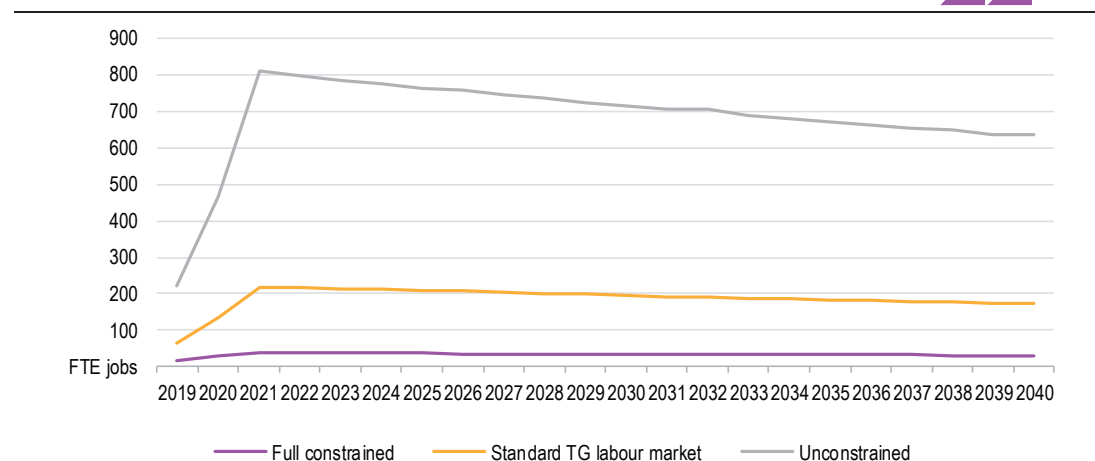
still constrained and productivity in the economy is constant between the Reference Case and the Base Case scenario.

FIGURE 5.7 LABOUR MARKET SENSITIVITY: CHANGE IN NT REAL ECONOMIC OUTPUT AND REAL INCOME AS A RESULT OF THE SLAMI PROJECT (NSS OPTION), RELATIVE TO THE REFERENCE CASE (IN 2019 TERMS)



SOURCE: ACIL ALLEN CONSULTING

FIGURE 5.8 LABOUR MARKET SENSITIVITY: CHANGE IN NT EMPLOYMENT AS A RESULT OF THE SLAMI PROJECT (NSS OPTION), RELATIVE TO THE REFERENCE CASE



Note: FTE = full time equivalent

SOURCE: ACIL ALLEN ANALYSIS

TABLE 5.3 LABOUR MARKET SENSITIVITY ANALYSIS: SLAMI BASE CASE (NSS OPTION)

Heading	Real economic output (GTP)	Real income	Employment
	Total 2019–2040 2019 \$A m	Total 2019–2040 2019 \$A m	Total 2019–2040 Employee years
Full constrained (Lower bound)	653	1,200	739
Standard <i>Tasman Global</i> labour market	1,105	1,612	4,110
Unconstrained (Upper bound)	2,561	2,900	14,976

Note: All projected impacts are for the Northern Territory

SOURCE: ACIL ALLEN ANALYSIS

These results highlight the sensitivity of the projected impacts to the flexibility of the Northern Territory labour market in response to the jobs stimulated by the SLAMI complex. A key constraint to achieving the projected impacts under the unconstrained labour market will be the ability for the Northern Territory to successfully attract the workers and their families from interstate and/or overseas.



6

SCALE AND CONFIGURATION OF SLAMI FACILITIES

The preceding analysis has focussed on the SLAMI facilities as specified by SMEC (2018) plus provision of a PVC-covered work area. The centrepiece of these facilities was a synchrolift with maximum limiting vessel characteristics of:

- docking displacement 4,000 tonnes
- length 85 metres
- beam 24 metres
- draught 6 metres.

The specified facilities also included two wet berths adjacent to the synchrolift's finger-pier structures. The wet-berth pockets were to be sufficiently long, wide and deep to be able to accommodate vessels that can be handled by the ship lift. Other facilities included multiple dry berths, and a self-propelled modular transporter (SPMT) to move vessels on-land between the synchrolift and the dry berths.

The analysis in chapter 2 indicated that parts of the target market for the SLAMI facilities could not be accommodated by the synchrolift. In addition, it was observed that the financial and economic performance of the SLAMI complex could be adversely affected because it included insufficient wet-berths.

The “scope of requirement” for this assignment requested that on the basis of the market analysis (chapter 2), ACIL Allen should “provide high-level views on the scale, size and configuration of Darwin ship-lift infrastructure”. This matter is addressed in subsequent sections of this chapter.

6.1 Discrete Lift of the Vessel Size Constraint

6.1.1 Synchrolift and SPMT

The analysis in chapter 2 indicated that the synchrolift would be too small for a high proportion of the anchor handling tug supply vessels, platform supply vessels and multi-purpose support vessels providing services to the petroleum exploration and extraction sector off the north-western Australian coast. Many had lengths between 90 metres and 111 metres, draughts between 6.4 and 8.5 metres, and lightship displacements between 4,000 and 5,500 tonnes. The synchrolift would also be too small for the Australian Border Force's Ocean Shield (110.9 metres long), which previously was a multi-purpose offshore petroleum support vessel, and the Royal Australian Navy's ANZAC-class frigates (118 metres long).

The high scenario formulated in chapter 2, and analysed in chapter 3 (financial analysis), chapter 4 (SBCA), and chapter 5 (economic impact assessment using CGE analysis) allowed for the possibility of provision of a synchrolift and SPMT able to handle the vessels identified in the preceding paragraph. The maximum limiting vessel characteristics were assumed to be:

- docking displacement 5,500 tonnes

- length 120 metres
- beam 24 metres
- draught 8.5 metres.

The revised characteristics were selected to test the effects of easing the vessel-size constraint imposed by the SLAMI design specifications provided to ACIL Allen (see SMEC, 2018), having regard to existing vessels operating off north-western Australia that reasonably could be expected to use larger SLAMI facilities. The revised specifications were not the result of an optimisation exercise. That would require market, financial, and economic analysis and costings of a range of SLAMI specifications on an iterative, interactive basis involving ACIL Allen's economists and specialist engineering advisers. Such an exercise was beyond the scope of the "scope of requirement" for the assignment.

Nevertheless, more limited analysis may not detract greatly from the value of the insights provided in this chapter, because vessels in the upper levels of the target market appear to be tightly grouped by size. Therefore, incremental changes above and below the revised specifications selected for testing would result in only small absolute changes in numbers of vessels that could be accommodated by the SLAMI complex.

It was estimated that the illustrative change in specifications of the synchrolift would increase the target market by about 26 vessels, resulting in around seven additional vessel lifts relative to the base scenario. Offshore petroleum support vessels would account for an average of about 5.5 extra lifts each year. Defence vessels would contribute the other 1.5 lifts each year on average. The estimated relative increase in lifts (over the base scenario) resulting from the assumed increase in capacity of the synchrolift would be around 6.4 per cent. Over time, the increase in absolute and relative terms could be expected to be larger as a result of a widely-observed trend towards larger vessels.

The constrained size of the synchrolift would mean loss of potential revenue by the SLAMI enterprise and by other providers of goods and services in Darwin. This should be compared with the cost of increasing the capacity of the synchrolift and SPMT.

6.1.2 Wet Berths

In chapters 2 and 3, it was observed that the inclusion of only two wet berths in the proposed SLAMI complex was likely to be inadequate to cater for the demand for wet berths under the base and high scenarios. In the base scenario, unconstrained demand for wet berths is 1,303.4 days, 78.5 per cent higher than available SLAMI capacity of 730 days. In the high scenario, unconstrained demand is 1,892.5 days, 159 per cent higher than available capacity. On this basis, it appears that the small number of wet berths available at the proposed SLAMI complex may limit the full revenue-generating potential of the facility. Based on a daily wet-berth charge of \$5,000, \$2.9 million in annual revenue would be foregone in the **base scenario**, and \$5.8 million in annual revenue would be lost under the **high scenario**.

It was assumed for the purposes of the financial analysis in chapter 2 that excess demand for wet berths would spill over to other sites in Port of Darwin. Under this assumption, having just two wet berths would mean loss of revenue to the SLAMI enterprise, but not necessarily to Darwin. However, if there is already little or no spare wet-berth capacity in Darwin – as claimed by several stakeholders – not only would SLAMI forgo revenue, but also other potential providers of other goods and services to the maritime sector in Darwin would be deprived of business, because vessel owners could be expected to go elsewhere for all repair-and-maintenance services.

6.2 Financial and Economic Implications of Discrete Easing of Size Constraint

Provision of more and larger wet berths and a higher capacity synchrolift are highly complementary, particularly if wet-berth space is already scarce before the SLAMI complex is built. An increase in capacity of the synchrolift would attract more vessels, increasing demand for wet berths. An increase in the number of wet berths and the size of some wet berths would facilitate attraction of more vessels that would no longer be deterred by a scarcity of wet berths.

6.2.1 Wet Berths

The present value (2019 terms) of lost wet-berth revenue of \$2.9 million per year for the SLAMI complex over 20 years from 2021 using a 6.15 per cent per annum real discount rate – the WACC calculated in the financial analysis – is \$28.94 million. If two extra wet berths could be built and maintained for aggregate costs with a present value less than \$28.9 million, it would be appropriate to proceed from the financial perspective of the owner of the SLAMI facilities if the owner was confident about the base scenario. Then, wet berth availability would be 1,460 days compared to demand of 1,303 days. Engineering estimates of the cost of providing two additional wet berths are needed to judge if such provision is economically justifiable.

The economic case for provision of two extra wet berths would be stronger than the financial case to the extent that there is insufficient wet-berth space at other locations in Darwin to accommodate excess demand in the context of two SLAMI wet berths. Then, the extra wet berths would ensure that repair and maintenance activity potentially induced by the SLAMI complex under the **base scenario** is not lost to facilities elsewhere in Australia or overseas.

6.2.2 Synchrolift and SPMT

If the capacities of the synchrolift and the SPMT are increased to accommodate larger offshore petroleum support vessels, the largest Australian Border Force vessel, and Navy ships the size of the ANZAC-class frigates, it was estimated in chapter 2, and reiterated above, that the market available to the SLAMI facilities would increase by 26 vessels, and the number of lifts would increase by seven per year above the base scenario. The size of the additional vessels would be above the range of lifts in the base scenario and well above the average in that scenario.

The additional patronage of the SLAMI facilities would add about \$1.89 million to lifting, transferring and dry-berth revenues and about \$1.88 million per year to wet-berth revenue (376 wet-berth days), providing the SLAMI facilities have enough wet berth capacity. After allowing for incremental annual operating costs of about \$0.035 million, annual additional net cash flows would be around \$3.8 million. In present value (2019) terms, the financial gain would be about \$37.9 million at a real discount rate of 6.15 per cent per annum (the estimated WACC).

If four wet berths are included in the SLAMI complex, as discussed in the preceding sub-section, there would be excess capacity in the base scenario without an increase in the scale of the synchrolift and SPMT. If each wet berth was occupied by one vessel, there would still be 157 berth days spare each year. In addition, in the context of expansion of the synchrolift, it is likely that four wet berths could be used to accommodate at least five vessels at a time, because of the size-distribution of the range of potential client vessels, and because the suggested increase in length of the synchrolift would simultaneously lengthen two adjacent wet berths by the same amount. For example, a berth able to accommodate a vessel 120 metres long could accommodate two vessels, each of which is about 50 metres long.

From a financial perspective (using the estimated real WACC of 6.15 percent as a discount rate), the larger synchrolift and SPMT would be justified if the present value of the cost in 2019 could be kept under \$37.9 million. In chapter 2, it was assumed for illustrative purposes that the larger synchrolift and SPMT would cost about \$32 million without a contingency allowance or \$38.4 million with a 20 per cent contingency allowance. Therefore, the expansion may seem to be marginally viable. However, it has been stressed that the figure of \$32 million to \$38.4 million is subject to confirmation, as ACIL Allen has not been provided with an engineering estimate of the extra capital cost.

The economic case for increasing the capacity of the synchrolift and SPMT would be stronger than the financial case, because this expansion should induce extra vessel repair-and-maintenance activity in Darwin, both in-water and out-of-water.

6.2.3 Complementary Expansion of Synchrolift and Wet Berths

It is obvious that it would not be sensible to increase the capacity of the synchrolift and SPMT without also increasing the SLAMI complex's wet-berth capacity. Its financial viability would be undermined by a dearth of wet-berth facilities. However, the dependency operates both ways. The financial attraction of adding wet berths would be enhanced by increasing the size of the synchrolift and SPMT.

If the larger synchrolift and SPMT and two wet berths additional to the two adjacent to the synchrolift could be provided for extra outlays with a present value less than \$66.8 million, provision of the extra capacity would be financially justifiable from the perspective of the owner of the SLAMI complex.

An expansion of the capacity of the synchrolift, SPMT, and wet berths as discussed above would be more attractive from the perspective of the Northern Territory economy, than from the narrow financial perspective of the owner of facilities (assuming the owner funds the expansion). As explained in chapters 2 and 4, provision of the SLAMI facilities could be expected to trigger additional vessel repair-and-maintenance activity in Darwin. The amount of induced activity should be increased by the expansion of lifting, transfer and wet-berth capacity. Based on the analysis in chapters 2 and 4, the increase in the SLAMI complex's market resulting from the illustrative increase in capacity of the facilities would add about to \$38.1 million per year to vessel repair-and-maintenance expenditures in Darwin (including wet berth charges of about \$1.9 million). After removing SLAMI wet berth charges (included in the financial analysis above) to avoid double-counting, the increase in repair and maintenance revenue for other service providers in Darwin would be around \$36.2 million per year. Annual expenditures of this magnitude for 20 years from 2021 at the SBCA real discount rates of 4 per cent and 7 per cent have present (2019) values of \$453.4 million and \$383.5 million, respectively.

Of course, incremental economic costs should be deducted from the additional repair-and-maintenance expenditures. These would include the opportunity cost of incremental labour/skills and inputs. Indicative opportunity costs from the perspective of the Northern Territory that were derived in section 4.10 of chapter 4 were 58 per cent of repair-and-maintenance expenditures (excluding payments for services of SLAMI facilities) induced by the SLAMI facilities. After deducting these opportunity costs, residual economic benefits of expansion of the SLAMI facilities have present values of \$190.4 million and \$161 million, at real discount rates of 4 per cent and 7 per cent, respectively.

To this should be added the present value of extra SLAMI cash flows resulting from expansion of the facilities. Using real discount rates of 4 per cent and 7 per cent, the present values of extra SLAMI operating cash flows is estimated to be \$83.5 million and \$61.1 million, respectively.²⁰ The combined economic gains associated with extra repair-and-maintenance activity in Darwin amount to \$273.9 million and \$222.1 million, at real discount rates of 4 per cent and 7 per cent, respectively. This estimate does not include some relatively small benefits from reduction of greenhouse-gas emissions. It also does not include benefits to owners and operators of large (defence and offshore petroleum support) vessels that could be accommodated only with the expanded facilities. Those benefits will accrue largely to people who are not domiciled in the Northern Territory. The package of operating benefits needs to be compared with the present value of the capital cost of the expansion of the SLAMI complex. The latter needs to be deducted from the former to arrive at a net present value.

The analysis suggests there is a solid economic case for expansion of the capacity of the synchrolift and the SPMT by about 40 per cent, and doubling the number of wet berths from two to four. There would also be a financial case for the expansion if the present value of the extra capital cost borne by the developer is less than \$66.8 million. However, because of lack of suitable, available information (highlighted throughout this report), the analysis in this section does not reduce uncertainty sufficiently to be regarded as a solid basis for an investment decision by government, private sector equity investors, and debt financiers.

²⁰ It does not affect the economic gains if there is some leakage of wet berth revenue to other facilities in Darwin.



Tasman Global is a dynamic, global computable general equilibrium (CGE) model that has been developed by ACIL Allen for the purpose of undertaking economic impact analysis at the regional, state, national and global level.

A CGE model captures the interlinkages between the markets of all commodities and factors, taking into account resource constraints, to find a simultaneous equilibrium in all markets. A global CGE model extends this interdependence of the markets across world regions and finds simultaneous equilibrium globally. A dynamic model adds onto this the interconnection of equilibrium economies across time periods. For example, investments made today are going to determine the capital stocks of tomorrow and hence future equilibrium outcomes depend on today's equilibrium outcome, and so on.

A dynamic global CGE model, such as *Tasman Global*, has the capability of addressing total, sectoral, spatial and temporal efficiency of resource allocation as it connects markets globally and over time. Being a recursively dynamic model, however, its ability to address temporal issues is limited. In particular, *Tasman Global* cannot typically address issues requiring partial or perfect foresight. However, as documented in Jakeman et al (2001), it is possible to introduce partial or perfect foresight in certain markets using algorithmic approaches. Notwithstanding this, the model does have the capability to project the economic impacts over time of given changes in policies, tastes and technologies in any region of the world economy on all sectors and agents of all regions of the world economy.

Tasman Global was developed from the 2001 version of the Global Trade and Environment Model (GTEM) developed by ABARE (Pant, 2001) and has been evolving ever since. In turn, GTEM was developed out of the MEGABARE model (ABARE, 1996), which contained significant advancements over the GTAP model of that time (Hertel, 1997).

A.1 A Dynamic Model

Tasman Global is a model that estimates relationships between variables at different points in time. This is in contrast to comparative static models, which compare two equilibriums (one before an economic disturbance and one following). A dynamic model such as *Tasman Global* is beneficial when analysing issues for which both the timing of and the adjustment path that economies follow are relevant in the analysis.

A.2 The Database

A key advantage of *Tasman Global* is the level of detail in the database underpinning the model. The database is derived from the Global Trade Analysis Project (GTAP) database. This database is a fully documented, publicly available global data base which contains complete bilateral trade information,

transport and protection linkages among regions for all GTAP commodities. It is the most detailed database of its type in the world.

Tasman Global builds on the GTAP database by adding the following important features:

- a detailed population and labour market database
- detailed technology representation within key industries (such as electricity generation and iron and steel production)
- disaggregation of a range of major commodities including iron ore, bauxite, alumina, primary aluminium, brown coal, black coal and LNG
- the ability to repatriate labour and capital income
- explicit representation of the states and territories of Australia
- the capacity to represent multiple regions within states and territories of Australia explicitly.

Nominally, version 9.1 of the *Tasman Global* database divides the world economy into 150 regions (142 international regions plus the 8 states and territories of Australia) although in reality the regions are frequently disaggregated further. ACIL Allen regularly models Australian or international projects or policies at the regional level including at the or at the state/territory/provincial level for various countries.

The *Tasman Global* database also contains a wealth of sectoral detail currently identifying up to 72 industries (Table A.1). The foundation of this information is the input-output tables that underpin the database. The input-output tables account for the distribution of industry production to satisfy industry and final demands.

Industry demands, so-called intermediate usage, are the demands from each industry for inputs. For example, electricity is an input into the production of communications. In other words, the communications industry uses electricity as an intermediate input.

Final demands are those made by households, governments, investors and foreigners (export demand). These final demands, as the name suggests, represent the demand for finished goods and services. To continue the example, electricity is used by households – their consumption of electricity is a final demand.

Each sector in the economy is typically assumed to produce one commodity, although in *Tasman Global*, the electricity, transport and iron and steel sectors are modelled using a ‘technology bundle’ approach. With this approach, different known production methods are used to generate a homogeneous output for the ‘technology bundle’ industry. For example, electricity can be generated using brown coal, black coal, petroleum, base load gas, peak load gas, nuclear, hydro, geothermal, biomass, wind, solar or other renewable based technologies – each of which has its own cost structure.

The other key feature of the database is that the cost structure of each industry is also represented in detail. Each industry purchases intermediate inputs (from domestic and imported sources) primary factors (labour, capital, land and natural resources) as well as paying taxes or receiving subsidies.

TABLE A.1 STANDARD SECTORS IN THE TASMAN GLOBAL MODEL

no	Name	no	Name
1	Paddy rice	37	Wood products
2	Wheat	38	Paper products, publishing
3	Cereal grains nec	39	Diesel (incl. nonconventional diesel)
4	Vegetables, fruit, nuts	40	Other petroleum, coal products
5	Oil seeds	41	Chemical, rubber, plastic products
6	Sugar cane, sugar beet	42	Iron ore
7	Plant- based fibres	43	Bauxite
8	Crops nec	44	Mineral products nec
9	Bovine cattle, sheep, goats, horses	45	Ferrous metals
10	Pigs	46	Alumina
11	Animal products nec	47	Primary aluminium
12	Raw milk	48	Metals nec
13	Wool, silk worm cocoons	49	Metal products
14	Forestry	50	Motor vehicle and parts
15	Fishing	51	Transport equipment nec
16	Brown coal	52	Electronic equipment
17	Black coal	53	Machinery and equipment nec
18	Oil	54	Manufactures nec
19	Liquefied natural gas (LNG)	55	Electricity generation
20	Other natural gas	56	Electricity transmission and distribution
21	Minerals nec	57	Gas manufacture, distribution
22	Bovine meat products	58	Water
23	Pig meat products	59	Construction
24	Meat products nec	60	Trade
25	Vegetables oils and fats	61	Road transport
26	Dairy products	62	Rail and pipeline transport
27	Processed rice	63	Water transport
28	Sugar	64	Air transport
29	Food products nec	65	Transport nec
30	Wine	66	Communication
31	Beer	67	Financial services nec
32	Spirits and RTDs	68	Insurance
33	Other beverages and tobacco products	69	Business services nec
34	Textiles	70	Recreational and other services
35	Wearing apparel	71	Public Administration, Defence, Education, Health
36	Leather products	72	Dwellings

Note: nec = not elsewhere classified.

SOURCE: ACIL ALLEN CONSULTING

A.3 Model Structure

Given its heritage, the structure of the *Tasman Global* model closely follows that of the GTAP and GTEM models and interested readers are encouraged to refer to the documentation of these models for more detail (namely Hertel, 1997 and Pant, 2001, respectively). In summary:

- The model divides the world into a variety of regions and international waters.

- Each region is fully represented with its own 'bottom-up' social accounting matrix and could be a local community, an LGA, state, country or a group of countries. The number of regions in a given simulation depends on the database aggregation. Each region consists of households, a government with a tax system, production sectors, investors, traders and finance brokers.
- 'International waters' are a hypothetical region in which global traders operate and use international shipping services to ship goods from one region to the other. It also houses an international finance 'clearing house' that pools global savings and allocates the fund to investors located in every region.
- Each region has a 'regional household'²¹ that collects all factor payments, taxes, net foreign borrowings, net repatriation of factor incomes due to foreign ownership and any net income from trading of emission permits.
- The income of the regional household is allocated across private consumption, government consumption and savings according to a Cobb-Douglas utility function, which, in practice, means that the share of income going to each component is assumed to remain constant in nominal terms.
- Private consumption of each commodity is determined by maximising utility subject to a Constant Difference of Elasticities (CDE) function which includes both price and income elasticities.
- Government consumption of each commodity is determined by maximising utility subject to a Cobb-Douglas utility function.
- Each region has n production sectors, each producing single products using various production functions where they aim to maximise profits (or minimise costs) and take all prices as given. The nature of the production functions chosen in the model means that producers exhibit constant returns to scale.
 - In general, each producer supplies consumption goods by combining an aggregate energy-primary factor bundle with other intermediate inputs and according to a Leontief production function (which in practice means that the quantity shares remain in fixed proportions). Within the aggregate energy-primary factor bundle, the individual energy commodities and primary factors are combined using a nested-CES (Constant Elasticity of Substitution) production function, in which energy and primary factor aggregates substitute according to a CES function with the individual energy commodities and individual primary factors substituting with their respective aggregates according to further CES production functions.
 - Exceptions to the above include the electricity generation, iron and steel and road transport sectors. These sectors employ the 'technology bundle' approach developed by ABARE (1996) in which non-homogenous technologies are employed to produce a homogenous output with the choice of technology governed by minimising costs according to a modified-CRESH production function. For example, electricity may be generated from a variety of technologies (including brown coal, black coal, gas, nuclear, hydro, solar etc.), iron and steel may be produced from blast furnace or electric arc technologies while road transport services may be supplied using a range of different vehicle technologies. The 'modified-CRESH' function differs from the traditional CRESH function by also imposing the condition that the quantity units are homogenous.
- There are four primary factors (land, labour, mobile capital and fixed capital). While labour and mobile capital are used by all production sectors, land is only used by agricultural sectors while fixed capital is typically employed in industries with natural resources (such as fishing, forestry and mining) or in selected industries built by ACIL Allen.
 - Land supply in each region is typically assumed to remain fixed through time with the allocation of land between sectors occurring to maximise returns subject to a Constant Elasticity of Transformation (CET) utility function.
 - Mobile capital accumulates as a result of net investment. It is implicitly assumed in *Tasman Global* that it takes one year for capital to be installed. Hence, supply of capital in the current period depends on the last year's capital stock and investments made during the previous year.
 - Labour supply in each year is determined by endogenous changes in population, given participation rates and a given unemployment rate. In policy scenarios, the supply of labour is

²¹ The term "regional household" was devised for the GTAP model. In essence, it is an agent that aggregates all incomes attributable to the residents of a given region before distributing the funds to the various types of regional consumption (including savings).

positively influenced by movements in the real wage rate governed by the elasticity of supply. For countries where sub-regions have been specified (such as Australia), migration between regions is induced by changes in relative real wages with the constraint that net interregional migration equals zero. For regions where the labour market has been disaggregated to include occupations, there is limited substitution allowed between occupations by individuals supplying labour (according to a CET utility function) and by firms demanding labour (according to a CES production function) based on movements in relative real wages.

- The supply of fixed capital is given for each sector in each region.

The model has the option for these assumptions to be changed at the time of model application if alternative factor supply behaviours are considered more relevant.

- It is assumed that labour (by occupation) and mobile capital are fully mobile across production sectors implying that, in equilibrium, wage rates (by occupation) and rental rates on capital are equalised across all sectors within each region. To a lesser extent, labour and capital are mobile between regions through international financial investment and migration, but this sort of mobility is sluggish and does not equalise rates of return across regions.
- For most international regions, for each consumer (private, government, industries and the local investment sector), consumption goods can be sourced either from domestic or imported sources. In any country that has disaggregated regions (such as Australia), consumption goods can also be sourced from other intrastate or interstate regions. In all cases, the source of non-domestically produced consumption goods is determined by minimising costs subject to a Constant Ratios of Elasticities of Substitution, Homothetic (CRESH) utility function. Like most other CGE models, a CES demand function is used to model the relative demand for domestically-produced commodities versus non-domestically produced commodities. The elasticities chosen for the CES and CRESH demand functions mean that consumers in each region have a higher preference for domestically-produced commodities than non-domestic commodities and a higher preference for intrastate- or interstate-produced commodities than foreign commodities.
- The capital account in *Tasman Global* is open. Domestic savers in each region purchase 'bonds' in the global financial market through local 'brokers' while investors in each region sell bonds to the global financial market to raise investible funds. A flexible global interest rate clears the global financial market.
- It is assumed that regions may differ in their risk characteristics and policy configurations. As a result, rates of return on money invested in physical capital may differ between regions and therefore may be different from the global cost of funds. Any difference between the local rates of return on capital and the global cost of borrowing is treated as the result of the existence of a risk premium and policy imperfections in the international capital market. It is maintained that the equilibrium allocation of investment requires the equalisation of changes in (as opposed to the absolute levels of) rates of return over the base year rates of return.
- Any excess of investment over domestic savings in a given region causes an increase in the net debt of that region. It is assumed that debtors service the debt at the interest rate that clears the global financial market. Similarly, regions that are net savers give rise to interest receipts from the global financial market at the same interest rate.
- Investment in each region is used by the regional investor to purchase a suite of intermediate goods according to a Leontief production function to construct capital stock with the regional investor cost minimising by choosing between domestic, interstate and imported sources of each intermediate good via the CRESH production function. The regional cost of creating new capital stock versus the local rates of return on mobile capital is what determines the regional rate of return on new investment.
- In equilibrium, exports of a good from one region to the rest of world are equal to the import demand for that good in the remaining regions. Together with the merchandise trade balance, the net payments on foreign debt add up to the current account balance. *Tasman Global* does not require that the current account be in balance every year. It allows the capital account to move in a compensatory direction to maintain the balance of payments. The exchange rate provides the flexibility to keep the balance of payments in balance.
- Emissions of six anthropogenic greenhouse gases (namely, carbon dioxide, methane, nitrous oxide, HFCs, PFCs and SF₆) associated with economic activity are tracked in the model. Almost all sources and sectors are represented; emissions from agricultural residues and land-use change

and forestry activities are not explicitly modelled but can be accounted for externally. Prices can be applied to emissions which are converted to industry-specific production taxes or commodity-specific sales taxes that impact on demand. Abatement technologies similar to those adopted in a report released by the Australian Government (2008) are available and emission quotas can be set globally or by region along with allocation schemes that enable emissions to be traded between regions.

More detail regarding specific elements of the model structure are discussed in the following sections.

A.4 Population Growth and Labour Supply

Population growth is an important determinant of economic growth through the supply of labour and the demand for final goods and services. Population growth for each region represented in the *Tasman Global* database is projected using ACIL Allen's in-house demographic model. The demographic model projects how the population in each region grows and how age and gender composition changes over time and is an important tool for determining the changes in regional labour supply and total population over the projection period.

For each of region, the model projects the changes in age-specific birth, mortality and net migration rates by gender for 101 age cohorts (0-99 and 100+). The demographic model also projects changes in participation rates by gender by age for each region, and, when combined with the age and gender composition of the population, endogenously projects the future supply of labour in each region. Changes in life expectancy are a function of income per person as well as assumed technical progress on lowering mortality rates for a given income (for example, reducing malaria-related mortality through better medicines, education, governance etc.). Participation rates are a function of life expectancy as well as expected changes in higher education rates, fertility rates and changes in the work force as a share of the total population.

Labour supply is derived from the combination of the projected regional population by age by gender and the projected regional participation rates by age by gender. Over the projection period labour supply in most developed economies is projected to grow slower than total population as a result of ageing population effects.

For the Australian states and territories, the projected aggregate labour supply from ACIL Allen's demographic module is used as the base level potential workforce for the detailed Australian labour market module, which is described in the next section.

A.4.1 The Australian Labour Market

Tasman Global has a detailed representation of the Australian labour market which has been designed to capture:

- different occupations
- changes to participation rates (or average hours worked) due to changes in real wages
- changes to unemployment rates due to changes in labour demand
- limited substitution between occupations by the firms demanding labour and by the individuals supplying labour, and
- limited labour mobility between states and regions within each state.

Tasman Global recognises 97 different occupations within Australia – although the exact number of occupations depends on the aggregation. The firms that hire labour are provided with some limited scope to change between these 97 labour types as the relative real wage between them changes. Similarly, the individuals supplying labour have a limited ability to change occupations in response to the changing relative real wage between occupations. Finally, as the real wage for a given occupation rises in one state relative to other states, workers are given some ability to respond by shifting their location. The model produces results at the 97 3-digit ANZSCO (Australian New Zealand Standard Classification of Occupations) level which are presented in Table A.2.

The labour market structure of *Tasman Global* is thus designed to capture the reality of labour markets in Australia, where supply and demand at the occupational level do adjust, but within limits.

TABLE A.2 OCCUPATIONS IN THE *TASMAN GLOBAL* DATABASE, ANZSCO 3-DIGIT LEVEL (MINOR GROUPS)

ANZSCO code, Description	ANZSCO code, Description	ANZSCO code, Description
1. MANAGERS	3. TECHNICIANS & TRADES WORKERS	5. CLERICAL & ADMINISTRATIVE
111 Chief Executives, General Managers and Legislators	311 Agricultural, Medical and Science Technicians	511 Contract, Program and Project Administrators
121 Farmers and Farm Managers	312 Building and Engineering Technicians	512 Office and Practice Managers
131 Advertising and Sales Managers	313 ICT and Telecommunications Technicians	521 Personal Assistants and Secretaries
132 Business Administration Managers	321 Automotive Electricians and Mechanics	531 General Clerks
133 Construction, Distribution and Production Managers	322 Fabrication Engineering Trades Workers	532 Keyboard Operators
134 Education, Health and Welfare Services Managers	323 Mechanical Engineering Trades Workers	541 Call or Contact Centre Information Clerks
135 ICT Managers	324 Panel beaters, and Vehicle Body Builders, Trimmers and Painters	542 Receptionists
139 Miscellaneous Specialist Managers	331 Bricklayers, and Carpenters and Joiners	551 Accounting Clerks and Bookkeepers
141 Accommodation and Hospitality Managers	332 Floor Finishers and Painting Trades Workers	552 Financial and Insurance Clerks
142 Retail Managers	333 Glaziers, Plasterers and Tilers	561 Clerical and Office Support Workers
149 Miscellaneous Hospitality, Retail and Service Managers	334 Plumbers	591 Logistics Clerks
	341 Electricians	599 Miscellaneous Clerical and Administrative Workers
	342 Electronics and Telecommunications Trades Workers	
2. PROFESSIONALS	351 Food Trades Workers	6. SALES WORKERS
211 Arts Professionals	361 Animal Attendants and Trainers, and Shearers	611 Insurance Agents and Sales Representatives
212 Media Professionals	362 Horticultural Trades Workers	612 Real Estate Sales Agents
221 Accountants, Auditors and Company Secretaries	391 Hairdressers	621 Sales Assistants and Salespersons
222 Financial Brokers and Dealers, and Investment Advisers	392 Printing Trades Workers	631 Checkout Operators and Office Cashiers
223 Human Resource and Training Professionals	393 Textile, Clothing and Footwear Trades Workers	639 Miscellaneous Sales Support Workers
224 Information and Organisation Professionals	394 Wood Trades Workers	
225 Sales, Marketing and Public Relations Professionals	399 Miscellaneous Technicians and Trades Workers	7. MACHINERY OPERATORS & DRIVERS
231 Air and Marine Transport Professionals		711 Machine Operators
232 Architects, Designers, Planners and Surveyors	4. COMMUNITY & PERSONAL SERVICE	712 Stationary Plant Operators
233 Engineering Professionals	411 Health and Welfare Support Workers	721 Mobile Plant Operators
234 Natural and Physical Science Professionals	421 Child Carers	731 Automobile, Bus and Rail Drivers
241 School Teachers	422 Education Aides	732 Delivery Drivers
242 Tertiary Education Teachers	423 Personal Carers and Assistants	733 Truck Drivers
249 Miscellaneous Education Professionals	431 Hospitality Workers	741 Storepersons
251 Health Diagnostic and Promotion Professionals	441 Defence Force Members, Fire Fighters and Police	
252 Health Therapy Professionals	442 Prison and Security Officers	8. LABOURERS
253 Medical Practitioners	451 Personal Service and Travel Workers	811 Cleaners and Laundry Workers
254 Midwifery and Nursing Professionals	452 Sports and Fitness Workers	821 Construction and Mining Labourers
261 Business and Systems Analysts, and Programmers		831 Food Process Workers
262 Database and Systems Administrators, and ICT Security Specialists		832 Packers and Product Assemblers
263 ICT Network and Support Professionals		839 Miscellaneous Factory Process Workers
271 Legal Professionals		841 Farm, Forestry and Garden Workers
272 Social and Welfare Professionals		851 Food Preparation Assistants
		891 Freight Handlers and Shelf Fillers
		899 Miscellaneous Labourers

SOURCE: ABS (2009), ANZSCO – AUSTRALIAN AND NEW ZEALAND STANDARD CLASSIFICATIONS OF OCCUPATIONS, FIRST EDITION, REVISION 1, ABS CATALOGUE NO. 1220.0.

Labour supply in *Tasman Global* is presented as a three-stage process:

- i) labour makes itself available to the workforce based on movements in the real wage and the unemployment rate;
- ii) labour chooses between occupations in a state based on relative real wages within the state; and

- iii) labour of a given occupation chooses in which state to locate based on movements in the relative real wage for that occupation between states.

By default, *Tasman Global*, like all CGE models, assumes that markets clear. Therefore, overall, supply and demand for different occupations will equate (as is the case in other markets in the model).

A.4.2 Labour Market Database

The *Tasman Global* database includes a detailed representation of the Australian labour market that has been designed to capture the supply and demand for different skills and occupations by industry. To achieve this, the Australian workforce is characterised by detailed supply and demand matrices.

On the supply side, the Australian population is characterised by a five-dimensional matrix consisting of:

- 7 post-school qualification levels
- 12 main qualification fields of highest educational attainment
- 97 occupations
- 101 age groups (namely 0 to 99 and 100+)
- 2 genders.

The data for this matrix is measured in persons and was sourced from the ABS 2011 Census. As the skills elements of the database and model structure have not been used for this project, it will be ignored in this discussion.

The 97 occupations are those specified at the 3-digit level (or Minor Groups) under the Australian New Zealand Standard Classification of Occupations (ANZSCO) (see Table A.2).

On the demand side, each industry demands a particular mix of occupations. This matrix is specified in units of full-time equivalent (FTE) jobs where an FTE employee works an average of 37.5 hours per week. Consistent with the labour supply matrix, the data for FTE jobs by occupation by industry was also sourced from the ABS 2011 Census and updated using the latest labour force statistics.

Matching the demand and supply side matrices means that there is the implicit assumption that the average hours per worker are constant, but it is noted that mathematically changes in participation rates have the same effect as changes in average hours worked.

A.4.3 Labour Market Model Structure

In the model, the underlying growth of each industry in the Australian economy results in a growth in demand for a particular set of skills and occupations. In contrast, the supply of each set of skills and occupations in a given year is primarily driven by the underlying demographics of the resident population. This creates a market for each skill by occupation that (unless specified otherwise) needs to clear at the start and end of each time period.²² The labour markets clear by a combination of different prices (i.e. wages) for each labour type and by allowing a range of demand and supply substitution possibilities, including:

- changes in firms' demand for labour driven by changes in the underlying production technology
 - for technology bundle industries (electricity, iron and steel and road transportation) this occurs due to changes between explicitly identified alternative technologies
 - for non-technology bundle industries this includes substitution between factors (such as labour for capital) or energy for factors
- changes to participation rates (or average hours worked) due to changes in real wages
- changes in the occupations of a person due to changes in relative real wages
- substitution between occupations by the firms demanding labour due to changes in the relative costs
- changes to unemployment rates due to changes in labour demand, and
- limited labour mobility between states due to changes in relative real wages.

²² For example, at the start and end of each week for this analysis. *Tasman Global* can be run with different steps in time, such as quarterly or bi-annually in which case the markets would clear at the start and end of these time points.

All of the labour supply substitution functions are modified-CET functions in which people supply their skills, occupation and rates of participation as a positive function of relative wages. However, unlike a standard CET (or CES) function, the functions are 'modified' to enforce an additional constraint that the number of people is maintained before and after substitution.²³

Although technically solved simultaneously, the labour market in *Tasman Global* can be thought of as a five-stage process:

- labour makes itself available to the workforce based on movements in the real wage (that is, it actively participates with a certain number of average hours worked per week)
- the age, gender and occupations of the underlying population combined with the participation rate by gender by age implies a given supply of labour (the potentially available workforce)
- a portion of the potentially available workforce is unemployed, implying a given available labour force
- labour chooses to move between occupations based on relative real wages
- industries alter their demands for labour as a whole and for specific occupations based on the relative cost of labour to other inputs and the relative cost of each occupation.

By default, *Tasman Global*, like all CGE models, assumes that markets clear at the start and end of each period. Therefore, overall, supply and demand for different occupations will equate (as is the case in other markets in the model). In principle, (subject to zero starting values) people of any age and gender can move between any of the 97 occupations while industries can produce their output with any mix of occupations. However, in practice the combination of the initial database, the functional forms, low elasticities and moderate changes in relative prices for skills, occupations etc. means that there is only low to moderate change induced by these functions. The changes are sufficient to clear the markets, but not enough to radically change the structure of the workforce in the timeframe of this analysis.

Factor-factor substitution elasticities in non-technology bundle industries are industry specific and are the same as those specified in the GTAP database²⁴, while the fuel-factor and technology bundle elasticities are the same as those specified in GTEM.²⁵ The detailed labour market elasticities are ACIL Allen assumptions, previously calibrated in the context of the model framework to replicate the historical change in the observed Australian labour market over a five year period²⁶. The unemployment rate function in the policy scenarios is a non-linear function of the change in the labour demand relative to the reference case with the elasticity being a function of the unemployment rate (that is, the lower the unemployment rate the lower the elasticity and the higher the unemployment rate the higher the elasticity).

A.5 Detailed Energy Sector and Linkage to *PowerMark* and *GasMark*

Tasman Global contains a detailed representation of the energy sector, particularly in relation to the interstate (trade in electricity and gas) and international linkages across the regions represented. To allow for more detailed electricity sector analysis, and to aid in linkages to bottom-up models such as ACIL Allen's *GasMark* and *PowerMark* models electricity generation is separated from transmission and distribution in the model. In addition, the electricity sector in the model employs a 'technology bundle' approach that separately identifies up to twelve different electricity generation technologies:

- brown coal (with and without carbon capture and storage)
- black coal (with and without carbon capture and storage)
- petroleum
- base load gas (with and without carbon capture and storage)

²³ As discussed in Dixon et al (1997), a standard CES/CET function is defined in terms of *effective units*. Quantitatively this means that, when substituting between, say, X_1 and X_2 to form a total quantity X using a CET function a simple summation generally does not actually equal X . Use of these functions is common practice in CGE models when substituting between substantially different units (such as labour versus capital or imported versus domestic services) but was not deemed appropriate when tracking the physical number of people. Such 'modified' functions have long been employed in the technology bundles of *Tasman Global* and GTEM. The Productivity Commission have proposed alternatives to the standard CES to overcome similar and other weaknesses when applied to internationally traded commodities.

²⁴ Narayanan et al. (2012).

²⁵ Pant (2007).

²⁶ This method is a common way of calibrating the economic relationships assumed in CGE models to those observed in the economy. See for example Dixon and Rimmer (2002).

- peak load gas
- hydro
- geothermal
- nuclear
- biomass
- wind
- solar
- other renewables.

To enable more accurate linking to *PowerMark* the generation cost of each technology is assumed to be equal to their long run marginal cost (LRMC) while the sales price in each region is matched to the average annual dispatch weighted prices projected by *PowerMark* – with any difference being returned as an economic rent to electricity generators. Fuel use and emissions factors by each technology are also matched to those projected in *PowerMark*. This representation enables the highly detailed market based projections from *PowerMark* to be incorporated as accurately as possible into *Tasman Global*.



REFERENCES

- Aguilar, A., Narayanan, B., McDougall, R. (2016), "An Overview of the GTAP 9 Data Base", *Journal of Global Economic Analysis*, 1(1), 181-208. doi:[dx.doi.org/10.21642/JGEA.010103AF](https://doi.org/10.21642/JGEA.010103AF) .
- Austal (2018a), *Production Facilities*, at www.austal.com/production-facilities, accessed 26 October.
- Austal (2018b), *The Australian Shipbuilder: Delivering Northern Australia Capability*, at https://www.austal.com/sites/default/files/00-images-philippines/Northern%20Australia%20Capability%20Statement_web.pdf, accessed 8 October.
- Austral Fisheries (2018), *On Board: Austral Fisheries Northern Prawn Fleet*, at <https://www.australfisheries.com.au/prawn-operation/on-board/>, accessed 24 November.
- Australian Border Force (2018), *Patrol Vessels*, at www.abf.gov.au/about-us/what-we-do/border-protection/maritime/patrolpatrol-vessels, accessed 25 October.
- Australian Commercial Marine Group (2018), *Business Directory*, at <https://www.commercialmarine.com.au/directory/>, accessed 30 September.
- Australian Fisheries Management Authority (2018), *Northern Prawn Fishery*, at <https://www.afma.gov.au/fisheries/northern-prawn-fishery>, accessed 12 November.
- Australian Government (2008), *Australia's Low Pollution Future: the economics of climate change mitigation*, Australian Government, Canberra.
- Australian Marine Complex (2018), *Common User Facility and Marine Support Facility*, at www.australianmarinecomplex.com.au accessed 28 September.
- Australian Maritime Safety Authority (2018a), *The New Survey Requirements for Domestic Commercial Vessels*, at <https://www.amsa.gov.au>, accessed 20 December.
- Australian Maritime Safety Authority (2018b), *Survey Modifiers – Domestic Commercial Vessels*, at <https://www.amsa.gov.au>, accessed 20 December.
- BAE Systems (2014), *Henderson Facility*, at <https://www.baesystems.com/en/download-en/20151109151028/1434555684832.pdf>, accessed 28 September 2018.
- Bhagwan Marine (2018), *Company Profile, Fleet, Services and Projects*, <http://www.bhagwanmarine.com>, accessed 31 October.
- BHP Billiton, *Port Hedland Towage Services Contract*, 9 November 2015, at <https://www.bhp.com/media-and-insights/news-releases/2015/11/port-hedland-towage-service-contract>, accessed 30 October.
- Civmec (2018a), *Offshore Patrol Vessels Contract Award*, Press Release, Singapore, 16 April, at www.civmec.com.au, accessed 9 October.

- Civmec (2018b), *Prime Minister Visits Henderson Facility*, Press Release, Perth 3 October, at www.civmec.com.au, accessed 9 October.
- ConocoPhillips (2018), *Barossa Area Development Offshore Project Proposal*, accepted by National Offshore Petroleum Safety and Environmental Management Authority, March 2018, at <http://www.conocophillips.com.au/what-we-do/our-projects-activities/barossa-project/>, accessed 1 December.
- BSE Maritime Solutions (2018), *Brisbane Slipway and Cairns Slipway*, at <http://www.bse.net.au/brisbane> and <http://www.bse.net.au/cairns>, accessed 30 September.
- Darwin Port (2018), *Pilotage*, at <https://www.darwinport.com.au/facilities-services/pilotage>, accessed 13 November.
- Deloitte Access Economics (2015), *Economic Assessment of Marine Industry Park*, prepared for Land Development Corporation, November.
- Deloitte Access Economics (2016), *Impact on Reported Benefit-Cost Analysis Results from Updated Information on Ship Lifts*, prepared for Land Development Corporation, 24 April.
- Dixon, P., Parmenter, B., Sutton, J., Vincent, D. (1982), *ORANI: A Multisectoral Model of the Australian Economy*, Amsterdam: North Holland.
- Dixon, P., Rimmer, M. (2002), *Dynamic General Equilibrium Modelling for Forecasting and Policy*. Contributions to Economic Analysis 256, Amsterdam: North Holland.
- DOF Subsea (2018), *Capabilities – Vessels*, at <http://www.dofsubsea.com/capabilities/vessels/>, accessed 30 November 2018.
- Guardian Offshore (2018), *Corporate Profile, Fleet and Services*, at <https://www.guardianoffshore.com.au>, accessed 8 November.
- Hastie, H. (2018) *WA Tug Company Wins \$200m Rio Tinto Pilbara Ports Contract*, 11 July, at <http://www.watoday.com.au>, accessed 30 October.
- Hertel, T. (1997), *Global Trade Analysis: Modelling and Applications*, Cambridge University Press, Cambridge.
- Historical Society of the Northern Territory (2018), *Frances Bay Circa 1982*, at https://d.facebook.com/HistoricalSocietyNT/photos/a.588285221241875.1073741841.398104373593295/1863365640400487/?type=3&_tn=%2AW-R, accessed 15 November.
- Industry Capability Network (2017), *Supply Chain Mapping and Gap Analysis: Marine Services*, prepared for Department of Trade, Business and Innovation, Darwin.
- Industry Capability Network (2018), *Statement Of Capacity: Marine Services Industry in the Northern Territory*, prepared for Department of Trade, Business and Innovation, Darwin, at <https://business.nt.gov.au/business/publications/statement-of-capacity-marine-services-industry-in-the-northern-territory>, accessed 30 October 2018.
- Industry Skills Advisory Council, Northern Territory (2017), *Northern Territory Defence Industry Maritime Maintenance Skilling Capacity Analysis*, prepared for Department of Trade, Business and Innovation, Darwin September.
- Jakeman, G., Heyhoe, E., Pant, H., Woffenden, K. and Fisher, B. (2001), *The Kyoto Protocol: Economic Impacts under the Terms of the Bonn Agreement*, ABARE paper presented to the International Petroleum Industry Environmental Conservation Association conference, 'Long Term Carbon and Energy Management - Issues and Approaches', Cambridge, Massachusetts, 15-16 October.
- Joseph, T. (2016a), *Offshore Support Vessels: Their Roles in the Oil and Gas Industry*, 22 January, at <https://www.linkedin.com/pulse/offshore-support-vessels-osv-roles-oil-gas-industry-taiwo-joseph>, accessed 30 November 2018.
- Joseph, T. (2016a), *Offshore Support Vessels: Their Roles in the Oil and Gas Industry – Concluding Part*, 28 January at <https://www.linkedin.com/pulse/offshore-support-vessels-osv-roles-oil-gas-part-taiwo-joseph>, accessed 30 November 2018.

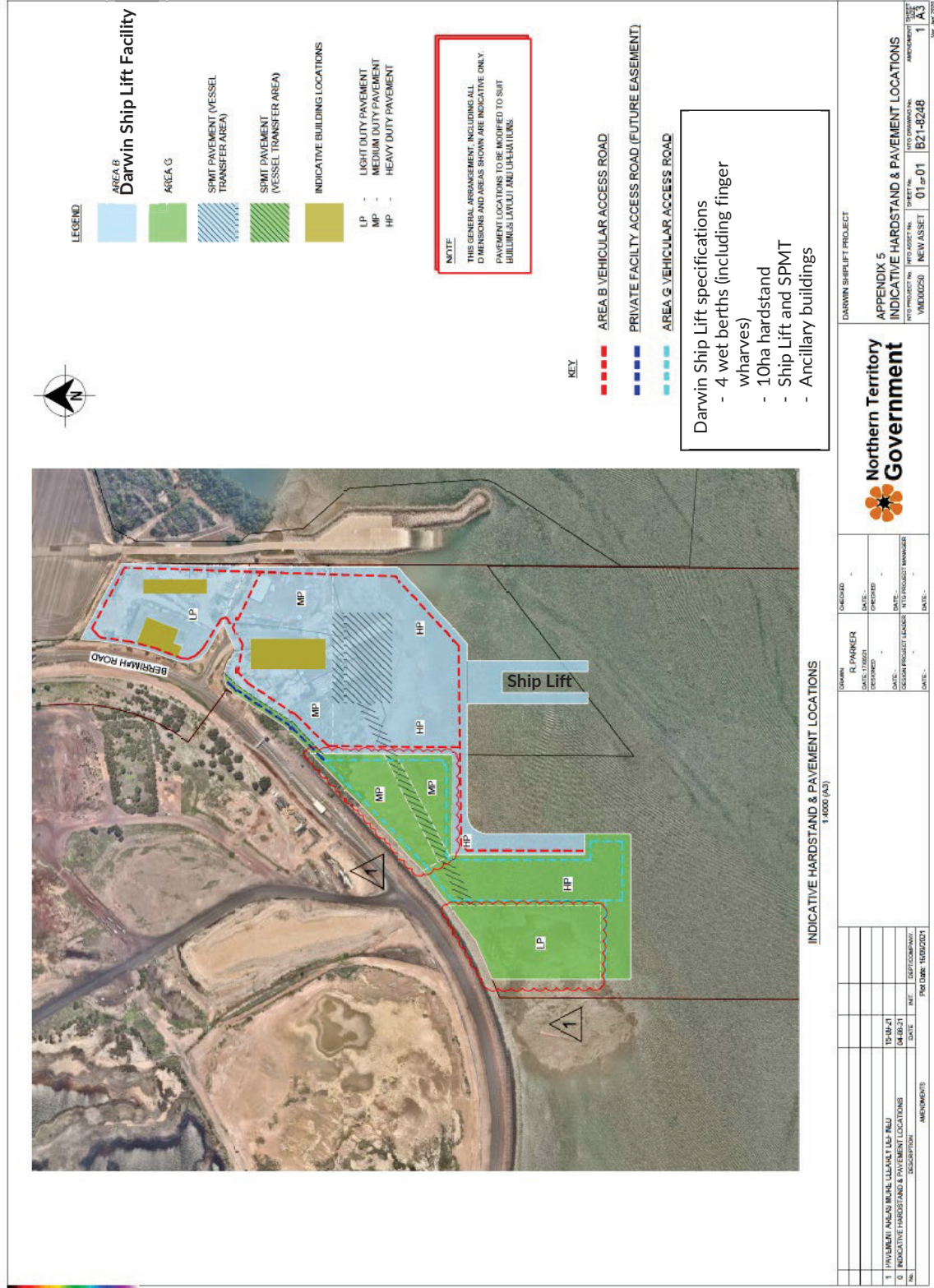
- Larcombe, J., Marton, N. and Curtotti, R. (2018), *Northern Prawn Fishery*, ABARES, Department of Agriculture and Water Resources, at <http://www.agriculture.gov.au/abares/Pages/northern-prawn-fishery.aspx#51-description-of-the-fishery>, accessed 24 November.
- Marine Traffic (2018), *Ship Details and ID*, at <https://www.marinetraffic.com/en/ais/details/ships/shipid>, accessed 1 December.
- MMA Offshore (2017), *Annual Report 2017*.
- MMA Offshore (2018a), *Dampier Slipway Facility*, at <https://www.mmaoffshore.com/onshore-support/onshore-facilities/dampier-slipway-facility>, accessed 29 September.
- MMA Offshore (2018b), *Company Profile, Vessel Fleet, Offshore Services and Onshore Services*, at <https://www.mmaoffshore.com>, accessed 10 October.
- Mott MacDonald (2016a), *Darwin East Arm Marine Industry Park: Market Review Final Report*, prepared for Northern Territory Land Development Corporation, January.
- Mott MacDonald (2016b), *Darwin MIP Technical and Engineering Advisory Services: Dry Dock Options Overview*, prepared for Northern Territory Land Development Corporation, January.
- Mott MacDonald (2017), *Darwin Ship Lift and Marine Industries Project: Preliminary Assessment of Travel Lift Suitability*, prepared for Department of Trade, Business and Innovation, October.
- Mott MacDonald (2018a), *Preliminary Analysis of Darwin Vessel Data*, prepared for Department of Trade, Business and Innovation, 16 March.
- Mott MacDonald (2018b), *Advice from Trevor Langbridge*, prepared for ACIL Allen, 11 October.
- Norship Marine (2018), *About Norship, Services, and Norship Shipyard in Cairns*, at www.norship.com.au, accessed 28 September.
- Northern Territory Government (2016), *Darwin Ship Lift and Marine Industries Project: Call for Expressions of Interest*, Darwin, 5 February.
- Pant, H. (2007), *GTEM: Global Trade and Environment Model*, ABARE Technical Report, Canberra, June.
- Paspaley Group (2018), *Marine Engineering*, at www.paspaleygroup.com/marineengineering, accessed 28 September.
- Pearl Marine Engineering (2018), *Capabilities*, at www.pearlmarineengineering.com/capabilities, accessed 28 September.
- Ports.com (2018), *Sea Route and Distance*, at www.ports.com/sea-route/, accessed 14 November.
- Royal Australian Navy (2018a), *Ships, Boats, Craft*, at www.navy.gov.au/fleet/ships-boats-craft/pb, accessed 25 October.
- Royal Australian Navy (2018b), *HMAS Coonawarra*, at www.navy.gov.au/establishments/hmas-coonawarra, accessed 25 October.
- Royal Australian Navy (2018c), *HMAS Cairns*, at www.navy.gov.au/establishments/hmas-cairns, accessed 25 October.
- Royal Australian Navy (2018d), *Arafura-Class OPV*, at <http://www.navy.gov.au/arafura-class-opv>, accessed 16 November.
- Royal Australian Navy (2018e), *ADV Cape Fourcroy*, at www.navy.gov.au/adv-cape-fourcroy, accessed 25 October.
- Sexton, D., *Threading the Needle at Port Hedland*, 30 August 2017, at <http://www.thedcn.com.au/threading-the-needle-at-port-hedland/>, accessed 30 October.
- Siem Offshore (2018), *Corporate Profile and Fleet*, at www.siemoffshore.com, accessed 10 November.
- SMEC Australia (2018), *SLAMI FEED Study: Basis of Design*, prepared for Northern Ship Support Pty Ltd, 24 August.

Solstad Offshore (2018), *Company Profile, Fleet and Services*, at <https://solstad.com>, accessed 11 November.

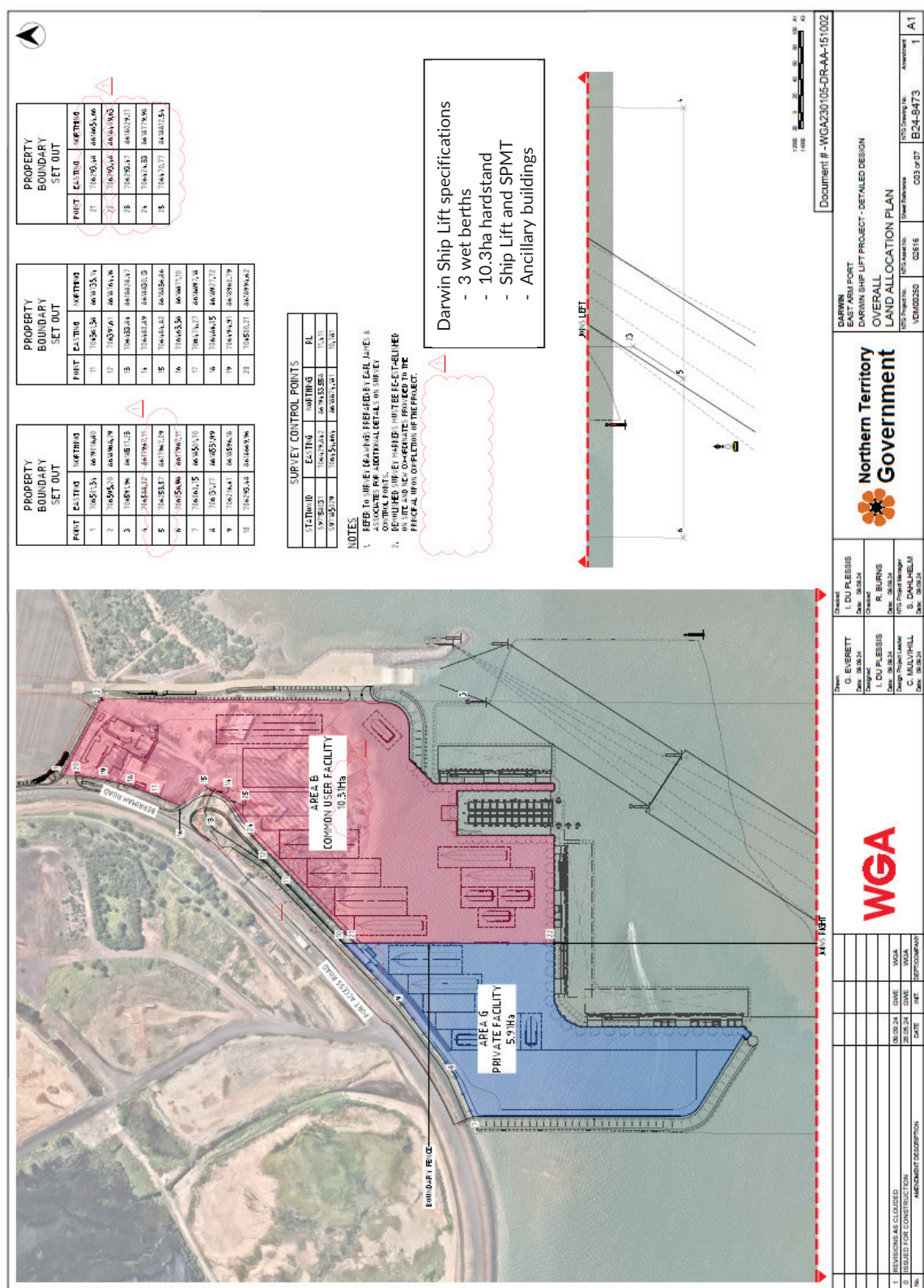
Swire Pacific Offshore (2018), *Corporate Profile, Fleet and Services*, at <http://www.swire.com.sg>, accessed 30 October.

Toll Energy and Marine (2017), *Logistics TEM DOP 706 Toll Dampier Supply Base Port Facility Handbook*, 27 June.

The Yard Brisbane (2018), *Services and Facilities*, at www.theyardbrisbane.com, accessed 29 September.



Attachment G – Current Design



Attachment H – Darwin Ship Lift Potential Demand and Revenue Estimates
June 2025, EY

Darwin Ship Lift Potential Demand and Revenue Estimates

June 2025

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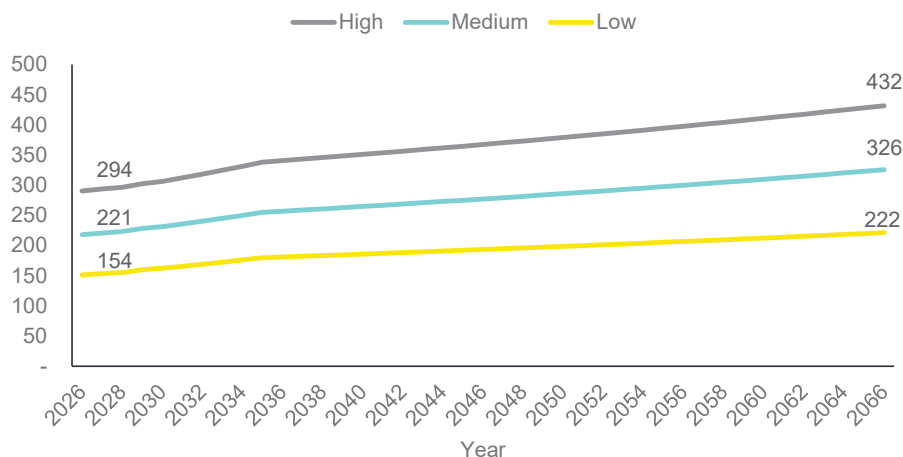
1. Executive Summary

The Darwin Ship Lift facility is being positioned as a key repair and service hub for vessels traveling in the Indo-Pacific and northern Australian waters. The objective of this report is to conduct desktop research on vessel traffic in Darwin Harbour and assess the potential market for the Ship Lift Facility. This assessment is used to estimate potential facility revenue by comparing pricing with existing similar facilities. The Australia Marine Complex (AMC) at Henderson WA was chosen as the benchmark for the range of similar offerings to the Darwin Ship Lift.

Vessels are classified into six sectors: Defence and National Security; Oil & Gas; Aquaculture, Fishing and Pearling; Marine Freight and Port Operations; Tourism; Leisure. Three usage scenarios were created to represent different levels of market uptake, see chart 1 below. The high usage case represents 100% of the identified vessels as using the Ship Lift facility for R&M, while the medium usage scenario adopts a 75% usage rate. In the low case, only vessels homeported in Darwin were assumed to use the facility for R&M. In the medium case, vessels which may use the facility are estimated to rise from 221 to 326, with a 40-year CAGR of 1.0%. In the high case, the vessels grow from 294 to 432, with a 40-year CAGR of 1.0%. In the low case, vessels grow from 154 to 222 resulting in a 40-year CAGR of 0.9%

Chart 1 Vessels by usage case

Vessels



Potential revenue arising from the three usage scenarios is summarised in table 1. The 40-year CAGR for the high, medium, and low case are 4.0%, 4.2% and 4.2% respectively.

Table 1 Revenue by usage case

Revenue	Year 1	Year 5	Year 10	Year 40	Total	40-year CAGR
High	10.8	16.8	20.4	51.9	1,194.7	4.0%
Medium	8.3	13.9	16.9	42.4	981.1	4.2%
Low	7.6	12.7	15.8	38.5	903.4	4.2%

Table 2 shows the R&M demand per vessel per annum which drives revenue for all three usage cases. The resulting revenue for the medium case, split by revenue type, is shown in table 3. Chart 2 illustrates the medium revenue case for the six sectors across the 40-year operational term of the facility.

Table 2 R&M demand by sector

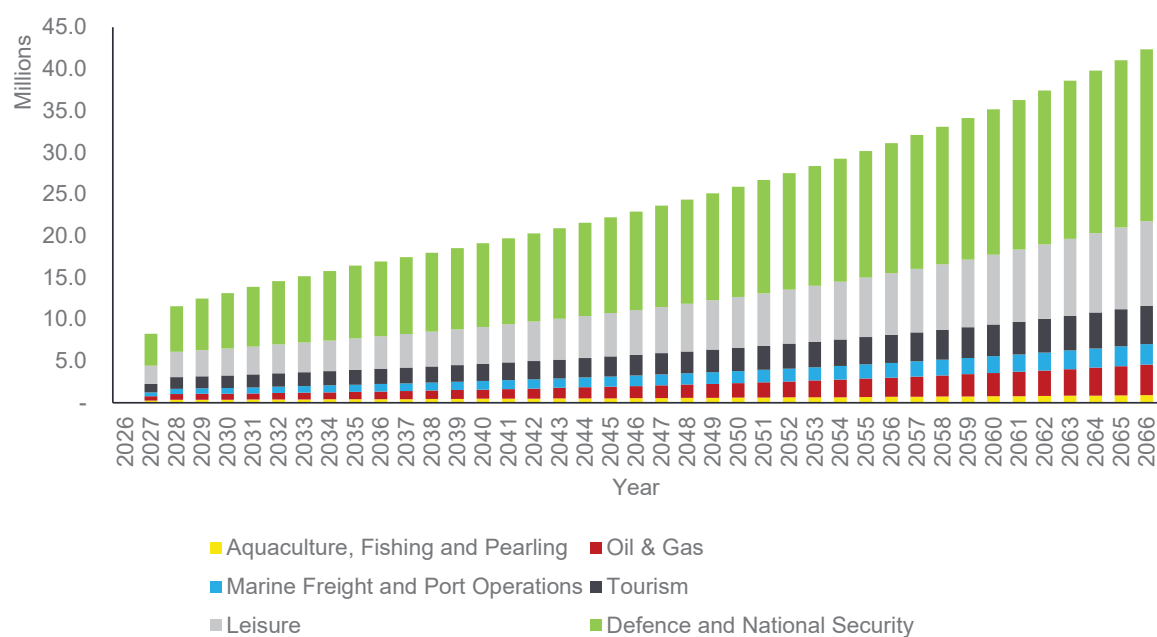
Sector	Vessel type	Dry maintenance	Maintenance	Lifts	Paint and Blast	SPMT
		Days per vessel p.a.	Days per vessel p.a.	# per vessel p.a.	weeks per vessel p.a.	moves per vessel p.a.
Aquaculture, Fishing and Pearling	Fishing	-	-	-	-	-
	Pearling	12.3	-	1.0	0.5	2.0
Oil & Gas	AHT / AHTS	14.0	1.0	0.5	0.3	1.0
	Crew Transfer Vessel	-	-	-	-	-
	PSV / OSV	14.0	1.0	0.5	0.3	1.0
Marine Freight and Port Operations	Tug	7.0	-	0.4	0.2	0.8
	Work boat	-	-	-	-	-
	Pilot vessel	-	-	-	-	-
	Dredger	7.0	-	0.4	0.2	0.8
	Cargo	-	-	-	-	-
Tourism	Tourism	56.0	7.0	2.0	1.0	4.0
Leisure	Leisure	15.0	-	2.0	1.0	4.0
Defence and National Security	Defence / ABF	21.0	21.0	1.0	0.5	2.0

Table 3 Medium case revenue breakdown by type for the 40-year operational term of the facility

Sector	Total Revenue over 40-year operational term of the facility (Medium)					Total
	Ship Lift	Hardstand Area	Paint and Blast	Wet Berth	SPMT	
Aquaculture, Fishing and Pearling	5.9	0.3	0.8	-	15.8	22.8
Oil & Gas	11.2	2.7	1.4	6.1	47.4	68.7
Marine Freight and Port Operations	15.0	0.9	1.9	-	36.7	54.5
Tourism	21.3	2.8	2.7	20.5	59.5	106.8
Leisure	66.1	0.6	8.4	-	157.3	232.4
Defence and National Security	48.3	8.4	6.1	277.6	155.5	496.0
Total facility revenue	167.8	15.7	21.3	304.2	472.2	981.1

Chart 2 Medium case revenue breakdown by sector over the 40-year operational term of the facility

Medium case revenue by sector

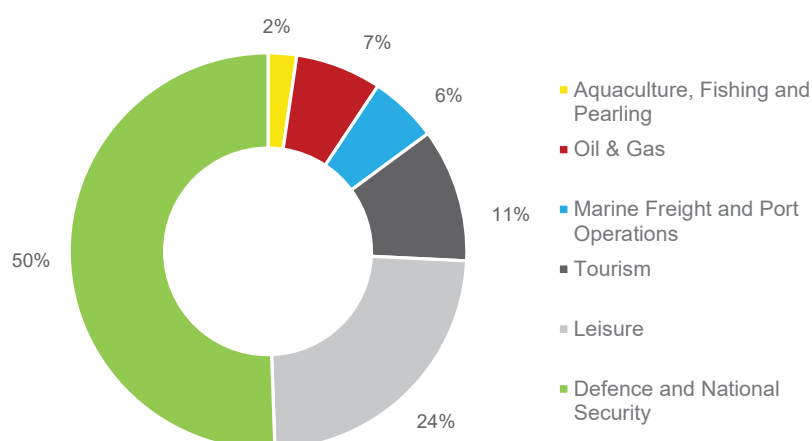


In all three usage cases, including the medium case, there is potential excess demand for the Paint and Blast facility and Wet berths. Revenues were adjusted according to the capacity of the facility at the overall facility level.

At the overall facility level for the medium case, as illustrated in chart 3, revenue is primarily from Defence and National Security (50%), leisure (24%), tourism (11%), Oil & Gas (7%), Marine Freight and Port Operations (6%), and Aquaculture, Fishing and Pearling (2%).

Chart 3 Medium case total revenue by sector over the 40-year operational term

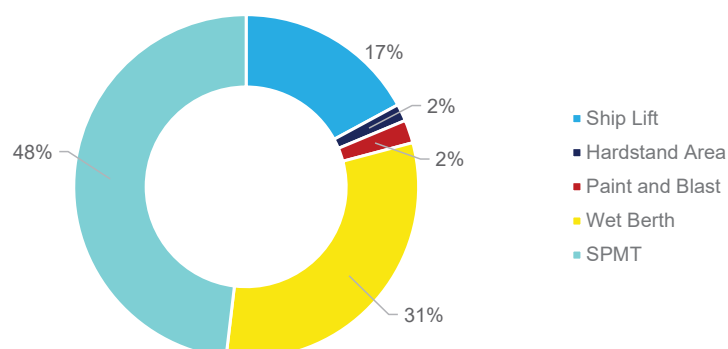
Medium case



In chart 4, the medium case total revenue for the 40-year operational term is broken down by revenue type. SPMT usage, ship lifting, and wet-berth usage account for 48%, 31%, and 17% of facility revenue, respectively. Hardstand and paint and blast facility revenue each represent approximately 2% of total facility revenue.

Chart 4 Medium case total revenue by type over the 40-year operational term

Darwin Ship Lift Facility Revenue Forecast (Medium)



Hardstand revenue is comparatively small due in part to limitations in available information on additional hardstand area requirements for office, storage, equipment, and other working space. Only the area required to 'park' the vessel was modelled. In practice, the hardstand requirement exceeds the area needed to park the vessel, resulting in these revenue estimates potentially being on the conservative side.

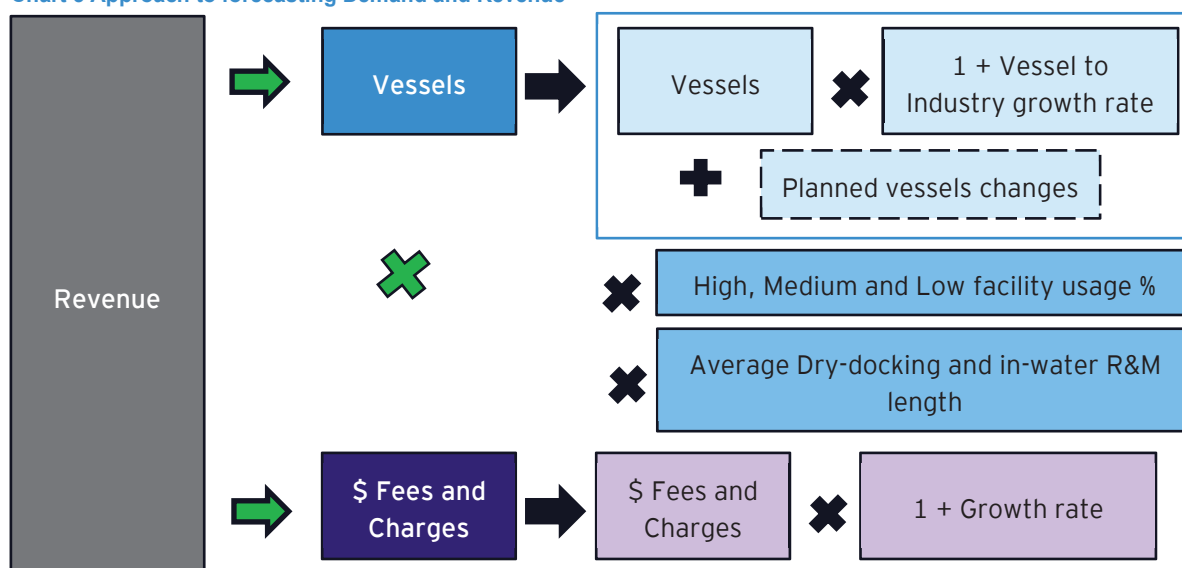
The revenue from the Paint and Blast facility is conservative, as the revenue model assumes for simplicity only one vessel occupies the facility at any given time due to the complexity of modelling the spectrum of possible vessel area combinations. In practice, the facility has the capacity to

accommodate multiple vessels simultaneously, allowing for differential pricing that may lead to increased revenue.

2. Approach to Forecasting Demand and Revenue

A price times quantity approach was employed to forecast potential revenue at the Darwin Ship Lift Facility. This approach leverages data obtained from public data sources, industry reports, and previous work performed by EY on vessel movements in Darwin. The methodology is used to derive indicative potential revenue should vessel number, vessel usage and pricing assumptions hold. The levels of uncertainty associated with these estimates are high and hence multiple revenue scenarios have been generated to provide for an indicative and potential range of revenue outcomes.

Chart 5 Approach to forecasting Demand and Revenue



2.1 Forecasting vessel traffic at the facility

A list of registered vessels was obtained from the Australian Maritime Safety Authority (AMSA) and filtered based on whether their homeport was in the Northern Territory. The vessels were then classified into one of the segments below, according to their type as indicated in the AMSA data.

- Defence and National Security
- Oil & Gas
- Marine Freight and Port Operations
- Aquaculture, Fishing and Pearling
- Tourism
- Leisure

This information was subsequently combined with a list of vessels that are known to frequent the Darwin Harbour but are not homeported in Darwin. Further refinement was performed based on ship lift specifications:

- Length Over-All (LOA) less than or equal to 103 metres and greater than or equal to 15 metres
- Dead Weight Tonnage (DWT) less than or equal to 5500 tonnes
- Bam less than or equal to 26 metres
- Draught less than or equal to 6.95metres

Vessels less than 15 metres in LOA are assumed to be serviced by smaller providers. Adjustments were made to account for specific factors that are anticipated to affect demand, including:

- Defence and National Security – the forecasted number of vessels are adjusted for any planned vessel developments or decommissioning where information is available.

Utilising growth rates from IBISWorld industry reports and government agencies, sectoral growth outlooks were established for time horizons of 5 year (short term), 10 year (medium term), and 10+ (long term). Compounded Annual Growth Rates (CAGR) served as the baseline for growth and were applied conservatively across all sectors for each time frame. Since sector growth does not directly correlate with vessel activity, a discount of 50 percent was applied to convert sector growth into vessel growth. For instance, a sector with a 6% CAGR would translate to a 3% increase in the number of vessels required to support that growth.

2.2 Price benchmarking

Pricing of the Common user facility (CUF), Self-Propelled Modular Transporter (SPMT) and Lifting at the Darwin Ship Lift is benchmarked using comparable facilities that offer similar services. The Australian Marine Complex (AMC) located in Henderson in Western Australia is the only benchmark with publicly available information. Other facilities that could be used for benchmarking but did not have publicly available information include:

- BAE Systems Henderson – 8,000 tonnes ship lift
- Tropical Reef Shipyard – 3,000 tonnes slipway
- Austal Cairns Shipyard – 1,200 tonnes slipway
- Captain Cook Graving Dock Garden Island – 12,000 tonnes floating dock.

The AMC has been operating since 2003 and it offers services and infrastructure including: A CUF covering 40 hectares, deepwater harbour, maintenances and load out wharves, fabrication halls, workshops, offices, laydown and assembly areas, Floating dock with ship lifting capability, SPMTs for the transport of vessels from the floating dock to dry stand¹.

Due to insufficient detailed data on usage of ancillary services such as sewerage connections, admin buildings, etc, only key prices and rates relating to movement of vessel are modelled for the Darwin Ship Lift facility. It is effectively assumed that costs associated with supporting services are bundled into the rates that are used as the basis for estimation.

Prices for the CUF and services are modelled are shown in table 4 and this is based on AMC's 2023-24 pricing schedule^{2,3}. Revenue forecasting utilised prices that included GST. These prices are assumed to grown at CPI 2.5% per annum which is the midpoint of Reserve Bank Australia's target range⁴.

Table 4: Pricing for Darwin Ship Lift Facility

Item	Units	Rate (Excl GST)	Rate (Incl GST)
Ship Lift	\$/day	10,000	11,000
Hardstand Area	\$/sqm/day	0.12	0.13
Paint and Blast	\$/week	5,280	5,808.00
Wet Berth	\$/day	3,610	3,971
SPMT			
2 Trailer lines	\$/activity	10,000	11,000
SPMT	\$/day/axle line	350	385
SPMT (during set up)	\$/hour/axle line	25	28
SPMT power pack	\$/day/unit	700	770

¹ Common User Facility Description, available at <https://developmentwa.com.au/documents/1712-facility-description-2/viewdocument/1712>

² CUF rates available at: <https://developmentwa.com.au/documents/1445-schedule-of-rates-common-user-facility-2/viewdocument/1445>

³ SPMT and Floating Dock rates available at: <https://developmentwa.com.au/documents/1506-schedule-of-rates-floating-dock-and-transfer-system/viewdocument/1506>

⁴ [In Brief: Statement on Monetary Policy – May 2025 | RBA](#)

2.3 Assumptions

The following usage assumptions were applied in the modelling:

- **Ship Lift:** Lifts are required on the day of docking and undocking, which translates to two lifts per vessel per dry-docking. Due to tidal limitations, only two lifts per day are possible.
- **Hardstand:** the area requirement per vessel for each vessel type was derived from average length and beam of the vessel type. It was also rounded up to the closest 100sqm. Note that this is solely the area required to 'park' the vessel and in practice, R&M providers will need additional space for offices, storage, equipment, and other working area. Consequently, hardstand revenue estimates presented in this report are conservative. The hardstand area available for use is approximately 95,000 sqm.
- **Paint and Blast facility:** The price of the smallest fabrication hall (1500 sqm) at AMC was used as a proxy for the paint and blast facility. Paint and Blast facilities are used for activities such as antifouling painting, sandblasting, and anticorrosion coatings that require a controlled climate out of water, typically aligned with dry-docking intervals⁵. It is assumed that vessels require, 1 week in the paint and blast facility each dry-docking, with only one vessel occupying the facility at any given time for revenue modelling purposes given that modelling the spectrum of possible vessel area combinations would introduce unnecessary complexity. However, in practice, the facility may accommodate multiple vessels simultaneously, permitting differential pricing.
- **Wet berth:** This report assumes that the three berths at the Darwin Ship Lift are dedicated exclusively to in-water maintenance, while the demand for general mooring and berthing is accommodated by other providers in Darwin. Unfortunately, useful insights at a vessel type level could not be obtained from publicly available information. A recurring theme is the lack of scheduled in-water maintenance, with such work conducted on an 'as-needed' basis to sustain vessel operations⁶. However, there are typically periods of in-water maintenance performed at a maintenance wharf, either before or after dry-docking activities, with the duration varying based on the type of R&M required. It is advisable to conduct further stakeholder consultations to gain a more comprehensive understanding of maintenance wharf usage. For the purpose of this report, maintenance wharf usage is assumed to be proportional to the duration of dry-docking.
- **SPMTs:** SPMT usage is assumed to occur at the same interval as dry-dockings and arises from two key activities: transporting the vessel to and from the ship lift; usage associated moving vessels to and from the paint and blast facility. This translates to four times per dry-docking. A minimum of 2 trailer lines are used when transporting vessels. The axle lines required are based on the average weight of the vessel type, noting the level of detail publicly available varies. The capacity of each axle line is assumed to be 70 tonnes per axle line as per SPMT capacity of the Darwin Ship Lift facility. Vessels require 1 day for SPMTs and powerpacks, as the AMC considers part of day usage as one full day. An average of 6 hours SPMT set up time is assumed.

2.4 Limitations

The potential market for the Darwin Ship Lift Facility encompasses activities that align with the usage of industrial land at this location. Consequently, the revenue projections in this report should be interpreted as an estimate of market size rather than actual facility revenue. This is because R&M providers which may 'lease' area within the ship lift facility and hire equipment already possess their own shipyards and R&M facilities including slipways, ship lifts. Therefore, to attract and induce these providers and vessel operators to switch, the Darwin Ship Lift Facility must offer a compelling competitive advantage through competitive pricing, exceptional service, or strategic positioning.

⁵Darwin Marine Industry Park Repair and Maintenance Demand analysis

⁶Ibid

3. Defence and National Security Sector

Defence and National security vessel activity in Northern waters of Australia has traditionally been driven by government spending on expanding defence operations and strategy as it is a key strategic hub in the dynamic Indo-Pacific region. This trend is exemplified by the 2024 Naval Shipbuilding and Sustainment Plan (NSP) investing \$123–\$159 billion over the next decade supporting Australian Defence Force maritime capabilities, along with Plan Galileo, which aims to establish Regional Maintenance Centre (RMC) North. RMC North will support the maintenance and sustainment of the Defence and National security vessels including the Evolved Cape Class Patrol Boats, Armidale Class patrol boats and the future Arafura Class Offshore Patrol Vessels in Darwin⁷.

3.1 Potential Market

Repairs and maintenance of these vessel currently are outsourced to local contractors who provide the services, many times, using their own private infrastructure. As these defence initiatives unfold and deep-level maintenance capabilities increase to support the future fleet objectives, the demand for the ship lift facility is expected to increase significantly, driven by the need for efficient maintenance and repair capabilities⁸. Table 5 summarises the potential market for this sector.

Table 5 Potential market for the Defence and National Security sector

Defence and National Security	Current	5-year	10-year	40-year
Sector Growth rate	n/a	11.8 %	11.8 %	1.5 %
Sector to Vessel Growth rate	n/a	5.9 %	5.9 %	0.8 %
High	43	57	73	92
Medium	32	44	57	71
Low	32	42	54	67

The RAN has ten patrol vessels based at HMAS Coonawarra in Darwin including the:

- Armidale class: HMAS Bathurst, HMAS Albany, HMAS Childers.
- Evolved Cape Class: Cape Pillar, Cape Capricorn, Cape Woolamai, Cape Naturaliste, ADV Cape Solander and ADV Cape Schanck⁹

Given that the homeports of the Armidale and Evolved Cape Class are in Darwin and the size and capacity of ship lift facility at HMAS Coonawarra is relatively low and due for decommissioning, sustainment work could be expected to be occur at Darwin Ship Lift once it is operational in 2026.

The Armidale class vessels are expected to be gradually decommissioned and replaced by the Evolved Cape class and Arafura class vessels. The Arafura class Offshore Patrol Vessels (OPV) has 6 vessels including HMAS Arafura, HMAS Eyre, HMAS Pilbara, HMAS Gippsland, HMAS Illawarra, and HMAS Carpentaria. HMAS Arafura and HMAS Eyre is both estimated to be commissioned in 2025 with the remaining commissioning dates unconfirmed as they are under construction at Henderson in Western Australia¹⁰. Although the home port has not been confirmed to be Darwin, the ship lift facility at HMAS Coonawarra cannot accommodate the Arafura class due to facility limitations, thereby making Darwin Ship Lift facility well placed to meet this demand.

Darwin also hosts major exercises and operations involving around 100 visiting Australian and foreign major warships each year. However, RAN and US Navy representatives indicate that the likelihood of using the Darwin Ship Lift facility for planned R&M is low except for unplanned or emergency work.

⁷ [Plan Galileo | Business & Industry | Defence](#)

⁸ Strategic Business Case For the Development of a Marine Industry Park To Support the Growth And Capabilities Of the Maritime Sector In Northern Australia

⁹ [Navy commissions two more patrol boats - Australian Defence Magazine](#)

¹⁰ Naval Shipbuilding And Sustainment Plan 2024

The eight Cape Class Patrol boats operated by the ABF may be serviced at the Darwin Ship Lift, as they currently lack a designated home port¹¹. The 2024 NSP also indicates that future Landing Crafts will operate between NT and Queensland, replacing a portion of the existing landing crafts¹². It is anticipated that the vessels and R&M activity will be apportioned evenly.

Additionally, there is potential for Darwin Ship Lift to handle maintenance services for visiting vessels, particularly from the Pacific fleet.

Short Term (5 Years): A CAGR of 11.8%¹³ is applied in the short term. Growth is driven by the delivery of new vessels to Darwin, maintenance and modernisation of existing fleets, and the enhancement of capabilities at the Darwin Ship Lift.

Medium Term (10 Years): In the medium term, demand is expected to remain high due to the continued introduction of new vessels through the NSP and aging of current vessels increasing maintenance, repair, and overhaul demand. A CAGR of 11.8% is applied¹⁴.

Long Term (10+ years): In the long term, demand is projected to remain steady as the fleet continues to age, necessitating extensive maintenance, repair, and potential life-extension programs. The NSP does not indicate investments after the 10-year horizon so vessel growth is expected to be in line with NT's 10-year GSP CAGR of 1.5%¹⁵.

3.2 Repairs and Maintenance Demand

Estimated requirement of R&M work per vessel per year is summarized in table 6. Defence and national security vessels typically dry-dock for 6 weeks every 2 years which averages to 21 days per vessel per annum. Maintenance wharfs are required by the sector however, the length of usage was not revealed. It is assumed that maintenance wharf usage is proportional to dry-docking.

Table 6 R&M activities required by the Defence and National Security sector at the Darwin Ship Lift facility

Item	Unit	Defence / ABF
Dry maintenance	Days per vessel p.a.	21.0
Maintenance wharf	Days per vessel p.a.	21.0
Lifts	# per vessel p.a.	1.0
Paint and Blast	weeks per vessel p.a.	0.5
SPMT	moves per vessel p.a.	2.0

Other requirements identified by the sector include: dedicated office space, storage sheds, training facilities, parking, utilities, road access¹⁶ which translates to greater hardstand area requirement. However, these were not modelled as part of revenue.

3.3 Revenue Forecast

Revenue was forecasted based on the potential market of Defence and National Security vessels, utilising medium, high, low usage cases, along with prices from existing comparable facilities. In the high scenario, all vessels within facility's service capacity were assumed to use the Ship Lift, while the medium case assumes 75%. The low case assumes only vessels homeported in Darwin may use the facility for R&M. The total revenue over the operational term of the facility is illustrated in table 7 and chart 6. A large portion of the vessels in this sector are homeported in Darwin, resulting in similar revenue figures for the Medium and Low case (i.e. the 'Medium' line cannot be seen on the chart as it

¹¹ Strategic Business Case For The Development Of A Marine Industry Park To Support The Growth And Capabilities Of The Maritime Sector In Northern Australia

¹² [Australia pushes ahead on reinstating heavy landing capability with selection of Damen | Shephard](#)

¹³ [Performance - C2391 Shipbuilding and Repair Services in Australia - MyIBISWorld](#)

¹⁴ Ibid

¹⁵ [NT Industry Outlook](#)

¹⁶ Strategic Business Case For The Development Of A Marine Industry Park To Support The Growth And Capabilities Of The Maritime Sector In Northern Australia

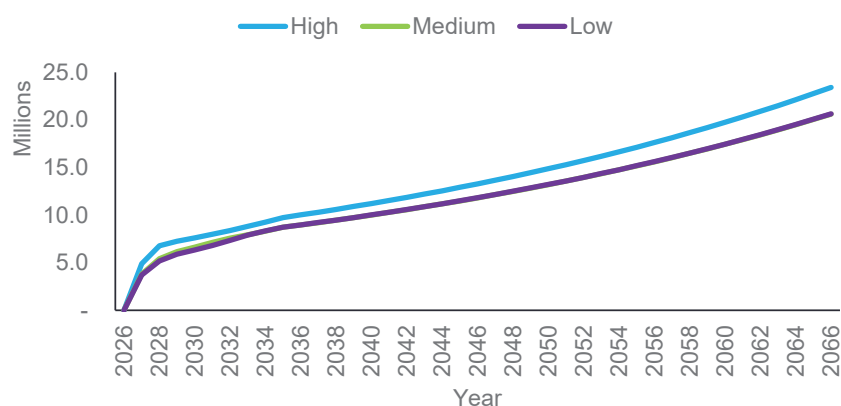
is overshadowed by the 'Low' line). The difference between the High and Medium and High and Low case is approximately \$64 million and \$65 million respectively.

Table 7 Total revenue over the 40-year operational term of the facility

Case	Revenue
High	560.7
Medium	496.0
Low	495.1

Chart 6 Defence and National Security sector Revenue over the 40-year operational term of the facility

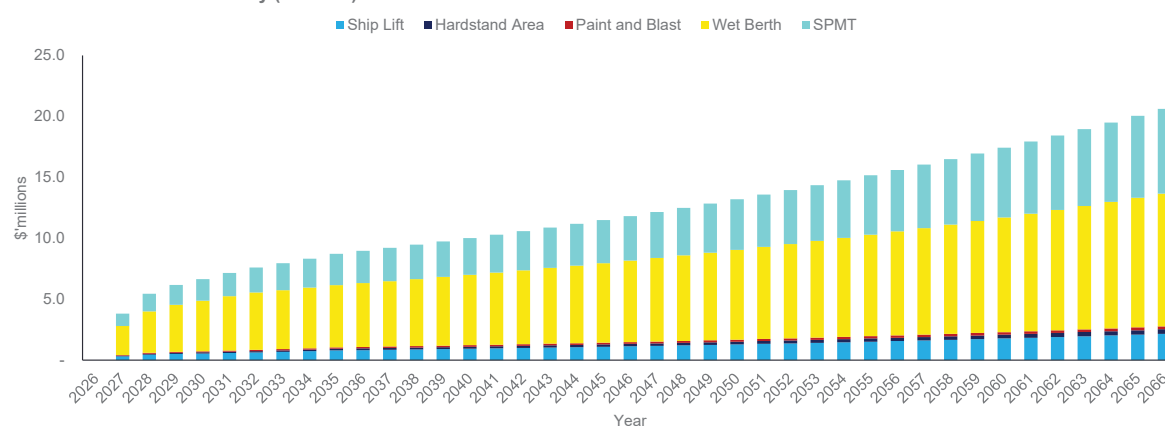
Defence and National Security



Under the medium usage case, as illustrated in chart 7, facility revenue is driven by maintenance wharf usage, followed by SPMT, Ship Lift, Paint and Blast facility usage. Relatively little revenue is generated from hardstand usage as the price of the hardstand is relatively low compared to other items and hardstand requirement in practice is larger than area required to 'park' the vessel. There is excess demand for wet-berths and the paint and blast facility, and this has been adjusted to the capacity of the facility.

Chart 7 Medium case revenue by type over the 40-year operational term of the facility

Defence and National Security (Medium)



4. Oil & Gas

Northern Territory's oil and gas sector extensively relies on the marine interface and services. These include shipping for export purposes, importing for components for large scale multi-billion-dollar projects, and providing services and support to the offshore gas industry. Darwin is home to the Darwin LNG and Ichthys LNG plants and more widely, Middle Arm is positioned as a future sustainable industrial precinct for oil, gas and energy sector. Current vessels traffic is driven by production from the onshore Amadeus basin and offshore Bayu-Undan, Blacktip and Ichthys fields. The Barossa field is planned to be the source of gas to backfill Darwin LNG from 2025, following the end of field life at Bayu-Undan. The Barossa field, located 300 km north of Darwin, is set to be the source of backfill gas for Darwin LNG facility from 2025, after the Bayu-Undan field reaches its end of economic life¹⁷.

As the offshore oil and gas fields reach the end of economic life, there is potential for Darwin to become a decommissioning service centre. The pipeline of decommissioning work in Australia has an estimated valued of over \$50 billion and Darwin Ship Lift with its heavy lifting capability can potentially play a crucial role in providing R&M for vessels involved.

There is also significant potential in the Beetaloo sub-basin which is estimated by industry to be a p50 resource containing 500 trillion cubic feet of gas and increase economic activity by \$17billion¹⁸. If commercially viable volumes can be produced, it would potentially bring elevate levels of maritime activity including shipping of heavy machinery, drilling equipment, and other materials to the basin.

4.1 Potential Market

Oil & Gas vessels that may use the Darwin Ship Lift facility consists of Anchor Handling Tugs (AHT) / Anchor Handling Tugs Supply (AHTS), Platform Supply Vessel (PSV) / Offshore Support Vessels (OSVs), and Crew Transfer Vessels¹⁹. Freight vessels used for exports and imports are covered in Marine Freight and Port Operations section. Stakeholders have indicated that major or routine repairs and maintenance are conducted internationally, such as in Singapore or Indonesia due to shorter wait times and costs²⁰.

Table 8 Potential market for Oil & Gas

Oil & Gas	Current	5-year	10-year	40-year
Sector Growth rate	n/a	(3.2%)	4.5 %	4.5 %
Sector to Vessel Growth rate	n/a	(1.6%)	2.3 %	2.3 %
High	28	26	29	56
Medium	21	19	22	42
Low	4	4	4	8

Short Term (5 Years): In the short term, there is considerable volatility due to fluctuations in oil and gas prices, exchange rate movements, annual production volumes, and variations in both domestic and export demand. While output has increased over the past decade, global oil and natural gas prices have exhibited significant instability. Thus, a negative growth rate of -3.2%²¹ was applied.

¹⁷ Santos Western Australia and Northern Australia Offshore Quarterly Update. Available at https://www.santos.com/wp-content/uploads/2025/04/Santos-WA-and-NT-Quarterly-Update-March-2025_Final.pdf

¹⁸ Beetaloo Sub-basin. Available at [Beetaloo Sub-basin | Our Territory Gas Plan](#)

¹⁹ Strategic Business Case For The Development Of A Marine Industry Park To Support The Growth And Capabilities Of The Maritime Sector In Northern Australia

²⁰ Strategic Business Case For The Development Of A Marine Industry Park To Support The Growth And Capabilities Of The Maritime Sector In Northern Australia

²¹ [Performance - B0700 Oil and Gas Extraction in Australia - MyIBISWorld](#)

Medium Term (10 Years) and Long Term (10+ years): In the medium and long term, it is anticipated that grow rates will revert to historical 10-year CAGR of 4.5%²² driven by easing tensions, and pipeline of decommissioning work for offshore oil and gas producers.

4.2 Repairs and Maintenance Demand

Estimated requirement of R&M work per vessel per year is summarized in table 9. Dry-dockings are typically scheduled for 2.5-year to 5 year cycles with costs varying by age, complexity, and size of the vessel²³. For simplicity 4-year dry-docking cycles are assumed with the length of dry-dockings averaging to 14 days per vessel per annum. There are no scheduled in-water maintenance periods for these vessels but vessels tend to have 1 or 2 day in-water survey at a two-and-a-half year point²⁴. There is insufficient data for crew transfer vessels in relation to R&M so no assumptions were included in modelling.

Table 9 R&M activities required by the Oil & Gas sector at the Darwin Ship Lift facility

Item	Unit	AHT / AHTS	Crew Transfer Vessel	PSV / OSV
Dry maintenance	Days per vessel p.a.	14.0	-	14.0
Maintenance wharf	Days per vessel p.a.	1.0	-	1.0
Lifts	# per vessel p.a.	0.5	-	0.5
Paint and Blast	weeks per vessel p.a.	0.3	-	0.3
SPMT	moves per vessel p.a.	1.0	-	1.0

4.3 Revenue Forecast

Revenue was forecasted based on the potential market of Oil and Gas vessels, utilizing medium, high, low usage cases, along with prices from existing comparable facilities. In the high scenario, all of the vessels within facility's service capacity were assumed to use the Ship Lift, while the medium case assumes 75%. The low case assumes only vessels homeported in Darwin may use the facility for R&M. The total revenue over the 40-year operational term of the facility is shown in table 10 and chart 8. The difference between the high and medium case is approximately \$21 million, while the difference between the high and low case is approximately \$78 million. In the low case, revenue drops significantly due to a salient portion of the vessels being homeported outside of Darwin, such as in Singapore or Dampier.

Table 10 Total revenue over the 40-year operational term of the facility

Case	Revenue
High	89.3
Medium	68.7
Low	11.0

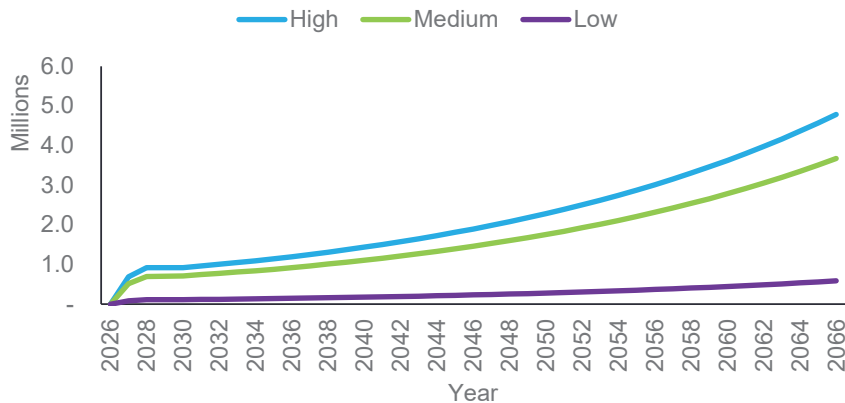
²² [NT Industry Outlook](#)

²³ Darwin Marine Industry Park Repair and Maintenance Demand analysis

²⁴ Ibid

Chart 8 Oil & Gas sector Revenue over the 40-year operational term of the facility

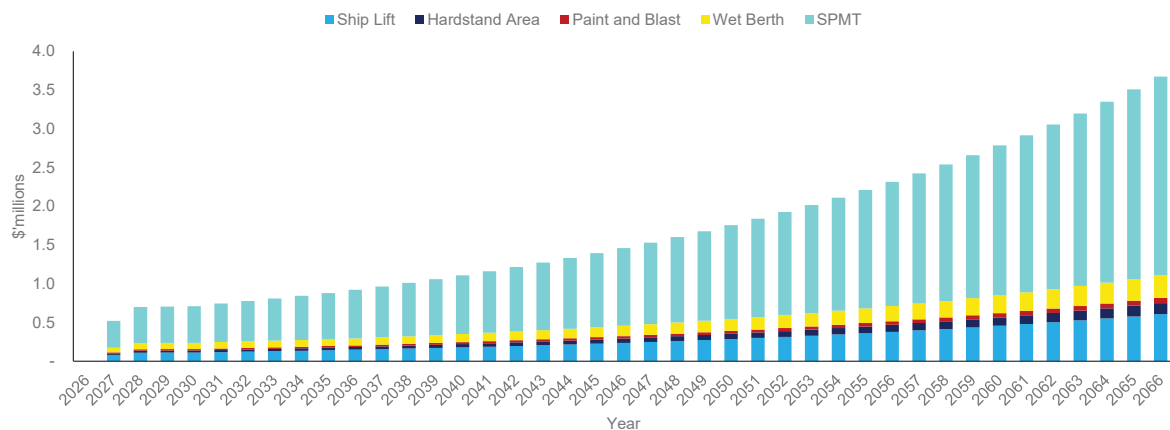
Oil & Gas



In the medium case, facility revenue is primarily generated by SPMT usage, followed by the Ship Lift, maintenance wharf, and then the Paint and Blast facility usage as illustrated in chart 9. For this sector, dry-docking occurs at intervals of 4 years, resulting in lower average yearly demand. Little revenue is generated from hardstand usage as the price of the hardstand is extremely low compared to other items, noting that hardstand requirement in practice is larger than area required to 'park' the vessel. As there is excess demand for wet-berths and the paint and blast facility at the overall facility level, revenue for these two items have been adjusted for each sector according to the capacity of the facility.

Chart 9 Medium case revenue by type over the 40-year operational term of the facility

Oil & Gas (Medium)



5. Aquaculture, Fishing and Pearling

The Aquaculture, Fishing, and Pearling sector in the NT plays a vital role in the regional economy, contributing significantly to both local consumption and export markets. With a GVP of \$125 million²⁵, this sector encompasses a variety of activities, including wild catch fisheries, aquaculture, and pearling. Key species include barramundi, mud crab, and various types of prawns, which are essential to both local consumption and export markets. The NT Government oversees and regulates commercial fishing through Fisheries NT. The types of licenses available are limited and can be bought, sold, or leased. This restriction on commercial fishing licenses inherently constrains the sector's growth potential. In the absence of new licenses being issued, growth is expected to shift towards the onshore aquaculture industry, particularly in barramundi farming. It is unlikely these license holders will make use of the ship lift.

The fishing fleet is predominantly based in Darwin, particularly in the Frances Bay precinct, which is strategically located for efficient operations. These vessels are not likely to use the Ship Lift facility²⁶. Due to confidentiality, there is limited data in relation to the production value of pearling to the Territory, but Darwin is an important hub for pearling with several Darwin-based vessels operating in Northern Australia. These vessels are more likely to use the facility for dry-maintenance but not in-water maintenance which requires a maintenance wharf²⁷.

5.1 Potential Market

Table 11 summarises the potential market for this sector from vessel modelling.

Table 11 Potential market for Aquaculture, Fishing and Pearling sector

Aquaculture, Fishing and Pearling	Current	5-year	10-year	40-year
Sector Growth rate	n/a	0.3 %	0.1 %	0.1 %
Sector to Vessel Growth rate	n/a	0.1 %	0.1 %	0.1 %
High	55	55	56	57
Medium	41	42	42	43
Low	27	27	27	28

Short Term (5 Years): the weighted-average sector CAGR is 0.3%^{28,29}. This is driven by a combination of factors. As inflationary pressures subside, an increase in disposable incomes is expected to boost consumer demand for seafood, coupled with a growing awareness of nutritional benefits. This trend indicates a greater need for seafood to satisfy demand. Barramundi farming, is projected to continue its growth trajectory, contributing significantly to the overall production value. Pearling activity is expected to remain steady in the NT and provide a demand for the ship lift.

Medium Term (10 Years) and Long Term (10+ years): In the medium and long term, a decline in revenue stemming from diminishing fishery stocks is expected to continue impacting vessel activity. The aquaculture sector is anticipated to see an increase in production as new species are explored and innovative farming techniques may diversify the sector and enhance its resilience³⁰. The aquaculture industry is expected to evolve, with advancements in technology and practices leading to increased production capabilities.

²⁵ [NT Industry Outlook](#)

²⁶ Strategic Business Case For The Development Of A Marine Industry Park To Support The Growth And Capabilities Of The Maritime Sector In Northern Australia

²⁷ Ibid

²⁸ [At a Glance - A0200 Aquaculture in Australia - MyIBISWorld](#)

²⁹ [At a Glance - A0410 Fishing in Australia - MyIBISWorld](#)

³⁰ [NT Industry Outlook](#)

5.2 Repairs and Maintenance demand

Estimated requirement of R&M work per vessel per year is summarized in table 12. AMSA requires commercial fishing vessels to perform two dry-dockings every 5-year. For modelling, 2-year dry-docking intervals are assumed for pearling vessels with the average length of dry-dockings being 12 days per vessel per annum. In-water maintenance demanding maintenance wharf usage performed elsewhere.

Table 12 R&M activities required by the Aquaculture, Fishing, and Pearling sector at the Darwin Ship Lift facility

Item	Unit	Fishing	Pearling
Dry maintenance	Days per vessel p.a.	-	12.3
Maintenance wharf	Days per vessel p.a.	-	-
Lifts	# per vessel p.a.	-	1.0
Paint and Blast	weeks per vessel p.a.	-	0.5
SPMT	moves per vessel p.a.	-	2.0

5.3 Revenue Forecast

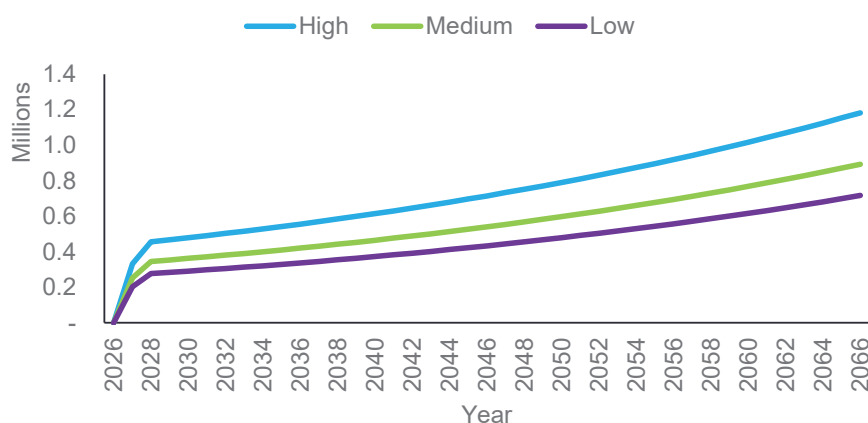
Revenue was estimated based on the potential market of Aquaculture, Fishing and Pearling vessels, utilizing medium, high, low usage cases, along with prices from existing comparable facilities. In the high scenario, all the vessels within facility's service capacity were assumed to use the Ship Lift, while the medium case assumes 75%. The low case assumes only vessels homeported in Darwin may use the facility for R&M. The total revenue over the 40-year operational term of the facility is shown in table 13 and chart 10. The difference between the high and medium case is approximately \$8 million, while the difference between the high and low case is approximately \$12 million.

Table 13 Total Revenue over the 40-year operational term of the facility

Case	Revenue
High	30.1
Medium	22.8
Low	18.3

Chart 10 Aquaculture, Fishing and Pearling sector Revenue over the 40-year operational term of the facility

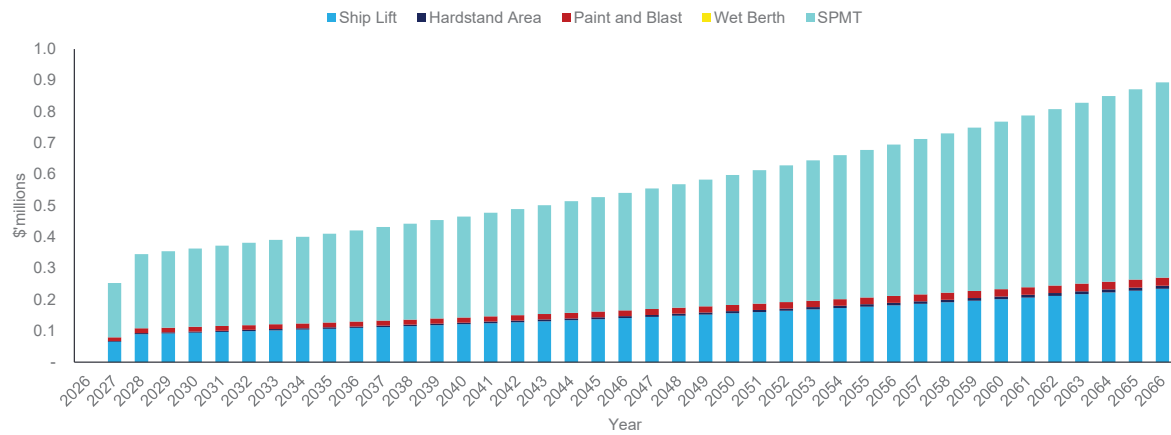
Aquaculture, Fishing and Pearling



In the medium case, illustrated in chart 11, facility revenue is primarily driven by SPMT usage, followed by Ship Lift, and Paint and Blast facility usage. Minimal revenue is generated from hardstand usage as the price of the hardstand is extremely low compared to other items and note that hardstand requirement in practice is larger than area required to 'park' the vessel. As there is excess demand for wet-berths and the paint and blast facility at the overall facility level, revenue for these two items have been adjusted for each sector according to the capacity of the facility.

Chart 11 Medium case revenue by type over the 40-year operational term of the facility

Aquaculture, Fishing and Pearling (Medium)



6. Marine Freight and Port Operations Sector

The Marine Freight and Port Operations sector in the Northern Territory is a crucial component of the region's economy, facilitating access to essential goods for the NT community as well as supporting the operations of the defence, oil and gas, and tourism sector. The sector comprises of two key activities:

- Port Operations Activities: Tugs, Work Boats, Pilot Vessels, and Dredgers
- Marine Freight Activities: small cargo, landing crafts and barges

Towage tugs are used to move vessels around ports, harbours and water channels. A large portion of the tugs are not based in Darwin so only tugs known to operate in the area were included.

Containers, chemical and product tankers and bulk carriers represent a source of demand for port operations vessels but are not considered a potential class of demand for the Darwin Ship Lift Facility as the majority are flagged in Asia, for example in Indonesia and Singapore³¹. These vessels are expected to undertake R&M in their home port country.

Smaller cargo vessels, landing crafts and barges are essential for communities along the northern coastline delivering goods to remote areas, especially when roads become inaccessible during the wet season.

6.1 Potential Market

Port Operations: Tugs, Work Boats, Pilot Vessels, and Dredgers

Modelling forecasts growth in port operation vessels over the next 40 years, reflecting the average growth rate in tourism, cargo, defense, oil & gas sectors. It is expected that growth in the oil and gas, and defence sectors will outpace the national average over the next 15 years but will stabilize once key projects are established.

Table 14 summarizes the modelling results for port operation vessels, including tugboats, work boats, pilot vessels, and dredgers. This analysis excludes coastal barges, which are addressed separately in this chapter. According to strategic business case for the MIP, tugs and dredgers would use the ship lift facility for dry-docking only. In-water maintenance at a maintenance wharf is performed elsewhere³².

Table 14 Potential market for Port Operations

Port Operations	Current	5-year	10-year	40-year
Sector Growth rate	n/a	3.0 %	4.9 %	1.9 %
Sector to Vessel Growth rate	n/a	1.5 %	2.4 %	1.0 %
High	59	64	72	95
Medium	44	48	54	72
Low	18	19	22	29

Cargo: small cargo, landing crafts and barges

The wet season restricts access to coastal regions and remote communities in northern Australia and vessels in this category provide essential connectivity during this period. SeaSwift is one of the key players in the NT, offering scheduled freight and cargo, project, and charter services, across 3 ports in Darwin, Gove, and Groote Eylandt.

³¹ Darwin Marine Industry Park Repair and Maintenance Demand analysis

³² Strategic Business Case For The Development Of A Marine Industry Park To Support The Growth And Capabilities Of The Maritime Sector In Northern Australia

Over the next 40 years, growth of this vessel type will persist without significant investment in road and rail infrastructure. It is anticipated that upon the retirement of existing vessels, new additions to the fleet will feature increased capacity, consistent with global trends³³. Consequently, the size of the fleet is expected to remain static, with the understanding that capacity will still increase, see table 15. According to strategic business case for the MIP, vessels in this category are unlikely to use the ship lift facility³⁴.

Table 15 Potential market for Cargo

Cargo	Current	5-year	10-year	40-year
Sector Growth rate	n/a	0.4 %	0.4 %	0.4 %
Sector to Vessel Growth rate	n/a	0.2 %	0.2 %	0.2 %
High	41	41	42	44
Medium	31	31	31	33
Low	18	18	18	19

6.2 Repairs and Maintenance Demand

The scope and costs of R&M work increase as vessels age. For instance, dry-docking for tugs may require the removal and rebuilding of thrusters while general cargo vessels often involve replacing the decking board. The average annual R&M work per vessel is summarized in Table 16.

These vessels are typically dry-docked on 5-year cycles. In-water maintenance is unlikely to be done at the ship lift facility.

Table 16 R&M activities required by the Marine Freight and Port Operations sector at the Darwin Ship Lift facility

Item	Unit	Tug	Work boat	Pilot vessel	Dredger	Cargo
Dry maintenance	Days per vessel p.a.	7.0	-	-	7.0	-
Maintenance wharf	Days per vessel p.a.	-	-	-	-	-
Lifts	# per vessel p.a.	0.4	-	-	0.4	-
Paint and Blast	weeks per vessel p.a.	0.2	-	-	0.2	-
SPMT	moves per vessel p.a.	0.8	-	-	0.8	-

6.3 Revenue Forecast

Revenue was forecasted based on the potential market of Marine Freight and Port Operations sector, utilizing medium, high, low usage cases, along with prices from existing comparable facilities. In the high scenario, all of the vessels within facility's service capacity were assumed to use the Ship Lift, while the medium case assumes 75%. The low case assumes only vessels homeported in Darwin may use the facility for R&M. The total revenue over the 40-year operational term of the facility is shown in table 17 and chart 12. The difference between the high and medium case is approximately \$18 million. The High and Low case revenue difference is approximately \$50 million largely driven by a large portion of the vessel not homeported in Darwin.

Table 17 Total Revenue over the 40-year operational term of the facility

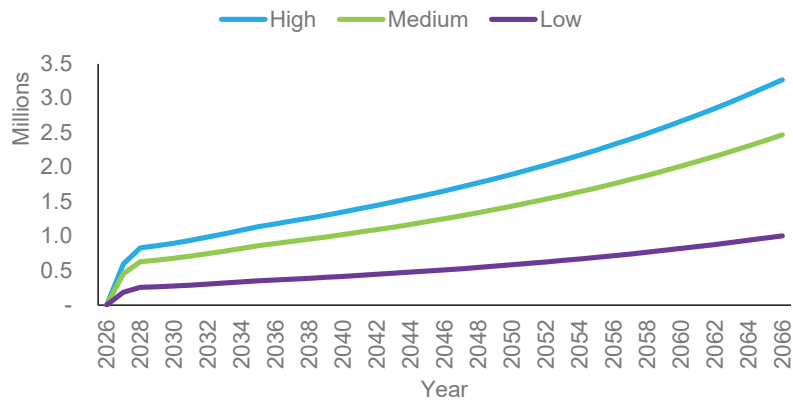
Case	Revenue
High	72.1
Medium	54.5
Low	22.2

³³ [Performance - I5212 Port and Water Transport Terminal Operations in Australia - MyIBISWorld](#)

³⁴ Strategic Business Case For The Development Of A Marine Industry Park To Support The Growth And Capabilities Of The Maritime Sector In Northern Australia

Chart 12 Marine Freight and Port Operations sector Revenue over the 40-year operational term of the facility

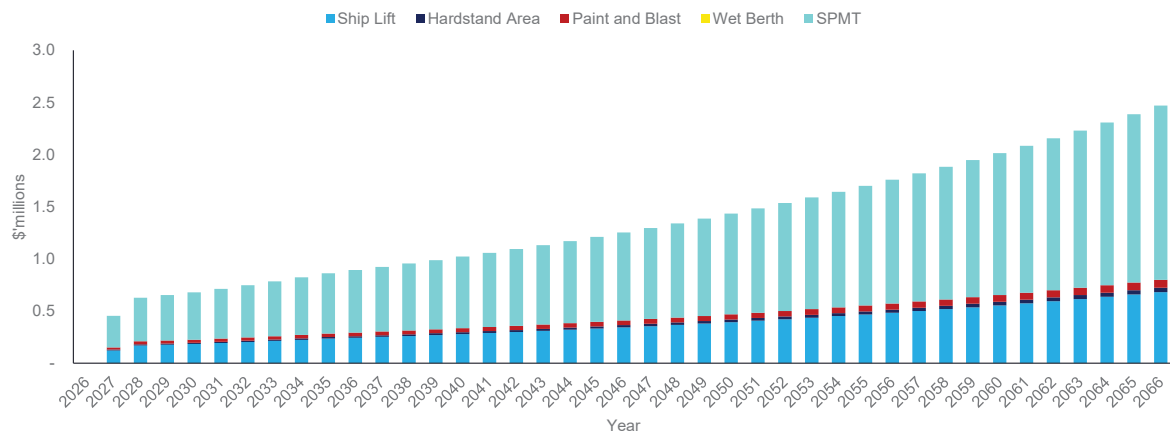
Marine Freight and Port Operations



In the medium case, facility revenue is primarily driven by SPMT usage, followed by Ship Lift, and Paint and Blast facility usage. As illustrated in chart 13, minimal revenue is generated from hardstand usage as the price of the hardstand is extremely low compared to other items and note that hardstand requirement in practice is larger than area required to 'park' the vessel. As there is excess demand for wet-berths and the paint and blast facility at the overall facility level, revenue for these two items have been adjusted for each sector according to the capacity of the facility.

Chart 13 Medium case revenue by type over the 40-year operational term of the facility

Marine Freight and Port Operations (Medium)



7. Tourism

Darwin's strategic location as a conduit between Western Australia and Queensland's tropical coastline enhances its attractiveness to expedition cruise passengers and operators. The NT Government continues to prioritize cruise tourism growth, promoting Darwin as the preferred cruise gateway through the Cruise Tourism Strategy 2022-2025 to increase the number of cruise liners and expedition ships. In 2024, the NT generated \$181 million in total activity (~1.5% of the overall tourism sector activity) and supported 527 jobs from cruise ship visits, with Darwin serving as the primary port. In 2023-24, 107 cruise and expedition ships visited Darwin port³⁵ which represents a 55% increase from average pre-pandemic levels, or a 5-year CAGR of 9%.

7.1 Potential Market

Tourism vessels operating in Darwin Harbour range from large international cruise ships to 50-meter sailing catamarans for sunset tours and small passenger ferries. These vessels are owned by a variety of companies that currently utilize a limited number of local and national contractors for services, as well as private infrastructure for permanent berth and R&M activities. Table 18 summarises the modelling results.

Table 18 Potential market for Tourism

Tourism	Current	5-year	10-year	40-year
Sector Growth rate	n/a	3.1 %	3.1 %	1.5 %
Sector to Vessel Growth rate	n/a	1.6 %	1.6 %	0.8 %
High	14	15	16	20
Medium	11	11	12	15
Low	7	8	8	10

Short Term (5 Years): In the short term, growth is expected to be driven by recovery to pre-pandemic levels. The NT Budget indicates that domestic and international overnight visitations in 2024 were 16.5% and 25.9% below pre-pandemic levels, respectively, but are expected to return to those levels, equating to a CAGR of 3.1% over the next five years.

Medium Term (10 Years): The number of cruise liners and expedition ships visiting the Northern Territory is expected to increase due to expanded berthing capacity at Darwin Port for the 2032 Brisbane Olympics. Superyachts Australia predicts an additional 200 foreign vessels will visit Australia, leading to a forecasted annual growth rate of 3.1%.

Long Term (10+ Years): The Northern Territory is expected to consolidate its position as a premier destination for marine tourism with CAGR settling to the 1.5% in line with the NT's 10-year GSP growth rate.

7.2 Repairs and Maintenance demand

Only larger vessels, 15 metres in length or more, are likely to use the ship lift facility for R&M. These vessels dry-dock each year and the demand for services are summarised in table 19.

Table 19 R&M activities required by the Tourism sector at the Darwin Ship Lift facility

Item	Unit	Tourism
Dry maintenance	Days per vessel p.a.	56.0
Maintenance wharf	Days per vessel p.a.	7.0
Lifts	# per vessel p.a.	2.0
Paint and Blast	weeks per vessel p.a.	1.0
SPMT	moves per vessel p.a.	4.0

³⁵ [Cruise Ships | Darwin Port](#)

7.3 Revenue Forecast

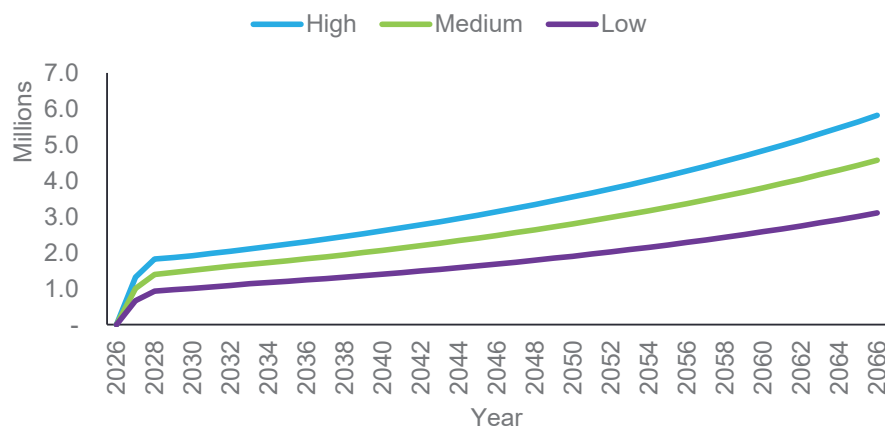
Revenue was forecasted based on the potential market of Tourism sector, utilizing medium, high, low usage cases, along with prices from existing comparable facilities. In the high scenario, all of the vessels within facility's service capacity were assumed to use the Ship Lift, while the medium case assumes 75%. The low case assumes only vessels homeported in Darwin may use the facility for R&M. The total revenue over the 40-year operational term of the facility is shown in table 20 and chart 14. The difference between the high and medium case is approximately \$29 million. The high and Low case revenue differs by approximately \$63 million driven by a large portion of the vessels not being homeported in Darwin.

Table 20 Total revenue over the 40-year operational term of the facility

Case	Revenue
High	135.4
Medium	106.8
Low	72.4

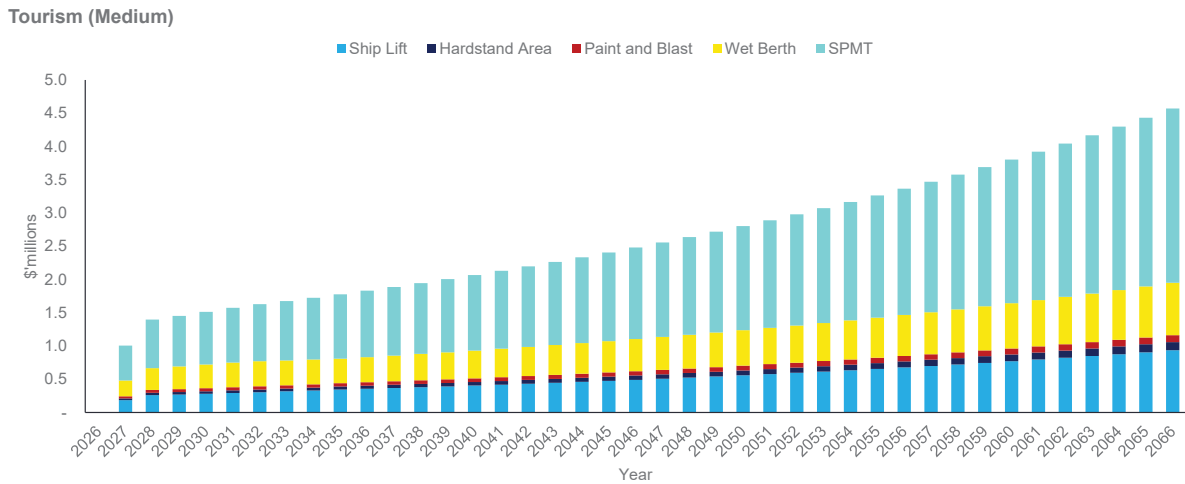
Chart 14 Tourism sector Revenue over the 40-year operational term of the facility

Tourism



In the medium case, as illustrated in chart 15, facility is revenue is primarily driven by SPMT usage, followed by Ship Lift, and Wet-berths, and then Paint and Blast facility usage. Minimal revenue is generated from hardstand usage as the price of the hardstand is extremely low compared to other items and note that hardstand requirement in practice is larger than area required to 'park' the vessel. As there is excess demand for wet-berths and the paint and blast facility at the overall facility level, revenue for these two items have been adjusted for each sector according to the capacity of the facility.

Chart 15 Medium case revenue by type over the 40-year operational term of the facility



8. Leisure

Darwin is positioning itself as a key hub for superyacht and white boat services, supply, and sustainment in Northern Australia and the broader Southeast Asian region. As of July 2022, 10% of Australians hold a boat license³⁶; however, in the Northern Territory, a license is not required to legally operate a recreational boat³⁷, making boating more accessible to the local population. With the right enabling infrastructure, the superyacht industry has the potential to contribute \$148.5 million to the NT economy by 2028³⁸.

The leisure sector tends to favour infrastructure and services located near Darwin CBD, so Cullen Bay and Frances Bay are the top spots for berthing, despite length capacity limits, at Frances Bay (35 metres) and Cullen Bay (25 metres). Repairs and maintenance for local white boats and visiting superyachts could be conducted at the Ship Lift Facility, white boats have alternative options, such as East Point, which potentially reduces the market.

8.1 Potential Market

The sector encompasses private vessels 15 meters or more, including local recreational boats and visiting superyachts. Table 21 summarises demand forecasting for the leisure sector. In the 'low' case there are more vessels homeported in Darwin than the medium case, which represents 75% of the identified vessels.

Table 21 Potential market for Leisure sector

Leisure	Current	5-year	10-year	40-year
Sector Growth rate	n/a	1.5 %	1.5 %	1.5 %
Sector to Vessel Growth rate	n/a	0.8 %	0.8 %	0.8 %
High	47	49	51	63
Medium	35	37	38	48
Low	43	45	46	58

Sector growth is expected to be driven by economic growth, population growth, urbanization, and continued appreciation for leisure activities and nature-based experiences. A 1.5% CAGR is adopted reflecting the NT's 10-year GSP CAGR³⁹.

8.2 Repairs and Maintenance demand

While some growth is anticipated in the leisure boating sector, maintenance, repair, and overhaul schedules are not required as frequently as in commercial operations⁴⁰. Table 22 summarises the various R&M requirements from the sector. It is anticipated these vessels dry-dock at the ship lift facility while in-water maintenance is performed at a maintenance wharf elsewhere closer to Darwin CBD. In this sector, dry-dockings average at 15 days per year and common R&M activities include refit, painting and blasting.

³⁶ [2024 Boating Industry Data Report Card Released - Boating Industry Association](#)

³⁷ [Safety guide for recreational boating | NT.GOV.AU](#)

³⁸ [Maritime industry development plan](#)

³⁹ [NT Industry Outlook](#)

⁴⁰ Strategic Business Case For The Development Of A Marine Industry Park To Support The Growth And Capabilities Of The Maritime Sector In Northern Australia

Table 22 R&M activities required by the Leisure sector at the Darwin Ship Lift facility

Item	Unit	Leisure
Dry maintenance	Days per vessel p.a.	15.0
Maintenance wharf	Days per vessel p.a.	-
Lifts	# per vessel p.a.	2.0
Paint and Blast	weeks per vessel p.a.	1.0
SPMT	moves per vessel p.a.	4.0

8.3 Revenue Forecast

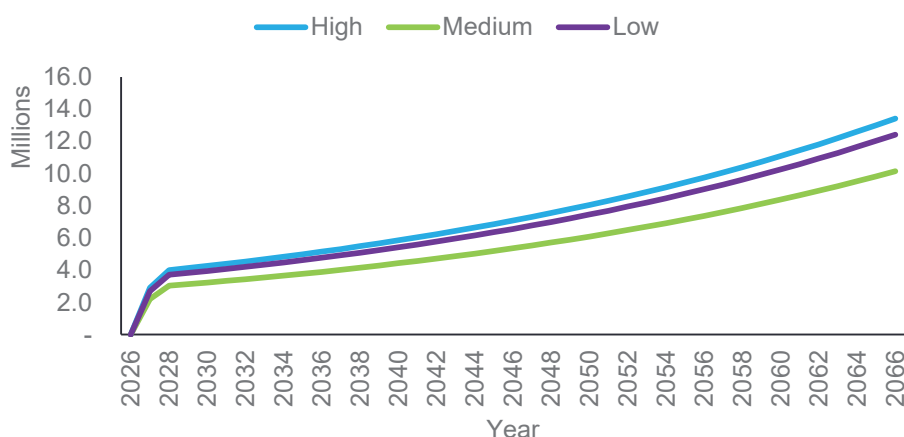
Revenue was forecasted based on the potential market of Leisure sector, utilising medium, high, low usage cases, along with prices from existing comparable facilities. In the high scenario, all of the vessels within facility's service capacity were assumed to use the Ship Lift, while the medium case assumes 75%. The low case assumes only vessels homeported in Darwin may use the facility for R&M. The total revenue over the 40-year operational term of the facility is shown in table 23 and chart 16. The difference between the high and medium case is approximately \$75 million while the high and 'low' case revenue differs by approximately \$23 million. The 'low' case revenue exceeds the medium case as a large portion of leisure vessels are homeported in Darwin compared to 75% of the identified vessels.

Table 23 Total revenue over the 40-year operational term of the facility

Case	Revenue
High	307.1
Medium	232.4
Low	284.4

Chart 16 Leisure sector Revenue over the 40-year operational term of the facility

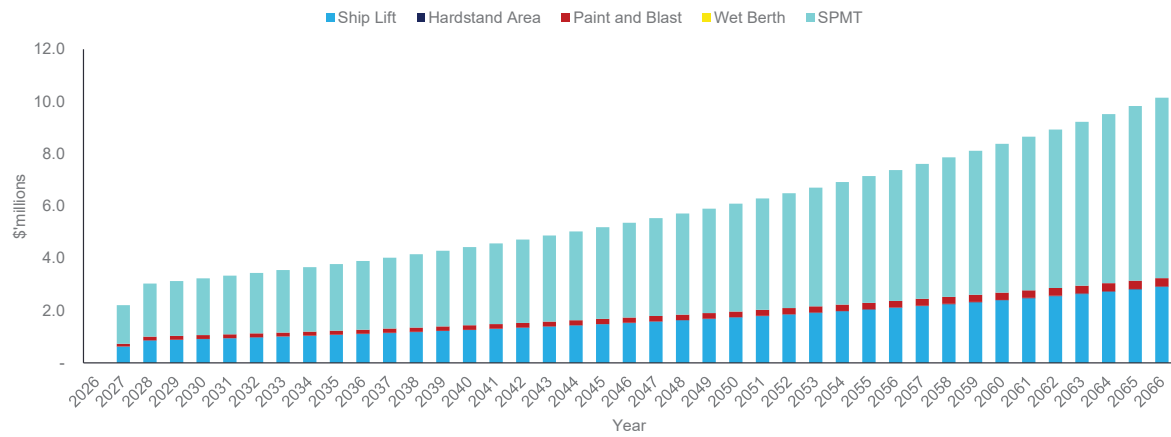
Leisure



In the medium case, as per chart 17, facility is revenue is primarily driven by SPMT usage, followed by Ship Lift, and then Paint and Blast facility usage. Minimal revenue is generated from hardstand usage as the price of the hardstand is extremely low compared to other items and note that hardstand requirement in practice is larger than area required to 'park' the vessel. As there is excess demand for wet-berths and the paint and blast facility at the overall facility level, revenue for these two items have been adjusted for each sector according to the capacity of the facility.

Chart 17 Medium case revenue by type over the 40-year operational term of the facility

Leisure (Medium)



9. Facility Revenue Forecast

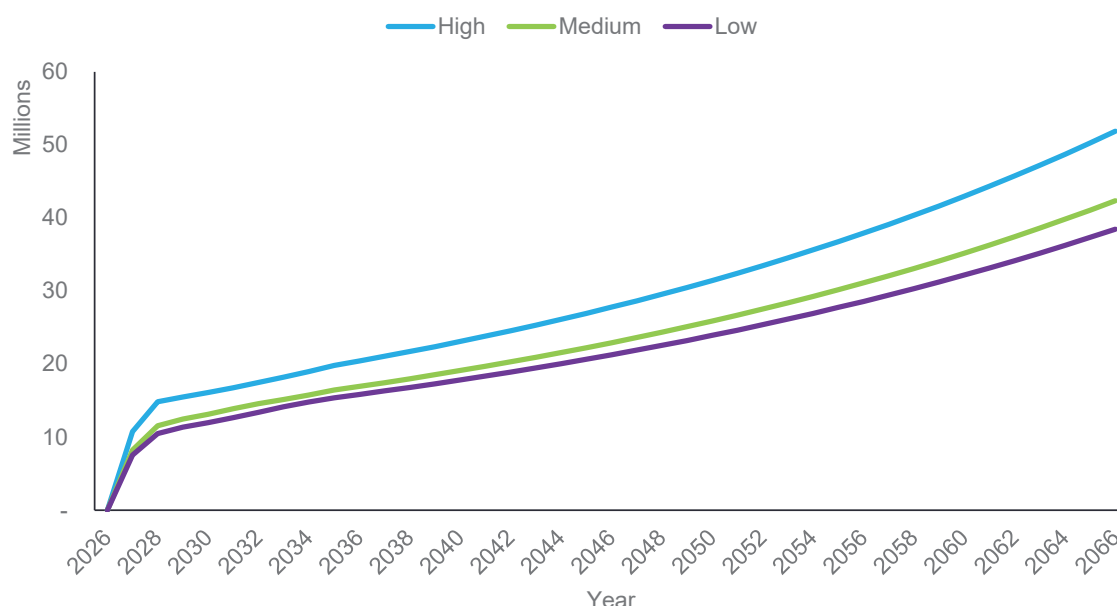
The total revenue for the Darwin Ship Lift Facility for three usage cases are shown below. In the high case, it is assumed that all identified vessels will use the facility for the R&M activities required at Darwin Ship Lift facility and this results in CAGR of 4% over 40 years. The medium case 75% of the vessels are assumed to use the facility with a 40-year revenue CAGR of 4.2%. In the low case, only vessels homeported in Darwin are assumed to frequent the facility producing a CAGR of 4.2% over 40 years.

Table 24 Revenue by usage case

Revenue	Year 1	Year 5	Year 10	Year 40	Total	40-year CAGR
High	10.8	16.8	20.4	51.9	1,194.7	4.0%
Medium	8.3	13.9	16.9	42.4	981.1	4.2%
Low	7.6	12.7	15.8	38.5	903.4	4.2%

Chart 18 Revenue by usage case over the 40-year operational term of the facility

Darwin Ship Lift Facility Revenue by Usage Case



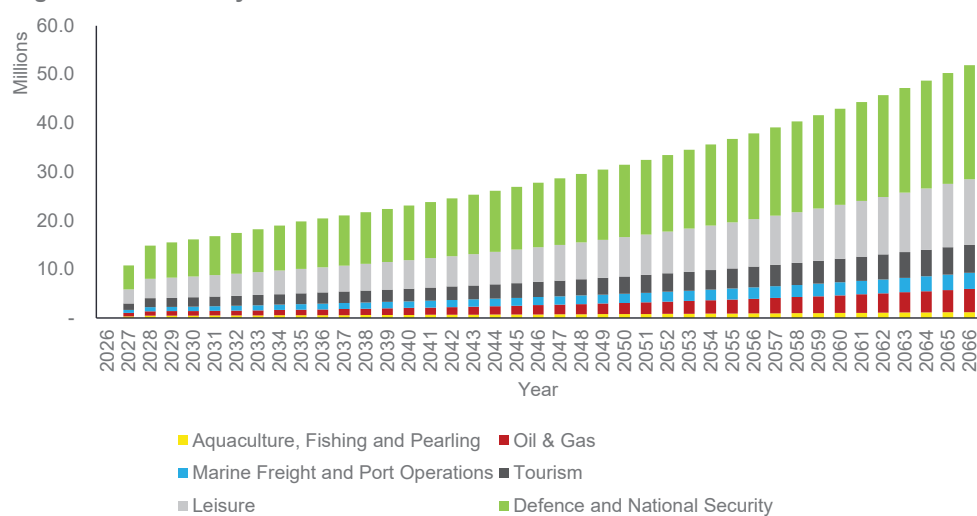
Looking at the medium case in chart 19 and 20, revenue is predominantly derived from Defence and National Security (50%), followed by leisure (24%), tourism (11%), Oil & Gas (7%), Marine Freight and Port Operations (6%), and Aquaculture, Fishing and Pearling (2%).

In the high case, revenue is predominantly derived from Defence and National Security (47%), followed by leisure (26%), tourism (11%), Oil & Gas (7%), Marine Freight and Port Operations (6%), and Aquaculture, Fishing and Pearling (3%).

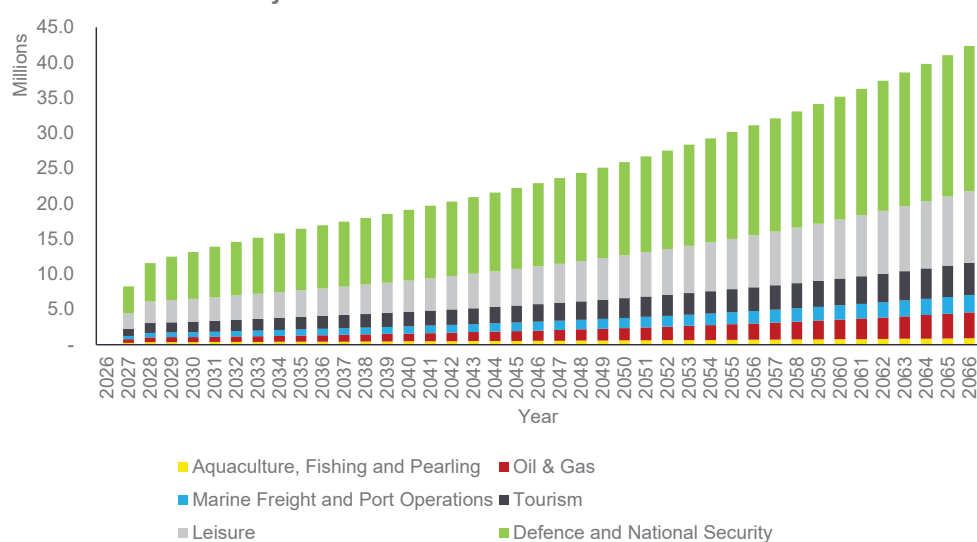
In the low case where only vessels homeported in Darwin are assumed to use the facility, the revenue is driven from Defence and National Security (55%), followed by leisure (32%), tourism (8%), Marine Freight and Port Operations (2%), Aquaculture, Fishing and Pearling (2%), and Oil & Gas (1%).

Chart 19 Revenue by usage case and sector over the 40-year operational term of the facility

High case revenue by sector



Medium case revenue by sector

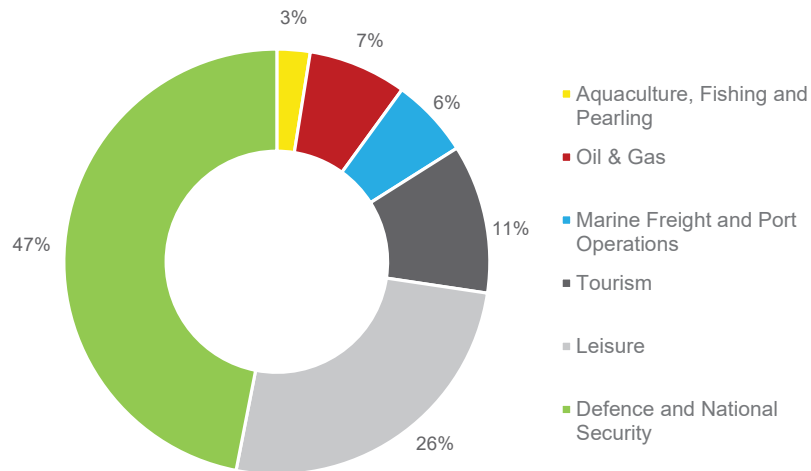


Low case revenue by sector

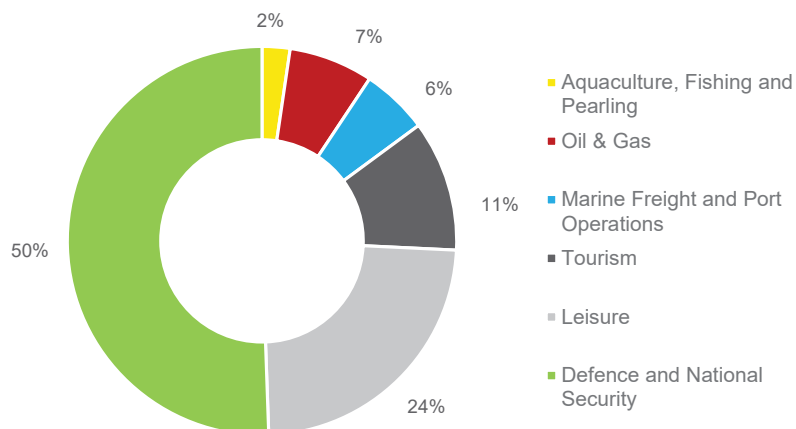


Chart 20 Total Revenue for the 40-year operational term by usage case and sector

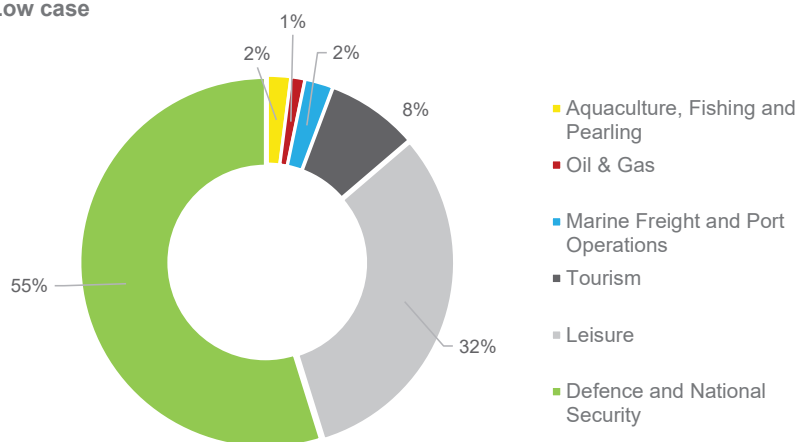
High case



Medium case



Low case

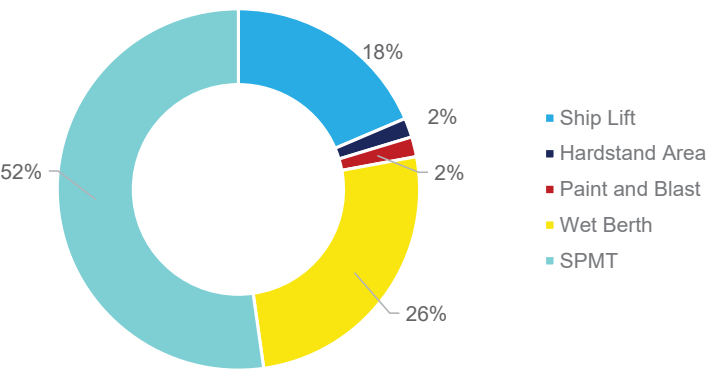


In all three usage cases, Paint and Blast facility demand exceeds the capacity of the facility. Excess demand for wet-berths were also observed in all three usage cases even when wet berths were assumed to be only used for in-water maintenance. Paint and Blast and wet-berth revenue was therefore adjusted according to the capacity of the facility.

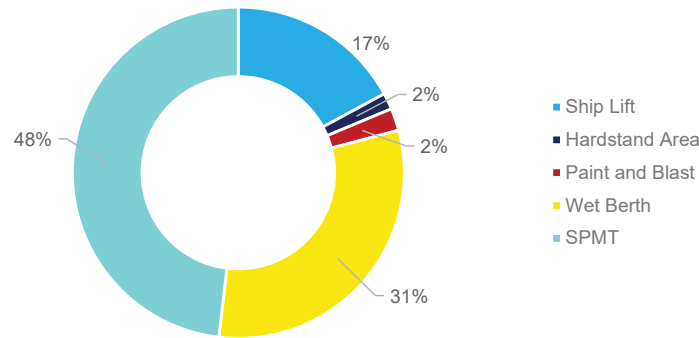
Across the three usage cases, revenue is primary driven by SPMT, wet-berth and then ship lift usage as illustrated in chart 21. Hardstand revenue is little compared to other items due to the low rates observed at the AMC. In practice, hardstand area requirement would be greater than 'parking' area and thus hardstand revenue estimates in this report are conservative. Additional hardstand area would be required for office space, storage sheds, training facilities, utilities but due to lack of detailed information on usage of these items, they were not modelled as part of revenue.

The revenue from the Paint and Blast facility is relatively conservative, as the revenue model assumes only one vessel occupies the facility at any given time. Nevertheless, in practice, the facility has the capacity to accommodate multiple vessels simultaneously, allowing for differential pricing that may lead to increased revenue.

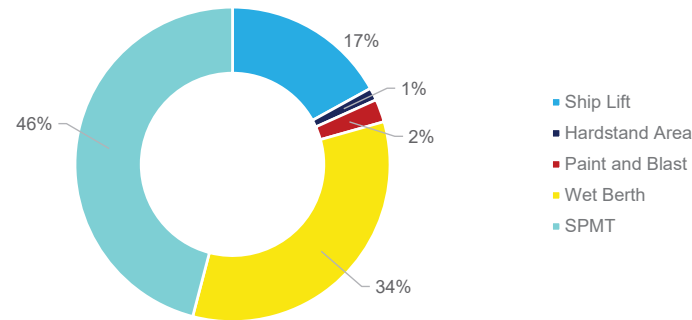
Chart 21 Total Revenue for the 40-year operational term by usage case and type
Darwin Ship Lift Facility Revenue Forecast (High)



Darwin Ship Lift Facility Revenue Forecast (Medium)



Darwin Ship Lift Facility Revenue Forecast (Low)



Annexure A - Defence and National Security Revenue

Year	Ship Lift	Hardstand Area	Medium			Total revenue	Vessels
			Paint and Blast	Wet Berth	SPMT		Defence/ABF
2026	-	-	-	-	-	-	34
2027	313,875	54,708	53,655	2,379,486	1,010,677	3,812,402	36
2028	448,339	78,146	75,428	3,398,862	1,443,653	5,444,428	38
2029	508,080	88,558	82,958	3,851,752	1,636,017	6,167,364	42
2030	547,102	95,360	87,716	4,147,581	1,761,669	6,639,427	44
2031	589,350	102,724	92,483	4,467,861	1,897,706	7,150,124	46
2032	635,096	110,697	97,506	4,704,104	2,045,008	7,592,411	49
2033	684,636	119,332	102,793	4,836,089	2,204,528	7,947,379	51
2034	738,292	128,684	108,358	4,971,470	2,377,301	8,324,105	54
2035	796,413	138,815	114,210	5,110,317	2,564,450	8,724,205	57
2036	822,446	143,352	116,984	5,236,863	2,648,276	8,967,921	57
2037	849,330	148,038	119,824	5,366,525	2,734,841	9,218,558	57
2038	877,092	152,877	122,732	5,499,378	2,824,236	9,476,315	58
2039	905,762	157,874	125,708	5,635,500	2,916,554	9,741,398	58
2040	935,369	163,035	128,755	5,774,971	3,011,888	10,014,018	59
2041	965,944	168,364	131,873	5,917,873	3,110,340	10,294,394	59
2042	997,518	173,867	135,066	6,064,289	3,212,009	10,582,749	60
2043	1,030,125	179,551	138,334	6,214,304	3,317,001	10,879,314	60
2044	1,063,797	185,420	141,678	6,368,006	3,425,426	11,184,327	60
2045	1,098,570	191,481	145,102	6,525,486	3,537,394	11,498,032	61
2046	1,134,479	197,740	148,606	6,686,833	3,653,023	11,820,681	61
2047	1,171,562	204,203	152,192	6,852,144	3,772,431	12,152,533	62
2048	1,209,858	210,878	155,863	7,021,513	3,895,743	12,493,855	62
2049	1,249,405	217,771	159,620	7,195,040	4,023,085	12,844,921	63
2050	1,290,245	224,890	163,465	7,372,826	4,154,589	13,206,014	63
2051	1,332,420	232,241	167,399	7,554,973	4,290,392	13,577,425	64
2052	1,375,973	239,832	171,426	7,741,587	4,430,635	13,959,454	64
2053	1,420,951	247,672	175,548	7,932,778	4,575,461	14,352,408	65
2054	1,467,398	255,767	179,765	8,128,655	4,725,021	14,756,606	65
2055	1,515,363	264,128	184,081	8,329,332	4,879,470	15,172,374	66
2056	1,564,897	272,762	188,497	8,534,925	5,038,968	15,600,048	66
2057	1,616,049	281,677	193,016	8,745,554	5,203,679	16,039,976	67
2058	1,668,874	290,885	197,640	8,961,339	5,373,775	16,492,513	67
2059	1,723,425	300,393	202,372	9,182,407	5,549,430	16,958,027	68
2060	1,779,760	310,212	207,213	9,408,883	5,730,827	17,436,895	68
2061	1,837,936	320,352	212,167	9,640,900	5,918,153	17,929,508	69
2062	1,898,013	330,824	217,235	9,878,590	6,111,603	18,436,265	69
2063	1,960,055	341,638	222,420	10,122,090	6,311,376	18,957,579	70
2064	2,024,124	352,805	227,726	10,371,541	6,517,679	19,493,875	70
2065	2,090,287	364,337	233,153	10,627,086	6,730,726	20,045,590	71
2066	2,158,614	376,246	238,706	10,888,872	6,950,736	20,613,174	71

Year	High					Vessels	
	Ship Lift	Hardstand Area	Paint and Blast	Wet Berth	SPMT	Total revenue	Defence/ABF
2026	-	-	-	-	-	-	45
2027	412,722	71,937	53,080	3,042,149	1,328,963	4,908,851	48
2028	581,992	101,441	73,888	4,167,783	1,874,013	6,799,116	49
2029	653,156	113,845	80,704	4,308,935	2,103,161	7,259,801	54
2030	704,578	122,808	85,471	4,435,091	2,268,743	7,616,691	57
2031	760,286	132,518	90,254	4,561,265	2,448,122	7,992,446	60
2032	820,643	143,038	95,294	4,690,669	2,642,471	8,392,115	63
2033	886,043	154,437	100,600	4,823,369	2,853,059	8,817,509	66
2034	956,915	166,790	106,185	4,959,436	3,081,265	9,270,591	70
2035	1,033,722	180,178	112,059	5,098,941	3,328,586	9,753,486	73
2036	1,067,512	186,067	114,780	5,225,176	3,437,389	10,030,925	74
2037	1,102,406	192,149	117,566	5,354,517	3,549,749	10,316,388	75
2038	1,138,441	198,430	120,418	5,487,040	3,665,781	10,610,111	75
2039	1,175,654	204,917	123,338	5,622,823	3,785,606	10,912,338	76
2040	1,214,083	211,615	126,326	5,761,945	3,909,348	11,223,318	76
2041	1,253,769	218,532	129,385	5,904,488	4,037,135	11,543,309	77
2042	1,294,751	225,675	132,517	6,050,534	4,169,099	11,872,576	77
2043	1,337,073	233,052	135,722	6,200,170	4,305,376	12,211,393	78
2044	1,380,779	240,670	139,003	6,353,482	4,446,108	12,560,041	79
2045	1,425,913	248,537	142,361	6,510,559	4,591,441	12,918,810	79
2046	1,472,523	256,661	145,797	6,671,493	4,741,523	13,287,997	80
2047	1,520,656	265,050	149,315	6,836,378	4,896,512	13,667,911	80
2048	1,570,362	273,714	152,915	7,005,310	5,056,567	14,058,869	81
2049	1,621,693	282,661	156,600	7,178,387	5,221,853	14,461,195	82
2050	1,674,703	291,901	160,371	7,355,709	5,392,542	14,875,226	82
2051	1,729,444	301,442	164,230	7,537,379	5,568,811	15,301,307	83
2052	1,785,976	311,296	168,180	7,723,503	5,750,842	15,739,796	83
2053	1,844,355	321,471	172,222	7,914,189	5,938,822	16,191,058	84
2054	1,904,642	331,979	176,358	8,109,546	6,132,947	16,655,472	85
2055	1,966,900	342,831	180,590	8,309,688	6,333,418	17,133,428	85
2056	2,031,193	354,037	184,921	8,514,732	6,540,442	17,625,325	86
2057	2,097,588	365,610	189,353	8,724,794	6,754,233	18,131,577	87
2058	2,166,153	377,560	193,888	8,939,997	6,975,011	18,652,610	87
2059	2,236,959	389,902	198,528	9,160,464	7,203,007	19,188,861	88
2060	2,310,079	402,647	203,276	9,386,323	7,438,455	19,740,781	88
2061	2,385,590	415,808	208,134	9,617,704	7,681,600	20,308,837	89
2062	2,463,569	429,400	213,104	9,854,740	7,932,692	20,893,506	90
2063	2,544,097	443,436	218,189	10,097,567	8,191,992	21,495,282	90
2064	2,627,257	457,931	223,392	10,346,325	8,459,768	22,114,673	91
2065	2,713,136	472,900	228,714	10,601,156	8,736,297	22,752,202	92
2066	2,801,821	488,357	234,159	10,862,207	9,021,864	23,408,409	93

Year	Low					Vessels	
	Ship Lift	Hardstand Area	Paint and Blast	Wet Berth	SPMT	Total revenue	Defence/ABF
2026	-	-	-	-	-	-	34
2027	305,795	53,300	55,878	2,318,230	984,659	3,717,863	35
2028	427,237	74,467	77,176	3,238,880	1,375,702	5,193,462	36
2029	485,173	84,566	84,930	3,678,096	1,562,257	5,895,021	40
2030	522,237	91,026	89,716	3,959,082	1,681,604	6,343,665	42
2031	562,360	98,019	94,706	4,263,249	1,810,798	6,829,133	44
2032	605,799	105,591	99,968	4,592,560	1,950,672	7,354,590	46
2033	652,835	113,789	105,514	4,949,142	2,102,128	7,923,408	49
2034	703,773	122,668	111,355	5,146,375	2,266,149	8,350,319	51
2035	758,943	132,284	117,504	5,284,519	2,443,797	8,737,047	54
2036	783,751	136,608	120,444	5,416,423	2,523,679	8,980,905	54
2037	809,370	141,073	123,458	5,551,615	2,606,172	9,231,688	55
2038	835,826	145,685	126,546	5,690,179	2,691,361	9,489,598	55
2039	863,147	150,447	129,712	5,832,198	2,779,335	9,754,839	56
2040	891,362	155,364	132,956	5,977,758	2,870,184	10,027,624	56
2041	920,498	160,443	136,280	6,126,948	2,964,003	10,308,172	56
2042	950,587	165,687	139,688	6,279,856	3,060,889	10,596,707	57
2043	981,659	171,103	143,179	6,436,577	3,160,942	10,893,461	57
2044	1,013,747	176,696	146,758	6,597,205	3,264,265	11,198,671	58
2045	1,046,884	182,472	150,426	6,761,837	3,370,966	11,512,584	58
2046	1,081,104	188,436	154,184	6,930,572	3,481,155	11,835,451	59
2047	1,116,442	194,596	158,036	7,103,514	3,594,945	12,167,533	59
2048	1,152,936	200,957	161,983	7,280,766	3,712,455	12,509,097	59
2049	1,190,623	207,526	166,029	7,462,436	3,833,805	12,860,419	60
2050	1,229,541	214,309	170,174	7,648,634	3,959,123	13,221,782	60
2051	1,269,732	221,314	174,423	7,839,472	4,088,537	13,593,478	61
2052	1,311,236	228,548	178,777	8,035,066	4,222,181	13,975,808	61
2053	1,354,097	236,019	183,239	8,235,534	4,360,193	14,369,082	62
2054	1,398,359	243,734	187,811	8,440,997	4,502,717	14,773,619	62
2055	1,444,068	251,701	192,497	8,651,580	4,649,900	15,189,746	63
2056	1,491,271	259,929	197,299	8,867,409	4,801,893	15,617,801	63
2057	1,540,017	268,425	202,220	9,088,616	4,958,855	16,058,133	64
2058	1,590,356	277,199	207,262	9,315,334	5,120,948	16,511,100	64
2059	1,642,341	286,260	212,430	9,547,700	5,288,339	16,977,070	64
2060	1,696,025	295,617	217,725	9,785,854	5,461,201	17,456,423	65
2061	1,751,464	305,280	223,152	10,029,940	5,639,714	17,949,551	65
2062	1,808,715	315,259	228,713	10,280,106	5,824,062	18,456,856	66
2063	1,867,837	325,564	234,411	10,536,503	6,014,437	18,978,752	66
2064	1,928,892	336,206	240,250	10,799,286	6,211,033	19,515,668	67
2065	1,991,943	347,196	246,234	11,068,612	6,414,057	20,068,041	67
2066	2,057,055	358,545	252,365	11,344,646	6,623,716	20,636,327	68

Annexure B – Oil & Gas Revenue

Year	Medium					Vessels				
	Ship Lift	Hardstand Area	Paint and Blast	Wet Berth	SPMT	Total revenue	AHT / AHTS	Crew Transfer Vessel	PSV / OSV	
2026	-	-	-	-	-	-	3		1	16
2027	81,827	19,435	13,988	59,079	345,876	520,205	3		1	16
2028	110,041	26,136	18,513	79,450	465,134	699,274	3		1	16
2029	110,987	26,360	18,122	80,133	469,135	704,737	3		1	15
2030	111,942	26,587	17,947	80,822	473,169	710,467	3		1	15
2031	117,322	27,865	18,411	84,706	495,911	744,215	3		1	16
2032	122,961	29,204	18,878	86,739	519,746	777,528	3		1	16
2033	128,871	30,608	19,349	86,696	544,726	810,249	3		1	16
2034	135,064	32,079	19,823	86,618	570,907	844,491	3		2	17
2035	141,556	33,621	20,300	86,506	598,346	880,329	3		2	17
2036	148,359	35,237	21,103	89,968	627,104	921,771	3		2	17
2037	155,490	36,930	21,937	93,569	657,244	965,169	3		2	18
2038	162,963	38,705	22,803	97,313	688,833	1,010,617	3		2	18
2039	170,796	40,565	23,704	101,206	721,940	1,058,211	3		2	19
2040	179,004	42,515	24,640	105,255	756,638	1,108,053	3		2	19
2041	187,608	44,558	25,613	109,465	793,004	1,160,248	4		2	19
2042	196,625	46,700	26,623	113,843	831,118	1,214,909	4		2	20
2043	206,075	48,944	27,673	118,397	871,064	1,272,153	4		2	20
2044	215,980	51,297	28,765	123,131	912,929	1,332,101	4		2	21
2045	226,360	53,762	29,898	128,055	956,807	1,394,882	4		2	21
2046	237,240	56,346	31,076	133,175	1,002,793	1,460,630	4		2	22
2047	248,642	59,054	32,300	138,499	1,050,990	1,529,485	4		2	22
2048	260,592	61,893	33,571	144,035	1,101,503	1,601,595	4		2	23
2049	273,117	64,867	34,892	149,792	1,154,444	1,677,113	4		2	23
2050	286,244	67,985	36,265	155,779	1,209,930	1,756,202	4		2	24
2051	300,001	71,253	37,691	162,004	1,268,082	1,839,030	4		2	24
2052	314,420	74,677	39,172	168,477	1,329,029	1,925,775	5		2	25
2053	329,532	78,266	40,711	175,208	1,392,905	2,016,623	5		2	25
2054	345,370	82,028	42,310	182,207	1,459,852	2,111,767	5		2	26
2055	361,969	85,970	43,971	189,485	1,530,016	2,211,412	5		2	27
2056	379,366	90,102	45,696	197,053	1,603,553	2,315,771	5		2	27
2057	397,600	94,433	47,488	204,922	1,680,623	2,425,066	5		3	28
2058	416,709	98,972	49,350	213,105	1,761,398	2,539,534	5		3	28
2059	436,737	103,728	51,284	221,613	1,846,055	2,659,418	5		3	29
2060	457,728	108,714	53,292	230,460	1,934,782	2,784,975	5		3	30
2061	479,728	113,939	55,379	239,658	2,027,772	2,916,476	6		3	30
2062	502,785	119,415	57,546	249,223	2,125,232	3,054,200	6		3	31
2063	526,950	125,155	59,796	259,168	2,227,376	3,198,445	6		3	32
2064	552,276	131,170	62,134	269,509	2,334,429	3,349,518	6		3	32
2065	578,820	137,474	64,562	280,261	2,446,627	3,507,745	6		3	33
2066	606,639	144,082	67,084	291,440	2,564,218	3,673,464	6		3	34

Year	High					Vessels				
	Ship Lift	Hardstand Area	Paint and Blast	Wet Berth	SPMT	Total revenue	AHT / AHTS	Crew Transfer Vessel	PSV / OSV	
2026	-	-	-	-	-	-	4		2	22
2027	109,103	25,913	14,032	76,590	461,168	686,805	4		2	21
2028	146,721	34,847	18,627	100,067	620,179	920,442	4		2	21
2029	147,983	35,147	18,285	92,977	625,513	919,905	4		2	21
2030	149,256	35,449	18,106	89,478	630,892	923,181	4		2	20
2031	156,429	37,153	18,570	89,379	661,215	962,746	4		2	21
2032	163,948	38,939	19,038	89,248	692,994	1,004,166	4		2	21
2033	171,827	40,810	19,509	89,084	726,301	1,047,532	4		2	22
2034	180,086	42,772	19,983	88,889	761,209	1,092,939	4		2	22
2035	188,741	44,827	20,460	88,665	797,795	1,140,489	4		2	23
2036	197,813	46,982	21,269	92,213	836,139	1,194,415	4		2	23
2037	207,320	49,240	22,110	95,903	876,326	1,250,898	4		2	24
2038	217,284	51,607	22,983	99,739	918,444	1,310,057	4		2	24
2039	227,728	54,087	23,891	103,729	962,587	1,372,021	5		2	25
2040	238,673	56,687	24,834	107,878	1,008,851	1,436,923	5		2	25
2041	250,144	59,411	25,814	112,193	1,057,339	1,504,901	5		2	26
2042	262,166	62,267	26,833	116,680	1,108,157	1,576,102	5		2	27
2043	274,767	65,259	27,891	121,345	1,161,418	1,650,680	5		2	27
2044	287,973	68,396	28,990	126,197	1,217,239	1,728,795	5		3	28
2045	301,813	71,683	30,132	131,242	1,275,742	1,810,614	5		3	28
2046	316,319	75,128	31,319	136,489	1,337,058	1,896,314	5		3	29
2047	331,522	78,739	32,553	141,945	1,401,320	1,986,079	5		3	30
2048	347,456	82,524	33,834	147,618	1,468,671	2,080,102	6		3	30
2049	364,156	86,490	35,165	153,517	1,539,259	2,178,586	6		3	31
2050	381,658	90,647	36,548	159,651	1,613,239	2,281,743	6		3	32
2051	400,002	95,003	37,985	166,030	1,690,776	2,389,795	6		3	32
2052	419,227	99,570	39,477	172,663	1,772,039	2,502,975	6		3	33
2053	439,376	104,355	41,028	179,560	1,857,207	2,621,526	6		3	34
2054	460,493	109,371	42,639	186,731	1,946,469	2,745,703	6		3	35
2055	482,626	114,627	44,312	194,189	2,040,022	2,875,775	6		3	35
2056	505,822	120,137	46,050	201,943	2,138,070	3,012,022	7		3	36
2057	530,133	125,911	47,856	210,005	2,240,831	3,154,736	7		3	37
2058	555,612	131,962	49,732	218,389	2,348,531	3,304,227	7		3	38
2059	582,317	138,305	51,680	227,106	2,461,407	3,460,815	7		4	39
2060	610,304	144,952	53,704	236,170	2,579,709	3,624,839	7		4	40
2061	639,637	151,919	55,806	245,595	2,703,696	3,796,653	7		4	40
2062	670,379	159,220	57,989	255,395	2,833,642	3,976,626	8		4	41
2063	702,600	166,873	60,257	265,584	2,969,834	4,165,147	8		4	42
2064	736,368	174,893	62,612	276,178	3,112,572	4,362,624	8		4	43
2065	771,760	183,299	65,058	287,194	3,262,170	4,569,481	8		4	44
2066	808,853	192,109	67,599	298,647	3,418,958	4,786,165	8		4	45

Year	Low					Vessels				
	Ship Lift	Hardstand Area	Paint and Blast	Wet Berth	SPMT	Total revenue	AHT / AHTS	Crew Transfer Vessel	PSV / OSV	
2026	-	-	-	-	-	-	-	-	1	3
2027	12,589	2,926	2,300	9,089	55,516	82,420	-	-	1	3
2028	16,929	3,934	3,058	12,223	74,659	110,803	-	-	1	3
2029	17,075	3,968	2,989	12,328	75,301	111,661	-	-	1	3
2030	17,222	4,002	2,959	12,434	75,948	112,565	-	-	1	3
2031	18,050	4,195	3,040	13,032	79,598	117,914	-	-	1	3
2032	18,917	4,396	3,122	13,658	83,424	123,517	-	-	1	3
2033	19,826	4,608	3,204	14,315	87,434	129,387	-	-	1	3
2034	20,779	4,829	3,288	14,471	91,636	135,003	-	-	1	3
2035	21,778	5,061	3,372	14,442	96,040	140,693	-	-	1	3
2036	22,825	5,304	3,508	15,023	100,656	147,315	-	-	1	3
2037	23,922	5,559	3,649	15,627	105,494	154,251	-	-	1	3
2038	25,071	5,827	3,796	16,255	110,564	161,513	-	-	1	3
2039	26,276	6,107	3,949	16,909	115,878	169,119	-	-	1	3
2040	27,539	6,400	4,108	17,589	121,448	177,084	-	-	1	3
2041	28,863	6,708	4,273	18,297	127,285	185,425	-	-	1	4
2042	30,250	7,030	4,445	19,032	133,402	194,160	-	-	1	4
2043	31,704	7,368	4,624	19,798	139,814	203,308	-	-	1	4
2044	33,228	7,722	4,810	20,594	146,534	212,888	-	-	1	4
2045	34,825	8,093	5,004	21,422	153,577	222,921	-	-	1	4
2046	36,498	8,482	5,205	22,284	160,958	233,427	-	-	1	4
2047	38,253	8,890	5,415	23,180	168,694	244,431	-	-	1	4
2048	40,091	9,317	5,633	24,112	176,802	255,955	-	-	1	4
2049	42,018	9,765	5,859	25,081	185,299	268,023	-	-	1	4
2050	44,037	10,234	6,095	26,090	194,205	280,662	-	-	1	4
2051	46,154	10,726	6,340	27,139	203,539	293,899	-	-	1	4
2052	48,372	11,242	6,595	28,230	213,322	307,761	-	-	2	5
2053	50,697	11,782	6,860	29,365	223,575	322,280	-	-	2	5
2054	53,134	12,348	7,136	30,546	234,320	337,485	-	-	2	5
2055	55,688	12,942	7,423	31,774	245,582	353,409	-	-	2	5
2056	58,364	13,564	7,722	33,052	257,386	370,087	-	-	2	5
2057	61,169	14,216	8,032	34,381	269,756	387,554	-	-	2	5
2058	64,109	14,899	8,355	35,763	282,721	405,847	-	-	2	5
2059	67,190	15,615	8,691	37,201	296,310	425,007	-	-	2	5
2060	70,420	16,366	9,040	38,696	310,551	445,073	-	-	2	5
2061	73,804	17,152	9,403	40,252	325,477	466,089	-	-	2	6
2062	77,351	17,976	9,781	41,870	341,120	488,099	-	-	2	6
2063	81,069	18,840	10,174	43,554	357,515	511,152	-	-	2	6
2064	84,966	19,746	10,583	45,304	374,698	535,297	-	-	2	6
2065	89,049	20,695	11,008	47,126	392,707	560,585	-	-	2	6
2066	93,329	21,690	11,450	49,020	411,582	587,070	-	-	2	6

Annexure C – Aquaculture, Fishing and Pearling Revenue

Year	Ship Lift	Hardstand Area	Medium			Total revenue	Vessels	
			Paint and Blast	Wet Berth	SPMT		Fishing	Pearling
2026	-	-	-	-	-	-	34	8
2027	65,183	2,840	11,143	-	173,388	252,555	34	8
2028	89,205	3,887	15,008	-	237,284	345,383	34	8
2029	91,558	3,990	14,949	-	243,545	354,043	34	8
2030	93,974	4,095	15,067	-	249,972	363,108	34	8
2031	96,389	4,200	15,126	-	256,394	372,109	34	8
2032	98,865	4,308	15,179	-	262,982	381,334	34	8
2033	101,406	4,419	15,225	-	269,739	390,788	34	8
2034	104,011	4,532	15,265	-	276,669	400,478	34	8
2035	106,683	4,649	15,299	-	283,778	410,409	34	8
2036	109,424	4,768	15,564	-	291,069	420,826	34	8
2037	112,236	4,891	15,834	-	298,548	431,509	34	8
2038	115,120	5,016	16,109	-	306,218	442,463	34	8
2039	118,077	5,145	16,388	-	314,086	453,697	34	8
2040	121,111	5,277	16,671	-	322,156	465,216	34	8
2041	124,223	5,413	16,959	-	330,433	477,029	34	8
2042	127,415	5,552	17,252	-	338,923	489,142	34	8
2043	130,688	5,695	17,550	-	347,631	501,565	34	8
2044	134,046	5,841	17,853	-	356,563	514,303	34	8
2045	137,490	5,991	18,160	-	365,725	527,366	34	8
2046	141,023	6,145	18,473	-	375,121	540,762	34	8
2047	144,646	6,303	18,790	-	384,759	554,499	34	8
2048	148,363	6,465	19,113	-	394,645	568,586	34	8
2049	152,175	6,631	19,441	-	404,785	583,032	34	8
2050	156,085	6,801	19,775	-	415,185	597,846	34	8
2051	160,095	6,976	20,114	-	425,853	613,038	34	8
2052	164,208	7,155	20,458	-	436,794	628,616	34	8
2053	168,427	7,339	20,808	-	448,017	644,592	35	8
2054	172,755	7,528	21,163	-	459,528	660,974	35	8
2055	177,194	7,721	21,525	-	471,335	677,775	35	8
2056	181,746	7,920	21,892	-	483,445	695,003	35	8
2057	186,416	8,123	22,265	-	495,866	712,670	35	8
2058	191,206	8,332	22,644	-	508,607	730,788	35	8
2059	196,118	8,546	23,029	-	521,675	749,368	35	8
2060	201,157	8,765	23,420	-	535,078	768,421	35	8
2061	206,326	8,991	23,818	-	548,826	787,960	35	8
2062	211,627	9,222	24,222	-	562,928	807,998	35	8
2063	217,064	9,459	24,632	-	577,391	828,546	35	8
2064	222,641	9,702	25,048	-	592,226	849,618	35	8
2065	228,362	9,951	25,472	-	607,442	871,227	35	8
2066	234,229	10,207	25,902	-	623,050	893,387	35	8

Year	Ship Lift	Hardstand Area	High			Total revenue	Vessels	
			Paint and Blast	Wet Berth	SPMT		Fishing	Pearling
2026	-	-	-	-	-	-	45	10
2027	86,911	3,787	11,178	-	231,184	333,060	45	10
2028	118,939	5,183	15,100	-	316,379	455,601	45	10
2029	122,078	5,320	15,084	-	324,727	467,208	45	10
2030	125,299	5,460	15,200	-	333,296	479,254	45	10
2031	128,518	5,600	15,257	-	341,859	491,234	45	10
2032	131,821	5,744	15,307	-	350,643	503,514	45	10
2033	135,207	5,892	15,351	-	359,652	516,102	45	10
2034	138,681	6,043	15,389	-	368,892	529,006	45	10
2035	142,245	6,198	15,420	-	378,371	542,233	45	10
2036	145,899	6,358	15,687	-	388,092	556,036	45	10
2037	149,648	6,521	15,959	-	398,064	570,192	46	10
2038	153,493	6,688	16,236	-	408,291	584,708	46	10
2039	157,437	6,860	16,517	-	418,782	599,595	46	10
2040	161,482	7,037	16,802	-	429,541	614,862	46	10
2041	165,631	7,217	17,093	-	440,578	630,519	46	10
2042	169,886	7,403	17,388	-	451,898	646,575	46	10
2043	174,251	7,593	17,688	-	463,509	663,041	46	10
2044	178,728	7,788	17,993	-	475,418	679,927	46	10
2045	183,321	7,988	18,302	-	487,633	697,244	46	10
2046	188,031	8,193	18,617	-	500,162	715,003	46	10
2047	192,862	8,404	18,937	-	513,013	733,216	46	10
2048	197,817	8,620	19,263	-	526,194	751,893	46	10
2049	202,900	8,841	19,593	-	539,713	771,047	46	10
2050	208,113	9,069	19,929	-	553,580	790,691	46	10
2051	213,460	9,302	20,270	-	567,804	810,836	46	10
2052	218,945	9,541	20,617	-	582,392	831,495	46	10
2053	224,570	9,786	20,970	-	597,356	852,681	46	10
2054	230,340	10,037	21,328	-	612,704	874,409	46	10
2055	236,258	10,295	21,692	-	628,447	896,692	46	10
2056	242,328	10,559	22,062	-	644,594	919,543	46	10
2057	248,555	10,831	22,438	-	661,155	942,978	46	10
2058	254,941	11,109	22,819	-	678,143	967,012	46	10
2059	261,491	11,394	23,207	-	695,566	991,659	46	10
2060	268,210	11,687	23,601	-	713,438	1,016,936	46	10
2061	275,101	11,988	24,002	-	731,768	1,042,858	46	10
2062	282,169	12,296	24,408	-	750,570	1,069,443	46	10
2063	289,419	12,611	24,821	-	769,855	1,096,707	46	10
2064	296,855	12,935	25,241	-	789,635	1,124,667	46	10
2065	304,482	13,268	25,667	-	809,923	1,153,341	46	10
2066	312,306	13,609	26,101	-	830,733	1,182,748	46	10

Year	Ship Lift	Hardstand Area	Low			SPMT	Total revenue	Vessels	
			Paint and Blast	Wet Berth				Fishing	Pearling
2026	-	-	-	-	-	-	-	21	6
2027	52,147	2,272	9,529	-	138,710	202,658	21	6	6
2028	71,364	3,110	12,891	-	189,827	277,192	21	6	6
2029	73,247	3,192	12,822	-	194,836	284,097	21	6	6
2030	75,179	3,276	12,915	-	199,977	291,348	21	6	6
2031	77,111	3,360	12,986	-	205,115	298,573	21	6	6
2032	79,092	3,446	13,052	-	210,386	305,976	21	6	6
2033	81,124	3,535	13,112	-	215,791	313,562	21	6	6
2034	83,209	3,626	13,166	-	221,335	321,336	21	6	6
2035	85,347	3,719	13,214	-	227,022	329,302	21	6	6
2036	87,540	3,815	13,453	-	232,855	337,662	21	6	6
2037	89,789	3,913	13,696	-	238,838	346,235	21	6	6
2038	92,096	4,013	13,944	-	244,975	355,027	21	6	6
2039	94,462	4,116	14,196	-	251,269	364,043	21	6	6
2040	96,889	4,222	14,452	-	257,725	373,288	21	6	6
2041	99,378	4,330	14,713	-	264,347	382,769	21	6	6
2042	101,932	4,442	14,979	-	271,139	392,491	21	6	6
2043	104,551	4,556	15,249	-	278,105	402,461	21	6	6
2044	107,237	4,673	15,524	-	285,251	412,685	21	6	6
2045	109,992	4,793	15,805	-	292,580	423,170	21	6	6
2046	112,818	4,916	16,090	-	300,097	433,921	21	6	6
2047	115,717	5,042	16,380	-	307,808	444,947	21	6	6
2048	118,690	5,172	16,676	-	315,716	456,254	21	6	6
2049	121,740	5,305	16,976	-	323,828	467,849	21	6	6
2050	124,868	5,441	17,282	-	332,148	479,739	21	6	6
2051	128,076	5,581	17,594	-	340,682	491,933	21	6	6
2052	131,367	5,724	17,911	-	349,435	504,437	21	6	6
2053	134,742	5,871	18,234	-	358,414	517,260	21	6	6
2054	138,204	6,022	18,562	-	367,622	530,411	21	6	6
2055	141,755	6,177	18,896	-	377,068	543,896	22	6	6
2056	145,397	6,336	19,236	-	386,756	557,725	22	6	6
2057	149,133	6,498	19,583	-	396,693	571,907	22	6	6
2058	152,964	6,665	19,935	-	406,886	586,451	22	6	6
2059	156,895	6,837	20,294	-	417,340	601,365	22	6	6
2060	160,926	7,012	20,659	-	428,063	616,660	22	6	6
2061	165,061	7,193	21,030	-	439,061	632,344	22	6	6
2062	169,302	7,377	21,408	-	450,342	648,429	22	6	6
2063	173,651	7,567	21,793	-	461,913	664,924	22	6	6
2064	178,113	7,761	22,185	-	473,781	681,840	22	6	6
2065	182,689	7,961	22,583	-	485,954	699,187	22	6	6
2066	187,383	8,165	22,989	-	498,440	716,977	22	6	6

Annexure D – Marine Freight and Port Operations Revenue

Year	Ship Lift	Medium					Vessels				
		Hardstand Area	Paint and Blast	Wet Berth	SPMT	Total revenue	Tugs	Work boats	Pilot boats	Dredger	General cargo
2026	-	-	-	-	-	-	34	8	2	1	31
2027	123,228	7,727	21,065	-	301,909	453,929	35	8	2	1	31
2028	170,937	10,718	28,758	-	418,797	629,210	35	8	2	1	31
2029	177,838	11,151	29,037	-	435,704	653,730	36	8	2	1	31
2030	185,018	11,601	29,664	-	453,294	679,576	36	8	2	1	31
2031	194,281	12,182	30,487	-	475,987	712,937	37	8	2	1	31
2032	204,007	12,791	31,321	-	499,817	747,937	38	8	3	1	31
2033	214,220	13,432	32,164	-	524,840	784,656	39	9	3	1	31
2034	224,945	14,104	33,015	-	551,115	823,179	40	9	3	1	31
2035	236,207	14,810	33,873	-	578,706	863,596	41	9	3	1	31
2036	244,422	15,326	34,766	-	598,835	893,350	41	9	3	1	31
2037	252,924	15,859	35,683	-	619,664	924,130	42	9	3	1	31
2038	261,722	16,410	36,623	-	641,218	955,972	42	9	3	1	32
2039	270,825	16,981	37,587	-	663,521	988,914	43	9	3	1	32
2040	280,245	17,572	38,576	-	686,600	1,022,993	43	10	3	1	32
2041	289,993	18,183	39,591	-	710,482	1,058,248	43	10	3	1	32
2042	300,079	18,815	40,631	-	735,195	1,094,721	44	10	3	1	32
2043	310,517	19,470	41,699	-	760,767	1,132,452	44	10	3	1	32
2044	321,318	20,147	42,794	-	787,228	1,171,486	45	10	3	1	32
2045	332,494	20,848	43,917	-	814,610	1,211,868	45	10	3	1	32
2046	344,059	21,573	45,068	-	842,944	1,253,645	46	10	3	1	32
2047	356,026	22,323	46,250	-	872,264	1,296,864	46	10	3	1	32
2048	368,410	23,100	47,461	-	902,604	1,341,575	46	10	3	1	32
2049	381,224	23,903	48,704	-	933,999	1,387,830	47	10	3	1	32
2050	394,484	24,735	49,978	-	966,486	1,435,683	47	11	3	1	32
2051	408,205	25,595	51,285	-	1,000,103	1,485,189	48	11	3	1	32
2052	422,404	26,485	52,625	-	1,034,889	1,536,404	48	11	3	1	32
2053	437,096	27,406	54,000	-	1,070,886	1,589,388	49	11	3	1	33
2054	452,300	28,360	55,409	-	1,108,134	1,644,203	49	11	3	1	33
2055	468,032	29,346	56,855	-	1,146,678	1,700,911	50	11	3	1	33
2056	484,311	30,367	58,337	-	1,186,563	1,759,577	50	11	3	1	33
2057	501,157	31,423	59,857	-	1,227,834	1,820,271	51	11	3	1	33
2058	518,588	32,516	61,415	-	1,270,542	1,883,061	51	11	3	1	33
2059	536,626	33,647	63,013	-	1,314,735	1,948,021	52	11	3	1	33
2060	555,292	34,817	64,651	-	1,360,465	2,015,225	52	12	3	1	33
2061	574,606	36,028	66,331	-	1,407,785	2,084,751	53	12	4	1	33
2062	594,593	37,282	68,053	-	1,456,752	2,156,680	53	12	4	1	33
2063	615,274	38,578	69,819	-	1,507,422	2,231,094	54	12	4	1	33
2064	636,675	39,920	71,630	-	1,559,854	2,308,079	54	12	4	1	33
2065	658,820	41,309	73,486	-	1,614,110	2,387,725	55	12	4	1	33
2066	681,736	42,746	75,388	-	1,670,253	2,470,123	55	12	4	1	33

Year	Ship Lift	High					Vessels				
		Hardstand Area	Paint and Blast	Wet Berth	SPMT	Total revenue	Tugs	Work boats	Pilot boats	Dredger	General cargo
2026	-	-	-	-	-	-	46	10	3	1	41
2027	164,304	10,302	21,131	-	402,545	598,282	46	10	3	1	41
2028	227,916	14,291	28,936	-	558,395	829,538	47	10	3	1	41
2029	237,118	14,868	29,298	-	580,939	862,222	48	11	3	1	41
2030	246,691	15,468	29,926	-	604,392	896,476	48	11	3	1	41
2031	259,041	16,242	30,751	-	634,650	940,684	50	11	3	1	41
2032	272,009	17,055	31,586	-	666,423	987,073	51	11	3	1	42
2033	285,627	17,909	32,430	-	699,786	1,035,752	52	12	3	1	42
2034	299,927	18,806	33,282	-	734,820	1,086,834	53	12	4	1	42
2035	314,942	19,747	34,141	-	771,608	1,140,438	55	12	4	1	42
2036	325,897	20,434	35,041	-	798,447	1,179,818	55	12	4	1	42
2037	337,232	21,145	35,964	-	826,219	1,220,560	56	12	4	1	42
2038	348,962	21,880	36,911	-	854,957	1,262,711	56	13	4	1	42
2039	361,100	22,641	37,883	-	884,695	1,306,319	57	13	4	1	42
2040	373,660	23,429	38,880	-	915,467	1,351,435	57	13	4	1	42
2041	386,657	24,244	39,902	-	947,309	1,398,112	58	13	4	1	42
2042	400,106	25,087	40,950	-	980,259	1,446,403	58	13	4	1	42
2043	414,023	25,960	42,026	-	1,014,355	1,496,364	59	13	4	1	43
2044	428,423	26,863	43,129	-	1,049,638	1,548,053	60	13	4	1	43
2045	443,325	27,797	44,261	-	1,086,147	1,601,530	60	13	4	1	43
2046	458,745	28,764	45,421	-	1,123,926	1,656,856	61	13	4	1	43
2047	474,702	29,764	46,612	-	1,163,019	1,714,097	61	14	4	1	43
2048	491,213	30,800	47,832	-	1,203,472	1,773,317	62	14	4	1	43
2049	508,299	31,871	49,084	-	1,245,332	1,834,586	62	14	4	1	43
2050	525,979	32,979	50,368	-	1,288,648	1,897,975	63	14	4	1	43
2051	544,274	34,127	51,685	-	1,333,471	1,963,556	64	14	4	1	43
2052	563,205	35,314	53,035	-	1,379,853	2,031,407	64	14	4	1	43
2053	582,795	36,542	54,420	-	1,427,848	2,101,604	65	14	4	1	43
2054	603,066	37,813	55,840	-	1,477,512	2,174,231	66	15	4	1	43
2055	624,042	39,128	57,296	-	1,528,904	2,249,371	66	15	4	1	44
2056	645,748	40,489	58,789	-	1,582,083	2,327,110	67	15	4	1	44
2057	668,209	41,897	60,321	-	1,637,113	2,407,540	67	15	4	1	44
2058	691,451	43,355	61,891	-	1,694,056	2,490,752	68	15	5	2	44
2059	715,502	44,863	63,500	-	1,752,980	2,576,844	69	15	5	2	44
2060	740,389	46,423	65,151	-	1,813,953	2,665,916	69	15	5	2	44
2061	766,142	48,038	66,843	-	1,877,047	2,758,070	70	16	5	2	44
2062	792,790	49,709	68,578	-	1,942,336	2,853,413	71	16	5	2	44
2063	820,366	51,438	70,357	-	2,009,896	2,952,056	71	16	5	2	44
2064	848,900	53,227	72,181	-	2,079,805	3,054,113	72	16	5	2	44
2065	878,427	55,078	74,050	-	2,152,147	3,159,703	73	16	5	2	44
2066	908,981	56,994	75,967	-	2,227,004	3,268,947	73	16	5	2	45

Year	Low					Vessels					
	Ship Lift	Hardstand Area	Paint and Blast	Wet Berth	SPMT	Total revenue	Tugs	Work boats	Pilot boats	Dredger	General cargo
2026	-	-	-	-	-	-	13	3	1	1	18
2027	50,006	3,187	9,138	-	122,514	184,844	13	3	1	1	18
2028	69,366	4,421	12,530	-	169,946	256,263	14	3	1	1	18
2029	72,166	4,599	12,633	-	176,807	266,206	14	3	1	1	18
2030	75,080	4,785	12,898	-	183,945	276,708	14	3	1	1	18
2031	78,839	5,025	13,277	-	193,154	290,294	14	3	1	1	18
2032	82,785	5,276	13,661	-	202,824	304,547	15	3	1	1	18
2033	86,930	5,540	14,050	-	212,978	319,499	15	3	1	1	18
2034	91,282	5,818	14,443	-	223,641	335,184	15	4	1	1	18
2035	95,852	6,109	14,840	-	234,837	351,638	16	4	1	1	18
2036	99,186	6,321	15,243	-	243,006	363,755	16	4	1	1	18
2037	102,636	6,541	15,656	-	251,458	376,291	16	4	1	1	18
2038	106,206	6,769	16,080	-	260,204	389,259	16	4	1	1	18
2039	109,900	7,004	16,516	-	269,255	402,675	16	4	1	1	19
2040	113,723	7,248	16,963	-	278,620	416,554	17	4	1	1	19
2041	117,678	7,500	17,422	-	288,312	430,912	17	4	1	1	19
2042	121,771	7,761	17,894	-	298,340	445,766	17	4	1	1	19
2043	126,007	8,031	18,379	-	308,717	461,133	17	4	1	1	19
2044	130,390	8,310	18,876	-	319,455	477,031	17	4	1	1	19
2045	134,925	8,599	19,387	-	330,566	493,478	17	4	1	1	19
2046	139,618	8,898	19,912	-	342,064	510,493	18	4	1	1	19
2047	144,474	9,208	20,451	-	353,962	528,095	18	4	1	1	19
2048	149,500	9,528	21,004	-	366,274	546,306	18	4	1	1	19
2049	154,700	9,859	21,572	-	379,014	565,145	18	4	1	1	19
2050	160,081	10,202	22,156	-	392,197	584,636	18	4	1	1	19
2051	165,649	10,557	22,755	-	405,839	604,800	18	4	1	1	19
2052	171,410	10,924	23,370	-	419,955	625,660	19	4	1	1	19
2053	177,372	11,304	24,002	-	434,562	647,241	19	4	1	1	19
2054	183,542	11,698	24,651	-	449,678	669,568	19	4	1	1	19
2055	189,926	12,104	25,317	-	465,319	692,666	19	4	1	1	19
2056	196,532	12,525	26,002	-	481,504	716,563	19	4	1	1	19
2057	203,368	12,961	26,704	-	498,252	741,285	19	4	1	1	19
2058	210,442	13,412	27,426	-	515,582	766,861	20	5	2	2	19
2059	217,761	13,878	28,167	-	533,516	793,322	20	5	2	2	19
2060	225,336	14,361	28,927	-	552,073	820,697	20	5	2	2	19
2061	233,174	14,861	29,708	-	571,275	849,018	20	5	2	2	19
2062	241,284	15,378	30,510	-	591,146	878,318	20	5	2	2	19
2063	249,676	15,912	31,334	-	611,707	908,630	21	5	2	2	19
2064	258,361	16,466	32,180	-	632,984	939,991	21	5	2	2	19
2065	267,347	17,039	33,048	-	655,001	972,435	21	5	2	2	19
2066	276,646	17,631	33,940	-	677,784	1,006,001	21	5	2	2	20

Annexure E – Tourism Revenue

	Medium						Vessels
Year	Ship Lift	Hardstand Area	Paint and Blast	Wet Berth	SPMT	Total revenue	Tourism
2026	-	-	-	-	-	-	11
2027	187,756	24,934	32,096	237,230	525,718	1,007,734	11
2028	260,612	34,609	43,845	329,283	729,713	1,398,062	11
2029	271,303	36,029	44,297	342,791	759,649	1,454,070	11
2030	282,433	37,507	45,282	356,854	790,812	1,512,888	11
2031	294,019	39,046	46,139	371,494	823,255	1,573,952	12
2032	306,081	40,648	46,992	377,853	857,028	1,628,602	12
2033	318,638	42,315	47,841	375,129	892,186	1,676,110	12
2034	331,710	44,051	48,684	372,275	928,787	1,725,507	12
2035	345,318	45,858	49,520	369,298	966,890	1,776,884	12
2036	356,605	47,357	50,723	378,443	998,495	1,831,623	12
2037	368,262	48,905	51,955	387,813	1,031,133	1,888,068	12
2038	380,299	50,504	53,215	397,414	1,064,838	1,946,270	13
2039	392,730	52,155	54,506	407,250	1,099,645	2,006,286	13
2040	405,568	53,859	55,827	417,329	1,135,590	2,068,173	13
2041	418,825	55,620	57,179	427,656	1,172,709	2,131,989	13
2042	432,515	57,438	58,563	438,237	1,211,042	2,197,796	13
2043	446,653	59,316	59,980	449,078	1,250,628	2,265,655	13
2044	461,253	61,254	61,430	460,185	1,291,508	2,335,631	13
2045	476,330	63,257	62,915	471,565	1,333,724	2,407,791	13
2046	491,900	65,324	64,434	483,225	1,377,320	2,482,204	13
2047	507,979	67,460	65,989	495,172	1,422,342	2,558,941	13
2048	524,584	69,665	67,581	507,411	1,468,834	2,638,075	14
2049	541,731	71,942	69,210	519,951	1,516,847	2,719,680	14
2050	559,439	74,293	70,877	532,799	1,566,429	2,803,837	14
2051	577,726	76,722	72,583	545,962	1,617,631	2,890,623	14
2052	596,610	79,230	74,329	559,447	1,670,508	2,980,124	14
2053	616,112	81,820	76,116	573,264	1,725,113	3,072,423	14
2054	636,251	84,494	77,944	587,419	1,781,502	3,167,610	14
2055	657,048	87,256	79,816	601,921	1,839,735	3,265,776	14
2056	678,525	90,108	81,731	616,778	1,899,871	3,367,014	14
2057	700,705	93,054	83,690	631,999	1,961,973	3,471,421	14
2058	723,609	96,095	85,695	647,593	2,026,105	3,579,098	15
2059	747,262	99,236	87,747	663,568	2,092,334	3,690,147	15
2060	771,688	102,480	89,846	679,935	2,160,727	3,804,676	15
2061	796,913	105,830	91,994	696,701	2,231,356	3,922,793	15
2062	822,962	109,289	94,191	713,878	2,304,293	4,044,613	15
2063	849,862	112,862	96,440	731,475	2,379,615	4,170,253	15
2064	877,642	116,551	98,740	749,501	2,457,398	4,299,833	15
2065	906,330	120,361	101,093	767,968	2,537,724	4,433,477	15
2066	935,956	124,295	103,501	786,886	2,620,676	4,571,314	15

Year	Ship Lift	Hardstand Area	High			SPMT	Total revenue	Vessels
			Paint and Blast	Wet Berth				Tourism
2026	-	-	-	-	-	-	-	14
2027	250,342	33,245	32,196	307,543	700,957	1,324,283		14
2028	347,482	46,146	44,115	414,734	972,951	1,825,428		15
2029	361,737	48,039	44,696	397,737	1,012,865	1,865,074		15
2030	376,577	50,009	45,682	395,072	1,054,416	1,921,757		15
2031	392,026	52,061	46,538	391,987	1,097,673	1,980,284		15
2032	408,108	54,197	47,390	388,781	1,142,703	2,041,179		16
2033	424,851	56,420	48,237	385,461	1,189,582	2,104,550		16
2034	442,280	58,735	49,078	382,036	1,238,383	2,170,511		16
2035	460,424	61,144	49,911	378,514	1,289,186	2,239,180		16
2036	475,474	63,143	51,124	387,885	1,331,326	2,308,952		16
2037	491,016	65,207	52,364	397,487	1,374,844	2,380,918		17
2038	507,066	67,338	53,635	407,325	1,419,784	2,455,148		17
2039	523,641	69,539	54,935	417,404	1,466,193	2,531,713		17
2040	540,757	71,813	56,266	427,732	1,514,120	2,610,687		17
2041	558,433	74,160	57,629	438,313	1,563,612	2,692,147		17
2042	576,687	76,584	59,023	449,155	1,614,723	2,776,172		17
2043	595,537	79,087	60,451	460,263	1,667,504	2,862,843		17
2044	615,004	81,673	61,912	471,644	1,722,011	2,952,243		17
2045	635,107	84,342	63,408	483,304	1,778,299	3,044,460		18
2046	655,867	87,099	64,939	495,251	1,836,427	3,139,583		18
2047	677,306	89,946	66,505	507,491	1,896,455	3,237,704		18
2048	699,445	92,886	68,109	520,032	1,958,446	3,338,918		18
2049	722,308	95,923	69,750	532,880	2,022,463	3,443,323		18
2050	745,918	99,058	71,430	546,043	2,088,572	3,551,021		18
2051	770,301	102,296	73,149	559,529	2,156,842	3,662,117		18
2052	795,480	105,640	74,908	573,346	2,227,344	3,776,717		19
2053	821,482	109,093	76,708	587,501	2,300,150	3,894,934		19
2054	848,334	112,659	78,550	602,003	2,375,336	4,016,883		19
2055	876,064	116,341	80,436	616,861	2,452,980	4,142,682		19
2056	904,701	120,144	82,365	632,082	2,533,162	4,272,453		19
2057	934,273	124,071	84,339	647,676	2,615,964	4,406,323		19
2058	964,812	128,127	86,359	663,651	2,701,474	4,544,422		19
2059	996,349	132,315	88,425	680,017	2,789,778	4,686,885		20
2060	1,028,918	136,640	90,540	696,784	2,880,969	4,833,850		20
2061	1,062,550	141,107	92,704	713,960	2,975,141	4,985,461		20
2062	1,097,282	145,719	94,917	731,556	3,072,391	5,141,866		20
2063	1,133,150	150,482	97,182	749,582	3,172,819	5,303,216		20
2064	1,170,190	155,401	99,499	768,048	3,276,531	5,469,670		20
2065	1,208,440	160,481	101,870	786,965	3,383,633	5,641,389		20
2066	1,247,941	165,727	104,295	806,344	3,494,235	5,818,542		21

Year	Low					Vessels	
	Ship Lift	Hardstand Area	Paint and Blast	Wet Berth	SPMT	Total revenue	Tourism
2026	-	-	-	-	-	-	7
2027	125,171	16,623	22,873	158,153	350,479	673,298	7
2028	173,741	23,073	31,385	219,522	486,475	934,196	7
2029	180,869	24,019	31,661	228,528	506,432	971,509	7
2030	188,289	25,005	32,346	237,903	527,208	1,010,751	8
2031	196,013	26,031	33,010	247,662	548,836	1,051,552	8
2032	204,054	27,098	33,673	257,822	571,352	1,094,000	8
2033	212,425	28,210	34,333	268,399	594,791	1,138,158	8
2034	221,140	29,367	34,990	269,516	619,191	1,174,205	8
2035	230,212	30,572	35,643	267,161	644,593	1,208,180	8
2036	237,737	31,571	36,535	273,829	665,663	1,245,335	8
2037	245,508	32,603	37,449	280,664	687,422	1,283,646	8
2038	253,533	33,669	38,386	287,669	709,892	1,323,149	8
2039	261,820	34,770	39,346	294,849	733,097	1,363,881	8
2040	270,379	35,906	40,330	302,208	757,060	1,405,882	8
2041	279,217	37,080	41,338	309,750	781,806	1,449,191	9
2042	288,343	38,292	42,372	317,480	807,362	1,493,849	9
2043	297,769	39,544	43,431	325,403	833,752	1,539,899	9
2044	307,502	40,836	44,516	333,524	861,005	1,587,384	9
2045	317,553	42,171	45,629	341,847	889,150	1,636,350	9
2046	327,933	43,550	46,769	350,377	918,214	1,686,843	9
2047	338,653	44,973	47,937	359,121	948,228	1,738,911	9
2048	349,722	46,443	49,135	368,082	979,223	1,792,605	9
2049	361,154	47,961	50,362	377,266	1,011,231	1,847,974	9
2050	372,959	49,529	51,619	386,679	1,044,286	1,905,073	9
2051	385,150	51,148	52,908	396,327	1,078,421	1,963,954	9
2052	397,740	52,820	54,229	406,215	1,113,672	2,024,676	9
2053	410,741	54,546	55,582	416,350	1,150,075	2,087,295	9
2054	424,167	56,329	56,969	426,737	1,187,668	2,151,871	9
2055	438,032	58,171	58,390	437,384	1,226,490	2,218,467	9
2056	452,350	60,072	59,847	448,295	1,266,581	2,287,145	10
2057	467,137	62,036	61,340	459,478	1,307,982	2,357,972	10
2058	482,406	64,064	62,869	470,940	1,350,737	2,431,016	10
2059	498,175	66,158	64,437	482,687	1,394,889	2,506,345	10
2060	514,459	68,320	66,043	494,727	1,440,485	2,584,034	10
2061	531,275	70,553	67,689	507,067	1,487,570	2,664,155	10
2062	548,641	72,860	69,376	519,714	1,536,195	2,746,786	10
2063	566,575	75,241	71,104	532,676	1,586,410	2,832,007	10
2064	585,095	77,701	72,876	545,962	1,638,266	2,919,898	10
2065	604,220	80,240	74,691	559,577	1,691,816	3,010,545	10
2066	623,971	82,863	76,551	573,532	1,747,118	3,104,034	10

Annexure F – Leisure Revenue

Medium							Vessels
Year	Ship Lift	Hardstand Area	Paint and Blast	Wet Berth	SPMT	Total revenue	Leisure
2026	-	-	-	-	-	-	36
2027	620,270	5,516	106,032	-	1,476,243	2,208,061	36
2028	854,060	7,595	143,686	-	2,032,664	3,038,005	36
2029	881,977	7,843	144,006	-	2,099,106	3,132,933	36
2030	910,807	8,100	146,028	-	2,167,721	3,232,656	37
2031	940,579	8,364	147,600	-	2,238,578	3,335,122	37
2032	971,324	8,638	149,126	-	2,311,752	3,440,840	37
2033	1,003,074	8,920	150,605	-	2,387,317	3,549,916	37
2034	1,035,862	9,212	152,031	-	2,465,353	3,662,458	38
2035	1,069,722	9,513	153,404	-	2,545,939	3,778,578	38
2036	1,104,689	9,824	157,130	-	2,629,159	3,900,802	38
2037	1,140,798	10,145	160,945	-	2,715,100	4,026,988	39
2038	1,178,088	10,477	164,850	-	2,803,850	4,157,265	39
2039	1,216,597	10,819	168,848	-	2,895,500	4,291,764	39
2040	1,256,364	11,173	172,940	-	2,990,147	4,430,624	39
2041	1,297,432	11,538	177,129	-	3,087,888	4,573,986	40
2042	1,339,842	11,915	181,417	-	3,188,823	4,721,997	40
2043	1,383,638	12,304	185,806	-	3,293,058	4,874,806	40
2044	1,428,865	12,707	190,299	-	3,400,699	5,032,570	41
2045	1,475,571	13,122	194,897	-	3,511,860	5,195,450	41
2046	1,523,804	13,551	199,604	-	3,626,654	5,363,612	41
2047	1,573,613	13,994	204,421	-	3,745,200	5,537,228	42
2048	1,625,051	14,451	209,351	-	3,867,621	5,716,474	42
2049	1,678,170	14,924	214,397	-	3,994,044	5,901,535	42
2050	1,733,025	15,412	219,561	-	4,124,599	6,092,597	42
2051	1,789,673	15,915	224,847	-	4,259,422	6,289,857	43
2052	1,848,173	16,436	230,256	-	4,398,652	6,493,516	43
2053	1,908,585	16,973	235,791	-	4,542,433	6,703,782	43
2054	1,970,972	17,528	241,456	-	4,690,914	6,920,869	44
2055	2,035,398	18,101	247,252	-	4,844,248	7,144,999	44
2056	2,101,930	18,692	253,184	-	5,002,594	7,376,401	44
2057	2,170,637	19,303	259,254	-	5,166,117	7,615,311	45
2058	2,241,590	19,934	265,465	-	5,334,984	7,861,973	45
2059	2,314,862	20,586	271,821	-	5,509,371	8,116,640	45
2060	2,390,529	21,259	278,323	-	5,689,459	8,379,570	46
2061	2,468,669	21,954	284,977	-	5,875,433	8,651,033	46
2062	2,549,364	22,671	291,785	-	6,067,486	8,931,306	46
2063	2,632,696	23,412	298,750	-	6,265,817	9,220,675	47
2064	2,718,753	24,177	305,875	-	6,470,631	9,519,437	47
2065	2,807,622	24,968	313,166	-	6,682,140	9,827,895	48
2066	2,899,396	25,784	320,624	-	6,900,562	10,146,366	48

Year	Ship Lift	Hardstand Area	High			Total revenue	Vessels
			Paint and Blast	Wet Berth	SPMT		Leisure
2026	-	-	-	-	-	-	47
2027	827,027	7,355	106,363	-	1,968,324	2,909,069	48
2028	1,138,747	10,127	144,572	-	2,710,218	4,003,664	48
2029	1,175,970	10,458	145,302	-	2,798,808	4,130,539	48
2030	1,214,409	10,800	147,318	-	2,890,295	4,262,822	49
2031	1,254,105	11,153	148,876	-	2,984,771	4,398,905	49
2032	1,295,099	11,517	150,388	-	3,082,336	4,539,340	50
2033	1,337,433	11,894	151,850	-	3,183,090	4,684,266	50
2034	1,381,150	12,282	153,260	-	3,287,137	4,833,829	50
2035	1,426,296	12,684	154,615	-	3,394,585	4,988,180	51
2036	1,472,918	13,098	158,370	-	3,505,546	5,149,932	51
2037	1,521,064	13,527	162,214	-	3,620,133	5,316,938	51
2038	1,570,784	13,969	166,149	-	3,738,466	5,489,368	52
2039	1,622,129	14,425	170,177	-	3,860,667	5,667,399	52
2040	1,675,152	14,897	174,301	-	3,986,863	5,851,213	53
2041	1,729,909	15,384	178,522	-	4,117,183	6,040,998	53
2042	1,786,455	15,887	182,842	-	4,251,764	6,236,948	53
2043	1,844,850	16,406	187,265	-	4,390,743	6,439,264	54
2044	1,905,154	16,942	191,791	-	4,534,266	6,648,153	54
2045	1,967,428	17,496	196,424	-	4,682,480	6,863,829	55
2046	2,031,739	18,068	201,167	-	4,835,538	7,086,511	55
2047	2,098,151	18,659	206,020	-	4,993,600	7,316,430	55
2048	2,166,735	19,268	210,988	-	5,156,828	7,553,819	56
2049	2,237,560	19,898	216,072	-	5,325,392	7,798,922	56
2050	2,310,700	20,549	221,275	-	5,499,466	8,051,989	57
2051	2,386,231	21,220	226,600	-	5,679,230	8,313,280	57
2052	2,464,231	21,914	232,049	-	5,864,869	8,583,063	58
2053	2,544,780	22,630	237,626	-	6,056,577	8,861,614	58
2054	2,627,963	23,370	243,333	-	6,254,552	9,149,217	58
2055	2,713,864	24,134	249,173	-	6,458,997	9,446,168	59
2056	2,802,574	24,923	255,149	-	6,670,126	9,752,771	59
2057	2,894,183	25,738	261,264	-	6,888,155	10,069,340	60
2058	2,988,787	26,579	267,521	-	7,113,312	10,396,198	60
2059	3,086,483	27,448	273,923	-	7,345,828	10,733,682	61
2060	3,187,372	28,345	280,474	-	7,585,945	11,082,136	61
2061	3,291,559	29,271	287,176	-	7,833,911	11,441,918	62
2062	3,399,152	30,228	294,034	-	8,089,982	11,813,396	62
2063	3,510,262	31,216	301,050	-	8,354,423	12,196,951	62
2064	3,625,003	32,237	308,228	-	8,627,508	12,592,977	63
2065	3,743,496	33,290	315,572	-	8,909,520	13,001,878	63
2066	3,865,861	34,379	323,085	-	9,200,750	13,424,075	64

Year	Low					Vessels	
	Ship Lift	Hardstand Area	Paint and Blast	Wet Berth	SPMT	Total revenue	Leisure
2026	-	-	-	-	-	-	43
2027	756,642	6,729	138,262	-	1,800,807	2,702,439	44
2028	1,041,832	9,265	188,197	-	2,479,561	3,718,856	44
2029	1,075,887	9,568	188,335	-	2,560,612	3,834,402	44
2030	1,111,055	9,880	190,870	-	2,644,312	3,956,117	45
2031	1,147,373	10,203	193,227	-	2,730,748	4,081,551	45
2032	1,184,878	10,537	195,527	-	2,820,009	4,210,951	45
2033	1,223,609	10,881	197,764	-	2,912,188	4,344,443	46
2034	1,263,605	11,237	199,935	-	3,007,380	4,482,158	46
2035	1,304,909	11,604	202,033	-	3,105,684	4,624,231	46
2036	1,347,564	11,984	207,089	-	3,207,201	4,773,838	47
2037	1,391,612	12,375	212,271	-	3,312,037	4,928,295	47
2038	1,437,100	12,780	217,581	-	3,420,299	5,087,760	47
2039	1,484,076	13,198	223,023	-	3,532,100	5,252,397	48
2040	1,532,586	13,629	228,601	-	3,647,555	5,422,372	48
2041	1,582,683	14,075	234,317	-	3,766,785	5,597,859	48
2042	1,634,417	14,535	240,176	-	3,889,912	5,779,039	49
2043	1,687,842	15,010	246,179	-	4,017,063	5,966,094	49
2044	1,743,013	15,500	252,332	-	4,148,371	6,159,217	50
2045	1,799,988	16,007	258,638	-	4,283,971	6,358,604	50
2046	1,858,825	16,530	265,100	-	4,424,003	6,564,459	50
2047	1,919,585	17,071	271,723	-	4,568,613	6,776,992	51
2048	1,982,332	17,629	278,510	-	4,717,949	6,996,420	51
2049	2,047,129	18,205	285,466	-	4,872,167	7,222,967	51
2050	2,114,045	18,800	292,594	-	5,031,426	7,456,864	52
2051	2,183,147	19,414	299,899	-	5,195,891	7,698,351	52
2052	2,254,509	20,049	307,385	-	5,365,732	7,947,674	53
2053	2,328,203	20,704	315,056	-	5,541,124	8,205,088	53
2054	2,404,306	21,381	322,918	-	5,722,249	8,470,855	53
2055	2,482,897	22,080	330,975	-	5,909,295	8,745,247	54
2056	2,564,057	22,802	339,231	-	6,102,455	9,028,545	54
2057	2,647,870	23,547	347,692	-	6,301,929	9,321,038	55
2058	2,734,422	24,317	356,362	-	6,507,924	9,623,024	55
2059	2,823,803	25,112	365,247	-	6,720,652	9,934,813	55
2060	2,916,106	25,933	374,352	-	6,940,333	10,256,723	56
2061	3,011,426	26,780	383,682	-	7,167,195	10,589,084	56
2062	3,109,862	27,656	393,243	-	7,401,473	10,932,234	57
2063	3,211,516	28,560	403,041	-	7,643,408	11,286,525	57
2064	3,316,493	29,493	413,081	-	7,893,252	11,652,318	58
2065	3,424,900	30,457	423,369	-	8,151,263	12,029,989	58
2066	3,536,852	31,453	433,911	-	8,417,707	12,419,923	58

Annexure G – Facility Revenue

Year	Ship Lift	Hardstand Area	Medium			Total revenue	Vessels
			Paint and Blast	Wet Berth	SPMT		Total vessels
2026	-	-	-	-	-	-	218
2027	1,392,140	115,160	237,979	2,675,795	3,833,811	8,254,886	221
2028	1,933,194	161,090	325,238	3,807,594	5,327,245	11,554,362	224
2029	2,041,744	173,931	333,369	4,274,676	5,643,155	12,466,876	228
2030	2,131,276	183,249	341,703	4,585,257	5,896,637	13,138,123	232
2031	2,231,940	194,381	350,246	4,924,061	6,187,832	13,888,459	236
2032	2,338,334	206,286	359,002	5,168,697	6,496,332	14,568,652	240
2033	2,450,845	219,026	367,977	5,297,914	6,823,336	15,159,098	245
2034	2,569,885	232,663	377,177	5,430,362	7,170,132	15,780,218	250
2035	2,695,899	247,266	386,606	5,566,121	7,538,109	16,434,000	255
2036	2,785,946	255,864	396,271	5,705,274	7,792,938	16,936,293	257
2037	2,879,040	264,768	406,178	5,847,906	8,056,530	17,454,422	259
2038	2,975,284	273,989	416,332	5,994,104	8,329,193	17,988,903	261
2039	3,074,787	283,539	426,741	6,143,956	8,611,246	18,540,270	263
2040	3,177,662	293,431	437,409	6,297,555	8,903,020	19,109,077	265
2041	3,284,024	303,676	448,344	6,454,994	9,204,856	19,695,895	267
2042	3,393,994	314,288	459,553	6,616,369	9,517,110	20,301,313	269
2043	3,507,696	325,280	471,042	6,781,778	9,840,149	20,925,944	271
2044	3,625,259	336,666	482,818	6,951,323	10,174,354	21,570,419	273
2045	3,746,816	348,461	494,888	7,125,106	10,520,120	22,235,390	275
2046	3,872,505	360,679	507,261	7,303,233	10,877,856	22,921,534	277
2047	4,002,469	373,337	519,942	7,485,814	11,247,986	23,629,550	280
2048	4,136,857	386,452	532,941	7,672,960	11,630,950	24,360,160	282
2049	4,275,822	400,038	546,264	7,864,784	12,027,204	25,114,112	284
2050	4,419,521	414,116	559,921	8,061,403	12,437,218	25,892,179	286
2051	4,568,120	428,702	573,919	8,262,938	12,861,484	26,695,163	288
2052	4,721,789	443,815	588,267	8,469,512	13,300,507	27,523,889	291
2053	4,880,703	459,476	602,973	8,681,249	13,754,815	28,379,216	293
2054	5,045,045	475,705	618,048	8,898,281	14,224,951	29,262,030	295
2055	5,215,005	492,522	633,499	9,120,738	14,711,482	30,173,246	298
2056	5,390,777	509,951	649,336	9,348,756	15,214,994	31,113,814	300
2057	5,572,564	528,013	665,570	9,582,475	15,736,093	32,084,716	303
2058	5,760,577	546,734	682,209	9,822,037	16,275,411	33,086,967	305
2059	5,955,032	566,137	699,264	10,067,588	16,833,600	34,121,620	308
2060	6,156,154	586,248	716,746	10,319,278	17,411,337	35,189,763	310
2061	6,364,178	607,094	734,665	10,577,260	18,009,326	36,292,521	313
2062	6,579,343	628,703	753,031	10,841,691	18,628,294	37,431,062	315
2063	6,801,902	651,103	771,857	11,112,733	19,268,996	38,606,591	318
2064	7,032,111	674,325	791,153	11,390,552	19,932,218	39,820,359	321
2065	7,270,242	698,399	810,932	11,675,315	20,618,770	41,073,659	323
2066	7,516,570	723,359	831,206	11,967,198	21,329,496	42,367,829	326

Year	High					Vessels	
	Ship Lift	Hardstand Area	Paint and Blast	Wet Berth	SPMT	Total revenue	Total vessels
2026	-	-	-	-	-	-	290
2027	1,850,408	152,539	237,979	3,426,281	5,093,142	10,760,350	294
2028	2,561,798	212,034	325,238	4,682,584	7,052,135	14,833,790	297
2029	2,698,042	227,676	333,369	4,799,649	7,446,013	15,504,748	303
2030	2,816,811	239,994	341,703	4,919,640	7,782,033	16,100,181	307
2031	2,950,406	254,727	350,246	5,042,631	8,168,290	16,766,300	313
2032	3,091,628	270,490	359,002	5,168,697	8,577,570	17,467,387	319
2033	3,240,988	287,362	367,977	5,297,914	9,011,470	18,205,712	325
2034	3,399,038	305,428	377,177	5,430,362	9,471,707	18,983,711	332
2035	3,566,370	324,779	386,606	5,566,121	9,960,130	19,804,007	338
2036	3,685,513	336,082	396,271	5,705,274	10,296,939	20,420,079	341
2037	3,808,687	347,789	406,178	5,847,906	10,645,334	21,055,893	343
2038	3,936,031	359,913	416,332	5,994,104	11,005,724	21,712,103	346
2039	4,067,688	372,470	426,741	6,143,956	11,378,530	22,389,385	349
2040	4,203,807	385,476	437,409	6,297,555	11,764,190	23,088,438	351
2041	4,344,542	398,948	448,344	6,454,994	12,163,157	23,809,986	354
2042	4,490,052	412,902	459,553	6,616,369	12,575,900	24,554,777	357
2043	4,640,502	427,357	471,042	6,781,778	13,002,906	25,323,585	359
2044	4,796,061	442,331	482,818	6,951,323	13,444,679	26,117,212	362
2045	4,956,908	457,843	494,888	7,125,106	13,901,741	26,936,486	365
2046	5,123,224	473,913	507,261	7,303,233	14,374,634	27,782,265	368
2047	5,295,199	490,562	519,942	7,485,814	14,863,919	28,655,436	371
2048	5,473,028	507,812	532,941	7,672,960	15,370,177	29,556,917	373
2049	5,656,916	525,684	546,264	7,864,784	15,894,012	30,487,659	376
2050	5,847,071	544,202	559,921	8,061,403	16,436,048	31,448,645	379
2051	6,043,711	563,390	573,919	8,262,938	16,996,933	32,440,891	382
2052	6,247,063	583,273	588,267	8,469,512	17,577,338	33,465,452	385
2053	6,457,358	603,877	602,973	8,681,249	18,177,960	34,523,418	388
2054	6,674,839	625,229	618,048	8,898,281	18,799,521	35,615,916	392
2055	6,899,755	647,356	633,499	9,120,738	19,442,768	36,744,116	395
2056	7,132,366	670,289	649,336	9,348,756	20,108,476	37,909,224	398
2057	7,372,940	694,057	665,570	9,582,475	20,797,451	39,112,494	401
2058	7,621,756	718,692	682,209	9,822,037	21,510,527	40,355,221	404
2059	7,879,100	744,227	699,264	10,067,588	22,248,567	41,638,746	408
2060	8,145,272	770,694	716,746	10,319,278	23,012,469	42,964,459	411
2061	8,420,579	798,131	734,665	10,577,260	23,803,163	44,333,797	414
2062	8,705,342	826,572	753,031	10,841,691	24,621,613	45,748,250	418
2063	8,999,893	856,057	771,857	11,112,733	25,468,819	47,209,359	421
2064	9,304,574	886,624	791,153	11,390,552	26,345,819	48,718,723	425
2065	9,619,741	918,316	810,932	11,675,315	27,253,689	50,277,994	428
2066	9,945,763	951,174	831,206	11,967,198	28,193,544	51,888,886	432

Year	Low					Vessels	
	Ship Lift	Hardstand Area	Paint and Blast	Wet Berth	SPMT	Total revenue	Total vessels
2026	-	-	-	-	-	-	151
2027	1,302,348	85,036	237,979	2,485,473	3,452,685	7,563,522	154
2028	1,800,469	118,270	325,238	3,470,625	4,776,170	10,490,773	155
2029	1,904,417	129,912	333,369	3,918,952	5,076,245	11,362,895	160
2030	1,989,062	137,974	341,703	4,209,418	5,312,995	11,991,154	163
2031	2,079,745	146,833	350,246	4,523,944	5,568,251	12,669,018	166
2032	2,175,526	156,345	359,002	4,864,041	5,838,667	13,393,580	169
2033	2,276,749	166,563	367,977	5,231,855	6,125,311	14,168,456	173
2034	2,383,788	177,545	377,177	5,430,362	6,429,333	14,798,204	176
2035	2,497,041	189,349	386,606	5,566,121	6,751,974	15,391,092	180
2036	2,578,602	195,603	396,271	5,705,274	6,973,060	15,848,811	181
2037	2,662,836	202,065	406,178	5,847,906	7,201,420	16,320,406	182
2038	2,749,833	208,742	416,332	5,994,104	7,437,295	16,806,306	184
2039	2,839,682	215,641	426,741	6,143,956	7,680,934	17,306,953	185
2040	2,932,477	222,769	437,409	6,297,555	7,932,592	17,822,804	186
2041	3,028,317	230,135	448,344	6,454,994	8,192,537	18,354,328	187
2042	3,127,300	237,746	459,553	6,616,369	8,461,043	18,902,012	188
2043	3,229,531	245,611	471,042	6,781,778	8,738,393	19,466,355	190
2044	3,335,116	253,738	482,818	6,951,323	9,024,881	20,047,876	191
2045	3,444,167	262,135	494,888	7,125,106	9,320,809	20,647,105	192
2046	3,556,797	270,813	507,261	7,303,233	9,626,490	21,264,594	194
2047	3,673,124	279,780	519,942	7,485,814	9,942,249	21,900,909	195
2048	3,793,271	289,046	532,941	7,672,960	10,268,419	22,556,636	196
2049	3,917,363	298,621	546,264	7,864,784	10,605,345	23,232,377	197
2050	4,045,531	308,516	559,921	8,061,403	10,953,386	23,928,756	199
2051	4,177,908	318,741	573,919	8,262,938	11,312,909	24,646,415	200
2052	4,314,635	329,308	588,267	8,469,512	11,684,297	25,386,017	201
2053	4,455,853	340,228	602,973	8,681,249	12,067,943	26,148,247	203
2054	4,601,713	351,513	618,048	8,898,281	12,464,255	26,933,809	204
2055	4,752,366	363,175	633,499	9,120,738	12,873,654	27,743,431	206
2056	4,907,972	375,227	649,336	9,348,756	13,296,575	28,577,867	207
2057	5,068,693	387,683	665,570	9,582,475	13,733,468	29,437,889	208
2058	5,234,700	400,556	682,209	9,822,037	14,184,797	30,324,299	210
2059	5,406,166	413,859	699,264	10,067,588	14,651,044	31,237,922	211
2060	5,583,272	427,609	716,746	10,319,278	15,132,705	32,179,609	213
2061	5,766,204	441,819	734,665	10,577,260	15,630,293	33,150,240	214
2062	5,955,156	456,505	753,031	10,841,691	16,144,338	34,150,722	216
2063	6,150,326	471,685	771,857	11,112,733	16,675,390	35,181,990	217
2064	6,351,919	487,373	791,153	11,390,552	17,224,015	36,245,012	219
2065	6,560,150	503,588	810,932	11,675,315	17,790,798	37,340,783	220
2066	6,775,236	520,347	831,206	11,967,198	18,376,346	38,470,333	222

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