Still waiting for some feedback (eg DAC, Tasmanian Seafoods) and Larrakia consultation
Still waiting for several technical reports (dredging, greenhouse gas, health, emergency planning work).
Approval from Planning Commission to use maps, EcOz maps to come

PRELIMINARY DRAFT – based on research, stakeholder input – to be revised when all technical reports are available.

Middle Arm
Preliminary Strategic Social Impact Assessment

Prepared by True North Strategic Communication
February 2023

Version No.	Issue Date	Prepared by:	Approved by:	Approval Date
V1	12 January 2023	Jane Munday	Elena Madden	20 January 2023
V2	15 February	Jane Munday	Kylie Welch, EcOz	23 February 2023

Recipients are responsible for eliminating all superseded documents in their possession

Consultation statement
True North Strategic Communication is guided by the principles of good community engagement, based on people's level of interest and concern as outlined by the International Association for Public Participation (IAP2).
Our role is to provide stakeholders and the general public with objective information, so they can provide informed feedback on consultation projects. We give people the opportunity to provide input that is balanced and reflective of the range of community views to independently provide the best possible guidance to decision makers.
Our practice reflects professional standards and ethical standards for human research including anonymity, confidentiality, record storage and keeping people informed.

Limitations

- A key limitation of this Strategic Social Impact Assessment (SSIA) is that planning for the Middle Arm Sustainable Development Precinct (MASDP) is still at a conceptual level, the make-up of industrial tenants is uncertain, the project description is still at the concept design stage and includes options that will not be resolved until final design. Strategic assessments are novel, which makes it difficult for stakeholders to envisage and provide feedback on how they might be affected. On the positive side, the value of a strategic assessment is to consider a range of possibilities and provide advice to decision-makers that should influence the final configuration of the project. A key recommendation of the SSIA is that stakeholders continue to have opportunities for early and meaningful engagement for precinct and project level decisions.
- A second key challenge was that DIPL took responsibility for communication and community engagement. Given that community input is the best way to gather qualitative data for an independent social impact assessment, this issue was addressed by setting up a social expert panel to oversight the social research methodology and attending many community engagement meetings to hear first-hand the issues raised.
- A third key limitation was delays in consultation with Larrakia people (and other potentially affected peoples such as Tiwi Islanders), which limited sharing of cultural knowledge and assessment of cultural impacts. This issue is acknowledged and will be addressed by DIPL and Larrakia organisations in early 2023 with the intent of reporting Larrakia perspectives in the Supplementary to the EIS.
- Most stakeholder and community engagement took place at the end of 2022. Challenges included stakeholder fatigue, heavy demands on under-resourced and busy industry associations and NGOs and gaps in the information presented.
- The requirement for a social impact assessment was not included in initial tender documents for the strategic assessment, so scoping began after the Draft Terms of Reference (TOR) were issued and was not informed by fieldwork or primary research.
- There are substantial limitations in considering social, cultural and economic outcomes and sustainability under the auspices of the *Environment Protection and Biodiversity Conservation (EPBC) Act*, which restricts consideration of people and wellbeing to impacts associated with 'controlled actions' or biophysical impacts. However, the *NT Environment Protection Act* (2019) allows for social, economic and cultural heritage assessments and the SSIA draws heavily on Infrastructure Australia and the Infrastructure Sustainability Council's sustainability principles and sustainability rating scheme.
- The subjective and variable nature of many social impacts makes it difficult to predict and assess the significance of risks and opportunities with accuracy.
- It is difficult to predict and assess potential cumulative impacts and benefits given the early stages of planning and uncertainty about the project's ultimate configuration. On the other hand, sophisticated and high-level planning by several agencies such as the Planning Commission, Transport Planning in DIPL and Infrastructure Northern Territory should allow the flexibility to respond and adapt as scenarios of development evolve.

We thank many busy people for the gift of their time, for sharing data and for their responsiveness in contributing to this report.

Executive summary

This Strategic Social Impact Assessment (SSIA) has been prepared by True North Strategic Communication for EcOz Environmental Consulting, which is coordinating the Strategic Assessment for the Middle Arm Sustainable Development Precinct (the Project) on behalf of the Department of Planning, Infrastructure and Logistics (DIPL).

The purpose of a social impact assessment (SIA) is to combine community insights with expert judgement in order to determine how projects, policies or programs are likely to be experienced or perceived by affected people, communities and service providers. Effective studies will:

- reduce uncertainty about the consequences of projects (or policy changes)
- inform and influence decision-making by regulators, project proponents and affected communities
- provide data and insights that improve planning (such as project design, alternatives and workforce and accommodation issues)
- provide baseline quantitative and qualitative data against which to track cumulative change across the life span of the project, from conception to closure
- inform effective management plans and proponents' long-term social performance (including enhancement of social and economic benefits, trust and relationships).

A strategic or regional social impact assessment expands the temporal and geographic boundaries of a project-level SIA to consider the issues at a broader regional – or in this case – precinct scale as described in the MASDP 'program'.

The objectives of the SSIA were:

- **To inform planning** for development of Middle Arm:
  - including insights into community values, sensitivities, attitudes, perceptions and local knowledge that may inform design, planning and governance decisions on the Middle Arm Sustainable Development Precinct (MASDP);
  - planning for social infrastructure (housing, schools, education, transport, utilities, essential services) that may be affected by various scenarios of cumulative development on and related to Middle Arm;
  - implications for land use planning and infrastructure investments, such as the timing for land release and headworks for future urban development at Weddell, Mitchell and Holtze.
- **To streamline project level approvals** by:
  - contributing to a high-level development program, reducing the scope of individual level studies for classes of action that fall within the scope of the Middle Arm development program;

- de-risking investment decisions by providing greater certainty and clarity to proponents about likely project approval conditions and important social, cultural and economic values to be protected or enhanced;
- providing access to a shared knowledge map and database of social, economic and cultural baseline data.

- **To provide advice**:
  - to government on the values of Darwin Harbour, how these values (community, economic, ecological, cultural) might be disturbed by development at different scales, and the pace and scale of development the community will accept;
  - to individual proponents about government expectations and community priorities;
  - to the community about the implications of proposed development and ongoing governance;
  - on enhancement of potential positive local social and economic benefits that might be unlocked by development;
  - on management and mitigation of potential negative cumulative social, economic and cultural impacts at various scales of development;
  - on collaborative and adaptive approaches to maximise benefits, e.g. community development funding, workforce development and training plans;
  - on coordinated, long-term communication and engagement with stakeholders.

Scoping for the SSIA in late 2021 drew on public submissions to draft TOR for the Project, a literature review and analysis of other impact assessments in the Greater Darwin region. Scoping included a desktop risk and opportunity matrix based on the predicted likelihood of impacts and the

- scale
- extent
- duration, and
- community sensitivity

to the effects of change. The risk and opportunity ratings helped determine the materiality of topics for assessment in the SIA and key data required.

The SSIA characterises the social area of influence for the study, describes communities and economic sectors likely to be affected by the precinct development over the next 50 years, gathers baseline data and draws on stakeholder and public consultation for qualitative insights and local knowledge on how impacts might be experienced.

Values mapping was used as a key social research method of gathering qualitative data through a survey, mapping tool, focus groups and focussed interviews.

A risk and opportunity assessment (Attachment 1) outlines ways in which negative impacts might be avoided, mitigated or managed and positive impacts enhanced. This matrix informs a Social Sustainability Outcomes Framework and Social Performance Plan (Attachment 2).

In summary, the SSIA identifies xxx potential impacts, of which are xxx potential opportunities and xxx are potential risks. Given that impact assessment is designed to ensure that proponents understand

and can manage project harms or risks, it is to be expected that assessments will identify a disproportionate number of negative impacts.

It is important to note that residual ratings assume that recommended enhancement or mitigation strategies can be implemented. For some risks and opportunities, this is uncertain. In the case of greenhouse gas emissions and climate change, for example, the residual rating of 'high' assumes renewable energy sources and successful carbon capture, storage. Should these not apply, a rating of 'Very high' would remain.

Many identified impacts have both positive and negative ratings, depending on the staging of development and effectiveness of solutions. For example, enabling infrastructure such as diversified water and energy sources could provide transformational benefits for the Greater Darwin region. However, both could threaten water and energy sources if precinct demand exceeds or gets ahead of new sources of supply. The precinct provides both opportunities and threats for labour markets and skills development, with flow-on effects for social infrastructure and business productivity.

The potential opportunities with the highest residual ratings (transformational or beneficial) were:

- enhanced water supply that benefits other sectors
- diversified more reliable and affordable energy supplies
- sustained local prosperity through regional economic development, diversification and population growth
- more viable port and maritime sector
- a stronger business community
- enhanced human capital through sustained growth of a skilled workforce
- enhanced capabilities of Aboriginal businesses due to successful tendering
- collaborative approaches to build human capital and collective benefits.

The potential negative impacts with the highest residual risk ratings (very high or high) were:

- reduced ability for recreational fishing in parts of Darwin Harbour
- potential impacts on Darwin's residential and industrial water supplies
- pressure on emergency services' capacity to respond to incidents at Middle Arm
- skills shortages constrain growth and lead to crowding out of existing economic sectors
- greenhouse gas emissions jeopardise the NT's zero emissions targets.

Table 0-1: Summary of potential impacts identified to be completed

Potential impacts identified			
Positive residual ratings		**Negative residual ratings**	
Transformational		**Very high**	
Beneficial		**High**	

Noticeable		**Medium**	
Barely perceptible		**Low**	
Total positive		**Total negative**	

The SSIA provides an overview of the Project, engagement and social research methodology, baseline data on affected communities, prediction and assessment of potential impacts and advice on how positive and negative impacts might be managed and monitored.

The key issues raised in submissions to the TOR and during social research were:

- cumulative industrialisation of the harbour undermining Greater Darwin's quality of life and values of the harbour
- fears of toxicity and pollution from water discharges and air emissions, close to residential areas
- concern at the social and ecological impacts of dredging, shipping, construction and operations of marine infrastructure and projects in the precinct
- lost or substantially reduced access to the popular Elizabeth River boat ramp
- the severe impacts of skills shortages as a constraint to current and future economic activities
- concerns about impacts on other economic sectors such as aquaculture, tourism, recreational fishing and extractive industries
- general support for a low-emissions precinct fuelled by renewable energy but strong opposition to continued use of fossil fuels, concern about increases in greenhouse gas emissions and fears of climate change
- mixed reactions to the concept of carbon capture and storage, ranging from cynicism to support, or qualified support if used to abate emissions from existing LNG plants on Middle Arm
- comments across the board that people lacked the information to provide informed feedback
- concerns that pressure to fast-track economic development and streamline approvals should not undermine the public's right to be informed and comment on individual project approval notices.

Attachments to the SSIA include:

- **a risk and opportunity matrix** outlining initial and residual ratings and key suggested mitigation and enhancements that would be expected in an EIS;
- **a social sustainability outcomes framework** that outcomes desired social, cultural, economic, governance and ecological outcomes desired by stakeholders, together with more detailed objectives and actions to achieve these objectives in line with infrastructure sustainability frameworks;
- **a social performance plan** which groups key recommendations arising from the SSIA and sustainability outcomes framework into 10 groups.

Some notes on terminology

For the purposes of this report:

The **environment** takes its natural meaning, which is the air, water and land on which people, plants and animals live, organic and inorganic matter, living organisms and interacting natural systems. **Ecological** means all living organisms and their surroundings. **Ecosystem** means a biological system of interconnected organisms, including humans. '**Environment'** in Australia is often defined as the **biophysical** (biotic and abiotic) '**surroundings'** of people, which sidelines consideration of the social settings and behaviour of people and communities. We refer to the **natural** and **human** environments. **Biodiversity** is a diversity of species of plants and animals.

Aboriginal is used to describe the First Nations peoples of the Northern Territory, **Indigenous** refers to Aboriginal and Torres Strait Islander peoples of Australia, **Larrakia, Tiwi, Wulna and Wagaitj** and other named groups refers to the Aboriginal people of specific lands and seas under study.

Cultural heritage refers to archaeological sites of cultural significance. Archaeological places are defined by the NT *Heritage Act 2011* as relating to 'the past human occupation of the Territory'. **Cultural values** may refer to the values associated with these archaeological/heritage sites (Earthsea's **cultural heritage report**) or to the social/anthropological values of living cultures, including contemporary cultural knowledge and uses of traditional land and seas (**social impact assessment report**).

Social impact refers to the social risks and opportunities of policies, programs or projects, drawing from social science and impact assessment methodologies. It does not refer to the process of determining an organisation's 'social impact', or contribution to society, often used in accounting or sustainability reporting models (see Literature Review in Section 4.6).

Community engagement or **public participation** covers a spectrum from 'inform' (one way telling) to 'consult' (listening), 'involve' or 'collaborate' (more participative ways of giving people input to decisions that affect them). **Communication** is a two-way process of creating shared understanding (eg telling stories, interactive dialogue, producing explanatory material). **Community engagement** is a core research methodology for **social impact assessment** (an applied form of sociological research) but does not mean the same thing.

A **community** is a grouping of people bound by common ties to a geographic location, social group, professional or industry group. Communities are rarely homogenous. **Stakeholders** are people with a specific interest, or stake, in an issue. The **public** is the general public. So, stakeholder consultation is proactively targeted at stakeholder groups identified in stakeholder mapping as those who are impacted, interested or influential. 'Public' or 'community' consultation includes everyone living in the social area of influence.

Summary of findings against Draft Terms of Reference

Table 0-2: Summary of findings

Specific information required by the ToR	Key findings	Where addressed
Statement of reasons (19 September 2022) – against environmental factors		
Community and economy: The proposed action has the potential to significantly impact communities, including Aboriginal communities, within its area of influence, both adversely and beneficially. **Culture and heritage:** Cultural and historical heritage may be impacted during construction of the proposed action. The significance of impacts is uncertain. **Human health**: The potential for significant adverse impacts to human health from the proposed action is unknown with the industry types proposed potentially emitting hazardous substances through air emissions, liquid waste discharges and solid waste streams. Controls and mitigation measures are uncertain.	Depending on its ultimate configuration, development at Middle Arm is highly likely to disturb the closely held values of many Darwin residents who revere their harbour, tropical lifestyle and recreational fishing. Cultural heritage may be affected, although sensitive design should be able to avoid high value cultural heritage. However, progressive industrialisation of Darwin Harbour does threaten the cultural values of Larrakia people, including cultural knowledge and culturally significant places. The key health impacts would come from pollutants and emissions that reduce air and water quality, enter the food chain or which cause psychosocial impacts (fears). The extent to which these fears will be realised, depends on what industries ultimately operate in the precinct and the thresholds or standards to which they are held accountable. The Air Quality Impact Assessment prepared for the EIS (at Appendix xxx) indicates that the nominated industries can be accommodated at the MASDP without an unacceptable impact on air quality. The air emissions modelling indicates that the National Environmental Protection Measure (NEMP) guidelines for air quality will be met within the precinct boundaries.	Throughout the SSIA, cultural heritage and health reports.
Requires a standard EIS The Statement of Reasons provided by the Minister includes the potential for significant impacts to people, refers to limited opportunities to consult with stakeholders on the specifics of likely industry types and comments that the EIS provides opportunities to provide detailed information about the strategic proposal.		
Terms of Reference for a strategic assessment by an Environmental Impact Statement, September 2022		
Community and the economy NTEPA Objective: Enhance communities and the economy for the welfare, amenity and benefit of current and future generations of Territorians.		
Describe and provide baseline data for the social area of influence likely to be affected by cumulative impacts from actions proposed to be taken under the strategic proposal. This must include, at a minimum:		
• definition of social area of influence and affected community	For the SIA, the social area of influence is taken to be Darwin Harbour, the three municipalities of the Greater Darwin region (Darwin, Palmerston, Litchfield) and further afield to Wagait, Coomalie and Belyuen.	Section 1: Overview Section 6: People and Communities
• economic modelling to demonstrate the feasibility of government's investment in enabling infrastructure and the return on investment	Deloitte prepared an Economic Impact Analysis, building on Computable General Equilibrium (CGE) modelling, which estimates the economy-wide impact of the precinct, including flow-on effects and spill overs based on three development scenarios.	Section 8: Economies and Jobs

Specific information required by the ToR	Key findings	Where addressed
	The analysis estimated the direct benefits over the life of the project and the costs associated with the investment. The analysis finds that the MASDP is a strategically significant project for the region. Investment directly associated with the scope of development covered by the SEA is estimated at $59.3 billion over 50 years, including capital expenditure of $31 billion, operating expenditure of $25.2 billion and supporting infrastructure worth $3.1 billion in present value terms. Over the 50-year modelled period, output from the precinct is estimated to be valued at $101 billion. This equates to a net present value of $41.6 billion and a benefit-cost ratio of 1.70.	Economic Impact Assessment (Deloitte 2023) at Appendix xxxx
• economic impact assessment to consider the equitable intra- and intergenerational distribution of economic benefits at a regional level	This is unable to be predicted with any certainty but is addressed as a desirable outcome, with suggested equitable outcomes and commitments covered in the social performance plan at Attachment 2.	Section 8: Economies and Jobs
• existing and emerging economic sectors	An overview of key existing and emerging economic sectors in Section 8 is based on NTG 2021-22 Budget papers (2022), TERC report (2020), *NT Infrastructure Plan and Pipeline* (NTIPP, 2022) and industry interviews. Particular attention is paid to the tourism, aquaculture, transport, recreational fishing and extractives industries.	Section 8 : Economies and Jobs
• existing social infrastructure (health, education, housing, transport, emergency services, utilities)	Described in Section 7, based on Planning Commission, Transport Planning and Infrastructure NT reports and stakeholder interviews. A key area of concern is maintaining a supply of affordable housing to support population growth. Discussion of water demand and supply is drawn from the AROWS business case (PwC 2020 and 2022). Challenges incorporating renewable energy is drawn from Power and Water, the Utilities Commission and NTG policy documents. The sequencing of planning for water and energy will be important in order to align supply and demand and avoid disruption to residential and industrial customers. A key area that needs addressing is the adequacy and capability of emergency services to respond to a major incident at the Middle Arm Precinct. An options study for a new fire station and training area might be incorporated in the pending sub-regional plan for Middle Arm and Weddell.	Section 7: Social Infrastructure Planning Commission reports on land use planning Infrastructure Northern Territory
• demographic composition and population trends	Characterisation of the Greater Darwin Region is covered in Section 6, including demographic composition, population projections and challenges with the outmigration of young families. The section describes key demographic features for the three Greater Darwin municipalities. Key features are the youth and mobility of people living in the social area of influence, low unemployment levels, the fast growth of Palmerston and Litchfield municipalities and relatively large proportion of Aboriginal residents.	Section 6: People and Communities

Specific information required by the ToR	Key findings	Where addressed
• workforce participation	Workforce participation is discussed in Section 8. In general, the Greater Darwin Region has higher levels of workforce participation than the national average, as workers tend to leave the region if there is no work. However, this masks lower levels of participation and disengagement by Aboriginal populations in the region. The Workforce Development Strategy provides a deeper analysis of labour force demand and supply in Greater Darwin, likely skills gaps and how they might be addressed. Given the lack of detailed workforce assumptions and occupational breakdowns at this stage, more definitive research and planning will be needed once there is greater certainty about the precinct's industrial make-up.	Section 8: Economies and Jobs Workforce Development Strategy (Chamber of Commerce NT) at Attachment 4 of the SSIA
• levels of disadvantage against relevant social indicators	Aggregated data such as median household income can gloss over the gaps between the affluent and the disadvantaged. Section 6 draws on data such as the SEIFA Index, public housing waiting lists and research into indicators of disadvantage. This data suggests that despite positive economic metrics, such as median household income and GDP growth, there remains a large cohort of disadvantaged people in the Greater Darwin region.	Section 6: People and Communities
• land and sea uses, including recreational values	Darwin Harbour has a rich cultural history associated with its traditional owners, the Larrakia, or 'Saltwater' people as well as a rich heritage and historical values from European settlement and World War II. Cultural values include shellfish and camping areas along its shores, sacred sites and Song Lines. Ecological values include mangroves that act as nursery for barramundi, muddy creeks popular for crabbing and crocodile nests, iconic marine mammals and coral. Economic values are derived from livelihoods, and industries reliant on water quality, such as tourism, recreational fishing and aquaculture. The harbour supports trade and transport to the only deep-water port on Australian's northern coast, coastal and regional ferries and barges, LNG ships and a strong marine sustainment industry spread along its shores. The harbour's natural values are integral to Territorians' wellbeing and quality of life. Darwin's tourism brand and recreational activities cover guided fishing, sailing, sunset tours, ecotourism, walking, dining along the foreshore and thriving waterfront. The values mapping section in particular describes the diverse uses and highly treasured values of Darwin Harbour and its catchment, including social, cultural, economic and environmental values.	Section 5: Values mapping
• community values of Darwin Harbour, Middle Arm Peninsula and the broader region (including the municipalities of Darwin, Palmerston, Litchfield, Belyuen and Wagait)	Community values are diverse but generally shared. There is some polarisation around those who prioritise economic and population growth and those who prioritise preservation of the harbour's natural values. However, a majority view would support careful economic growth that balances the need to protect existing lifestyle values.	Section 5 Values mapping

Specific information required by the ToR	Key findings	Where addressed
• historical context, including previous relevant studies	The literature review and Section 5 outline the history of development on Middle Arm, current land use and key themes raised in previous studies.	SSIA in Sections 3 and 5.
• relevant government policies and legislation	Covered under context, including government policies relevant to 'sustainable development', economic development and local government strategies relevant to the social area of influence.	Section 2 of SSIA
Identify, describe and assess likely direct and indirect impacts and benefits, and cumulative impacts, of implementing the strategic proposal on communities and the economy. This must include (at a minimum) consideration of:		
• disturbance to social, cultural, economic and ecological values of East Arm and Darwin Harbour (including cultural activities, recreation, aesthetics, liveability and sense of place)	Covered mainly in Section 5 in the values mapping results, but also in subsequent sections. The social research suggests that lifestyle and liveability are important assets for Greater Darwin residents. Disturbance to key uses and values from industrialisation of the harbour are likely to spark conflict, particularly threats to recreational fishing. There are likely to be impacts on other activities, such as sailing, and greater congestion of shipping in the harbour.	Section 5: Values Mapping and all sections Values mapping report at Attachment 3
• the promotion of Darwin as an iconic, world-class harbour city	Darwin's lifestyle and tourism brand is based on its identity as a tropical harbour city. Its competitive advantage for trade and logistics is based on its deep-water port, service and supply industry, intermodal transport and geographic location. Promotional material draws heavily on images and descriptions of sunsets, sailing, dining and fishing in the harbour. Tourism product development is focussed on cultural and ecotourist experiences, or 'nature and culture'. This is at odds with industrialisation of the harbour and increased defence activities, which is both a social and economic impact.	Section 5: Values mapping Section 8: Economies and Jobs
• disturbance to the environmental surrounds that provide for the tropical lifestyle and amenity of residents and visitors, through alteration of: ○ air quality ○ noise ○ odour ○ light ○ visual amenity	Much of the opposition to the Middle Arm precinct is based on fears of disruption of strongly held values and quality of life. Surveys and submissions suggested fears and anxieties about the health impacts of emissions and pollutants, with reference to 'factories' and 'petrochemicals'. Visual, noise, vibrations and light pollution were rarely raised, but this may be due to a lack of detailed description of the precinct and difficulty envisaging the implications of development. The Living Environment section includes the potential impacts on amenity from increased heavy vehicle movements through residential areas and approaches to Middle Arm.	Section 11: Living Environment Technical studies
• concerns about cumulative impacts, eg discharges of waste water, dredging, reclamation, increased marine traffic, loss of mangroves and iconic species such as turtles, dugong and dolphins migratory birds loss	There is general concern at the progressive 'industrialisation' of the harbour at the expense of its natural values. This emerged as a key issue during scoping for the SSIA, in submissions to the Draft TOR, and throughout community consultation and social research. Survey respondents and interviewees cited concern at the progressive erosion of what makes Darwin special as a result of major projects, dredging and increased shipping.	Section 5: Values mapping and most subsequent sections

Specific information required by the ToR	Key findings	Where addressed
of fish breeding areas, reduced water quality, contribution to greenhouse gas emissions and climate change	There are widespread concerns about increased greenhouse gas emissions, climate change and the need to move to from fossil fuels to renewable energy and concern that the precinct will enable more gas-based manufacturing.	Section 13: Cumulative impacts Technical studies
• economic benefits from local industry participation and economic diversification	The local business sector is cautiously supportive of the project. But Darwin businesses are typically small to medium enterprises (SMEs) and many were cautious based on previous experience of 'boom bust' major project cycles, which often benefit multinationals at the expense of local business sustainability. The key focus of public and private sector employers is addressing skills shortages rather than creating new jobs. Suggestions included skilled migration, adherence to procurement policies and sequencing of construction to suit local capacities. The social performance plan will address 'enduring local prosperity', or how to maximise long-term benefits and local participation.	Section 8: Economies and Jobs
• economic benefits generated by short-term construction and long-term operational job opportunities	The economic impact assessment suggests the precinct will provide jobs as well as capital and operating expenditure. During the construction phase, this will likely include expenditure on materials, services, equipment, plant and infrastructure. A large inflow of temporary non-resident workers will contribute local expenditure but these workers are unlikely to foster long-term economic prosperity. Development entails between 355 and 1975 direct FTEs when fully operational. Many of these jobs are likely to be high-skilled engineering and technical roles, which are unlikely to be filled locally, although this does offer a chance to improve Darwin's human capital. A cumulative contribution is predicted of 16,867 FTEs between 2024 and 2040, which will create jobs in other sectors such as services and retail and wholesale trade. These are not necessarily new jobs but may take workers from existing positions (see below).	Section 8: Economies and Jobs Economic Impact assessment at Appendix xxx Workforce Development Strategy at Attachment 4 to this SSIA
• the equitable distribution of benefits within the communities affected	The history of previous development cycles suggests that benefits are rarely equitably spread and can put pressure on disadvantaged sectors of the community through inflation and housing scarcity. However, the longevity of the development provides opportunities to create pathways into jobs, thus spreading the benefits more equitably. This is addressed in the Workforce Development Strategy and Social Performance Plan, which could include a collective community development or community benefits fund.	Section 8: Economies and Jobs Social sustainability framework and social performance plan at Attachment 2
• pressure on existing employers through skills shortages and competition for skilled staff	The experience of local businesses is that large projects tend to poach staff from existing employers. Smaller businesses are already struggling to find and retain staff	Section 8: Economies and Jobs

Specific information required by the ToR	Key findings	Where addressed
	and fear the loss of workers to more highly paid construction jobs. The Workforce Development Strategy for the SSIA (Chamber of Commerce NT 2022) and *Recovery and Beyond: A Renewed Northern Territory Population Strategy (*ACIL Allen 2022) for the Property Council of Australia NT outline ways to grow the local workforce and attract skilled workers.	Workforce Development Strategy at Attachment 4
• impacts on other economic sectors, including tourism, fishing and aquaculture	Other economic sectors can be harmed by increased demand for productive factors such as land, labour and intermediate inputs to production. This has the effect of crowding out sectors such as agriculture and mining and other resources, which find inputs relatively more challenging to resource (Deloitte 2022, p.29). The recreational fishing sector, including guided fishing charters, could be displaced by reduced access to the Elizabeth River boat ramp and fishing and crabbing spots in the harbour, which would result in economic losses for the Greater Darwin economy. The aquaculture sector could be displaced by the loss of trade staff, land and sea use conflicts and reduced water quality affecting nurseries. The extractive industry sees Middle Arm as both opportunity and threat as urban sprawl and industrial activities displaces extractive leases. Tourism marketing and product development experienced major disruption during construction of INPEX's Bladin Point LNG plant, with scarcity and high costs of short-term accommodation and flights. Leisure, business and convention travel took a while to recover. The transport sector is facing staff shortages and productivity issues which would be alleviated with good transport planning, including the proposed Weddell Freeway from the Stuart Highway near Noonamah to East Arm Port.	Section 8: Economies and Jobs Economic impact assessment (Deloitte 2022) at Appendix xxxx
• whether the strategic proposal is consistent with regional land use concept plans	The precinct is consistent with the land use objectives outlined in the Darwin Region Land Use Plan 2015 and Litchfield Subregional Plan 2016. Middle Arm has been set aside for 'strategic industry' since the 1984 Darwin Regional Land Use Plan. Weddell has been set aside as a residential and industrial area that would support development at Middle Arm. Land use planning provides for industrial areas and social infrastructure. The Planning Commission will release a discussion paper in mid-2023 as part of a Weddell and Middle Arm sub-regional land use plan. What is unclear is the location and compatibility with land use plans of industry or support industry that does not fit in the precinct or ancillary projects catalysed by MASDP such as solar farms. Shipping in the Elizabeth River mouth could preclude options for ferry transport from Palmerston and Weddell.	Section 6: People and Communities

Specific information required by the ToR	Key findings	Where addressed
• the need to coordinate planning for future population and industrial growth	The NT Planning Commission's land use planning provides a strategy for the orderly release of residential and industrial land in the Greater Darwin Region, including a comprehensive needs assessment for the social infrastructure that will be needed to support near-term, medium-term and long-term growth projections. Investment NT's *Infrastructure Plan and Pipeline* (2022) also considers the need for social infrastructure planning, including housing.	Section 6: People and Communities Section 7: Social Infrastructure
• availability, quality and affordability of short-term and privately owned accommodation, including worker accommodation	Housing affordability is currently under pressure in the Greater Darwin region, including privately owned housing, rentals and social housing. An advantage of staged and master planned development is that it provides sufficient lead time for orderly land use planning and residential development that will be needed to support population growth. A substantial or sudden population increase is likely to place extra demand on residential rental properties given the relatively small permanent population of the region. However, the land use planning caters for short, medium and long-term development of fast-growing suburbs near Palmerston, the rural area and Weddell. The highest risk period would be during construction, which tends to require large external workforces for a short period. This will require dedicated workforce accommodation to avoid disrupting short-term accommodation and the residential rental market.	Section 8: Economies and Jobs
• disturbance to community cohesion as a result of polarised values and changed demographics (including the potential inclusion of fly-in, fly-out workers)	Community cohesion may be disrupted by polarised values over development and by sudden population movements that change the demographics and amenity of a place. Opposition to the project would reduce if decision-making takes account of business and community views regarding the scale and type of development proposed for Middle Arm. Quarantining large external workforces in worker accommodation will mitigate against the negative impacts of what tends to be predominantly young, male FIFO workforces. The gradual absorption of workers and families would minimise disruption to the existing social fabric of areas such as Palmerston, already characterised by young, mobile families with a greater proportion of defence and trades. Drawing on a local workforce will minimise the impacts of demographic change but will require substantial skills development to avoid disrupting a labour market already under pressure.	Section 6: People and Communities
• increased road trauma as a result of increased industrial traffic through residential areas	Heightened road safety risks are possible on approaches to Middle Arm, including trucks bringing quarrying materials along the Arnhem Highway, industrial vehicles on Jenkins and Channel Island Roads and heavy vehicles passing by residential areas and schools on Elrundie	Section 6: People and Communities

Specific information required by the ToR	Key findings	Where addressed
	Avenue, at the back of Palmerston. This would affect both residential amenity, the risk of hitting pedestrians and the potential for head-on crashes. The Traffic Assessment (GHD 2022) is focussed mainly on the adequacy of Channel Island Road southwest of the Elizabeth River Bridge toward the intersection with Wickham Point Road and Jenkins Road north-west of the Jenkins Road and Finn Road intersections and suggests the eventual duplication of Channel Island Road. Transport Planning includes the proposed Weddell Freeway (although this is unlikely for at least 15 years), which would divert heavy vehicles off Jenkins Road and Elrundie Avenue, providing a signal free run from the Stuart Highway near Noonamah to Berrimah and East Arm Port. Transport Planning includes upgrades to the Arnhem Highway, taking account of heavy vehicles using this road.	Traffic Assessment at Appendix xxx
• disturbance to non-heritage listed sites of historical importance, including World War II historical sites around East Arm and Darwin Harbour	East Arm, Middle Arm and Darwin Harbour were on the frontline of World War II, with many heritage and historical remnants on Middle Arm, East Arm, around the shoreline and wrecks such as Catalinas on the floor of the harbour. Showcasing remnants of early settlement and Darwin's war history is a key element of Darwin's tourism marketing. Time, weather and development is slowly reducing the number and access to these sites.	Section 9: Cultural identity Cultural Heritage Report at Appendix xxx
• cultural identity, ties to the land and seas and ability to pass on knowledge (fishing, foraging, camping, access to and enjoyment of places around the Harbour)	Larrakia and other Aboriginal people living in Darwin maintain strong spiritual ties to their land and seas and fish, forage and camp along the shoreline. The progressive loss of cultural knowledge associated with traditional and spiritual connections to land and sea could weaken cultural values. To come	Section 9: Cultural Identity Section 10: Healthy Country
• public concerns regarding industrialisation of Darwin Harbour with consequent pollution and degradation of the environment	Public submissions and survey respondents to the values mapping exercise discussed in Section 5 highlighted the concerns of many residents about cumulative industrialisation and the implications for the natural environment.	Section 5: Values mapping Section 10: Healthy Country
• public concerns about the use of fossil fuels and sustainability of gas-based development and the implications for climate change	A key aspect of opposition to development at Middle Arm is societal concern at increased greenhouse gas emissions, climate change and the urgency of moving from dependence on fossil fuels to renewable energy. The NTG has a goal of 50% renewables by 2030. Full development of the precinct would be contingent on proponents' ability to demonstrate their ability to be net zero by 2050. Combined with the challenges of offsetting greenhouse gas emissions from gas-based development in the Beetaloo Basin, any increase in greenhouse gas emissions predicted in the scope of work covered by the MASDP SEA would negate these goals and compound the	Section 10: Healthy Country Greenhouse emissions assessment at Appendix xxx

Specific information required by the ToR	Key findings	Where addressed
	concern of opponents, many of whom do not accept the credentials of carbon capture and storage and other carbon offset methodologies. The MASDP was initially devised as a 'gas-based manufacturing' precinct. Any gas-based energy would need to transition to renewables or demonstrate effective carbon capture and storage solutions to allay these concerns. Rating to be reviewed once ghg study is available.	
• access issues between Elizabeth River boat ramp and Darwin Harbour	Dredging would create localised and short-term interruption to access (and water turbidity) along the Elizabeth River shipping channel, possibly over several years. Marine infrastructure and up to 860 ships a year by 2040 (based on full development) will gradually reduce access along a one-way shipping channel on the southern bank of the Elizabeth River mouth as ships berth, manoeuvre and turn, particularly with a 'pinch point' at the turning basin. The level of impact will depend on conditions, including the tide and size of the ship. Smaller vessels will be able to navigate outside the navigation channel, however a number of shoals pose a hazard to navigation at low tide. Safety zones would prevent access to the highly valued crabbing creeks in the MASDP footprint. There would be exclusion zones around dangerous cargoes. AFANT and the values mapping survey suggest this would be an unacceptable threat to recreational fishers, undermining strongly held lifestyle values and recreational fishing as an economic sector.	Section 5: Values Mapping Section 8: Economies and jobs
• reduced marine safety in East Arm and Darwin Harbour, and rivers and creeks	Dredging and an additional 860 MASDP-related ships a year will compound the effects of an estimated 540 more ships from INPEX and Darwin Port by 2040. This increases congestion and the likelihood of a collision between commercial and recreational traffic in shared shipping channels. Dredging presents the risk of collisions with dredgers and associated equipment along the Elizabeth River Channel and potentially in the outer harbour. A marine safety campaign is recommended. Other aspects of marine safety, such as oil spills, the need for more tugs and emergency incidents, are covered in the emergency planning report.	Section 6: People and Communities
• opposition to the need to find new water sources to support development (eg desalination, new dams)	Water supply for the development is contingent on new water sources which may of themselves concern the community. This could include the return to service of Manton Dam, currently popular with recreational uses (although the NTG has announced recreational use will continue). The Adelaide River Offstream Water Storage (AROWS) project is the major new water supply option proposed in Darwin's Water Strategy. This would benefit other uses, such as horticulture and residential development. However, stakeholders wanted more information to know how this project would impact on cultural and economic	Section 7: Social Infrastructure Section 10: Healthy Country

Specific information required by the ToR	Key findings	Where addressed
	values. Humpty Doo Barramundi, which is on the Adelaide River flood plain, wanted reassurance that the project would not affect flooding and seasonal flushing of the river. A 12 GL desalination plant is planned as an interim measure or to meet demand for water by green hydrogen plants. The public has little information on this option or understanding of the implications, however aquaculture businesses were concerned. Humpty Doo Barramundi commented that brine can increase algal blooms and change the ecology and water quality of the harbour. Desalination would draw in sea water for reverse osmosis or cooling. No water will be discharged into the harbour (see xxxxxx).	
Avoidance, mitigation and management: • **Identify how impacts to communities and the economy would be avoided and opportunities enhanced** • **Identify appropriate frameworks and management strategies and their likely effectiveness in avoiding social, cultural and economic impacts and enhancing potential benefits of the strategic proposal at the Precinct level, including (at a minimum):**		
• coordinated identification of skills gaps and workforce planning across industries	Skills development and a pipeline of projects is the greatest opportunity arising from development at Middle Arm, with potential to grow trade competencies, build a competitive maritime industry and provide long-term contracts and training positions. Much of the Territory's trade workforce is mobile (see 6.2.3). The Darwin region's human capital would be enhanced by retaining this workforce as a permanent population. Even more importantly, the project offers employment pathways for the long-term unemployed and disengaged, many of whom are Aboriginal. Realising this opportunity will require good will, good intent and approaches that provide long-term pathways into work, mentoring and support, such as Saltbush's Future Stars program.	Section 8: Economies and Jobs Workforce Development Strategy at Attachment 4 of this report Social Performance Framework at Attachment 2
• coordinated land use and long-term social infrastructure planning	Covered by NT Planning Commission land use studies and Infrastructure Northern Territory's *Infrastructure Plan and Pipeline* (see Section 6 and 7)	Section 6: People and Communities; Section 7: Social Infrastructure
• five-yearly independent audits against agreed key indicators, including values of the Harbour	The Social Performance Plan recommends five-yearly audits to track progress of recommendations, compliance with any conditions and capture any emerging issues. Five-yearly values mapping is also recommended given the high level of uncertainty about the ultimate industrial make-up of the MASDP.	Section 5: Values Mapping Social Performance Plan at Attachment 2
• a coordinated Territory Benefit Plan that individual proponents are accountable for implementing and reporting against	The Social Performance Plan outlines expectations of proponents but also suggests aspects of coordination that could be adopted at a precinct level, such as research, industry development, collaborative benefits and precinct-wide communication of opportunities.	Social Performance Framework at Attachment 2

Specific information required by the ToR	Key findings	Where addressed
• an ongoing communication and community engagement plan and appropriate governance mechanisms (eg an industry and community reference group that must include strong Larrakia participation)	Covered at Section 14.1 and in the draft social performance plan, including the importance of communication and consultation for all individual projects as a condition of approval and a precinct-wide engagement strategy. Governance structures involving Larrakia-led engagement to come.	Social Performance Framework at Attachment 2
• recommended conditions to be applied at a Precinct and individual project approval level	Summarised at Section 14.1 and in the social performance plan	Section 12: Strong Voice Social Performance Plan at Attachment 2
• an agreed Precinct and harbour-wide management strategy with timelines for agreed monitoring and evaluation of sustainability outcomes against agreed indicators	The social sustainability outcomes framework suggests desired outcomes, objectives and indicators. The draft Social Performance Plan makes recommendations on how this might be done (although NTG responsibility for compliance is unclear). Any monitoring and evaluation should also link to the Darwin Harbour Advisory Committee's integrated reporting and a proposed harbour-wide dredge management strategy.	Social sustainability framework and social performance plan at Attachment 2
Predicted Outcome		
Describe the predicted outcome against the factor's environmental objective and state whether there is likely to be any significant residual environmental impacts or risks to identified values.	The overarching outcome for people and communities is a precinct that has community acceptance because it accords with the social, cultural, environmental, economic values of the region. This outcome has many multi-faceted components. See Attachment 2 for a social outcomes sustainability framework and draft social performance plan (see below) The risk and opportunities matrix at Attachment 2 outlines a number of residual risks and opportunities.	Section 15: Conclusion Attachments 1 and 2
Describe clear and measurable outcomes and commitments for the protection and enhancement of social, cultural and economic values that are relevant to the strategic proposal. These outcomes must include: • community acceptance of development at Middle Arm Peninsula • equitable distribution of benefits and enhanced community wellbeing. Demonstrate how the outcomes and commitments will ensure the factor's environmental objective is met via the implementation of the strategic proposal.	The SSIA finds that the MASDP will bring many opportunities but also social, economic and cultural risks, some of which will be unacceptable to Greater Darwin residents. There is ambivalence about the project, compounded by uncertainty as to the extent and type of industries proposed for the precinct, potential health impacts, contribution to greenhouse gas emissions and climate change and cumulative industrialisation of Darwin Harbour. Economic development, on the whole, will be supported as long as it delivers enduring, or sustainable, benefits to locals rather than crowding out or displacing existing sectors, in particular aquaculture, tourism and recreational fishing. The mantra of 'more jobs' does not resonate with local businesses, who are already struggling with skills shortages. Some are cynical about the 'sustainable' label and government's investment attraction efforts focussing on 'shiny big projects' that often fail to go ahead, rather	Section 15: Conclusion Attachment 2 Social Sustainability Outcomes Framework and Social Performance Plan

Specific information required by the ToR	Key findings	Where addressed
Provide a clear explanation as to why the impacts of implementing the strategic proposal are acceptable.	than supporting smaller existing or emerging sectors that are operated by and employ locals. There has been inadequate consultation with Larrakia and Tiwi people to allow for findings of cultural impacts at this stage. Community wellbeing may be enhanced by sustainable economic benefits and skills development, as long as wellbeing is not measured by population and GDP growth alone but by broader measures of social, cultural, economic and ecological sustainability. Sustainable governance will require more inclusive decision-making on project planning, design and regulatory approvals for individual projects. The SSIA finds that the impacts of implementing the strategic proposal will not be acceptable to many Greater Darwin residents because it does not align with deeply held values and uses of the harbour, in particular recreational fishers. Fishers face reduced or lost access to parts of the channel between the harbour and the popular Elizabeth River boat ramp. Short-term impacts would result from safety zones around dredging equipment and the ecological impacts of dredging. Longer-term, increased shipping and ship safety zones would reduce recreational use of the Elizabeth River channel, increase congestion in shipping channels and reduce access to popular crabbing spots. While there are many likely benefits from the precinct development, there are also some likely and consequential negative impacts that will be challenging to mitigate.	

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Abbreviations and terminology

AAPA	Aboriginal Areas Protection Authority
ABS	Australian Bureau of Statistics
AFANT	Amateur Fishermen's Association of the NT
ALRA	*Aboriginal Land Rights Act (Northern Territory) 1976 (Commonwealth)*
CDU	Charles Darwin University
DCA	Development Consent Authority
DCMC	Department of the Chief Minister and Cabinet
DHAC	Darwin Harbour Advisory Committee
DIPL	Department of Infrastructure, Planning and Logistics
DITT	Department of Industry, Tourism and Trade
DEPWS	Department of Environment, Parks and Water Security
ECNT	Environment Centre of the Northern Territory
EIS	Environmental Impact Statement
EP Act	*Environment Protection Act 2019* (NT)
EPBC	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
ERA	Emergency Response Area
ERP	Estimated Residential Population
FID	Final Investment Decision
GDP	Gross Domestic Product
GRP	Gross Regional Product
GRT	Gross Registered Tonnage
GSP	Gross State Product
GTP	Gross Territory Product
IAIA	International Association for Impact Assessment
IAP2	International Association for Public Participation
ICN	Industry Capability Network
LDC	Larrakia Development Corporation

LDC	Land Development Corporation
LGA	Local Government Area (ABS statistical area)
LNAC	Larrakia National Aboriginal Corporation
LNG	Liquid Natural Gas
MASDP	Middle Arm Strategic Development Precinct
MCA	Minerals Council of Australia
MNES	Matters of National Environmental Significance
MOU	Memorandum of Understanding
MW	Megawatt
NAIF	North Australia Infrastructure Facility
NLC	Northern Land Council
NT	Northern Territory
NTA	*Native Title Act 199*3 (Commonwealth)
NT EPA	Northern Territory Environment Protection Authority
NTG	Northern Territory Government
NTIBN	Northern Territory Indigenous Business Network
NTIPP	NT Infrastructure Plan and Pipeline 2022
NTRTA	NT Road Transport Association
OSOM	Over size over mass (transport)
RELM	Real Estate Local Market report
SEA	Strategic Environmental Assessment
SEIFA	Socioeconomic Indexes for Areas
SFD	State Final Demand
SIA	Social Impact Assessment
SSIA	Strategic Social Impact Assessment
STEAM	Science, technology, engineering, arts and mathematics
TBP	Territory Benefit Plan
TERC	Territory Economic Reconstruction Commission
TLC	Tiwi Land Council
ToR	Terms of Reference (issued by the NTEPA)
VET	Vocational Education and Training

1. Introduction

1.1 Purpose of this report

The aim of this report is to provide comprehensive quantitative and qualitative insights to inform good decision-making by government and individual projects. The report should also serve as a useful knowledge base of key issues, sensitivities and expectations by residents, businesses and service providers in the Greater Darwin Region.

The purpose of a social impact assessment (SIA) is to combine community insights with expert judgement in order to determine how the consequences of projects are likely to be experienced or perceived by affected people, communities and service providers. Effective studies will:

- reduce uncertainty about the consequences of projects (or policy changes)
- inform and influence decision-making by regulators, project proponents and affected communities
- provide data and insights that improve project planning (such as project design, alternatives and workforce and accommodation issues)
- provide baseline quantitative and qualitative data against which to track project and cumulative change across the life span of the project, from conception to closure
- inform effective management plans and proponents' long-term social performance (including enhancement of social and economic benefits, trust and relationships).

A strategic or regional social impact assessment expands the temporal and geographic boundaries of a project-level SIA to consider the issues at a broader regional – or is this case – precinct scale.

The NT EPA's requirements for a strategic social impact assessment (SSIA) and management plan are outlined in the Draft TOR (see Table 0-1 above).

1.2 Objectives of the strategic social impact assessment

- **To inform planning** for development of Middle Arm:
  - including insights into community values, sensitivities, attitudes, perceptions and local knowledge that may inform design, planning and governance decisions on the Middle Arm Sustainable Development Precinct (MASDP);
  - planning for social infrastructure (housing, schools, education, transport, utilities, essential services) that may be affected by various scenarios of cumulative development on and related to Middle Arm;
  - implications for land use planning and infrastructure investments, such as the timing for land release and headworks for future urban development at Weddell, Mitchell and Holtze.

- **To streamline project level approvals** by:
  - contributing to a high-level development program, reducing the scope of individual level studies for classes of action that fall within the scope of the Middle Arm development program;
  - de-risking investment decisions by providing greater certainty and clarity to proponents about likely project approval conditions and important social, cultural and economic values to be protected or enhanced;
  - providing access to a shared knowledge map and database of social, economic and cultural baseline data.
- **To provide advice**:
  - to government on the values of Darwin Harbour, how these values (community, economic, ecological, cultural) might be disturbed by development at different scales, and the pace and scale of development the community will accept;
  - to individual proponents about government expectations and community priorities;
  - to the community about the implications of proposed development and ongoing governance;
  - on enhancement of potential positive local social and economic benefits that might be unlocked by development;
  - on management and mitigation of potential negative cumulative social, economic and cultural impacts at various scales of development;
  - on collaborative and adaptive approaches to maximise benefits, e.g. community development funding, workforce development and training plans;
  - on coordinated, long-term communication and engagement with stakeholders.

1.3 Social area of influence

Scoping for the SSIA considered the communities and people most likely to experience change and resultant positive and negative social, economic and cultural impacts from the development at Middle Arm. These impacts will be experienced in different ways, depending on context such as where people live, their resilience to change, the stage of the project and situational factors such as cumulative impacts from other projects.

Geographic

The social area of influence for the SSIA considers possible impacts on lives, livelihoods and lifestyles as a result of precinct and regional cumulative development:

- within the direct footprint at Middle Arm
- nearby areas, such as Weddell, which may experience demand from industries and support services unable to obtain land within the precinct and which may be developed as a residential area close to Middle Arm
- in and around Darwin Harbour, including the Cox Peninsula, as experienced by groups who value and use the harbour for economic, recreational, cultural and social purposes

- on Greater Darwin, particularly Darwin, Palmerston and Litchfield municipalities which may serve as the catchment areas for workers, services and supplies, transport routes that may be used by workers and project traffic.

For the purposes of this report:

- **'local'** covers immediately affected areas such as the Elizabeth River and the wider harbour
- '**regional'** means the Greater Darwin region, encompassing the municipalities of Darwin, Palmerston and Litchfield, as well as unincorporated areas and Coomalie, Belyuen and Wagait, with most statistical analysis based on Australian Bureau of Statistics (ABS) Local Government Areas (LGAs)
- **Northern Territory** covers Territory-wide impacts, including economies, government policies, programs and development of human capacity.

Temporal

The SSIA will consider potential impacts at all stages of planning, incremental development, the 50-year operations of the precinct and potential closure, rehabilitation and repurposing of common user infrastructure and individual projects.

Social and cultural

Included in the social area of influence are potential impacts on people and communities with social and spiritual connections to the region, including:

- Larrakia people with cultural links to the land and seas around Darwin Harbour, who are likely to be dispersed across broad areas[1]
- people living in areas where workforces may be accommodated, or where new subdivisions and social infrastructure is developed to accommodate a growing population
- the Greater Darwin region, which is likely to be the key catchment for procurement and workers and where social impacts are most likely to be experienced.

[1] Tiwi people may be added depending on options for placement of dredge spoil material

1.4 Structure of this report

The report includes an introduction and project description, then outlines True North's methodology and the policy context for the SIA. The community profile at Chapter 5 provides baseline data, including the results of a values mapping exercise to research the values and uses of Darwin Harbour. Sections 6 to 13 predict and assess impacts categorised against the dimensions outlined in Section 3. In many cases, these chapters draw on the findings of other technical reports.

Section 1	**Introduction**
Section 2	**Project description and policy context**
Section 3	**Methodology**
Section 4	**Literature review**
Section 5	**Values mapping**
Section 6	**People and communities**
Section 7	**Social infrastructure and services**
Section 8	**Economies and jobs**
Section 9	**Healthy country**
Section 10	**Living environment**
Section 11	**Cultural identity**
Section 12	**Strong voice**
Section 13	**Cumulative impacts**
Section 14	**Social performance plan**
Section 15	**Conclusion**

For those wanting to skip methodology and background, we suggest starting at Section 5. Sections 5 to 13 each incorporate a baseline description of the social area of influence, change processes, risks and opportunities, impact assessment to determine the significance of these risks and opportunities and key recommendations (which are then captured in the social performance plan at Attachment 2).

2. Background

2.1 Project description (to be completed)

The Department of Infrastructure, Planning and Logistics (DIPL) has commissioned a Strategic Environmental Assessment for a Middle Arm Sustainable Development Precinct (MASDP). The precinct is proposed as a master planned area focussing on low emission petrochemicals, green hydrogen, advanced manufacturing, carbon capture and storage and minerals processing.

The Strategic Assessment considers the potential positive and negative impacts of the MASDP Development Plan, or an envelope of potential activities, common user infrastructure and industries that could form part of the MASDP. This includes:

Actions and activities

> **Land construction**, including land clearing and earthworks, land-based infrastructure, causeways and industrial facilities
>
> **Marine construction,** including marine infrastructure, coastal protection revetments, dredging, reclamation, disposal of dredge material offshore
>
> **Operations,** including land-based and marine infrastructure, industries, maintenance dredging and spoil disposal
>
> **Decommissioning** at the end of life of the infrastructure.

The SEA scope of development considers the following potential industries:

- ammonia and derivatives
- blue hydrogen
- green hydrogen
- green ammonia
- ethane cracker plant
- liquified natural gas (LNG) plant
- urea and derivatives
- gas to liquids (G2L) plant
- methanol and derivates
- minerals processing
- urea and derivatives
- advanced manufacturing
- carbon capture and storage.

Marine enabling infrastructure:

- module offloading facility (MOF) to receive and handle cargo
- 5 product jetties
- marine navigational channel
- berth pockets
- causeway from common user facility (CUF) to MOF.

See Chapter 2 of the Strategic Assessment for more detail.

2.2 Policy context

The Territory Economic Reconstruction Commission (TERC) final report in November 2020 outlines strategies to support the Government's ambition of a $40 billion economy by 2030. Priorities are creating jobs, attracting private investment, supporting current and emerging industries, building on the Territory's competitive advantages and unlocking the potential of its regions

The TERC report (p.35) encourages master planning and the establishment of Sustainable Development Precincts, defined as an identified precinct with a master plan where the proposed industrial activities can be done.

Sustainability principles are:

- contribution to net zero emissions, including through renewable energy use to the maximum extent
- efficient water use, including reuse where possible
- circular economy principles.

The following Northern Territory Government policy documents are relevant to these principles:

Table 2-1: Key policies relevant to sustainable development

Contribution to net zero emissions	Efficient water use	Circular economy principles
Climate Change Response: Towards 2050 (DPWS 2020); Greenhouse Gas Emissions: Management of New and Expanding Large Emitters (Northern Territory Government 2021) NT Offsets Principles (2021) Hydrogen Renewable Strategy (DITT 2020)	NT Strategic Water Plan (NTG, 2021); Darwin Region Water Supply Infrastructure Program (2022) Directions paper (NTG 2019)	NT Circular Economy Strategy 2022-2027 (Department of Environment, Parks and Water Security 2022)

The climate change plan is designed to achieve a well-managed transition to a low-carbon economy, with net zero emissions by 2050. Government aims to capitalise on low carbon options, invest in long-term growth of renewable energy, increase low carbon industries and become a key renewable energy exporter to the Asia Pacific. The NT Government in June 2022 announced it was investing $5 million over four years to accelerate and expand the Territory's hydrogen industry.	The water plan suggests that "competing demands for water is now one of the greatest challenges we face as a community" (p.3). Principles include that water use is efficient and productive, is a key enabler of the Territory economy and that its use should reflect community values and aspirations for water. The NT Government's priorities for future water supplies are returning Manton Dam to service and the AROWS (Adelaide River Off-Stream Water Storage) project.	This policy supersedes the NTEPA's Waste Management Strategy for the NT 2015-2022). Three fundamental principles are: • designing out waste and pollution • keep products and materials in use for as long as possible • regenerating natural systems.

2.3 Broader strategic context

The goal of a $40 billion economy also drives the *NT Infrastructure Strategy 2022-2030* and *NT Infrastructure Plan and Pipeline* (Infrastructure Northern Territory 2022), which aim to boost the population beyond 300,000 and create 35,000 more jobs by growing key sectors, including the maritime industry, critical minerals, advanced manufacturing, data, solar, hydrogen and carbon capture and storage.

Reflecting the critical role of infrastructure in enabling economic and population growth, the Infrastructure Australia Plan (2021) and Priority List covers nationally significant projects, including common user infrastructure at the Middle Arm Sustainable Development Precinct, Darwin region water region infrastructure upgrades, the Darwin ship lift facility and the marine industry park at East Arm.

Sustainable development precincts are described as building business competitiveness and accelerating investment decisions by co-locating projects within a precinct and aligning them with the best available infrastructure (see also Section 3.4).

Additional Northern Territory policy documents and reports relevant to this SIA are listed below for context:

Table 2-2: Other policy documents relevant to this SIA

Policy or strategy	Year	Released by	Relevant points
NT Social Outcomes Framework	2021	NT Government, Department of Chief Minister and Cabinet (DCMC)	The Social Outcomes Framework outlines a need to move from outputs (number of activities) to outcomes (what was achieved and how much people's lives were improved) in order to understand and measure how programs and activities are making a difference to the lives of Territorians. The framework is based on a program logic (or theory of change) model, similar to that espoused by Infrastructure Australia (see literature review). Its vision is "all Territory individuals, families and communities are inclusive, healthy, safe, resilient and thriving". The domains of the framework are: • Territorians are able to live a healthy life • Territorians have appropriate and secure housing • Territorians are connected to culture and community • Territorians are able to learn, contribute and achieve • Territorians are safe • Territorians are financially secure and have material basics • The Territory has a natural and built environment that supports a high quality of life. CDU has been commissioned to establish social indicators and a social capital index.
NT Infrastructure Plan and Infrastructure Pipeline and Plan (NTIPP 2022)	2022	Infrastructure Northern Territory	The *NT Infrastructure Plan and Pipeline* vision is: "Infrastructure investment that enables growth of the Territory economy and population and supports wellbeing and quality of life for all Territorians, underpinned by sustainability and resilience." Key infrastructure investments outlined in the plan include the Middle Arm precinct, Darwin Regional Water Supply Program, housing and land release, strategic road corridors, a network of regional logistics hubs and common user infrastructure to support gas development in the Beetaloo Sub-basin. A key focus of the plan is a development precinct framework. Key objectives include: • improving liveability: integrating place-based planning with local decision-making and regional development strategies; • embedding sustainability and resilience: incorporating economic, environmental, social, cultural and governance sustainability principles. (See literature review in Section 4).
Nature Positive Plan: better for the environment, better for business	2022	Australian Government	Released in response to the Samuel Review of the EPBC Act 1993 and the 2021 *State of the Environment Report,* this plan outline's the Australian Government's environmental policy reforms. Proposed reforms include an independent Environmental Protection Authority, greater participation in decision-making by First Nations people, regional planning and better community engagement.

Policy or strategy	Year	Released by	Relevant points
			"A resilient and healthy environment is necessary for a vibrant economy and society and essential to quality of life." Three guiding principles of the plan are: • the need to better protect Australia's environment and prevent further extinction of native plants and animals; • outcomes-focussed decisions that are nature positive; • better partnerships with First Nations and conservation planning.
2021 Infrastructure Priority List	2021	Infrastructure Australia	This document provides a comprehensive overview of nationally-significant infrastructure needs, as well as an investment roadmap to guide Australia's economic recovery. Key themes include regional economic development and new sources of energy. Proposals are assessed for inclusion on the Priority List using Infrastructure Australia's detailed *Assessment Framework*, which includes: • strategic fit • the social, economic and environmental value of the project • deliverability.
Territory Economic Reconstruction Commission (TERC)	2020	Northern Territory Government	The Territory Economic Reconstruction Commission (TERC) final report in November 2020 outlines strategies to support the Government's ambition of a $40B economy by 2030. Priorities are creating jobs, attracting private investment, supporting current and emerging industries, building on the Territory's competitive advantages and unlocking the potential of the Territory's regions. The TERC report identifies the Territory's strengths as including its strategic location for both trade and defence, a deep-water harbour and intermodal logistics, world-class mineral deposits and highly prospective onshore gas resources. Key sectors identified as contributing to economic growth were mining and energy, manufacturing and agribusiness. Other focus areas include tourism, renewable energy, national security and defence, the maritime industry and digital and space industries.
Northern Territory Roadmap to Renewables (Langworthy et al. 2017)	2017	Northern Territory Government	This report assumes a population of 245,048 by 2030 with the percentage of renewable energy forecast to increase from 4% to 50%. The panel's role was to provide a roadmap to achieve this target, while maintaining the affordability of energy supply and without compromising network reliability and security. Downward pressure on wholesale electricity prices would stimulate significant economic development, job creation, industry growth and new investment in the Territory, the panel found (see p.4).
Territory Benefit Policy	2019	Northern Territory Government	The Territory Benefit Policy aims to 'maximise the contribution to the NT economy by private sector investments in the NT'. The policy covers all phases of a Project's life. It applies to: • private sector projects granted major project status

Policy or strategy	Year	Released by	Relevant points
			• private projects where the NT Government provides support valued at or greater than $500,000 • projects where a Territory Benefit Plan is specified as a condition of an NT Government agreement. It covers: • local workforce development and employment • regional and Aboriginal economic and community development • local business participation and small to medium enterprise capability development • economic, industry and social infrastructure investment. A Territory Benefit Plan is consistent with the objectives of the Australian Industry Participation (AIP) National Framework.
Aboriginal Economic Participation Framework	2022	Northern Territory Government	The Framework is a whole-of-government strategy designed to increase Aboriginal employment, encourage Aboriginal businesses, target skills development and strengthen the Territory's regions.
Northern Territory Aboriginal Procurement Policy	2022	Northern Territory Government	An Aboriginal Procurement Policy came into effect on 1 July 2022. Its goals include building capacity and capability and increasing partnerships with Territory enterprises. Principles of the framework: • Aboriginal Territorians are key drivers and partners in the Territory's economic future • equal inclusion of Aboriginal Territorians in the economy is critical to the NT reaching its economic potential • the best value for the Territory in procurement includes taking account of social value • (places) Aboriginal people and communities at the centre of decision making • public funds expenditure must achieve the best value for the Territory and be an accountable use of public money. The policy estimates that bringing Aboriginal Territorians to the forefront of economic development could generate between $49 and $146M in social benefits and is vital for the Territory's future prosperity. An Aboriginal business enterprise is defined as having a minimum 51% ownership by Aboriginal people. The policy sets a target of 5% for the number and value of NT Government contracts awarded to Aboriginal Business Enterprises. NT Indigenous Business Network provides certification of Aboriginal enterprises and maintains a database of certified businesses.
Buy Local Plan	2018	NT Department of Industry, Tourism and Trade (DITT)	The primary objective of the Buy Local Plan is to maximise retention of the NT Government's procurement spend within the Northern Territory. The plan's objectives include: • giving competitive Territory businesses the chance to take part in the Territory's growth

Policy or strategy	Year	Released by	Relevant points
			• improving recognition and evaluation of local content.
Palmerston Community Plan	2018	City of Palmerston	The plan was developed through a deliberative democracy process with community members. Its vision is for Palmerston to be "A place for people". The Mayor's foreword outlines an ambition to be the "family city of the Northern Territory". Outcomes of the strategy are: • **family and community** (including wellbeing, family values will determine everything we do, young people's voices are heard) • **vibrant economy** • **cultural diversity** • **future focussed** (can sustain itself through the challenges of the future) • **environmental sustainability** • **governance** (values and encourages participation).
Palmerston Local Economic Plan	2021	City of Palmerston	The City of Palmerston's *Local Economic Plan 2021-31* (Deloitte 2021) comments on the potential of expanded industrial areas, such as Pinelands and Yarrawonga. It sees opportunities in light industry, transport and logistics, commenting that city's: "proximity to Darwin, the port and rail line, and cheaper rents, could make Palmerston an attractive location for… businesses in light industry, oil and gas service supply, manufacturing or logistics… and businesses finding commercial and residential rents in Darwin increasingly expensive". The plan's key areas of focus are: • business and industry attraction and retention • population attraction and retention • fostering business development and innovation • strategic pursuits.
City of Darwin Strategic Plan: 2030 City for People. City of Colour	2019	City of Darwin	The City of Darwin strategic plan identifies the following strategic directions for the Darwin municipality: • a capital city with best practice and sustainable infrastructure • a safe, liveable and healthy city • a cool, clean and green city • a smart and prosperous city (including to implement an economic development plan to retain people and jobs) • a vibrant and creative city. The aim is that Darwin will be known as a vibrant, creative, innovative, connected, healthy and environmentally responsible city, with well-planned amenities and services. Values of the plan are: • **diversity and acceptance** (including multicultural heritage and a sense of belonging) • **choice of lifestyles** (unique, laid back, connected, active, safe)

Policy or strategy	Year	Released by	Relevant points
			• **environment** (integrated, long-term planning, sustainable, ecologically sound decisions) • **sense of community** (active participation) • **equality** (collaborative and transparent decisions, listening and responding).
Litchfield Strategic Plan 2018-22		Litchfield Council	The vision of Litchfield's strategic plan is for a place where social and community wellbeing stems from four unique attributes: • **wellbeing** (personal, social, community) • **natural and scenic** (large blocks with attractive scenic outlooks) • **spacious** (but close to everything) • **opportunity and prosperity** (fully employment, strong industries and business) • **family-friendly and connected** ("the best place to live in the Top End").
Darwin Harbour Strategy 2020-2025 Darwin Harbour Regional Plan of Management (2003)	2021	Darwin Harbour Advisory Committee (DHAC)	The Darwin Harbour Advisory Committee (DHAC) was established in 2002. DHAC's role is to provide advice to government through the Minister for the Environment. It produced a Darwin Harbour Regional Plan of Management in 2003, with a vision of "A biologically rich and diverse marine and terrestrial environment for our use and enjoyment today, and for our children tomorrow". A Darwin Harbour Strategy was published in 2010 and a revised strategy in 2020 to guide sustainable management and planning in the region. The then Chair of DHAC, Professor Karen Gibb suggests: "Darwin Harbour is a thriving tropical harbour, which is highly valued by the community for its significant natural, cultural and social values. As a working harbour it supports an important industry hub and is the gateway of Northern Australia, which presents a diversity of economic opportunities." The values and goals espoused by the strategy are: • **Foster partnerships**: To protect and enhance Darwin Harbour through integrated management and in a partnership between government, industry and the community. • **Protect and preserve**: To protect and enhance the natural environment of Darwin Harbour. • **Celebrate connection**: To protect and enhance the cultural values and heritage of Darwin Harbour. • **Sustainable industry**: To protect and enhance the economic value of Darwin Harbour in accordance with ecologically sustainable development principles. • **Maintain our unique lifestyle**: To protect and enhance social, recreational, lifestyle use and enjoyment of Darwin Harbour in an ecologically sustainable manner. DHAC in 2021 released an Integrated Report Card based on 12 values identified in consultation with stakeholders. Indicators for Indigenous values were food security, future generations and spiritual and sacred sites.

3. Methodology

3.1 Requirements of the NTEPA

A referral and Draft Terms for Reference (ToR) were accepted by the Northern Territory Environment Protection Authority (NTEPA) in March 2022. These were placed on public exhibition from 12 April to 10 June, receiving 7 government and 169 public submissions. The final ToR for a strategic assessment at the level of an EIS were published on 7 October 2022. EcOz analysis of the submissions found the top five issues raised were, in order of frequency:

- transparency and consultation
- human health
- marine baseline and impacts
- social and economic impacts
- greenhouse gas emissions.

Table 3-1: Themes raised in submissions to ToR (raised in > 10 submissions, raised in 5-10 submissions, raised in <5 submissions) (Analysis by EcOz)

Row Labels	NT EP Act Comments	EPBC Act Comments	Total
Biting insects	1	0	1
Carbon Capture and Storage	8	0	8
Climate Change Risk	4	0	4
Concern about no EIS for industries	10	1	11
Culture and Heritage	5	1	6
Cumulative Impacts	8	3	11
Emergency response	4	0	4
Fishing impacts	7	0	7
GHG emissions	14	1	15
Human Health	23	1	24
Management & Monitoring	10	0	10
Mangroves	1	0	1
Marine baseline and impacts	16	0	16
Marine Impacts	3	1	4
Other	11	1	12
Permits & Licensing	2	0	2
Social and economic impacts	16	0	16
Sustainability	9	1	10
Traffic (Marine)	1	0	1
Traffic (Road)	1	0	1
Transparency & Consultation	23	7	30
Whole of Environment	10	0	10
Grand Total	**187**	**17**	**204**

3.2 Overview of approach

The methodology for this study and categorisation of impacts is in accord with best practice social impact assessment guidelines and principles (see Section 3.6). The following diagram (Figure 3-1) outlines the steps of our approach to social impact assessment. The last steps have been modified to provide a social performance plan instead of a social impact management plan (see Section 14).

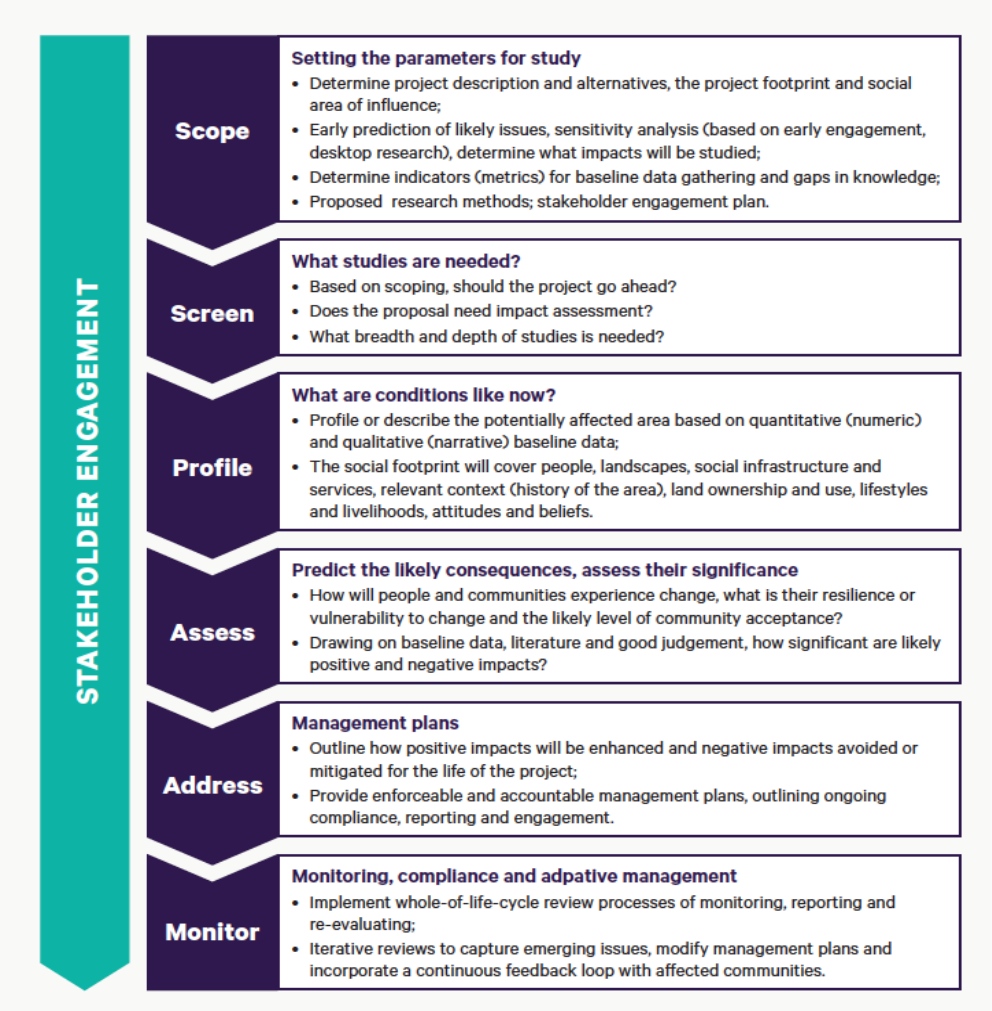

Figure 3-1: The steps of social impact assessment

3.2.1 Scoping

The scoping phase began with an analysis of the key issues likely to be raised by key stakeholders and the wider public. This was based on:

- **desk research**, including environmental studies for other projects, media coverage, reports from the Darwin Harbour Advisory Committee and land use planning documents;
- **expert judgement**: our local knowledge and experience of working on previous similar projects;

- **a literature review** of best practice strategic and cumulative social impact assessments, guidance documents, the legislative framework for strategic assessments, international and national case studies and academic research;
- **policy documents:** a review of relevant government policy documents and frameworks;
- **consultation:** feedback from the Department of Infrastructure, Planning and Logistics (DIPL) communication and engagement staff on engagement and feedback for the project.

The key issues of significance to emerge from this scoping exercise were:

- concerns about industrialisation of Darwin Harbour and disturbance to environmental, social, cultural and local economic values
- indirect impacts likely to be invoked by project activities, including the need to find major sources of water and energy to enable development
- impacts from an influx of workers, for example pressures on social infrastructure, accommodation and sense of place
- pressures for land release to support industrial and residential growth invoked by the development of Middle Arm
- potential collective benefits, including economic diversification, employment, contracting, long-term opportunities to develop skills and capacity
- changes to recreational, aesthetic and residential amenity for people living, working and visiting the harbour
- reduced community cohesion as a result of polarised views about the development and use of fossil fuels.

Additional impacts were added if:

- they were raised during consultation
- a better understanding of the project and its implications suggested additional impacts or benefits, for example consideration of the "promotion of Darwin as an iconic, world-class harbour city", which was raised in several submissions and added to the Terms of Reference
- situational factors (such as debate about the future of the harbour) made certain issues topical during our research period.

3.2.2 Screening: preliminary issues analysis

The parameters of research for this strategic social impact assessment (SSIA) were determined by a preliminary significance assessment which considered likely stages of activation of the Middle Arm precinct, activities that would trigger change processes, cumulative impacts from other projects and the indirect impacts on people and communities in the Greater Darwin Region.

Assessment of the significance of – or community sensitivity to – possible impacts of the Project was based on an analysis of likelihood and consequence. Likelihood is an assessment of how likely it is that the impact (perceived or not) will happen. Consequence is the extent to which impacts are felt, or how much the change matters to affected people and communities. Social risk and

opportunity ratings may differ from those of technical studies in that they are measuring how aspects of the natural environment are valued and used and sensitivity to change.

Some potential impacts and benefits were rated as inconsequential, so were screened out from further assessment. The remainder were giving residual ratings based on a consideration of predicted likelihood, consequence and potential mitigation or enhancement measures.

The following criteria (Munday, 2020) was used to determine consequence from the community's perspective:

- **Extent**: how many people will experience the impacts
- **Duration**: how long the impacts will last
- **Severity**: the scale of change from the current conditions
- **Sensitivity**: based on the level of controversy, disturbance to values, people's resilience and capacity to absorb change.

The tables below show the methodology and descriptors used to assess social risks and opportunities.

Table 3-2: Ratings for negative impacts (based on AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines)

		Negative consequence (for harms, disturbance)				
		1	2	3	4	5
Likelihood	Descriptor	Insignificant	Minor	Moderate	Major	Extreme
A	Almost certain	A1	A2	A3	A4	A5
B	Likely	B1	B2	B3	B4	B5
C	Possible	C1	C2	C3	C4	C5
D	Unlikely	D1	D2	D3	D4	D5
E	Rare	E1	E2	E3	E4	E5

Table 3-3: Descriptors for negative impacts

Very High	Intolerable social, cultural and economic cumulative impacts that are unlikely to be amenable to management.
High	Intolerable cumulative impacts that might be accepted if managed to as low as reasonably practicable, taking account of community perceptions, values and resilience.
Medium	Tolerable (depending on the level of community acceptance) cumulative impacts if managed effectively, but requires close monitoring.
Low	Tolerable, barely perceptible negative impacts, but implement adaptive management approaches to ensure the threat level doesn't increase and exacerbate emerging threats as development unfolds across the region.

Table 3-4: Ratings for positive impacts

		Positive consequences or opportunities				
		1	2	3	4	5
Likelihood	Descriptor	Insignificant	Minor	Moderate	Major	Extreme
A	Almost certain	A1	A2	A3	A4	A5
B	Likely	B1	B2	B3	B4	B5
C	Possible	C1	C2	C3	C4	C5
D	Unlikely	D1	D2	D3	D4	D5
E	Rare	E1	E2	E3	E4	E5

Table 3-5: Descriptors for positive impacts

Transformational	Transformational, game-changing and enduring social, cultural and economic opportunities for the region
Beneficial	Positive cumulative change across the region that will be noticed immediately or accrue over time
Noticeable	Changes are welcome and noticed but temporary or quickly absorbed
Barely perceptible	Positive but barely discernible changes to the way of life, livelihoods and lifestyles of the region

3.2.3 Prediction and assessment

Risks and opportunities were further considered at a multidisciplinary risk workshop. Some additional risks and opportunities were added at this point. The final risk and opportunity matrix (see Attachment 1) incorporates new issues raised in the final TOR (NT EPA 2022) and during the social and technical studies for the Strategic Environmental Assessment. Each predicted risk and opportunity (impact and benefit) is discussed throughout this report. A refined residual rating assumes adoption of recommended mitigation or enhancement actions.

3.2.4 Categorising impacts

The potential key impacts and benefits were categorised using the dimensions of social impacts adapted for a North Australia context (Munday 2020). These categories are adapted from the International Association for Impact Assessment (IAIA) Principles (Vanclay 2003) and Guidelines (Vanclay et al. 2015) but also draw on a Social Framework for Projects developed by Smyth and Vanclay (2017) and New Zealand's Living Standards Framework (New Zealand Treasury 2019), which is based on the OECD 'How's Life?' wellbeing indicators. 'Strong Voice' reflects the concept of political efficacy developed by Blishen and Lockhart (1979) in a Canadian First Nations Context. The dimensions are illustrated in Fig 3.1 and Table 3.5 below.

Figure 3-2: Dimensions of social impacts adapted for a North Australia context (Munday 2020)

Table 3-6: Description of key dimensions

What is covered by the key dimensions	
People and communities (Section 6) 	Health, wellbeing, safety, community cohesion, our sense of connectedness, ability to feel safe, shared values and capacity to absorb newcomers into the community.
Social infrastructure and services (Section 7) 	The quality, accessibility and affordability of social infrastructure and services, such as housing, health, education, transport, emergency services, utilities.
Economies and jobs (Section 8) 	Jobs, economic opportunities and community development, including the employment and training of Aboriginal people, local procurement and equitable distribution of economic benefits and harms.
Cultural identity (Section 9) 	Covers connections to country, cultural authority and respect for Aboriginal worldviews and cultural values. Cultural identity can be affected by reduced access to land and traditional livelihoods, damage to sacred or important cultural sites, threats to traditional leadership or dilution of shared values. This dimension also covers the shared culture and values of communities.
Healthy country (Section 10) 	Healthy land and seas covers values associated with the use and enjoyment of the natural environment. This is sometimes described as socioecological systems or 'ecosystem services', which are the commercial, cultural, recreational and aesthetic benefits, goods and services we derive from the use of our land, clean air and water.
Living environment (Section 11) 	Our living environment incorporates what is often described as 'surroundings' and includes the community's experience or perceptions of factors that cause annoyance or disturbance to the amenity of places where people and families live, work and play. This includes disturbance from industrial noise, dust, lights, heat, vibrations, traffic congestion, destruction of landscapes or pollution that detracts from the quality of our environs. Technical studies might assess the likelihood and consequences of impacts on receptors. A social perspective explores who these 'receptors' might be, their values and their sensitivity to disturbance.
Strong voice (Section 12) 	A strong voice means having influence over decisions and contributing to our own governance. Communities may feel ineffectual if their voice is not heard.

3.3 Social research methodology

The Department of Infrastructure, Planning and Logistics (DIPL) coordinated all communication and community engagement for this project, including for the strategic environmental assessment. Consequently, independent fieldwork for the strategic social impact assessment was confined to some limited social research.

Scoping identified that industrialisation of the harbour was a key sensitivity. The research gathered baseline data on current uses and values of Darwin Harbour and how these might be positively or negatively affected by cumulative development in the region, including the Middle Arm Sustainable Development Precinct.

The four key elements of social research reported on in Section 5 and Attachment 3 comprised:

1. **Values mapping:** Respondents were asked to drop pins on a map of Darwin Harbour showing areas they value or have concerns about. The map was loaded to the Northern Territory Government's 'Have Your Say' website, which presented some technical constraints.
2. **Survey:** Attached to the mapping exercise was a survey, which received 235 responses. The survey ran from 8 August to 30 November 2022 and promoted by direct mail, personal contacts, social media and flyers.
3. **Interviews:** Informed stakeholders were approached for individual interviews based on their knowledge and insights relevant to specific material topics, in particular key harbour user groups such as aquaculture, tourism, recreational fishing and the maritime industry.
4. **Focus groups:** Are planned for 2023.

3.3.1 Social expert panel

Research for the SSIA was guided by an expert panel, recognising that the Middle Arm SSIA scope of work intersects with several other related fields of social, economic and cultural research. Members of the expert panel were approached for their expertise in social, economic, cultural, workforce development and planning research. The panel was guided by the following Terms of Reference:

Purpose: To ensure a coordinated approach to social research that provides knowledge and data that can be used:

- to inform the SSIA, including guidelines and recommendations for future SSIAs and approvals;
- by individual proponents, to streamline approvals and reduce the consultation burden on stakeholders having to repeatedly provide the same information;
- to provide shared knowledge that will inform collaborative planning for population growth and economic development in the Greater Darwin region as a result of Middle Arm development;

- to establish indicators, governance and protocols for long-term monitoring of key issues, such as demographics, workforce development, social infrastructure needs analysis, community acceptance of development of Middle Arm.

The **role** of the expert panel was to:

- agree on the priorities for collaborative planning and immediate, near-term and long-term research needed to guide this (what evidence base is needed by decision-makers)
- determine any gaps in the proposed research and other scopes of work that might be needed
- review the scoping document and agree on key areas of research and indicators for long-term monitoring and management
- approve suggested research methods
- provide advice on the availability of existing data
- prevent duplication of data gathering and research by various agencies
- consider progress reports on social research
- provide feedback on the draft SSIA.

The expert panel met 4 times between April 2022 and March 2023. Its membership:

- Jane Munday (Chair), leading the SSIA
- Nicole Conroy, senior environmental officer, DIPL, leading the Strategic Assessment
- Planning Commission (land use planning and needs analysis work)
- Transport Planning (DIPL)
- DIPL communication and community engagement adviser
- Darwin Harbour Advisory Committee (DHAC) – (three members: the Chair and representatives from AFANT and the Environment Centre of the NT)
- Deloitte – economic assessment
- EarthSea Heritage Surveys – cultural heritage
- Department of the Chief Minister and Cabinet, social, economic and environmental policy
- Palmerston Council (most affected local government authority and not represented on DHAC)
- NT Chamber of Commerce
- Department of Treasury and Finance
- Department of Industry, Tourism and Trade
- Investment Territory (DCMC)
- Litchfield Council (joined in 2023).

3.3.2 Consultation with Larrakia people

Consultation with Larrakia people will be coordinated by a committee convened by DIPL. Discussions with key Larrakia groups are ongoing. This section of the SIA will be completed xxxxx.

3.3.3 Other independent or separate scopes of work

Rather than duplicating, the SSIA drew on a number of other scopes of work, guided by a social research expert panel:

- **Planning Commission:** Including the Darwin Regional Land Use Plan (2015); Litchfield Sub-Regional Land Use Plan for Holtze to Elizabeth River (including a needs analysis of social infrastructure by Fyfe) and discussion paper on a Middle Arm and Weddell Sub-Regional Land Use Plan (due in mid-203). The Planning Commission's work is rigorous, professional and participative. The needs analysis provided sufficient analysis for both social infrastructure covered by the SSIA (see Sections 6 and 7).
- **Infrastructure NT** and **Transport Planning** documents, including Infrastructure NT's *Infrastructure Plan and Pipeline 2022*.
- **The Darwin Harbour Advisory Committee (DHAC)** prepared an integrated report card on the values of Darwin Harbour (2021) and continued this work in 2022. The SSIA draws extensively on various DHAC reports, particularly when mapping values of Darwin Harbour.
- **Economic study**: a Deloitte Economic Impact Assessment provided a detailed overview of the potential economic impacts of the project. The modelling builds on a Computable General Equilibrium (CGE) modelling which estimates the economy-wide impact of the precinct, including flow-on effects and spill-overs based on three potential scenarios. (see Section 8).
- **Cultural heritage study**: Earthsea's cultural heritage work (see Section 9 and Appendix xxx).
- **Workforce development strategy**: The NT Chamber of Commerce was engaged to develop the first stage of a Workforce Development Strategy (see Section 8 and Attachment 4), with workforce planning and occupational gaps also being done by Infrastructure NT, DITT and the Industry Skills Advisory Council of the NT.
- **Communication and community engagement**: DIPL coordinated communication and general community engagement for the Middle Arm Sustainable Development Precinct (see Consultation Report at Chapter 3 and Appendix xxxx of the EIS).

3.4 Sustainability outcomes

Outcomes in impact assessment parlance generally refer to thresholds for acceptable disturbance – with a focus on the 'mitigation hierarchy' of avoiding or mitigating negative impacts – and a description of how environmental outcomes will be achieved. For example, 95% of mangroves will be preserved, that there will be no net loss of iconic species, total dredging volumes will be capped at a certain amount or thresholds will be set to prevent a decline of water quality from cumulative pollution or discharges in a geographic area.

Social sustainability outcomes incorporate both thresholds for disturbance – based on a community's resilience and capacity to absorb change – as well as goals and objectives for a project's contribution to positive sustainability outcomes, or enduring benefits.

Both require indicators and longitudinal monitoring.

The Draft MASDP social performance plan (at Attachment 2) incorporates a number of social, cultural, economic and governance objectives, serving as a bridge between:

- the assessment of the positive and negative consequences of the project's change processes
- an actionable plan to deliver on the social, cultural, economic and governance benefits expected as a local dividend or trade-off for disturbance in the Greater Darwin area.

The social sustainability outcomes are based on a 'theory of change' approach to measuring social outcomes, in line with the Northern Territory Government's *Social Outcomes Framework* (2021) and impact evaluation models from the impact and infrastructure sectors (Section 4.6 below). 'Social impact' in this context is typically a driver of social purpose organisations, which exist to create positive impacts. It goes beyond describing what will change (delivering 1000 meals) to providing lasting, system change (reducing hunger by 5%). Outcomes can also set allowable limits for potentially negative impacts, such as limiting cost of living pressures, or maintaining an adequate supply of affordable housing in the face of worker in-migration.

The social sustainability outcomes framework attached to this SSIA envisages sustainability outcomes as enduring, lasting benefits that meet the needs of the people and communities of Greater Darwin in line with the Sustainability Principles outlined in the *NT Infrastructure Plan and Pipeline* (Infrastructure Northern Territory 2022, p.30), which describes sustainable infrastructure as:

> planned, designed, procured, constructed and operated to optimise economic, environmental, social, cultural and governance outcomes over the life of the asset. This is done in a way that ensures it supports to needs of society today without compromising the needs of future generations.

This elements of sustainability from the plan are adopted in the sustainability outcomes and social performance plan for the MASDP.

Table 3-7: Components of sustainability (Investment NT 2022)

Component of sustainability	Principle
Economic	Infrastructure should grow productivity, the Australian economy and allow equitable access to economic and growth opportunities, while efficiently using financial resources.
Environmental	Infrastructure and policies should protect environmental outcomes by reducing pollution, balancing resource consumption, conserving natural ecosystems and resources, and supporting climate mitigation and adaption.
Social	Infrastructure and policies should improve quality-of-life, access and wellbeing, to create an inclusive and fair society.
Cultural	Infrastructure and policies that maintain cultural beliefs, cultural practices, heritage conservation and culture as its own entity.
Governance	Infrastructure and policies should build trust in governance and institutions through transparent, accountable and inclusive decision-making.

3.5 Social performance plan

Social Impact Management Plans (SIMP) provide commitments that respond to the social risks and opportunities identified during impact assessment. A SIMP should provide a blueprint for ongoing monitoring, measurement and management.

For this SSIA, the key risks and opportunities are at Attachment 1. A social sustainability outcomes framework outlines social, economic, environmental, cultural and governance outcomes and objectives. The draft social performance plan at Attachment 2 identify actions and accountabilities at government, precinct and project levels to address identified risks and opportunities and achieve the identified outcomes and objectives.

This approach reflects the common experience of social impact management plans being ignored once regulatory approvals are retained. Companies' social performance plans are more likely to drive actions and a community development (as opposed to an investor) focus. As articulated by the International Council on Minerals and Mining (2020), the purpose of social performance is to "contribute to the social and economic development of affected people".

Although environmental sustainability outcomes are addressed in the overall program, they are included in the social sustainability outcomes framework to ensure a holistic consideration of interconnected perspectives:

Social: Connected society, wellbeing and quality of life, good housing and living conditions, human development.

Cultural: Enduring connections to land and seas, cultural knowledge and identity.

Economic: Equitably shared material wellbeing, household income, GDP per capita, enduring local prosperity, livelihoods, workforce development.

Ecosystems: Continued healthy ecosystems, able to meet the needs of future generations.

Governance: Strong institutions that reflect their context, ability to have influence at and between elections, civic involvement in managing socio-ecological systems (interdependence between humans and nature) transparency.

3.6 Relevant standards

Engagement

A requirement to consult is a key requirement of regulatory approvals in the Northern Territory. The objects of the Northern Territory *Environment Protection Act 2019* (sections 3(d) and 3(e)) expressively:

- provide for "broad community involvement during the process of environmental impact assessment and environmental approval"
- recognise "the role that Aboriginal people have as stewards of their country as conferred under their traditions and recognised in law, and the importance of participation by Aboriginal people and communities in environmental decision making process".

- The Northern Territory EPA's *Stakeholder Engagement and Consultation Guidance for Proponents* (updated January 2021) recognises that stakeholder consultation is an important component of social, cultural and health impact assessments, over and above formal opportunities for feedback on documents placed on public exhibition.
- The guidance recommends that proponents adopt the International Association for Public Participation (IAP2) core values as principles for best practice stakeholder engagement.
- IAP2 Spectrum of Participation (n.d) and *Quality Assurance Standard* (2015)

Social impact assessment

- International Association for Impact Assessment (IAIA) Principles (Vanclay 2003) and Guidelines (Vanclay et al. 2015) for Social Impact Assessment
- New South Wales Government's *Social Impact Assessment Guideline for State Significant Projects* (2021)
- The NT EPA's *Guidance for Economic and Social Impact Assessment* (2013)
- Munday, J (2020), *Guide to Social Impact Assessment*

- international finance institutions guidelines and internal research by True North Strategic Communication into best practice impact assessment.

Social Impact Assessment

"A Social Impact Assessment includes the process of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any change processes invoked by those interventions. Its primary purpose is to bring about a more sustainable and equitable biophysical and human environment."

Source: International Association for Impact Assessment, Principles of SIA, (Vanclay 2003)

Sustainability

- Infrastructure Australia's *Assessment Framework* (2021) – Principles are social, economic, environmental, governance and social.
- UN Sustainable Development Goals (2015) – includes goals such as reducing poverty, equal access to education and clean water.
- Infrastructure Sustainability Council (ISC) *IS Rating Scheme* and annual *Return on Investment Studies.* The latter use cost benefit analysis to assess the costs and benefits to all impacted parties, including the environment, community members and government. This excludes benefits not amenable to monetisation, such as the benefits of open space, health outcomes and human capital development.

Measuring social impact

- Centre for Social Impact, University of NSW, 2021, *Roadmap to Social Impact: Your step-by-step guide to planning, measuring and communicating social impact*
- Northern Territory Government's *Social Outcomes Framework* (2021) has a vision that "all Territory individuals, families and communities are inclusive, healthy, safe, resilient and thriving".

4. Literature review

4.1 Strategic assessments

From existential to practical crises, decision-making in the 21st Century is being challenged to consider the future of the planet and future generations; to accommodate changing societal values; and to consider tipping points to societal tolerance of economic growth.

The purpose of a strategic assessment is to consider these issues in the early stages of decision-making, in the context of sustainability, and to be guided by transparent and accountable discussion on the type of development considered appropriate at a regional, landscape or precinct scale.

A strategic assessment should take account of the carrying capacity and competitive advantage of a region, the types of development that provide a strategic fit with policy intent, the likely collective positive and negative impacts of regional development, how potential projects (or classes of action) align with diverse community values and aspirations and collective approaches to maximising benefits.

Strategic assessment takes account of the cumulative impacts of past, present and foreseeable projects to inform policy, planning, budgets and governance. This contrasts with individual project approvals, which generally fail to address the successive, incremental effects of multiple projects in the same area: whether from multiple discharges of wastewater into the harbour or the unplanned, ad hoc arrival of new residents.

The need for strategic assessment was identified in the mid-1980s by the Canadian and American Research Councils to address the shortcomings of project level assessments (Blakley 2021). These shortcomings included:

- ignoring the additive effects of repeated developments in the same ecological system
- not dealing adequately with precedent-setting developments that stimulate other activities, particularly in fragile environments
- ignoring changes in the behaviour of ecological systems in response to increasing levels of perturbation and non-linear functional relationships
- not encouraging the development of comprehensive environmental objectives that reflect the broad goals of society.

The advantages of a strategic assessment (CSIR 2007; Department of Agriculture, Water and the Environment 2011; Noble & Gunn 2015; Noble & Harriman 2009; OECD 2006; Duinker & Greg 2021; Taylor and Mackay 2013; IAIA 2002) include that it:

- addresses the piecemeal nature of assessing multiple projects that may gradually degrade the receiving environment

- contributes to higher-level tiers of decision-making with a broader set of objectives (Noble & Gunn 2015)
- informs planning at an early stage of decision-making and is proactive and futures-focussed (OECD, 2006)
- integrates environmental, social and economic concerns into strategic decision-making, whereas project level assessments tend to be tied to 'environmental' assessments
- should prevent irreversible and undesirable effects and ideally facilitate positive effects
- provides communities with long-term certainty by considering in advance what types of development are suitable for a region or precinct, much like an urban masterplan
- provides proponents with clarity and reduces risk by setting conditions in advance for an agreed class of actions
- streamlines individual approvals by determining what classes of action activities and classes of will be deemed acceptable
- provides a roadmap or goals for desired futures and informs key decisions on how to achieve them
- provides a collective knowledge base and baseline data that can be used to guide longitudinal or time series monitoring
- integrates broad and early public participation to avoid issues being raised too late, incorporates local knowledge and fosters collaborative planning and policy making
- creates "a public decision space in which alternative development options can be debated" (Beckwith 2013).
- informs policy, governance and planning for multiple projects in a region to guide an orderly roll-out of development and supporting social and economic infrastructure
- enhances the credibility of decisions and leads to more cost and time-effective impact assessment
- can help develop more socially sensitive policy and plans and set the context for project-level assessments (Taylor & Mackay 2013)
- generally has more flexible timeframes than project level approvals.

Strategic assessments are particularly valuable where rapid growth or complex large-scale actions are likely (Department of Environment 2012) and where early investment in large projects may lead to "economic and political lock-in resulting in inflexibility later in the decision stream" (Blakley & Noble, 2021, p.169).

4.2 The principles of strategic assessment

The principles of strategic assessment, compiled from the literature:

- **Participative** – early and ongoing involvement of relevant stakeholders and affected parties, including government bodies, explicitly addresses their inputs and concerns in documents and decisions and ensures access to relevant information (IAIA 2002; Noble and Harriman 2098)
- **Integrative** – addresses the interrelationships of biophysical, social and economic (IAIA 2002)
- **Sustainability**-led (IAIA 2002)
- **Focussed** – sufficient, reliable and useful information for development planning and decision-making, customised, time-efficient and cost effective
- **Accountable and transparent** (EIANZ)
- **Futures oriented**: focuses on identifying possible futures and the means to shape regional outcomes (Noble & Harriman 2009)
- **Multi-tiered and multi-sectoral** (Noble & Harriman 2009)
- **Adaptive**: sufficient flexible to modify and adapt plans as new knowledge is gained through implementation, monitoring and feedback (Noble & Harriman 2009).

4.3 Cumulative impact assessment

Cumulative impacts are successive, incremental, combined effects of past, present and foreseeable land use activities that accumulate, over time, on the environment. They may be individually minor but collectively significant (Hegmann 2021), resulting from the additive effects of multiple actors and causal pathways across the landscape, occurring simultaneously, sequentially from a single source over time or collectively from different sources (Kaveney, Kerswell & Buick 2010; Atkinson et al. 2016).

Significant cumulative effects are often overlooked because they are not substantial at a project level (Noble & Gunn 2013). Impacts typically aggregate in a linear or piecemeal way, which makes them difficult to detect until they reach a 'tipping point' (Blakely & Noble 2021; Franks, Brereton & Moran 2010). This has been described as 'progressive nibbling', 'death by a thousand cuts' or the 'tyranny of small decisions' (Noble & Gunn 2015).

Effective cumulative effects analysis is, therefore, focussed on understanding the condition of complex adaptive systems (Atkinson et al. 2016) and the total effects of stressors in a regional environment, "including the additional stress caused by potential future development combined with natural events and surprise disturbances such as wildlife, floods and drought" (Blakley & Noble 2021, p.160).

Causes of cumulative effects include (Kaveney et al. 2010):

- multiple activities gradually disturbing the same space
- time crowding where multiple effects are so close in time that they don't clear (e.g. discharge into a creek)
- additive and compound effects that interact, such as the compounding effects of dust and noise on a community
- indirect, or downstream effects such as weeds from civil works.

Cumulative impact assessment overcomes these shortfalls by considering the total effect on a resource, ecosystem or human community that may require collective action to address (Franks, Brereton & Moran 2010; Noble & Harriman 2008; Blakely 2021).

Cumulative community effects include social disruption and displacement, loss of social capital and community cohesion, erosion of culture and language loss, loss of heritage, income and gender inequalities and health issues (Blakely, 2021).

Key features of cumulative impact assessment are that it:

- takes account of all impacts or stressors that a community or system will experience, whether these are acceptable and tipping points or thresholds
- captures many impacts which are missed by ad hoc or project-level impacts, some of which will last for years
- considers how multiple projects might sustainably operate within the same receiving environment rather than determining whether a new project should proceed (Sutherland 2021)
- considers the carrying capacity of a system, incremental effects, multiple interactions that accumulate across space and time and thresholds for harmful change
- takes account of how past cumulative effects have conditioned the present environment (Blakley & Noble 2021) and may require a shifting baseline or snapshot in time that reflects an already disturbed system (Kaveney et al. 2010)
- integrates assessment, monitoring and management programs by different agencies into a regionalised strategic framework to support scientific assessment of cumulative change, inform land use planning and inform approvals of specific development (Blakley & Noble 2021).

4.4 Strategic social impact assessment

Cumulative social impact assessment is well-described in the literature, particularly arising from longitudinal studies of coal and coal seam gas developments in Queensland and New South Wales. Approaches to longitudinal tracking of cumulative social impacts include the University of Queensland's 'Boomtown Toolkit' (Rifkin 2021; University of Queensland 2018). A key limitation is that cumulative social impact assessments are generally prompted when negative effects have already materialised, such as strains on housing when multiple projects start up in a region.

There is less guidance and literature on strategic social, cultural and economic impact assessment, although government inquiries (such as whether to allow uranium mining in Kakadu or hydraulic fracturing in the Beetaloo) and land use planning constitute a type of strategic assessment.

In Australia, the *Environment Protection and Biodiversity Conservation Act (EPBC) 1999* provides for strategic assessment. However, all strategic assessments under the Act have been confined to an examination of how urban or industrial development might negatively impact on environmental protection and conservation. The exception is the Browse Basin strategic assessment of the proposed James Price Point LNG (see case study below), noting that this study fell outside the 'controlled actions' covered by the *EPBC Act.*

The recent *Environment Protection Act (NT) 2019* provides for strategic as well as social, cultural and economic assessments. The Middle Arm Sustainable Development Precinct EIS will be the first assessed under this Act. A social, cultural and economic study is in progress (as of the end of 2022) for the Strategic Regional Environmental and Baseline Assessment (SREBA) of the Beetaloo onshore gas precinct as a recommendation of the Inquiry into Hydraulic Fracturing in the Northern Territory (2019).

Case studies

Three key case studies are provided from the jurisdictions of South Africa, Australia and Canada:

1. **James Price Point**: The only Australian strategic social impact assessment was funded by the Australian and West Australian Governments for the Browse Basin. What is noteworthy about this case is that the social component was led by the WA Department of State Development because the WA EPA's remit did not extend to social impact assessment. The intent of the strategic assessment was to establish a state management framework that would apply to all future proponents at James Price Point, including conditions. Future proponents would request that projects be considered a 'derived proposal' as long as the activity had been identified in the strategic proposal, did not raise environmental issues that had not been adequately addressed and there had not been a significant change in environmental factors.

   A separate Aboriginal Social Impact Assessment was commissioned by the Kimberley Land Council with government funding (Kahn and O'Faircheallaigh 2010). This comprehensive and highly participatory study was co-managed by affected land holders. Some of the key issues raised in the KSIA (from previous analysis by Munday 2017) include:

- the importance of addressing current factors of socioeconomic disadvantage;
- the potential loss of economic resources, such as access to land and water or adverse impacts on wildlife from pollution or changed wildlife behaviour;
- the need for sustained action to realise opportunities for Aboriginal employment and address negative factors such as racism, a lack of skills and work experience, alienation and loneliness arising from the unfamiliarity of industrial environments and distance from home communities, a reluctance to forgo land-based activities such as hunting and fishing for industrial jobs, a lack of suitable accommodation and insufficient attention to the needs of female employees;
- the loss of land and sea country can have profound social, cultural and spiritual ramifications, causing anguish and fear;
- an influx of outsiders who may have little empathy with Aboriginal culture, causing anxiety and stress, sexual exploitation of women and potential envy and resentment if local Aboriginal people do not share the benefits;
- social tensions from inequitable income distribution and inequality;
- impacts on social structures, for example cash incomes reducing access to land, diminishing the importance of knowledge about traditional economic uses and, in turn, the authority of elders;
- conflict over pressures to redefine interests in land;
- community divisions over the desirability of projects, loss of control and self-esteem;
- positive impacts if Aboriginal people do have control over their traditional lands and the capacity to deal with large-scale resource development;
- the potential contribution if development leads to enhanced social services;
- frustrations with the level of information available, short timeframes and perceptions by Aboriginal people that their voices were not being heard.

2. **South Africa, Karoo Basin:** The Council for Scientific and Industrial Research (CSIR) has produced guidelines on strategic assessments (2007) and in 2016 produced a comprehensive, multidisciplinary strategic environmental assessment of the Karoo Basin for onshore gas development. The mission statement for the Karoo SEA was:

   > "to provide an integrated assessment and decision-making framework to enable South Africa to establish effective policy, legislation and sustainability conditions under which shale gas development (SDG) could occur. It does not assume SDG will occur. The key objective is to provide decision makers and stakeholders with an evidence base that will help develop a better understanding of the opportunities and risks associated with SDG."

The CSIR commissioned a comprehensive, independent report on potential impacts on the social fabric of the region, as well as reports on a number of other social and economic aspects of development, including tourism. The social fabric study (Atkinson et al. 2016) examines risk related to four main pathways:

- human migration: pressure on housing and infrastructure, increases in the cost of living, potential squeezing out of other economic options
- safety and security: fear of crime, traffic, risks to clean household water supply
- social disruption: competition for resources, conflicts, loosening social ties, population church
- governance: may be increased pressure on municipal services and political tensions.

3. **Mackenzie Valley Pipeline Inquiry** by Justice Thomas Berger (1977; 1983). While not called a strategic assessment, the Berger Inquiry into the social, environmental and economic impacts of the proposed Mackenzie Valley Pipeline is still regarded as ground-breaking for the depth of the social and cultural studies, and for Justice Berger's comprehensive engagement of the 35 First Nations communities along the Mackenzie River Valley (Munday 2017). Some his findings:

    - poverty is not necessarily alleviated by jobs, with First Nations people not inclined to resource jobs and many lacking the skills;
    - the devastating consequence of settlement on patterns of collective and cooperative self-reliance makes First Nations people particularly vulnerable to large-scale industrial development;
    - company reports overlook the persistence of traditional economies;
    - pipeline construction would attract new populations to First Nations lands;
    - the gas was likely to bypass communities, who should get cheaper gas as compensation to ensure they share the benefits of the pipeline;
    - the need for one regulatory agency and an impact assessment group with broad representation to advise the agency.

    Justice Berger commented that the social, economic and environmental considerations should be addressed in the early stages of projects and throughout their development "with the same intensity and concern as technical and engineering questions" (covering letter, p. 27). He commented on a tendency in examining the impacts of large-scale industrial projects to accept the prospect of negative social impacts and make recommendations for remedial measures that could or should be taken:

    > "All that can safely be said is that the social costs will be borne by the local population and that the financial costs will be borne by industry and the government. There is a strong tendency to underestimate and to understate social impact and social costs, and there is a tendency to believe that, whatever the problems may be, they can be overcome. The approach here is curative rather than preventative (p. 143)."

4.5 Sustainability and sustainable development

The term 'sustainable development' emerged in the 1970s and 1980s in reaction to a post-war era of unfettered growth. Turning points were Rachel Carson's book *Silent Spring* (1962) – exposing the destructive consequences of widespread use of pesticides – and the world's first environmental legislation, America's 1969 *National Environmental Policy Act* (NEPA), which for the first time required environmental and social assessments of Federal projects that impacted on the 'human environment'.

Various international covenants since the 1980s have articulated two key elements of sustainable development, both of which are 'people-centred'.

1. **Sustainability:** The idea of 'sustainability' was driven by the Club of Rome and 'limits to growth' literature of the 1970s (Meadows et al. 1972). Sustainability refers to the future of our planet and enduring human wellbeing (Grace & Pope 2013). It promotes the need to conserve finite renewable and non-renewable resources at a time when population growth and over-consumption is running down the planet's precious stock of resources.

2. **'Development'** was driven by justice literature in an era of emergent concerns about inequality between rich and poor nations. Key literature was John Rawls' *A Theory of Justice* (1971) and Amartya Sen's *Development as Freedom* (1999), which had a strong influence on the United Nations' Human Development Index. Sen argues that economic development should create freedoms, including choice, agency and the freedom to thrive. So, development was envisaged as meeting the needs of humans, ensuring that we all have the chance to lead a decent life and that economic development meets the needs of emerging nations.

'Sustainable development' combines the two elements, incorporating concerns about intergenerational equity (the planet we bequeath to future generations) and intra-generational equity (equitable distribution of the costs and benefits of development). Sustainable development sees the planet as society's life support system and humans as its stewards. It was intended to address the rapid change of ecosystems to meet human needs for food, fresh water, timber, fibre and fuel, which is leading to pollution, environmental degradation and the irreversible depletion of the Earth's natural capital (Millennium Ecosystem Assessment 2005; Dovers & Hussey 2013).

Three key definitions of sustainable development were thus:

- **Brundtland 'Our Common Future' Report** (World Commission on Environment and Development 1987) referred to the need for a new era of economic growth that is socially and environmentally sustainable. The report described 'sustainable development' as follows:

> (Par 27): Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. The concept of sustainable development

does imply limits – not absolute limits but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities. But technology and social organization can be both managed and improved to make way for a new era of economic growth. The Commission believes that widespread poverty is no longer inevitable. Poverty is not only an evil in itself, but sustainable development requires meeting the basic needs of all and extending to all the opportunity to fulfil their aspirations for a better life. A world in which poverty is endemic will always be prone to ecological and other catastrophes.

- **Rio Declaration, Agenda 21** (UN Conference on Environment and Development, or 'Earth Summit' 1992) outlined a mission for sustainable development to improve human lives and maintain the planet's finite resources. Principle One was:

  Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

- **Sustainable Development Goals (UN 2015),** replaced the 2000 Millennium Development Goals. The 17 Goals were described as a "blueprint for peace and prosperity for people and the planet, now and into the future". The goals are shown below in Figure 4.1.

Figure 4-1: UN Sustainable Development Goals 2015

Early graphics portrayed sustainability as resting on three pillars or as intersecting domains of social, environment and economic to deliver projects that are bearable, equitable and viable. This interdisciplinary equity is retained in the International Association of Impact Assessment's best practice principles for impact assessment (IAIA 1999) and international approaches, such as Canada's definitions and approach to sustainability and impact assessment (with cultural and health among the 'five pillars').

Australia's sustainable development agenda evolved in response to the Brundtland Report and concurrently with preparations for the 1992 Rio Earth Summit. However, a strong conservation movement of that era (reacting to large-scale environmental destruction by contentious projects) led to the insertion of 'ecological' in front of sustainable development.

The preoccupation with 'economic' considerations by governments and industry and 'environmental' assessment by regulators ('environment' meaning the entire biosphere, including air and water and 'ecological' referring to plants, animals and living organisms) sidelines 'social' sustainability (Colantonio 2009). As James and Magee (2017, p.2) comment, 'The social is often relegated to being the vague domain of extra things that do not fit the first two categories', while cultural issues – apart from heritage – are 'completely passed over', ignoring the relationships between domains. Thus social sustainability is generally assessed as an implication of environmental policies rather than as an equally constitutive component of sustainable development (OECD 2006).

The contemporary trend to multi-facetted sustainability reporting and infrastructure sustainability principles (see below) may offer potential to restore the equilibrium of the original pillars. Under infrastructure sustainability models in Australia and New Zealand, consideration of the costs and benefits of development is multidisciplinary and the community is integral, not an afterthought. Additional facets include enduring wellbeing, vitality and cultural identity at a local and regional level. Wellbeing budgets are being adopted to go beyond short-term, market-based metrics such as Gross Domestic Product (GDP) to consider equity, quality of life, economic and social participation, security and freedom of choice (New Zealand Treasury 2019).

A concurrent theme is how industrial development can meet human needs while addressing sustainability concerns. Threats from climate change, carbon emissions and consumerism have driven a quest for innovative technologies and the emergence of 'eco-industrial precincts' (Townsville Council), 'green manufacturing' (using renewable energies), 'industrial ecology' (using the waste streams from one industry as inputs for another) and 'circular economies' (capturing waste and using it productively, such as recycling plastics and water).

The MASDP strategic social impact assessment (SSIA) will consider sustainability outcomes from this broader perspective, rather than being confined to the 'ecologically sustainable development principles' contained in environmentally-oriented legislation. The SSIA will assess positive and negative impacts as part of a traditional impact assessment approach, then provide guidance on a social performance plan that delivers enduring social, economic, environmental and governance outcomes, or benefits.

Importantly, the social sustainability outcomes framework will consider cultural sustainability: the deep, intergenerational stewardship, or sense of connection of First Nations people to Country. Living in harmony with the land and seas and replenishing what we take is the ultimate in sustainability:

> "We have stepped lightly, living sustainably and ensuring that we live in harmony with Country. Always giving back as we take, knowing Country is our mother, and always with the knowledge that we must be good ancestors for those who come after us." (State of the Environment Report, 2022, Indigenous Report).

4.6 Measurement

Measuring impact has come to mean many things in different contexts. Two key distinctions are made for the purposes of this study.

- **Impact assessment:** (referred to as environmental impact assessment in Australia) aims to predict and assess how a project/s will affect the social, cultural, ecological and economic environment and the significance of these impacts (positive and negative) in order to inform decisions about:
  - whether the project/s should proceed
  - how impacts might be mitigated or enhanced
  - what regulatory conditions might apply, including monitoring and management plans.
- **Measuring impact:** An increasingly common approach that measures the contribution – or impact – of investment (such as infrastructure) to public good outcomes. Rather than being predictive, measuring impact is more goal or outcomes oriented. It often adopts an economic or accounting approach, where the benefits of activities are monetised and quantified, generally as part of cost benefit analysis, sustainability reporting or social return on investment approaches. A distinction between the approaches is described by the Centre for Social Impact's *Roadmap to Social Impact* (2021):
  - **Economic analysis approaches**: include cost-benefit analysis (a ratio that compares the costs of a program or intervention to the financial value of its benefits), a social return on investment (how much value is created or destroyed by a program or intervention and for whom).
  - **Theory driven evaluation**: a social research approach using theory of change/program logic approaches to present the relationship between inputs, activities, outputs, outcomes and impact and evaluate the extent to which long-term, sustained changes resulted from program activities. Establishes indicators to show whether change has occurred in underlying conditions or circumstances.

Infrastructure Australia's Infrastructure Plan 2021 outlines that its vision for 2036 "is to have infrastructure that improves the sustainability of the country's economic, social, environmental and governance settings, builds quality of life for all Australians and is resilient to shocks and emerging stresses". Sustainability Principles are:

- **Social**: Infrastructure and policies should improve quality of life, access and wellbeing, to create an inclusive and fair society.
- **Economic** Infrastructure and policies should grow productivity, the Australian economy and allow equitable access to economic and growth opportunities, while efficiently using financial resources.
- **Environmental:** Infrastructure and policies should protect environmental outcomes by reducing pollution, balancing consumption, conserving natural ecosystems and resources, and supporting climate mitigation and adaption.
- **Governance**: Infrastructure and policies should build trust in governance and institutions through transparent, accountable and inclusive decision-making.

Infrastructure Australia's latest *Assessment Framework* (July 2021) allows for a more holistic review of a proposal's broader community benefits in addition to those that can be monetised through traditional cost-benefit analysis. "This enables Infrastructure Australia to better take account of benefits such as sustainability, resilience and quality of life." Proponents are advised to draw on quantitative and qualitative evidence to demonstrate the merit of each proposal across three overarching assessment criteria:

- strategic fit
- societal impact (the value of the proposal to society and the economy)
- deliverability.

The SSIA will incorporate quantitative and qualitative data. It will draw on best practice social impact assessment methodologies and best practice ethics for human research.

The social sustainability outcomes framework (at Attachment 2) draws on theory of change/program logic models to outline an approach to measuring social, cultural, economic, environmental and governance sustainability.

5. Values mapping

5.1 Overview

> Values are deep-seated standards and beliefs that infuse our worldviews, attitudes, positions on issues and decision-making. They are moulded by a lifetime of socialisation, learning and life experience. They drive our psychological responses and resilience or resistance to change. Values are the seeds of conflict and collaboration, the precursors to social movements, the window to individual and community perceptions and the key barrier to persuasion by factual argument (Munday 2020).

Values mapping explores the strength of place attachment, or what people love about their neighbourhood or lifestyle, what they will fight to defend, and the grief - or solastalgia - they might feel at the loss of treasured land and seascapes. The insights from values mapping thus predict conflict, political tensions from deeply polarised values, or the social movements that may emerge as people are confronted by changes to places they love. Some may absorb change, some may accept it as the price of progress, but some may reach a tipping point when change offends their personal, family or neighbourhood values and they protest, or leave.

A major theme of our literature review for this SSIA was concern over the past 20 years at the industrialisation of Darwin Harbour (see Section 3.2.1). A key element of the social research, therefore, was to map the social, economic, cultural and ecological values and uses of Darwin Harbour. This qualitative research will provide advice to decision-makers about likely community acceptance of the Middle Arm precinct based on the proposal's alignment with the values of Darwin residents (see objectives in Section 1.2).

Section 5 is based on an analysis of submissions to the Draft TOR, a survey, mapping tool and interviews. The prevailing sentiment would suggest that the current scale and type of industrial development envisaged by the scope of development covered by the SEA does not align with the strongly held values of many Darwin residents.

Table 5-1: What is covered by Values Mapping

What is covered by values mapping	What the Terms of Reference asked for
The values mapping section describes how Darwin Harbour is used and valued by various groups, how these values might be enhanced or disturbed by development and the implications for community acceptance of the Precinct	Describe and provide baseline data for the social area of influence likely to be affected by cumulative impacts: • land and sea uses, including recreational values • community values of Darwin Harbour, Middle Arm Peninsula, and the broader region (including the municipalities of Darwin, Palmerston, Litchfield, Coomalie, Belyuen and Wagait Identify, describe and assess cumulative impacts and benefits: • disturbance to social, cultural, economic and ecological values of East Arm and Darwin Harbour (including cultural activities, recreation, aesthetics, liveability and sense of place) (see also 6.4.4) • the promotion of Darwin as an iconic, world-class harbour city (see also 8.4.8) • access issues between Elizabeth River boat ramp and Darwin Harbour. Identify appropriate frameworks and management strategies: • five-yearly independent audits against agreed key indicators, including values of the Harbour.

5.2 Baseline

Darwin is the only major city and port on Australia's northern coast. For generations, Aboriginal people visited Garramilla (Darwin) by canoe from neighbouring lands and seas such as the Tiwi Islands. Makassans came in praus from the Celebes (now Sulawesi in Indonesia) seeking trepang and traded with Aboriginal peoples throughout Arnhem Land. From the late 1860s, the harbour enabled European settlement, Japanese pearl divers, telecommunications connections, coastal transport, trade with Asia and defence installations.

The deep-water harbour these days is a key economic asset. East Arm Wharf was opened by the Northern Territory Government in 2000 to support coastal and international trade, multimodal logistics and a transcontinental trade route (see Section 6 on Economies and Jobs). The port is now operated by Chinese-owned Landbridge. The harbour is the terminus of a transcontinental railway, a service and supply for offshore oil and gas activities, a home port for fishing, pearling and prawn fleets, port of call for cruise ships and the centre of a growing maritime industry cluster.

As well as its historic and economic contributions, Darwin Harbour is synonymous with a lifestyle: highly valued for its social, cultural and ecological values, for its scenery, sunsets, sailing, birdlife, iconic marine mammals and recreational fishing. So much so, that in 2002 a multi-sectoral Darwin Harbour Advisory Committee was established to maintain the balance between sustainable

development, a working harbour and protecting healthy ecosystems in the harbour and its catchments. As then Chair John Bailey says in his foreword to the *Darwin Harbour Regional Plan of Management* (2003):

> Territorians clearly revere their harbour and want to see it well managed for future generations to enjoy.

A unique feature of Darwin's CBD is its location on a narrow peninsula, encircled by a vast harbour fed by the rivers and creeks of its 3227 square kilometre catchment from Charles Point to Gunn Point. More than any other capital city is Australia, its history, character, transport routes, economic activities, recreation, culture and development constraints are shaped by Darwin's natural assets and geography as a 'tropical harbour city'.

5.2.1. Image of Darwin

The values of Darwin residents are reflected in descriptions of what is distinct, unique and loved about the city's lifestyle. Government and municipal strategic planning documents for the Greater Darwin Region emphasise objectives such as quality of life, being 'a place for people' (Palmerston) and a vision to be the 'family city of the Northern Territory' (Palmerston). Promotional images convey vistas of the harbour and taglines such as 'tropical harbour city'. As is discussed in Section 8.2.5 below, the image of a place has both a wellbeing and an economic value in that it supports tourism and attracts people to live and work.

Figure 5-1: promotional material for Darwin: Australia's tropical harbour city

5.2.2 Recreational fishing

Fishing is a religion to many in the Territory, with $27 million allocated in the 2022-23 Budget for fishing infrastructure. Fishing cuts across demographics and is both part of the Territory's lifestyle and a key drawcard for prospective workers and tourists alike. Tourism and lifestyle advertising promotes iconic sunsets, sailing, fishing, crabbing and dining around its foreshore. The Government has invested in a popular Million Dollar Fish competition, with Season 8 running from 1 November to March 2023.

Of the 235 respondents to the values mapping survey for this SSIA, 187 said their use of the harbour included recreational fishing. There are 10 public boat ramps in and around the harbour:

- Cox Peninsula, at Mandorah
- East Arm, at the end of Berrimah Road
- Middle Arm, off Cox Peninsula Road
- Southport
- Palmerston (Elizabeth River Bridge), 9 km from Palmerston
- Channel Island, at the end of Middle Arm Peninsula
- Dinah Beach, on Frances Bay Drive, close to the city
- Doyles Ramp (Darwin Ski Club)
- Nightcliff, which has limited carparks
- Buffalo Creek (off Lee Point Road, provides access to Shoal Bay on tides above 4 metres).

A 2021 Fisheries survey of Darwin Harbour boat ramp usage between March and November showed the following average daily boat and boat trailer counts, while Table 5-3 shows where people fished.

Table 5-2: Data on 2021 boat ramp use (Source: Fisheries, DITT, personal communication December 2022)

Ramp	No of survey days (2021)	Average boat and trailer counts per survey day	Highest trailer count during survey
Dinah Beach	34	24.9	58
East Arm	36	10.1	35
Palmerston (Elizabeth River)	34	13.5	35
Middle Arm	33	6.7	19
Channel Island	20	1.8	7
Darwin Ski Club	19	2.2	10
Southport	20	0.5	2

*Table 5.3: Recreational fishing effort by Darwin Harbour region (Source: Fisheries, DITT, personal communication, December 2022) * Darwin Harbour area includes all other areas not covered by the arms and wrecks (see Fig 5-2 below)*

Fishing Region (see Fig 5-2)	Area	2017 Greater Darwin Recreational Fishing Survey (% of NT residents and fishing effort as a proportion of Greater Darwin Harbour effort)	2018/19 Greater Darwin Recreational Fishing Survey (% of NT residents fishing effort as a proportion of total Greater Darwin Harbour)
10	*Darwin Harbour	38%	56%
10a	West Arm	6%	2%

10b	Middle Arm	29%	16%
10c	East Arm (Elizabeth River included)	24%	26%
12	Harbour wrecks	3%	0%

Between 2013 and 2014, 2600 boat-based recreational fishing parties were interviewed at boat ramps as part of research for the INPEX LNG plant by consultants from Cardno. Of these, 63% described themselves as 'avid' fishers (more than 12 times a year) and 83% were locals, living within 300 kilometres of Darwin.

In terms of popular fishing spots, Darwin has three large arms: East, Middle and West Arm, with a small central arm dubbed 'Little West Arm' (see Fig 5-2 below). These are "shallow, mangrove-lined waterways, swept by huge tides, with large areas of dry mud and sandflat during big low tides" (Flynn 2022).

East Arm is described as the most accessible but is rocky in the upper tidal section, which becomes Elizabeth River. The rocks provide refuge for small crabs, which attract jacks, bream, cod and golden snapper. The larger rock outcrops create eddies where barramundi "lie in ambush" The area beyond Wells Creek is described in the North Australian Fish Finder guide as "particularly hazardous" (Flynn, p.124).

Channel Island at the top of Middle Arm, offers good land-based fishing, including a rocky area under the bridge. The harbour and Bynoe Harbour to the south-west are lined by productive mangrove forest (Flynn 2022).

Many of the 'great' fishing spots in the harbour are in or near shipping channels, according to Fish Finder. While the channels can be fished, boaters are warned not to anchor in the channels and to move well before LNG ships approach.

In terms of species, Fish Finder suggests (Flynn 2022):

- barramundi, blue and threadfin salmon, queenfish, trevally, golden snapper, cod, jacks, jewfish, grunter, pikey bream, tripletail, milkfish, flathead and whiting are abundant;
- mud crabs "and a seemingly infinite supply of prawns": "the NT's Darwin Harbour has a particularly healthy crab fishery thanks to ideal habitat and commercial restrictions".

Flynn notes that on high tides, barramundi fishers cast lures to draining mud gutters and fish low-tide holes. At high tide, fish move into the mangroves to feed.

> Small neap tides clear the turbid waters, when flats sight-fishing and deep-water or night bottom fishing works well.
>
> The harbour has pelagic fish, mainly in the dry season, including longtail tuna, various mackerel and trevally species, queenfish and occasional cobia (p.109).

The harbour contains a number of natural and artificial reefs, the latter comprising wrecks, scuttled boats, sunken industrial equipment and concrete culverts. Offshore artificial reefs have been established at Fenton Patches, about 35 km off Darwin, comprising scuttled hulls, concrete pipes, tyres, bus shelters and concrete modules.

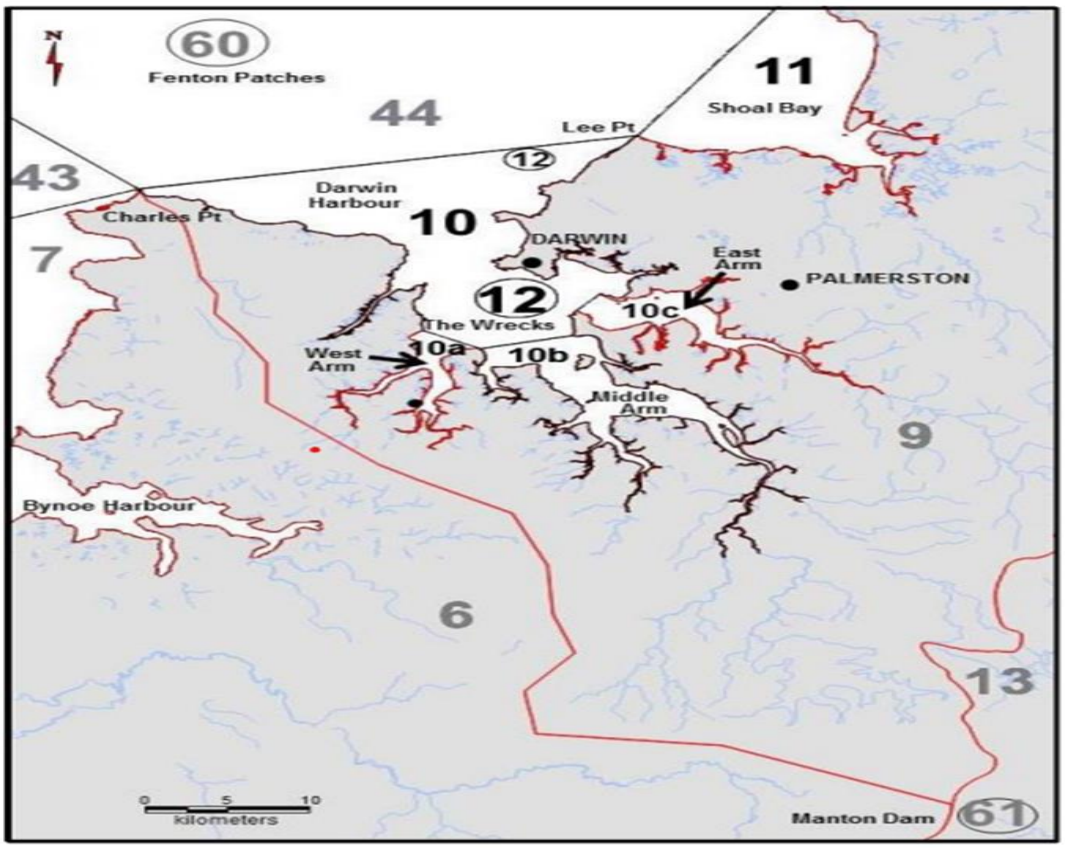

Figure 5-2: Map of Greater Darwin Harbour showing fishing regions (Source: Fisheries, DITT)

5.2.3 Tourism

A review of the Tourism Top End (TTE) membership directory, NT Guided Fishing Association website and brochures available at the TTE visitor information centre and Fishing and Outdoor World suggests:

- 37 guided fishing/charter operators in the Top End of whom 28 operate in Darwin Harbour or from locations in the harbour, such as Cullen Bay;
- two adventure tour operators, including 007 Adventures (operates Jetski tours from Stokes Hill Wharf, including towards Elizabeth River) and Darwin Adventure Boats (one-hour adventure cruises, enjoying the "beauty of the harbour" and "city's pristine coastline";
- Sealink Darwin provides commuter transport between Darwin and the Cox Peninsula, also boasting sightseeing tours on Darwin Harbour, to Mandorah and the Cox Country Club and to Crab Claw Island;

- 7 sunset cruise companies, most of which promote “the magnificent waters of Darwin Harbour” sunsets and seafood;
- Airborne Solutions’ scenic flights of the harbour and to nearby locations, such as Crab Claw Island and North Australian Helicopters’ Helifish tours to the ‘secret spot where the Big Barra Bites’;
- 9 dining venues specifically mention harbour views or locations, including Darwin Sailing Club, Ski Club, Trailer Boat Club and Dinah Beach Yacht Cruising Association;
- Darwin Convention Centre boasts of its “world class venue with spectacular views over Darwin Harbour”
- Stokes Hill Wharf boasts 10 food outlets and, during the Dry season, Skyline Ferris wheel’s 360 degree views across the harbour
- the Darwin Waterfront boasts of seaside promenades with “sweeping views across Fannie Bay”
- 11 accommodation venues specifically refer to locations as “the buzzing heart of this vibrant tropical harbour”, offering “stunning ocean views” or “spectacular views over picturesque Darwin Harbour”;
- two guided bus tours, including Bombing of Darwin heritage tours and the Darwin Explorer Bus that includes Stokes Hill Wharf and Aquascene
- Aquascene, an eco-certified tourist experience, established at Doctors Gully in 1981, provides tourists with a fish feeding experience at high tide
- at least one bird watching tour that uses Darwin Harbour, see https://ntbirdspecialists.com.au/.

See Section 8.2.5 for data on the economic impact of recreational fishing and tourism in Darwin Harbour.

5.2.4 Cultural

To come – Discussed in more detail under cultural identity...

Larrakia – or Saltwater people, have deep spiritual ties to the land and seascapes and have depended on the seas for food, connections to nearby regions...

5.3 Research results

The mapping tool and survey were available on the NT Government’s ‘Have Your Say’ website from 8 August to 30 November, attracting 235 survey responses and 22 people who dropped 72 pins on the map showing places in the harbour that they loved or were concerned about.

Respondents tended to be older than the Darwin median age, longer-term residents and better educated. While they might not be typical of all Darwin residents, they represent a cross-section of people who care deeply about the health of their harbour.

In addition to the survey, community group Top End Coasts in October launched a ‘Protect Darwin Harbour’ campaign. This encouraged people to provide their name and suburb and submit an automated letter. These were sent between 19 October and 7 December to True North, DIPL and

two Ministers' offices (see attached letter). Many people sent the letter more than once, usually on different dates. After duplicates were deleted, 304 emails were received by True North Strategic Communication[2]. All nominated their address as within the NT and most gave their suburb of residence as in the Greater Darwin Region. A majority were female. The letter is provided in the values mapping report at Attachment 3.

Table 5-4: Profile of Top End Coasts submitters

Male	Female	Unsure	Total
109	180	15	304
Darwin	**Alice Springs**	**Other**	**Total**
275	16	13	304

5.3.1 Values conflict

What is evident from the survey and mapping exercise is a values conflict between investment attraction of big projects and protection of the harbour's diverse and treasured values, perhaps epitomised by the conflicting images of the natural environment and big ships in this article in the *Northern Territory News*.


GIANT CARGO MOVERS TO

Middle Arm precinct to handle 300m-long ships

BE A NEW SIGHT

Left, Middle Arm – where the new sustainable development precinct will be developed – seen from the air. Above, giant Panamax class cargo ships will be able to land at the new Middle Arm precinct when it is completed. Below, the transhipment vessel, the MV Lucky Eyre, pictured in South Australia, is used to load from ports onto ocean-going vessels up to the Panamax size. Pictures: Wayne Zerbe (main), Supplied

Figure 5-2: Values conflict (NT News 18 November 2022) copyright

[2] Note there was a discrepancy in the number of emails received by True North and DIPL that is not fully explained by duplicates being deleted.

Polarisation is evident in some of the extreme rhetoric evoked by the development: with the gas industry disparaging opponents as 'activists' and environmental campaigns suggesting Middle Arm will become 'cancer alley', accompanied by pictures of children with respiratory masks.

However, the fault lines are not so clear-cut between local business and environmentalists. While economic development is widely supported, and several respondents and interviewees saw the logic of the industrial ecology and circular economy elements of this project, many Darwin business people hold dear both economic and recreational values and want to see an equilibrium maintained between the two. Economic sustainability was described by local businesses in terms of smaller, more durable, industries, often family-owned and employing locals rather than 'shiny big projects' associated with boom-bust cycles where local benefits do not necessarily endure (see Section 8). This ambivalence is reflected in an anonymous submission to the EPA's Draft TOR and one from the Australian Marine Scientists Association:

> *I am not anti-industry or anti-jobs – it's just that I strongly resent the fact that my taxpayer dollars are being spent by the Commonwealth and NT governments supporting a proposal which presents such huge risks to a place that means so much to me, my family and a large chunk of my social circle in Darwin and Palmerston. We all love the harbour precisely for all the things this project risks: biodiversity, healthy ecosystems, clean air, physical beauty, a relative lack of intensive industrialisation and of course its recreational fishing prospects. It's not worth losing these things.*

> *AMSA is concerned that the current proposed proponent-driven, SEA approach for the MASDP places great emphasis on economic development and incentives for investors (fast environmental approvals, low regulatory burden, no requirement for EIS) – but does not sufficiently prioritize the protection of Darwin Harbour's wide range of environmental, social, cultural values, uses and users. And particularly the commitments under the Darwin Harbour Strategy 2020-2025 to "protect and enhance the natural environment of Darwin Harbour" (DHAC 2020) (submission to ToR).*

5.3.2 Why Darwin Harbour is valued

Survey responses suggest that Darwin Harbour is strongly valued for its natural beauty, serenity, its vastness and its relatively undeveloped state, its views, birdlife, healthy marine life and its sunsets. It is seen as a place that enriches the soul, that is accessible to families for crabbing, fishing or picnics and that provides residents and tourists alike with an experience that is quintessentially tropical Darwin.

> *Darwin harbour is special because I can take my family out fishing and crabbing within sight of the city skyline and still come home with a great catch. It is mostly clear of major shipping traffic and is very user friendly to any local people who want to enjoy the great Territory lifestyle within reach of your average-sized boat. Also, when we spend time down on the wharf or at the waterfront the view is not cluttered up with massive amounts of industrial shipping.*

> *Darwin Harbour is amazing because of the wildlife you can see, so close to the city! Threatened species are easy to see here. You can catch quality fish for a feed and you have*

only to go a few kilometres and, among the mangroves, you feel like you are a million miles away from civilisation. It's really special."

I find that being on the water of Darwin Harbour or sitting on the coastline enjoying nature… provides a positive impact on wellbeing. It is calming and improves general mood and happiness."

It is still authentic and natural, and beautiful, and not littered with an industry skyline.

I love that there (are) healthy wild spaces that can be enjoyed and appreciated. That I can find quiet peaceful places in the bush and beach away from infrastructure. That I can safely eat what I catch. That I can learn about the biodiversity of flora and fauna in the harbour (marine life) and in the coastal ecosystems.

While Darwin is also valued for a range of commercial activities, it was still described by respondents as pristine, healthy, relatively unspoilt and supporting species such as dugongs, seagrass, turtles, mantra rays, dolphins and mangroves.

Bluest looking ocean next to a capital city.

Commerce and the quality of life we experience would not be possible without a healthy harbour.

That it is largely undeveloped; that extensive areas of habitat such as mangroves persist; that it is an urban city that supports a diversity of wildlife including globally Critically Endangered species like Eastern Curlew, sawfishes, Giant Guitarfish.

5.3.3 Key concerns about Darwin Harbour

A key concern in survey responses related to industrialisation of the harbour, including an increased Defence presence and oil and gas activities. There were fears of irreparable damage to Darwin's special lifestyle and fragile environment from pollution, wastes, spills, dredging, metal contamination and ship strikes on turtles.

I worry about the cumulative impacts of development in Darwin Harbour. Some of the developments are small so they may not be deemed to cause a big environmental response, but each small development contributes to the cumulative loss of habitat, particularly for birds and other fauna that rely on Darwin Harbour mangroves, mudflats and tidal area.

Large sea life is still present (mantras, dolphins) but dwindling and more dredging with increased effluent will exacerbate this. A well-managed marine plan can provide an environment for large creatures and people to thrive recreationally and commercially.

Many commented on perceptions of declining water quality in the harbour.

I worry that major development will have environmental impacts for the harbour. I worry that the development and environmental impacts will also affect the social and lifestyle

value that the Harbour provides to the Darwin community. It is such an important focal point for many people for their Darwin lifestyle.

Maintaining good water quality is very important. Fishing opportunities are rapidly declining as industrial activity increases.

Changes in the hydrodynamics in channels due to big infrastructure, biosecurity threats from foreign vessels.

Many were concerned about destruction of the harbour's mangroves, which play an important role in the harbour's ecological function, supporting mud crabs and fish breeding habitat.

Mangroves are crucial to keeping the harbour healthy, preventing erosion, filtering toxins, (a) nursery for so many species of wildlife. The more we clear, the less healthy the harbour is, which has a direct impact on the benefits we enjoy from being connected to the harbour.

The dredging and destruction of marine habitats along the Channel Island to Darwin coastline. I grew up admiring the coral reefs out to Channel Island and seeing the biodiversity plummet over the past years has been very sad.

5.3.4 The social, cultural, economic and environmental values of Darwin Harbour

This section describes the social, cultural, economic, environmental values of Darwin Harbour and wider societal values that compound a perceived loss of values and uses of the harbour (unless noted otherwise, the quotes are from survey respondents).

5.3.4.1 Cultural, heritage and historical values

Darwin Harbour has a rich cultural history associated with its traditional owners, the Larrakia, or 'Saltwater' people as well as a rich heritage and historical values from European settlement and World War II. Cultural values include shellfish and camping areas along its shores, sacred sites and Song Lines.

It's a beautiful harbour with incredible natural diversity and cultural significance for First Nations peoples.

The Larrakia people's connection to country remains strong and this must be protected from the impacts of heavy industry. (Top End Coasts letter)

The harbour is integral to my life as a Larrakia woman, the land and the seas are essentially who I am. It is my heritage and my stories from past up to the present day tell of the many generations of my family... woven into the land and the seas. (survey)

5.3.4.2 Economic values

Economic values are derived from livelihoods and industries reliant on water quality, such as tourism, recreational fishing and aquaculture. The harbour supports trade and transport to the

only deep-water port on Australian's northern coast, coastal and regional ferries and barges, LNG shipping and a strong marine sustainment industry spread along its shores. The harbour's natural values are integral to Territorians' wellbeing and quality of life, which support population growth. Darwin's tourism brand and recreational activities cover guided fishing, sailing, sunset tours, ecotourism, walking, dining along the foreshore and thriving waterfront.

Large projects are often seen as disrupting existing sectors, which might be individually small but collectively substantial, such as aquaculture, tourism and recreational fishing. A few respondents were concerned that environmental considerations were stifling economic development. A greater number thought economic and social activities could co-exist and pointed to Darwin's long-standing role as a working harbour.

> *The harbour is the most important part of Darwin. Commerce and the quality of life we experience would not be possible without a healthy harbour.*
>
> *The vastness of the harbour and its many attributes both natural and built and the ability to confidently balance recreational/social use and commercial developments are essential to maximise social use and economic needs and benefits.*
>
> *I love that it is an active harbour with many people sharing recreational and commercial use.*
>
> *The harbour is amazing, such a pristine place of beauty so close to a major city, with wildlife, fishing, picnicking and boating opportunities for all to enjoy. Since living in Darwin for the past 30 years I have enjoyed all of the above and, so far, despite gas and port development in the harbour, the environment appears to have retained its charm.*

5.3.4.3 Social and recreational values and uses

Social uses of the harbour extended from easy access to fishing and crabbing, to family picnics, sunsets at Nightcliff foreshore and Cullen Bay, walking, jogging, diving, kayaking, family visits to beaches and coastal reserves and the serenity of outdoor dining experiences.

> *Social sailing at sunset, yacht racing around the harbour and anchoring off the sandbar for a BBQ and swim at low tide.*
>
> *I love the variety of recreational opportunities the harbour offers and the overall aesthetic appeal of the Darwin Harbour seascapes and landscapes.*
>
> *I'm a very keen angler and crabber. I appreciate the pristine waterways on our doorstep.*
>
> *I've fished Darwin harbour for many years now, and I've travelled extensively, and there is no place that is like it in the world. Nowhere else can you catch a barra or golden snapper with line of sight to a CBD; nowhere else can you clock off a shift in the city and within minutes be on the water and gone to fish, to crab or just to get a mental health break amidst such a dynamic tropical environment. That this can be done in a waterway that is relatively undeveloped is as rare as hen's teeth...*

5.3.4.4 Ecological and research values

The harbour was highly valued for its natural values, attributed to its general lack of industries and pollution. Ecological values include mangroves that act as a nursery for barramundi, muddy creeks popular for crabbing and crocodile nests, iconic marine mammals and coral. The waters of the harbour were variously described as 'pristine', 'clean', 'unspoiled', 'blue', 'relatively untouched' and a 'jewel in the Crown' of the Territory's lifestyle.

> *Fishing, birdlife and marine animals. Abundance of many different mangroves that play a vital role that keep the ecosystem in check. Mangroves, seagrass beds and coral work as a system that keeps our coast and sea healthy. The whole harbour is a very special place being so close to home/city. It is what is unique about Darwin…*
>
> *Untouched beauty. Clean and healthy water system.*
>
> *It is the greatest harbour in the world. It's pristine and should be kept that way.*
>
> *It seems remarkable that a competent government in this century would seek to establish a heavy industry precinct alongside a developing major urban centre or a highly valued fragile tidal ecosystem (anonymous submission to ToR).*

Ecological values are covered further in Section 10, Healthy Land and Seas

5.3.4.5 Societal values, climate change, fossil fuels

Broader societal values were a recurrent theme in many submissions and survey responses. Climate change is alarming many respondents, along with the urgency of transitioning to renewable energy, opposition to continued reliance on fossil fuels, health impacts from pollution and emissions, a distrust of government, concerns about our legacy to future generations and perceptions of 'greenwashing' in the project's description as a 'sustainable development' precinct. As captured by Alice Nagy, in her submission to the ToR:

> *Darwin Parents for Climate Action is dedicated to advocating for a safe and healthy environment and climate for our young people. This is our one goal, and that is why we are so alarmed by the proposed 'Middle Arm Sustainable Development Precinct'. This proposal with the inclusion of petrochemical manufacturing poses a very real and immediate risk to the health of families living in Palmerston, merely three kilometres from the proposed development. It also relies on the development of new gas fields to fuel the proposed industries – gas fields that will significantly increase Australia's Green House Gas (GHG) emissions and contribute to warming our already hot climate.*
>
> *We understand the need for and support industry and jobs in the NT, however, we do not believe the benefits are worth the enormous risk when considering the impacts on health, the environment and the climate that will result from the Middle Arm Precinct and from the related expansion of the gas industry. Also of concern is the inclusion of a Carbon Capture and Storage (CCS) facility. Our concern is that CCS is being used by fossil fuel companies to 'green wash' their operations and justify further extraction...*

5.4 Change processes

The following change processes (or impact pathways) may disturb strongly held values and create direct or indirect impacts:

- cumulative industrialisation of Darwin Harbour
- dredging and construction of common user marine facilities
- exclusion zones and reduced access to Elizabeth River and creeks
- increased shipping transiting the harbour and berthing
- potential pollution and changes to water quality
- clearing of mangroves

5.5 Impact assessment for values mapping

Many technical and design risks can be identified, quantified and modified by careful risk assessment and management. Social risks and opportunities are influenced by contextual and subjective human factors, often beyond the control of proponents and design engineers. They include the level of trust in proponents and regulators, societal values such as the future of the planet, the lived experience of residents of previous development and perceptions and fears of likely benefits and harms.

Community acceptance of Middle Arm will be influenced by the extent to which the pace, scale and type of development aligns with the deeply held values of Greater Darwin residents. As outlined in the *Northern Territory Infrastructure Plan and Pipeline* (Investment NT 2022, p.123), a key challenge in planning economic and infrastructure growth is to balance urban population growth and industrial development with rural lifestyle, cultural heritage and the natural environment.

Table 5-5: Impacts and benefits: Values of Darwin Harbour

Potential benefits and impacts – Values and uses of Darwin Harbour	
Potential cumulative benefits	**Potential cumulative impacts**
	R-1 Disturbance to strongly held social, economic, cultural and environmental values and use of Darwin Harbour
	R-2 Reduced ability to enjoy highly valued recreational fishing in Darwin Harbour
	R-3 Damage to Darwin's tourism branding and sense of place as a tropical, harbour city

5.5.1 Disturbance to strongly held social, economic, cultural and environmental values and use of Darwin Harbour

There were strong protests against the Darwin LNG plant 20 years ago, which gave rise to 'Save Darwin Harbour'. Concerns at industrialisation of the harbour have been a recurrent theme in opposition to subsequent developments such as the East Arm Wharf and the recent proposal for TNG's processing plant at Middle Arm. This is compounded by recent protests at the extent of land clearing in the Territory, loss of biodiversity and opposition to water allocation decisions.

The results of recent surveys conducted by Charles Darwin University (*My Territory Connections 2022* exploring social capital), the Environment Centre of the NT (nature protection), the Darwin Harbour Advisory Committee's integrated report card (2021) and for this project would suggest momentum is building to prioritise protection of the values of Darwin Harbour over large-scale development.

It is difficult to assign a rating to this risk, given that immediate disturbance will be relatively localised and Darwin Harbour is already a working harbour. Disturbance to values will depend on the ultimate configuration of the Middle Arm precinct and level of sudden or incremental change. Disturbance to values will also vary according to personal and situational factors and a subjective assessment of perceived threats. However, progressive industrialisation of the harbour – combined with the trend to global and national reforms to protect the world's biodiversity[3] – would suggest acceptance of change by many Darwin residents may have reached a tipping point. Given that disturbance to values creates emotional responses and is a predictor of conflict, the untreated risk is rated as HIGH. It is likely to be mitigated only by a scaled-back proposal or one able to demonstrate that it is aligned with community values, which would leave a residual rating of MEDIUM.

5.5.2 Reduced ability to enjoy highly valued fishing in Darwin Harbour

Values mapping would suggest staunchly held values tied to the Darwin lifestyle, with recreational fishing a strongly held value across many demographic sectors. A major concern expressed in the survey related to the loss of fishing spots through over-development.

> *Unless you fish the Harbour yourself it would be hard to understand. Once an area is impacted and out of bounds to the public you cannot just pack up and go to another spot, especially fishing for barra on lure around mangrove/creeks and drains. There are only certain areas that hold fish and where they like to feed. The Barra is a very hard and elusive fish in the Harbour to catch on lure casting. There is no run off like the big rivers. It takes years of fishing and gaining knowledge (of) fishing, different tides and times of the year to even have a chance of catching a barra.*

While the concerns are harbour-wide, of particular concern would be reduced access along the channel to the Elizabeth River boat ramp, which is 9 kilometres from Palmerston. The second most frequently used boat ramp in Darwin Harbour (see Section 5.2.2.), Elizabeth River is the only all-weather, all-tide boat ramp with ample parking and catering for disabled fishers with land-based fishing options. From the boat ramp, fishers head down the Elizabeth River to popular crabbing spots in Kittyhawk and Spitfire Creeks (referred to as Pikey and Slack Creeks in Northern Fish Finder), to sit in shipping channels or to access the harbour and beyond.

[3] The most recent being the UN COP15 (Conference of the Parties to the Convention on Biological Diversity) statement issued in Montreal on 18 December which espoused a vision of a world living in harmony with nature where: "By 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people."

It's about the whole experience of going fishing. You launch from Elizabeth River boat ramp and you might do some fishing on the way along Elizabeth River, put out some crab pots at the creeks and move on to go fishing in the harbour (David Ciaravolo, AFANT, interview).

Potential impacts are two-fold:

- short-term localised impacts from a major dredging campaign, possibly over several years, expected to be more extensive than for INPEX
- longer-term localised and harbour-wide disturbance as shipping movements increase (at full development, shipping in the harbour is likely to treble by 2040).

A preliminary navigational safety assessment by Royal HaskoningDHV (2023) examined conflict between industrial and recreational users in four zones.

MASDP turning basin

When a ship is manoeuvring in the turning basin at low tide, recreational vessels may not be able to safely navigate past the turning basin, due to ships occupying the waterway and potentially high propellor wash. This could happen several times a day at full development.

MASDP Channel through the Elizabeth River

Smaller vessels would be able to navigate outside the navigation channel, however they would need to remain outside ship safety zones. A number of shoals pose a hazard to navigation at low tide without additional aids to navigation (AtoNs).

Kittyhawk Creek and Wirraway Inlet

Recreational vessels would not be able to access Kittyhawk Creek or Wirraway Inlet. Access to Spitfire Creek may be restricted at the start of construction. These are popular crabbing spots, with few other crabbing options in this part of the harbour.

Darwin Harbour

Vessels of a similar size to MASDP marine traffic already access berths in Darwin Harbour. Due to the width of the waterway and available anchorages, no issues are expected with ships passing in the harbour. However, a likely trebling of ships under full development by 2040 would increase congestion and increase the likelihood of marine incidents, particularly if recreational sailing and fishing vessels drift into the main channel.

In addition to navigational safety and restricted access, causal pathways to reduced fishing and crabbing activity include:

- dredging to deepen the shipping channel would stir up sediment and disturb ecological functions, including breeding habitat in creeks
- clearing of mangroves would disturb breeding habitat
- disturbance of oyster beds and rock (oysters serve as biofilters)

- potential loss of water quality should there be any discharge of heavy metals into the harbour (a key concern with the proposed TNG processing plant at Middle Arm).

Reduced access along the Elizabeth River and to popular crabbing creeks will come as a blow to recreational fishers, particularly Palmerston and rural residents.

AFANT CEO David Ciaravolo is concerned that the ecological and social impacts would be 'extreme', unacceptable and could not be offset within Darwin Harbour. Loss of fishing spots could be compounded by population growth, including construction workers, leading to over-fishing in the harbour.

This would compound other pressures in Darwin Harbour, such as reduced access to fishing in waters overlaying Aboriginal land as a result of the Blue Mud Bay decision and Native Title claims.

While some fishers may head to other boat ramps such as Dinah Beach, many "don't have time to drive to other spots", says David Ciaravolo. There are also parking constraints at many city boat ramps and security issues at the Middle Arm carpark. As of December 2022, there were technical issues with the East Arm pontoon.

AFANT, which represents 30,000 fishers, suggests the only sustainable development of Middle Arm is that which is "nested within a healthy and abundant natural environment" (submission to Draft TOR).

Based on the potential development program covered by the strategic assessment, substantial impacts on fishing from reduced access and reduced ecological functions are likely, consequential, long-lasting and would disturb deeply held values. This is assigned an initial and residual rating of VERY HIGH.

5.5.3 Damage to Darwin's tourism image and quality of life

The physical health of Darwin Harbour is seen as important to the tourism brand, natural and cultural values and the operations of sunset, fishing and historical tours in the harbour. People come to Darwin for heritage tours, fishing, bird watching, Darwin's military history, guided barramundi and fishing tours. Tourism industry operators interviewed for the SSIA were concerned at potential physical and reputational damage to the industry from pollution, dredging, more LNG ships travelling through the harbour, visual pollution at night, perceptions of a petrochemical precinct on the harbour, reduced access to fishing, safety and any damage to cultural sites.

Increased industrialisation was also seen as potentially detrimental to a sense of arrival for the *Ghan* passenger train, operated by Journey Beyond. The twice-weekly transcontinental journey terminates near the East Arm freight terminal, regarding by the tourism industry as an increasingly unwelcome point of arrival (alternative locations are being considered in current land use planning). Comments made during interviews include:

> *The fact that it's right in the harbour. And you can see the gas ships.*

> *It's like bracket creep putting (more development out there). Whereas if you were starting again, you'd look at another place.*

Tourism industry representatives commented on the values conflict inherent in the Territory's tourism branding (nature and culture) and 'petrochemicals and B52 bombers' (which was topical in media coverage at the time of geopolitical pressures and a Defence build-up).

The NT *Infrastructure Plan and Pipeline* (p.46) acknowledges the need to protect nature and culture in order to attract tourists who value the Territory's natural assets, ancient Aboriginal culture and its pioneering and world war history.

> While they are valuable tourism assets, our parks and reserves are intrinsically linked to our Territorian lifestyle, health and wellbeing, retaining people and attracting visitors and people to live and work in the Territory (Infrastructure Northern Territory 2022, p. 48)

Again, this risk is hard to rate given the diffuse nature of tourism activities. Many other cities combine working harbours with strong tourism assets. While the fears were strongly held and expressed, many of the potential impacts will be localised to the area between East Arm Port and the Middle Arm Peninsula. Therefore this risk is assigned an initial rating of MEDIUM, which would be reduced to LOW should the ultimate industry mix align with community values and assuming continued access to charter fishing operations in the harbour.

The economic implications of this risk are discussed at Section 8.4.8.4. Damage to Darwin's ecological or natural values is further discussed in Section 10: Healthy Country.

5.6 Recommendations

At the end of the day, taking account of disturbance to values is a political decision that is likely to involve trade-offs in order to balance competing pressures on government. However, the research would suggest a likely backlash from stakeholders who perceive they are strongly impacted, who have a strong interest and who are likely to voice influential concerns if their deeply held values and uses of Darwin Harbour are disturbed. Recommendations arising from the research include the following.

5.6.1 Five-yearly values mapping

Given the uncertainty about how development will evolve, it would be valuable for the NTG to track change against select indicators. This should include five-yearly values-mapping and research to track changes in values and attitudes. Ideally, this would be correlated with population mobility and place attachment. Five-yearly audits should also track whether recommendations have been implemented, identify emerging issues and provide public reports on progress (see Section 13). The NT EPA might make this a condition of approval for the MASDP.

5.6.2 Offsets

The NT Government should work with AFANT to explore any possible mitigation strategies or offsets, including the potential upgrade of other boat ramps in the harbour, additional navigation

aids and the potential for a recreational channel past the turning basin. AFANT suggests any substantial threat to fishing in Darwin Harbour must be offset by investing in fish habitat such as oyster reefs and artificial reefs. However, CEO David Ciaravolo is dubious about any capacity to do this within the Harbour.

Offsets could include artificial reefs, combined with carefully located dredge spoil grounds, or upgraded boat ramps in Shoal Bay. For example, there are privately owned boat ramps on the Howard River. But new facilities in Shoal Bay would be expensive and mainly benefit Litchfield residents rather than compensating for the readily accessible Elizabeth River boat ramp.

> *And offsetting the boat ramps still doesn't offset the ecological damage. With INPEX, it wasn't just the dredging but the influx of workers who all bought a tinnie and went fishing. Fishing is only just recovering now.*
>
> *You'd have to invest in $50 to $60 million of recreational fishing, build a new boat ramp and a road, say $20 million at Shoal Bay. It's a very high price to pay when people are already running out of places to go. (David Ciaravolo, AFANT, interview)*

5.6.3 Greater accommodation of community values in design options

The purpose of the SSIA and values mapping was to inform good decision-making, that reflects the values of Greater Darwin residents. All decisions involve trade-offs. It is recommended that, as much as possible, government prioritises the scale and type of development that most closely aligns with community values.

Communication on the project should report on how community input shaped consideration of alternatives and decision-making.

6. People and Communities

6.1 Overview

People, families and their communities are the intended beneficiaries but often the unintended recipients of unwelcome change brought by development.

Key objectives of large infrastructure projects, such as the Middle Arm precinct, are to grow Greater Darwin's population, diversify its economy and attract skilled workers.

Key change processes with human consequences would be population growth, particularly if workers and their families can be persuaded to relocate and remain in the region.

In a region characterised by youth and mobility, these change processes are likely to be readily absorbed, provided they are appropriately sequenced and thoughtfully managed.

Communities are not homogenous, of course, so the consequences of change will not be captured in aggregated data alone. Different groups will have varied perspectives on what development means for individuals, families and communities, with special attention required to determine how vulnerable and disadvantaged members of a community may experience change.

This section covers the demography of the Greater Darwin Region and municipalities around Darwin Harbour. It covers data on population growth, mobility and indicators of disadvantage, then an overview of current land use and planning for growth in the Greater Darwin Region. Section 7 will address the implications of change for social infrastructure in the Greater Darwin Region, while the implications for workforce development will be addressed in Chapter 8.

Table 6-1: What is covered People and Communities

What is covered by People and Communities	What the Terms of Reference asked for
 Health, wellbeing, safety, community cohesion, our sense of connectedness, ability to feel safe, shared values and capacity to absorb newcomers into the community.	• demographic composition and population trends • levels of disadvantage against relevant social indicators • whether the strategic proposal is consistent with regional land use concept plans • the need to coordinate planning for future population and industrial growth • disturbance to community cohesion as a result of polarised values and changed demographics (including the potential influx of fly-in, fly-out workers) • increased road trauma as a result of increased industrial traffic through residential areas • potential impacts on human health • reduced marine safety in East Arm and Darwin Harbour, and rivers and creeks.

	Identify appropriate frameworks and management strategies, including: • coordinated land use and long-term social infrastructure planning (in line with current scopes of work by the NT Planning Commission).

6.2 Characterisation of Greater Darwin

The Middle Arm precinct is on a peninsula in Darwin Harbour, an iconic land and seascape encircled by the Greater Darwin municipalities of Darwin, Palmerston, Litchfield, unincorporated areas of Cox Peninsula, the Aboriginal community of Belyuen and beachside community of Wagait. Coomalie Council to the south takes in Batchelor, Adelaide River and Manton Dam.

This is the traditional land and seas of the 'Salt Water' Larrakia people, whose land extends from Cox Peninsula in the west to Gunn Point in the North, Adelaide River to the east and south to Manton Dam. Neighbouring language groups include the Tiwi (including the Vernon Islands); the Wulna to the east; Kungarankany, Warai and Arawa of the Coomalie area; and many Wagaitj people living in Belyuen and on the Cox Peninsula (see Section 9).

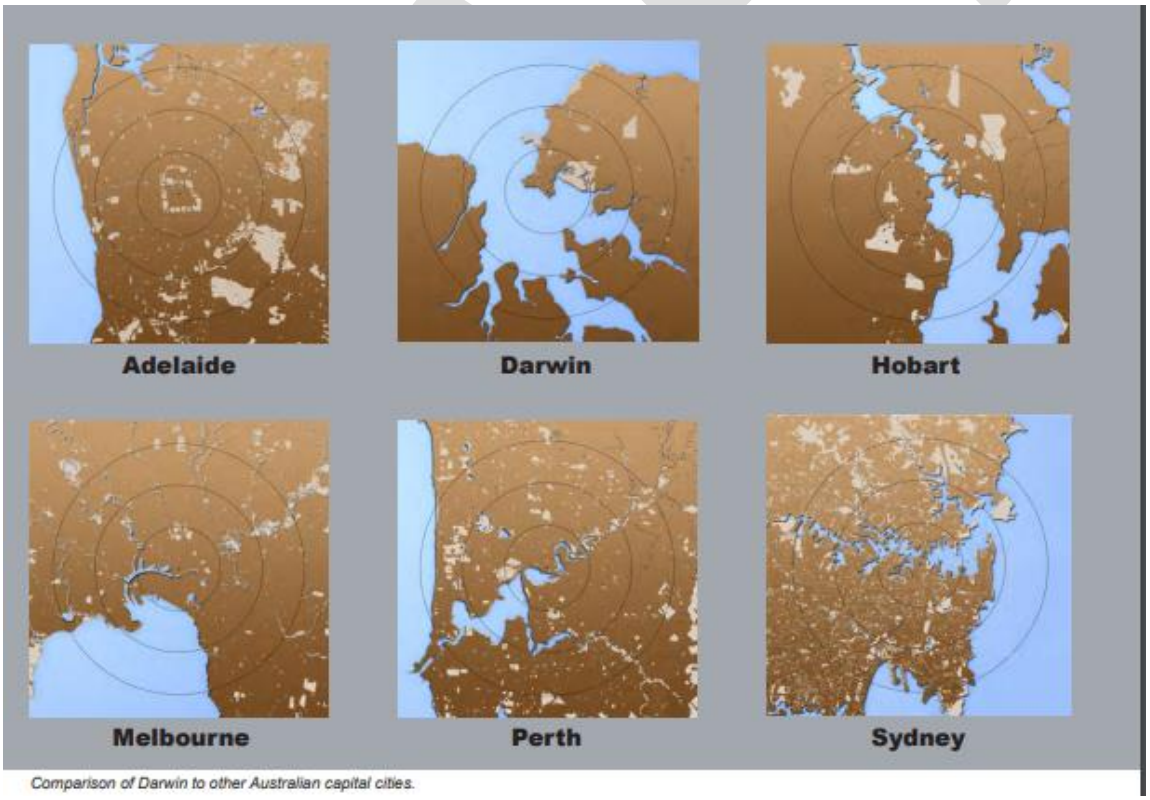

Figure 6-1: DRLUP (2015, p3) showing Darwin and its harbour compared with other cities (to get original)

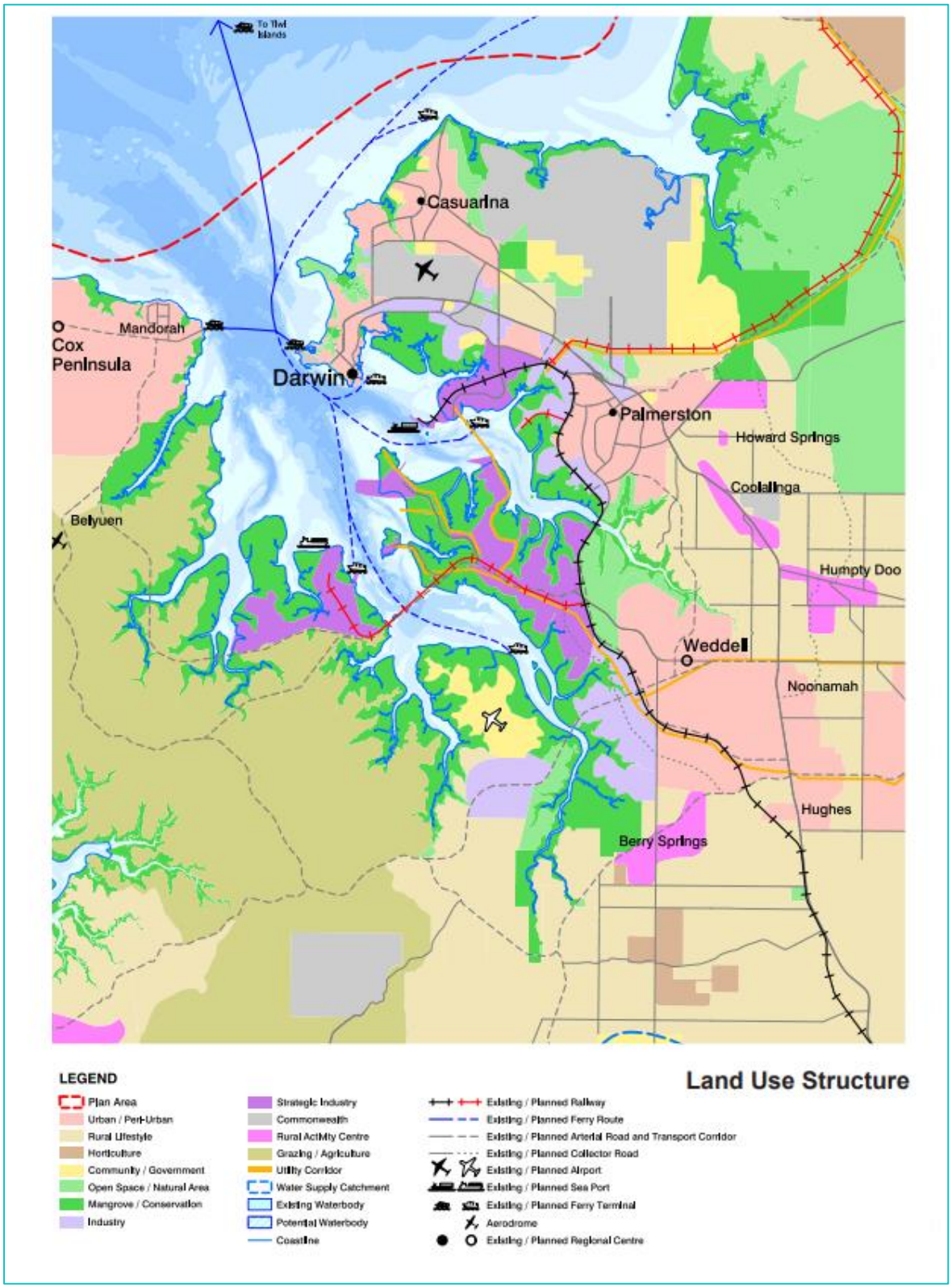

Figure 6-2: Land Use Structure in Darwin Regional Land Use Plan (2015, p13)

6.2.1 Demography

Greater Darwin comprises the municipalities of Darwin, Palmerston and Litchfield. The region is home to 60% of the Northern Territory's population, with an estimated residential population of 139,902 in the 2021 Census (ABS Quick Stats 2022) and slightly more males (50.6% compared with 49.3% for Australia). The Census recorded that 10.4% of residents were Aboriginal or Torres Strait Islanders, compared with 26.3% across the Territory and 3.2% nationally.

Greater Darwin is characterised by a young population, with a median age of 34 compared with 38 nationally. Palmerston residents tend to be younger (median age of 31), whereas Litchfield residents tend to be older people, living in their own home on rural blocks (median age of 39).

Between 2007 and 2017, the Greater Darwin population increased each year, peaking at 4.27% growth in 2013 as a result of the INPEX Ichthys LNG plant construction. However, Greater Darwin was the only capital city to record a population decrease in the 2019-20 financial year, with a decline of 180 people or 0.1% (ABS 2021).

Many of Greater Darwin's workers are transient, relocating to the region for work, then leaving when major projects end. A Charles Darwin University study (Taylor & Tan 2020) found only 57% of early career individuals planned to continue living in the Territory for the next two years. This retention rate rose across age groups to 82% for residents at retirement age. Workers holding trade certificates had the lowest intended two-year retention rates across all life stages, particularly in early career respondents (43%) and pre-retiree stages (55%). The study suggests "people working in trades are potentially more affected by broader economic conditions and may migrate more quickly to where work is available".

Five-year population averages to June 2020 for major townships in the NT were either negative or flat, except for Palmerston (4.2%) and Litchfield (4.8%) (NTIPP 2022, p.43). ABS data suggests that Greater Darwin experienced a net migration loss of 1864 internally in 2020 (not counting overseas migration), which is equivalent to 1.26% of the population. Other greater capital city areas such as Sydney and Melbourne experienced an internal migration loss equivalent to 0.56% and 0.18% of the population respectively in the same period.

Greater Darwin residents have a comparable level of education with the rest of the Australia, with more in the Darwin Local Government Area (LGA) having a Bachelor's degree or above (33.2% compared with 17.6% for Palmerston and 12% for Litchfield). However, 18.2% of people in Greater Darwin had obtained a Certificate III or IV compared with 16.1% nationally. Rates were higher in Palmerston and Litchfield, at 23% and 24.7% respectively.

Labour force participation in 2021 was relatively high, at 69.7% compared with 61.1% nationally, while unemployment was lower, at 4%, compared with 5.1% nationally.

The highest industry of employment was public administration (7.9% compared with only 1.4% nationally), followed by hospitals (5%) defence (4.7%), primary education (2.6%) and other social assistance services (2.2%). A higher proportion of residents reported their occupations as technicians and trades (14.5% compared with 12.9% nationally), but in Palmerston and Litchfield rates were 16.5% and 19.7% respectively. Overall, the proportion of professionals was lower

(21.7% compared with 24% nationally), but this ranged from 13.5% in Litchfield to 26.2% in the Darwin LGA.

Greater Darwin had a higher median weekly income of $2209, compared with $2061 for the Northern Territory and $1746 for Australia. However, weekly mortgages were higher ($2100 in Greater Darwin compared with $1863 nationally) and slightly higher rents ($385 compared with $375 nationally).

Overall, the 2021 Census would suggest that the population is culturally diverse, with 63.8% of residents born in Australia compared with 66.9% nationally. The Darwin LGA had a lower proportion of people born in Australia (58%) than Litchfield (77%). The key source countries for immigrants were England, New Zealand, the Philippines, India and Nepal. Reflecting earlier waves of migration to Greater Darwin, 2.3% of the population reported speaking Greek at home.

Not surprisingly, rural residents were more likely to live in a detached house than residents of Darwin and Palmerston, with 63.3% of Greater Darwin residents living in a house compared with 72.3% nationally. This ranged from only 51.8% in the Darwin LGA to 92% in Litchfield. Conversely, 34.5% of Darwin residents lived in a flat or apartment, compared with only 1.9% in Litchfield.

Greater Darwin residents were less likely to own their homes outright (17.3% compared with 31% nationally) but about equally likely to be paying a mortgage (35.7% compared with 35% nationally). Of Greater Darwin residents, 43.8% were renting, compared with 30.6% nationally. However this ranged from 49% in the Darwin LGA to only 17.8% in Litchfield.

The table below compares key characteristics of the population of Greater Darwin, highlighting key points of difference across the region.

Section 6.2.4 contains more detail of the three Greater Darwin municipalities, as well as the adjoining municipalities of Coomalie (based in Batchelor), Belyuen and Wagait on the Cox Peninsula. This does not capture some unincorporated areas with mostly small, rural populations on the western side of Darwin Harbour. Section 6.2.5 then examines levels of disadvantage, a factor not captured in the aggregated data described above.

Table 6-2: Demographic highlights of Greater Darwin and local government areas.

For the sake of consistency, all data based on ABS QuickStats (viewed 21 October 2022). Note that some 2021 Census data is yet to be released. Defence accounts for 5.9% of employment in Litchfield, with the Greater Darwin Region incorporating Robertson Barracks. The Litchfield data suggests that 63.7% of Aboriginal or Torres Strait Islander people in Litchfield for the 2021 Census were males (compared with 36.3% females), which would reflect Darwin's prison being in the municipality. Highlights

	Greater Darwin	Darwin LGA	Palmerston LGA	Litchfield LGA	NT	Aust
Land area		112 sq km	63 sq km	3000 sq km		
Estimated residential population 2021	139,902	80,530	37,247	21,411	233,000	25,422,788
Median age	34	35	31	39	33	38
Proportion males	50.6%	49.9%	49.5%	54.6%**	50.5%	49.3%
Proportion female	49.4%	50.1%	50.5%	45.4%	49.5%	50.7%
Proportion Aboriginal, TSI	10.4%	8.7%	13.0%	12.4%**	26.3%	3.2%
Average people per household	2.6	2.6	2.8	2.8	2.8	2.6
Median weekly household income	$2209	$2188	$2199	$2346	$2061	$1746
Median weekly mortgage repayments	$2100	$2000	$2037	$2253	$2000	$1863
Median weekly rent	$385	$380	$400.00	$380	$325	$375
Av vehicles per dwelling	1.9	1.8	1.9	2.5	1.5	1.8
Aged 0-19	25.7%	23.5%	31.4%	24.2%	27.1%	23.9%
Aged 20-39	33.6%	34.7%	34.1%	27.3%	33.5%	27.7%
Aged 40-59	26.2%	25.7%	24.6%	30.4%	25.6%	25.3%
Aged 60-79	13.1%	14.2%	8.9%	16.9%	12.4%	18.7%
Aged 80 and over	1.5%	1.8%	1%	1.3%	1.3%	4.3%
Highest level of educational attainment						
• Bachelor or above	26%	33.2%	17.6%	12%	21.5%	26.3%
• Advanced/Diploma	8.9%	8.8%	9.4%	8.2%	7.5%	9.4%
• Certificate IV	4.7%	3.9%	6.1%	5.3%	4%	3.5%
• Cert III	13.5%	10.5%	16.9%	19.4%	12%	12.6%
• Year 12	14.1%	13.8%	15%	13.8%	13.3%	14.9%
• Year 11	5.3%	4.8%	6.4%	5.9%	6.3%	4.6%
• Year 10	8.5%	6.6%	9.5%	13.9%	10.5%	10.0%
Country of birth						
• Australia	63.8%	58%	69.1	77%	69.5%	66.9%
• England	2.7%	2.8%	2.3%	3.1%	2.2%	3.6%
• New Zealand	1.7%	1.7%	1.8%	1.8%	1.7%	2.1%
• Philippines	3.8%	4.1%	4.6%	0.7%	2.7%	1.2%
• India	2.7%	3.7%	2%		2.2%	2.6%
• Nepal	1.8%	2.9%			1.3%	0.5%
• Thailand				0.7%	0.5%	0.3%
• Vietnam				0.6%	0.6%	1.0%
• Indonesia			0.7%		0.6%	0.3%
Participation in the labour force	69.7%	70.1%	72.2%	63.7%	61.7%	61.1%
Unemployed (15 years and over)	4.0%	4.1%	4.2%	3.5%	5.6%	5.1%
Top occupations						
Technicians and trades	14.5%	12.3%	16.5%	19.7%	13.8%	12.9%
Clerical and admin	14.2%	13.1%	16.1%	15.1%	13.2%	12.7%
Managers	13%	13.4%	11%	14.6%	12.9%	13.7%
Professionals	21.7%	26.2%	15.6%	13.5%	22%	24.%

Community and personal service workers	14.7%	14.4%	16.4%	12.6%	15.7%	11.5%
Labourers	7.8%	7.6%	7.9%	8.5%	8.5%	9.0%
Machinery operators, drivers	5.4%	4.3%	6.5%	7.9%	5.2%	6.3%
Sales workers	7%	6.8%	8%	5.8%	6.5%	8.2%
Top responses for industry of employment						
Territory Government admin	7.9%	8.3%	7.3%	6.9%	6.8%	1.4%
Defence	4.7%	4.3%	4.8%	5.9%	4.1%	0.7%
Primary Education	2.6%	2.6%		2.7%	2.9%	2.2%
Other social assistance services	2.2%				2.7%	2.3%
Hospitals	5%	6.5%	3.3%	2.1%	5.1%	4.5%
Cafes and restaurants		2.7%			1.7%	2.2%
Supermarkets and grocery stores			2.7%		2.4%	2.5%
Electrical services				1.9%	1.1%	0.9%
Family composition						
Couple without children	37%	39.1%	30.7%	40.2%	34.8%	38.8%
Couple with children	45.2%	43.3%	48.4%	46.3%	44.7%	43.7%
One parent family • Male • female	16.2% 22.5% 77.6%	15.5% 21% 79.2%	19.6% 22.6% 77.6%	12.7% 30.0% 69.6%	18.5% 21.0 79.0	15.9% 19.6 80.4
Both parents employed full-time	34.5%	33.7%	37.2%	32.7%	31.6%	22.2%
Both not working	9.8%	10.9%	6.3%	11.9%	16.6%	21.0%
Dwellings						
• Separate house	63.3%	51.8%	75.9%	92%	66.8%	72.3%
• Semi-detached, townhouse	10.5%	12.9%	9.4%	1.8%	12.7%	12.6%
• Flat, apartment	25%	34.3%	14.5%	1.9%	17.9%	14.2%
• Other dwelling	0.9%	0.6%	0.1%	3.6%	1.7%	0.6%
• 1 bedroom	6.1%	6.6%	3.1%	1.9%	1.2%	5.3%
• 2 bedroom	22.8%	27.6%	14.9%	8.6%	7.3%	19.1%
• 3 bedroom	40.9%	40.1%	46.3%	16%	22.4%	39%
• 4+ bedrooms	27.5%	23.1%	33.8%	36%	24.9%	34.8%
Housing tenure						
Owned outright	17.3%	18.5%	9.6%	27.8%	15.8	31.0%
Owned with mortgage	35.7%	29.5%	42.8%	49.6%	30.2%	35.0%
Rented	43.8%	49%	45%	17.8%	47.6%	30.6%
Renter householders where payments are less than or equal to 30% of household income	66.7%	68.6%	74.5%	60.7%	67.7%	58.7%
Where rent payments are greater than 30% of household income	19.5%	18.4%	11.1%	23.1%	16.3%	32.2%

6.2.2 Population growth

The NT Government sees investment in strategic infrastructure as key to realising a population of 300,000 by 2030. This will require sustained growth, in contrast with the past 10 years which saw annual average growth of 1.9% for Darwin, 3.7% for Palmerston and 4% for Litchfield.

The target population outlined in the NT *Infrastructure Plan and Pipeline* Report (2022, p.36) is summarised below:

Table 6-3: Desired population growth to achieve a $40B economy by 2030 (Infrastructure NT 2022).

	2030-31 target (modelled on max 10-year average)	Current population (June 2020)	Total population growth required
NT	300,000	246,143	53,857
Greater Darwin	189,390	147,231	42,159
Rest of NT	110,610	98,912	11,698
Darwin	92,456	83,050	9,415
Palmerston	58,186	39,017	19,169
Litchfield	38,739	25,164	13,575

Assumptions for population growth projected in the Darwin Land Use Plan (2015) would suggest growth was lagging these aspirations:

Table 6-4: Source Draft Holtze to Elizabeth River (HESLUP) Land Capability and Needs Assessment (Planning Commission 2021)

	Near term	Intermediate term	Far term
Greater Darwin	150,000	175,000	250,000
HESLUP catchment	58,000	72,000	101,200
Palmerston LGA	37,000	44,000	57,000
The report notes that modelling for population growth is based on 2015 figures. The Planning Commission defines near-term as less than 10 years, mid-term as 10-30 and long-term as beyond 30 years.			

More recent data in a report commissioned by the Property Council of Australia NT, *A Renewed Northern Territory Population Strategy: Recovery and Beyond* (ACIL Allen 2022), suggests the Territory needs to overcome several years of negative or low population growth, including a continued loss of people interstate, increased departures of early career workers, fewer families relocating to the Territory, and an outflow of young people. The report suggests the NT's slow population growth and outflow of young families has constrained economic growth and poses a significant threat to future economic growth and meeting future workforce needs.

The total NT population declined in 2018 and 2019. A return to slight positive growth in 2020 and an increase of 0.4% in the year ending June 2021 was supported by growth in remote parts of the Territory - where fertility rates are higher than in both Territory urban areas and all other States and Territories - and decline in net interstate outflows due to COVID-19 travel restrictions.

The Territory has experienced a substantial loss of overseas workers due to COVID-19 restrictions. Over the past 10 years, the highest share of temporary visa arrivals in the NT were in the working

holiday category (33.5%) and visitors (23.7%), peaking at 3620 in 2012. In 2020-21, there was an net out-migration of temporary visa holders due to COVID-19. Most permanent visa arrivals in the 10 years to 2021 were skilled migrants (54.8%) and family (33.3%), although the share of permanent visa arrivals in the family category has declined from 50% to 20.3% between 2012 and 2018. Permanent visa arrivals peaked in 2016 at 1930 people and recorded a year-on-year decline of 71% in 2020 (ACIL Allen analysis).

ACIL Allen suggests that "in the fight for talent in the recovery following COVID-19 restrictions" the Territory needs to attract and retain more young people. Between 2022 and 2027, the Territory should double the intake of independent skilled migrants and better target skills in demand.

Research by the Northern Institute of Charles Darwin University in 2019 (cited in ACIL Allen 2022) suggests the potential for population growth within the Filipino community in the Greater Darwin region. Respondents from the Philippines were the most satisfied (78%) with their experience of living in the NT and expressed the strongest intention to still be in the NT in 5 years (50%).

6.2.3 Population mobility

A key feature of the Territory's population is its mobility. Census data suggests that between 2016 and 2021, the NT had the highest population turnover of any state or Territory, with a turnover rate of 333 people per 1000 residents. The key movement was people in their 30s for work.

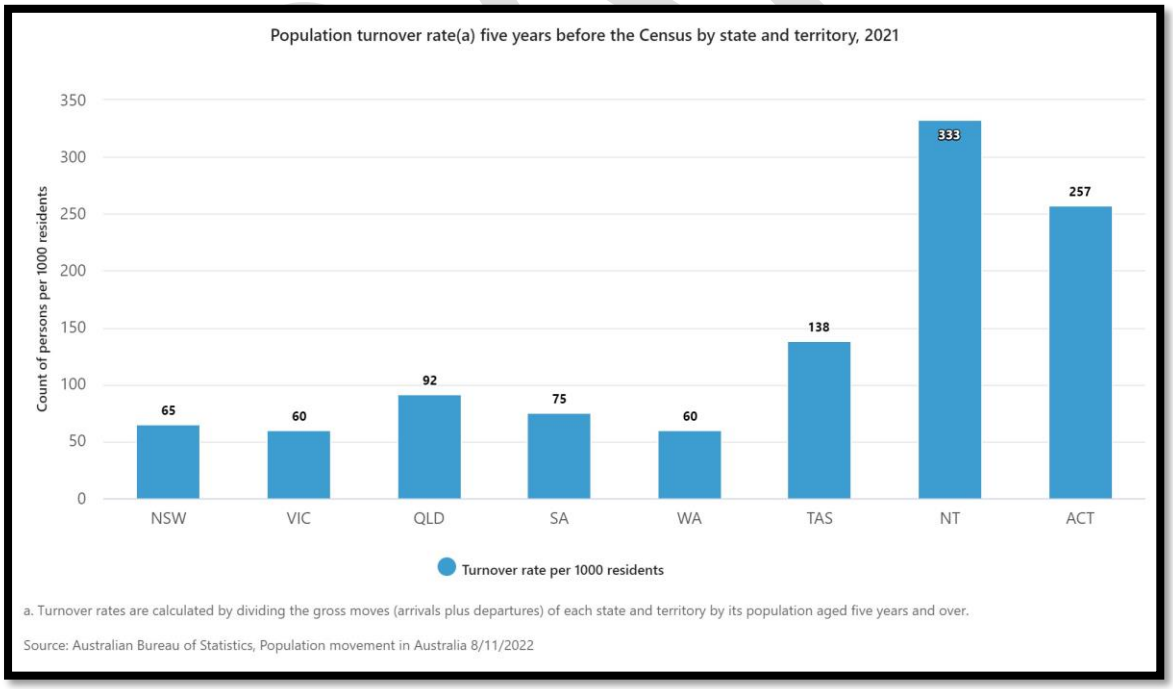

Figure 6-3: Population turnover from 2016-2021 (Source: ABS 2022)

The median age of arrivals was 31 years, compared with 34 years for departure. Arrivals were more likely to be in the labour force (83.5%) than those departing (76.1%). People who had lived at the same address as five years ago, were much less likely to be in the labour force (64.2%) than those arriving and departing.

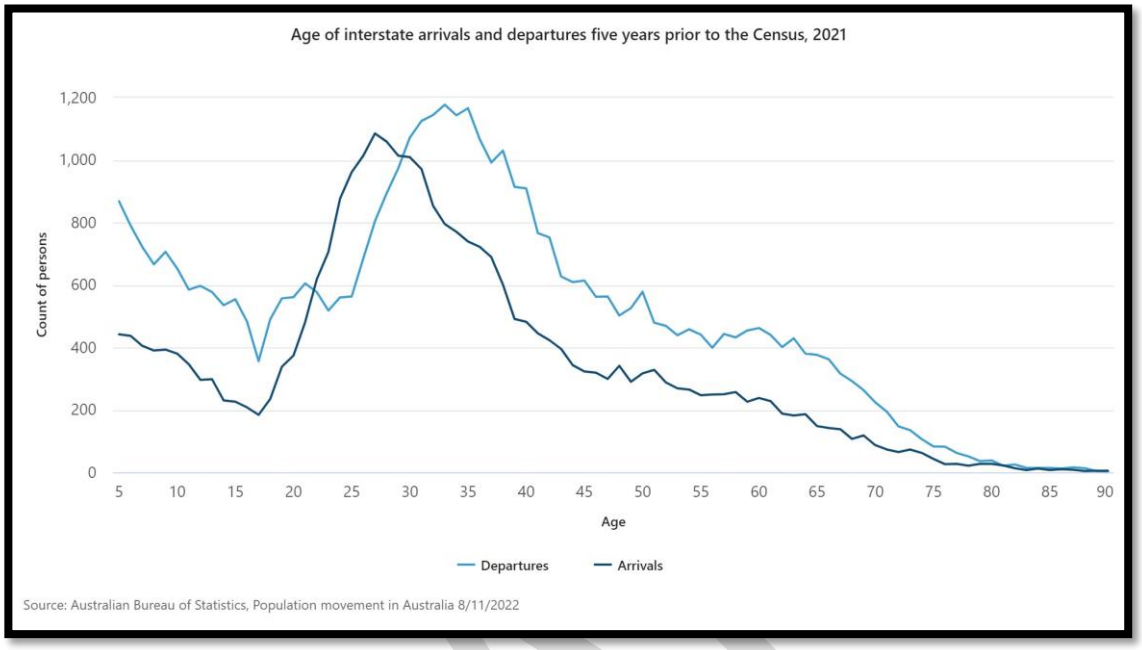

Figure 6-4: Age of interstate arrivals and departments from 2016 to 2021 (Source: ABS 2022)

The two most common industries of employment for people who arrived in the NT in the five years prior to 2021 were public administration and safety (23.4%) and health care and social assistance (18.4). The construction industry had a much higher number of employees who left the NT in the past five years than arrived. This is consistent with the completion of the INPEX LNG plant at Bladin Point. Arrivals came mainly from Queensland (25.9%), Victoria (22.7%) and New South Wales (22.6%).

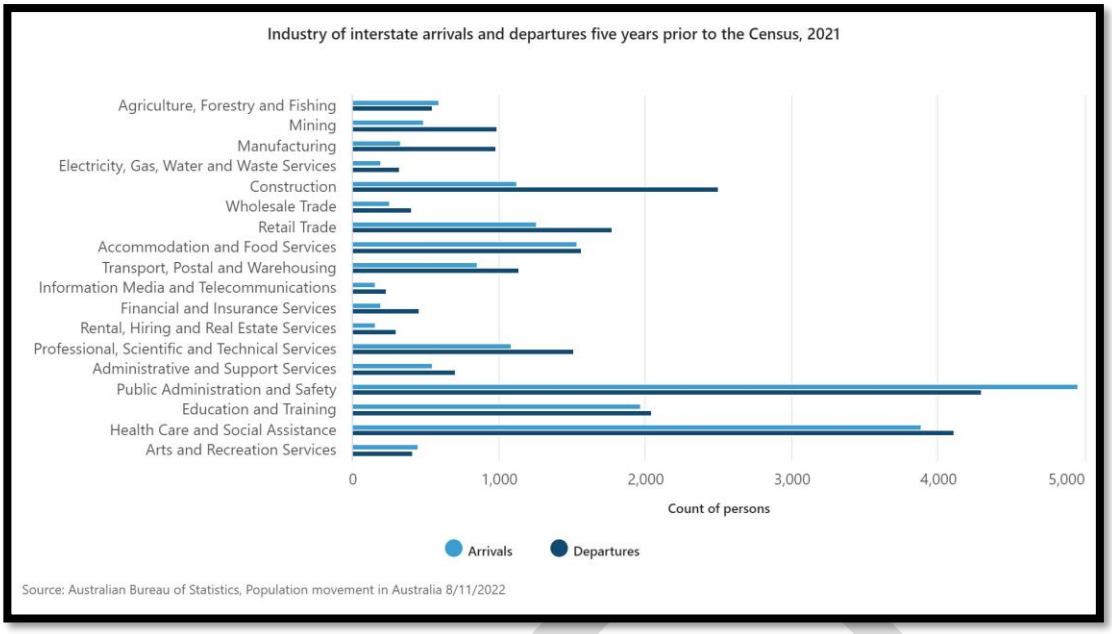

Figure 6-5: Industry of arrivals and departures from 2016 to 2021 (Source: ABS 2022)

6.2.4 Municipalities in the social area of influence

The following section profiles the municipalities closest to Darwin Harbour, including Greater Darwin and beyond to the Cox Peninsula.

6.2.4.1 Darwin

The Darwin local government area covers 143 square kilometres, extending from Lee Point in the north to the East Arm of Darwin Harbour in the west and south along the Stuart Highway. Established in 1869, the city was initially called 'Palmerston' but was renamed Darwin in 1911, after its port. Now the closest Australian capital to Asia, Darwin plays a strategic role in trade, logistics and defence activities in Northern Australia. The city an administrative centre, reflected in the higher proportion of public servants.

The municipality had an estimated residential population of 80,530 in the 2021 Census, with a median age of 35. Darwin residents were far more likely to report a tertiary level of education (33.2%) and to work in professional occupations (26.2%) than the rest of Greater Darwin. They were more ethnically diverse, with a lower proportion (58%) reporting Australia as their country of birth. The three main source countries for those born overseas were the Philippines, India and Nepal.

Darwin residents reported a lower proportion of households comprising a couple with children, reflected in a lower rate of residents aged under 20 (23.5%) than for neighbouring Palmerston (31.4%). Residents were less likely to live in a separate house (51.8%), more likely to live in a flat or apartment (34.3%), less likely to own their property than residents of the broader Greater Darwin area and more likely to rent (49%).

The five key sectors of employment in the Darwin municipality were Territory Government administration, hospitals, defence, cafes and restaurants and primary education.

6.2.4.2 Palmerston

The need to accommodate urban growth in the Greater Darwin Region was identified in 1971. Construction of a new town began in 1980, soon after the Territory gained Self-Government in 1978. Palmerston was declared a city in 2000 and is now the third largest town in the Northern Territory. Covering 63 square kilometres, the city is predominantly residential, with retail in the town centre and light industrial and commercial precincts at Pinelands and Yarrawonga (DRLUP 2015).

During the 1980s and 1990s Palmerston experienced significant growth, with its population more than doubling between 1991 and 2000, much of it driven by Defence personnel moving into the area (.id community, 2020). While growth rates have steadied, Palmerston recorded 1.9% growth in 2019-20, the strongest in the Territory in 2019-20 (Department of Treasury and Finance, 2020).

The newest suburbs in Palmerston are Zuccoli, The Heights Durack and Mitchell Green. Population projections suggest Palmerston will grow at an annual rate of 2.4 per cent from 2016-36 (Department of Treasury and Finance, 2019).

Many Palmerston residents enjoy a high income ($2199 median weekly household income). However, the area has a higher rate of socioeconomic disadvantage than Darwin and Litchfield as ranked by the Australian Bureau of Statistics' Socio-Economic Indexes for Areas (ABS 2016). More families live in Palmerston than in Darwin and Litchfield but the area also has the highest proportion of single parent families (19.6% in 2021).

A lower level of tertiary educational attainment correlates with a slightly higher proportion of technicians and trade workers than in Darwin (16.5% compared with 14.4%).

Aboriginal people comprise nearly 11% of Palmerston's population, with an unemployment rate of 12.4%. However, participation rates (the proportion of a working-age people working or actively looking for work) for Aboriginal people in Palmerston and Litchfield are relatively low. This is likely to reflect disengaged youth and people on welfare benefits (non-participation includes retired persons, students, those taking care of children or other family members, and others who are neither working nor seeking work).

6.2.4.3 Litchfield

Litchfield municipality is a mostly rural area covering 3100 square kilometres beyond Darwin and Palmerston, from Gunn Point in the north to Darwin River about 60 kilometres south of Darwin. Originally surveyed in 1869, Litchfield was earmarked as an agricultural region but proved popular for its rural lifestyles and became a municipality in 1985 (DRLUP 2015). The original inhabitants of the Litchfield Council area were the Larrakia, Wulna and Djowei Aboriginal people (profile.id 2022).

The Litchfield local government area accounts for 91.8% of Greater Darwin's land, but only a small portion is residential. It takes in Middle Arm Peninsula, Southport, Weddell, Holtze, Howard Springs, McMinns Lagoon, Coolalinga, Girraween, Herbert, Lambells Lagoon, Freds Pass, Virginia, Bees Creek, Humpty Doo and Noonamah. The Litchfield Subregional Land Use Plan (2020), suggests that growth is most likely in the urban and peri-urban areas of Holtze, Weddell, Hughes, Murrumujuk, and the Noonamah area.

The Subregional Land Use Plan, updated in 2020, noted that Litchfield has relatively few residents but is heavily visited for recreational purposes by Darwin and rural residents. The fast-growing municipality had an estimated population of 21,411 in 2021. People in Litchfield are typically older (median age of 39) with 5.9% citing Defence as their employer (reflecting the location of Robertson Barracks in the municipality).

The municipality includes a range of rural residential, horticultural and agricultural activities, with rural residential blocks generally clustered around the four activity centres of Howard Springs, Humpty Doo, Berry Springs and Coolalinga (Planning Commission 2015). Residents value their rural lifestyle, many living on two-acre blocks. Recent residential developments, such as Noonamah Ridge, have been opposed as a threat to this lifestyle.

The municipality contains many scenic and conservation attractions, from Gunn Point beaches, popular with recreational fishers and campers, to the Berry Springs Nature Park, a significant tourism draw card.

The former INPEX workers' village at Howard Springs accommodated FIFO workers during construction of the Ichthys project's LNG plant at Bladin Point, on Middle Arm Peninsula. More recently, the facility was repurposed as the Centre for National Resilience, or quarantine facility, for the COVID-19 pandemic.

6.2.4.4 Coomalie

Coomalie covers 2056 square kilometres, with an estimated residential population of 1276, of whom 20.5% are Aboriginal or Torres Strait Islander (ABS 2022). Coomalie Council covers the towns of Adelaide River and Batchelor. The original inhabitants of the Coomalie Region were Kungarakany, Awara and Warai groups. The first European activity was recorded in 1860 when George Goyder's expedition surveyed the area.

The industry base of the Coomalie Region has moved from a reliance on the pastoral and mining sectors to include education (Batchelor Institute of Indigenous Tertiary Education), horticulture and service industries. The Region is a significant tourist destination, "steeped in history from early Chinese market gardens, used as a base during the Second World War and mining" (Coomalie Community Government Council 2021).

Reflecting its older population (median age of 51), the 2021 Census recorded that 83.4% of residents lived in a separate house with high rates of ownership (37.9% owned outright) and lower rates of renting (24.9%). Coomalie had a high proportion of couple families without children (58.9%). The 2021 Census reports that 31.6% of Coomalie residents were aged between 60 and 80, with only 20% under 20.

Coomalie residents reported a lower level of workforce participation (43.9%), suggesting many are retired, and higher unemployment (7.7%). The top five areas of employment were accommodation (9.7%), technical and VET (5.7%, substantially down from 15.7% in 2016), 5.5% in meat processing and 4.8% in primary and secondary education.

6.2.4.5 Cox Peninsula, Wagait and Belyuen

Much of the Cox Peninsula was subject to the long-running Kenbi Land Claim, lodged in 1979 under the *Aboriginal Land Rights Act 1976*, which recognised the Larrakia people as traditional owners of most of the Cox Peninsula. Many residents of Belyuen identify as members of Daly River language groups. While these groups have lived on the Cox Peninsula for 140 years, they recognise the Larrakia as traditional owners (Povinelli 1992).

Two key communities are the beachside suburb of Wagait (with 423 people) and nearby Aboriginal community of Belyuen.

Belyuen is Aboriginal freehold land under the control of the Belyuen Community Government Council. In 2021, the town had an estimated residential population of 149, of whom 49% were male, with a median age of 32. The 2021 Census suggests an average 3.2 people per household (compared with 2.6 for Greater Darwin), a median weekly household income of only $680, weekly median rent of only $75 and only 0.2 vehicles per dwelling. The SEIFA Index (see 6.2.5 below) finds Belyuen was the most disadvantaged local government area in the Northern Territory.

The freehold residential area of Wagait Beach (the Wagaitj word for sandy beach) was first settled in the 1970s on the north-east coast of the peninsula and is now administered by the Wagait Shire Council. The suburban of Wagait Beach covers 658 hectares and is a 15-minute ferry ride from Cullen Bay to Mandorah or a 138-kilometre road trip from Darwin. The area is popular for fishing and camping.

In the 2021 Census, the estimated residential population of Wagait was 52.4% male and older, with a median age of 52 (36.4% between 60 and 80, only 17.6% under 20). Residents reported a lower median weekly household income ($1355) and lower weekly rent $250.

Reflecting a lower level of cultural diversity, only 8% of Wagait residents were Aboriginal and, apart from 1.2% born in the Philippines, all residents reported being were born in Australia or English-speaking countries.

The town had a slightly higher number of professionals and managers and a large number of couple families without children (57.1%). Most live in a house (97.7%), of which 40% were owned outright, 41.1% were owned with a mortgage and only 13.1% were rented.

6.2.5 Levels of disadvantage

Socio-economic advantage and disadvantage can be defined as people's access to material and social resources, and their ability to participate in society (ABS 2017).

Socio-Economic Indexes for Areas (SEIFA) rank areas in Australia according to relative socio-economic advantage and disadvantage. The indexes are based on information from the five-yearly Census of Population and Housing. The most recent SEIFA is based on the 2016 Census. SEIFA 2016 consists of four indexes: the Index of Relative Socio-economic Disadvantage (IRSD); Index of Relative Socio-economic Advantage and Disadvantage (IRSAD); Index of Education and Occupation (IEO); and the Index of Economic Resources (IER).

Data for Territory local government areas suggests that urban areas such as Darwin, Litchfield and Palmerston score better than remote areas with high Aboriginal populations such as Belyuen on the Cox Peninsula, Central Desert and West Daly which were ranked among the 10 most disadvantaged areas in Australia. While the three Greater Darwin local government areas score well, aggregated data masks likely gaps between disadvantage and affluence.

Table 6-5: Socio-Economic Indexes for Australia (SEIFA) 2033.0.55.001 2016 (released 2018)

Alice Springs	1007
Barkly	679
Belyuen	435
Central Desert	492
Coomalie	877
Darwin	1041
East Arnhem	562
Katherine	991
Litchfield	1040
MacDonnell	581
Palmerston	1027
Roper Gulf	597
Tiwi Islands	630
Victoria Daly	657
Wagait	1011
West Arnhem	622
West Daly	441
Unincorporated NT	1023

Another indicator for disadvantage is demand for public housing in the Darwin and Palmerston regions, which as of June 2022 stood at 2443 for the Darwin region and 989 for Palmerston, with wait times of between 6 and 10 years for one-bedroom accommodation and a total of only 85 allocations over the previous year. Based on 2016 Census data, 57.8% of Aboriginal residents were renting compared with an overall rate of 48.8% for Palmerston.

Reflecting high levels of disadvantage among Aboriginal families in the Greater Darwin Area, the following is based on De Vencintiis et al. (2019)

Table 6-6: Indicators of disadvantage in Greater Darwin

	Greater Darwin	Australia
Proportion of children aged 0-17% with notifications of child abuse or neglect	11.6%	n/a
Annual rate of males aged 10-17 (per population of 1000) apprehended for being involved in crime	62	n/a
Children aged 15 and below in low-income households	27.5%	15.7%
Students in Year 7 reaching the minimum national standard in literacy at NT Government schools	69%	94.1%
Students in Year 7 reaching the minimum national standard in numeracy at NT Government school	76.8%	95.6%
Unemployment among Aboriginal people aged 15-24 (excludes those not actively looking for work)	9%	12%

6.2.6 Land use planning

Strategic land use planning is akin to a strategic assessment in that it identifies the characteristics of a region, allows for likely growth and provides a regional framework for orderly residential and industrial growth, while taking account of geographic, environmental and cultural constraints to growth.

Darwin's first resident planner, Harcourt Long, arrived in Darwin in 1963 when the town had 18,000 residents and produced the Darwin Residential Plan 1965. A long-term strategy for staged development around Darwin Harbour to Cox Peninsula was produced in 1980, followed by the first Darwin Region Land Use Plan in 1984. Middle Arm and Glyde Point have been identified for industrial development since the 1984 Darwin Regional Structure Plan (Department of Lands 1984), while a number of areas around Palmerston and the rural area have been earmarked for future activity centres as the fast-growing municipality of Palmerston reaches capacity.

Land use planning takes account of population projections, Northern Territory Government strategic directions and predicted market demand over the short, medium and long-term. It restricts activities that could impact on the amenity of future residential areas or strategic infrastructure needs.

The Northern Territory Planning Commission is an independent statutory body established in 2012 to develop strategic land use plans and provide advice on major development proposals.

The Commission's aims include sustainable development that meets the diverse needs and aspirations of all sectors of the community (see Fig 6-1). This is supported by a needs analysis of growth areas to determine the future demands and adequacy of key social infrastructure, such as housing, education, health, recreation, essential services, waste and transport (discussed in Section 7).

The DRLUP (2015) outlines the benefits of appropriate sequencing of future development. This approach identifies greenfield and infill locations to accommodate growth and responds to predicted demand. It then allows for a tailored provision of community facilities based on identified need, as opposed to supplying generic facilities where a community has not been established. Development costs include roads, reticulated water, power and sewerage

connections as well as social infrastructure such as housing, education, health, transport, emergency services, waste and community facilities.

The Darwin Regional Land Use Plan (DRLUP) is supported by sub-regional and area plans to provide a pipeline of residential land supply in suburbs around Palmerston and the rural area. These are areas that could absorb new residents to meet growing workforce, industrial and service demands at Middle Arm. Plans can be refined as growth projections become more certain or actual development materialises.

The key subregional and area plans relevant to the Middle Arm Precinct's social area of influence are described below.

Rather that duplicate the work of the NT Planning Commission, which is comprehensive and based on widespread community participation, Sections 6 and 7 of the Strategic Social Impact Assessment draw on the Commission's work.

Key residential objectives

- Integrate new and existing residential development to maintain character and create a cohesive society that meets the diverse needs and aspirations of all sectors of the community;
- Ensure sustainable development by encouraging:
  - the efficient use of land, water, energy and other resources
  - accessible and efficient public transport to reduce transport demands
  - cost-effective provision and efficient use of infrastructure and service
  - development that is consistent with the community's economic, social, cultural and environmental values
  - the creation of character and identity
  - opportunities for community initiatives that support

Figure 6-6: DRLUP Objectives

Table 6-7: Hierarchy of land use plans relevant to this report

Relevant plans	Purpose	Area covered
Greater Darwin Land Use Plan 2015	Identifies the essential characteristics and needs that will shape future growth and establishes an overarching strategic framework to guide this growth, including integrated land use, transport and infrastructure planning.	Greater Darwin Region
Litchfield Subregional Land Use Plan 2016	Identifies land to support growth while protecting established rural areas.	Gunn Point to Middle Arm, including Howard Springs, Humpty Doo, Coolalinga, Freds Pass rural activity centres
Holtze to Elizabeth River Subregional Plan (in development)	A far-term framework for future land use to support a strategy of maintaining a supply of serviced land for future development and consider transport and service infrastructure, land capability and environmental values.	Four key areas surrounding the city of Palmerston: 11 Mile, Holtze, Archer and Mitchell, Virginia South-West
Greater Holtze Area Plan (first draft released for comment November 2022)	Area Plans provide a detailed framework for land use change, to guide the future use and development of land. These plans contain planning principles and objectives to give the community, industry and decision-makers a degree of confidence and understanding about potential land uses. Covered under the NT Planning Scheme 2020.	Holtze, Holtze North, Kowandi and Howard Springs North
Weddell and Middle Arm Subregional Plan	Discussion paper due for release early 2023.	Weddell, Middle Arm

6.2.5.1 Darwin Regional Land Use Plan

The Darwin Region Land Use Plan 2015 (DRLUP) provides a policy framework for future development in the Darwin Region and has been adopted as a policy document within the NT Planning Scheme 2020.

The vision of the plan is (p8):

> A Darwin Region that is alive and prosperous, led by a thriving global city with high-quality amenity and connectivity.
>
> A region with a diverse economy and strong society that promotes innovation and tropical concepts, and holds an enduring connection to the natural environment.

The DRLUP describes the essential characteristics of the region, anticipates the share of future development and establishes an overarching strategic planning framework with the flexibility to cater for economic and demographic volatility. It considers

- integrated land use
- infrastructure and transport planning
- delivery of more sustainable and cost-effective outcomes for the community
- sensitivity to environmental and heritage values (p.9).

The plan highlights options for a range of densities and lifestyle choices, from affordable urban living to the treasured 'rural lifestyle' of two hectare lots and larger horticultural blocks.

Drawing on population projections, the plan provides for a short-term population of 150,000 in the Greater Darwin Region[4], then a population of 250,000 by 2055-2065 and ultimately a population of more than 500,000.

Current residential land is under development at Durack Heights, Zuccoli South and Northcrest. Options to accommodate population growth include urban, in-fill and staged development at Holtze (where a new hospital has been built), Weddell (see below), Murrumujuk (on Gunn Point Peninsula), Noonamah, and Hughes (on the Stuart Highway) and the Cox Peninsula (which suffers from groundwater constraints) at a range of densities.

Sitting under the Darwin Land Use Plan are six subregional plans:

- Darwin (143 square kilometres including the waterfront precinct, East Arm and Berrimah Farm
- Palmerston and Elrundie unincorporated area (63 square kilometres
- Palmerston Environs (now Holtze to Elizabeth River – see below)
- Cox Peninsula (875 square kilometres including Belyuen and Wagait)
- Finniss (1700 square kilometres including Dundee Beach and Bynoe Harbour)
- Litchfield (see below)
- Coomalie.

[4] The population of Greater Darwin -covering Darwin, Palmerston and Litchfield municipalities in the 2021 Census was 139,902 (ABS Quick Stats).

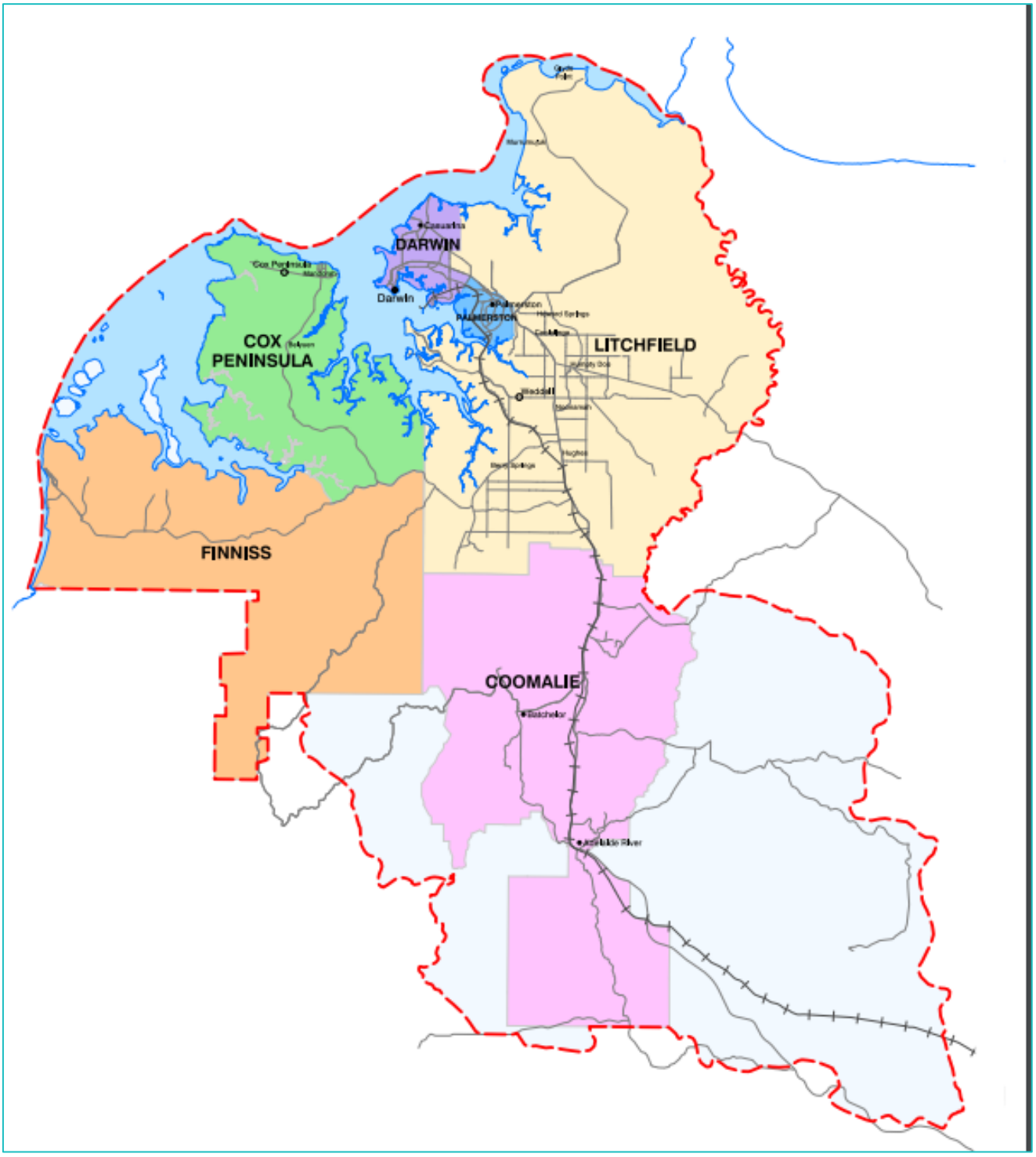

Figure 6-7: Subregions of the Darwin Region Land Use Plan (2015, p.3)

6.2.5.2 Litchfield Subregional Plan 2016.

Subregional plans set land aside to meet short, medium and long-term residential, commercial and industrial demand, while respecting the cultural, social and natural values of landscapes and the environment. These plans aim to minimise land use conflicts and incorporate needs analysis for social infrastructure, based on projected population growth (see Statements of Policy, pages 12-13 in Litchfield Subregional Plan 2016).

The Litchfield Subregional Land Use Plan 2016 identifies land and rural activity centres that could support residential and industrial growth while protecting established rural areas. Its footprint extends from Gunn and Glyde Points, through the rural area east of Palmerston and further south to embrace Middle Arm, Weddell, Noonamah, Hughes and Berry Springs.

6.2.5.2 Holtze to Elizabeth River Area Subregional Land Use Plan

The Holtze to Elizabeth River Land Use Plan (previously described as 'Palmerston Environs') plans for far-term growth to 2050, catering for population growth of 44,825 and an additional 15,500 dwellings. The residential potential of Archer and Mitchell West is limited by exposure to biting insects, storm surge and seasonal waterlogging (Holtze to Elizabeth River Subregional Land Use Plan 2021).

A Palmerston Environs Regional Social Infrastructure Assessment identified existing and future demand for social infrastructure based on estimated subregional population growth: a medium scenario of 70,000 and a high scenario of 91,000 (Fyfe 2021). The plan suggests the greatest demand for subregional social infrastructure will be services that support younger families, such as schools, libraries, family healthcare and open space and recreation (see Section 7).

The subregional land use plan includes four focus areas: 11 Mile, Greater Holtze, Archer and Mitchell, and Virginia South-West. It includes strategic corridors for main roads, rail and utilities.

6.2.5.3 Greater Holtze area plan

Local area plans are designed to prepare for near-term (less than 10 years), mid-term (10-30) and long-term (beyond 30 years) demand for industrial and residential land. The plans aim to provide sufficient understanding of future land uses to give essential services, government and councils an efficient planning window.

The Greater Holtze area plan, near the new Palmerston Regional Hospital, predicts a 2.5% average growth in the Greater Holtze district (Holtze, Holtze North, Kowandi and Howard Springs North). Identified for urban development in 2016, the 3300-hectare area includes the former defence area of Kowandi and is earmarked for Darwin's next residential land release.

A proposed initial 5000 lots in Holtze and Kowandi could cater for a population of 15,000. In the longer-term, Greater Holtze has the potential to support 30,000 to 35,000 people. Planning in 2022 has included engineering, surveying and geotechnical studies. The 2022 Budget (Treasury and Finance, July 22) allocated $44 million for the design and construction of enabling

infrastructure over three years, including sewer and water networks. In November 2022, DIPL released a request for proposals to develop a 46-hectare residential subdivision on Crown land at Holtze

The area plan identifies sufficient industrial land at the Holtze Industrial Estate and Pinelands to meet demand for the next 20 years.

6.2.5.4 Glyde Point

The Darwin Regional Land Use Plan 2015 confirms the 1984 identification of Glyde Point, on the Gunn Point Peninsula, as an area for strategic industrial development, with potential for a deep-water port and strategic industry. A transport and utilities corridor was set aside and an urban area proposed for Murrumujuk, near the site of a former prison farm.

In 2007, in the face of opposition from environmental groups, former Planning Minister Delia Lawrie and Chief Minister Clare Martin announced that Glyde Point would be rezoned from industrial to public open space to respect significant conservation values. It was determined that gas-based development would, instead, be concentrated at Middle Arm.

In 2013, a new CLP Chief Minister Adam Giles suggested a 'dirty port' could be built outside Darwin Harbour to ship bulk minerals such as iron ore and ilmenite. There have been suggestions over the years that this port could be located at Glyde Point. The Litchfield Subregional Land Use Plan 2016 retains the utilities corridor set aside to service Glyde Point. The Gunn Point Road was upgraded in 2018 to provide better access to a Seafarms' proposed prawn facility near Murrumujuk. The Sun Cable Australia-Asia Power Link solar energy project proposes to route 67 kilometres of its high voltage transmission line along the utilities corridor to a land-sea connection at Gunn Point Beach on Shoal Bay.

6.2.5.5 Weddell and Middle Arm Subregional Land Use Plan

A discussion paper for a proposed Weddell and Middle Arm Land Subregional Use Plan is scheduled for release in mid-2023.

Key land uses on Middle Arm includes:

- **The Channel Island power station**: operational since 1987, the plant generates Darwin's power supply with gas from Eni's Blacktip field.
- **Heritage listed leprosarium and conservation reserve**: Next to the power station is a heritage listed former quarantine station completed in 1914 and run as leprosarium between 1931 and 1955. A conservation reserve includes a reef between the mainland and island containing many small coral communities.
- **Darwin LNG plant** built by ConocoPhillips from 2003 and now operated by Santos: a single train liquefaction and storage plant that began production in 2006. The Barossa field, 300 kilometres north of Darwin is expected to become the next source of gas when the current Bayu Undan field ceases production.

- **INPEX's Bladin Point** LNG plant, part of the Ichthys project. Construction of the two trains began in 2012, with the $37 billion plant opening in 2018 and expected to operate for 40 years.
- **Extractive leases:** Five of 12 extractive leases on Middle Arm lie in the precinct footprint, supporting civil operations by a number of local companies (see Section 8 for more detail).
- **Weddell power station:** On the Channel Island Road, the 129 MW natural gas-fired station is owned and operated by Territory Generation. It is the second largest power station in the Territory and supplies the Darwin-Katherine Electricity System.
- **Kittyhawk and Spitfire Estates:** At 300 hectares each, these estates are being developed by the Land Development Corporation and lie within the precinct footprint. Stage one of the 32.5 hectare Kittyhawk Estate has sub-divided lots and an access road.
- **Bladin Village**: privately-owned workers' accommodation (used as an immigration centre).
- The **Darwin Aquaculture Centre** and aquaculture on and near Middle Arm is covered in Section 8.

The proposed City of Weddell is about 40 km from central Darwin and 19 km south of Palmerston. It is bounded by the Elizabeth and Blackmore Rivers, the Middle Arm Peninsula and the Stuart Highway and bisected by the Adelaide to Darwin rail line (see map below).

Weddell covers about 6000 hectares of both Crown and private land. It has long been proposed as the next major urban centre as Palmerston reaches its limits to further growth. Planning for Weddell began in 2009, with a five-day design forum and public surveys in 2010. Construction was due to start in 2014, however priorities shifted to suburbs closer to Palmerston to provide an efficient roll-out of land release.

The Litchfield Subregional Plan envisages a population of 40,000 at Weddell, supported by retail, commercial, community and residential land uses. An industrial area has been set aside south-west of Middle Arm, while proposed private developments at Noonamah and Hughes, along the Stuart Highway, would be complementary.

About 3000-4000 hectares of the land at Weddell is regarded as suited to residential development. Major constraints are flood-prone land, waterlogged soils, biting insect breeding areas, archaeological heritage sites and land zoned for conservation and industrial purposes (Litchfield subregional land use plan 2016)

6.2.7 Governance structures

In addition to the above-mentioned local government areas, the social area of influence for this study is covered by:

- the Federal electorates of Lingiari and Solomon (which is focussed on Darwin).
- NT electorates of Daly River, Goyder, Nelson
- Aboriginal governance structures such as the Northern and Tiwi Land Councils, Larrakia National Aboriginal Corporation, Larrakia Development Corporation, and Gwalwa Daraniki.

6.3 Key change processes

- project announcements and regulatory processes
- presence of newcomers from in-migration of workers and families as construction starts
- presence of temporary (FIFO) construction workers to support development activities, particularly at peak periods
- land clearing and start of construction
- industrial and worker traffic (land and marine) to support development activities
- increased emissions or pollutants as operations start.

6.4 Impact assessment for people and communities

Table 6-8: Risks and opportunities for people and communities

Potential benefits and impacts – People and Communities	
Potential cumulative benefits	**Potential cumulative impacts**
	R-4 Increased road trauma or reduced feelings of safety on transport routes
	R-5 Reduced marine safety in the harbour due to dredging and increased marine traffic
	R-6 Reduced community cohesion, social capital and wellbeing
	R-7 Reduced sense of place
	R-8 Reduced health and safety due to emissions, pollution or discharges

As outlined in the *Northern Territory Infrastructure Plan and Pipeline (*Infrastructure NT 2022, p.123), a key challenge in planning economic and infrastructure growth is to balance development with existing lifestyles, cultural heritage and the natural environment. Growth entails an expanded supply and choice of housing, facilitating land use for strategic uses, developing new and growth industry sectors and developing the workforce skills to capitalise on the region's economic development opportunities. These implications are discussed further in the Section 7 on social infrastructure and Section 8 on Economies and Jobs.

However, growth may bring unwelcome change such as more traffic, a change in community composition and stability, industrialised landscapes and reduced wellbeing and quality of life.

6.4.1 Increased road trauma or reduced feelings of safety on transport routes

Road safety risks are inevitably heightened as traffic volumes increase, particularly with a mix of heavy and light vehicles. The consequences of head-on crashes on dual lane roads would be high. The sense of safety would be affected by road trains interacting with light vehicles or travelling through residential areas with schools and pedestrians.

Key approaches to Middle Arm are:

- along Elrundie Avenue, past the Palmerston suburbs of Gray, Moulden, Durack and Bellamack
- along Jenkins Road, which is also used to access the Elizabeth River boat ramp.

Crash data from DIPL's Transport Planning section regarding Elrundie Avenue shows:

- head on collisions
- deaths and injuries of pedestrians
- general crash data for Elrundie Avenue.

Crash data for 2017-2022 for the study area (Channel Island and Jenkins Road) suggests 20 incidents over the past five years, with 7 resulting in a serious injury (GHD 2022).

The risks posed by industrial traffic are likely to be addressed with existing traffic planning, including the eventual duplication of the Channel Island Road and the proposed Weddell Freeway, which will take heavy vehicles away from built-up areas (see Section 7.2.6). The new freeway, which is unlikely for at least 15 years, would also give heavy transport a signal-free run from Noonamah to the port and leave Jenkins Road to local traffic.

We assess the untreated risk as HIGH, because of the extreme consequences of collisions involving industrial traffic, reducing to LOW with proposed new transport routes and appropriate traffic management plans and engineered solutions. The reduced residual rating depends on appropriate sequencing of transport solutions being funded and implemented.

6.4.2 Reduced marine safety in the harbour due to dredging and increased marine traffic

Short-term, the key potential marine navigational risk will come from dredging. Longer-term, a potential trebling of shipping in Darwin Harbour by 2040 could lead to increased congestion and potential conflict between commercial shipping and recreational boats, including sailing and recreational fishing.

Dredging of the Elizabeth River Channel, from the Bladin Point Channel to MASDP marine infrastructure, could take up to four years, depending on how development is staged, and dredge a turning basin and channel of between 200 and 240 metres wide. Overall, the dredging campaign would be bigger than that of INPEX, with dredge spoil to be used for reclamation or dumped at an offshore dredge spoil site.

A Preliminary Navigational Safety Assessment (Royal HaskoningDHV 2023) suggests that the MASDP at full development could contribute to increased shipping movements in the harbour by 2040 as follows (see Table 7-3 of the preliminary navigational safety report along with important explanations and qualifications):

Table 6-9: Likely increases in shipping in Darwin Harbour based on full development of the MASDP (source Royal HaskoningDHV 2023)

Source	2019	2020	2030-40 (assumed)
East Arm Wharf	334	328	350
INPEX LNG	150	176	200
MASDP	n/a	n/a	860

Some of the harbour's best fishing spots are in shipping channels, with fishers warned not to anchor in the path of large ships (a requirement of the Marine (General) Regulations 2013). LNG ships, barges, defence boats and large freight vessels increasingly mingle with anglers, cross-harbour ferries, sailing boats, sunset cruises and cruise ships.

The preliminary navigational safety report (Royal HaskoningDHV at Section 5.4) suggests activities most impacted by the MASDP would be:

- sailing in Darwin Harbour by the Darwin Sailing Club and Dinah Beach Cruising Yacht Association which uses AtoNs (aid to navigation) as rounding marks for organised races. Sailing boats might navigate within the shipping channel or drift into the channel, depending on the wind.
- more localised impacts on recreational boating in the Elizabeth River including vessels launched at the Palmerston Boat Ramp and Palmerston Game Fishing Club, due to dredging and shipping.

Boat owners in the Northern Territory do not need to register their boat or get a licence to operate them. Recommendations by the Riley review into the Territory's alcohol laws and tentative political attempts to toughen regulations have been resisted by AFANT on the basis that "fishing and boating are an inherent way of life in the Northern Territory… We've got so many people — mums, dads, kids, families out there every day of the week — and largely it's all done safely and without incident" (Garrick 2019). Boats occasionally break down in and around the harbour, particularly during poor weather.

Dredging creates a risk of collisions with dredgers and equipment such as pipelines in the harbour If dredge spoil is disposed offshore, these risks could extend to the outer harbour. In 2012, during construction of the marine supply base, an INPEX worker returning from a fishing trip crashed into dredging equipment, resulting in severe injuries to a child.

Recreational traffic in the shipping channel from East Arm to the Elizabeth River will operate in a congested space, particularly in the turning basin near the jetties serving the Middle Arm precinct.

More broadly, increased shipping in the harbour will compound pressures from other projects involving dredging and shipping, including:

- the proposed Ship Lift Project and Marine Industry Park at East Arm

- other projects on Middle Arm such as INPEX adding an extra train and a proposed pipeline expansion from Barossa to Santos's Darwin LNG plant
- further afield, such as Sun Cable's land-sea converter station on Gunn Point Peninsula at Shoal Bay.

Boat owners are required to observe the Marine (General) Regulations 2013 and the *Marine Act 1981*. They can be issued with infringement notices for failing to have safety equipment on board, operating in a restricted area, anchoring in a shipping channel or operating recklessly. During dredging and construction of Bladin Point LNG plant, INPEX ran a strong marine safety campaign to educate recreational boat users on navigational safety around large ships and the role of Harbour Master's Notice to Mariners.

We assess the untreated risk as HIGH given the increasing incompatibility of recreational and industrial shipping sharing the same shipping channels and major consequences of any navigational incident. This could reduce to MEDIUM given appropriate exclusion zones (which leads to other consequences for recreational fishing) and public education.

6.4.3 Reduced community cohesion, social capital and wellbeing

Wellbeing covers both material and non-material aspects of our quality of life such as security (including an environmentally clean and safe place to live), having the basic materials for a good life (the resources to support incomes and livelihoods), health (including freedom from disease and access to clean drinking water and air) and good social relations (Millennium Ecosystem Assessment, UN, 2005).

Community cohesion includes our sense of connectedness, ability to live in harmony with each other and whether we feel safe and be healthy (Munday 2020). Cohesion is an important element of social capital, along with civic participation, attachment to place, supportive networks, trust in people and shared goals.

Cohesion and wellbeing can be disrupted by high levels of crime and anti-social behaviour, as well as values conflicts, or polarised debate, that reduces our quality of life and makes our neighbourhood or region a less pleasant place to live.

While communities are rarely homogenous, the in-migration of project workforces can change a town's demographic composition, values, economic equilibrium and sense of wellbeing. Interviewees referred to the 'boom bust' phenomenon of northern Australian development. Writing about 'boomtowns' Taylor and Winter (2013) describe how initial euphoria over major project 'booms' is often followed by social impacts during construction, such as anti-social behaviour, resentment over wage differentials and inflationary effects. Then comes the social and economic deterioration of the 'bust' phase, with the withdrawal of construction labour and sudden decline in demand for local goods, services and housing. The literature suggests that an influx of predominantly young, single males (typical of a construction workforce) can reduce

community cohesion, sense of purpose, belonging, inclusion, social ties and level of participation in community activities (CSIR 2016; Carrington et al. 2011).[5]

More permanent demographic change can erode community cohesion and prevailing values (such as farming communities in Queensland becoming coal-mining towns). Volunteering in community activities, such as sports clubs, emergency services, service clubs community groups and tourism venues, can be reduced if workers are away from home while on shift or have looser social ties when moving into a new community.

The extent to which community cohesion and wellbeing are disrupted by the Middle Arm precinct may depend on the extent to which the impacts of development are managed to avoid sudden ('boom bust') demographic change and ensure the absorption of new arrivals. Given that Palmerston and its environs are characterised by high population mobility (see 6.2.3) and a high proportion of young families, workers relocating to this municipality are likely to blend in with existing demographic mix.

Consideration of community wellbeing measures extends to equity, inclusion and the distribution of effects on the disadvantaged and vulnerable, who are highly represented in Palmerston's urban area (see 6.2.5). The project could enhance community wellbeing if it builds social capital, in line with the Northern Territory Government's *Social Outcomes Framework* (2021), which establishes a number of measures for how peoples' lives might be improved.

A governance structure to deliver benefits might include precinct and project-level community benefit plans (required by the NTG for all major projects) that outline opportunities for community development, local jobs and training (particularly for disadvantaged youth and the long-term unemployed youth), social procurement and community sponsorships.

A Charles Darwin University study into social capital, commissioned by the Department of the Chief Minister, would be a useful starting point in establishing relevant social indicators, monitoring, reporting, regular evaluative research, ongoing community input and reporting of progress. Initial results of *My Territory Connections* released in November 2022 suggest respondents felt a strong connection to the Territory and that their neighbourhoods were friendly places (83%). Most respondents took part in a range of community activities (78%) and indicated a high level of trust in people generally (66.5%). Most agreed they had control over decisions that affected their lives (79%) and three in five rated the importance of living close to the natural environment as 8 or more out of 10. As with the values mapping survey (Attachment 3), more than half of the 3000 respondents had lived in the Territory for more than 20 years, the sample is skewed towards women and younger people and Aboriginal people were under-represented.

[5] While the INPEX 'bust' has been described as a 'cliff', catching local businesses unawares and causing a sudden economic contraction, economic modelling commissioned by INPEX shows the operational phase continues to support an estimated 600 FTEs a year and inject $56 million a year into the NT economy (www.inpex.com.au/sustainability/economic-contribution/).

Crime and anti-social behaviour contributes negatively to a community's sense of wellbeing. This topical issue is dealt with in Section 8.4.7 as a factor potentially inhibiting recruitment of workers to Greater Darwin rather than a consequence of precinct development.

On balance, we assess the likely impact on community cohesion and wellbeing as MEDIUM, reducing to LOW with appropriately sequenced development. However, given the paucity of relevant baseline data and high level of uncertainty regarding benefits and impacts on community wellbeing and cohesion, this will require close monitoring.

6.4.4 Reduced sense of place

A strong theme that emerged from submissions and values mapping research was alarm at the progressive industrialisation of Darwin Harbour. Long-term residents were particularly worried at how this might erode their quality of life, sense of attachment to the harbour and its surrounds and popular recreational activities such as fishing. A form letter from Protect Top End Coasts described the harbour as "providing a beautiful backdrop to the daily lives of locals and the centrepiece for the Territory experience". A submission to the Draft TOR suggested "the project places great risk on what is the jewel in Darwin's crown: the harbour".

In a 2019 New South Wales Land Court decision that refused consent for the Rocky Hill coal mine in a scenic rural valley, Chief Justice Preston cited expert evidence regarding 'solastalgia', or an intense emotion associated with the loss or desolation of a much-loved landscape. Aboriginal people "who live closely to the land and soil" may feel particular distress at such disturbance (Preston 2019).

Disturbance to Greater Darwin residents' sense of place could also come from an influx of new residents changing the demographic composition or feel of a neighbourhood, denser housing in rural areas or land releases to accommodate a growing population.

Impacts on sense of place are both likely and consequential, with both social and economic impacts, as will be discussed in Section 8. For the many residents who value Middle Arm and those parts of the harbour affected by development, there could be a sense of loss with increasing marine traffic and reduced access to the area between East Arm and Middle Arm and approaches to the Elizabeth River. For those who feel strongly on this issue, the impact would be mitigated only by scaling back the size and intrusion of the proposed development.

Impacts on residential landscapes, particularly fiercely held values associated with a rural lifestyle, should be minimised by the current land use planning process and development of Weddell to accommodate newcomers.

The significance of the impact is hard to predict, based on limited data, subjectivity and uncertainty about what will actually materialise. However, given the visibility of dredging, shipping activities and changes to the skyline (Appendix xxxx Visual Assessment), non-alignment with strongly held values (as discussed in Section 5) and perceived scale of change to residents' experience of place, we assign a tentative rating of MEDIUM, which would be unevenly distributed across population segments. This finding is consistent with previous assessment reports, protests over the past 20 years during planning for the LNG plants at Wickham Point and

Bladin Point, which have much smaller footprints than Middle Arm (INPEX is on 520 hectares; the Darwin LNG Plant is on 66.8 or 88.3 hectares) and submissions to the NTEPA on Santos's Barossa project. Land use planning, which is designed to take account of sense of place, would reduce this risk to LOW.

6.4.5 Reduced health and safety due to emissions, pollution or discharges

The risks of industrialisation may include detrimental effects on the health and wellbeing of people from pollution, emissions, contaminated wastes and discharges. These may be direct impacts — from emissions — or indirect, from consuming contaminated food such as fish, crabs and shellfish.

Health risks extend to psychosocial, or mental health impacts, due to fears and anxieties associated with words such as 'toxic' or 'carcinogenic' and loss of control.

Sensitivity to health impacts is particularly acute because of the proximity of the precinct to residential areas, particularly Palmerston. Descriptions of the precinct as being for 'petrochemicals' have fuelled alarm. Perceived threats to the health of both people and marine biodiversity were a common theme of submissions and survey responses. Particularly acute were concerns at heavy metals being discharged into the harbour, declining water quality and 'nasty chemicals' (survey response).

A heightened risk of cancer and respiratory conditions was raised by the Environment Centre of the NT's (ECNT) submission to the Draft TOR. The ECNT went to the extent of commissioning its own report on potential health risks (dealt with in more detail in the Health Impact Assessment at Appendix xxxx of the EIS).

Fears may be mitigated by better communication. As noted by Dr Peter Sandman (2003), people assess risk according to metrics other than technical seriousness. Outrage factors such as trust, control, whether risks are voluntary or imposed, the level of dread and familiarity are just as important as metrics on morbidity or mortality. Risk communication requires transparent and authentic responses and not disparaging people's fears.

There are, of course, advantages to co-locating industrial activities in one precinct, however the cumulative risk may require a buffer zone between the precinct and proposed residential development in the town of Weddell.

The initial rating assigned to this risk was HIGH, largely because of the consequences and sensitivity to pollutants and contaminants, compounded by the scale of change, particularly in the event of an emergency relatively close to populated areas. The risk would be mitigated to MEDIUM or LOW should the air quality and human health assessments indicate that that proposed industries individually or collectively do not pose an unacceptable risk. In this case, transparent monitoring and good risk communication would be mitigation strategies to help allay fears.

Cross-reference to findings of health impact assessment – ratings to be revisited once available

6.5 Recommendations

6.5.1 Road safety

Most road safety risks will be alleviated by transport planning that accommodates increases in heavy vehicles, such as the Weddell Freeway, which would remove heavy vehicles from residential roads, provide grade-separated road and rail crossings, duplicate Channel Island Road and incorporate emerging and turn-off lanes.

Proponent traffic management plans could include controls over vehicle speeds, workers travelling by bus from 'park and ride' locations, and avoiding peak hour school and commuter traffic.

6.5.2 Navigational safety

Measures to protect navigational safety are both practical and educational. Measures to reduce collisions include clearly marked dredging equipment, speed restrictions, notices to mariners and anti-collision radars (Royal HaskoningDHV 2023).

Peak dredging or shipping movements should be accompanied by marine safety campaigns, similar to those of INPEX during construction of Bladin Point. These included advertising, posters at boat ramps and recreational fishing newsletters to provide advice on the stopping distances of large ships, the meaning of maritime signals and exclusion zones.

Licensing of recreational boats and alcohol restrictions could be considered, despite controversy over these measures in the past.

6.5.3 Community cohesion and sense of place

The draft social performance plan (at Attachment 2) should be developed in a participatory way to capture community sensitivities, goals and aspirations. Inclusive decision-making will take account of sensitivities and that the scale and type of development aligns with community values.

Measures to protect community cohesion include careful planning to manage the impact of any sudden influxes of FIFO workers, including accommodation of FIFO workers in a dedicated village, and incentives for families to relocate to the region so they become part of and contribute to the community (see also 7.5.1 and 7.5.2 below).

6.5.4 Public health

The key mitigation strategy to maintain good public health is to select industries that are a strategic fit with the intent of the precinct and aligned with community values.

Additional measures would adopt the principles of Sandman's (2003) risk communication, including transparent information about the industries proposed for the precinct and the results of studies about health risks.

It will be important to incorporate independent monitoring and ongoing reporting of environmental health impacts and any implications for human health (see health impact assessment).

7. Social infrastructure and services

7.1 Overview

> Social infrastructure is the human side of economic growth. Economic growth cannot occur without population growth. Social infrastructure includes buildings that support government services such as health, education and emergency services. It includes lifestyle and recreation infrastructure such as parks, sporting facilities and cultural venues. The Northern Territory needs to reach critical mass for our population to sustain continual economic growth. Investment in social infrastructure will ensure the wellbeing and quality of life for existing Territorians and attract more people to the Territory (NTIPP 2022, p.25).

To grow capacity and capability, the Territory aspires to attract and retain workers. Well-planned social infrastructure — including childcare, medical, housing and educational facilities — will increase the wellbeing and quality of life of Territorians and support a diverse population, including students, families and workers. However, planning for growth must also take account of potential social infrastructure constraints, budgetary pressures and consequent demands for the physical buildings, staffing and resources to deliver reliable and affordable services.

Individual major projects can put pressure on social infrastructure if they lead to substantial demographic change, particularly if the pressure is sudden and short-lived. An influx of families or temporary construction workers may lead to increased demand for services such as housing, education, transport, emergency services and community infrastructure.

Cumulative industrial development can compound pressures on the availability, quality and affordability of social infrastructure in the catchment area for workers, particularly given current pressures on the housing, rental and accommodation markets in the Greater Darwin Region (REINT 2021).

A likely pressure is for the appropriate sequencing of land release and housing, in order to stay ahead of demand, while not causing inflationary pressures, eroding commercial viability or reducing the amenity of existing residents.

Overall, Section 7 finds that transport planning, the Planning Commission's strategic approach to land use planning and Infrastructure NT's *Infrastructure Plan and Pipeline* (2022) address these challenges.

The section assigns the highest risk ratings to impacts on housing affordability (which is susceptible to market forces, sudden increases in demand and pressures on the supply of social housing); the capacity of the NT Fire and Rescue Service to respond to emergencies at Middle Arm; and the resilience of the Territory's electricity system in the face of pressures on the grid.

Table 7-1: What is covered by this section

What is covered by Social Infrastructure and Services	What the Terms of Reference asked for
 The quality, accessibility and affordability of social infrastructure and services, such as housing, health, education, transport, emergency services, utilities.	• existing social infrastructure (health, education, housing, transport, emergency services, utilities) • availability, quality and affordability of short-term and privately owned accommodation, including worker accommodation • pressure on existing social infrastructure and services in nearby suburbs, including education, health, transport, emergency services and utilities.

7.2 Baseline

7.2.1 Housing

The residential property market in Greater Darwin recorded strong growth in 2021 and is expected to remain strong, boosted by the return of overseas migration, a steady pipeline of large construction projects and government's commitment to increasing residential land supply across the Territory. Data from the Real Estate Institute of Australia, reported by the Department of Treasury and Finance for the September quarter to 2022 (https://nteconomy.nt.gov.au/housing), suggests:

- median house prices decreased by 6.1% to $550,000 for the September quarter and by 4.3% annually
- median unit prices decreased by 2.8% to $403,500, but increased by 3.5% annually
- median weekly house rents increased by 4.7% to $596 a week and by 1.3% annually
- median weekly unit rents increased by 3.1% to $464 a week and by 9.7% annually
- vacancy rates for all dwellings increased by 0.7 percentage points to 2.4%

In the June quarter of 2022:

- Darwin had the second lowest median house price of all capital cities at $586,000 and median unit prices of $415,000 was the second lowest of the capital cities
- Greater Darwin had the third highest median weekly house rent ($569) and fourth highest median unit rent ($450) of the capital cities.

Budget papers suggest year-on-year growth for the number of housing finance commitments (excluding refinancing) has slowed from 65.1% in August 2021 to 30.1% in February 2022. While residential building approvals across the Territory rose 36.6% in 2020-21, year-on-year growth has been negative since December 2021 (Department of Treasury and Finance 2022).

Adequate land for housing is a critical enabler of population and economic growth, with key towns in the Territory suffering from growing pains (NTIPP, p.77). The Greater Darwin region has a

number of urban growth areas with the capacity to support new housing, including Zuccoli, The Heights, Northcrest and Lee Point[6]. There are plans to fast track the development of 5000 residential lots in Holtze and Kowandi to cater for population growth in the medium term, with the first stage due for release in 2024. Longer term, there are plans to cater for a population of 40,000 at Weddell.

Bringing Land to Market: An Independent Review of the Land Development Processes, Land Under Development and Titled Land (2022) identified areas for improvement in existing development processes for the release of land, production of lots, authority approvals and initiatives to bring forward titles. The NTG aims to increase the supply of titled residential land, with $132 million allocated over three years in the 2022-23 Budget for developments in Darwin, Katherine, Alice Springs and Tennant Creek.

The Darwin Region Land Use Plan (Planning Commission 2015) notes that housing need in the Greater Darwin Region is changing. The region is experiencing rapid population growth, an ageing population, decline in traditional households with couples and children, increase in lone parents and decline in housing affordability. The land use plan aims to encourage housing choice and influence affordability by encouraging opportunities for various types of residential development.

7.2.1.1 Housing affordability in the Northern Territory

The proportion of the median weekly family income required to rent a three-bedroom house increased by 1.9 percentage points in annual terms to 25.9% in the December quarter of 2021, while the proportion to meet loan repayments increased by 1.6 percentage points to 25.1% over the same period. However, the Territory was the most affordable of the jurisdictions for loan repayments, 11.9 percentage points below the national average of 37%, but ranked the third least affordable for rental affordability, 2.9 percentage points above the national average of 23% (Department of Treasury and Finance 2022).

The Northern Territory Government's submission on homelessness in the Northern Territory (2020b) suggests the private rental market in urban and regional centres is largely unaffordable for low to moderate income households. Vacant rental properties, particularly in major urban centres (Darwin and Palmerston), are high-priced and not affordable options for very low, low and moderate income households and families. The submission refers to the June 2018 Cost of Living Report by the NT Council of Social Services (NTCOSS) which found a lack of rental properties in the NT that could be considered affordable for households receiving income support payments.

Scarce affordable housing contributes to long waiting lists for public housing. As of June 2022, there were 5941 applications for public housing in the Territory but only 162 vacant properties. This included 2443 applications in the Darwin region (with 68 vacancies) and 989 in Palmerston (with 37 vacancies). Waiting lists for one-bedroom housing in Darwin/Casuarina and Palmerston were between 6 and 10 years.

[6] A proposed Defence Housing development at Lee Point has become contentious due to high-profile protests at land-clearing and the recent finding of the threatened Gouldian Finch.

7.2.1.2 Homelessness in the Northern Territory

The Northern Territory's population comprises just 1% of Australia's people, yet the NT accounts for 12% of Australia's homelessness. Aboriginal people make up one-third of the Northern Territory's population, but 88% of the NT's homeless (Department of Local Government, Housing and Community Development 2020a).

Data from the 2016 Census suggests the NT has 12 times the national rate of homelessness (599.4 and 49.8 per 10,000 persons, respectively). The primary causes are a shortage of affordable and appropriately sized dwellings, which contributes to the high rates of overcrowding found across the Territory (NTG submission, Inquiry into Homelessness 2021).

Indigenous Australians rely on public housing because individual land ownership in remote and very remote Australia is difficult to obtain. The 2016 census found that 57% of NT Aboriginal households were rented and 21% of those were public housing (AIHW, 2020). Indigenous people in remote and very remote areas were three times more likely to live in public housing when compared with Aboriginal households in non-remote areas (56 and 17% respectively) (AIHW 2020).

7.2.2 Education and youth services

The Palmerston Environs Regional Social Infrastructure Assessment (Fyfe 2021) suggests a potential oversupply of community centres, community health and private middle and senior schools. This was attributed to the small scale of some facilities as well as a market preference for private education.

There are six middle and/or senior schools in the Palmerston and surrounds subregion as well as Taminmin College (independent public school) at Humpty Doo:

- Palmerston College (government)
- Palmerston Christian School
- MacKillop Catholic College
- Haileybury Rendall
- Sattler Christian College
- Good Shepherd Lutheran College

Table 7-2: School enrolments and capacity, based on Fyfe, in Draft Holtze to Elizabeth River Subregional Land Use Plan Land Capability and Needs Assessment (2021, p.35).

Total enrolment 2021	Enrolled	Capacity	Remaining capacity
Middle	1845	2362	517
Senior	1175	1878	701
Taminmin	1174	1496	322
Total	4194	5736	1540

The NTIPP (2022) outlines a plan for a new pre-primary school at Northcrest, catering for 500 students, within the next 5-10 years.

Fyfe's analysis suggests the need for an additional one or two youth centres, based on moderate and high future population scenarios respectively. It suggests youth centres and services should be in a local activity centre serviced by pubic transport or close to recreation or sporting facilities.

7.2.3 Health

The Palmerston subregion is well-served by three regional health facilities, including the Palmerston Regional Hospital, Palmerston GP Super Clinic and Danila Dilba Health Service facility.

The Palmerston Regional Hospital in Holtze provides 116 hospital beds, emergency facilities and an ancillary specialist day patient service. The 44-hectare site is identified in the Holtze Area Plan 2016 as a hospital and mixed-use health precinct to cater for current and future growth (Fyfe 2021).

While the physical infrastructure may be adequate, the Territory's health services (including the new Palmerston Regional Hospital) have faced staff shortages and burn-out in the past few years, compounded by the COVID-19 pandemic, health budget constraints and a reliance on the recruitment of overseas doctors and nurses (Australian Medical Association 2022).

7.2.4 Emergency services

A new $25 million Palmerston Regional Fire, Rescue and Emergency Services complex, opened in late 2022, will provide a modern fire station and accommodate the Palmerston NT Emergency Service (NTES) volunteer unit. It will provide a 24-hour service for Palmerston, the rural area and the Stuart Highway, replacing a station built in Palmerton in the 1980s.

The new station on Howard Springs Road can accommodate up to 18 career firefighters 24/7. However, as of late 2022, it was allocated only one urban fire truck and one rescue tender. Staff cross crew onto four-wheel drive grassfire firefighting units. The facility has operation and meeting rooms, breathing apparatus room, workshop and communications tower.

Palmerston Fire and Rescue Service responds mainly to grassfires, road accidents, hazardous materials and structure fires from Humpty Doo to Palmerston and along the Stuart Highway. The service relies on volunteer units to respond to and assist with grass fires across all emergency response areas. The nearby Humpty Doo station operates only Monday to Friday, 8 am to 6 pm, and is closed at weekends and after hours.

The Berrimah Fire Station opened in 2013. Based on Berrimah Road, the station can accommodate two crews however has only one urban fire appliance allocated. Staff also cross crew onto grassfire units. It houses a Capability Development Command, fleet development, urban search and rescue, chemical, biological, radiological and nuclear (CBRN) equipment and HAZMAT capabilities.

The NT Fire and Rescue Service (NTFRS) in 2020-21 had 218.7 full-time equivalent (FTE) firefighting staff and 23 civilians. Incident response times averaged 5.45 minutes, compared with the national standard of 8 minutes for turnout and travel time (NTPFES annual report 2020-21).

7.2.5 Aged care

There is an aged care facility in Farrar and an independent living retirement village in Durack. The NT Population Growth Strategy 2018-28 acknowledges a fast-growing population segment, however many are leaving the Territory, partly due to poor availability and affordability of seniors lifestyle and aged care beds. Private sector investment is being sought to address this shortage. Based on the 2016 Census data, there was a 68-place shortfall of aged care facilities in the sub-region, while a future population of 91,000 would require up to four aged care facilities (Fyfe 2021).

7.2.6 Transport

Road transport is a key enabler of industrial activity in the Territory. Productive freight operations contribute to efficient supply chains, while freight costs are a leading indicator of cost of living pressures says Executive Officer of the NT Road Transport Association (NTRTA) Louise Bilato. Road transport routes are a key factor in costs and efficiency.

For the Middle Arm precinct, key transport routes are:

- **Channel Island Road**: a rural sub-arterial, sealed, two-lane road and the continuation of **Elrundie Avenue** in Palmerston, which runs across the Elizabeth River Bridge to the Channel Island Power Station
- **Jenkins Road**, from the Stuart Highway to Channel Island Road, was sealed to provide better access to the Bladin Point LNG plant on Middle Arm (INPEX contributed $8.4 million towards the 13-kilometre, $19 million upgrade).
- **Arnhem Highway:** A route likely to be used for quarry materials, with trucks travelling down the Stuart Highway and along Jenkins Road.

Heavy vehicles generally travel along Jenkins Road and turn left into Channel Island Road to access Middle Arm or right to join up with Elrundie Avenue, as a preferred route to Berrimah and East Arm. The NTRTA says many vehicles, including cattle trucks, use Elrundie Road as a back way to the port to avoid repeated stops for traffic lights on the Stuart Highway. This will worsen with proposed traffic lights at Pinelands and Coolalinga (see below).

7.2.6.1 Transport planning

The Transport Planning section of DIPL is working closely with the NT Planning Commission and MASDP team to provide a master planned approach to transport routes leading to East Arm and Middle Arm. The objectives are to improve road safety, move heavy vehicles away from residential areas and provide reliable transport routes for heavy vehicles. Plans include a new Weddell Freeway to provide access from the Stuart Highway, grade separated rail crossings, fewer signalised intersection, an overpass at the Berrimah Road intersection of Tiger Brennan Drive, duplication of Channel Island Road and improvements to the Arnhem Highway (a key route used to transport quarry materials).

Weddell Freeway

The Weddell Freeway will provide an alternative transport route from the Stuart Highway at Noonamah, near the intersection of the Cox Peninsula Road, to Weddell then on past Archer and Marlow Lagoon to Tiger Brennan Drive. The freeway would take heavy vehicles off Elrundie Avenue, which passes by the back of Palmerston and four schools, and reduce heavy vehicles on Jenkins Road, which is also used by Litchfield residents to access the Elizabeth River boat ramp. The freeway and all interchanges will be designed for road trains, which are the dominant traffic, says Chandan Kalase, Acting Executive Director of Transport Planning.

The preliminary alignment of the freeway is defined and zoned under the NT Planning Scheme. The Holtze to Elizabeth River Subregional Land Use Plan highlights the future need for the freeway. In early 2022, SMEC was awarded a tender to do a planning study, with a draft concept design due to be released in mid 2023, including a construction staging plan. The NT *Infrastructure Plan and Pipeline* indicates a timeline of 15+ years for the Weddell Freeway.

A North-South Weddell Connector Freeway will provide an arterial corridor from Roystonea Avenue and across the Elizabeth River to the future town of Weddell.

Channel Island Road

DIPL is planning for eventual duplication of the Channel Island Road to take account of all likely development on Middle Arm. A major consideration for duplication is reducing the risk of head-on collisions. Planning will take account of access for emergency services, including the separation of utilities and accounting for a potential railway spur line into the precinct.

Berrimah Road overpass

Construction has begun of a Berrimah Road overpass of Tiger Brennan Drive, designed to separate the flow of traffic on Tiger Brennan Drive from traffic movements on Berrimah Road. Funded by the Australian and Northern Territory Governments, the overpass is intended to enhance safety, reduce traffic delays during peak hours and improve connectivity for freight transport to East Arm Port.

Arnhem Highway upgrades

The Arnhem Highway is heavily used by the extractives industry to get construction materials to the Greater Darwin Area. It was heavily used by INPEX to get rock armour from Mt Bundy. There are plans to upgrade the highway, incorporating a planning study to address risks posed by road trains.

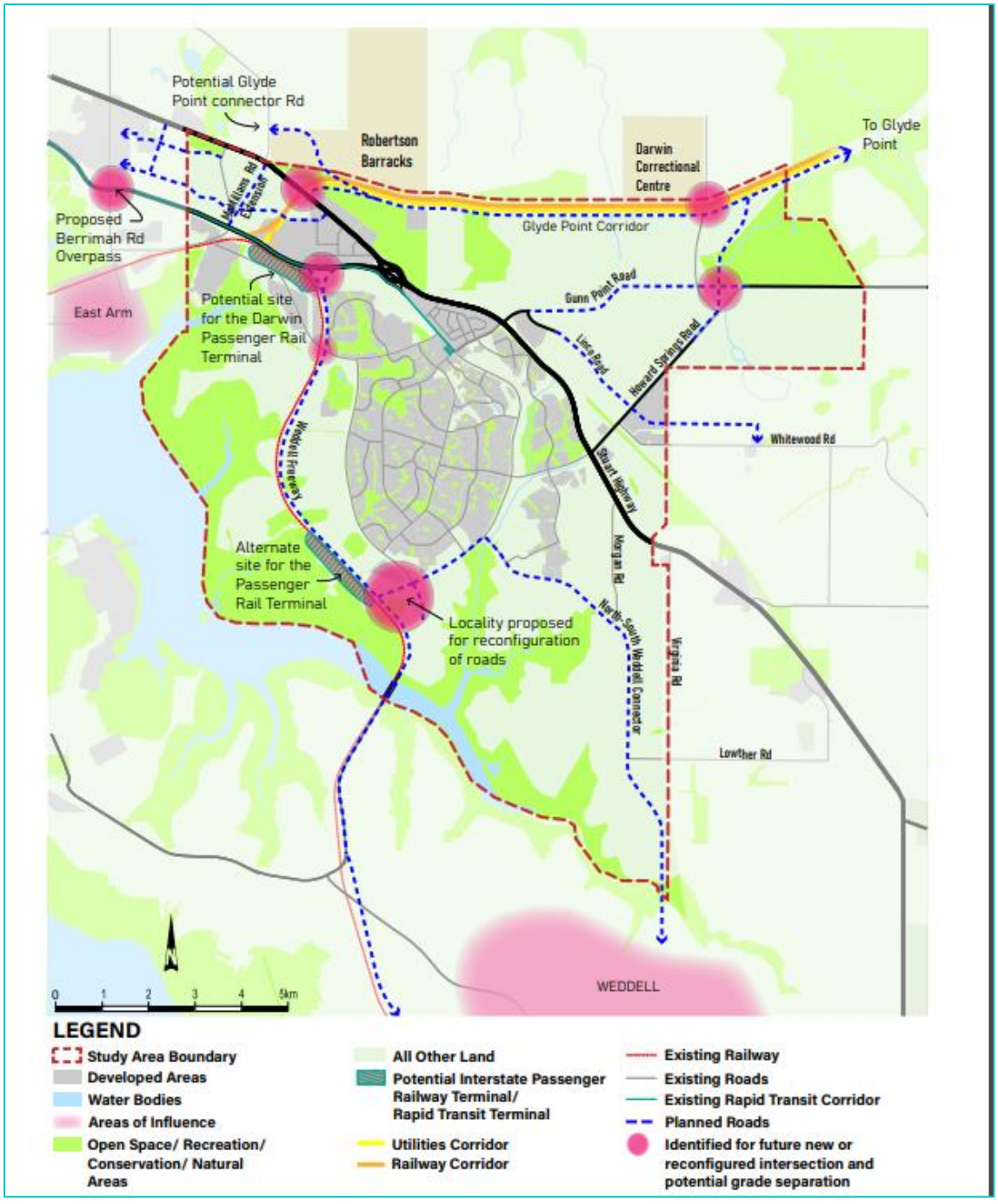

Figure 7-1: Holtze to Elizabeth River Subregional Land Use Plan (2022, p.13), Strategic Transport Network

7.2.6.2 Current road use

A key element of traffic planning is traffic counts of existing traffic, predictions of the mix of light and heavy traffic likely to use transport routes and consequent impacts on road safety (dealt with in Section 6), residential amenity and traffic congestion (see Section 11) and infrastructure priorities.

Transport Planning data

Annual average daily traffic (AADT) counts for Elrundie Avenue, Arnhem Highway and Channel Island Road (totals of inbound and outbound):

Table 7-3: Traffic counts - source Annual Traffic Report 2021 (DIPL 2021)

Roads	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Arnhem Highway (500m East of the Stuart Highway)	6929	7438	7797	7721	7571	7505	7344	6929	6857	7720
Elrundie Avenue (North of Chung Wah Tce)	8189	10,696	11,738	11,801	11,888	11,859	11,442	10,851	10,839	12,395
Channel Island Road, south of Elizabeth River Bridge	1546	2956	4587	3360	2924	3055	3631	1894	1478	1671

Traffic assessment data for Channel Island Road and Jenkins Road intersection

Traffic counts at the Channel Island and Jenkins Road intersection between 2001 and 2021 show an initial peak of 834 vehicles a day during construction of the Darwin LNG plant in 2005, followed by a peak of more than 4587 vehicles a day in 2014 during construction of INPEX's Bladin Point LNG plant. By 2021, this had declined to 1671 average movements a day. Traffic counts in 2022 showed 1295 two-way vehicle movements a day south-west of the intersection and 2805 north-west. Heavy vehicles represented 13.4% and 10.6% of the two two-way movements respectively. The proportion of heavy vehicles was 29.5% for east-bound movements and 12.6% for west-bound (GHD, Traffic Assessment 2022 at Appendix xxxx).

7.2.7 Areas for light industry

The DRLUP 2015 identifies areas for industrial and port-related development, which aligns with Palmerston's Council's Local Economic Plan.

7.3 Key change processes

- mobilisation of workforce and arrival of newcomers to the Greater Darwin Region

- the urbanisation of the Greater Darwin region, with pressures for residential and industrial land release
- start of construction increases demand for utilities such as power and water
- expanded transport network

Industrial development at Middle Arm, combined with the growth of marine and logistics activities at East Arm, is likely to lead to economic and population growth in the Greater Darwin Region. Growth pressures would be compounded by other major projects including Defence, renewable energy projects on Middle Arm and Sun Cable's proposed overhead transmission cable from the Barkly to Murrumujuk on the Gunn Peninsula. The municipalities most likely to experience pressure are the fast-growing Palmerston and Litchfield. The Middle Arm precinct could strain existing social infrastructure or act as a catalyst to planning for expansion, a challenge acknowledged by both the Planning Commission and Territory's Infrastructure Commissioner (see NTIPP 2022).

7.4 Impact assessment for social infrastructure and services

Table 7-4: Impacts on social infrastructure

Potential benefits and impacts – Social Infrastructure and Services	
Potential cumulative benefits	**Potential cumulative impacts**
O-1 Greater community vitality through enhanced social infrastructure	R-9 Saturation of short-term accommodation in Greater Darwin due to demand from FIFO workers
O-2 Enhanced water supply that benefits other sectors	R-10 Pressure on the affordability, availability and quality of housing in the region due to sudden population growth
O-3 Diversified, more reliable and affordable energy supplies	R-11 Population loss due to increased housing and living costs
	R-12 Pressure on transport infrastructure
	R-13 Reduced access and quality of other social infrastructure and services from rapid population growth
	R-14 Pressure on water supply leads to scarcity and constrains residential and industrial growth
	R-15 Reduced resilience and capacity of Greater Darwin's industrial and residential energy suppliers
	R-16 Pressure on emergency services' capapacity to respond to incidents at Middle Arm
	R-17 Budgetary pressures on local government to increase waste management facilities
	R-18 Budgetary pressures on local government to maintain transport infrastructure

7.4.1 Greater community vitality through enhanced social infrastructure

Community vitality is the competence of a community, the strength of its institutions, the agency or capacity of people to seize opportunities, their ability to collaborate to get things done, and

the strength and equality of social and economic institutions. Strategically planned growth may contribute to enhanced community vitality, particularly as new suburbs become home to permanent populations. However, the diffuse and intangible nature of community vitality and challenges in linking cause and effect to the Middle Arm precinct are difficult to rate with certainty. We assign an initial rating of BARELY NOTICEABLE which could rise to NOTICEABLE, particularly with increased housing options.

7.4.2 Enhanced water supply that benefits other sectors

Water is a critical enabler for sustainable economic growth. The AROWS project has been prompted by limitations on Darwin's current reticulated and groundwater supply to accommodate further urban and industrial growth. The return to service of Manton Dam and AROWS project will provide certainty for both Middle Arm and horticultural and agricultural growth and improved the environmental resilience of Darwin's water supply. This is critical to meeting the NTG's aspiration of a $40 B economy by 2030.

Assuming AROWS proceeds, the benefits would be likely and consequential, so are rated as TRANSFORMATIONAL. Given the advanced stages of planning and financial support from the Northern Territory and Australian Governments, this is considered almost certain, subject to regulatory approvals and sequencing of projects aligning with demand and environmental approvals (See 7.4.10 for potential risks if there are delays).

7.4.3 Diversified, more reliable and affordable energy supplies

Competitively priced energy is a fundamental input, along with land and water, to investment attraction and meeting the TERC goal of a $40 billion economy by 2030.

Industrial development at Middle Arm is likely to support any business case for the renewable energy sector in the Northern Territory to meet expanded energy demand. Planning for Middle Arm assumes a stand-alone, common user renewable energy grid which could later be integrated into the Darwin-Katherine Electricity System. There are plans for a renewable energy hub at Weddell. Options to provide renewable energy to Middle Arm and the wider grid include Sun Cable's Australia Asia PowerLink, which could provide industrial-scale supplies to Darwin and Singapore, proposed solar farms along the Darwin to Katherine Electricity System or the recently announced Larrakia Energy joint venture with Perth company Progressive Green Solutions. The Larrakia Development Corporation in November signed a MOU with Korean power company KOMIPO to build a 300 MW solar farm on Middle Arm to supply energy to INPEX's Bladin Point LNG plant and Santos's Darwin LNG plant at Wickham Point.

The Power and Water Corporation in 2022 was engaged in legal action with Eni over provision of contracted gas from the Blacktip field (see Section 7.4.10), which highlights the lack of resilience when a system relies on one source of energy (although contingency gas arrangements are in place with other gas providers). Diversified sources of energy would help mitigate this risk as well as helping the NTG meet its obligations to achieving net zero carbon emissions by 2050.

Power and Water CEO Djuna Pollard sees this as providing real opportunities for the Territory.

While we have a few challenges, the advantage of us being smaller is we should be able to cut through these faster and be nation-leading in terms of Middle Arm and what it offers (interview).

The benefits of more diversified energy sources, while challenging to achieve, are a fundamental enabler of renewables-enabled growth and thus game-changing. Therefore, this benefit, if achieved, is rated as TRANSFORMATIONAL.

7.4.4 Saturation of short-term accommodation in Greater Darwin to house FIFO workers

While the NTG wants to maximise the use of a residential workforce that grows the population, the construction phase of projects in regional areas inevitably depends on short-term external workforces. While the presence of extra workers can boost the local economy, surges can saturate local hotels and rentals, drive up prices and displace tourists and other visitors.

Solutions include purpose-built towns (common with remote mines) or a dedicated workers' village which can be dismantled or bequeathed as a community asset. ConocoPhillips, which began construction of the Darwin LNG plant in 2003, built a workers' village and bused workers to site. INPEX, which had a peak workforce of 10,000, built a 3500-bed Howard Springs workers' village, *Manigurr-ma,* at Howard Springs. Now an NTG asset, the village was repurposed as a quarantine centre during the COVID-19 pandemic. The privately-owned Bladin Workers Village on Middle Arm was repurposed as an immigration centre.

The experience with INPEX was that short-term accommodation was still saturated by contractors, management staff and service providers, symbolised by large white buses delivering workers wearing 'high vis' to hotels and rental properties around Darwin, which dented the tourism market for several years (see Section 8).

The need for worker accommodation to support peak construction periods at Middle Arm precinct or project shut-downs will depend on the sequencing of construction and ability to find suitable workers in a thin labour market. Solutions include reactivating an existing facility or building a workers' village at nearby Weddell to service all Middle Arm projects, which could be repurposed or remediated Weddell grows. The Bladin Village, owned by Trepang Services, can accommodate 750 workers and may be an option for smaller numbers (but would more likely be impacted by amenity issues, such as noise, and midges).

The potential scale of change, duration and consequences of multiple large-scale projects saturating Darwin's short-term accommodation suggests an initial risk rating of HIGH. Forward planning, good sequencing and collaborating on a Greater Darwin workforce accommodation strategy could reduce the rating to MEDIUM.

7.4.5 Pressure on the affordability, availability and quality of housing in the region

Darwin's relatively small housing market is susceptible to disruption by any sudden influx of workers and their families seeking to buy or rent properties. This would be most likely in

Palmerston or Litchfield suburbs closer to Middle Arm but could have a ripple effect throughout the region.

Housing affordability and scarcity has both social and economic consequences, by squeezing low income earners out of the market and inhibiting economic growth. Regional towns around Australia are reporting housing shortages, with people resorting to caravan parks, tents or living in cars. Territory towns such as Katherine are unable to attract either service or construction workers because of saturated and inflated rental markets driven by major construction projects. NT Shelter has called for action to address Katherine's housing crisis, as people struggle with both availability and affordability of rental properties (Cook 2022). In Whyalla, South Australia, the Regional Australia Institute (2022) found migration levels rose 55% in the year to September, with concerns that a critical housing shortage will be exacerbated as thousands of workers are sought for a proposed $593 million hydrogen plant (Selby 2022).

A planning dilemma is that these pressures may be short-lived. A trend to regional migration during the COVID-19 pandemic is slowing, with a net out-migration of 2% from Darwin in the year to September 2022 (Regional Australia Institute 2022). Over-reacting to an over-heated market can lead to gluts and financial losses for individuals and businesses who invest at the peak, as occurred in Gladstone, Queensland, where three LNG plants concurrently provided worker accommodation that was often completed after demand abated (Munday 2020b).

Key planning measures could include temporary accommodation, the sequential staging of development and accurate forecasting of demand to ensure alignment with government land release and private sector investment. Factors that could confound sustainable growth include the cumulative impacts of several major projects starting up concurrently, or a Defence build-up in response to geopolitical pressures. The risk will be difficult to predict and manage as demand will be driven by commercial pressures, market forces and human behaviour. Affordability pressures could be exacerbated if rents or rental subsidies and childcare fees are paid by companies as an incentive to relocating workers. The INPEX experience is that, despite providing a 3500-bed accommodation village at Howard Springs, many workers preferred to live in the community, often with their families, which created significant, but short-term, inflationary pressures on the housing market. Once construction finished, most of these families left (ABS 2022).

The negative consequences of housing scarcity include lower income earners being priced out of the market and downward pressures on already scarce public housing. This vulnerable population segment is likely to comprise long-term Territorians, so the risk can be mitigated to a large extent by government investments in social housing and essential worker accommodation.

Current land use planning is predicated on rapid growth in Palmerston overflowing to new developments in Litchfield, then Weddell as sub-divisions such as Durack Heights, Zuccoli South and Northcrest reach capacity. The Greater Holtze area could support a population of 30,000 to 35,000 people, with $44 million allocated in the 2022 Territory Budget to fast-track land release for future population growth. Headworks have started to provide the first 5000 lots at Holtze, to cater for a population of 15,000. The Holtze to Elizabeth River Subregional Land Use Plan (2021), which includes Greater Holtze, looks to short, medium and far-term development of Greater 11

Mile, Virginia South-West, Archer and Mitchell West, catering for far-term growth (by 2050) of 15,500 dwellings. Weddell could accommodate 40,000 people. A key scenario in a Weddell planning workshop in 2010 was that it would provide a residential base to support industrial activities at nearby Middle Arm. Various private developments proposed in areas such as Noonamah and the eastern sections of Weddell could be re-activated based on certainty of demand.

Current land use planning appears to provide the flexibility to respond to changed market conditions, reducing an initial risk rating of HIGH to MEDIUM given there are many factors beyond government's control.

7.4.6 Population loss due to increased housing and living costs

ABS and CDU research suggests that people come to Darwin for work, generally in their 30s, and many leave when jobs come to an end (see Section 6.2.3). Higher prices may inhibit the recruitment of lower-paid workers, however (as discussed above) the people most likely to be affected by inflationary pressures are likely to be those who have no desire or ability to leave. This is most likely to affect disadvantaged and vulnerable groups through downward pressure on public housing and rental costs. A key mitigation strategy would be a well-managed accommodation strategy and the Planning Commission's land use planning, which takes a short, medium and long-term perspective of likely housing demand and how best to meet it. This would reduce an initial risk rating of MEDIUM to LOW.

7.4.7 Pressure on transport infrastructure

Increased industrial traffic is likely to put pressure on existing transport routes linking Middle Arm to the Stuart Highway, Berrimah and East Arm Port. As described in 7.2.6, there was a substantial increase in heavy vehicles on Channel Island Road during construction of INPEX's Bladin Point LNG plant.

However, the Executive Officer of the NT Road Transport Association (NTRTA) Louise Bilato and Acting Executive Director of Transport Planning in DIPL Chandan Kalase believe pressures on transport routes can be alleviated with good forward planning.

On transport routes, the NTRTA says key issues are adequate merging and exit lanes and minimising signalised intersections that require heavy laden road trains to stop.

> *Every traffic light fully loaded is 20 litres of diesel at $2.50 a litre. When you pull up at the lights and drop all the gears, that first kilometre (afterwards) burns 20 litres of diesel, with 2.7 kilos of C02 emissions for every litre. (Louise Bilato, interview)*

In the precinct, key issues are ease of access to deliver and unload equipment, include adequate space to manoeuvre and laydown areas. Drivers at other major industrial facilities have reported that poor design can turn a one-hour task into a day, adding to costs and reducing productivity.

Another key requirement for road transport operators is over size over mass (OSOM) road corridors with underground power. Louise Bilato suggests removing overhead power lines or

increasing the height of those crossing freight supply routes to 9 metres. It is time-consuming and costly obtaining permits from the Power and Water Corporation and getting powerlines lifted for oversize transport.

Suggestions from the NTRTA:

- good forward planning forecasts of the freight demands and access requirements of prospective precinct operators to enhance the productivity of road transport
- extend public transport to Middle Arm, to ensure apprentices and young trainees can get to work
- good access to the precinct's common user marine facilities for OSOM transport to overcome limitations at East Arm Port, including overhead cranes
- duplicating Amy Johnson Drive to provide a corridor that would avoid duplicating Berrimah Road
- regional hubs with laydown areas, some level of security and catering for drivers (similar to the road train area at Berrimah)
- short-term accommodation for drivers and specialist service providers near the Port and Middle Arm, similar to the Quest serviced apartments at Berrimah
- good passing and emerging lanes wherever road trains will be turning
- traffic planning for the precinct that accommodates local road transport capacity, experience and equipment, rather than short notice of jobs without adequate staging areas (which may see work go to interstate operators).

Growth is likely to place pressures on the capacity of existing transport routes in the Greater Darwin region from increased residential and industrial traffic. The Litchfield subregional land use plan identifies arterial transport corridors, while the Holtze to Elizabeth River Subregional Land Use Plan highlights the need for the Weddell Freeway.

The Middle Arm precinct is likely to see significant growth in the volume of traffic on the surrounding road network. Channel Island Road and Jenkins Road currently serve as the two primary routes into the proposed MASDP, which may trigger future road network upgrades to accommodate the expected construction and operations traffic for each facility (GHD Traffic Assessment 2022 at Appendix xxx).

DIPL in 2022 began planning studies for a proposed Weddell Freeway, which would provide access to Middle Arm and greenfield development in the future town of Weddell. The Weddell Freeway is proposed to run from Tiger Brennan Drive near Palmerston, along the railway line west of Palmerston and through Weddell, before connecting to the Stuart Highway near the Cox Peninsula Road near Noonamah.

The unmitigated risk of pressure on road transport is HIGH given likely cumulative pressures. However, it is a risk that can be mitigated given the current transport planning focus on road infrastructure from DIPL, Infrastructure NT, the NT Planning Commission and the MASDP planning team. There are substantial budgetary implications, so staging of infrastructure upgrades will be critical in reducing this risk to LOW.

7.4.8 Reduced access and quality of other social infrastructure and services from sudden population growth

Social infrastructure is well-catered for in the growth areas of Litchfield and Palmerston, with a new hospital and schools. The predicted negative impacts will be less on the 'bricks and mortar' components of this infrastructure than on the operational budgets and staffing levels to provide adequate services, as already evidenced by the new Palmerston Hospital and Palmerston Fire Station. Staffing levels would be impacted by national worker shortages and exacerbated by budgetary pressures and the cost of living.

The Holtze to Elizabeth River Subregional Land Use Plan makes provision for strategic corridors for main roads, rail and utilities. Two options for an alternative passenger rail terminal are being considered along the Weddell Freeway route, one at Archer and the other off Tiger Brennan Drive on the approach to the current passenger terminal at East Arm.

Current land use planning suggests this as a MEDIUM risk, given the ability to respond to short, medium and long-range demand. Depending on workforce trends, the key impact may come from staff shortages rather than an investment in bricks and mortar, hence the risk rating remains at MEDIUM.

7.4.9 Pressure on water supply leads to scarcity and constrains residential and industrial growth

Darwin's water supply is inadequate to support population growth, relies on one primary water source, groundwater in the rural region is oversubscribed and potential industrial growth is constrained (PwC 2022, p.33).

Manton Dam, 50 km south-east of Darwin, was built in the early 1940s and was Darwin's main water source until Darwin River Dam was commissioned in 1972 to provide a reticulated water supply. The dam is now under care and maintenance and used mainly for recreational purposes. Darwin River Dam has for the past 10 years operated at its sustainable yield. This water supply is supplemented by groundwater resources in the rural area which are largely over-allocated. Much of the rural area relies on bore water for residential, horticulture and agricultural purposes, with sustainable groundwater extraction set at about 20% of annual recharge (Planning Commission 2016).

The three key drivers of additional demand are forecast urban growth, industrial demand (particularly at Middle Arm) and agricultural and horticultural growth.

AROWS is a proposed new reservoir to the west of Adelaide River, five kilometres north of Lake Bennett, which could store water harvested from wet season flows. AROWS has been assessed as having a lower environmental and cultural impact than in-stream options such as previously proposed dams at Marrakai, Mount Bennett and Upper Adelaide River.

The Territory's Strategic Water Plan outlines the return to service of Manton Dam to supply 7300 megalitres (ML) a year through new pumping stations and pipelines, while the yield from AROWS has been estimated at 60,200 ML a year by capturing wet season flows in a natural saddle with

pumping and pipeline infrastructure (NT Infrastructure 2022). This is double the existing annual supply of 32,000 ML from Darwin River Dam. The Adelaide River Catchment is one of the largest in the Darwin region, with reliable availability (PwC 2022, p.32).

The PwC report (2022, p.17) suggests the scale, approvals and development timeframe for the AROWS project create a risk that it may not be operational by 2025/26 when an additional urban water supply will be needed. However, this can be addressed by returning Manton Dam to service.

The water strategy business case discusses 'disaggregated water supply' options, being desalination and recycled water plants. Desalination could be an interim measure or to meet the large demand for water by green hydrogen plants. A small reverse osmosis desalination plant at Middle Arm was considered as an option by the PwC Detailed Business Case (2022). The report finds that this option offers flexibility, in terms of location and staging. However, desalination plants tend to have high operating and capital costs and require large amounts of energy (p.17). The public has little information on this option or understanding of the implications. Aquaculture businesses were concerned at potential negative impacts from desalination (see Section 10.3).

The MASDP includes a 12 GL common user desalination plant. The EIS will include modelling of water quality impacts from the discharge of brine and cooling water at Chapter xxx. The precinct would require a Waste Discharge Licence for the discharge of any brine, however, there is a commitment of no discharge to Middle Arm.

The recycled water plant option would treat wastewater from the Palmerston treatment plant. Recycled waste water, while meeting sustainability goals, would be challenging and expensive for a small population like Darwin.

A survey for the business case found the highest level of support was for the Manton Dam return to service option:

- Manton Dam Return to Service 52% supportive
- AROWS 50% supportive
- Disaggregated water supply 37% supportive

The cost-benefit ratio of the AROWS and Manton Dam combined option was 1.7 at 4% discount rate but only 0.6 for the disaggregated water supply option (p.30 of business case).

AROWS will require assessment under *Environment Protection Act 2019 (NT)* and Commonwealth *EPBC Act*. The business case recommends a water allocation plan for the Adelaide River catchment to provide for stakeholder input and consideration of other beneficial users. There are likely to be concerns from recreational users regarding the return to service of Manton Dam. The AROWS project has potential cultural and ecological impacts if extraction impacts on flushing of the river and the Adelaide River flood plain (interview with Humpty Doo Barramundi).

Stakeholders wanted more information on how this project would impact on cultural and economic values.

Given that Darwin's reticulated water supply is operating at its limits, proceeding with further industrial development ahead of delivery of the AROWS project, could lead to water restrictions,

constraints on residential and industrial development and investor uncertainty. A centralised desalination plant or individual proponents' plants could mitigate against this risk but bring implications of their own, including public concerns, which would need assessment. This risk is considered likely and extremely consequential given Darwin's reliance on one water source already at its limits. It is being assessed as part of the EIS at xxxxxx .

The Power and Water Corporation sees water as a key enabler of growth. Risks include dependence on one source of supply and demand exceeding supply, which it is trying to manage by reducing water consumption.

In order to balance supply and demand, "we need to be involved in the upfront discussions and the sequencing (of large projects)", says Power and Water CEO Djuna Pollard.

Given the fundamental importance of a safe and reliable water supply, any threats would have VERY HIGH consequences for both commercial and industrial customer. This rating reduces to HIGH given that additional demand from both MASDP or associated projects outside the precinct may still precede augmented supply. While the Manton Dam return to service option would likely meet the needs of initial projects, the timing of the AROWS project may depend on regulatory approvals. A 12 GL desalination plant is part of the common user infrastructure for the MASDP.

The indirect social, economic, environmental and cultural impacts from the AROWS project are beyond the scope of this study and should be addressed in any consultation and social impact assessment for the AROWS project which will start in 2023.

7.4.10 Reduced resilience and capacity of Greater Darwin's industrial and residential energy supplies

The supply of electricity, water and sewerage services is essential for the comfort, health and productivity of Territory households and businesses (Utilities Commission 2022). The role of the Power and Water Corporation is to provide safe, reliable and affordable power and water services across the Territory to cater for existing needs and accelerated growth. This includes the enabling of renewable energies to reach the Territory's goal of 50% renewables by 2030 (Power and Water Corporation 2021) while enabling the Territory Economic Reconstruction Commission's goal of a $40 billion economy by 2030.

The Territory's energy security faces three threats:

- aging gas-fired power stations and the ever-present threat of a 'system black', or widespread power failure
- connecting renewable energy generators to the Darwin-Katherine Electricity System grid while maintaining system security and reliability
- threats to the security of Blacktip gas, currently the only source of energy for Darwin's Channel Island power station.

Aging gas-fired power stations

The Utilities Commissioner has pointed to issues with Territory Generation's ageing thermal gas-based generators. Nine of the 19 thermal generation plants are expected to be retired between 2027 and 2030, accounting for 200 MW of the current 425 MW capacity.

Low-cost solar provides the perfect opportunity to replace thermal generators (NT Government 2019). However, there is still a need for new thermal generation to replace some of the retiring plants. The challenge is keeping the system secure while progressively retiring heavy thermal generation and incorporating new renewable supplies.

Challenges connecting to the grid

The Power and Water Corporation aims to balance the opportunities of renewable energy technologies with power system controls to ensure the safety, security and reliability of the Darwin-Katherine power supply system.

The challenges are two-fold. The first is maintaining supply based on the current minimum baseload demand. The second is threats to the stability of the grid should new energy sources come online ahead of customer demand, combined with the intermittent nature of renewable energy transmission.

When households or businesses 'flick the switch', they expect the lights to go on, which means the grid needs to be sufficiently flexible to match peaks and troughs of demand. But too much power surging into the grid can shut down the finely calibrated system, particularly as solar power from rooftop solar installations is generated during the day but peak demand is in the evening.

Stand-alone solar grids supply power in places such as Jabiru and to Darwin Airport. Solar farms could sign offtake agreements to provide dispatchable energy to individual proponents at Middle Arm, with independent grids, directly-connected transmission lines and batteries to store excess energy.

However, industrial scale additional renewables supply to the grid would require a) commensurate demand from customers b) meeting minimum Generator Performance Standards (GPS), which include parameters such as frequency, voltage and system strength, and c) battery storage to manage the intermittency of supply.

A $45 million Channel Island battery energy storage system (BESS) will help stabilise the power grid and reduce emissions. Government documents refer to plans for a renewable energy hub and a high-capacity transmission line that could transport large-scale solar between Hudson Creek and Channel Island using existing energy infrastructure. A Larrakia Energy joint venture is proposing a solar farm to be in production on Middle Arm by 2024 as a source of renewable energy for INPEX and Santos (see Section 7.4.3.

Threats to Blacktip gas

Darwin is part of the Darwin-Katherine Electricity System, a stand-alone grid reliant on natural gas from the Blacktip field, supplemented through a back-up agreement with INPEX's LNG plant on Middle Arm. The Power and Water Corporation in 2022 is engaged in legal action with Eni, operators of the Blacktip field, over Eni's failure to provide contracted volumes of gas. Production

fell by nearly 50% in 2022 (Fitzgerald 2022). This shortfall halted the operations of the Northern Gas Pipeline from Tennant Creek to Mount Isa for a number of months at the end of 2022.

These risks to energy security would be partly ameliorated by diversified energy sources and transitioning to renewable energy. The Sun Cable project aims to contribute competitively priced electricity at scale by 2026, which could be a key enabler of energy-intensive industries at Middle Arm. Renewables can help meet industrial-scale demand at Middle Arm, either through stand-alone transmission lines or by integration with the grid, subject to providing firming services[7] to ensure an uninterruptable power supply.

However, much work remains to be done, says Power and Water CEO Djuna Pollard. As with new water supplies, the shift to renewables will rely on:

- appropriate sequencing of supply and demand
- smaller and more agile generators that can seamlessly augment interruptible power supply
- regulatory frameworks that allow renewable energy to join the system while keeping it safe and secure
- new skillsets to support this activity such as power system modellers, engineers and control systems experts.

Power to the MASDP and other Middle Arm industries is likely to be a mix of onsite gas generation, dedicated renewables transmitted from offsite or connection to the grid if there is capacity.

Any additional demand for energy from the grid before technical issues are resolved would present a security risk for existing residential and industrial users in the Greater Darwin Region. The MASDP team advises that a common-user, stand-alone renewable energy grid is planned for the precinct. Given that some proposed projects are likely to be big energy users, these projects could not proceed without dedicated renewable energy options being available, which mitigates risk to other uses.

An additional issue is the viability of the Power and Water Corporation, Territory Generation (which generates energy) and Jacana (which retails it) if private energy sources undermine the viability of the government-owned system, which is already heavily subsidised to reflect a thin market.

Given the fundamental importance of access to stable and secure power supplies, threats to the system would attract a VERY HIGH rating, reducing to MEDIUM should no energy be required from the existing grid, with potential to connect to the grid once policy and technical issues are resolved. If power is required from the grid in the interim, this risk would be VERY HIGH. Clarify

7.4.11 Pressure on emergency services' capacity to respond to incidents at the precinct.

The NT Fire and Rescue Service (NTFRS) is concerned that the Middle Arm precinct presents a

[7] Firming is 'maintaining the output from a variable, intermittent power source, such as wind or solar, for a committed period of time' (Clean Energy Council).

serious challenge to both emergency services and companies operating in the precinct. This would be a safety risk for Darwin and an investment risk for proponents.

In its submission to the Draft TOR for the strategic assessment, the NTFRS says it has "extremely limited capacity or capability" to respond to potential HAZMAT or Chemical, Biological, Radiological and Nuclear (CBRN) incidents in the Greater Darwin Region, let alone Middle Arm, which is up to 40 minutes' away from the nearest stations at Berrimah or Palmerston.

While the precinct or individual proponents should have their own emergency response teams (see Section 7.4.12.10):

> *… they operate with skeleton crews so they can manage until the cavalry arrives. We are the cavalry, but if we haven't got horses, you might as well pack up and go home… when people call 000, they expect a response. (Mark Spain, Chief Fire Officer, interview)*

The Middle Arm precinct could prompt enhanced emergency service capabilities in the Greater Darwin region, providing the rationale for:

- specialist firefighting and urban search and rescue capabilities
- a new fire station to service industrial and residential development at Weddell and Middle Arm
- a dedicated training facility that could provide user pays services across Northern Australia, PNG and Timor.

This section discusses the limitations of the Fire and Rescue Service to respond to incidents at Middle Arm, then provides some solutions and recommendations.

7.4.11.1 Failure to keep up with growth

A key issue is that, since the 1980s, Darwin's population and infrastructure has grown rapidly, over a vast area. There are more hazardous industries, high-rise buildings, high-volume flights, heavy vehicles carrying hazardous materials (military and mining chemicals) on the Stuart Highway or through built-up areas, new mines (such as Core's lithium project on the Cox Peninsula Road), Defence activities, international shipping and gas-based industries. Growth of the Fire and Rescue Service – staff, appliances, equipment and specialised training – has not kept pace. The last additional station was opened at Berrimah in 2013, with an additional 20 firefighters. Otherwise, funding has covered only 'old for new' replacement.

Chief Fire Officer Mark Spain commented that Darwin has become a capital city, with capital city risks, served by a regional town's generalist fire service with little firefighting and rescue capacity for major incidents that are the same as those responded to in big cities.

7.4.11.2 Response times

The national standard for response times is eight minutes. Emergency response teams (ERTs) at industrial facilities, such as INPEX, Santos and fuel tanks at East Arm, are designed to provide an immediate response and containment until the Fire and Rescue Service can respond.

The new Palmerston fire station, which opened on Howard Springs Road in November 2022, will cover Palmerston and nearby rural areas. It is about 20 kilometres from the Middle Arm precinct,

with an estimated response time of 20-30 minutes via Roystonea Avenue and Channel Island Road, if the crews are on station and not already tied up at another incident. Berrimah Fire Station is about 25 kilometres (25-30 minutes based on the time of day) from the precinct, requiring travel along Wishart Road and Elrundie Avenue to Channel Island Road.

The NTFRS hazardous materials capability resides at Darwin Station, in Stuart Park. Two dedicated rescue appliances at Marrara and Palmerston cover Darwin, Casuarina, Marrara and Berrimah, Palmerston and Humpty Doo emergency response areas (ERAs) and outside the ERAs.

The airport's fire service can respond, but only if there is no high volume aircraft at the airport or due to arrive.

7.4.11.3 Emergency response capacity

Pressure on all emergency services is exacerbated during the Dry season, when permanent and volunteer firefighters operate at capacity to respond to grassfires. A requirement to divert resources to an incident at Middle Arm would leave the rest of Palmerston and the rural area exposed.

There is low 'surge capacity', or ability to scale up, compounded by current and ongoing industrial relations issues. Several recent incidents in Darwin stretched or exceeded the Fire Service's resources:

- CarCom fire at Bishop Street, Woolner, in early 2022
- the Wyuna cold stores fire at East Arm in 2011, where the Fire Service called on the Airport Fire Service for bulk foam (leading to a multiple fatality at the intersection of Tiger Brennan Drive)
- the Asian Emporium fire, Coconut Grove in 2020
- the Asian United Foods warehouse fire, Bishop Street Woolner, in May 2018
- a Health Department warehouse fire in August 2022.

In Darwin, a high-rise fire might get a response from two units with 16 firefighters that in Sydney would attract 100 firefighters. A major incident also leaves other emergency response areas exposed, which means the NTFRS is no longer able to meet its statutory obligations.

The NTFRS is often thought of as just fighting fires, but its mandate extends to road crash rescue and urban search and rescue (USAR), such as collapsed buildings, cyclones or rapid assessment for an incident such as the Christchurch earthquake in New Zealand. At present the service has limited USAR capabilities, which could be an issue if there are building collapses at the construction stage of the Middle Arm precinct.

7.4.11.5 Inadequate staff and appliances

The NTFRS has limited specialist equipment, such as technical rescue services, specialised aerial and bulk foam appliances. There are only two technical rescue appliances in the Greater Darwin Region, only one of which holds technical rescue equipment for rope or confined space rescue.

7.4.11.6 Lack of adequate training facilities

Training at existing fire stations is constrained by their proximity to residential areas, for example, 'hot burns' (simulated fires) at the Stuart Park station produce smoke. PFAS contamination from firefighting foam remains a legacy issue at many stations. The EGRT (oil and gas training facility at CDU) is being used for recruit training but its capacity is limited to about 10 people. In Queensland, the White Island training facility is at the back of an industrial area, whereas those in Darwin are near residential areas.

7.4.11.7 No capacity for at sea or shipboard response

The NTFRS has no capacity to respond to an incident at sea or shipboard incidents other than to 'hop onto a tug'. There is uncertainty about how the Harbour Master and NTFRS would collaborate in the event of a major incident (fires on board are the responsibility of the ship's captain, ships tied up at the wharf are the responsibility of the Harbour Master). A larger tug fleet will be needed in the harbour, with enhanced firefighting capacity (This issue is discussed in the navigational safety report (Royal HaskoningHDV and will require further discussion during the detailed design phase.)

7.4.11.8 Utilities corridor

The Fire and Rescue Service also raised the risk of the single road and utilities corridor leading into Middle Arm. This could hamper any emergency response but also increase the vulnerability of utilities to emergency incidents or even bushfires. The Acting Executive Director of Transport Planning Chandan Kalase advises that transport planning will take account of emergency services access, a new utilities corridor and separation between utilities.

7.4.11.9 The risks

The risks arising from development on Middle Arm include:

- a number of essential utilities (water, energy transmission lines) entering the peninsula along a shared corridor which could be damaged or destroyed by an emergency
- the co-location of a number of volatile or hazardous substances
- the geopolitical risk of so many industries and fuel storage being confined to a relatively small area
- the investor risk of not being able to respond in a timely and adequate way to any major marine or precinct incident.

In summary, the likelihood of a hazardous incident increases with the scale of industrialisation. The consequences of any incident would be VERY HIGH. Depending on the ultimate mix of activities, capacity of emergency response teams, dedicated location for a new fire station and incremental compounding of risk through staged development, this would still attract a HIGH rating given the human consequences of a major incident (need access to findings of emergency infrastructure planning work which may lead to a revised rating)

7.4.11.10 Mitigation and planning

There is substantial emergency infrastructure planning work being done for the MASDP that addresses prevention and preparedness for major incidents. Large industrial facilities on Middle Arm and East Arm will be required to have appropriate emergency response plans as part of their

work health and safety obligations. The precinct or individual proponents would need emergency response teams (ERTs) to provide the first response to an incident. The structure and complexity of the ERT would relate to the level of risk.

The role of an ERT would be to evacuate the immediate workplace, contain the incident as much as possible and raise the alarm. Specialist resources would then respond, ideally from the nearest station with appropriate equipment, appliances and training.

This means a new fire station is needed at Middle Arm or at Weddell, in an industrial area and away from incompatible activities. A combined fire station and training area would allow for crew rotations and an emergency response base. Its capacity could be scaled up as the precinct grows.

Ideally, any training ground could be connected to the common user industrial wastewater plant planned for the precinct so training can include foam.

An emergency response would require a minimum of two pumpers, a specialist HAZMAT/rescue vehicle, one watch commander to set up incident control and 12-16 firefighters per watch.

The MASDP project will require Darwin Harbour to have larger tug fleets to tow ships, to be on standby when severe storms occur while ships are at berth and with firefighting ability. The Royal HaskoningDHV navigational safety assessment suggests that additional firefighting would be needed for methanol plants in particular, including special training of tugboat captains and infrared capability due to the way methanol burns

Recruitment for additional staff needs to start early, not once construction begins. A needs analysis is recommended for emergency responses to Weddell in the context of preparedness in the Greater Darwin Region. The Chief Fire Officer suggests an additional 50 staff are needed.

Substantial volumes of water would be needed for an emergency response and, potentially, foam. This needs to be available to Australian standards, with a set number of hours of water supply and pressure (10 L/second at 300 kPa until the NTFRS arrives).

The Middle Arm development could provide the rationale to build a new fire station with a dedicated training facility. The opportunities from this include:

- charging a levy or fee for service to precinct users to cover the expense of upgraded capacity
- the ability to expand NTFRS training, which is also an efficiency gain as training can be structured around call outs
- the capacity to provide joint emergency management and hazardous materials training services for a range of agencies across Northern Australia, including Air Services Australia and neighbouring countries such as Timor, Papua New Guinea and South East Asia.

7.4.12 Budgetary pressures on local government to increase waste management facilities

Industrial development on Middle Arm and associated population and industrial development in the Greater Darwin Region is likely to strain waste management facilities in the three municipalities.

Shoal Bay Waste Management Facility is operated by the City of Darwin and services the greater Darwin region. It is the only licensed landfill in the area. The facility comprises a lined putrescible waste landfill and an inert landfill cell. It receives more than 180,000 tonnes of waste a year, with a forecast operational life until 2034. Council is upgrading the facility and encouraging recycling to reduce the volume of material entering landfill. Simone Saunders, CEO of Darwin Council, was keen to understand the implications of Middle Arm for Shoal Bay. (www.darwin.nt.gov.au/resident-services/waste-recycling/shoal-bay-waste-management-facility).

The NTIPP (2022) allows for expansion of Shoal Bay over the next 5-10 years, while the Litchfield Subregional Plan (2016) makes provision for a new regional waste management facility.

Individual proponents will be responsible for their own waste management in accordance with regulatory requirements under the Waste Management Pollution Control Act and will need to develop waste management plans as part of an approval notice application. Listed wastes will need to be disposed offsite at a licensed landfill (Shoal Bay). Proponents will be encouraged to recycle, in line with the NTG's circular economy strategy. The amount of additional waste is unknown and no new waste facilities are proposed as part of the MASDP strategic proposal.

This risk has an initial rating of MEDIUM, reducing to LOW should government funding keep pace with increased demand for a new facility. See 7.4.4 (above) for the opportunity.

7.4.13 Budgetary pressures on local government to maintain transport infrastructure

Litchfield Council's CEO Stephen Hoyne raised the issue of wear and tear on municipal roads from trucks carrying quarry materials, such as rock armour from Mt Bundy, and the consequent costs to council. Transport Planning advises that upgrades are planned to the Arnhem Highway, partly in recognition of its use for quarrying materials.

Pressure on local government roads could also come from commuter traffic and the extractive industry moving to leases on the Cox Peninsula, requiring access along the unsealed Finn Road, which is maintained by Litchfield Council. This risk is rated as LOW given the demand is not likely to be immediately substantial, however it should be factored into medium and long-range planning.

7.5 Recommendations

In general, the risks of social infrastructure failing to meet demand are low due to the land use planning and needs analysis already done by the Planning Commission and the 'infrastructure ecology' approach of Infrastructure Northern Territory. Both take account of likely economic development, population growth, the need for adequate social infrastructure to support the Territory's wellbeing and quality of life and a flexible implementation pathway to meet predicted needs.

The key gaps that attract a higher risk rating are the capabilities of the Fire and Rescue Service to respond to an emergency at Middle Arm; the resilience and reliability of the Territory's energy infrastructure; and pressure on Darwin's limited water supply.

7.5.1 Common user workers' village

It is recommended that the NTG:

- explore options for a common user workers' village to cater for collective demand for external workers
- consider repurposing an existing facility or a dedicated facility at Weddell that can be repurposed or dismantled as Weddell grows.

7.5.2 Accommodation strategy

It is recommended that the NTG:

- prepare a regional accommodation strategy that takes account of the pipeline of projects, labour market conditions, the likely demand for accommodation from contractors or those on short-term contracts wanting to live in the community, number of families likely to relocate and projected population growth
- where possible, encourage staged development of projects to allow for an incremental market response
- encourage private sector investments in additional housing options, based on good market signals from government research
- provide key worker housing to ensure continued provision of social services (in line with the regional accommodation strategy)
- mandate caps on precinct proponents' use of short-term accommodation, subject to vacancy rates.
- require precinct management to gather data on where workers and their families are living as an evidence base to track implementation of any strategy.

7.5.3 Water planning

Precinct staging should:

- take account of potential sequencing of projects in line with Darwin Region Water Supply Strategy and options such as Manton Dam return to service and AROWS coming on line to ensure demand does not exceed augmented supply
- require efficient water use, recycling and use of waste water as conditions of approval (a 12GL desalination plant is proposed for the MASDP as a contingency water supply and is assessed as part of the EIS).

7.5.4 Energy supply

- the precinct proceed only once proponents have established their own energy supplies and a common-user, stand-alone renewable energy grid is in place so there is no

dependence on the Darwin-Katherine Electricity System until current policy and technical issues are resolved (implementation of the Territory's energy reforms and technical solutions would eventually allow integration with the public electricity grid).

7.5.5 Transport planning

Recommendations for transport mainly reflect existing precinct and NTG policies and plans already in place, namely:

- continued transport planning, matched by appropriate budgeting ahead of increase heavy traffic demand
- construction of the first stages of the Weddell Freeway to provide a de-signalised route to East Arm and Berrimah once demand justifies the cost
- duplication of Channel Island Road as heavy vehicles increase
- public transport to Middle Arm for workers, particularly apprentices
- adequate lay down areas for freight
- well-designed entry, turn-around and exit space for heavy vehicles in common user areas
- proponent traffic plans and accommodating the needs of over-size, over-mass transport (such as undergrounding powerlines)
- consider potential future pressure on Finn Road from community and extractives traffic from the Cox Peninsula.

7.5.6 Emergency response capacity

It is recommended that NTG commission a study taking account of the current capabilities of the NTFRS, likely future demand for response to hazardous incidents in Greater Darwin. In addition:

- an options study be included in the Planning Commission's forthcoming Weddell and Middle Arm land use plan to identify an appropriate location for a new fire station and training area, ensuring the site is protected from incompatible neighbouring development
- proponents to allow for emergency response teams, which can provide a first response to any incident, and collaborative training exercises by Middle Arm proponents
- a user pays approach for some emergency services, including planning and training of emergency response teams
- consideration of additional firefighting capacity from tugs will require further investigation during detailed design when there is more certainty about the industry mix at the precinct.

(Need to cross-reference to findings of the emergency planning study on planning and preparation).

7.5.7 Waste management facility

It is recommended that the NTG consider (?in the *NT Infrastructure Plan and Pipeline*):

- planning for a new regional waste management facility, in line with Litchfield Subregional Plan (2016) to accommodate additional industrial waste from Middle Arm.

8. Economies and jobs

8.1 Overview

The purpose of an economic impact assessment is to identify the positive and negative economic consequences of a project at a national, Territory, regional and local level. This includes the equitable distribution of positive and negative impacts on local communities, with a particular focus on local employment and income and effects on other industry sectors, such as local suppliers (Queensland Government 2017; NSW Government 2015).

The rationale for the Middle Arm Sustainable Development Precinct is to grow and diversify the Northern Territory's economy and permanent population while meeting a goal of net zero emissions by 2050.

This section draws on analysis from the Department of Treasury and Finance, Infrastructure Northern Territory and the Territory Economic Reconstruction Commission's report (2020) to provide baseline data on economic sectors, trends and priorities for economic growth.

The section draws on a Deloitte economic impact assessment (Appendix xxxx of the EIS) to describe the predicted economic uplift from the precinct, based on potential development over the next 50 years. Predicted benefits include more sustainable economic growth, jobs, government revenue and population growth.

A more subjective analysis of the consequences of development predicts and assesses the likely equitable distribution of benefits. Stakeholders and a literature review provide insights into potential risks for local productivity, such as crowding out of existing sectors through inflationary pressures and competition for land, natural resources and workers.

A Workforce Development Strategy (Attachment 4 of this report) analyses the Territory's labour market and workforce constraints, then provides recommendations for workforce development planning covering strategy and policies, targeted migration, developing the skills, knowledge and competence of existing workers and building a future pool of workers by expanding training provider skills.

Traditionally, economic growth in the NT (as measured by GDP) has been driven by boom-bust cycles of private sector and government investment in major projects. The desired outcome, or collective benefit, of this Economies and Jobs section is that of 'enduring local economic prosperity' to move the Territory's economy to a more sustainable footing. Not only will this build the human capacity of the NT – in particular Aboriginal Territorians – but it will reduce the costs of a continued reliance on FIFO workforces at times of peak demand.

Table 8-1: What is covered by Economies and Jobs

What is covered by Economies and jobs	What the Terms of Reference asked for
 Jobs, economic opportunities and community development, including the employment and training of Aboriginal people, local procurement and equitable distribution of economic benefits and harms.	Describe and provide baseline data for the social area of influence likely to be affected by cumulative impacts, including: • economic modelling to demonstrate the feasibility of government's investment in enabling infrastructure and the return on investment • economic impact assessment to consider the equitable intra- and intergenerational distribution of economic benefits at a regional level • existing and emerging economic sectors • workforce participation Identify and describe likely cumulative impacts, including: • economic benefits from local industry participation and economic diversification • economic benefits generated by short-term construction and long-term operational jobs opportunities • the equitable distribution of benefits within the communities affected • pressure on existing employers through skills shortages and competition for skilled staff • impacts on other economic sectors, including tourism, fishing and aquaculture Identify appropriate frameworks and management strategies, including: • coordinated identification of skills gaps and workforce planning across industries

8.2 Baseline

8.2.1 Northern Territory economy and key economic sectors

The structure of the Territory's economy reflects its wealth of natural resources, strategic defence location, tourism attractions, proximity to key export markets in Asia and relatively large government and community services sector. The small open economy sees growth driven primarily by private and government infrastructure investment in major projects, the largest being the Ichthys LNG project, which generated significant construction activity and direct local employment.

In the 10 years to 2020-21, the economy grew by 25.6% from $20.9 billion in 2010-11. Over the same period, the Territory's population increased by about 15,000 to 246,000 people, while employment increased by about 8600 to almost 130,000. The NTG is aiming for a $40 billion economy by 2030 to support a population of 300,000 (up from 246,143 in June 2020) and 35,000

more jobs, driven by private sector investment and government delivery of economic infrastructure (TERC 2020, NTIPP 2022).

As outlined in the 2022-23 Budget Papers (Department of Treasury and Finance 2022), the Territory's gross state product (GSP) increased by 6% in 2019-20, driven by the increase in LNG exports, while state final demand (SFD) fell by 5.4% as consumption weakened on the back of declining employment and population growth and Ichthys construction investment declined. In 2020-21, GSP declined by 0.6% to $26.5 billion due to weaker net exports, while SFD grew by 6.1% as household consumption and private investment returned to growth. GSP is estimated to increase by 4.4% in 2021 and SFD by 8.8%. Economic growth is forecast to average 2.9% over the five years to 2025-26, heavily influenced by the proposed Barossa Project, a large offshore LNG facility and upgraded onshore processing plant.

Budget papers for 2022-23 note that the Northern Territory economy remains heavily reliant on government and community services, which accounted for 26.4% of the Territory's GSP and 43.7% of employment in 2020-21, compared with 17.8% and 29.2% respectively nationally. The Territory's service industries, the third most important sector, accounted for 20.6% of the Territory's output and 31.8% of employment in 2020-21 compared with national contributions of 33.4% and 37.5% respectively. Mining and manufacturing contributed to 24.1% of GDP (down from 31.6% in 2019-20 due to reduced LNG production) but only 4.9% of the Territory's residential employment (compared with 8.7% nationally), partly due to a reliance on fly in, fly out workers. The contribution of mining and manufacturing to GSP is significantly higher than the national rate of 16.3% (Department of Treasury and Finance 2022).

The construction sector contributed to 6% of GSP, with demand driven by private and public investment. Modest growth is expected in 2021-22 with a number of large projects underway or due to start.

The agriculture, forestry and fishing sector represented 3.6% of the Territory's GSP, compared with 2.3% nationally. Despite the sector's relatively small contribution, it is vital to generating economic activity and jobs in regional areas of the Territory, including the cattle industry.

The NTG has appointed an Infrastructure Commissioner and released an infrastructure strategy (DIPL 2021) and *Infrastructure Plan and Pipeline* (Infrastructure NT 2022) to grow economic infrastructure such as roads, rail, airports, ports, water, digital, energy and common user infrastructure.

> "Economic infrastructure supports businesses by connecting them to their markets and providing reliability for their customers and supply chains.... Governments and cooperative infrastructure investors can use economic infrastructure as a mechanism to de-risk investment for potential businesses and attract them to be part of the Northern Territory's economic growth" (NTIPP 2022).

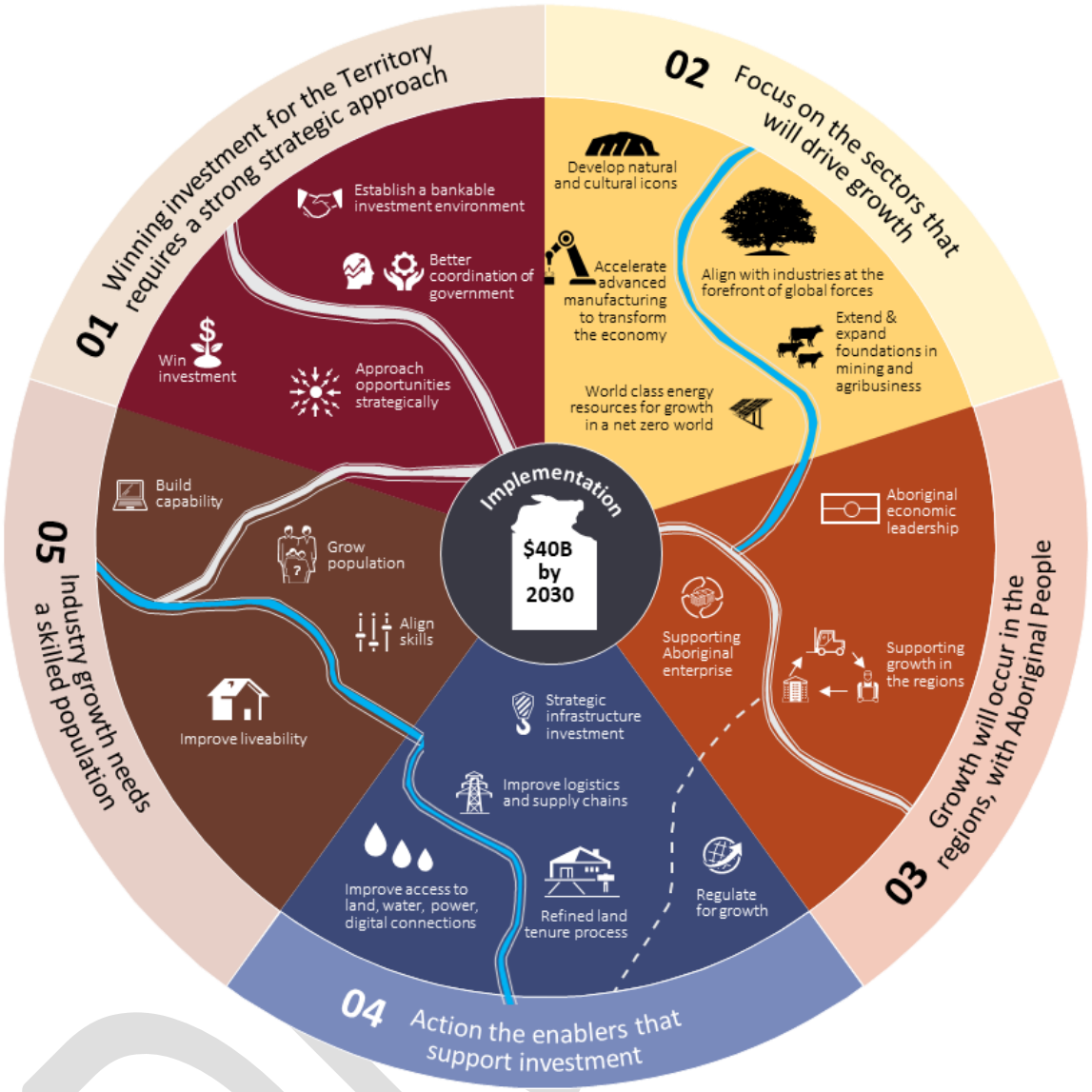

Figure 8-1: The Territory's step change blueprint (TERC 2020)

8.2.2 Population growth projections

Population growth in the NT tends to be volatile, with growth driven by local births and migrants. Population growth is expected to strengthen as large construction projects such as the Darwin Ship Lift Facility drive economic activity, combined with easing COVID-19 restrictions to resurrect overseas migration (Department of Treasury and Finance 2022).

The Territory's population is more mobile than other jurisdictions, with an interstate migration rate of about 13%, compared with 2-5% across most states in 2020-21. Interstate migration flows are influenced by local economic and labour market conditions, as well as lifestyle, housing prices and interstate family ties. Overseas migration tends to support population growth, contributing an average 0.3 percentage points annually over the five years to 2020-21. Mobility then declined

due to an outflow of 'other' visa holders and falls in permanent visa holders, exacerbated by COVID-19 travel restrictions (Department of Treasury and Finance 2022).

The Territory's population was estimated to decline by 0.2% in 2021-22 and to increase by 0.3% in 2022-23, 0.6% in 2023-24, then by 0.9% in 2024-25 and 2025-26 (Department of Treasury and Finance 2022). (See more detailed discussion in Section 6.2.2)

8.2.3 Labour market

The TERC report (2020) identified that a skilled population is a critical enabler of growth, with a need to grow skills and attract and retain a new population linked to industry and business demand. The three elements of this outlined in the TERC Report (p.26) were:

- **Right skills:** planning for the future workforce now, with education providers contributing to the Territory's competitive advantage;
- **More people:** including improvements to remote Aboriginal education, population growth and a reliance on an external workforce to meet peak demand periods;
- **Strength of place:** strategic planning for future demand includes improvements to liveability and access to a diverse housing supply.

Territory employment is highly cyclical and influenced by investment and construction activity for large, resource-based projects such as the Ichthys project, with its Bladin Point LNG plant. The labour market is characterised by a large government and community services sector (43.7% of employment in 2020-21) and relatively large defence and fly-in, fly-out workforces. The Workforce Development Strategy (Chamber of Commerce NT 2022 at Attachment 4) cites ABS data suggesting 8700 FIFO workers in the NT in February 2022, comprising 37.6% of the mining sector's workforce, but also 1700 Territorians who FIFO to jobs elsewhere.

The Territory's labour market rebounded in 2021-22, with employment expected to increase by 1.1% and unemployment expected to decline to 3.9%. The Territory Budget papers for 2022-23 refer to the downside risk of a shortage of skilled labour across Australia, particularly in the agriculture, construction and hospitality industries (Department of Treasury and Finance 2022).

Relatively high participation rates reflect a tendency for people to move to the Territory for work, then to leave when jobs come to an end, usually in their 30s. The Territory participation rate dropped from 72.8% to 72.8% in the year to March 2022 (Department of Treasury and Finance).

A partnership between the North Australia Infrastructure Facility (NAIF) and Territory's Local Jobs Fund announced in February 2022 is designed to provide capital funding for businesses to deliver small to medium Territory projects. The Local Jobs Fund is a co-investment fund to accelerate major and significant projects, with $120 million allocated in the 2021-22 Budget (Department of Treasury and Finance 2022).

8.2.4 Aboriginal economic participation

The TERC Report (2020) suggested economic growth will occur in the Territory's regions, with

Aboriginal people pursuing new opportunities for commercial development on their land to create jobs and wealth.

A number of government policies support this aspiration, including a Local Decision Making Framework (2018) designed to allow Aboriginal people to take control of their own affairs. An Aboriginal Economic Participation Framework (2022) is a whole-of-government strategy designed to increase Aboriginal employment, encourage Aboriginal businesses, target skills development and strengthen the Territory's regions. It is supported by an Aboriginal Procurement Policy (2022). This policy estimates that "bringing Aboriginal Territorians to the forefront of economic development" could generate between $49M and $146M in social benefits and is vital for the Territory's future prosperity (see outline in Section 2.3 above).

The NT Indigenous Business Network (NTIBN) provides certification of Aboriginal enterprises and maintains a database of certified businesses.

Key Larrakia organisations for the Greater Darwin Region are the Larrakia Development Corporation (LDC) and Larrakia National Aboriginal Corporation (LNAC). The LDC was incorporated in 2002 and provides jobs and business opportunities for Larrakia people. Its core activities include labour hire, heritage monitoring, ground and building maintenance, art, commercial cleaning and land holdings. It distributes payments through a Larrakia Development Trust.

In 2018, INPEX signed a $24 million benefits agreement with Darwin's Larrakia people. The 40-year agreement is the most significant long-term package of benefits and opportunities provided outside Native Title obligations. As outlined in Section 7.4.3 above, the LDC recently partnered in a joint venture with a Perth renewable energy company to sign a MOU with Korean KOMIPO to build a solar farm on Middle Arm. This deal is intended to provide energy to INPEX and Santos, who are key employers of Larrakia people.

An Aboriginal Tourism Strategy recognises that a key drawcard for international visitors is Aboriginal culture (more than 80% of visitors would like an Aboriginal tourism experience). There are more than 150 Aboriginal tourism experiences or products in the Territory (Tourism NT 2019). The goal is to build a sustainable Aboriginal tourism sector over the next 10 years to 'add value to the NT and share its beauty, its stories and its Aboriginal cultures' (p.7).

In Darwin, an iconic cultural experience will be provided by the proposed Larrakia Cultural Centre, at Stokes Hill, overlooking Frances Bay. The LDC sees the cultural centre as a cornerstone of its plan to reinvigorate Larrakia culture, history and language. The LDC had negotiated since 2005 with the NTG for the site, based on a 1998 Native Title extinguishment agreement related to the railway corridor from Alice Springs to Darwin. In September 2022, the LDC was granted Crown land valued at $16.9 million next to Stokes Hill, a registered Larrakia sacred site. The $40 million Larrakia Cultural Centre is funded by a grant from the Aboriginal Benefit Account and will be managed by the Larrakia Development Trust.

The cultural centre is a key commitment of the Darwin City Deal – a 10-year partnership between the Australian and Northern Territory governments and the City of Darwin to position Darwin as a vibrant and liveable tropical capital city, supported by a growing population and diversified economy (joint media release September 2022).

CEO of the LDC, Nigel Browne, described development of the cultural centre as "a primary example of the LDC developing a centre that has a focus on creating economic and social benefits for Larrakia people and the community at large." (www.larrakiaculturalcentre.com.au)

The Larrakia Cultural Centre (LCC) will:

- showcase Larrakia Culture and history to the world
- enable Larrakia people to continue caring for the land and sea
- be economically sustainable and foster economic independence for Larrakia people
- maintain Larrakia culture for future generations
- maintain existing links and build new relationships with other First Nations people in the region and world.

Larrakia Nation Aboriginal Corporation (LNAC) was set up in 1997 through the Northern Land Council to provide a corporate identity for Larrakia people to uphold Native Title claims (https://larrakia.com/). Primarily a membership-based service organisation, LNAC's economic participation includes the Larrakia Land and Sea Rangers:

> "… our 22 rangers work across Larrakia land and sea country, which comprises the greater Darwin region west across the Cox Peninsula and east to the Adelaide River. The ranger group differs from other ranger groups in that much of the effort is directed to commercial work and employment and training."

The rangers provide commercial services to oil and gas companies, government departments, councils and researchers environmental management and monitoring, land management, weed control, fencing and parks maintenance and grounds maintenance.

8.2.5 Sector analysis

The following section describes in greater detail the economic sectors relevant to considering the impacts of development at Middle Arm.

8.2.5.1 Tourism and cruise shipping

Tourism makes a substantial contribution to the Territory's economy and regional business and employment opportunities (Department of Treasury and Finance 2022). The sector is making a good recovery from COVID-19 travel constraints with visitor expenditure reaching $2.15 billion and 1.31 million visitors in the year to June 2022.

Pre-COVID-19, the sector supported 15,600 jobs, or 11.8% of the Territory's employment, with expectations of more than 3 million visitors spending $3 billion and generating 3900 new tourism jobs by 2030 (NT Tourism Industry Strategy 2030).

In the year to December 2019 (pre-COVID-19 figures), the Greater Darwin Region[8] received more than a million visitors for 5,911,000 visitor nights contributing $1.090 million of expenditure. The greatest number of visitors came from interstate and visited for holidays but a third (321,000)

[8] The Greater Darwin Region for tourism includes the Tiwi Islands and seven local government areas

were business visitors. Most arrived by air. Numbers were trending upwards when COVID-19 disrupted travel. Tourism in 2019-20 contributed $691 million to Gross Regional Product (GRP) and employed 4700 people in the Greater Darwin Region. This equates to 3.7% of GRP and 5.3% of the region's employment. The hospitality sector employed an estimated 1411 people, including accommodation, cafes and restaurants, pubs and casinos (Tourism NT 2022b).

The four key regional tourism experiences are described by Tourism NT as nature-based, Aboriginal cultures, history and heritage, food and lifestyle. Authentic cultural experiences and ecotourism are seen as key drawcards for the Territory. Priorities for tourism product development include:

- expanded Aboriginal cultural offerings such as the proposed Larrakia Cultural Centre (described in 8.2.4)
- the Darwin waterfront redevelopment
- activating nature-based offerings such as a 'sunset strip' development along Darwin Harbour from East Point to Cullen Bay (Tourism NT 2022b).

An Aboriginal Tourism Strategy 2020-30 (Tourism NT 2019) aims to position the Northern Territory as the leader in the Aboriginal tourism sector by developing "a sustainable Aboriginal tourism sector over the next 10 years to add value to the NT and share its beauty, its stories and its Aboriginal cultures".

Darwin Harbour

Darwin Harbour features prominently in the NT Government's destination marketing: the ambience of a tropical harbour city, sunset cruises, guided fishing tours, waterfront restaurants, a modern convention centre and destination for cruise ships and super yachts.

In 2003, the NTG contributed $100 million and called for expressions of interest to develop 25 hectares of waterfront land, including a world-class convention centre, hotels and mixed use residential and commercial buildings. Key criteria included a master planned development that captured the unique tropical character of Darwin and was sensitive to the area's contribution to the cultural and economic development of the region.

The $600 million waterfront development was envisaged as a magnet for tourists and locals alike, transforming a derelict industrial area and mudflats. In October 2022, the NTG announced an expression of interest to develop a Darwin Convention Centre Hotel to expand accommodation options for the lucrative convention market. The hotel is the first stage in a redevelopment masterplan designed to create "one of Australia's leading integrated tourism and lifestyle destinations".

Darwin is the first point of entry to Australia for many cruise ships, with visitors doubling to 60,205 passenger days in 2019. October 2022 saw the return of cruise ships to Darwin, including the *Coral Princess*, with a capacity of 1970 passengers.

A Darwin cruise study 2019-20 found that total visitor expenditure from cruise ships in 2019-20 was worth $16.83 million ($8.86 million direct and $6.42 million indirect), with 58,956 cruise visitors (arrivals, departures and crew). Of this spend:

- 34% went in wages for tourism employees
- 16% goes to returns on tourism businesses
- 42% goes to intermediate inputs, such as suppliers to tourism businesses.

Key expenditure by passengers and crew went on organised tours (averaging $163.29 per head) and shopping ($111.99 per head), with additional expenditure on food and drink, entertainment and transport.

As cruise shipping resumes post-COVID-19, the Darwin Cruise Strategy 2022-25 (Tourism NT 2022c) aims to expand on Darwin's geographic location to make it the preferred port of entry for international cruise ships, particularly those travelling from developing south-east Asian markets. A key market of interest is the smaller expedition ships, based on their ability to access unique cultural and geographic offerings.

Figure 8-2: A cruise ship visiting Darwin

Sustainable tourism

Sustainable tourism is an emerging sector, defined by the UN World Tourism Organisation as "tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities".

Sustainable tourism (Tourism NT 2022a, p.2) ensures that development meets the triple bottom line principles of:

- **social and cultural sustainability**: focuses on equitable, healthy, connected and diverse communities, providing a good quality of life for all
- **environmental sustainability**: focuses on the conservation of nature and the responsible use of natural resources
- **economic sustainability**: focuses on the long-term viability and prosperity of a business, industry and community.

The Territory's sustainable tourism action plan (Tourism NT 2022a) responds to the risks posed by climate change to the biodiversity and living cultural values of the NT, with a focus on reducing tourism's carbon footprint.

The strategy aims to "protect and restore our natural environment, hold sacred Aboriginal cultures, learn from Aboriginal Territorians and enrich our diverse local communities as we share our unique and stunning back yard with visitors from Australia and around the world".

8.2.5.2 Darwin Port

East Arm Wharf was built by the Northern Territory Government as major enabling infrastructure. It opened in 2001 as part of a vision for a transcontinental trade route between Asia and Southern Australia, opening up mineral provinces between Darwin and Adelaide. The deep-water port is the only multimodal port in Northern Australia (Darwin Port 2020). The new AustralAsia Railway has freight and passenger terminals in the business and logistics precinct on East Arm Peninsula.

Initially operated by the government-owned Darwin Port Corporation, in 2015 the port was leased to Chinese company Landbridge. Under the terms of its 99-year lease, Darwin Port committed to a range of upgrades, including a refrigerated container park, strategic hardstand development on reclaimed land next to the main quay line and the recent expansion of a bulk minerals hardstand, also through reclamation. In 2016, Darwin Port commissioned an expansion study with staged development options based on trade forecasting scenarios up to 2055.

In the 2020-21 financial year (update if available), the port (Landbridge Darwin Port 2021) reported the following 'greatly reduced' shipping movements:

- 165 LNG vessel visits
- 29 dry bulk vessels, with 842,565 tonnes exported (largely manganese from Bootu Creek and the first shipment of iron ore from Frances Creek since the mine's purchase by Linecrest
- slightly reduced cattle ship activity, with 105 cattle ships and 319, 526 head exported.
- 1646 pilotage movements
- reduced naval activities, but the port facilitated as US marine contingent rotation.

A shutdown at the INPEX LNG plant reduced the total gross registered tonnage (GRT) through the port to 28,622, 958 GRT, including a 30% increase in vehicle imports.

In September 2022, the first shipment of magnetite from the Peko Rehabilitation Project left Darwin Port.

Darwin Port also operates the cruise ship terminal at Fort Hill Wharf, near the city's waterfront precinct (see below).

8.2.5.3 Transport, logistics and marine industries

The transport and logistics sector provides critical support to the Territory's productivity and maintains national supply chain resilience. The NT *Infrastructure Plan and Pipeline* (2022) proposes a Logistics Advisory Council, supply chain database and analysis of the logistics infrastructure capability of the Territory's port, rail, road and intermodal facilities.

Marine infrastructure in Darwin Harbour includes commercial shipping facilities, supporting services such as tugs and pilot vessels, the proposed $400 million Darwin Ship Lift Facility and MASDP. The Adelaide to Darwin Railway terminates on East Arm Peninsula, which hosts a range of logistics businesses and a proposed 150-hectare Marine Industry Park. Fishing, oil and gas and defence industries are supported by a marine supply base and common user barge facility at East Arm. Commercial fishing uses berths and marine services at Frances Bay and Fisherman's Wharf near the CBD.

A report by Deloitte and the Industry Skills Advisory Council of the NT (ISACNT) (2020) on a potential NT maritime academy in Darwin found that, based on 2013 data from the Australian Shipowners Association, the Australian maritime industry contributed:

- $9 billion to GDP
- almost 31,000 jobs
- more than $900 million in taxation revenue.

Darwin's maritime sustainment capability supports Defence and Border Force vessels; commercial fishing, pearling and recreational boats; and industry vessels such as cruise ships, cargo ships and offshore oil and gas.

The Deloitte and ISACNT report on a potential Northern Territory maritime academy suggested national maritime industry employment growth of 1.4% between 2019 and 2024, with advanced training ('grey collar') options in the NT insufficient to meet the predicted demand for marine industry skills. Workforce demand was most acute for mechanical engineering, advanced welding, electronics technicians, integrated logistics system technicians and trades such as fitters, mechanics and electricians.

In anticipation of strong growth, the Industry Capability Network of the NT (ICN NT) was commissioned by the NTG to prepare industry mapping and a gap analysis of businesses in the greater Darwin region associated with servicing the marine industry. The study found 134 businesses with experience and relevant accreditations: "Industry in the greater Darwin region is currently meeting the service and supply requirements of a variety of vessels, including the Armidale Class Patrol Boats, Australian Border Force's Cape Class vessel, platform supply vessels servicing the offshore oil and gas industry, fishing, cargo ships and visiting international naval vessels."

8.2.5.4 Commercial fishing and aquaculture

While commercial fishing is banned in Darwin Harbour, Darwin is an important home base for commercial fishing and prawning fleets and sustainment industries as well as an emerging aquaculture hub with great potential to grow an Aboriginal aquaculture sector across the Territory.

The Australian Government aims to double the aquaculture industry in Australia to more than $2 billion by 2027, with 17% of Australia's aquaculture value coming from Northern Australia. A study by the Cooperative Research Centre for Developing Northern Australia (CRCNA 2020) found that annual GVP (FY 2017) from northern Australian aquaculture was about $223 million, comprising:

- barramundi (33%)
- prawns (32%)
- non-edible pearls.

Barriers to expansion of the aquaculture industry include environmental and biosecurity risks, the lack of breeding programs and brood stock supply, harsh weather, high costs of key inputs, skills shortages, poor infrastructure, distance to markets, regulatory burdens and uncoordinated policy. The CRCNA report recommends development hubs in Northern Australia, with aquaculture seen as supporting Indigenous economic development and independence.

Darwin Harbour provides pivotal support to the aquaculture industry, particularly around Middle Arm and the Blackmore River. This includes the government-run nursery and research centre at the Channel Island Darwin Aquaculture Centre (DAC), which produces barramundi and pearl oysters, as well as blacklip oysters, trepang and juvenile shellfish sent to Aboriginal enterprises across the Northern Territory. Emerging developments include an approved barramundi nursery near Channel Island and several aquaculture developments proposed for Elizabeth and Blackmore Rivers.

Humpty Doo Barramundi is Australia's largest farmed barramundi farm, growing steadily since 1993 within a saltwater wetland system on the Adelaide River. The family company's annual harvest has grown from 300 kilos to more than 4800 tonnes of barramundi a year, supplying restaurants, major retailers and fish markets around Australia. Humpty Doo Barramundi employs about 150 direct staff, supports an estimated 60 local businesses and is planning to continue the major expansion of its operations over the next few years.

An economic activity assessment in 2020 (AEC Group) found that Humpty Doo Barramundi's contribution to the Northern Territory economy would be substantial, based on most of the investment flowing back to the Territory economy. A summary of economic impact was estimated at:

- $63.3M business output ($35.2M direct)
- $30.4M contribution to Gross Territory Product (GTP), including $15.4M direct
- 178 full-time equivalent jobs (90 direct)
- $14.9M in wages and salaries a year, including $7.6M direct.

The company has received two North Australia Infrastructure Fund (NAIF) loans to expand its facilities in recent years. In 2020, Humpty Doo Barramundi obtained $48.4M through a $24.2 million NAIF loan, matched by loan funds from the ANZ bank. The company plans a major expansion to meet growing demand for sustainably produced Australian seafood by consumers and restaurants across Australia. This is estimated to triple its economic contribution to the Territory economy by 2030. Plans include a proposed hatchery on its privately owned land south of Channel Island and construction of new ponds.

The company also supports a number of local tourism ventures and small-scale aquaculture operations with seed stock, improving farmed Barramundi through a genetics research program with CSIRO.

Humpty Doo Barramundi prides itself on premium quality and its sustainability credentials, which are applied to its fish production and processing, from sustainable use of fresh water to fish feeding and a proposed solar farm. At interview, Dan and Tarun Richards expressed a strong social conscience. Dan cites 'The Spirit Level' (Wilkinson & Picket 2009) in saying 'harmonious societies are those with equality'. Humpty Doo Barramundi shares the benefits of its activities by supporting programs that create pathways into jobs for Aboriginal Territorians, providing work experience for secondary students and supporting work placements from Saltbush Social Enterprise's Future Stars program, Stars and the Clontarf Foundation.

Founders Bob Richards and his wife Julii Tyson were awarded Orders of Australia in the 2022 Queen's Birthday honours for their services to the Territory's seafood industry. Bob was inducted into the National Seafood Hall of Fame in September 2022. Julii was inducted into the Women in Seafood Australasia Honour Roll in 2018 for her work supporting women in seafood nationally.The company has received many primary industries, land care and sustainability rewards (www.humptydoobarramundi.com.au) and in 2022 was awarded the Woolworths Community Champion Award for its work with the local community and Aboriginal people.

The Darwin Aquaculture Centre (DAC) on Channel Island, 50 kilometres from the CBD, was established in 1998 to service emerging and established aquaculture industries in the Territory and to facilitate aquaculture enterprises on remote islands. It expanded in 2000 with a commercial barramundi fingerling production facility able to produce more than a million advanced fingerlings a year.

According to the DAC's website, the Centre has areas dedicated to fish, molluscs, echinoderms, crustaceans, algae, 'live feeds' and environmental control work. It has a large dry laboratory, office, workshop and store. The centre has delivered a range of research and development projects on pearl oysters, edible oysters, sea cucumber, giant clams, prawns, barramundi, blue fin tuna, mud crabs, reef fish, copepods, rotifers, algae, aquaponics and parasitic, viral and bacterial diseases. Current research involves the commercialisation of trepang (sea cucumber), tropical rock oysters, giant clams and an aquaponics display.

Pearling is one of the Territory's oldest industries with pearl oysters (*Pinctada maxima)* harvested from Darwin Harbour in the 1880s. By 1899, 51 luggers were harvesting new pearling grounds around the coast to provide shells used for buttons, ornaments and as an additive in paints and cosmetics. The arrival of plastics made shell harvesting uneconomic and by 1964 only two luggers remained (Department of Resources, Fishery Report 2009). Commercial pearl production has operated from Broome and Darwin since the 1950s, and today Australia is the world's most important cultured pearl producer. In the Northern Territory, Paspaley Pearls first established a pearl oyster farm at Port Essington in 1964. Today there are a number of pearl farms in the region, including at Bynoe Harbour, Cobourg Peninsula and the English Company Islands in the Arafura Sea. These farms predominantly source juvenile oysters from hatcheries.

The Darwin Aquaculture Centre at Channel Island is an important facility for the NT pearl industry and relies on a constant supply of clean seawater from Darwin Harbour.

> A pristine environment is essential to the production of fine-quality pearls and Paspaley has long been an advocate for the protection of the seas of northern Australia (Paspaley website).

In its 2020 submission on the proposed TNG processing plant at Middle Arm, Paspaley Pearls expressed concern at the proposed significant discharge of contaminated waste water. The submission suggested the proposed plant would impact on the wider community that relies on Darwin Harbour including health impacts for those consuming food from the harbour, tourism, recreational and customary use and reputation damage.

> "Paspaley is a significant Darwin based business which operates pearling aquaculture operations in and around Darwin Harbour. The pearling business relies on a shell breeding programme utilising the Darwin Aquaculture Centre and various harbour nursery sites where shells are grown. Its business relies upon the health of the harbour and the hygiene of its waters. Sensitive early life stages are known to be vulnerable and susceptible to very low levels of toxins, especially heavy metals, as is true of many marine fauna". (Submission to TNG EIS, February 2020 from Dr Sam Buchanan, Chief Operating Officer)

Trepang (dried sea cucumber), is Northern Australia's oldest export. From the mid-18th Century to about 1900, Makassans from the Celebes (modern-day Sulawesi) traded with Aboriginal people along the Arnhem Land coast to harvest the trepang at low tide. The trepang was boiled, dried and sold to Chinese merchants for sale in Asia, where the slug-like creature was prized for its medicinal, culinary and purportedly aphrodisiac properties.

Tasmanian Seafoods was established in Tasmania in 1986, initially specialising in abalone catches in Tasmania and Victoria and high value aquaculture exports. Over the past 17 years, the company has expanded into trepang aquaculture trials in the Northern Territory.

The Darwin Aquaculture Centre (DAC) at Channel Island has played a key role in Tasmanian Seafoods' research and development. The company leases an area at the DAC to produce

hatchery-bred juvenile sandfish, the sea cucumber species predominantly harvested in the Territory. In 2009, the company was awarded a research grant from the Australian Seafood Cooperative Research Centre for a pilot scale hatchery at the DAC. It has run trials with release and harvesting of juvenile sandfish on Groote Eylandt and Warrawi, on South Goulburn Island.

The company is now working with Baniyala Traditional Owners at Blue Mud Bay on a sandfish ranching operation, where juveniles will be released onto sea country, then harvested in tidal areas as they grow. A Memorandum of Understanding with the Northern Land Council specifies the employment of local people, who will also get paid by the kilo for harvested sandfish.

Tasmanian Seafoods is installing increasingly sophisticated infrastructure at the DAC to grow juvenile sandfish. The company has approval for a sandfish hatchery at William Road, Berry Springs, on the site of a former prawn farm. The venture has its environmental approvals and Tasmanian Seafoods has spent $.5 million on earthworks.

The next stage of commercialisation is co-investing in a land-based hatchery and nursery at an oceanic aquaculture site along the Top End coast. Tasmanian Seafoods would grow juveniles at its cost, release juveniles into the sea, build up the sandfish biomass then work with local people to harvest the trepang.

The aim is to build sustainable aquaculture operations, while contributing to the research and development and the economic development of Aboriginal communities, says Head of Sea Cucumber and Aquaculture Anton Krsinich.

Other aquaculture businesses operating in Darwin Harbour include:

- **Monsoon Aquatics** has won export awards for supplying sustainably sourced coral and marine life to aquarium stores. The company operates from East Arm and draws salt water from Hudson Creek, so would not want to see water quality affected in this area. In the past, Monsoon has used the Darwin Aquaculture Centre for its clam spawning program.
- **Barra Adventures** combines fishing charters with land-based fishing at its barramundi farm on the Blackmore River in Berry Springs.

8.2.5.5 Recreational fishing

Recreational fishing in 2012 contributed an estimated $26 million a year to the tourism industry, with $22 million generated by interstate or international visitors to the Territory. In 2012, there were 63 operating fishing tour operators in the NT, including 31 with tourism accreditation and 27 who were members of Tourism Top End. Expenditure also went to fishing lodges, fishing competitions, boat hire companies and angling clubs (source: Tourism NT, which is working with the NT Guided Fishing Association to update these figures).

Fishing is popular among both interstate and international visitors, who tend to come specifically for a fishing holiday and stay longer than the average tourist.

Darwin will continue to be positioned as a fishing hub for barramundi, considered a "signature NT fishing experience", as well as blue water fishing.

AFANT is the peak body for recreational fishing in the NT and represents the interests of 30,000 amateur fishers. Its 4000 members include fishing clubs, associations and related businesses. The latest Survey of Recreational Fishing 2018-19 (DITT 2022) suggests that:

- in the 12 months to September 2018, an estimated 39,926 non-Aboriginal Territory residents fished at least once (27%)
- 83% of these lived in Darwin, two-thirds were male and 12,000 of them were aged between 30 and 44
- 58% of all NT resident fishers fished within Darwin Harbour at least once during the 2018/19 survey period
- 30% of all NT resident fishing effort occurred in Darwin Harbour (and its arms)
- NT residents spent an estimated $52 million on goods and services related to recreational fishing, or $1950 per fisher, including:
    - $32 million on boats and trailers
    - $5 million on travel expenses
    - $3 million on fishing and diving gear.

"With a Million Dollar Fish tagged barramundi competition, a large area of gillnet-free coastline, and a long-established and expanding artificial reef network, Darwin has arguably Australia's best capital city fishing." (North Australia Fish Finder, Flynn 2022, p.109).

A Recreational Fishing Development Plan 2023-33 is being developed by Fisheries (in the Department of Industry, Tourism and Trade) in collaboration with the Amateur Fishermen's Association of the NT (AFANT) and the NT Recreational Fishing Council. Research kicked off in March 2022 with a survey and workshop.

8.2.5.6 Resources

The resource sector is the main contributor to the Territory's economy. The Territory has 14 of the world's 17 critical minerals, including lithium, rare earth elements, cobalt, tungsten, molybdenum, vanadium, nickel, titanium and magnesium. The Territory's mines produced $4.28 billion worth of commodities in 2020-21 and supported 4800 direct jobs (Infrastructure Northern Territory 2022).

The vision of the NT Government's Gas Strategy is that, by 2030, the Territory will be a world-class gas production, manufacturing and services hub. The vision sees Darwin as a service and supply centre for the marine and oil and gas industries, which are key contributors to export income.

Middle Arm is already home to the INPEX-led Ichthys LNG project, with a $US34 billion financial investment decision (FID) being the largest ever direct foreign investment ever made by Japan and France. INPEX has two LNG trains and recently announced plans for expansion, a transition to renewable power and plans to establish a carbon capture and storage facility. The Santos-operated Darwin LNG project was built at Wickham Point between 2003 and 2006, with a proposed $US3.6 billion Barossa gas and condensate project proposed to extend the life of the Darwin LNG plant (which currently relies on the Bayu Undan field). Part of the rationale for industrial development on Middle Arm is to grow a gas-based manufacturing precinct, based on feedstock from the Beetaloo Basin and Barossa projects.

8.2.5.7 Extractive industry

The Extractive Industries Association represents about 20 members – who employ about 200 people and provide about 80% of the Territory's aggregate (sand, gravel and crushed stone) – and 20 associate members. Extractive businesses are typically third-generation family companies and larger civil contractors. They contract mainly to the NTG, with products supporting tenders for civil works such as road-building, urban and industrial development projects. Reliable access to materials is critical if they are to be successful with government tenders. This has resulted in extractive titles being worked on a needs basis or being left idle for long periods.

> *We are providing concrete to everything from the Larrakeyah Wharf down to the footpaths you walk home on plus the sand market for glass.*
>
> *Commercially, to make good money, interstate companies find the Darwin market is a bit small for them. (Local companies) are medium family businesses. They are Territorians through and through and have a strong positive ethic towards the Territory. Plus they are astute business people who expand and contract depending on the economy. They might sell off 50 units when the economy goes down (Tim Burrow, Extractive Industries Association of the NT).*

Quarrying has come under pressure from urban sprawl in recent years, with companies moved from leases around Robertson Barracks, the Howard Sand Sheet and Holtze Prison, often from leases that have been held for decades. As a result, extractive companies have been moving further afield to the Cox Peninsula, Gunn Point and along the Arnhem Highway.

Middle Arm provides opportunities to tender for civil works at the precinct, however the project will result in the loss of 5 Mineral Authorities (MA) that have been granted in the Middle Arm footprint over the past 20 years. The Authorities (as opposed to Extractive Minerals Permits), cover extraction in the Greater Darwin Reserve area and contain early vacate clauses, which apply to areas that may be needed for future government development.

8.2.5.8 Defence

Defence has a strong presence in Darwin based on its strategic location. The Australian Government is implementing an $8 billion infrastructure commitment in the Territory, with

defence capital investment estimated at $4.4 billion over the next five years (Department of Treasury and Finance 2022). As part of Plan Galileo, announced in 2020, Regional Maintenance Centres are planned for strategic locations across Australia, including Darwin. The Royal Australian Navy is planning to replace its fleet of 12 Armidale Class patrol boats with 12 larger Arafura Class offshore patrol vessels, the first of which was due to arrive in 2022 (ICN 2021). Defence spending in the NT reached $2.2 billion in 2020-21, equivalent to 4.5% of the national defence expenditure. Defence Housing manages almost 1750 properties in the NT to accommodate defence personnel and their families, with an $8 billion major infrastructure investment commitment through to 2025 (NTIPP 2022, p.52).

8.2.6 Emerging economic sectors

The Territory Economic Reconstruction Commission (2020) noted that the Territory's economy is starting from a narrow economic base focussed on primary resources and raw materials. The NT Government (NTG) wants to see a greater proportion of value-added processing and jobs remaining in the Territory. It has established a Minerals Development Taskforce to accelerate private investment in mineral projects.

Manufacturing currently accounts for only 4.1% of Territory GSP, which the NTG sees as a prime opportunity for economic transformation. The NTG has invested $8.75 million over five years with the Australian Government's Advanced Manufacturing Growth Centre to establish an Advanced Manufacturing Ecosystem Fund. The fund provides grants to industry-led projects that commercialise new products and processes in priority sectors.

The NTG has produced a Critical Minerals Plan to accelerate exploration for critical minerals, or minerals strategic to the global economy such as lithium, cobalt, copper, titanium, manganese, rare earths, tungsten, vanadium and zircon. The plan aims to get projects to production and grow the refining, processing and manufacturing of critical minerals in the Territory.

The TERC report suggests that achieving a $40 billion economy by 2030 will require a sustained average annual GSP growth of 3.9%, requiring a 'step change' in the level of private investment. Enabling infrastructure for growth was identified as access to land, water and affordable power, access to digital connections and logistics to manage and connect supply chains.

A key emerging sector is energy, including low-emissions manufacturing and projects that contribute to decarbonisation, such as solar and hydrogen. The *NT Infrastructure Plan and Pipeline* (Infrastructure NT 2022) aims to capture 15% of the Australian hydrogen market by 2035. The Territory's large land mass, high solar irradiance and proximity to land-constrained population centres in Asia means the Territory is well-positioned to supply affordable and reliable renewable energy to both local and Asian markets. This includes Sun Cable's proposed 12,000-hectare solar farm in the Barkly, other solar projects, renewable energy hub and a proposed Battery Energy Storage System (BESS) at Middle Arm.

Other emerging sectors include digital technologies, cable networks and data centres, seafood processing, aviation and aerospace industries, electric vehicles and fertilisers (NT Treasury and Finance 2022; Infrastructure NT 2022). Maritime industries will be boosted by a $400 million ship

lift facility and marine industry park on East Arm Peninsula, in line with a Maritime Industry Development Plan (due for release in 2023). These emerging sectors will support traditional sectors such as gas, minerals, agribusiness and tourism (NT Treasury and Finance 2022).

8.3 Key change processes for economies and jobs

- start of construction activities and mobilisation of workforce
- change in availability of jobs and waged labour
- growth in economic activity in the Greater Darwin Region
- land and sea use conflicts
- inflationary pressures
- change to the image of Darwin.

8.4 Impact Assessment for economies and jobs

Table 8-2: Impacts on economies and jobs

Potential benefits and impacts – Economies and jobs	
Potential cumulative benefits	**Potential cumulative impacts**
O-4 Sustained local prosperity through regional economic development, diversification and population growth	R-19 Skills shortages constrain growth and lead to crowding out
O-5 More viable port and maritime sector	R-20 Displacement of other economic sectors due to land and sea use conflicts
O-6 Stronger business community	R-21 Failure to deliver local contracts and benefits to local industry sectors
O-7 Enhanced human capital through sustained growth of a skilled workforce	R-22 Failure to deliver on expectations of jobs and training, particularly for Aboriginal workers.
O-8 Enhanced capabilities of Aboriginal businesses due to successful tendering	
O-9 Enhanced standard of living and material wellbeing	

Enduring local prosperity is the key likely benefit of development at Middle Arm. The flip side of the opportunity, however, are threats that large projects may bring to the productivity and survival of Darwin's small to medium enterprise business sector. The following analysis presents first the opportunities, then the potential risks.

8.4.1 Sustained local prosperity through regional economic development, diversification and population growth

A key benefit of the Middle Arm would be sequenced development delivering economic diversification and a pipeline of projects that gradually builds local capacity and population growth. This is recognised by Infrastructure NT which is consulting with regional economic development groups as part of an audit of the Territory's infrastructure planning.

Several businesses commented that the sustainability of local benefits was predicated on the productivity and economic health of Darwin's small to medium business sector, which often finds it challenging to compete with large national and multinational firms during the 'boom' of major

projects. This opportunity is rated as NOTICEABLE which could increase to BENEFICIAL depending on policy settings, good intent and the preparedness of local businesses to capitalise on opportunities.

8.4.2 More viable port and maritime sector

Darwin's competitive advantage includes its geographic location as the only deep-water port in Northern Australia. Development of a cluster of maritime activities at Middle Arm, alongside the Darwin Ship Lift Facility and marine industry park at East Arm, will grow Darwin's competitive advantage and likely attract new support industries across the service, supply and sustainment sectors.

Darwin Port sees development at Middle Arm as potentially both complementary and competitive. The intent is that bulky goods from the precinct would be railed to East Arm, boosting exports. The collective benefits of increased maritime activity in Darwin Harbour are likely to be NOTICEABLE, rising to BENEFICIAL, again depending on the capacity of local businesses to take advantage of the opportunities and overcome barriers in the supply chain and labour market.

8.4.3 Stronger business community

The scale and longevity of development at Middle Arm should strengthen and diversify the local business sector, including construction, civil construction and extractives, and the region's small manufacturing sector. The ability to realise business opportunities will be enhanced by policy settings such as:

- a procurement policy that provides weightings for local companies and packages tenders that align with local capabilities
- providing good communication and advance notice of tenders
- use of the NT ICN (Industry Capability Network) to identify and match local services and suppliers
- building a skilled workforce.

The Extractive Industries Association is positive about the opportunities, particularly with headworks for the precinct, but suggests forward planning will be important:

> *Our members are positive about the development at Middle Arm and other developments happening at the moment. It's good for the Territory and it's good for our business.*
>
> *Forward planning is really critical to us. These are medium-sized $10 million businesses. We are more than happy to (help) build Middle Arm. But they need the opportunity to have a go. The last thing we would like to see is big contracts going outside the Territory.*
>
> *We suspect you will need a lot of our material in the first couple of years. Rather than getting rid of the (current 5) leases, we would like to see that they are used. We have been paying lease fees over the years. You will need a lot of extractive material. There are*

stockpiles on some of the leases. It is best to use the materials that are closest. (Tim Burrow, Extractives Industries Association of the NT, interview)

The industry would like input to planning for Weddell, which currently is off limits to any type of extractive operations. The ability to source materials from a well-located area while performing civil works (creating lakes, headworks for industrial areas) would help meet predicted demand for aggregate and reduce potential costs of Middle Arm civil works.

Growing a stronger business community is assigned an initial rating of NOTICEABLE, which would rise to BENEFICIAL based on the likely and consequential nature of cumulative opportunities. Achieving the higher rating will require capacity-building, a skilled workforce, strong local procurement policies and reliable communication of the opportunities.

8.4.4 Enhanced human capital due to sustained growth of a skilled workforce

Sustained growth of a skilled workforce will modernise Territory industry, grow the population and deliver economic value. A pipeline of infrastructure projects and realisation of a manufacturing sector at Middle Arm presents a substantial opportunity to grow the Territory's human capital.

As outlined in the Workforce Development Strategy (Chamber of Commerce NT 2022, Attachment 4), there are high level skill shortages in occupational roles such as project managers, engineers and architects, as well and skilled and general trade shortages. With such high stakes, sustained growth will require a multifaceted focus as it "involves a systems approach, new industrial settings, and skilling people for a clean energy future" (p.14).

The CEO of the Power and Water Corporation, Djuna Pollard, sees great opportunities, with flow-on benefits:

If I reflect on the INPEX project, having grown up here in the NT, I would like to see something given back to the community in terms of growing our own in addressing these skills and capability shortages in order to provide prosperity to the broader community.

Whether that takes more funding for CDU, (enhanced skills is) really important for the NT to sustain its desire for a $40B economy and being able to support it.

It's schools, it's health, it's hospitals, it's ringing a GP and getting an appointment. All of these makes us successful.

The greatest opportunity would be moving Aboriginal people into meaningful jobs given that a) they are the population segment least likely to leave and b) the higher levels of disadvantage and long-term unemployment or disengagement.

Population growth is most likely to come from skilled migration as COVID-19 travel restrictions ease. ACIL Allen (2022) recommends the NTG should double the intake of permanent skilled migrants based on 2019 levels and work with industry to ensure that skilled migration is better aligned to the critical skillsets needed by the local economy. Other growth may come from business and humanitarian migration and international education (including the VET sector).

An additional factor is the potential to grow human capital through research and development activities associated with renewable energies and industrial development.

The initial rating for this opportunity is NOTICEABLE, rising to BENEFICIAL with sustained and collaborative effort by government and industry, supported by investment in factors that make Greater Darwin an attractive place to live, such as safety and housing affordability.

8.4.5 Enhanced capabilities of Aboriginal businesses due to successful tendering

> A truly equal society would see the number of Aboriginal business enterprises and their share of the Northern Territory procurement broadly proportionate to the Aboriginal population in the Territory (Aboriginal Procurement Policy, NT Government 2022, p.9).

Greater Aboriginal economic participation may be achieved through normal competitive tenders, joint ventures, social enterprises, social procurement, weightings for First Nations businesses and local decision-making frameworks.

Meeting the objectives of the Aboriginal Procurement Policy should support proactive efforts to surpass what Aboriginal organisations described as fairly meagre targets (5% of the value and number of government contracts). The scale and duration of development may provide opportunities for existing businesses and corporations to expand their capabilities, including through joint ventures.

Precinct governance should ensure companies less familiar with local Aboriginal business capabilities make genuine efforts rather than bringing in preferred contractors from previous jobs, making tokenistic efforts or not keeping promises about local participation. Collaborative approaches across the precinct may create pathways into work: from work experience to apprenticeships and management training. Santos and INPEX have shown what can be achieved with community investments and commercial deals.

Realising good outcomes would be enhanced by:

- sensitising companies to local conditions and expectations
- strict obligations to prepare and meaningfully implement Territory Benefit Plans
- regular reporting against key indicators (such as proportion and value of tenders awarded to Aboriginal businesses, proportion and number of local Aboriginal employees, retention rates, training and professional development)
- using agencies such as the NT Indigenous Business Network (NTIBN) and ICN (Industry Capability Network) to identify capable local businesses
- packaging tenders to suit local capacity and deliver social outcomes
- continued business development and support of local enterprises.

This opportunity has an initial rating of NOTICEABLE, which could rise to BENEFICIAL with good will, good intent and good implementation.

8.4.6 Enhanced standard of living and material wellbeing

Contributing to a better standard of living and material wellbeing assumes equitable distribution of benefits. The downside risk is benefits flowing to a few and widening the gap between affluence and disadvantage. Aboriginal communities are not homogenous. Many of Darwin's Larrakia people are tertiary educated and leading affluent lives. However, many Aboriginal people in Darwin, including those from other regions, remain disadvantaged and vulnerable. It will take a solid and sustained effort to achieve good social outcomes. Groups such as Saltbush Social Enterprises and its Future Stars program are examples of what can be achieved.

This opportunity is given an initial rating of BARELY PERCEPTIBLE given that any benefits are likely to be diffuse, evolve over time and be challenging to achieve. This could rise to NOTICEABLE with good will and good effort by employers. Indicators to track progress would include the number and proportion of long-term unemployed who move into sustainable employment, qualifications achieved, gender equity and improvement in household incomes of workers.

8.4.7 Skills shortages constrain growth and lead to crowding out

Severe national and local skills shortages may constrain growth and increase the costs of development. Competition for scarce staff may have a crowding out effect and reduce the productivity of existing businesses in the Greater Darwin Region. Attracting workers and their families is likely to be a challenge given the outflow of younger workers described in Section 6.2.2, competition with other jurisdictions and liveability issues such as housing affordability, crime and anti-social behaviour.

In 2018, the NTG released the *Northern Territory Population Growth Strategy 2018-28.*The goal of the strategy was to return the population growth rate to the historical long-run average of 1.4%. The strategy was based on four pillars:

- a marketing strategy to 'tell the Territory story'
- attracting investment and creating jobs
- attracting and retaining migrants
- enhancing liveability.

The NTG invested $50.4 million over two years, of which $23 million was to enhance the Territory lifestyle by investing in safer communities, bush and regional communities and revitalising Darwin and Alice Springs CBDs. However, the Territory continues to face an outflow of young workers. Skilled migration and workers on temporary visas have been stymied by COVID-19 travel restrictions and business migrants opting for the East Coast of Australia. As the borders re-open, the Territory will need to be "effective in winning the battle for talent", with permanent skilled migration better aligned to industry needs and skills in demand (ACIL Allen 2022).

Should nation-wide pressures not be overcome by the start of MASDP construction in 2026, the project may be hampered by worker scarcity, higher wages and inflationary pressures. This hard to predict at a time of economic volatility. However, Darwin businesses cite negative pressures during construction of the two LNG plants on Middle Arm, including inflation, worker shortages and competition from national and multi-national companies.

With the number of major projects on the horizon around Darwin, the extractives industry expects its operators to be busy. However, the challenge of finding workers is worrying. While long-term employees tend to be stable, Anastasi Kambourakis, of DCT, says younger people are not entering the industry and a national skills shortage makes it difficult to recruit from interstate. The industry pays good wages to heavy machinery operators, but it is difficult to compete with the wages paid by mining companies. In remote communities, DCT has a focus on local Aboriginal employment, with rates of up to 40% of workers in recent sub-division work.

> *It's not an issue of losing workers as much as when we are trying to recruit (during busy times)… It's hard to bring people here from interstate. If you are getting good money in Melbourne or Brisbane, those cities would be more attractive (than coming to the NT). You have to enjoy the lifestyle, like going fishing, to come here. (Anastasi Kambourakis, DCT)*

> *Darwin doesn't need more jobs right now, we need more accommodation, more people. Not more jobs in an environment that's under stress. Everyone is under stress. (Dan Richards, Humpty Doo Barramundi)*

Businesses were concerned about losing tradespeople and attracting specialist skills at a time of national skills shortages. The CEO of the Power and Water Corporation, Djuna Pollard, said her organisation was competing both nationally and globally for skills such as engineers and project managers. Small businesses were concerned at a potential "two speed economy where people are paid megabucks and we can't compete. People leave and the price of housing goes up".

Executive Officer of the NT Road Transport Association (NTRTA) Louise Bilato says staff shortages are so bad in her industry that company directors are driving trucks and she has trouble getting them together for board meetings. Shortages extend to ancillary workers, like diesel fitters and auto electricians.

Other factors inhibiting workforce attraction and retention include affordable housing choices for frontline industries, including farming and aquaculture, (discussed in Section 7) and safe neighbourhoods. Businesses cited the cost of repeated break-ins, anti-social behaviour and vandalism affecting both their operations and the liveability of Alice Springs, Tennant Creek, Katherine and – increasingly – Darwin.

> *The elephant in the room for me is liveability… We have to deal with these social issues… staff are sick of having their homes broken into. Partners don't feel safe. We can have all the aspirations we like but liveability is fundamental.*

Given current conditions, this risk is considered likely and extremely consequential, with a breadth and duration of impact that could undermine the Territory's economic growth objectives. This risk is therefore assigned an initial rating of VERY HIGH, reducing to HIGH with a collaborative, innovative and sustainable approach to overcoming the challenges.

Solutions include workforce planning to 'grow our own' (see Attachment 4), skilled migration (many support industries have employed Filipino workers) and a steady pipeline of work to reduce seasonal or fluctuating demand and ensure apprentices have continued employment. The

Industry Skills Advisory Council of the NT (ISACNT) is looking at training for ancillary jobs, such as diesel fitters, and jobs of the future such as electricians who can work with an electric truck fleet. Another solution is attracting people who traditionally may not have considered construction jobs, including women. Louise Bilato cites a WA training program that helps women get their heavy rigid licence in school hours. Several employers, such as Australia Post and Star Trek are now hiring female drivers for city deliveries between 9 am and 2 pm.

> *They are finding a work solution for a proportion of the workforce that might otherwise see it as a bit too hard. They are driving around town, not remote road trains from Darwin to Perth. But with increased participation of women, other people who have been doing around town work might be willing to consider getting into a fuel tanker and other remote work.*

8.4.8 Displacement of other economic sectors due to land and sea use conflicts

Given a high level of uncertainty, the displacement of other economic sectors, such as extractives, marine, Weddell development, tourism, aquaculture developments and general competition for land are rated collectively in the section below.

8.4.8.1 Extractives

Cumulative development is likely to benefit extractive and civil operators by increasing demand for product. At the same time, urban and industrial development is displacing many leases or permits, forcing operators to go further afield to explore for suitable resources and, consequently, increasing the cost of their operations.

The industry's ability to meet demand may be diminished by the loss of 5 permits in the Middle Arm footprint. Depending on the quality of material in the remaining 7 permits to the south of Middle Arm, continued use of the 5 permits could supply the headworks stage of the Middle Arm precinct and would remove the need to go too far afield to find new supplies.

Government has to provide at least three months' notice to vacate the 5 Middle Arm permits. While the industry has been aware of this likelihood over the past 15 years, it would appreciate as much notice as possible.

> *Every time an extractive operative is removed from an area, and has to go and find a resource somewhere else, it increases the cost of supplying the material, mainly sand and gravel… They will move if required because they have moved every other time the Government has used the vacate clauses. But there is an opportunity here for more forethought about areas that might be developed for extractive activities close to the project area. (Denise Turnbull, Director, Mineral Titles, DITT, interview).*

Anastasi Kambourakis is from DCT Australia, a family-owned company that began in concreting, then moved into quarrying and purchased the Boral quarry at Howard Springs. Transport is the biggest cost of quarrying, he says, while higher grades of sand and road gravel are getting tougher to find. Moving to new leases is a lengthy process that entails finding the resource, doing

environmental studies to ensure they are not disturbing threatened species, then obtaining a new lease.

An additional cost impost of concern to the industry is whether they will be required to rehabilitate land where they have been operating for the past 20 years on Middle Arm.

8.4.8.2 Marine transport options

Ferry links between Palmerston, Weddell and Darwin have been raised over the years. A Weddell planning forum in 2010 raised the potential of a ferry link from the Elizabeth River Bridge for commuters in the future city of Weddell. Constraints included the distance from Weddell, the need for a carpark and midges.

Mandorah ferry operator SeaLink in 2016 suggested a 20-minute journey from the Elizabeth River jetty to a city waterfront ferry terminal, saving 10 minutes' travel on Tiger Brennan Drive peak hour traffic. This alternative mode of transport could service commuter traffic and visitor transfers to destinations such as the Wildlife Park and Berry Springs. Upstream options were ruled out due to rocky ledges beyond the Elizabeth River bridge.

Increased use of the shipping channel between the Middle and East Arm Peninsulas and exclusion zones near marine infrastructure could close off this option.

8.4.8.3 Weddell as an urban development

Weddell has long been set aside in land use plans for residential and industrial development. Workshops in 2010 identified Weddell as a logical place to house a Middle Arm workforce. However, the workshop also identified a number of constraints, including mangroves, biting insects, flood-prone areas and waterlogged land. About one-third of the land was deemed suitable for residential development, with other areas earmarked for industrial and conservation zones.

Part of Weddell, next to the Elizabeth River bridge, has been set aside for conservation and industrial purposes. Over-subscription of the Middle Arm precinct could create pressures to expand industrial zones or solar farms further east on both government and privately-owned land. These issues will be explored in the forthcoming Weddell/Middle Arm Subregional Land Use Plan.

8.4.8.4 Tourism

A brand represents the positive attributes of a product or experience that will resonate with potential consumers. A city's image is its brand. Kotler's classic textbook on 'Marketing Places' (2002) suggests that the image of a place must be valid, believable, simple, have appeal and be distinctive. A positive tourism image is generally associated with creative industries and quality of life as a residential location. A tarnished image has both economic consequences for tourism marketing and social consequences for a city's residents and employers.

As outlined in Section 5, the values of Darwin Harbour are integral to destination marketing of Darwin. Core values that appeal to tourists are 'culture' and 'nature'. A tourism representative

commented on the damage to Broome's image during debate over the future of James Price Point and feared the same could happen to Darwin if the brand became associated with 'B52 bombers and petrochemical factories' (in reference to topical commentary on both Middle Arm and geopolitical tensions).

Tourism was negatively affected during construction of INPEX's Bladin Point LNG plant, due to an influx of temporary staff and FIFO workers, who saturated Darwin's short-term accommodation and displaced leisure, conference and business travel to Darwin. Expensive and saturated accommodation diminished Darwin's role as gateway to regional destinations such as Kakadu.

> *It took a long time to recover. We were trying to attract investment for more accommodation. Then the* workforce *emptied out.* (Tourism NT interview)

Negative impacts on a place's tourism brand correlate with the desirability of a place to live and work as outlined in Section 5.5.3.

8.4.8.5 Aquaculture

The aquaculture industry is concerned about potential impacts on worker availability, pollution of the harbour and land and sea use conflicts. Aquaculture is sensitive to ecological change, particularly hatchlings, which is the predominant aquaculture activity on Middle Arm. Reduced water quality from pollutants or increased concentrations of brine could have devastating effects on pearling and projects which take in and discharge water, particularly on the Middle Arm side of the peninsula and Blackmore River.

"There's a reason why there's only one pearl company and one barra farming company near Darwin, when 20 barramundi farms have failed," comments Dan Richards from Humpty Doo Barramundi. "Our options are limited … It's hard to find land that's got a road, fresh water, power and people and is not a million miles from anywhere."

An indirect impact of contaminated water at the Channel Island Aquaculture Centre would be the reduced viability of an emerging Aboriginal fisheries sector across the Top End coast. Many of these enterprises rely on research and provision of hatchlings from the centre, including the emerging trepang sector discussed in 8.2.5.

There is a commitment in the MASDP Program (xxxxxxx) to protect water quality in Darwin Harbour so it continues to support the legislated beneficial uses under the *Water Act* (one of which is aquaculture).

8.4.8.6 Competition for land

Some businesses may face constraints to expansion or access to suitable land if the Middle Arm precinct is fully subscribed. This could lead to a loss of potential investors or displacement to less suitable areas. Of course, a benefit of over-subscription is that the NTG can be choosy, selecting projects that align with local values and the strategic vision for a sustainable precinct.

8.4.8.7 Collective rating

In summary, for Section 8.4.8, the displacement or loss of individual industries described above may be relatively inconsequential. However, collectively, these sectors are fundamental to the Territory's economy, jobs and diversification rather than capture by one sector. Many of these businesses are owned and managed by long-term Territorians with a vested interest in the future. All are sensitive to disruption and most are ambivalent about whether the Middle Arm precinct will be a benefit or a distraction from current operations. The collective extent and duration of this impact and the sensitivity of small business to disrupted productivity suggests an initial rating of HIGH, reducing to MEDIUM with avoidance of negative pressures.

8.4.9 Failure to deliver local contracts and benefits to local industry sectors

The flip side of opportunities for business growth is threats posed by a pace and scale of development that exceeds local capacity. This could lead to a leakage of economic benefits from the Territory and disruption to local businesses. Risks raised in interviews included:

- investment attraction getting ahead of detailed planning for enabling infrastructure, in particular power and water (see Section 7);
- national and global challenges sourcing skilled workers (see Section 8.4.7);
- national and global supply chain challenges, with big projects competing for contracts and resources;
- consequent cash flow pressures and companies going into administration (West Australian contractor Clough, for example, recently went into administration after winning work on the $500 million ship lift project in Darwin. The Tennant Creek Times of 4 November 2022 carried a story about a local hotel being owed $37,000 by a mining company not paying its contractors).

Many local businesses are already operating at capacity. While they philosophically support economic growth, in practical terms some were dubious as to whether the benefits of development would remain in the local economy. Aggregated data about economic impact, such as GDP growth, fails to capture this more nuanced experience of economic growth.

> *Up here, people talk big but often fail to deliver*
>
> *The Territory is full of opportunity but you don't want to destroy it.*
>
> *Governments always go for the shiny big projects at the expense of what is already here.*
>
> *Governments are so seduced by the big numbers of jobs, whereas the benefits go overseas and we get the pollution.*

Given the reservations, this risk is assigned an initial rating of MEDIUM, declining to LOW should local businesses experience the benefits of development.

8.4.10 Failure to deliver on expectations of jobs and training, particularly for Aboriginal workers.

The issue of skills shortages dominated discussion. Infrastructure Australia's latest market capacity report identifies shortages in 50 skilled labour occupations (2021, p.109). The workforce development strategy (Attachment 4 to this report) identifies low unemployment, high participation rates and widespread skills shortages.

Failure to build a local skills base by the start of construction in 2026 is a key risk to delivering the Middle Arm precinct. From a community perspective, the social risk would be a failure to capitalise on the current workforce scarcity in order to substantially improve outcomes for Aboriginal people living in and near the Greater Darwin Region. In this case, the aim should be to exceed what are probably LOW expectations (hence a LOW untreated risk rating) and substantially lift the bar to turn this risk into an enduring and beneficial opportunity (see Section 8.4.4).

8.5 Recommendations for economies and jobs

8.5.1 Territory Benefit Plans

In line with NTG policy, Territory Benefit Plans (or Australian Industry Participation Plans) should be mandatory for all proponents. Precinct management can play a role in fostering collaborative approaches, precinct wide research and guidance.

Proponent level requirements would include:

- an outline of expected project workforce, services and supplies
- an outline of proposed approaches to maximising local employment and industry participation
- a demonstrated understanding of the strengths and weaknesses of the local market
- how proponents will invest to build capacity
- a commitment to use ICN and IBN databases to identify local suppliers.

Precinct management can contribute to good outcomes by:

- precinct-wide research (eg ICN capability mapping)
- guidance on preparing Territory Benefit Plans
- business development strategies and business matching
- a communication strategy, including industry briefings and advance communication of opportunities
- precinct-wide community investment planning.

8.5.2 Workforce development strategy

Collaborative detailed workforce development planning is needed to build on the workforce development strategy (Attachment 4) as precinct activities and workforce needs are clarified.

Recommendations for achieving better local employment outcomes include:

- a more refined workforce development strategy taking account of precinct needs as they become more certain, combined with the needs of other sectors and projects (DITT)
- forecasting of likely workforce needs for all infrastructure projects in the region (Infrastructure NT)
- tracking national and regional skills and competencies gaps (ISACNT)
- a skilled migration policy that focusses on trades and skills likely to be needed in high tech manufacturing and the 'new economy' of renewable energy
- upskilling of existing workers, as well as attracting new skills
- strong mentoring and support for the long-term unemployed, similar to the pathways to employment approach offered by Saltbush Social Enterprises
- evidence-based marketing strategies to promote living and working in the Territory, targeting skills in highest demand
- retaining international students by resolving visa issues
- ensuring a pipeline of work that allows apprentices and trainees to gain qualifications and work experience
- investing in training providers, from VET in schools to trades and professional qualifications
- public transport to Middle Arm so apprentices and trainees can get to work, given many will lack private transport
- sequencing of work and allowing for social as well as economic outcomes (e.g. through social procurement[9]).

See Attachment 4 of this report including a summary of TERC recommendations (p.31) and the ACIL Allen report (2022) for the Property Council of Australia NT.

8.5.3 Procurement policies, including the Aboriginal Procurement Policy

Procurement policies by NTG and private investors must focus on business sustainability in the Greater Darwin region, through sequenced development, by:

- packaging tenders to suit local capacity
- using the Northern Territory ICN (Industry Capability Network) and NTIBN (Indigenous Business Network) to identify companies with appropriate capabilities
- government agencies must follow the Territory's procurement framework (updated in 2022) and principles, which include value for the Territory, ethical behaviour, open and effective competition, and enhancing the capabilities of Territory enterprises and industries.

Ensure accountability for implementation (set indicators, require data collection from proponents and report results), training and constructive feedback on tendering and advance notification of opportunities.

[9] "Social procurement is when organisations use their buying power to generate social value above and beyond the value of the goods, services or construction being procured. Social value refers to the benefits for all Victorians when social and sustainable outcomes are achieved through procurement activities." (Victorian Government, Social Procurement Framework 2018).

8.5.4 Extractives

The Weddell/Middle Arm subregional plan in 2023 to further consider issues such as areas that could be opened to extractive industries as part of planning for residential and industrial development.

8.5.5 Displacement of industries

Precinct master planning and land use planning to consider projects which provide the best strategic fit for the precinct and determine suitable locations for those exceeding its capacity, e.g. Weddell.

8.5.6 Coordination

Collaboration amongst precinct operators and across industry clusters and regional economic development bodies to maximise the benefits of development, develop support strategies (such as recruitment and social infrastructure), share data and workforce planning, e.g. Maritime Industry Development Plan.

8.5.7 Monitor and report:

Continued monitoring and reporting of outcomes, adaptive management based on the active participation of industry groups in planning. Monitor emerging workforce and industry participation issues and address with planning and industry capacity development.

9. Cultural identity

9.1 Overview

(This section should be read in conjunction with the cultural heritage report at Appendix xxx).

Aboriginal people have lived in the Darwin Region for tens of thousands of years, including the Larrakia (around Darwin Harbour), Wulna (towards Adelaide River) and Kungarakany (around Batchelor).

A 2003 Darwin Harbour Regional Plan of Management by DHAC has valuable context and background to the committee's work, including a section on Larrakia perspectives.

This section to be informed by cultural heritage report and Larrakia values

At the time of writing, only preliminary consultation...

Needs to cover cultural heritage, connections to land and seas, cultural uses, ecological knowledge, uses of plants and animals and how foods might be affected – link also to health impact assessment.

Table 9-1: What is covered under Cultural Identity

What is covered by Cultural Identity	What the Terms of Reference asked for
 Covers connections to country, cultural authority and respect for Aboriginal worldviews and cultural values. Cultural identity can be affected by reduced access to land and traditional livelihoods, damage to sacred or important cultural sites, threats to traditional leadership or dilution of shared values. This dimension also covers the shared culture and values of communities and the value of non-	Describe and provide baseline data, including: • land and sea uses, including recreational values. Potential impacts and opportunities, including: • disturbance to non-heritage listed sites of historical importance, including World War 11 historical sites around East Arm and Darwin Harbour • cultural identity, ties to the land and seas and ability to pass on knowledge (fishing, foraging, camping, access to and enjoyment of places around the Harbour).

heritage listed historical sites of importance.	

9.2 Baseline

Cultural heritage report

DHAC Report card ratings: Indigenous food security received a C, indicating a decline in sea and mainland food sources over time.

Future Generations received a good grade (B), reflecting survey responses that cultural knowledge is still practised and being passed on to children. However, concerns at access to jobs, that opinions were taken into account and their knowledge of country was recognised.

Spiritual and sacred sites received an overall moderate grade of C+, with concerns that sites are not respected by non-Indigenous people or sufficiently protected.

9.2.2 Historical

Historical – World War II remnants, from sunken Catalinas to remnants of military sites – tourist potential, slowly being lost to development

Terminus of Overland Telegraph Line, which celebrated its 125th anniversary in 2022

Terminus of the railway at Stokes Hill Port

to come from cultural heritage report

9.3 Key change processes

- planning and decision-making for the project and the extent to which Larrakia and other Aboriginal groups are involved
- project activities such as dredging, clearing and construction damage cultural, heritage or historical sites
- reduced access to cultural sites, food gathering

9.4 Impact assessment for cultural identity

Table 9-2: Impacts on cultural identity

Potential benefits and impacts – Cultural Identity	
Potential cumulative benefits	**Potential cumulative impacts**
	R-23 Distress at damage to sacred sites from land clearing, dredging or construction activities
	R-24 Distress at damage or loss of heritage or historical sites
	R-25 Reduced biocultural knowledge and ability to pursue cultural activities due to access constraints, pollution
	R-26 Diminished cultural values or reduced cultural identity

	R-27 Reduced enjoyment of human rights, racism, discrimination of marginalisation

9.4.1 Distress at damage to sacred sites from land clearing, dredging or construction activities

The consequences of damage to nearby cultural heritage would cause distress, therefore this impact has a HIGH rating, which could reduce to MEDIUM with appropriate Aboriginal Protection Authority Certificates, cultural heritage management plans and cultural inductions for workers.

9.4.2 Distress at damage or loss of heritage or historical sites

Development can affect historical values, beyond those formally protected by heritage legislation, in particular historical ties to early settlement and World War II activities around Darwin Harbour. Given the incremental loss of historical sites around the harbour, particularly with development of East Arm, the cumulative impact of this would be MEDIUM, reducing to LOW through a combination of avoidance and interpretive signage to honour the past.

9.4.3 Reduced biocultural knowledge and ability to pursue cultural activities

Spills, discharge or other contamination could lead to health concerns from eating shellfish, fish, and limit Larrakia hunting/gathering around the harbour or affect their health.

9.4.4 Diminished cultural values or reduced cultural identity

Activities that are important for cultural values and identity, eg fishing, foraging for shellfish, camping and enjoyment of places around the harbour. There has been a progressive loss of access to these places. Might include (to complete based on advice from Larrakia)

- reduced ties to country and family
- importance of involving Larrakia in decisions.

9.4.5 Reduced enjoyment of human rights, racism, discrimination or marginalisation

Key right is that of Free, Prior and Informed Consent, which increasingly is being interpreted as the right to subsidiarity, or local decision-making and First Nations led studies.

Racism in the workplace

Infrastructure projects such as the National Aboriginal Art Gallery in Alice Springs and the Larrakia Cultural Centre at Stokes Hill are a key part of the drive for quality offerings, supported by our Tourism NT Aboriginal tourism grants, dedicated marketing campaigns like the recent 'Culture is closer than you think' and the Aboriginal Tourism Committee.

Larrakia concerns that they weren't consulted or part of the decision-making process for Middle Arm (see strong voice). Tensions as to whether the NLC is the appropriate avenue.

Tiwi Islanders, associated with placement of offshore dredge material

9.5 Recommendations

9.5.1 Values mapping

Larrakia-led values mapping of cultural heritage sites to contribute to cultural heritage management plan, technical advisory committee of site custodians and cultural heritage training (as per cultural heritage report, Earthsea 2022);

9.5.2 Ongoing structure for Larrakia-led consultation and studies

To come from Larrakia

9.5.3 Sacred site clearances

DIPL has lodged an application for an Aboriginal Areas Protection Authority (AAPA) certificate for land and seas affected by the development.

Recommendations to come from Larrakia

Could include:

- cultural inductions and protocols for workers
- ongoing Larrakia-led research
- cultural heritage monitors
- interpretive signage for heritage and historical places on Middle Arm, East Arm or in Darwin Harbour
- collaboration/funding for Darwin Harbour Advisory Committee
- culturally appropriate communication and engagement methodologies

10. Healthy Country

10.1 Overview

While other sections of the Environmental Impact Assessment (EIS) cover potential impacts on biodiversity and environmental protection and conservation, this section of the SIA looks at the issue from the perspective of how people value and use healthy country and seas.

Understanding how people value and use natural resources reflects an ecosystem services approach, or analysis of how ecosystems contribute to human wellbeing through the following services (Millennium Ecosystem Services, UN, 2005):

- supporting (primary production)
- provisioning (food, fresh water)
- regulating (flood and climate regulation)
- cultural (aesthetic, spiritual, educational and recreational).

This is sometimes described as nature's contribution to people or the contribution of the living natural environment to the basic needs of humans for fresh air, food and water as well as resource-based livelihoods and quality of life issues such as recreation, art and sense of place (Diaz et al., 2018).

It is people's reactions to loss of the natural environment, and iconic or totemic species, that generates opposition to projects. As described in Section 5 on values mapping, healthy land and seas are integral to Darwin region lifestyles and livelihoods. Values influence the way that people perceive and judge reality, truth and knowledge in ways that may differ from mainstream science (Pascual et al. 2017).

Table 10-1: What is covered by Healthy Country

What is covered by Healthy Country	What the Terms of Reference asked for
 Healthy land and seas covers values associated with the use and enjoyment of the natural environment. This is sometimes described as socioecological systems or 'ecosystem services', which are the commercial, cultural, recreational and aesthetic benefits,	(see also Section 5 on values mapping) Potential impacts and opportunities, including: • concerns about cumulative impacts, eg discharges of waste water, dredging, reclamation, increased marine traffic, loss of mangroves and iconic species such as turtles, dugong and dolphins, migratory birds, loss of fish breeding areas, reduced water quality, contribution to greenhouse gas emissions and climate change • public concerns regarding industrialisation of Darwin Harbour with consequent pollution and degradation of the environment • public concerns about the use of fossil fuels and sustainability of gas-based development and the implications for climate change • opposition to the need to find new water sources to support development (eg desalination, new dams)

goods and services we derive from the use of our land, clean air and water.	Management plans, including: An agreed Precinct and harbour-wide management strategy with timelines for agreed monitoring and evaluation of sustainability outcomes against agreed indicators.

10.2 Baseline

> "The natural environment in and around Darwin makes it a paradise for people who love the outdoors." (Darwin Australia's Tropical Harbour City, 2008)

From the Darwin Harbour Advisory Committee's (DHAC) Integrated Report Card (2021, p.2):

> Darwin's Harbour supports the largest concentration of commerce and industry in Australia's Northern Territory (NT). It's home to most of the NT's residents and is the Country of the Larrakia people who have called the harbour home for many thousands of years.
>
> Darwin Harbour's diverse ecosystems, including relatively intact mangrove systems, coral reefs, mudflats and seagrass beds, support high biodiversity and provide habitat for nesting turtles, dolphins, dugongs, migratory shorebirds and fish.
>
> The harbour provides many recreational and tourism opportunities, including a large recreational fishing sector. Darwin Harbour is a strategically important working harbour and it is the only deep-water port between Cairns in Queensland and Broome in Western Australia.
>
> For the harbour to continue to play a central role in the ongoing economy of the NT, it is critical to ensure that cultural, environmental and recreational values of the harbour are also thriving and managed sustainably.

A healthy natural environment is integral to Territorians' lifestyle and the liveability of the Top End, with our natural assets and access to outdoor activities a key element of attracting and retaining people to live in Greater Darwin. The NTIPP 2022 comments: "People live in the Territory because they love the relaxed lifestyle, choice of outdoor activities and the chance to immerse yourself in nature".

A desired outcome of the Darwin Regional Land Use Plan (Planning Commission 2015) is that "natural attributes of the Darwin Region, that have high biodiversity values and contribute to the amenity enjoyed by residents and the economy, are identified and managed sustainably".

Healthy Country is particularly important for Aboriginal people, who have maintained their stewardship of land and seas for tens of thousands of years. In 2021, the CSIRO collaborated with Aboriginal groups around Australia to produce *Our Knowledge, Our Way in caring for Country: Indigenous-led approaches to strengthening and sharing our knowledge for land and sea management.* The guideline showcases innovative ways in which Indigenous people are drawing on their knowledge to build sustainable futures on their land and sea Country.

10.2.1 Health of the harbour

Several report cards suggest that Darwin Harbour remains in relatively good condition, although it faces pressure from urban development, industrial activities around East Arm and the discharge of effluent.

The Darwin Harbour Integrated Report Card (DHAC 2021) gives the harbour an overall rating of B-:

- The water quality index rated B, indicating good conditions in most of the harbour except Buffalo Creek and Myrmidion Creek which are influenced by these areas receiving treated effluent.
- A sediment quality index rated B, indicating good conditions for sediment metals, except for some areas of degraded quality around East Arm.
- The catchment disturbance index was rated as in a very good condition overall, attracting an A rating. However, poor catchment conditions were identified in the Rapid Creek and Darwin City Region. Palmerston and Elizabeth River received ratings of B- and B+ respectively.
- The mangrove area change received a rating of C+, with a slight decrease (less than 1%) in mangrove extent across the harbour between 2016 and 2020.
- Indigenous food security received a moderate grade of C, reflecting survey responses that indicated a decline in sea and mainland food sources over time, attributed to over-fishing, poor governance, habitat destruction and invasive species.

A report on anthropogenic pressures on Darwin Harbour (Department of Environment, Parks and Water Security 2022) noted increasing pressures on the harbour. Indicators measured as part of the Integrated Marine Monitoring and Research Program Monitoring Report 2020-21 matched catchment conditions such as land use, stormwater pollutant loads, fire regime, waste disposal, shipping activity and species harvesting with drivers such as population growth and economic development.

The report was funded by INPEX as part of a 40-year program under INPEX's voluntary offsets agreement with the NT Government. It found an increase in nutrient loads of nitrogen, phosphorus, volatile suspended solids, lead, copper and zinc, particularly in areas affected by urban sprawl.

The NT Government's annual Darwin Harbour Water Quality 2021 report gives the harbour an overall grade of A. Like the DHAC integrated report card, Myrmidon Creek (near Palmerston) and Buffalo Creek received poor ratings due to the localised impacts of treated wastewater inflows. The Elizabeth and Blackmore Rivers received A ratings. The water quality index measures algae, nutrients (nitrogen and phosphorus), dissolved oxygen and water turbidity that are likely to be affected by high nutrient loads from wastewater, urban and industrial run-off.

The report notes that the Elizabeth River estuary contains seagrass beds that provide feeding grounds for dugong and turtles (check with marine team). Large parts of the estuary are still lined with mangroves but industrial development along the foreshore has reduced mangrove cover in

recent years. The estuary receives urban stormwater runoff from the city of Palmerston during the wet season and dispersed discharge from the Palmerston wastewater treatment plant that enters the harbour in Myrmidon Creek.

Middle Arm comprises the Blackmore and Pioneer River estuaries. The water quality report notes that this zone has extensive mangrove fringes and intertidal mudflats. The Blackmore River flows into Darwin Harbour over the whole year, with dry season flows from Darwin River Dam and Berry Springs. Most of the zone's catchment is rural or savannah woodland.

10.3 Key change processes

- increased marine traffic and introduction of marine pests
- biophysical changes and loss of species as a result of project activities, such as clearing of land or mangroves, dredging, dredged material disposal, reclamation, piling, construction, turbidity or sedimentation, emergency incidents
- reduced water quality from spills, pollution and contaminated water runoff
- discharges of brine from a MASDP desalination plant
- urbanisation to support precinct development and population growth

10.4 Impact assessment for Healthy Country

Table 10-2: Potential benefits and impacts on Healthy Country

Potential benefits and impacts – Healthy Country	
Potential cumulative benefits	**Potential cumulative impacts**
	R-28 Poor water quality and fish health reduces recreational fishing
	R-29 Diminished ecological values of the harbour
	R-30 Constraints on the emerging aquaculture sector due to pollution, biosecurity risks and reduced water quality
	R-31 Greenhouse gas emissions jeopardise the NT's zero emissions targets and contribute to climate change

10.4.1 Poor water quality and fish health reduces recreational fishing

AFANT, recreational fishers, aquaculture businesses and tourist operators alike expressed concern that any decline in water quality in Darwin Harbour from pollutants, toxins and heavy metals would affect the health of fish, shellfish. and mud crabs: from breeding areas in mangroves to detritus that might enter the food chain or further loss of biofilters such as oyster reefs.

In the early days of settlement, edible oysters were harvested for food. Oyster reefs and shell middens were removed to make mortar from lime. Oyster beds have been further disturbed by dredging and clearing. The rocky reefs and pearl beds are part of the nutrient cycle of the harbour, says David Ciaravolo, the CEO of AFANT. Fish breed in estuarine areas that are heavily vegetated, shallow and provide safe refuge at night. Dugong and turtles feed on seagrass.

These impacts are likely with progressive development, while the consequences would be significant. This risk is therefore assigned an initial HIGH rating, which would reduce to MEDIUM with rigorously applied environmental management plans.

10.4.2 Diminished ecological values of the harbour

Of the 235 respondents to the values mapping survey in Section 5, 178 nominated 'enjoyment of nature' as one of their uses of the harbour. Other ecosystem services that would be diminished by reduced ecological values include:

- ecotourism and guided fishing tours
- the role of oysters as biofilters
- the role of mangroves and seagrasses as nurseries and a food source for fish, turtles and marine mammals
- fishing, crabbing and collecting shellfish as a provisioning service, particularly if heavy metals or toxins enter the food chain
- the contribution to human wellbeing of intact ecosystems
- feeding areas for threatened shorebirds.

Comments from survey respondents include:

> *Mangroves, seagrass beds and coral work as a system that keeps our coast and sea healthy. The whole harbour is a very special place, being so close to home/city.*
>
> *The speed at which the harbour water quality, biota and ecosystems could be degraded is concerning. Some impacts, for example an increase in contaminants, loss of biodiversity, loss of fisheries, may cause irreversible change and damage.*

The strength of values expressed in the mapping exercise would suggest that tolerance to disturbance may have reached a tipping point among long-term residents of Greater Darwin, particularly for any permanent decline in values. Population and industrial growth increase the risks of pollution of marine mammals, birdlife, corals, fish, mangroves and seagrass. The risks are heightened by the diffuse sources of additive impacts and duration and likely scale of dredging and shipping, which compounds the risk of marine strikes to turtles, dugong and dolphins.

This risk, therefore, is rated as HIGH. While cumulative impacts of population growth and industrialisation around the harbour would seem inevitable, the contribution of the Middle Arm precinct could be reduced to MEDIUM or LOW if impacts on ecological values are minimised through good environmental management. The outcome desired in community feedback is no further loss of species and further decline in the uses and values of the harbour.

10.4.3 Constraints on the emerging aquaculture sector due to pollution, biosecurity risks and reduced water quality

Dan Richards, of Humpty Doo Barramundi, grew up foraging for native longbums and periwinkles on Middle Arm Peninsula with Aboriginal friends, fishing off North Shell Island (now part of Darwin

Port) and crabbing up the creeks in the Middle Arm precinct footprint with his father Bob, an agricultural scientist.

> *I spent a lot of my youth walking through the mud pulling out crabs. And in every hole there were hundreds of little fish in the puddles (left behind).*

Dan is an environmental scientist, former Nuffield Farming Scholar and Chief Executive of Humpty Doo Barramundi. His wife Tarun is Head of Business Services, Chair of the Australian Barramundi Farming Association and sits on the NT Barramundi Fisheries Management Advisory Committee. They see Darwin Harbour and its catchment as offering immense opportunities for the aquaculture sector, including jobs and seeding of Aboriginal enterprises across the Top End. But the family is acutely sensitive to any disturbance of the harbour's ecological functioning, commenting that "Darwin Harbour isn't a toilet".

"It's hard to raise juvenile shellfish, they are really sensitive to heavy metals and water pollution. The Territory is full of opportunity but you don't want to destroy it," Dan and Tarun warn.

Humpty Doo Barramundi's hatchery at the Darwin Aquaculture Centre is kept separate from grow out ponds on the Adelaide River floodplains for biosecurity reasons. An indicative precinct pipeline corridor crosses a proposed hatchery site, south of Channel Island. Key concerns expressed by Dan and Tarun:

- any pollution by petrochemicals or heavy metals could affect water quality or end up in sediments on the harbour floor and be stirred up during storms;
- crabs, fish and shellfish collected by Aboriginal people and recreational fishers and crabbers could become unhealthy;
- any loss of mangroves would reduce fish breeding grounds (70% of the Territory's – check) mangroves are in the harbour and they are important);
- that desalination might draw in sea water for reverse osmosis or cooling then return potentially heated or brine to the harbour, which could increase algal blooms and change the ecology and water quality of the harbour (only intake pipelines are planned and there is a commitment in the MASDP program that there will be no discharges to Middle Arm)
- biosecurity breaches, such as pests and diseases bought in bilge water from international vessels, that could devastate the aquaculture industry.

These concerns were echoed by Paspaley Pearls and Tasmanian Seafoods, who emphasised the importance of water quality at the Darwin Aquaculture Centre and the risks of heavy metal contaminants.

Humpty Doo Barra also wanted reassurance that the AROWS project and current Arnhem Highway upgrade works across the Adelaide River floodplain would not affect flooding and seasonal flushing of Adelaide River floodplains and river.

The likelihood of impacts on aquaculture is uncertain but risks could be assumed to increase with cumulative industrialisation of the harbour. The consequences would be severe and likely enduring, therefore this risk is assigned a HIGH rating, which would reduce to MEDIUM with

careful avoidance, implementation of environmental management plans and monitoring, including hydrodynamic modelling.

10.4.4 Greenhouse gas emissions jeopardise the NT's zero emissions targets and contribute to climate change

A key driver of opposition to the Middle Arm precinct is alarm at climate change, continued reliance on fossil fuels, and the contribution of gas-based industries to greenhouse gas emissions. While there was support for low-emissions manufacturing, the precinct was also criticised as enabling Beetaloo and Barossa gas developments, thwarting the Territory's goal of net zero carbon emissions by 2050.

> *There are species in danger due to climate change. Sea level is affecting the mangroves which are the best trees to store carbon (blue carbon). There are fauna species which are abundant and others not doing so well.*
>
> *It doesn't make sense to start up a project like this when all Australian states are working towards lowering their carbon footprint and encouraging development in other power options.*

Data from greenhouse gas emissions assessment

The most recent independent oversight report on the Hydraulic Fracturing Inquiry (Ritchie 2022) notes that the Territory is unable to meet its objective of reducing the life cycle greenhouse gas emissions from development of the Beetaloo without support from the Commonwealth and other states. Based on a fully development precinct, the Middle Arm precinct could contribute xxxx of the Territory's emissions, which would substantially compound this dilemma.

Queensland and NSW land courts are rejecting approval of coal mines that generate scope 3 emissions and the new Australian Government is showing a greater commitment to reducing Australia's carbon emissions.

Given the NTG's commitments to reducing emissions and heightened community sensitivity to climate change, this risk is assigned a VERY HIGH rating. The rating would be reduced to HIGH only with the use of renewable energy, effective carbon capture, use and storage and reduced emissions from marine traffic, land clearing, construction and operations. to revisit once study available

10.5 Recommendations

10.5.1 Rigorous monitoring programs

Rigorous environmental management plans and monitoring will be needed to maintain healthy land and seas around Darwin Harbour and compliance with environmental conditions attached to precinct and project-level approvals. This might be informed by community involvement, transparent and accountable reporting and sensitivity to harbour-wide emerging issues. A collaborative approach with DHAC's integrated report card would be valuable.

10.5.2 Harbour Dredge Strategy

That the NTG complete the proposed harbour-wide dredge strategy.

10.5.3 Abatement of carbon emissions

To be truly sustainable, the precinct will need to abate rather than contribute to greenhouse gas emissions in the Northern Territory or other jurisdictions.

Addressing targets and reducing the risk rating would imply careful selection of industries and proven use of carbon, capture, use and storage.

To come from greenhouse gas study

11. Living environment

11.1 Overview

The 'living environment' covers impacts on community amenity or 'pleasantness of a place' (Oxford English Dictionary). Our living environment, or surrounds, is precious to our quality of life and may be disturbed by industrial activity, including noise, dust, smells, traffic congestion, pollution, lost access to places we value and destruction of landscapes. The living environment covered by this SSIA includes areas where people live, work or visit for recreational purposes, or the surrounds of residential, recreational or economically important places.

Table 11-1: What is covered by Living Environment

What is covered by Living Environment	What the Terms of Reference asked for
 Our living environment incorporates what is often described as a 'surroundings' and includes the community's experience or perceptions of factors that cause annoyance or disturbance to the amenity of places where people and families live, work and play. This includes disturbance from industrial noise, dust, lights, heat, vibrations, traffic congestion, destruction of landscapes or pollution that detracts from the quality of our environs. Technical studies might assess the likelihood and consequences of impacts on receptors. A social perspective explores who these 'receptors' might be, their values and their sensitivity to disturbance.	Identify, describe and assess likely cumulative impacts, including: • disturbance to the environmental surrounds that provide for the tropical lifestyle and amenity of residents and visitors, through alteration of: ○ air quality ○ noise ○ odour ○ light ○ visual amenity.

11.2 Baseline

The amenity of the Greater Darwin Region is a key element of the 'Territory lifestyle' and has been well-described in previous sections.

To come from technical studies

11.3 Key change processes

- industrialisation of Darwin Harbour, exclusion zones, reduced access and changed land uses
- operations of the precinct leading to noise, dust, odours, vibrations, pollution, changed land and seascapes
- increased marine and land transport, including worker self-drive traffic.

11.4 Impact assessment for Living Environment

Table 11-2: Potential benefits and impacts on Living Environment

Potential benefits and impacts – Living Environment	
Potential cumulative benefits	**Potential cumulative impacts**
	R-32 Increased travel times and traffic congestion for road transport operators, Palmerston residents and commuters
	R-33 Reduced quality of life due to nuisance impacts, such as noise, dust, pollution, visual, vibrations, smells

11.4.1 Increased travel times and traffic congestion for Palmerston residents, road transport operators and commuters on routes leading to Middle Arm

Development at Middle Arm would likely increase traffic between the precinct, Litchfield and Palmerston for workers, construction equipment, quarry materials and supplies. Cumulative traffic growth could lead to congestion and traffic delays for industrial and residential traffic, as well as fishers heading to the Elizabeth River boat ramp.

As outlined in 7.2.6, transport planning is designed to reduce congestion and safety risks. Heavy vehicles generally use Elrundie Avenue outside peak periods due to the nearby residential areas and schools (NTRTA). Executive Director of Transport Planning with DIPL, Chandan Kalase, says DIPL receives many complaints from schools and residents of Elrundie Avenue about “road trains honking, braking and pollution”.

The proposed Weddell Freeway should alleviate this issue by providing a free run along a de-signalised route from the Stuart Highway at Noonamah to Weddell, Middle Arm, Berrimah and East Arm Port. This would take traffic off Jenkins Road and Elrundie Avenue.

There are lessons to be learned from the INPEX LNG plant construction at Bladin Point, by providing park and ride facilities and bussing workers to site. This would both reduce both light vehicles and fuel consumption (Chandan Kalase).

Given the range of solutions proposed, and planning under way to stage enhanced transport infrastructure as the precinct grows, this risk was assigned a LOW rating.

11.4.2 Reduced quality of life due to nuisance impacts, such as noise, dust, pollution, visual, vibrations, smells

Nuisance impacts affect the amenity, or valued aspects of people's surroundings, thus impacting on the quality of life and wellbeing of people and communities (see Section 6). Nearby populations, such as Palmerston suburbs, would be sensitive to intrusive impacts, such as construction and piling noise, dust and air emissions and the visual impact of an industrialised land and seascape. Given that most of these are considered in separate reports and did not feature in stakeholder consultation, they are considered as a collective 'amenity' impact.

Noise

Noise impacts are sounds that disturb nearby residents or communities, such as disturbing sleep or disrupting concentration or conversations.

Disruption from terrestrial noise and vibrations was not raised during stakeholder consultation by DIPL or for the SSIA. A terrestrial noise and vibration assessment (GHD 2022 at Appendix xxxx) predicts that cumulative industrial noise during operations should not exceed the NT EPA's noise management guidelines except at night, in some weather conditions, in nearby suburbs of Bellamack, Moulden, Zuccoli, Virginia and Mitchell and at Bladin Village on Middle Arm Peninsula. Higher noise and vibrations during construction, such as piling for marine infrastructure, may be experienced temporarily. The Bladin Village would likely be affected, which could be an issue for sleeping workers if used as worker accommodation. Project proponents would need to prepare detailed noise management plans, including mitigation measures to reduce environmental noise levels and noise monitoring systems. Noise attenuation should be considered for any disruptive activities.

Submissions to the Draft TOR from ECNT and the Australian Marine Science Association (AMSA) and survey responses included concerns about the effects of marine noise, in particular on cetaceans. To come

Visual

The Middle Arm precinct will cover 1200 hectares of land off the Channel Island Road, past the Elizabeth River Bridge. In contrast with the Wickham Point and Bladin Point LNG plants, the site is unlikely to be visible during the day from Darwin's CBD and there is a natural buffer zone between the site and Palmerston suburbs closest to the site (Archer, Bellamack and the proposed suburb of Mitchell). It would be partly visible from Stokes Hill Wharf at the Darwin Waterfront.

However, the site will be highly visible to passing marine traffic, from the Elizabeth River Bridge and to passengers on the *Ghan* passenger train which passes to the east of the site. Surveys and interviewees suggested increased shipping movements would be visible along the harbour coastline and the precinct would compound visual pollution at night.

Comments on the mapping tool for the values mapping exercise (see Section 5 and Attachment 2 of this report), suggested views would be impacted for passengers on the Ghan and people crossing the Elizabeth River Bridge.

Executive Director of the NT Road Transport Association, Louise Bilato, who has run a psychology and injury management practice, suggests the importance of planting trees and creating green spaces throughout the precinct, like Singapore. This would improve the visual aesthetics, act as a noise barrier and contribute to the mental wellbeing of people working in the precinct.

> *I have been to Port Hedland. It is disgusting… town is tired and dirty. It should have beautifully tree-lined avenues…. yet it's dowdy and sad.*
>
> *When a place is aesthetically pleasing, it's good for mental health. If we are to support our future workforce to be resilient, we need to support all those things. Giving them the opportunity to feel less stress because they are in a clean, green space. It's more welcoming.*
>
> *An industrial precinct doesn't have to be ugly… You could have facilities for lunches and a workers' retreat.*

To provide context, not only does the site provide a cumulative impact, but its individual impact would be greater due to the larger footprint, compared with the two existing LNG plants:

Table 11-3: Footprint comparisons

Site	Footprint	Comments
Middle Arm Sustainable Development Precinct	1200 hectares (about half of Middle Arm Peninsula	Not visible from CBD? but from railway, Channel Island Road and Elizabeth River Bridge. 5 jetties, one MOF
INPEX Bladin Point LNG Plant, in operation since 2018	520 hectares	3 km from East Arm, 5 km from Wickham Point Two jetties
Santos Darwin LNG Plant, in operation since 2006	66.8 or 88.3 ha	Closest part of the peninsula, behind a hill but still visible from the CBD One jetty, one MOF

A preliminary visual assessment (Royal HaskoningDHV 2023 at Appendix xxxx) considered changes to day and night-time visual amenity as a result of the onshore MASDP development as well as the nearshore area where maritime infrastructure is proposed. A viewshed analysis considered a number of viewpoints such as the Darwin Waterfront, the Mandorah Jetty, Darwin and Palmerston suburbs, East Arm and the Elizabeth River Bridge.

The precinct would be visible from Stokes Hill Wharf, although the existing Bladin Point LNG plant would partly obscure the view. It would be barely visible from many suburban viewpoints in Darwin and Palmerston due to barriers such as trees and hills. There would be medium visibility from the rooftop bar at the Zen Hotel in the CBD. The tanks, product loading jetty, tankers and precinct would be highly visible from the East Arm boat ramp. The site is only kilometre from the

Elizabeth River bridge and would be highly visible to marine traffic. The preliminary visual assessment suggests vegetated buffers, including existing mangroves. While much of the proposed infrastructure will be higher than the tree line, vegetation in the foreground will reduce the stark contrast between the onshore development area and surrounding mangrove coastline.

The MASDP will be readily visible at night from many view points. Light pollution can affect some species' breeding and migratory patterns and attract nocturnal animals that may be harmful to local ecosystems. The preliminary visual assessment recommends controlling the intensity and direction of lighting, and strategic lighting design to reduce light spill. Night-time shipping should be minimised, particularly in the early stages of development, to reduce the impact of navigational lights.

Insert visual from PVA, view from Elizabeth River Bridge (Fig 43) to come from Royal Haskoning + viewshed map

Air quality

The Air Quality Impact Assessment prepared for the EIS (at Appendix xxx) indicates that the nominated industries can be accommodated at the MASDP without an unacceptable impact on air quality. The air emissions modelling indicates that the National Environmental Protection Measure (NEMP) guidelines for air quality will be met within the precinct boundaries.

11.5 Recommendations

11.5.1 Road transport

The risks of congestion and traffic delays should be mitigated by proposed upgrades to roads leading to Middle Arm to cater for increased construction, industrial and commuter traffic. Other recommendations include:

- public transport or dedicated buses for workers;
- planning and capital works budgeting keeps pace with forecast increases in road traffic from the MASDP and other sources (e.g. eventual duplication of Channel Island Road, the Weddell Freeway will eventually take heavy vehicles off Elrundie Avenue)
- proponents' traffic plans factor in avoidance of residential areas at peak hour.

11.5.2 Environmental management plans

Rigorous environmental management plans by proponents should ensure compliance with precinct and project-level approvals and take account of emerging cumulative issues. These are covered in separate technical reports. Community perspectives should remain an important consideration in setting and adapting conditions.

Particular attention should be paid to dust suppression, noise attenuation, scheduling of works and avoiding noisy activities when weather conditions are amenable to noise carrying to nearby suburbs.

The preliminary visual assessment (outlined above) recommends vegetation buffers, strategic lighting and minimising night-time shipping. Louise Bilato suggests that landscaping would improve visual amenity and create a more attractive workspace within the precinct.

11.5.3 Grievance registers and communication

It will be important to communicate conditions of approval and advise the public what acceptable thresholds are for disturbance and how to make a complaint, for example to the NT EPA.

Community members should be able to register for updates in order to receive advance notice of activities that are likely to disturb amenity.

Precinct management should also maintain a grievance register, particularly during construction periods where higher exceedances are likely. The register should have standards for recording and responding to complaints, with regular analysis of trends.

12. Strong voice

12.1 Overview

Having a strong voice means being given the time, opportunity and resources to have real input to decision-making on policies and projects that affect the lives, lifestyles and livelihoods of people, families and communities. For Aboriginal people, it incorporates the concept of Free, Prior and Informed Consent (FPIC) (United Nations 2007) to activities on their traditional lands and seas, recognition of traditional governance structures and enjoyment of statutory rights.

The concept of FPIC is considered particularly important for vulnerable and disadvantaged communities, recognising unequal power relationships and greater vulnerability to impacts:

- **free**: no coercion, harassment or retribution
- **prior**: before any activity starts
- **informed**: full disclosure
- **consent**: that communities have a real choice (Vanclay et al. 2015).

For the general citizens of a place and impacted, influential or interested stakeholders, having a strong voice is akin to democratic participation between elections. Public participation means individuals, families and communities have influential input to decisions that affect their lives, livelihoods or lifestyles.

Table 12-1: What is covered by Strong Voice

What is covered by Strong Voice	What the Terms of Reference asked for
A strong voice means having influence over decisions and contributing to our own governance. Communities may feel ineffectual if their voice is not heard.	• Engagement in line with the NTEPA Guidance Note for Proponents on Community Engagement (2021) and objects of the *Environment Protection Act* (2019) Management, to include: • an ongoing communication and community engagement plan and appropriate governance mechanisms (eg an industry and community reference group that must include strong Larrakia participation).

12.2 Baseline

Stakeholders have taken a keen interest in developments on Middle Arm and East Arm Peninsulas over the past 20 years. Development of the harbour has been contentious, particularly for projects such as the expansion of East Arm Wharf, the Darwin LNG plant at Wickham Point, INPEX LNG plant at Bladin Point and, most recently, a proposed TNG processing plant that did not proceed. In some cases, the combination of disturbed values and a feeling of disempowerment has led to protests and social movements, such as Save Darwin Harbour and, more recently, Love Darwin Harbour.

(www.ecnt.org.au/love_darwin_harbour).

12.3 Key change processes

- decision-making and regulatory approvals at precinct and project level
- ongoing community engagement
- governance structures in the precinct management plan.

12.4 Impact assessment

Infrastructure Northern Territory has a commitment to "building trust with the community through more inclusive decision-making". It is applying this approach at a strategic level through a comprehensive infrastructure audit with regional growth committees throughout the Northern Territory.

The challenge for inclusive and transparent consultation for the MASDP has been the abstract, conceptual nature of the project. Early and meaningful engagement has not occurred. A key challenge has been the inability to provide transparent and tangible communication on key aspects of the project. The other is that few decisions were open to consultation.

Engagement to date has been largely at the level of 'inform' and 'consult' (IAP2 Spectrum of Participation), with little opportunity for the community to influence key decisions such as:

- the establishment of the precinct (this decision has already been taken)
- design of common user infrastructure (including jetties and marine offloading facilities)
- what industries will be located in the precinct (which is subject to ongoing investment attract and market studies, with no public consultation).

The key concern raised in submissions to the Draft TOR for the strategic assessment related to the importance of transparent and accountable communication, meaningful consultation and an inclusive governance structure that incorporates meaningful consultation for individual project approvals.

Consultation by DIPL for the EIS and by True North for the Strategic Social Impact Assessment confirms these concerns. Community groups as diverse as the Chamber of Commerce and the

Environment Centre of the NT suggested communication materials were too abstract. Many comments expressed alarm that 'streamlining' approvals may preclude transparency and scrutiny of individual project proposals. Stakeholders want governance structures to include a requirement for project level consultation before approval notices are granted. This is particularly important given the pioneering nature of many likely projects.

For people to have trust in government decision-making and feel that infrastructure planning is inclusive, the strategic assessment must be considered the first step on consultation for the MASDP. The findings of this report need to inform the next stage of decision-making on both design elements and whether infrastructure and projects align with community values.

In particular, Larrakia and other Aboriginal groups have not been given the chance to provide Free, Prior or Informed Consent, share knowledge or provide their perspectives on ecological, social, cultural and governance issues. Inclusive decision-making in future must include a far more culturally appropriate, Larrakia-led approach to consultation.

Table 12-2: Potential impacts and benefits for Strong Voice

Potential benefits and impacts – Strong Voice	
Potential cumulative benefits	**Potential cumulative impacts**
	R-34 Loss of trust and confidence in ability to influence decision-making

12.4.1 Loss of trust and confidence in the ability to influence decision-making

> *While the potential benefits of a strategic approach to precinct planning for industry, environment and community are acknowledged by our organisation, we remain concerned about the potential for significantly less transparency and opportunity for community input on the assessment of subsequent project approvals within the precinct. We highlight the highly connected, contested, and valued nature of the precinct site(s) and we suggest any strategic approval must include mechanisms for the proponent to be required to host a mandatory process to facilitate public notice, comment and review of individual projects within the precinct (AFANT submission to ToR).*
>
> *There is concerning lack of transparency around the project. With the NTG as the proponent the public is in the dark about what private companies will be operating from the Precinct. We know the NTG has decided to apply a Strategic Environmental Assessment (SEA) process to this project. However, we would like to see each private company involved to have to go through a separate Environmental Impact Assessment (EIA) process so the impacts of their specific enterprise can be assessed and scrutinised by the public and they can be held to account if communities or the environment is adversely impacted by their operations (Alice Nagy submission).*

A key theme in submissions to the Draft TOR, the values mapping survey and interviews was concern at the perceived lack of transparency and accountability in decision-making about the

precinct, including what industries would operate within the precinct, the inclusion of carbon capture and storage and how individual projects would be assessed.

As Justin Tutty commented in his submission, “assessment of these features cannot be effectively relegated to mere Approval Notices, potentially 49 years after the SEA”.

Many submissions and comments related to the lack of information on the proposal and called for a public inquiry to ensure community views were appropriately considered. Indeed, it was difficult to get informed feedback for the SIA from many key groups, due to the conceptual nature of the proposal and lack of information on its implications, such as extent of shipping, dredging, location of desalination plants and whether there would be toxic emissions or pollutants.

Distrust of government was evident in many submissions, with comments about greenwashing, and cynicism at use of the word ‘sustainable’

The Australian Marine Scientists’ Association recommended that both the SEA and EIS process for the MASDP should ensure clear separation between the proponent, industry and NT and Australian Government regulators. The AMSA submission suggested transparency and accountability could be achieved by establishing independent (non-industry, non-government) advisory structures, independent experts and advice and independent peer reviews.

Given the controversy surrounding the project, the limited contribution of early and meaningful engagement to planning and the precinct’s association with gas-based industrial development, we suggest an initial risk rating of HIGH. This could be reduced to MEDIUM with greater clarity about what is proposed, clarification of proposed governance arrangements, opportunities for stakeholders to provide influential comment on project level approvals and decisions that demonstrate the community’s voice has been heard (such as a scaled back project).

12.5 Recommendations

12.5.1 Governance structure to provide ongoing input to decisions

Stakeholders want ongoing input to decisions on individual projects, rather than a ‘set and forget’ approach of a precinct-level approval assuming adequate consultation. The assurance plan for the precinct must include provision for meaningful consultation on individual projects, including the provision of objective and accessible information and taking account of feedback.

In order to be issued with an approval notice, proponents must submit a communication and engagement report outlining who was consulted, what issues were raised and how any concerns or expectations will be addressed. This should go on public exhibition for 30 days.

It will be important for consultation to be independently assessed by an agency such as the NT EPA. This is covered in the Social Performance Plan at Attachment 2.

12.5.2 Social performance plan to guide precinct operations

The Social Performance Plan at Attachment 2 makes several suggestions for inclusive decision-making to guide construction and precinct operations.

12.5.3 Larrakia-led governance structure

To come – importance that Larrakia have input to decisions and control over how their input is considered.

13. Cumulative social, economic and cultural impacts

13.1 Overview

Cumulative impacts are the successive, incremental impacts of a number of past, present and reasonably foreseeable activities that may be individually inconsequential but collectively harmful. Cumulative impacts are additive, or the result of multiple causal pathways across land and seascapes. They can occur simultaneously, from a number of projects or growth pressures occurring at the same time, or sequentially from single or collective activities (see Literature Review in Section 4).

From a social perspective, economic growth is likely to accelerate a range of change processes, with consequences for the social fabric of a region. Land clearing and industrial development can transform relatively intact landscapes and change dominant land uses. A growth spurt can change the character of a neighbourhood. More people may reduce the accessibility, affordability and quality of social infrastructure or justify new facilities, as has been experienced in Palmerston.

Cumulative development can create a pipeline of opportunity or exacerbate gaps between the affluent and those left behind. It can lead to shared visions or compound divisions between those with opposing values. Growth can be inclusive or compound stakeholder fatigue by requiring negotiation with multiple proponents, particularly if people feel their views have not influenced previous decisions.

Predictions of collective negative actions may suggest a collective threshold that cannot be exceeded, and the need for regional air and water quality monitoring programs to determine whether outcomes are being achieved.

Equally, however, this SSIA and social performance plan consider how collective action may lead to enduring benefits: from workforce planning to land use and social infrastructure to accommodate forecast growth.

At a precinct level, cumulative benefits might be harnessed by collective policies and data gathering: including procurement, workforce development planning, training and apprenticeships, business capacity building, community investments or contributing to a fund that supports regional offset plans.

Strategic assessment should act as a window into the future, or 'look before you leap' (Morrison-Saunders 2018) advice to guide game-changing decisions while avoiding the collective consequences of piecemeal decisions. Most cumulative social, economic and cultural impacts have been addressed throughout this SSIA, therefore Section 13 addresses the topic of cumulative impacts only as expressed during consultation, in particular fears of cumulative impacts on Darwin Harbour.

Table 13-1: What is covered by Cumulative Impacts

What is covered by Cumulative impacts	What the Terms of Reference asked for
The incremental effects of multiple projects affecting a social area of influence simultaneously or accumulating over time or the compounding (positive and negative) effects of diffuse or additive sources of change, whether policies, programs or projects.	As a strategic assessment, the entire strategic social impact assessment takes account of likely cumulative impacts: past, present and reasonably foreseeable over the next 50 years.

13.2 Baseline

The strategic assessment for the MASDP considers the impacts and benefits of development over 50 years, from land clearing, dredging and civil works to construction of common user infrastructure and individual projects. The exact configuration will be influenced by companies' financial decisions, market demand, technical and financial feasibility, community acceptance and political decisions. The assessment, therefore, has been informed by a scope of potential projects in order to predict impacts which might happen.

Cumulative impact assessment also considers projects that may happen in the region, now or in the future. Some may have Territory-wide cumulative impacts, such as a demand for workers, or pressures on supply chains. Other impacts will be more regional or localised, such as multiple dredging campaigns between Middle Arm and East Arm Peninsulas or multiple emissions creating noticeable change in nearby suburbs such as Palmerston.

13.3 Key change processes

Change processes that may bring compounding positive or negative cumulative effects include:

- headworks and common use infrastructure for the precinct
- precinct projects, both concurrent and sequential
- nearby developments, such as the Darwin Ship Lift, expansion of the port and marine industrial park on East Arm Peninsula, Defence activities in Darwin Harbour
- downstream projects catalysed by or that enable precinct activities, such as gas fields, water supply and renewable energy
- support industries or industry spilling into nearby areas such as Weddell
- land clearing and land use planning to support population and economic growth
- precinct governance structures
- policies, monitoring and management of cumulative impacts.

The following projects have been mentioned in public presentations, media releases and media coverage as proposed for the precinct or Middle Arm and East Arm more broadly. Negotiations

with proponents are the responsibility of the Department of the Chief Minister and are commercial in confidence. Therefore, this list is compiled only from publicly available information and should not be taken to represent actual projects. While it is unlikely most will materialise, the impact of announcements has been experienced already in the uncertainty and opposition some have created (to be refined to reasonably foreseeable projects).

- **Darwin Clean Fuels**: A condensate processing plant originally proposed for East Arm Peninsula, taking a waste stream from existing LNG plants. In October 2019, former Chief Minister Michael Gunner announced that DCF was partnering with American company McDermott to produce 100,000 barrels of transport fuels daily. Work was expected to start in 2021 (up to 400 jobs during construction and 140 during operations);
- **Coogee Chemicals**: In 2019, former Chief Minister Michael Gunner announced that Coogee Chemicals was doing a feasibility study for a $500 million, 350,000 tonne per annum methanol plant at Middle Arm. Methanol is used as a fuel additive and in the manufacture of textiles and pharmaceuticals. The Final Investment Decision was due at the end of 2021 (1000 construction jobs, 350 direct and indirect ongoing).
- **Total Eren:** French company Total (part-owner of the Ichthys project with INPEX) and renewable energy company Eren in August 2022 signed a MOU with the NT Government to develop a green hydrogen project in Darwin. Plans include a 4000-hectare solar plant and 1GW hydrogen electrolyser to produce more than 80,000 tonnes a year (more than 2000 jobs during construction and 175 ongoing);
- **Larrakia Energy**: In November 2022, Larrakia Development Corporation announced a joint venture with Perth company Progressive Green Solutions and signed a MOU with Korean power company KOMIPO to build a 300 MW solar farm on Middle Arm to supply energy to INPEX's Bladin Point LNG plant and Santos' Darwin LNG plant at Wickham Point.
- **Fortescue Future Industries:** Former Chief Minister Michael Gunner in November took up a position to lead development of green hydrogen projects in Northern Australia, which could include a green hydrogen plant at Middle Arm.
- **Good Water Energy:** Good Water Energy plans to provide heat from closed loop geothermal wells for green hydrogen, urea and ammonia plants on Middle Arm. In May 2022, the NT Government granted a geothermal exploration permit to drill a well at Middle Arm, believed to be outside MASDP (Smith, 2022, NT News, Exploration Green Light).
- **Carbon Capture and Storage Hub**: CSIRO announced in September 2021 that it will lead a consortium to assess the viability of a large-scale low emissions Carbon Capture Utilisation and Storage (CCUS) Hub outside Darwin to reduce emissions from the energy sector in Northern Australia. Partners include the Northern Territory Government, INPEX, Santos, Woodside, Eni, Origin and Xodus. Infrastructure to support such a hub is included in the MASDP, such as compression facilities, but not the actual storage (www.csiro.au/en/news/news-releases/2021/csiro-and-partners-scope-nt-hub-to-lower-emissions-and-boost-investment)
- **Middle Arm Petrochemicals Pty Ltd:** Perth-based Malabar Associates is promoted on the Advanced Manufacturing Growth Centre website as involved in: "Early stage project development of demonstration-scale (series of 20' containers) petrochemicals process

plant. Utilising carbon dioxide and renewable energy as major feedstock components to manufacture commodity chemicals for export. Attractive 'Carbon Capture and Utilisation' commercial alternative to Sequestration. Integrating availability of renewable energy with emerging electro-chemical and photo-catalytic technologies together with conventional petrochemical technologies. Business model aims to demonstrate concept at pilot plant scale as a precursor to industrial scale-up by other major industry stakeholders." (www.amgc.org.au/members/middlearmpetrochemicalsptyltd/)

- **Battery cathode manufacturing plant:** In September 2022, the NTG signed a MOU with Taiwanese company Aleees and Perth-based Avenira (formerly Wonarah Phosphate) to develop and operate the Territory's first battery cathode manufacturing plant in Darwin. The project is designed to produce 10,000 tonnes of lithium-ion phosphate battery cathode material a year. It will source phosphoric acid from the Wonarah Phosphate Project in the Barkly (100 jobs, increasing to 1000 at full production);
- **Core Lithium:** As part of Australian and Northern Territory Advanced Manufacturing commentary, it has been suggested that Core may process lithium from its Cox Peninsula mine at Middle Arm. Core's website (https://corelithium.com.au/finniss-lithium-project) says:

  > A longer-term objective of Core Lithium is to assess and explore the potential of adding downstream processing opportunities in the Northern Territory to accommodate the Finniss Project.
  >
  > Core is considering the downstream value potential given the Project's synergies with the adjacent Middle-Arm industrial infrastructure near Darwin, as well as the alignment with Australia's Modern Manufacturing strategy, and the rapid expansion of global lithium-ion battery (LIB) supply chains to meet the demands of the ever-increasing EV and renewable energy markets.[10]

- **NT Solar** is developing a solar farm at Livingston, in Darwin's rural area. The company website also refers to a Middle Arm Floating Solar Farm (25MW), to be installed on a large, man-made lake in the Middle Arm region, an area close to Darwin which is currently the focus of planning for medium to large-scale industrial development (Kittyhawk Development Zone) (https://ntsolarfutures.com/about/).
- **Tivan:** In February 2023, TIVAN (formerly TNG) announced that its proposed processing facility was returning from Mount Peake to the MASDP. The plant would process titanium, vanadium and iron oxide which may be included as part of the strategic assessment. The company suggests this could provide 1500 construction jobs.[11]

East Arm Peninsula

- **Darwin Ship Lift Facility:** In July 2022, the NTG announced Clough-BMD as the preferred contractor to deliver design and construction works for the proposed facility. The 5500-tonne ship lift will provide services to offshore petroleum, fishing, pearling, Defence and

[10] Conflict of interest declaration: True North Strategic Communication provides community engagement and communication services to Core. This consultant contributed to the SIA for the project.
[11] Conflict of interest declaration. True North Strategic Communication assisted with media relations for the company's announcement. This consultant has had no involvement with the project.

Australian Border Force vessels. The proposed $500 million facility (with $300 million of NAIF fundings) will be a common user facility operated by the Paspaley Group. As of early 2023 Clough is in administration and environmental approvals have not been finalised (a peak of 250 jobs during construction).

- **Marine Industry Park:** The adjacent Land Development Corporation's marine industry park and existing common user barge ramp facility and common user area are designed to support defence and maritime activities.[12]
- **Crowley Bulk Fuel Storage Facility** under construction in 2022 in the bulk liquids area at East Arm to service US defence operations. Due to be completed by September 2023 (up to 200 jobs, 70% local, partnership with Larrakia Development Corporation)
- **Dredging:** Maintenance dredging is likely for other projects in the harbour, including the port. In December 2022, the NTEPA advertised for public comment a referral for an INPEX LNG maintenance dredging program 2023-2027 that could involve dredging up to 1.5 million tonnes of material. Material would be transported to the previously used dredge spoil disposal area in the Beagle Gulf, about 45 kilometres north of East Arm. (It is proposed to be assessed as a 'standard assessment' based on referral documents.)

Broader projects that will enable or be catalysed by MASDP

- **Darwin Water Strategy.** Including the return to service of Manton Dam and Adelaide River Offstream Water Storage (AROWS), discussed in Section 7.
- **Renewable energy**: Including the proposed Sun Cable Australia-Asia PowerLink project discussed in Section 7.[13]
- **Oil and gas projects:** Initially proposed as a gas-based manufacturing precinct, the MASDP would enable gas developments in the Beetaloo Basin or Barossa field (to replace gas from the Bayu Undan field to the Darwin LNG Plant). In September 2022, Tamboran Resources' Chief Executive Joel Riddle suggested that development of its Beetaloo assets could provide 1000 Terrajoules a day to Middle Arm to support "the production of ammonia, urea, hydrogen and potentially LNG" (Smith, *Tamboran goes big in Beetaloo*, NT News, 21 September 2022).
- A proposed gas pipeline, or industrial corridor, from Tennant Creek to Middle Arm.

13.4 Impact assessment for cumulative impacts

Table 13-4: Impact assessment for Cumulative Impacts

Potential benefits and impacts – Cumulative	
Potential cumulative benefits	**Potential cumulative impacts**
O-10 Collaborative approaches to build human capital and collective benefits	R-36 Community concern about cumulative development in the Greater Darwin region.
	R-37 Concerns at piecemeal development in Darwin Harbour

[12] This consultant wrote the SIA for the Darwin Shiplift Facility and has provided services to the Land Development Corporation during planning for the Marine Industry Park.
[13] This consultant wrote the SIA for Sun Cable's EIS but has no current involvement with the project.

13.4.1 Community concern about cumulative development in Greater Darwin

Economic development brings inevitable change. However, a number of large projects could exacerbate many of the impacts described above, particularly if they occur suddenly or simultaneously. For example, rapid growth could exceed the capacity to plan for and absorb new residents, stretch the labour market, and fundamentally change the way of life that draws people to live in the Greater Darwin region in the first place. For the MASDP, change will be substantial and prolonged in the area between East Arm and Middle Arm and shipping channels through the harbour.

It will be important to maintain a long-term perspective and invest in projects that can be absorbed without fracturing the social fabric of Greater Darwin. Equally important will be to screen out projects that may provide a short-term 'sugar hit' to the economy at the expense of enduring harms, as experienced by other regions which have experienced sudden, short-term and unsustainable growth.

Potential cumulative impacts will be simultaneous, sequential and substantial over the next 50 years, suggesting an initial rating of HIGH. This would reduce to MEDIUM only with careful environmental management plans and development empathetic to the strongly held and diverse values of Greater Darwin residents.

13.4.2 Concerns at piecemeal development in Darwin Harbour

Concern about the industrialisation of Darwin Harbour has prompted opposition to major projects over the past 20 years, such as East Arm Wharf, Darwin LNG and INPEX's Bladin Point LNG plant. It remained a key concern in submissions to the NT EPA on the Draft ToR for this strategic assessment and in values mapping and interviews for the SSIA. The Darwin Harbour Strategy 2020-2025 refers to the need for sustainable management of Darwin Harbour.

Development can impact on the values of the harbour, but also the values of the harbour's natural and human catchment areas: the creeks and run-off discharging into the harbour and Greater Darwin region population centres.

To a large extent, the impacts of economic development on the harbour are inevitable given that the Territory's capital city is encircled by the harbour, with constraints on residential and industrial growth.

However, while successive development may be seen as piecemeal, Darwin's land use plans have since 1984 set aside areas such as Middle Arm for strategic industry. Land use planning is designed to provide flexibility and increasing certainty about future residential and industrial development. The aim of the MASDP was to concentrate gas-based industries in one place, overcoming the issue of piecemeal development around the harbour. Strategic approaches to economic development include the TERC report (2020), a proposed whole of harbour dredge management strategy, a proposed regional conservation strategy, Infrastructure NT's NTIPP (2022) to guide the short,

medium and long-term roll out of economic and social infrastructure, and the NTG's *Social Outcomes Framework* (2021) designed to deliver broader community wellbeing.

This risk is assigned an initial rating of MEDIUM, given current uncertainty about the ultimate pace, scale and type of industry in the precinct and other projects around the harbour. It would reduce to LOW with greater certainty about Middle Arm developments (both inside and outside the precinct) and plans for Weddell and nearby suburbs.

13.4.3 Collaborative approaches to build human capacity and collective benefits

The converse of cumulative impacts is the opportunity for collaborative planning for growth that considers the social, cultural, economic and environmental sustainability of the Greater Darwin region, in accord with the *Social Outcomes Framework*.

At a regional level, this is covered by the plans outlined above in Section 13.4.2. A pipeline of projects would contribute to better workforce planning and training that builds pathways to employment and competencies across economic sectors, such as construction, maritime and advanced manufacturing.

At a precinct level, governance structures could enforce collective planning and data-gathering on a range of issues such as training, professional development, pipelines of work for apprentices (INPEX and Santos already collaborate on projects to provide employment and training for Aboriginal people) and scholarships.

It is suggested that a precinct-wide Territory Benefit Plan would provide transparent, accountable and enforceable policy on a range of issues that will deliver equity and enduring benefits for Greater Darwin residents. This could include social procurement, a collective community investment fund and contributions to a regional conservation or offsets fund. As outlined in sections above, these benefits may be diffuse and hard to measure, so attract an initial rating of LOW. However, with good will, good intent, credible governance and strong enforcement, this could rise to BENEFICIAL.

13.5 Recommendations

13.5.1 Whole of harbour dredge management strategy

The proposed whole-of-harbour dredge management strategy would allay some fears about piecemeal development. The Darwin Harbour Advisory Committee has long recommended a harbour wide strategic assessment and dredge management strategy.

13.5.2 Collaborative planning

A collaborative approach to minimising negative impacts and collectively planning to maximise benefits is included in the attached draft Social Performance Plan. Further participatory planning is recommended as the ultimate shape of the precinct becomes more certain.

13.5.2 Five-yearly audits and values mapping

This SSIA and the Social Performance Plan should be audited every five years against the sustainability outcomes and objectives, in addition to five-yearly values mapping to provide longitudinal qualitative data.

14. Social performance plan

Table 14-1: Social Performance Plan

What is covered by Management Plans	What the Terms of Reference asked for
A management plan that provides for ongoing avoidance and management of impacts and enhancement of potential benefits, over the 50-year life of the precinct.	Identify how impacts to communities and the economy would be avoided and opportunities enhanced. Identify appropriate frameworks and management strategies and their likely effectiveness in avoid social, cultural and economic impacts and enhancing potential benefits of the strategic proposal at the Precinct level, including: • a coordinated Territory Benefit Plan that individual proponents are accountable for implementing and reporting against • recommended conditions to be applied at a Precinct and individual project approval level.

The traditional approach to social impact assessment is a social impact management plan (or SIMP). In order to move from impact assessment to an outcomes approach, a social outcomes framework and a social performance plan is attached to this SSIA.

In order to meet the requirements of an Environment Impact Assessment, a summary of **risk and opportunities ratings** is attached to this SSIA at Attachment 1.

A **social sustainability framework** at Attachment 2 moves beyond mitigation and management to setting goals, or desired social, economic, cultural, governance and environmental outcomes, objectives, commitments and an assurance approach for delivery. This approach is based on theories of change methodologies, or qualitative approaches to measuring impact and outcomes (see Literature Review in Section 4). The social sustainability framework is presented as high-level outcomes designed to evolve as the Middle Arm precinct timelines and activities become more certain.

The framework moves from technical, quantitative, monetised approaches to assessing costs and benefits to community-led qualitative social, cultural, ecological, economic and governance outcomes that have community wellbeing at their heart.

An outcomes focus is commensurate with the sustainable infrastructure principles and requirements of Infrastructure Australia, the Infrastructure Sustainability Council, Infrastructure NT's *Infrastructure Plan and Pipeline (2022)* and the NT Government's *Social Outcomes Framework*. It adapts the outcomes approach advocated by the *EPBC Act* by placing a stronger emphasis on positive outcomes, not just setting thresholds for potential negative impacts.

A **social performance plan** is then attached that captures both the recommendations of the SSIA and the key actions from the sustainability outcomes framework. This is more in line with the social performance functions of companies as they implement projects. The plan incorporates accountability and reporting against social commitments, a compliance or assurance function often missing in 'environmental' approvals.

14.1 Summary of recommendations and commitments

The following summarises the recommendations made throughout the SSIA, indicating whether NT Government, precinct governance or individual proponents should take the lead responsibility. Each recommendation includes a cross-reference to the relevant section of this report and risk and opportunity number. It is recognised that some recommendations or mitigation strategies may not be possible, however they form part of the decision-making evidence base about trade-offs that may be necessary.

14.1.1 Northern Territory Government

The key role of government is to provide the enabling social and economic infrastructure to support growth and quality of life (NTIPP 2022) and to grow the human capital and knowledge base to grow a sustainable local economy and workforce.

Note that these are recommendations to NT Government. Responsibility for their implementation should be assigned as the project gets closer to realisation. Many actions are likely to fall within the remit of the NT Planning Commission and Infrastructure NT (social infrastructure), the Department of Industry, Tourism and Trade (workforce planning) and Department of the Chief Minister (social outcomes).

Whole-of-government strategies that should take account of the MASDP include:

Table 14-1: Recommendations for whole-of-government implementation

Number	Summary of recommendation (see sections for detail)	Risk/op ratings
5.6.1	Five-yearly audit and values mapping to track changes in values and attitudes, identify emerging issues and report on compliance with commitments	R-1, R-35
5.6.2	Explore options for offset strategy for recreational fishing, in conjunction with AFANT (noting that a 'like for like' offset is unlikely)	R-2
5.6.3	Greater accommodation of community sensitivities in precinct design and reporting on how community input informed design alternatives	R-3
6.5.1 7.5.5 11.5.1	NTG transport planning that takes account of increased traffic from MASDP and other sources, including the eventual duplication of Channel Island Road and Weddell Freeway), public transport to Middle Arm, funding to seal Finn Road if traffic from	R-4, R-12. R-18, R32

	Cox Peninsula increases. To reduce road safety risks, provide enabling infrastructure and mitigate against congestion.	
6.5.2	Harbour-wide navigational safety measures, including education campaigns, clearly marked dredging equipment, speed restrictions, notices to mariners	R-5
6.5.3	Careful planning to avoid 'boom bust' impacts, dedicated accommodation village for FIFO workers, participative development of draft social performance plan (Attachment 2) and inclusive decision-making to maintain community cohesion and sense of place	R-6, R9
7.5.1	NTG to consider a common user workers' village to accommodate external workers for all major projects in the Darwin Region, including options for facilities that could later be repurposed	R-9
7.5.2	Regional accommodation planning that takes account of predicted projects, labour market conditions, likely demand for accommodation, staged development of projects, private sector investment and key worker housing to ensure provision of social services (land use planning).	R-10, R-11
7.5.3	Ensure projects to not precede options for augmented water supply, as outlined in the Darwin Region Water Strategy, projects not to proceed ahead of adequate augmented supply	R-14
7.5.4	Common-user, stand-alone renewable energy grid, no project to rely on the Darwin-Katherine Electricity System until current policy and technical issues are resolved	R-15
7.5.6	Government to prepare a study on forecast demand and implications for NTFRS response. The proposed Weddell/Middle Arm subregional plan could include an options study for a Fire and Rescue station and training facility (to link to emergency planning study).	R-16
7.5.7	NT Infrastructure Plan and Pipeline to include options for a new Darwin region waste management facility.	R-17
8.5.1	Investment attraction and major project agreements to stipulate requirement for accountable and transparent Territory Benefit Plans, including Aboriginal procurement, ensure compliance with NTG policy.	O-4, 0-6, R-21

8.5.2	Next stages of a Workforce Development Strategy to cover mapping of labour force supply and demand and government activities to attract, retain and train workers in key occupations (see detailed recommendations at 8.5.2 and Workforce Development Strategy at Attachment 4)	0-7, R-19
8.5.3	Adherence and accountability for local and Aboriginal procurement, including for NTG tenders	R-21
8.5.4	Make provision for extractive industry leases needed to supply the construction industry.	R-20
8.5.4	Advance planning for the needs of the extractive industry	R-20
8.5.5.	Avoid displacement of existing economic sectors (eg tourism and aquaculture) by determining industries with the best fit with the MASDP objectives and ensuring both adequate engineering solutions and environmental management to minimise risks.	R-20
10.5.2 and 13.5.1	NTG to complete a proposed harbour-wide dredge management strategy	R-28, R-29, R-35, R-36

14.1.2 Precinct governance structure

The key role of the precinct governance structure is to ensure individual projects fall within the scope of the approved program and provide overarching frameworks that specify the obligations of individual project proponents, such as traffic management plans, workforce planning, local procurement, collaborative community engagement and community investment approaches. The precinct governance structure may also provide the framework for centralised data and knowledge gathering and retention to provide guidance to individual proponents.

A key constraint in terms of making recommendations is that by the time the MASDP Program is approved by the NT EPA and governance structures are established, key projects for the precinct are likely to be announced.

Table 14-2: Recommendations for precinct manager implementation

Number	Recommendation	Risk/op ratings
6.5.2	Collaborative navigational safety plans	R-5
6.5.4	Selection of industries that are a strategic fit with precinct objectives, independent monitoring and reporting of emissions, transparent communication	R-8

7.5.1 7.5.2	Maintain collective data on predicted local and external workers, their accommodation needs, vacancy rates and communication on peak tourist periods, monitoring and reporting on actual accommodation use	R-9, R-10, R-11
7.5.5	Collaborative options to reduce commuter traffic to the MASDP, such as park and ride facilities and buses.	R-12
7.5.5	Precinct traffic planning to accommodate needs of road transport, including over-size over-mass transport (such as avoiding overhead powerlines on transport routes)	R-12
7.5.6	Common use wastewater facilities (incorporate needs of NTFRS)	R-17
8.5.1	Precinct wide strategies to enhance proponents' community benefit plans including collaborative benefit plans or measures to enhance outcomes, precinct-wide research (such as ICN capability mapping), industry development and business matching, guidance and monitoring of proponent strategies, coordinated communication of opportunities.	R-21, O-4, 0-6
8.5.2	Precinct workforce development strategy that explores collaborative approaches to employment and training (as above)	R-19, R-22
8.5.3	Coordinate reporting against procurement and Aboriginal procurement policies	R-21
8.5.7	Maximise collaborative planning and reporting by precinct proponents, including adaptive management to emerging workforce and procurement issues, coordinated industry capacity-building	O-4
10.5.1 11.5.2	Collaborative monitoring programs, including the potential for citizen monitoring programs, precinct-wide grievance procedures, analysis of complaints for precinct-wide issues	
12.5.1	Precinct governance structure to include collaborative community engagement, community relations and communication (eg newsletters, website, community advisory committee)	R-34
12.5.2	Collaborative social performance plan, including community engagement, community investments, consultative committee of precinct operators and key stakeholders	R-34

14.1.3 Proponents, as part of approval notice

Individual proponents will be responsible for gaining project approval notices that fall within the parameters of the overarching program approvals. Approval conditions are likely to include a number of commitments that complement, rather than duplicating, precinct and government strategies.

Table 14-3: Recommendations for individual proponents

Number	Recommendation	Risk/op ratings
6.5.1 7.5.5	Proponent traffic management plans, site plans to accommodate road transport needs including over-size, over-mass transport. Park, ride and worker transport to the precinct to reduce commuter traffic, road safety measures for heavy vehicles commuting to and from the precinct	R-4, R-12
6.5.2	Project navigational safety plans and reporting, educational campaigns, notices to mariners, communication of dredging and shipping movements at boat ramps and through AFANT	R-5
6.5.4	Transparent monitoring and reporting of emissions, good risk communication	R-8
7.5.1	Prepare individual workforce accommodation plans, in line with NTG strategy, advance notice of needs, data on workers (where from, where they are living, local vs external, moving to Darwin with families)	R-9, R-9, R-11
7.5.3	Project approval notices to take account of demand and availability of water	R-14
7.5.6	Proponents to have appropriate emergency response plans and emergency response teams to provide a first response to incidents, could include user-pays plans and training by NTFRS	R-16
7.5.7	Proponent management plan to incorporate circular economy principles	R-17
8.5.1	Proponents to prepare and report against Territory Benefit Plans, in line with precinct templates. Collaborate with precinct-wide plans (see above).	R-21, O-4, 0-6
8.5.2	Individual proponent employment and training plans (as part of Territory Benefit Plans)	R-19, R-22 O7-9

10.5.1 11.5.2	Rigorous environmental monitoring and management plans	R-28
10.5.4	No projects to proceed until emissions are identified, remain under the threshold allowed for the precinct and can be abated or offset	R-31
12.5.1	All proponents required to prepare communication and engagement plan and provide an engagement report to NT EPA outlining who was consulted, issues raised and how issues will be addressed, reports to go on public exhibition for 30 days	R-34
11.5.3	All proponents to maintain and report against grievance registers, communicate any likely disturbance to amenity (eg noise, vibrations, dust, excessive traffic, share information to identify precinct-wide issues	R-32, R-33
S14	All proponents to prepare individual social performance plans to demonstrate how NTG and precinct outcomes and objectives will be met, take part in collaborative governance.	
General	Proponents to generally show awareness of all strategic assessment material and recommendations, engagement strategies should reflect the findings of community consultation report and social research for the strategic assessment.	
	Cultural to come, including compulsory cultural inductions	

To also capture recommendations in technical studies

15. Conclusion

This strategic social impact assessment (SSIA) set out to inform planning and provide advice to government on implementing a Middle Arm Sustainable Development Precinct (MASDP) that is environmentally, socially, culturally and economically sustainable.

The outcome, or intended benefit, for the 'people and communities' factor of the strategic assessment is a project that has community acceptance because it aligns with the values of Territorians, in particular existing residents and businesses in the Greater Darwin region.

While many benefits will flow from the precinct development, there are also some likely and consequential social risks that will be challenging to mitigate.

These impacts will be unacceptable to many Greater Darwin residents because scale of the proposal (based on the scope of developed covered by the SEA) does not align with their deeply held values and uses of the harbour.

Social research suggests ambivalence, compounded by uncertainty as to the extent and type of industries proposed, potential health impacts and the precinct's contribution to greenhouse gas emissions and climate change. Many find it hard to accept that gas-based manufacturing or petrochemicals constitute 'sustainable'.

There is unease at the industrialisation of Darwin Harbour and threats to Darwin's quality of life, sense of place and image.

Recreational fishers in particular face partial or lost access to the popular Elizabeth River boat ramp and favourite crabbing spots due to dredging, ship safety zones, and a turning basin in a 'pinch point' or constrained area of the Elizabeth River mouth. A likely trebling of ships in the harbour will create congestion and increased risks of accidents between commercial and recreational traffic in shared shipping channels.

The mantra of 'more jobs' does not resonate with local businesses, who are already struggling with skills shortages. Some are cynical about government's investment attraction efforts focussing on 'shiny big projects' that often fail to materialise.

Greater Darwin residents and businesses are more likely to accept a smaller precinct that is genuinely innovative, powered by renewables and applying circular economy principles.

Economic development, on the whole, will be supported as long as it delivers enduring, or sustainable, benefits to locals rather than crowding out or displacing existing sectors, in particular aquaculture, tourism and recreational fishing that are operated by and employ locals.

Sustainable development is development that contributes to human welling without running down the stock of natural resources needed to ensure the next generations' wellbeing, including the wellbeing of the planet.

Human wellbeing is not measured by population growth and GDP alone but by broader measures of social, cultural, economic and ecological sustainability. So, growth should contribute to an

equitable distribution of benefits, or building a bridge or pathway out of disadvantage to jobs and meaningful lives. Inequality is a divide that is detrimental to society's wellbeing.

Sustainable governance will require far more inclusive decision-making on project planning, design and ongoing consultation for individual projects. Better communication is required on what is proposed, along with transparent explanations of the proposed industry mix, how benefits will be realised and harms prevented.

There has been inadequate consultation with Larrakia and Tiwi people to allow for findings of cultural impacts at this stage.

Some of the most telling moments of research for this study came at the end of formal interviews when businesses and government staff gave off-the-cuff comments about their concerns as residents of Darwin. Almost universally, public servants and businesspeople spoken to support the directions of the Territory Economic Reconstruction Commission (TERC) and the need for a more stable, resilient economy. Most accept that government has to make difficult trade-offs between economic growth and the loss of places used for other purposes, often seen as the price to pay for progress faced by all cities. But many were sad, conflicted or saw continued industrial growth around the harbour as a threat to the quality of life that draws people to live, work and visit the Greater Darwin area in the first place. This constitutes a values conflict that echoes the results of the values mapping survey. While the survey might not reflect the views of an average cross-section of Darwin residents, it does capture the views of a broad sample of people who care. This was particularly the case for tourism operators and recreational fishers. As one commented, he accepted that development on Middle Arm was inevitable. But, as a keen fisherman who had lived in the rural area for 20 years, the precinct might be the tipping point for him to leave.

Most of the negative impacts raised in this study have technical solutions and the findings should inform good planning to optimise the benefits of developing Middle Arm. A lifestyle, however, is hard to replace.

16. Qualifications of the consultants

Jane Munday

The Strategic Social Impact Assessment (SSIA) was prepared by Dr Jane Munday, Senior Adviser with True North Strategic Communication based in Darwin, NT. Jane has lived in the Northern Territory since 1994 and specialises in community engagement and SIA. Qualifications include:

- PhD, Charles Darwin University (CDU), 2021 on social and cultural impact assessment
- Graduate of the Australian Institute of Company Directors (2016)
- Master of Business Administration, University of Southern Queensland (2005)
- Graduate Diploma in Public Sector Executive Management (CDU, 2000)
- Bachelor of Arts (Psychology, Indonesian, North Australian History), CDU (2000)
- Bachelor of Arts (Journalism, part-completed), RMIT Melbourne and journalism cadetship, *The Age* (1982-83)
- Certificate in Public Participation, Advanced Certificate in Community Engagement (IAP2 2015-2016) and Certificates in Social Impact Assessment (IAIA 2013 and 2015)

Jane spent 10 years in NTG executive management communication and marketing positions. She established a strategic communication consultancy in 2004. Since selling the company in late 2015, she has consulted back to True North Strategic Communication. She has written or led SIAs for Arafura Resources, Jemena's Northern Gas Pipeline, Verdant Resources' Ammaroo phosphate project, the Darwin Ship Lift Facility, Sun Cable's Australia ASEAN Power Link (AAPL) project and contributed to or peer-reviewed others. She produced a Guideline to Social Impact Assessment (2020) based on her PhD research.

Jane is Deputy Chair of the Territory Natural Resource Management (TNRM), Secretary of the Territory's Environment Institute of Australia and New Zealand (EIANZ) committee, on a national EIANZ committee looking at certification of social impact assessment practitioners, and on the NT Attorney-General's Community Benefit Fund. She is a member of EIANZ, IAIA, IAP2, the Australian Research Society, AICD and Public Relations Institute of Australia (PRIA).

Claire Butler

The SSIA drew heavily on a scoping study prepared in 2021 by Claire Butler, Senior Consultant with True North Strategic Consultation. Claire has lived and worked in Darwin, Nhulunbuy and Cairns for the past 20 years, mostly with True North Strategic Communication. Claire has extensive experience in community and stakeholder engagement and has co-led a number of social impact assessments for major projects in Central Australia and the Top End.

She has Bachelor of International Business, Graduate Diploma of Management and Certificate of Public Participation with the International Association for Public Participation (IAP2). She has studied SIA through the Community Insights Group and the University of Strathclyde, an intermediate SIA course through the Centre for Social Responsibility in Mining at the University

of Queensland and has a certificate in SIA from the International Association for Impact Assessment (IAIA).

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(Regional Australia Institute, 2022)
(Australian Bureau of Statistics, 2022i)
(ACIL Allen, 2022)
(Blishen, Lockhart, Craig, & Lockhart, 1979) (City of Palmerston, 2018) (City of Palmerston, 2021) (City of Darwin, 2019) (Darwin Harbour Advisory Committee, 2003) (De Vincentiis, Guthridge, Su, Harding, & Williams, 2021)
(Department of Infrastructure, Planning and Logistics, 2021)
(Department of Industry, Tourism and Trade, 2019) (Department of Business, Trade and Innovation, 2018) (Department of Treasury and Finance, 2021c) (Department of Treasury and Finance, 2021j) (Department of Treasury and Finance, 2021j) (Department of Treasury and Finance, 2022); (Fitzgerald, 2022); (NT Utilities Commissioner, 2022); (NT Planning Commissioner, 2021) (Northern Territory Government, 2019) (Northern Territory Planning Commission, 2021a) (Northern Territory Planning Commission, 2015) (Northern Territory Planning Commission, 2021) (Northern Territory Planning Commission, 2021b); (Social Atlas, 2022) (International Association for Impact Assessment, 1999) (Morrison-Saunders, 2018) (Langworthy, et al., 2017) (Northern Territory Environment Protection Authority, 2013) (NSW Department of Planing Industry and Environment, 2021); (Pascual, 2017) (Smyth & Vanclay, 2017) (Ritchie, 2022) (Sandman, 2012) (United Nations Conference on Environment & Development, 1992) (United Nations, 1972); (The World Commission on the Environment and Development, 1987); (Victorian Government, 2021); (Povinelli, 1993); (Northern Territory Government, 2020); (Northern Territory Police, Fire and Emergency Services, 2021); (Larrakia Development Corporation, 2022); (Landbridge Darwin Port, 2021); (Munday, Objective Truths or Subject Realities: A model of social and cultural impact assessment to deliver socially, culturally, ecologically and economically sustainable development of Northern Australia, 2020b)

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Attachment 1: Risk and opportunity assessment

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
RISKS								
Section 5: Values and uses of Darwin Harbour (ecological, social, economic, cultural)								
R-1 Disturbance to strongly held social, economic, cultural and environmental values and use of Darwin Harbour	Clearing, dredging, start of construction, shipping, restricted access	Likely	Major	High	Some disturbance of strongly held values is likely. In terms of consequence, the extent, duration and scale of change will be significant as the precinct evolves. The sensitivity and resilience to this change is likely to be mixed. The values mapping survey suggests disturbance will be felt most strongly by long-term Territorians for whom varied uses of the harbour are intrinsic to the Greater Darwin lifestyle. For some, change would be absorbed over time or is seen as the price of progress. However two decades of opposition to development around the harbour would suggest that, for many, the cumulative scale of change will remain disturbing. While the immediate impact may be localised to Middle Arm and it could be argued that parts of Darwin Harbour are not pristine, the strength of feedback in the values mapping survey suggest this is not the perception of many respondents.	• Reduce the scale of the project to more closely align with the values of existing Darwin residents. • Accommodate community concerns in the selection of industries and design.	Medium	• Recreational fishing industry • Environmentalists • Tourism industry • Larrakia people • Darwin residents generally
R-2 Reduced ability to enjoy highly valued recreational fishing in Darwin Harbour	Reduced access from dredging, shipping, berthing, exclusion zones, population	Likely	Major	Very High	Reduced access along the Elizabeth River and to popular crabbing creeks will come as a blow to recreational fishers, particularly Palmerston and rural residents. Elizabeth River is only 9 km from Palmerston. It is the only all-weather, all-tide boat ramp with ample	• Reduced access to Elizabeth River and popular crabbing creeks is difficult to mitigate, hence the residual rating. • An alternative would be offsets, however AFANT does not believe social and ecological offsets in the harbour are possible. While new boat ramps could be	Very High	• AFANT • Recreational fishers, particularly individuals who fish or visit the Elizabeth River side of Middle Arm Peninsula

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
	growth and over-fishing				parking and land-based fishing options. Access and water quality will be impacted by dredging and construction of marine facilities, then by increased marine traffic and ships berthing in the constrained space at the mouth of the Elizabeth River. AFANT is concerned that the ecological and social impacts are 'extreme', unacceptable and could not be offset within Darwin Harbour. Loss of fishing spots could be compounded by population growth, including construction workers, leading to over-fishing in the harbour. Based on the scope of development covered by the SEA, substantial and long-lasting impacts on fishing are predicted for a large number of fishers, which would disturb deeply held values and likely fuel vocal opposition to the precinct.	built, e.g. on the Howard River in Shoal Bay, this would mainly benefit rural residents and does not address the issue of convenient access for the large population of Palmerston. • The dredge disposal grounds could be combined with new artificial reefs to create new fishing spots in the harbour. • AFANT should be closely involved in exploring all options.		• Fisheries (DITT) • Palmerston Council
R-3 Damage to Darwin's tourism branding and quality of life as a tropical, harbour city	Changes to land and seascapes, industrial activity	Possible	Moderate	Medium	Evolution of the Middle Arm Precinct and changes to the land and seascape would affect the sense of arrival by air and rail. Tourism operators would concerned if the values and uses of Darwin Harbour are incrementally displaced by industrial landscapes and industrial shipping. The extent and scale of change would be more localised and less jarring perhaps for people from other cities where industrial use of harbours is part of a way of life. However, concerns at the additive impacts of industrialisation at East Arm	• A reduced scale of development means impacts would be mostly localised to Middle Arm. • Although shipping volumes will increase, the gradual nature of this may be absorbed.	Low	• Tourism industry • Tourists • Darwin residents broadly

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
					and elsewhere in the harbour will heighten the sensitivity.			
Section 6: People and communities (impacts on social fabric, health, wellbeing and safety, vulnerable community segments)								
R-4 Increased road trauma or reduced feelings of safety on transport routes	Start of construction and project activity for each project; increased industrial traffic	Possible	Moderate	High	Increased traffic volumes are likely to be gradual as common user infrastructure and projects evolve. Projects at Middle Arm will result in construction traffic, operational vehicles, transport of materials and commuting workers. Higher volumes of industrial traffic passing by residential areas and schools, such as Elrundie Avenue, increases the risk of head on crashes or the deaths and injuries of pedestrians. The consequences would be catastrophic, hence the high untreated rating. The risk would reduce to low with proposed solutions such as the Weddell Freeway, which would take heavy vehicles off Elrundie Avenue, and duplication of Channel Island Road.	• Improvements and adequate transport planning to cater for increased industrial and commuter traffic. • Construction of the first stage of the Weddell Freeway, Berrimah Road overpass of Tiger Brennan Drive, grade separated road/rail crossings, emerging and turn-off lanes, duplication of Channel Island road and appropriate traffic management plans. • Other mitigation measures include reducing industrial traffic at peak hours and bussing of workers to site from 'park and ride' sites to reduce commuter vehicles.	Low	• Northern Territory Government • Transport Planning • Planning Commission • Local Members of Parliament • Other road users – community • Residential areas • Road Transport Association of the NT • Palmerston and Litchfield Councils • Extractive Industries Association
R-5 Reduced marine safety in the harbour due to dredging and increased marine traffic	Dredging, start of construction and project activity for each project; Traffic will increase as each	Possible	Moderate	High	Increased marine traffic and construction activity due to projects at Middle Arm – dredging, supply vessels, and export vessels – could reduce safety in the harbour and increase marine accidents, particularly given the size of ships likely to visit Darwin and the popularity of	• Planning to cater for increased shipping/marine traffic in the harbour. • Adequate safety measures to protect all harbour users – safety exclusion zones, speed restrictions, notice to mariners, lighting, anti-collision radars. • Navigational safety campaign (similar to INPEX).	Medium	• Darwin Port – Harbour Master • NTG – Marine Safety • AFANT • Harbour-related businesses • Other users of Darwin Harbour

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
	project is developed				shipping channels for fishing and recreational traffic, including sailing. The area between East Arm and Middle Arm, popular with recreational fishers, will become particularly congested. The scale of change, extent and duration are significant and will be compounded by industrial growth at East Arm (including the Port, Ship Lift Facility and Marine Industry Park), other projects on the Middle Arm Peninsula and Sun Cable's land-sea converter station at Gunn Point. By 2040, an extra 860 ships using the MASDP terminal will compound other increases from East Arm and INPEX's Bladin Point facility.	• Licensing and alcohol restrictions are mitigation measures, but are likely to be opposed by recreational fishers.		
R-6 Reduced community cohesion, social capital and wellbeing	Mobilisation of construction workforces; influx of workers; changed demographic composition of Greater Darwin	Possible	Minor	Medium	Community cohesion and wellbeing can be eroded by a sudden influx of newcomers, typical of the 'boom' phase of economic growth. Large cohorts of FIFO workers with high disposable incomes can lead to anti-social behaviour and reduced wellbeing. More permanent demographic change can change the character and prevailing values of a neighbourhood. It is likely that population growth will occur in Palmerston suburbs, which are already characterised by young, mobile families, including Defence. Land use planning and the release of new residential blocks should see newcomers absorbed, particularly if development is sequenced to maximise social as well as economic outcomes.	• Staged development of projects to minimise multiple large influxes of temporary workers and draw on people already living in the community. • Project proponents provide incentives for relocation rather than FIFO, so workers and their families become part of and contribute to the community. • Large FIFO workforces accommodated in a dedicated workers' village to reduce impacts on community cohesion, perhaps at Weddell.	Low	• Local residents/ community • City of Palmerston • City of Darwin • Litchfield Council

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
R-7 Reduced sense of place	Dredging, start of construction, development of the precinct; Industrialisation of the harbour; Changes to demographic composition and character of rural living	Possible	Minor	Medium	Concerns about industrialisation of the harbour have been expressed in consultation for projects over the past 20 years and are an inevitable consequence of economic growth. Even stakeholders who support economic growth rued this likely impact on the quality of life of Greater Darwin, given that the harbour is integral to residents' sense of place and the region's image. Sense of place can also be affected by sudden changes to the living environment, such as land clearing and denser development of rural areas. Larrakia people may feel their attachment to land and seas is weakened by development (see Section 9). The duration is permanent and the scale of change incremental but substantial. The extent and sensitivity, however, will vary amongst population segments and is likely to be strongest among longer-term residents (as shown by response rates to surveys).	• A changed sense of place to residential areas should be partly mitigated by land use planning, particularly if many newcomers are accommodated in the new town of Weddell. • Inclusive decision-making will help ensure sensitivities are taken account of and the scale of and type of development aligns with community values.	Low	• Longer-term residents in particular • Larrakia people • Environmental and community groups • All users of the harbour
R-8 Reduced health and safety due to emissions, pollution, discharges	Emission of pollutants into the air and sea; Fears of toxicity, and impacts on human health	Likely	Moderate	High	The impact of industrial activities on health and mental health can include psychosocial impacts, or fears and anxieties invoked by announcements of particular industries. These fears may be heightened by people's actual or vicarious experience of harms caused by other projects (such as spills at East Arm, pollution from mining projects, or case studies in environmental campaigns). Environmental groups are campaigning against the development and pointing to	• Selection of industries that are a strategic fit with the intent of the precinct. • Good public health studies and transparent monitoring and risk communication. • (to come from health impact assessment)	Medium	• Environmental and community groups • Department of Health • Palmerston Council • Public health groups and researchers • General public

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					risks, such as pollution and toxicity in air emissions or discharges to the harbour. The sensitivity to these risks is heightened because of Middle Arm's proximity to the key population centre of Palmerston. Larrakia people and fishers were concerned about contaminants getting into the food chain. Other health and safety risks include chronic diseases, population health, environmental health (such as biting insects) and occupational health (the physical and mental wellbeing of workers).			
Section 7: Social infrastructure and services (housing, schools, transport, emergency services, health, utilities, community centres)								
R-9 Saturation of short-term accommodation in Greater Darwin to house FIFO workers	Project announcements; mobilisation of workforces, contractors and project management teams; multiple concurrent projects, requiring workers	Likely	Mod	High	Many workers are likely to be drawn from Palmerston and surrounding growth areas. It is a government objective to minimise FIFO workforces, grow the Territory's population and draw from residential workforces. However, given the relatively small population base and skills shortages, a reliance on FIFO workers is likely, particularly at peak construction or shut down periods. Many survey respondents and interviewees referred to the inflationary and scarcity pressures created by construction of existing LNG plants on Middle Arm. While pressures for individual projects might be short-term, this of itself is a disruption that would be hard to absorb.	• Worker accommodation plan that considers the collective needs of FIFO workforces for all major projects in the Greater Darwin region. • This could include repurposing existing facilities or a dedicated facility at Weddell that can be remediated or repurposed as Weddell grows.	Medium	• Northern Territory Government • Tourism and hospitality industry • Industry and employers • Greater Darwin residents • Local Government

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					The extent, scale and duration of change will depend on the sequencing of projects, planning lead times and labour markets.			
R-10 Pressure on the affordability and quality of housing in the region due to sudden population growth	Start of construction and operations attracts workers and families to relocate to Greater Darwin; Population growth; Skilled migration	Possible	Moderate	High	Projects that require large operational workforces, or concurrent projects, will increase demand for housing and long-term rentals. Scarcity and unaffordable housing and accommodation are constraints to the NT's economic development. However, building in advance of demand can create a glut and economic losses for developers and home owners. Given the size of Greater Darwin market, it is particularly susceptible to short-term shocks, however current land use and infrastructure planning have factored in various scenarios of growth and any strains should be short-term.	• Staged development of projects. • Collaborative employment plans. • Government and private investment in housing • Tracking the source of workers and where they live. • Government land release, headworks and commercial opportunities to cater for growth. • Private sector investment in additional housing options.	Medium	• Planning Commission • Infrastructure NT • NTG • Local Government • Construction and real estate industries • Employers • Residents
R-11 Population loss due to increased housing and living costs	Project announcements, cumulative pressures on supply chain, labour market and housing; mobilisation for subsequent projects	Possible	Minor	Medium	The cost of living is a key element of the liveability of a place, which in turn influences the willingness of people to relocate to and stay in a region. Many regional areas, including Darwin, are already facing pressure on supply chains and higher living costs. This can have a ripple effect on social and key worker housing. Any impacts should be temporary as the market responds.	• Staged development of projects. • Local employment plans. • Land use and infrastructure planning that incorporates needs analysis for social infrastructure.	Low	• Northern Territory Government • Planning Commission • Investment NT • City of Palmerston • City of Darwin • Litchfield Council • Local residents
R-12: Pressure on transport infrastructure	Start of construction, increased industrial traffic	Likely	Major	High	Industrial development is likely to increase heavy vehicles on approaches to the precinct, including Elrundie Avenue, Jenkins Road, Channel Island Road and	• Transport planning matched by appropriate budgeting ahead of increased traffic.	Low	• Transport Planning • Infrastructure NT • Palmerston Council • Litchfield Council

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
					the Arnhem Highway, creating pressure to fast-track new and upgraded roads, such as the duplication of Channel Island Road and the Weddell Freeway to take heavy vehicles off Elrundie Avenue and Jenkins Roads. The Road Transport Association and Palmerston residents are already experiencing the consequences of heavy vehicles using Elrundie Avenue, while road transport operators experience higher costs and lost productivity from repeated stops at signalised intersections. The scale, extent and duration of increased demand will be high. While this might be alleviated by incremental growth, construction pressures are likely to see periods of peak demand (as experienced by INPEX) and create budgetary pressures to fast-track planned infrastructure.	• Precinct design to accommodate road transport needs. • Undergrounding powerlines to avoid delays to over-size over-mass transport.		• Palmerston residents • Road Transport Association of the NT • Extractive Industries Association
R-13 Reduced access and quality of other social infrastructure and services due to sudden population growth	In-migration of workers or people seeking work; Accommodation of workers and their families	Possible	Moderate	Medium	Concurrent projects could lead to sudden population increases, putting pressure on social infrastructure such as education, health, community facilities and childcare. Land use planning and needs analysis are designed to predict and prepare for projected population growth. While thresholds can be set for increased demand, this impact requires long-range planning and may be affected by market forces and unexpected concurrent projects.	• A pace of development that allows population growth to be planned for and absorbed. • Good sharing of data ahead of projects to inform good planning. • Continued land use and infrastructure planning. The NT Infrastructure Plan and Pipeline adopts an 'infrastructure ecosystem' approach that includes social infrastructure to support growth. • Skills development and key worker housing to provide staffing to deliver services.	Medium	• Planning Commission • Infrastructure NT • City of Palmerston • City of Darwin • Litchfield Council • Workers and other residents

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
					A key risk could be finding to staff to provide the services, particularly if inflationary pressures affect key workers.			
R-14 Pressure on water supply leads to scarcity and constrains residential and industrial growth	Projects start operating before water solutions are in place, eg AROWS and Manton Dam return to service	Possible	Extreme	Very high	Availability of a suitable water supply has been identified as both a key enabler for development at Middle Arm as well as a constraining factor if there are delays in augmenting water supplies. This issue is a priority for both the Australian Government and the NT's strategic water planning. Infrastructure Australia's Infrastructure Plan 2021 includes prioritising water safety and security as a key area for consideration for major infrastructure projects in Australia. Delays in boosting the Darwin Region's water supply could lead to water restrictions, constraints on population growth, limits to industrial growth and investor uncertainty. A high rating is assigned due to uncertainty about timing of the AROWS project, which is still subject to an EIS, uncertainty about the location and implications of desalination plants and feasibility of waste water treatment options which are not covered in this analysis.	• Sequencing of projects at Middle Arm dependent on water availability, starting with Manton Dam return to service. • Efficient water use and recycling and industrial use of waste water. • Implementation of water supply options within the timeframes required for Middle Arm development. • Darwin Region Water Supply Strategy. • An environmental impact study for the AROWS project is due to start in 2023.	High	• Power and Water • Northern Territory Government • Infrastructure NT • Invest NT • Infrastructure Australia • Environmental and community groups • All residential and industrial water users • Project proponents
R-15 Reduced resilience and capacity of Greater Darwin's industrial and	Increased demand puts pressure on stability and capability of the Darwin-	Likely	Major	Very high	Threats to the reliability of the electricity grid could compound existing issues with ageing infrastructure and shortfalls in supply from Blacktip. Increased pressure on an already challenged system increase the risk of a	• A stand-alone, common-user renewable energy grid which does not depend on or impact the Darwin-Katherine Energy System. • All energy infrastructure supplying the precinct or Middle Arm more broadly to	Medium	• Power and Water Corporation • Jacana • Territory Generation • Invest NT • Infrastructure NT

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
residential energy supplies	Katherine electricity system				'system black' which could delay integration of renewables into the grid. As with water, a mismatch in timelines between energy demand and supply could strain the Greater Darwin region's energy reliability and security and dent investor confidence. The NTIPP (2022) notes the need to reduce the use of gas generators, to upgrade secondary energy storage systems (p.114) and to establish a Weddell renewable energy hub within the next 5-10 years at a cost of $10M (p.150).	be independent of Power and Water infrastructure, but with the capacity to connect to the grid once policy and technical issues are resolved in the future. • Advice from the MASDP team is the precinct will have a stand-alone, common user energy grid which could accommodate a range of renewable energy sources. Projects would not be able to proceed until this stand-alone grid is in place, so there should be no impact on Darwin's residential or industrial power supplies. The grid could connect to the Darwin-Katherine Electricity System at a later stage, providing benefits to Darwin (see opportunity O3 below).		• Planning Commission • Industrial and residential customers.
R-16 Pressure on emergency services' capacity to respond to incidents at Middle Arm	Industrial growth at Middle Arm, including an expand industrial risks	Likely	Major	Very high	Darwin's emergency services are already under strain. Middle Arm is too far from Berrimah and Palmerston Fire Stations to allow for the required 8-minute response time and the Fire and Rescue Service lacks the specialist equipment and training to respond to an emergency incident. Marine or shipboard firefighting capacity is also limited. A major incident would exceed the capacity of emergency response teams. While the likelihood may be low, making it hard to justify costly increases in capacity, the consequences would be catastrophic.	• This risk can be partially mitigated by having highly trained emergency response teams and equipment at individual project sites. However, ERTs are generally equipped to provide an immediate response until NTFRS resources arrive. • The proposed Weddell/Middle Arm sub-regional plan could include an options study for a new fire station to ensure a site is quarantined for later activation. • Additional tugs with firefighting capacity, and specialist training to respond to the types of incidents most likely. • User pays training and response services.	High	• NT Fire and Rescue Service • NTG • Proponents • Greater Darwin residents

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
R-17 Budgetary pressures to increase waste management facilities	New projects require waste management facilities	Possible	Minor	Medium	Waste management facilities in the Greater Darwin region are at capacity. Individual proponents within the MASDP will be expected to manage their own waste disposal although the amount of waste has not been quantified. Darwin City Council's CEO queried what impact Middle Arm would have on waste facilities at Shoal Bay. Current waste management strategies are focussed on the circular economy, not the disposal of non-recyclable waste. The NTIPP (2022) identifies the need for a new leachate pond at Shoal Bay, at a cost of $8 million, within the next five years and a $12 million Stage 2 expansion ($12 million in the next five years). The Litchfield Subregional Land Use Plan (2016) makes provision for a potential new regional waste management facility but this appears to be unfunded. This topic is out of scope for the strategic assessment, which elevates the uncertainty of the MASDP's impact, increasing the risk rating. The Fire and Rescue Service would like access to waste water treatment facilities to accommodate training or emergency response foams.	• A Greater Darwin region waste strategy that caters for cumulative impacts of industrial waste disposal and population growth, including a new regional waste facility. (Higher rating due to not being covered by strategic assessment and uncertainty about timing)	Medium	• NTG • Industry • Local Government • NTFRS
R-18 Budgetary pressures on local government to maintain transport infrastructure	Workers commuting to work or extractives on rural roads, eg from Cox Peninsula;	Possible	Minor	Medium	Pressure on local government roads could come from the extractives industry having to move further afield to source materials and workers commuting to Middle Arm from the Cox Peninsula. This would put pressure on unsealed roads, such as Finn Road. This issue was raised	Transport Planning taking account of commuter and extractives traffic, eg from the Cox Peninsula along Finn Road. Funding support to Litchfield Council to upgrade rural roads.	Low	• Litchfield Council • Infrastructure NT • Transport Planning • Extractive Industries Association • Road Transport Association

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					by Litchfield Council and the Road Transport Association of the NT.			
Section 8: Economies (jobs, industry participation, livelihoods, economic and community development)								
R-19 Skills shortages constrain growth and lead to crowding out	Start of construction and operations draws on existing workforce	Almost certain	Extreme	Very high	The Northern Territory and Australia already face extreme worker shortages, both professionals and trades, which is likely to constrain economic development and service delivery. Challenging economic conditions and worker shortages in the NT are exacerbated by an outflow of young workers, competition from other jurisdictions and skilled migration drying up during COVID. Liveability issues such as crime and the cost and availability of housing are additional deterrents to attracting and retaining workers in a tight market. Local construction businesses could lose staff, face escalating costs and declining productivity due to workforce challenges. Given current conditions, this risk is considered likely and extremely consequential. The breadth and duration are uncertain but workforce shortages could undermine the Territory's economic growth targets. The risk is therefore assigned an initial rating of VERY HIGH, reducing to HIGH with a sustained, collaborative and innovative approach.	• Opportunities for workforce development plans to support local recruitment and retention, whole of industry approach with gas-based and marine industries. • A workforce development strategy that 'grows our own' workforce by moving long-term unemployed into employment pathways. • A skilled migration policy that focusses on trades and skills likely to be needed in manufacturing and the 'new economy' of renewable energy. • Target students who can meet skills shortages and make it easier to obtain visas. • Target countries where migrants report high satisfaction with the NT, eg the Philippines. • Continued marketing strategies targeting skills in highest demand. • Adopt recommendations in the attached workforce development strategy as labour demands become more certain. • Adopt recommendations in the ACIL Allen report (2022) for the Property Council of Australia NT and Workforce Development Strategy at Attachment 4.	High	• NTG • DITT • industry groups • workers • training organisations
R-20 Displacement of other economic sectors due to	Industrial land use and marine activities are incompatible	Likely	Moderate	High	Land and sea use conflicts may displace other sectors, which might be individually small but which collectively account for	• Adhere to land use plans, including proposed Weddell/Middle Arm subregional plan (discussion paper in mid-2023).	Medium	• Planning Commission • Tourism, extractives, aquaculture and

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
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land and sea use conflicts	with existing economic sectors				substantial employment and economic activity. This includes: • incompatibility of the development with Darwin's tourism image; • displacement of extractive companies; • pollution or increased brine concentration of sea water damaging the aquaculture sector, particularly hatcheries on Channel Island and along the Blackmore River side of the Middle Arm peninsula; • potential incompatibility of development with land use objectives at Weddell, including emissions affecting potential residential land, demands for solar farms and industrial land; • ferry transport to the Elizabeth River Bridge. Competitive for limited land may deter or displace other investors once the precinct is fully-subscribed.	• Type and scale of development that is sensitive to existing sectors and proposed residential areas. Master planning for the precinct and land use planning for the Greater Darwin Region identifies projects that are the best strategic fit with the precinct concept and identifies alternative sites for others. Rigorous hydrodynamic and water quality monitoring that takes account of the sensitivity of harms to aquaculture. Engineering solutions include avoiding any potential pollution to aquaculture intake pipes. No discharge of heavy metals or contaminated water (to be collected on site).		recreational fishing industries • Local business and industry associations • Litchfield and Palmerston Councils • NT Government
R-21 Failure to deliver local contracts and benefits to local industry sectors	Project announcements, start of procurement and construction	Possible	Minor	Medium	While the business community is generally supportive of the Middle Arm project, many are operating at capacity and short of staff, so expectations may not be high to start with. There is some cynicism about whether benefits from large projects flow to local companies.	• Procurement policies that favour local businesses and build capacity. • Sequencing of projects to give local businesses the confidence to expand. • Recruitment, training and retention of workers.	Low	• NT Government • Industry groups
R-22 Failure to deliver on expectations of jobs and training,	Start of training and recruitment, construction and operations	Possible	Insignifica nt	Low	There is low unemployment and high participation in the Territory. The main benefit of the project would be moving disengaged and long-term Aboriginal	• Intensive support and mentoring for the long-term unemployed, based on the breadth and longevity of opportunities.	Low	• Aboriginal organisations and residents • NTG

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
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particularly for Aboriginal workers.					people from unemployment and disadvantage and exceeding what may be low expectations. Focus on the quality, not just the quantity, of employment outcomes.	• A focus on social as well as economic outcomes. • Adhering to the Aboriginal Procurement Policy.		• Industry groups • Employment and training providers.
Section 9: Cultural identity (connections to kin and country, cultural values, traditional livelihoods)								
R-23 Distress at damage to sacred sites from land clearing, dredging or construction activities	Construction, dredging and changes to tidal activity causing silting	Possible	Moderate	High	Cultural heritage will be covered by Earthsea Heritage Surveys. The consequences of damage to nearby cultural heritage would cause distress, therefore this impact has a higher rating. Damage may be inadvertent, through a lack of knowledge and understanding, or through cumulative deposits of sediments and increased shipping.	• AAPA certificates • Avoidance of sacred sites or cultural heritage in planning • Close relationships and engagement with custodians of sites • Cultural heritage monitors • Cultural protocols and training for workers • Clearly marked restricted work areas.	Medium	• Larrakia custodians and traditional owners • AAPA • NLC • Larrakia Rangers • Larrakia Nation • Larrakia Development Corporation • Tiwi Land Council and traditional owners
R-24 Distress at damage or loss of heritage or historical sites	Construction, land reclamation and dredging disturb heritage sites	Possible	Minor	Medium	Development can affect historical values, beyond those formally protected by heritage legislation, in particular historical ties to early settlement and World War II activities around Darwin Harbour. There has been a cumulative loss of these sites with time and from development, particularly at East Arm.	• Avoidance of heritage sites • Engagement with heritage stakeholders about how to maintain a balance between development and heritage values • Heritage stakeholder input into decisions about development of Middle Arm • Interpretive signage	Low	• Heritage Branch • Heritage Advisory Council • National Trust • Historical Society • Darwin Military Museum •
R-25 Reduced biocultural knowledge and ability to pursue cultural activities	Start of dredging, clearing and construction leads to pollution and				Reduced access or time for traditional activities can lead to a loss of cultural knowledge about the names and uses of flora and fauna in the harbour catchment area.	• To come from Larrakia		•

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
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	access constraints							
R-26 Diminished cultural values or reduced cultural identity	Reduced access to areas important for cultural activities and passing on biocultural knowledge, damage to areas used for traditional activities				Activities that are important for cultural values and identity include fishing, foraging for shellfish, camping and enjoyment of places around the harbour. Development could limit public access and the ability to continue some activities and pass on knowledge, reducing cultural identity. Spills, discharge or other contamination could lead to health concerns from eating shellfish, fish, and limit Larrakia hunting/gathering around the harbour.	• Engagement with Larrakia people about how to maintain a balance between development and cultural values • Larrakia input influences decisions about development at Middle Arm • Planned development of Middle Arm that balances economic development with cultural values		• Larrakia custodians and traditional owners • Larrakia Rangers • Larrakia Nation • Larrakia Development Corporation
R-27 Reduced enjoyment of human rights, racism, discrimination or marginalisation	From project announcements throughout the life of the project				Relevant human rights include freedom from racism or discrimination based on race, gender or religion. This may be overt racism in the workplace, or more subtle systemic barriers that might preclude women from the workplace. While Native Title Rights have been extinguished at Middle Arm, Larrakia people have not ceded sovereignty and retain strong connections to their land and seas. A key human right is that of Free, Prior and Informed Consent (UN Declaration on the Rights of Indigenous Peoples, 2007), which is reflected in key NTG policies such as Local Decision Making and the NT EPA's engagement guidelines.	• Early and meaningful engagement with Larrakia and Tiwi peoples. • Culturally appropriate communication and engagement methodologies. To come from Larrakia		As above
Section 10: Healthy country (commercial, cultural, recreational, aesthetic benefits from the use of land and clean air and water)								
R-28 Poor water quality and fish health reduces	Dredging, construction activities causing turbidity and	Possible	Moderate	High	Several groups flagged concerns at the impacts of development at Middle Arm and in Darwin Harbour on fish health, from discharges of heavy metals or	• Development at Middle Arm that minimises impacts to fish health/ecosystems.	Medium	• DHAC • AFANT • Larrakia people • ECNT

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recreational fishing	noise; spills or contamination by projects; clearing of mangroves				toxins, heightened biosecurity risks and disturbance to the harbour's ecosystems. Alarm regarding discharges was also raised during consultation and submissions from fishing, environmental, Larrakia and aquaculture groups on TNG's proposed Middle Arm processing plant at Middle Arm. Recreational fishers are highly sensitive to the implications of clearing mangroves or harming seagrass beds, which are breeding or eating habitat.	• Rigorous environmental management plans and monitoring. • Engineering controls to prevent pollution, including no discharges of heavy metal or contaminants. • Harbour dredge management strategy. (This assessment does not extent to the impacts of desalination.)		• Environmental and community groups • Harbour tourism operators • Darwin Port • Researchers
R-29 Diminished ecological values of the harbour	Start of construction, dredging, piling, clearing of mangroves and industrial activities; Population growth	Likely	Moderate	High	The harbour's natural assets are highly valued by many stakeholders, particularly long-term residents. The community would be sensitive to any decline in the harbour's ecological values, particularly if these are permanent. Population and industrial growth increases the risks of pollution on coral, marine mammals, birdlife, corals, fish, mangroves and seagrass. The risks are heightened by the diffuse sources of additive impacts and the likely scale and duration of dredging and shipping. This could include marine strikes of marine mammals and disturbance to habitat such as mangroves and seagrass. Progressive growth compounds the cumulative risks of species loss and compromises the harbour's ecological values.	• Development that minimises impacts on the biodiversity of the harbour • Rigorous environmental management plans and monitoring. • Darwin Harbour dredge management strategy. • Community input into planning for the future development of Middle Arm • Regulations/requirements in place to minimise the risk of biodiversity impacts To come from marine studies	Medium	• DHAC • Commercial and recreational fishers • Aquaculture • NTG • Community and environmental groups • Researchers • Darwin residents • Tourists

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
R-30 Constraints on the emerging aquaculture sector due to pollution, biosecurity risks, reduced water quality	Dredging, construction and marine activities	Possible	Moderate	High	Marine/environmental health is crucial for the marine aquaculture and commercial fishing industries. Aquaculture businesses operating in the harbour would be impacted by reduced harbour health or reduced water quality at intake pipes for hatcheries. Increased marine traffic brings biosecurity risks, such as pests and diseases, that could devastate the local aquaculture industry.	• Engineering controls on development in Middle Arm to avoid impacting the health of the harbour/water quality. • Rigorous environmental management plans and monitoring. • Strict biosecurity controls in line with recently raised standards, e.g. no discharge in Territory waters) • (As above) no discharges of heavy metals or other contaminants into Elizabeth River or Middle Arm/Blackmore, with particular sensitivity at the Darwin Aquaculture Centre.	Medium	• Aquaculture operators • DHAC • Commercial fishing industry - waters near the harbour
R-31 Greenhouse gas emissions jeopardise the NT's zero emissions targets and contribute to climate change	Land clearing, dredging, construction and operations	Almost certain	Major	Very high	Given that the Middle Arm precinct was announced as supporting gas-based manufacturing and petrochemical industries, it has attracted strong criticism from environmental groups. The most recent independent oversight report on the Hydraulic Fracturing Inquiry (November 2022) notes that the Territory is unable to meet its objective of reducing the life cycle greenhouse gas emissions from development of the Beetaloo without support from the Commonwealth and other states. Based on the scope of development covered by the SEA informing assumptions for this assessment, the Middle Arm precinct will contribute the equivalent of xxx % of the Territory's emissions, which would substantially compound this dilemma without renewable energy and robust carbon capture and storage solutions.	• Selection of industries that are a strategic fit with the concept of a sustainable precinct (i.e. lower carbon emissions). • Carbon capture and reuse to reduce emissions from existing LNG plants would be acceptable to some opponents of fossil fuels. • Conditions to prevent growth ahead of ability to abate or offset emissions. To come from GHG report NB: CSIRO report and media coverage on the credibility of carbon offset schemes	High	• NTG • Australian Government • Oil and gas industry • Environment groups • Community

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
					Queensland and NSW land courts are rejecting approval of coal mines that generate scope 3 emissions and a new Australian Government showing a greater commitment to reducing Australia's carbon emissions.			
Section 11: Living environment (surroundings, amenity issues, landscape)								
R-32 Increased travel times and traffic congestion for road transport operators, Palmerston residents and commuters	Heavy vehicles and worker traffic during clearing, construction, operations	Likely	Insignifica nt	Medium	Increased self-drive traffic and worker parking was raised as an issue for the TNG Middle Arm processing plant (Elton 2019). The traffic assessment shows high traffic volumes during the peak of construction for the INPEX LNG plant along Channel Island Road. Industrial traffic would increase to transport construction materials and workers to site, including from East Arm Port and quarrying material along the Arnhem Highway. This could cause congestion and slower travel times in and around Palmerston, Channel Island Road, Jenkins Road and Elrundie Avenue, including an incompatible mix with recreational fishing vehicles travelling from the rural area down Jenkins Road to the Elizabeth River boat ramp.	• Planning and upgrades to roads leading to Middle Arm to cater for increase in construction, industrial and worker traffic. • Workers travel to Middle Arm by bus. • Eventual duplication of Channel Island Road. • Construction of Weddell Freeway to connect Palmerston with Middle Arm and Weddell. • Avoiding residential/school areas at peak hour. See also Traffic Assessment at Appendix xxx	Low	• Palmerston residents • Commuters travelling on roads leading to Middle Arm • DIPL, Transport Planning • Planning Commission • Road Transport Association of the NT • Palmerston and Litchfield Councils
R-33 Reduced quality of life due to nuisance impacts, such as noise and vibrations, dust, light pollution,	Start of clearing, dredging, construction, pile-driving, compounding with subsequent projects	Possible	Moderate	High	The amenity, or surrounds, of Greater residential areas, Palmerston in particular, could be affected by noise and vibrations, dust, visual impacts such as industrialisation of the skyline, smells and light pollution from construction and operational activities.	• Management plans that reduce nuisance impacts, including noise attenuation and dust suppression. • Rigorous monitoring, reporting and effective grievance policies. • Good communication to allay fears or provide advice on likely disruption.	Medium	• Local residents • Harbour tourism businesses • Environmental and community groups • Palmerston, Litchfield, Darwin Councils

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
visual, and smells					People are likely to absorb short-term noise, dust and visual impacts from construction however they are less likely to accept long-term, intrusive cumulative impacts. A terrestrial noise and vibration assessment (GHD 2022 at Appendix xxxx) predicts that cumulative industrial noise during operations should not exceed the NT EPA's noise management guidelines except at night, in some weather conditions, in nearby Palmerston suburbs and at Bladin Village on Middle Arm Peninsula. Higher noise and vibrations during construction, such as piling for marine infrastructure, may be experienced temporarily. Impacts on residential amenity may reduce the area of Weddell suitable for residential development. A preliminary visual assessment suggests the precinct will be partly obscured from Stokes Hill Wharf and will be mainly visible from East Arm, Elizabeth River and the Elizabeth River Bridge (including trains and commuters). Need results of technical studies	• Avoiding intrusive work practices at night, such as piling. • Selection of industries least likely to impact on amenity. • Landscaping and buffers of mangroves and trees to reduce the visual impacts of the precinct. • Complaints hotline.		• AFANT
Section 12: Strong voice (having an influence over decisions, governance structures)								
R-34 Loss of trust and confidence in ability to influence decision-making	Announcements and decisions about the project; consultation processes not seen as transparent,	Possible	Minor	High	Stakeholders have taken a keen interest in developments on Middle Arm and East Arm Peninsulas over the past 20 years. Development of the harbour has been contentious in the past. There is potential for social movements to form if people feel disempowered and their values threatened.	• Meaningful engagement with the community and stakeholders and input into planning for future development of Middle Arm. • A key mitigation would be a scaled back precinct in response to community concerns.	Medium	• DHAC • Councils • Industry groups and businesses • Larrakia people and organisations • Environmental and community groups

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
	accountable and meaningful				Key issues raised in submissions to the ToR were accountability and transparency of decision-making, the need for a public inquiry to give the community a genuine say and concerns about fast-tracking individual project decisions. Larrakia people have complained at the limited consultation to date. Continued concerns are likely as many decisions have been made without the scope for consultation, eg location and initial configuration of the site.	• The assurance plan for the precinct should include provision for project-level information and consultation, to be independently assessed by the NT EPA. • A precinct-level consultative structure to ensure continued two-way communication. • Work with existing groups and governance structures, such as DHAC, councils, industry bodies. Larrakia to advise		• Recreational fishers • Harbour cruises, fishing charters and tourism operators
Section 13: Cumulative								
R-35 Community concern about cumulative impacts of development in Greater Darwin	Announcements and start of construction of MASDP and other projects in the Greater Darwin region; Large influxes of workers	Likely	Moderate	High	Change is inevitable. However, a number of large projects could exacerbate many of the impacts described above, particularly if they occur suddenly or simultaneously. For example, rapid growth could exceed the capacity to plan for and absorb new residents, stretch the labour market, and fundamentally change the way of life that draws people to live in the Greater Darwin region in the first place.	• Careful and collaborative planning with all stakeholders, in line with current infrastructure and land use planning. • An evidence-based approach to longitudinal monitoring of social, cultural, economic and environmental benefits and harms against community standards and desired outcomes. • Adopting a balanced approach to development to maintain the equilibrium between the social, cultural, economic and environmental aspects of sustainability. • Maintaining a long-term perspective and screening out projects that may provide a short-term 'sugar hit' to the economy at the expense of enduring harms, as experienced by other regions which have experienced sudden, short-term and unsustainable growth.	Medium	All stakeholders described above and future generations of Darwin residents and businesses.

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
R-36 Concerns about piecemeal development in Darwin harbour	Individual project announcements at Middle Arm	Possible	Minor	Medium	• Project announcements, proposals and industrial developments around Darwin harbour have generated community concern about the impacts on the harbour and the piecemeal approach to development. • The Darwin Harbour Strategy 2020-2025 refers to the need for sustainable management of Darwin Harbour.	• Development of the strategic impact assessment takes into account the cumulative environmental, social and economic impacts of development at Middle Arm and in the human and natural catchments of Darwin Harbour. • A harbour-wide dredge management strategy and regional conservation plan. • Existing long-range infrastructure, land use planning and economic plans.	Low	• As above
OPPORTUNITIES								
Social infrastructure								
O-1 Greater community vitality through enhanced social infrastructure	Population growth leads to new schools, health centres, housing options, transport, utilities	Unlikely	Minor	Barely noticeable	A pipeline of projects should support population growth as workers and their families relocate, including skilled migration. Population growth may provide the impetus for enhanced social infrastructure. However, the diffuse and uncertain nature of this benefit and challenges establishing cause and effect lead to a lower opportunity rating.	• Land use and infrastructure planning and needs analysis should help optimise the benefits of growth and inform fiscal planning by the NT and Australian Governments	Barely noticeable	NT Government Planning Commission Infrastructure NT Darwin, Palmerston and Litchfield municipalities Greater Darwin residents
O-2 Enhanced water supply that benefits other sectors	Project a catalyst for development of new water supply	Almost certain	Extremely important	Beneficial	The Greater Darwin Water Strategy acknowledges pressures on existing water supply and pressures to expand. This infrastructure project is a priority of the NTIPP and has funding support from the Australian Government. An enhanced water supply is a critical enabler of	Implementation of Greater Darwin Water Strategy, including Manton Dam return to service and AROWS project.	Transformational	Power and Water Corporation NTG Australian Government Local Government Industry associations

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
					economic growth and has bipartisan support. A business case by PwC supports the Manton Dam return to service and AROWS project. An EIS is due to start in 2023. Development of Middle Arm should provide the impetus and economic rationale to proceed with the AROWS project, diversify water sources and create widespread benefits to other industrial, horticultural and residential customers. Should there be delays and demand outpaces available supply, this becomes a major risk (see R-11), with consequential indirect risks (for example if AROWS is delayed or desalination is used).			
O-3 Diversified, more reliable and affordable energy supplies	Industrial demand for energy, including renewable sources.	Possible	Important	Beneficial	The Greater Darwin region's aging gas turbines and reliance on Blacktip gas leave the region vulnerable to energy insecurity. Expanding the system's capacity and providing new sources of industrial-scale, dispatchable renewable energy would be significant if technical issues can be resolved. This would provide security to residential and industrial customers and constitute a key enabler for a value-adding manufacturing sector. However, given that initial plans are for a stand-alone, common user grid, these benefits are unlikely to be realised immediately.	Long-range reforms to Greater Darwin's energy grid, including the capacity to link to the Darwin-Katherine Electricity System.	Noticeable	Power and Water Corporation Jacana Energy Territory Generation Industry Residential customers
Economic								

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
O-4 Sustained local prosperity through regional economic development, diversification and population growth	Construction and operation create pipeline of jobs and enable projects	Likely	Moderate	Noticeable	Economic diversification will contribute to immediate and long-term jobs, modernise the Territory's economy, build productivity and human capacity and contribute to population growth. A larger advanced manufacturing sector will develop new value-adding economic sectors. These opportunities will be enhanced by the NTG's implementation of TERC recommendations, a steady pipeline of projects and government and private sector investment in enabling infrastructure, as outlined in the NTIPP.	Collaborative implementation of a raft of policies and strategies will help deliver success including: . regional development plans . procurement policies . business growth . workforce development . population strategies . investment in social infrastructure . marketing campaigns . maintaining the liveability of the Greater Darwin region (including crime).	Beneficial	• NT Government • Industry groups • Greater Darwin businesses • ICNNT
O-5 More viable port and maritime sector	Project operations contribute to economic activity at the port and maritime precinct	Possible	Minor	Noticeable	A draft Maritime Industry Development Plan aims to build the capacity of Darwin's maritime sector, which is complementary to development on Middle Arm and the broader service and supply sector. The precinct is likely to grow Darwin's competitive advantage and trade through the port, both imports to support construction and increased exports. Bulky goods will travel from Middle Arm to the port.	Implementation of key government infrastructure, economic and maritime policies, support industries (eg Ship Lift). Coordination between stakeholder groups.	Beneficial	• Darwin Port • NTG • Marine industry stakeholders • Marine Industry Council • Port Users Group
O-6 Stronger business community	Start of construction creates cumulative opportunities for service, supply	Likely	Important	Noticeable	There will be expectations of local contracts for projects. Increased local service and supply should have ongoing economic benefits. Opportunities for contracts with a pipeline of projects at	• Local participation plans/Territory Benefit Plan • Development of industry plans, eg ICN capability mapping (identify capacity and capability, skills shortages, training and development opportunities)	Beneficial	• Local business and industry groups • ICN NT • NTG

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
	and support industries				the MASDP will enable local businesses to increase capacity and capability.			
O-7 Enhanced human capital through sustained growth of a skilled workforce	Influx of workers and their families and opportunities to grow a local workforce, particularly Aboriginal jobs, training and apprenticeships	Likely	Important	Noticeable	Skills shortages are one of the constraints to economic development in the NT. Long-term service and supply opportunities with multiple projects allows long-term planning and the ability for local businesses to address skills shortages. Research and development opportunities would grow human capital. Population growth and skilled migration will enhance the local labour force and skills base. The extent, duration and scale of change may be difficult to attribute to Middle Arm (will require rigorous data-gathering from proponents).	• Local participation plans/Territory Benefit Plan • Collaboration to build skills, implement workforce development plans. • Sequencing of projects to suit local capabilities and deliver social outcomes.	Beneficial	• NTG • Local industry • Chamber of Commerce • training institutions
O-8 Enhanced capabilities of Aboriginal businesses due to successful tendering	Procurement policies and practices lead to successful tendering by Aboriginal businesses	Possible	Minor	Noticeable	There has been a growth in Aboriginal-owned enterprises and recognition of the importance of this sector to sustainable economic development that also delivers social and cultural benefits, including jobs for Aboriginal people on their Country. The scale of change may be lower given the current number of Aboriginal Business Enterprises, however the precinct may provide opportunities for Aboriginal-led economic development and more durable enterprises.	• Aboriginal Procurement Strategy • Aboriginal Economic Development Strategy • Use of ICN and Indigenous Business Network certified Aboriginal Business Enterprises	• Beneficial	• Aboriginal businesses and corporations • Larrakia organisations • NTG Aboriginal Affairs • NTIBN
O-9 Enhanced standard of living and material wellbeing	Start of construction leads to higher wages and business opportunities	Possible	Insignifica nt	Barely perceptibl e	Economic development should flow through economy as wages and taxes, while employment opportunities should enhance the material wellbeing of a local workforce. However, the diffuse nature of this benefit would make it difficult to	Economic development that has a focus on sustainable, inclusive and equitably shared benefits would increase the likelihood of realising material and social wellbeing. The Social Performance Plan will establish objectives and indicators to track the	Noticeable	NTG Darwin residents Service organisations

Positive or negative impact	Impact pathway triggering change process	Significance Assessment			Explanation	Mitigation measures (negative) Enhancement measures (positive)	Residual rating (after mitigation)	Stakeholders and potentially affected people
		Likelihood (before mitigation)	Conse-quence	Signifi-cance before mitigation				
					establish cause and effect and attribute to any one development. The proportion of economic contribution by Middle Arm would also likely decline as projects move to their operational phases and other projects start up in the Darwin region over the next 50 years.	contribution of Middle Arm projects to local wellbeing.		
Cumulative								
O-10 Collaborative approaches to build human capital and collective benefits	Pipeline of projects and local contracts	Possible	Insignifica nt	Barely perceptibl e	The NT Government's vision of a $40 billion economy and population of 300,000 by 2040 will have many benefits for Territorians by stimulating and diversifying the economy.	Innovative, collaborative approaches to building capacity, guided by clear strategies, focus, policies and investment. Will require coordinated investment by both government and the private sector. As above: implementation of existing plans.	Beneficial	NTG Industry associations Businesses Residents

Attachment 2: Social sustainability framework

MIDDLE ARM SUSTAINABLE DEVELOPMENT PRECINCT SOCIAL SUSTAINABILITY FRAMEWORK (as at January 2023)					
OVERARCHING OUTCOME	**Development of a precinct that has community acceptance because it aligns with the social, cultural, ecological and economic values of the Greater Darwin region**				
Categories	**Social sustainability**	**Economic sustainability**	**Cultural sustainability**	**Governance sustainability**	**Ecological sustainability**
Sustainability outcomes Desired benefits, conditions	**Enduring social fabric and wellbeing**	**Enduring and equitable local prosperity**	**Enduring cultural identity of Larrakia and other Aboriginal groups**	**Strong institutions that encourage civic participation in decision-making**	**Enduring ability of ecosystems to meet the needs and wellbeing of current and future generations**
Objectives Specific Measurable Achievable Relevant Short, medium and long-term	**Social** To: • enhance community wellbeing and quality of life • contribute to land use and social infrastructure planning • grow the Territory's population by attracting workers and their families.	**Economic** To: • diversify and strengthen the Territory's economy • maximise the equitable local distribution of economic benefits • contribute to the material wellbeing of Territorians • minimise 'boom bust' cycles and reliance on FIFO workers.	**Cultural** To: • maintain respect for Larrakia and their enduring stewardship of land and seas • avoid impacts on sacred sites and places of cultural and heritage significance • maintain or grow cultural knowledge and its transmission	**Governance** To: • give people and communities an influential voice in decision-making • contribute to transparent and accountable decisions • enhance the quality of long-term planning by contributing local and traditional knowledge.	**Ecological** To: • protect valued components of the natural environment • conserve renewable and non-renewable resources for future generations • eliminate or reduce waste, emissions, pollution.

			to future generations • maintain access to traditional activities (eg fishing, food harvesting, camping).		
Valued components Aspects of natural, cultural, social and economic conditions that are important to people and communities (purpose is to identify materiality of issues for assessment)	• wellbeing (quality of life, health and safety) of people and communities (material, social, cultural) • social cohesion • affordable, accessible and quality housing choices • accessible, affordable and reliable social services (transport, education, policing, health) • access to residential and industrial land • reliable emergency response capability • reliable and affordable utilities (power, water, waste, sewerage) • attachment to place (iconic harbour city) • good living environment/amenity: (noise, dust, visual, light, traffic, pollution)	• thriving and diverse local economy • productive small, medium and large local businesses • social and economic equity and inclusion (including gender equity) • emerging aquaculture industry • sustainable Aboriginal enterprises and livelihoods • sustainable population growth and retention • thriving tourism industry and image • strong human capacity, skills and knowledge • strong education and training sector	• strong cultural identity • enduring cultural connections to land and seas • enduring cultural knowledge, and respect for knowledge holders and ability to pass on knowledge • honouring Darwin's rich Aboriginal and settler history and heritage, including World War II • land rights and human rights	• inclusive civic participation in decision-making • trust in institutions and decision-making.	• healthy land and seascapes (free of pollution) • recreational fishing and crabbing, breeding habitat • future of the planet and addressing climate change

Key findings: the evidence base Key findings of Strategic Social Impact Assessment (refer to risk and opportunity matrix for detail)	• likely substantial and long-lasting impacts on highly-valued fishing and crabbing, including reduced access to Elizabeth River boat ramp • likely disturbance to strongly held values and uses of Darwin Harbour, resulting in reduced quality of life • potential road safety risks, particularly Elrundie Avenue • potential marine safety risks in Darwin Harbour • likely accommodation pressures from FIFO workers and population growth • likely and consequential pressure on water and energy supplies for residential and industrial customers • likely and extreme pressures on the capacity of the NT Fire and Rescue Service to respond to major incidents	• Greater Darwin's economy is prone to the boom bust cycles of major projects and needs to be more sustainable • the key issue of concern to businesses is severe worker shortages, constraining expansion and productivity • a key transformational benefit would be growing local human capital • existing and emerging sectors are concerned about crowding out due to competition for staff and land and sea use conflicts, eg tourism, aquaculture, recreational fishing, extractives • aquaculture nurseries and oysters would be particularly susceptible to heavy metals, discharging of pollutants, and biosecurity risks.	To come from Larrakia	• concern about the limited information on what industries will operate in the precinct • Greater Darwin residents distrust government and regulatory institutions • stakeholders want input to transparent and accountable decisions for the precinct and for all individual projects.	• Darwin Harbour is highly valued for its sunsets, nature, and range of recreational activities it supports • any decline in water quality from pollution, discharges, heavy metals and mangrove clearing would be a threat to fishing, crabbing, habitat, aquaculture and food gathering • there is alarm at any enabling of fossil fuel developments, the difficulty of abating likely greenhouse gas emissions, and the contribution of gas-based development to climate change.

	• fears of health impacts from emissions and pollution.				
Baseline context What are conditions like now? ✓ Good (don't reduce) ◎ Adequate (maintain) ✗ Poor (lift) What is the resilience or vulnerability of the community to change?	High mobility of young workers and their families but also high levels of disadvantage among permanent residents (many of them Aboriginal). The disadvantaged would be most vulnerable to pressures and benefit most from positive change. Sensitivity to change will be greater among longer-term residents who fear the loss of what makes Greater Darwin special. ◎ Social infrastructure and community cohesion generally good, except social housing. ✓ The baseline for quality of life and wellbeing needs to be protected. ✗ The baseline for levels of disadvantage needs lifting. ✗ The baseline for emergency services and utilities is high risk and needs improvement.	SMEs, many of which are family-owned and operated, are ambivalent about the benefits of large projects based on their experience of boom-bust cycles, poor payment terms and debts and seeing many 'shiny big' government-supported projects not proceeding. They are susceptible to inflationary pressures, have limited capacity to absorb further skills shortages and want growth to be at a pace that protects them from unsustainable competitive pressures. ◎ A small emerging economy susceptible to the booms and busts of major projects. ◎ Baseline for economic growth could be raised but must provide sustainable benefits for locals. ✗ Baseline for skilled workforce unacceptable and needs substantial raising ✗ Baseline for Aboriginal workforce participation is unacceptable and needs raising.	Baseline of cultural knowledge and identity is lowering. Culturally-led research could be improved. Baseline needs to be held.	✗ Distrust of government, industry and regulatory institutions, baseline for civic participation could be raised. ✗ Clear and coordinated government communication could be improved.	• The natural environment is highly valued. There is growing concern at threats to ecosystems, in particular in Darwin Harbour. • Concerns at climate change and greenhouse gas emissions is a strong societal value, with further change unable to be absorbed. ◎ The baseline for the natural environment and emissions has been steadily declining nationally and in the NT, with a progressive loss of biodiversity that needs both protection and improving. ✗ The baseline for greenhouse gas emissions is already unacceptable in terms of meeting the NTG's zero emissions targets.

Implementation: Actions and commitments to achieve outcomes (Set KPI's in conjunction with stakeholders - detailed action plans below)	• establish a collective community investment fund; • accommodation plans; • collaborative workers' accommodation on a user-pays basis; • investment in social infrastructure, particularly housing, transport, emergency services and utilities.	• more detailed workforce development strategy and implementation plans as details become more certain; • local procurement commitments for investors; • Territory benefit/industry participation plans. • funding for industry development; • social procurement.	• obtain sacred sites certificates • protect sacred sites • cultural inductions • to come from Larrakia	• establish advisory committee with key precinct operators, council, community and industry members. • implement long-term engagement strategy • produce regular reporting.	• environmental management plans focussed on key values and uses of Greater Darwin's ecosystems; • environmental and recreational fishing offsets; • grievance register; • values mapping.
Reporting: Indicators for reporting against objectives Quantitative (statistical) and qualitative (attitudinal) Have to be able to measure + establish cause and effect relationships between the precinct and data	• road safety, crash data for arterial roads leading to middle arm; • expenditure on social infrastructure in Greater Darwin; • satisfaction levels for social infrastructure and services; • emergency services' response times; • satisfaction levels with cost and access to utilities; • trends in five-yearly values mapping; • social capital or wellbeing surveys.	• total spend on construction and operations • number and proportion of contracts, total spend on local businesses • number of local businesses going into administration • number of contracts and proportion of spend on Aboriginal business enterprises • number of direct workers during planning, construction and operations • number, proportion and retention of direct local workers • workforce diversity, including gender • number and proportion of Aboriginal workers	• adopt Darwin Harbour Advisory Committee indicators. • Larrakia to advise	• level of satisfaction with inclusiveness of decision-making • precinct engagement strategy and implementation plan produced • number of advisory group meetings; • satisfaction of stakeholders with meetings against agreed terms of reference • Larrakia (and Tiwi) people have provided FPIC, which includes good communication and consultation.	• as per environmental management plans • number of complaints/grievances about environmental incidents • number, value and satisfaction with offsets • five-yearly values mapping surveys to track attitudinal trends.

		• number and type of training courses attended • number and type of qualifications achieved • number of workers/families relocating to live in the territory and length of stay • total government vs private sector investment in the precinct • population mobility • economic impact (contribution to GDP, Territory revenue).			
Assurance Corrective or adaptive management to rectify failure to achieve targets or respond to emerging issues. Depends on effective monitoring and reporting, data management	ACROSS ALL CATEGORIES • audits and progress reports on adherence to plans and strategies, including Greater Darwin Land Use Plan, TERC, Utilities Commission, Darwin Water Strategy, Infrastructure NT's infrastructure pipeline and plan • interviews with Darwin, Palmerston and Litchfield Councils: impacts on municipal planning and budgets • maintain centralised database • community and workforce surveys.	• reporting against economic and infrastructure strategies; • adherence to procurement policies; • careful monitoring of labour force supply and demand forecasts and actual results in order to adapt.	• Larrakia to advise • reporting on any breaches of Sacred Sites or Heritage Acts • Larrakia cultural monitors • penalties for failing to complete cultural training and any workplace breaches • Cultural Heritage Management Plan • Collaboration with DHAC Larrakia work	• satisfaction surveys with key stakeholders: level of participation, ability to influence decisions • that individual projects align with local values and aspirations (precinct manager, EPA). Reporting to? Corrective action would be?	• environmental management plans • monitor complaints for trends • report on adaptive management responses, emerging issues.

Links to other studies, key government policies	• Planning Commission land use studies • NTG Social Outcomes Framework • CDU Social Capitals survey	• Infrastructure NT's Infrastructure Strategy; Infrastructure Pipeline and Plan (show how MASDP is a fit with priorities); • Infrastructure Australia's priority list (strategic fit, societal impact, deliverability); • Territory Economic Reconstruction Commission (TERC) report (show how MASDP fits with economic and workforce priorities); • NTG workforce development and skilled migration plans. • AcilAllen's report commissioned by the Property Council of the NT; • Treasury, Budget papers.	• DHAC Integrated Report Card • CSIRO biodiversity study • to come from Larrakia	• precinct governance strategy	• precinct environmental management plans; • renewable energy plans; • regional dredge management and conservation plans.

Social performance plan

(assumes participatory development of this plan)

This is a preliminary implementation plan for the social sustainability framework, to deliver sustainable social, economic, cultural and environmental outcomes and objectives as outlined above. This plan should be expanded on in collaboration with key stakeholders as MASDP development becomes more certain.

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator
1. Workforce development strategy	**Northern Territory Government (?Infrastructure NT/DITT)** A staged implementation of a workforce development strategy, building on the report prepared for the strategic assessment (Attachment 4): • ongoing work to establish likely workforce demand for MASDP and other projects in the Greater Darwin region, using Infrastructure Australia's occupational categories identification of skills gaps against occupational groupings, occupations in demand and potential for reskilling, shared competencies (Industry Skills Advisory Council NT) • a whole-of-industry approach, incorporating construction, marine, manufacturing, renewable energies, gas-based industries competencies • skilled migration targetting priority high tech and trades skills and regional sources of migrants most likely to study, work and stay (eg Philippines)	Infrastructure NT and Department of Industry, Tourism and Trade (DITT) Precinct management to coordinate implementation for MASDP, report against indicators Project operators to report	Start now, with refinements as projects become more certain Training graduates for civil work and construction by 2026 Progressive implementation in response to forecast and actual supply	✓	✓	✓

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator
	• evidence-based marketing campaign to attract workers and families who are a strategic fit with labour force demands and the Territory's values and quality of life • population mobility research: why people come, why they leave or stay, the influence of factors such as housing, relevant demographic trends (CDU, Northern Institute) • modelling of the workforce that flies out of the NT to other jurisdictions to identify what might encourage these people to work locally • address liveability factors that deter workers and their families (crime, anti-social behaviour, housing affordability) • invest in relevant employment and training programs to grow the skills, knowledge and capacity of existing residents, including pathways to employment from VET in schools to tertiary qualifications • investment in regional Aboriginal pre-employment and training, mentoring and support • strategies that keep women and older people in the workforce • close liaison with education and training providers, including identification of STEAM (science, technology, engineering, arts and mathematics) skills related to occupational skills and workforce requirements • implement Maritime Industry Development Plan **Precinct** • encourage social procurement strategies that deliver social outcomes (as opposed to lowest cost, fastest build)		and demand data			

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator
	• encourage collaborative investment in regional Aboriginal pre-employment and training, mentoring and support with MASDP and other Middle Arm proponents • strict reporting requirements for government and private sector investors on their local outcomes • staging or sequencing of development where possible to reduce 'boom bust' cycles and provide a pipeline of projects where the benefits are retained locally. **Proponents** • employer incentives for families to relocate and become part of the community • investment in Aboriginal pre-employment and training, mentoring and support • provide data to precinct management. **Useful documents:** See more detailed recommendations in the Workforce Development Strategy (Chamber of Commerce NT 2022 at Attachment 4); ACIL Allen (2022), *Recovery and Beyond: A Renewed Northern Territory Population Strategy* (for the Property Council of Australia) Population studies by the demography unit of the Northern Institute, CDU. Industry Skills Advisory Council NT for skills data, occupations in demand: www.icacnt.org.au *Territory Economic Reconstruction Commission Final Report (2020)* https://ntrebound.nt.gov.au/publications/final-report					

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator

2. Housing and accommodation strategy	**NT Government**
	Predict housing trends, invest in social infrastructure and measure influence of workforce demands, including:
	• predictions for local vs FIFO/temporary workforces and accommodation needs;
	• trends in vacancy rates and costs of rental and permanent accommodation options in Darwin, Palmerston and Litchfield;
	• proportion of temporary and permanent workforce in Greater Darwin accommodation;
	• options study for a whole-of-Darwin workers' accommodation that can flex with demand, including options for repurposing as the housing market grows to absorb newcomers (could include transition for skilled migrants, use of Bladin Workers' Village, facility in Weddell) – could include user pays policy to recoup costs
	• track key tourism indicators such as:
	  ○ occupancy rates
	  ○ cost and availability of flights
	  ○ capacity of short-term accommodation
	  ○ perceptions
	• progress development of Weddell.
	Precinct
	• policy restricting the proportion of workers in local accommodation, particularly during peak tourist season or major events (Darwin Cup, Darwin Festival);
	Proponent
	• adhere to precinct policy and provide data to support implementation of the policy.
		Infrastructure NT
		NT Planning Commission
		
		Precinct manager to coordinate reporting and policies
		
		Project operators to provide data and adhere to policies
			Ongoing planning already in place
			
			Workers' accommodation options by 2026
			
			Ongoing reporting and management
				✓	✓	✓

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator
	Useful documents: NT Shelter reports on homelessness in the NT https://ntshelter.org.au/latest-reports/ Real Estate Institute of Australia: Housing affordability reports and real estate markets: https://reia.com.au/product-category/research/					
3. Procurement strategy	Ensure adherence to the Territory's procurement policies **NT Government** • adhere to policy for NT-Government funded infrastructure • be clear with proponents as to NTG expectations • provide guidance on how to achieve good outcomes • commission regular capability mapping of Territory businesses, identify gaps and business development strategies • industry development fund, business growth and matching **Precinct management** • provide guidance to proponents • gather data for collaborative reporting. **Proponents (including NTG works)** • weightings for local and Aboriginal content (exceeding current 5% quota for Aboriginal enterprises) • package tenders to suit local capabilities • social procurement (i.e. achieving social outcomes such as Aboriginal employment might requiring additional investment and longer build times)	DIPL Infrastructure NT Precinct management to implement and ensure compliance Project operators to adhere to policies with good will and good intent	Strategies already exist Precinct procurement plan by 2026 Progressive implementation	✓	✓	✓

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator
	• ensure tenderers have the financial capacity to deliver and don't over-extend themselves • mandate use of ICN and NTIBN and urge all local businesses to register • include terms and conditions required to be met by prime contractors (eg 30-day payment) • good communication about upcoming opportunities. **Useful documents:** Territory Procurement Framework, policies and principles: https://nt.gov.au/industry/procurement/how-procurement-works/procurement-framework Aboriginal Procurement Policy https://nt.gov.au/industry/procurement/how-to-tender/tendering-with-government/aboriginal-procurement-policy Territory Benefits Plans https://industry.nt.gov.au/publications/business/policies/territory-benefit-policy-and-planning ICN NT: https://icn.org.au NTIBN: https://ntibn.com.au					
4. Investment in social infrastructure, transport and land use planning	**NT Government** Maintain a focus on social infrastructure planning as a key enabler of economic outcomes and quality of life for the Greater Darwin region. **Social infrastructure and planning** • short, medium and long-term land use planning	NT Planning Commission Infrastructure NT DIPL – Transport Planning Power and Water Corporation	Already in place, Weddell/Middle Arm subregional plan in 2023 Ongoing implementation	✓		

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator

	• needs analysis and population projections to provide an evidence base for investment, in particular:
	  ○ housing choice, including social housing
	  ○ options study for fire station and training facility, increased staffing and capacity of NT Fire and Rescue Service
	  ○ access to common user waste facilities
	  ○ options study for extractives' use of Weddell
	• infrastructure strategy covering public and private sector investment in enabling economic and supporting social infrastructure and staffing
	Transport planning
	• investment in transport planning including staged development of Weddell Freeway and duplication of Channel Island Road, based on traffic assessments, road safety data
	• project design to accommodate efficient and productive movement of heavy vehicles within the precinct
	• maintain database on increased civilian and industrial traffic trends
	• maintain data on project-related incidents involving serious damage, injury or fatalities
	  ○ project level traffic management plans to consider congestion and safety issues
	  ○ hours of operation
	  ○ avoiding residential areas
	  ○ worker transport by bus
	  ○ hotline for reporting poor driver behaviour.
	Energy and water policy and planning
	• investment in utilities, in line with NTG zero emissions commitments and Darwin Water Strategy, including:					

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator
	○ environmental studies and planning for AROWS and any desalination proposals ○ systems requirements for Darwin-Katherine Electricity System or independent grids to supply Middle Arm ○ continued forecasting so precinct demand matches staged capacity increases, without risking the security of supply to the Greater Darwin region ○ sequenced development ○ measures for efficient water use and industrial use of waste water. **Proponents** Individual plans and provision of data on needs. **Useful documents:** *Infrastructure Pipeline and Plan (Infrastructure NT 2022)* *https://dipl.nt.gov.au/industry/nt-infrastructure-plan-and-pipeline-2022* Darwin Region Future Water Supply https://watersecurity.nt.gov.au/darwin-region-future-water-supply NT Strategic Water Plan: https://watersecurity.nt.gov.au/ Darwin-Katherine Electricity System Plan https://territoryrenewableenergy.nt.gov.au/__data/assets/pdf_file/0011/1056782/darwin-katherine-electricity-system-plan-web.pdf Planning Commission: https://planningcommission.nt.gov.au/ Darwin Region Transport Plan: https://dipl.nt.gov.au/strategies/darwin-regional-transport-plan					

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator
5. Precinct Territory Benefit Plan	Under the Territory Benefit Policy (2019), Territory Benefit Plans must be prepared for all private sector projects awarded NT Major Project status or private projects where the NTG provides support of $500,000 or more. For the MASDP, a precinct level plan will provide a template guiding individual proponents on mandatory actions and reporting requirements. A Territory Benefit Plan meets the requirements for an Australian Industry Participation Plan, which is required for major public and private projects in Australia or projects receiving Australian Government funding of $20M or more. Needs to cover: • identification of local and Aboriginal suppliers of goods and services • a procurement strategy that outlines how the precinct and individual projects will maximise local industry participation and build the capacity of small to medium businesses • local workforce development and employment, including workforce diversity • regional and Aboriginal economic and community development • investment in economic and social infrastructure • a reporting structure • precinct plan to include collaborative approaches, eg collective workforce development plans and training, project pipelines to encourage apprenticeships and a precinct community investment plan to maximise the cumulative opportunities of collective efforts (below). **Useful documents:**	Precinct manager to oversight Operators to prepare individual plans as per template	Precinct plan to be in place by 2026 Individual projects prior to approval Progressive implementation	✓	✓	✓

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator
	Territory Benefits Plans https://industry.nt.gov.au/publications/business/policies/territory-benefit-policy-and-planning Australian Industry Participation Plans https://www.finance.gov.au/government/procurement/clausebank/australian-industry-participation-plan-aip-plan					
6. Precinct community investment plan	In conjunction with key precinct operators, community and industry bodies, establish a collaborative community investment fund and determine priorities for investment against precinct outcomes and objectives, eg: • professional development programs • scholarships • facilities in the precinct that improve worker wellbeing • childcare support • community projects such as public art • enterprise development fund • collaborative offsets or environmental monitoring • heritage signage	Precinct manager to coordinate, act as secretariat, report Proponents to contribute on a pro rata basis as part of lease agreements	Governance structure to be in place by 2026 and progressively implemented and reported against.	✓	✓	✓
7. Cultural plan	To come from Larrakia • include sacred site certificates • cultural inductions • management of restricted works areas • Larrakia cultural monitors and rangers • acknowledgement of historical and heritage sites of value (eg interpretive signage **Useful documents**	Precinct management Proponents (to come)	To come	✓	✓	✓

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator
	Aboriginal Areas Protection Authority FAQs: www.aapant.org.au/factsheets-faqs Aboriginal Peak Organisations of the NT (APONT), Partnership Principles for working with Aboriginal organisations and communities in the NT www.amrric.org/wp-content/uploads/2019/12/21070504-APO-NT-Partnership-Principles-Updated-version.pdf NT Government Local Decision Making Framework: https://ldm.nt.gov.au/ *Our Knowledge, Our Way in caring for Country: Indigenous-led approaches to strengthening and sharing our knowledge for land and sea management (CSIRO 2021)* www.csiro.au/en/research/indigenous-science/indigenous-knowledge/our-knowledge-our-way *Ethical guidelines for research with Aboriginal and Torres Strait Islander Peoples* (National Health and Medical Research Council (NHMRC) (2018) *www.nhmrc.gov.au/research-policy/ethics/ethical-guidelines-research-aboriginal-and-torres-strait-islander-peoples*					
8. Ongoing community engagement plan	Community engagement means giving people input and an influence over decisions that affect them. This should include: **Precinct governance** • a participation framework for project level approvals • guideline for proponents on communication, consultation and reporting • a stakeholder map to inform all project operators of community sensitivities and who should be kept informed • coordinated communication on precinct development, respond to issues raised in strategic assessment, provide advice on progress of	NTG – whole-of-government communication and reporting Precinct manager/engagement officer Proponents	Before 2026 to inform proponents Ongoing implementation	✓	✓	✓

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator
	regulatory approvals, alerts on activities that might disturb amenity, such as over-size transports, dredging or piling • community relations program, such as site open days, talks to community groups, displays at regional shows • dashboard and report cards to show progress against objectives • precinct advisory committee, to include precinct management, operators, community, council and industry representatives, ensure a coordinated approach to engagement; • website and newsletters; • accountability standards and grievance procedures (eg community 'hot line' and email address) for people to raise issues, along with protocols for recording, responding, providing feedback and regular analysis to determine trends; • crisis communication strategy, to ensure preparedness and coordinated communication in the event of an incident • risk communication strategy (see Peter Sandman) • regular audits against commitments. **Proponents** • individual engagement plans that are in line with above • in order to be issued an approval notice, proponents must submit an engagement and consultation report outlining who was consulted, what issues were raised and how concerns and expectations will be addressed (to be on public display for 30 days). Larrakia to come **Useful documents:**					

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator
	Quality Assurance Standard (IAP2 2015) https://iap2.org.au/resources/quality-assurance-standard/ Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_handbook_stakeholderengagement__wci__1319577185063 *Responding to Community Outrage: Strategies for Effective Risk Communication* (Sandman 2003) https://www.psandman.com/book.htm NTEPA Stakeholder Engagement and Consultation: Guidance for Proponents https://ntepa.nt.gov.au/__data/assets/pdf_file/0005/884696/guidance-proponents-stakeholder-engagement-and-consultation.pdf					
9. Environmental management and safety plans	Environmental and safety management plans ensure compliance with regulatory approvals, but should also be adaptive and participative, over the project's 50-year life cycle. To include: **NT Government** • reporting against environmental valued components important to individuals, families and communities, particularly the health of Darwin Harbour • consolidated reporting against all environmental management plans (in other technical studies), including offsets, conservation, harbour-wide dredge management strategy, marine pests, air and water quality, mangroves, amenity issues)	NTG, NT EPA to ensure compliance Harbour Master Precinct manager to ensure projects fit within the terms of approval notices and ensure	By 2026, well ahead of dredging Ongoing, particularly during clearing, construction, maintenance dredging	✓	✓	✓

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator

	• work with AFANT and Fisheries to plan dredge disposal (for both precinct and whole-of-harbour dredging strategy)
	• work with AFANT and Fisheries to design offsets for recreational fishing, such as artificial reefs
	• investment in monitoring or DHAC integrated reporting
	• stakeholder collaboration in regional conservation and offset strategies.
	
	Precinct
	• transparent accounting of greenhouse gas emissions and any contributions to abatement
	• could include citizen monitoring programs
	• use of Larrakia Rangers for environmental monitoring and rehabilitation
	• well-publicised reporting hotline
	• implement navigational safety plan
	• independent oversight of environmental management
	• marine safety campaign (similar to INPEX) highlighting:
	  ○ marine safety
	  ○ stopping distances of commercial vessels
	  ○ exclusion zones
	  ○ speed restrictions
	  ○ notices to mariners
	• maintain traffic data (as outlined under social infrastructure)
	
	Proponent
	• strict adherence to biosecurity controls
	• project management plans and reporting.
		compliance, coordinated reporting
		
		Proponents
			Individual projects prior to approval			

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator
	Useful documents National *State of the Environment* Reports: https://soe.dcceew.gov.au/ Australian Government's Nature Positive Plan: www.dcceew.gov.au/sites/default/files/documents/nature-positive-plan.pdf *Northern Territory Roadmap to Renewables (*Langworthy et al. 2017) https://territoryrenewableenergy.nt.gov.au/about/roadmap-to-renewables Darwin Harbour Strategy 2020-2025 (DHAC 2020) https://nt.gov.au/darwinharbour/key-deliverables Darwin Harbour Integrated Report Card (DHAC 2021): https://dhir.org.au/					
10. Compliance, monitoring and evaluation of social sustainability framework and performance plan	**Compliance** • monitoring of any regulatory conditions and commitments • five-yearly audit of social performance plan and whether recommendations and commitments are being met • implement assurance measures as needed. **Evaluation and monitoring** Using an adaptive management approach, longitudinal evaluation of the social sustainability framework against the outcomes and objectives, adapt to capture emerging issues: • qualitative and quantitative data-gathering against suggested indicators • include five-yearly values surveys to track community sentiment, whether any changes to values and use of the harbour, acceptance of development • five-yearly evaluation of progress against objectives	NTG – Who? ?Precinct manager to coordinate	Every five years Ongoing maintenance of data base and knowledge map	✓	✓	

Plan	Detail	Responsibility/ governance	Timing	NTG	Precinct	Operator
	• could be expanded to consider community wellbeing and social capital (in line with current CDU *My Connections* study) **Data** • maintain a central data base and 'knowledge library' of resources to inform individual project operators and sensitise new precinct arrivals to government and community expectations (adhering to appropriate privacy and confidentiality requirements) **Guiding documents:** *Northern Territory Social Outcomes Framework (2021)* https://cmc.nt.gov.au/children/northern-territory-social-outcomes-framework NT EPA guidance and approval documents					

Relevant frameworks

	Social	Environment	Economic	Cultural	Governance
Social Outcomes Framework (NTG 2021)	**Domains** • Territorians are able to live a healthy life • Territorians have appropriate and secure housing • Territorians are able to learn, contribute and achieve • Territorians are safe	• The Territory has a natural and built environment that supports a high quality of life	• Territorians are financially secure and have material basics	• Territorians are connected to culture and community	
Sustainable Development Goals (United Nations 2015)	1. No poverty 2. Zero hunger 3. Good health and wellbeing 4. Quality education 5. Gender equality 10. Reduced inequalities 11. Sustainable cities and communities	6. Clean water and sanitation 7. Affordable and clean energy 12. Responsible consumption and production 13. Climate action 14. Life on land	8. Decent work and economic growth 9. Industry, innovation and infrastructure		15. Peace, justice and strong institutions 16. Partnerships for the goals
IA Sustainability principles (2021)	Infrastructure and policies should improve quality-of-life, access and wellbeing, to create an inclusive and fair society.	Infrastructure and policies should protect environmental outcomes by reducing pollution, balancing resource consumption, conserving natural ecosystems and resources, and supporting climate mitigation and adaptation.	Infrastructure and policies should grow productivity, the Australian economy and allow equitable access to economic and growth opportunities, while efficiently using financial resources.		Infrastructure and policies should build trust in governance and institutions through transparent, accountable and inclusive decision-making.

	Social	Environment	Economic	Cultural	Governance
Infrastructure Australia – societal impact (2021) Quality of life Productivity Environment Sustainability Resilience **IA Outcomes** **Factors driving good outcomes**	**Wellbeing and quality of life:** Improving communities' health, social cohesion and liveability; **Fairness**: Equitable outcomes for Australian communities. Comparable services across geographies, and for diverse groups, including disadvantaged and vulnerable individuals; **Inclusivity:** Considering the needs of all Australians, including cultural needs and the needs of vulnerable individuals. Ensuring all communities can access essential services.	**Protection and enhancement:** Preserving ecological value by taking account of impacts on atmosphere, land, oceans, seas, habitat, coasts, freshwater and biodiversity. Climate change mitigation and adaptation, and building resilience to shocks and stresses. **Circular economy:** Ensuring balanced extraction and use of natural resources, materials, waste and food, focusing on waste reduction, increased recovery, reuse and recycling. **Reducing pollution:** Limited all types of pollution, including air, water, noise, soil ad greenhouse gas pollution.	**Equity:** Distributing equitable economic benefits to Australians. The distribution of costs and benefits should also consider how disadvantaged members of society are impacted. Costs should be distributed fairly based on users' ability to pay; **Value for money:** Ensuring financially sustainable, proportionate infrastructure investment that takes account of consumer willingness to pay. Optimising service levels and lifecycle costs through the delivery of long-term improvements and enhancements, such as demand response; **Productivity:** Improving the rate an economy transforms inputs (including its people and natural resources) into outputs. Greater productivity results in more efficient use of resources and increased economic yields.		**Transparency of decision-making:** Ensuring transparent, accountable and consistent governance systems that communicate and measure short-term and long-term economic, environmental and social impact. Creation of anti-corruption frameworks to safeguard the integrity of infrastructure investments; **Trust in institutions and leadership:** Supporting informed and inclusive decision-making, to ensure processes across government jurisdictions effectively engage affected or interested communities and users. Better understanding local sensitivities and needs, local customs and the needs of disadvantaged groups;

	Social	Environment	Economic	Cultural	Governance
					Coordinated planning and decision-making: Ensuring decision-making is guided by robust planning and coordination, which involves proactively establishing priorities and allocating resources. Processes should also monitor and adjust work to accomplish goals and deliver outputs that reflect the community's expectations.
Ecologically Sustainable Development Principles (NT version 2019 EP Act)		• Decision-making processes should effectively integrate both long-term and short-term environmental and equitable considerations (*NT dropped social and economic*) • Precautionary Principle • Principle of evidence-based decision-making (*added*) • The present generation should ensure that the health, diversity and productivity of the environment is	Principle of improved valuation, pricing and incentive mechanisms (*wording changed)* (1992 ESD strategy and EPBC Act dropped an earlier principle of economic competitiveness)		Decision-making processes should provide for community involvement in relation to decisions and actions that affect the community

	Social	Environment	Economic	Cultural	Governance
		maintained or enhanced for the benefit of present and future generations (*dropped intragenerational equity)* • Principle of sustainable use (*added*) • Principle of conservation of biological diversity and ecological integrity			
Infrastructure Sustainability Council ratings Purpose: Ensuring all infrastructure delivers social, cultural, environmental and economic benefit Themes as categorised by ISC (not well-matched to above purpose)	(weak) (stakeholder engagement – process) • legacy • heritage • workforce sustainability (strategic workforce planning, jobs and skills, workplace culture and wellbeing, diversity and inclusion, sustainable site facilities)	• energy and carbon, including renewable energy and offsetting • green infrastructure • environmental impacts (receiving water quality, noise, vibration, air quality, light pollution) • resource strategy development (contamination remediation, management of acid sulfate soil, resource recovery, adaptability, material life cycle impact, sustainability labelled products and supply chains) • water (use) • ecological (assessment and risk management, ecological monitoring)	• options assessment and business case (including options assessment, valuing and considering externalities, equity and distributional impacts, economic and financial sustainability) • benefits (benefits mapping and post project evaluation)		• context (strategic context, urban and landscape design context) • leadership and management (integrating sustainability, risks and opportunities, knowledge sharing) • sustainable procurement (risk and opportunity assessment, supplier assessment and selection, contract and supplier management) • resilience (including climate and natural hazard risks) • innovation

Attachment 3: Values mapping report

Attachment 4: Workforce Development Strategy