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Dear Mr Purdon

Re: Darwin Pipeline Duplication (DPD) Project – Notice of Decision –Stakeholderconsultation

Please find below my formal submission on the proposed Darwin Pipeline Duplication (DPD) project – as per the referral and Notice of Decision (EP2022/011) made on 14 January 2022 by the NT EPA, under regulation 50 of the Environment Protection Regulations 2020 (EP Regulations).

By way of background, I am a professional marine scientist with >30 years of experience in coastal and marine science and environmental management. I have lived and worked in the Northern Territory since 2006 - including 7 years as the Director/Chief Scientist of the Marine Biodiversity Group of the Department of Natural Resources, Environment and the Arts (NRETA). This included undertaking marine biodiversity surveys and marine environmental assessments/monitoring – and developing marine environmental conservation, assessment, monitoring and policy frameworks for the NT Government. Including, the '*NT Marine Protected Areas Strategy*', the '*NT Marine and Coastal Biodiversity Strategy*' and the '*NT Coastal, Estuarine and Marine Monitoring and Assessment Framework*'.

Significantly, in my role with NRETA, I also represented the Northern Territory Government at the national level on the following policy/technical forums, under Natural Resource Management Ministerial Council - the Marine and Coastal Committee (MACC), Intergovernmental Coastal Advisory Group (ICAG) and the National Taskforce for Marine Protected Areas – in developing national approaches to marine and coastal conservation, monitoring, assessment and management. Including being Co-Chair of the MACC R&D Working Group, which in 2010, developed '*A National Approach to Monitoring, Evaluation and Reporting for Coastal, Estuarine and Marine Environments*'.

Since leaving the NT Government in 2015, I have been working as an international consultant/adviser with the UN (eg. UNDP, FAO) and other international agencies (eg. World Bank, Asian Development Bank, USAID), on marine biodiversity, sustainability, environmental impacts and governance projects - in the broader Arafura and Timor Seas (ATS) and Indonesian Seas region.

My professional experience and expertise, particularly in my employment with the NT Government – included providing expert advice and input on marine environmental issues and monitoring in Darwin Harbour, including (among others):

- a) technical input on environmental impact assessment (EIA's) in Darwin Harbour - including water quality, ecological and environmental impacts – including major developments (INPEX Icthyus Project)
- b) co-author and joint-funding submission with the Aquatic Health Unit (NRETA) on developing a '*Healthy Harbour Partnership – Collaborative Monitoring of Darwin Harbour*' for funding under the Caring for Our Country' (2009/2010) (funding requested - \$4,664,192)
- c) membership/participation in the Darwin Harbour Advisory Committee (DHAC)'s Ecosystem Research Group (ERG) and Ecosystem Management Group (EMG) – including strategic planning

- d) presentations to DHAC on '*NT Coastal, Estuarine and Marine Monitoring Framework*' and the '*NT Marine Assessment and Reporting System (NT MARS)*' software
- e) preparing technical input and advice to the CEO NRETA and the Minister for Environment, in developing an Integrated Marine Monitoring Program (IMMP) for Darwin Harbour
- f) preparing technical input and advice to the CEO NRETA and the Minister for Environment, on developing a North Australia Marine Research Alliance (NAMRA) (a R&D partnership between NTG, AIMS, CDU and the ANU) – and representing the NT Government on the NAMRA Board
- g) providing technical advice/support to the CEO NRETA and the CEO AIMS on a potential major public-private industry marine R&D partnership in Darwin Harbour – based on the successful WAMSI model in Western Australia.

The current DPD project, includes construction of ~100 km of gas pipeline in NT waters including Darwin Harbour and a shore crossing at Wickham Point in the Greater Darwin Area. With the operation of the pipeline to transport gas from the Barossa gas field to the existing Darwin LNG facility. The pipeline will traverse two areas within the Oceanic Shoals Marine Park, and will come within 6km of the Tiwi Islands' western coast. It will pass through Tiwi sea country, which is subject to native title rights and interests, however the Tiwi have not given their free, prior and informed consent to the project. The Tiwi Islands' western coastline is also recognised as a biologically significant interesting area for Olive Ridley turtles and green turtles.

The Northern Territory Environmental Protection Authority (NTEPA) is now inviting public comment on the referral submitted by Santos to construct and operate the 100 km gas pipeline from Darwin to the Barossa gas field in the Timor Sea – which will facilitate the use of the current pipeline to Bayu-Undan for carbon capture and storage (CCS).

Previous Advice on the Barossa Offshore Gas Project

As a member (and former President) of the NT Branch of Australian Marine Science Association (AMSA), I have provided previous advice on the Santos Barossa Offshore Gas Project – both, as an individual, and also prepared the submission by AMSA (national).

The Australian Marine Science Association (and myself) provided a formal response on the feedback request for the Santos Drilling EP (9 July 2021), which raised the globally significant environmental, fisheries and megafauna values of Darwin Harbour and the region, and also, the importance and relevance of the international and transboundary (and legal) issues in the assessing and/or undertaking development activities in the ATS region (ie. current Australia-Indonesia maritime boundary negotiations).

AMSA also noted that the oil-gas industry and its regulator, NOPSEMA, focus on developing and assessing 'activity-based' EPs for all exploration and development activities. And for large-scale development activities like the current Santos Barossa Gas Field development, noted the failure of 'activity-based EPs to adequately assess and assess the need for potential cumulative pressures, multiple stressors and impacts and interactions of a range of individual activities.

Recommended Advice to the NTEPA on the DPD Project

Having examined Santos's plans and particularly the Proponent's referral report, appendices – I strongly recommend that the DPD Project be referred to the NTEPA for an environmental assessment at the highest level of assessment – an Inquiry. With a primary focus of assessing the DPD potential environmental impacts on the ecosystem condition and health of the harbour - including significantly, a comprehensive and independent assessment of the status, adequacy and effectiveness of the current Darwin Harbour integrated monitoring and assessment framework to detect and assess medium and long-term anthropogenic impacts.

A major consideration is the conservation significance and global ecological values of Darwin Harbour – and particularly its formal recognition as a 'Site of Recognised Conservation Significance' (Harrison et al 2009). Including the major commercial and recreational fisheries values of the harbour – and national maritime heritage values. And the failure of the Proponent to adequately incorporate and address the protection of these values in its monitoring and assessment program.

I also recommend this highest level of assessment based on my expert opinion that the current water quality and environmental quality monitoring and assessment in Darwin Harbour – particularly the Integrated Marine Monitoring and Research Program (IMMRP) – fails to provide an adequate and integrated framework to detect and assess anthropogenic impacts in Darwin Harbour.

I provide this opinion on the basis on being involved in leading the development of integrated marine monitoring and reporting programs in the Northern Territory (and nationally)– and my active involvement in the early development of the IMMRP (2006-2010). And also, an independent evaluation and assessment of the progress of the Northern Territory since 2010.

Below are some key concerns which the Proponent’s Referral Report fails to address:

1. Lack of an Adequate & Integrated Marine Monitoring & Assessment Program for Darwin Harbour

Throughout the Referral Report, the Proponent emphasizes the critical value and contribution of the monitoring undertaken under the NT Government’s Darwin Harbour Integrated Marine Monitoring and Research Program (IMMRP) - both, in assessing the medium and long-term impacts of the INPEX Icthus Project and also, assessing the potential impacts of the current DPD Project.

In 2016, the IMMRP was seen as holding great potential in developing an integrated marine monitoring program for Darwin Harbour:

An Integrated Monitoring and Research Program (IMRP) has thus been proposed for the Darwin region to help address many of these issues and to develop and integrate more ecologically relevant measures of ecosystem condition across marine, estuarine and freshwater habitats (DHAC, 2005; Fox, 2011). As with all such endeavours, the success of the IMRP will depend on its ability to overcome the challenges of coordinating numerous stakeholders with divergent interests and ensure funding streams and continuity of management. To this end, the recent securing of \$20 million of funding for the IMRP over 40 years, as part of an offset agreement between INPEX Corporation and the NT Government, represents a significant step forward.” [From Hallett et al (2016)]

While the NT has made significant progress towards an integrated marine and estuarine monitoring program in Darwin Harbour through WQPP for the Darwin Harbour – it is important to note that the establishment of the \$20 million, 40-year IMMRP has primarily remained a ‘long-term offsets program’ for the INPEX Icthus project. And significantly, was never specifically designed as a holistic and integrated marine assessment, monitoring program to assess the ecosystem condition and ecosystem health of Darwin Harbour.

As such, the current IMMRP falls far short of both, an adequate and integrated marine monitoring program to assess potential marine anthropogenic impacts in Darwin Harbour - for the following specific reasons:

- a) **The NT remains the only jurisdiction in Australia not to have an integrated monitoring and assessment system underpinned by an understanding of drivers, activities, threats, condition/impacts and responses** (see Hallett et al. 2016).

Hallett et al (2016) (including NTG co-authors) review of national, jurisdictional approaches to monitoring/assessing and reporting on estuarine condition, highlights the Northern Territory’s lack of integrated monitoring and assessment:

“To date, however, there has been no integration of the outputs from the above biophysical and ecological monitoring programs with the report cards for Darwin Harbour, which remain strongly focused on water quality. Moreover, many of the logistical and administrative barriers identified by DHAC (2005) are still relevant today, including the inaccessibility of monitoring data, fragmented and overly-technical reporting of outputs, and the lack of accountability of monitoring agencies to the community. There also remains little coordination of monitoring activities among the government departments, industry groups and other relevant agencies (DHAC, 2005; Fox, 2011).

Current reporting uses just 2 indicators to assess “**Healthy ecosystems and landscapes in the catchment and harbour – catchment disturbance index and mangrove area change.**”

While there has clearly been recent progress by DENR in identifying proposing a suite of pressure indicators for the harbour (see Radke et al 2018) – in an integrated approach, additional stress and response indicators also need to be evaluated and identified for the harbour.

b) The current IMMRP in Darwin Harbour is very focused on water quality monitoring programs – with very little biological and biodiversity monitoring to assess ‘ecosystem condition’.

The lack of ecologically-relevant indicators and monitoring has been highlighted in major national reviews of WQ monitoring programs (eg. Hallett et al. 2016). And also, repeatedly, in the multiple reviews of the Darwin Harbour WQ monitoring program – both by DENR and also, DHAC (ERG and EMG).

Further, the latest **Darwin Harbour Integrated Report Card 2021** also highlights this major monitoring gap and has recommended the following urgent action:

“Urgent need for systematic and ongoing biodiversity monitoring programs in the harbour and catchment. Opportunities were identified through this project to partner in the future with Indigenous rangers, biosecurity departments and volunteer groups to assist in collecting this information.”

c) Lack of an effective long-term WQ monitoring program for Darwin Harbour - The current water quality monitoring under the IMMRP is inadequate and fails to address non-anthropogenic, seasonal and climatic factors on water quality variability (see Makarynska 2019).

Throughout the Referral Report, the Proponent emphasizes the critical value and contribution of the **IMMRP WQ monitoring** - both, in assessing the medium and long-term WQ impacts of the INPEX Icthus Project and also, the impacts of the current DPD Project.

However, DENR latest report for the IMMRP WQ program (Makarynska 2019) – clearly highlights the inadequacies of the current DENR WQ monitoring, due to its failure to account for seasonal WQ variability and the NT’s significant climatic and seasonal factors (ie. monsoonal climate).

The report highlights that for the past 2 decades, WQ monitoring has only been conducted in May (two 3-hr neap tide samplings) and October (two 3-hr neap tide sampling).

DENR then goes on to make the following ‘recommendation’:

“The results indicated that the existing DENR WQMP protocol based on monitoring in May and October over a 3-hour window centred on high neap tide provides an adequate operational approach for collecting data with acceptable level of variability. However, in order to make consistent comparisons between different years to detect long-term changes in water quality in the Harbour it is recommended to collect data on seasonal basis: (1) in July and/or August (dry season) coinciding with lowest variability in natural conditions and (2) in the wet season (December to March) with highest variability and potentially highest pollutant loads to the Harbour.” (page 251)

DENR also notes the need to link WQ field monitoring with other important data sources/tools (eg. satellites). The use of remote sensed data for WQ monitoring

“Linking water quality data from field campaigns and other sources (e.g. satellites) with metocean and hydrological data, with focus on discerning seasonal differences, would provide a better framework to differentiate between natural variability and anthropogenic impacts. Therefore, gaining sufficient knowledge of water quality driving forces in Darwin Harbour is paramount for a successful long-term monitoring campaign.” (page 251)

“To help with anthropogenic change detection, it is recommended to analyse data by season in conjunction with metocean and hydrological data and water quality data from other sources (if available).”

Significantly, the report also highlights the failure to include any remote sensing data to monitoring and detecting anthropogenic impacts/change. This is despite the fact that use of remote sensed data for WQ monitoring has been an accepted industry environmental standard practice for several decades.

2. Lack of Baseline, Ecosystem Understanding of Darwin Harbour

While over the past 10 years, DENR has clearly embraced the concept of 'integrated management' and 'integrated report cards' for DH - <https://dhir.org.au/> - baseline ecosystem understanding of Darwin Harbour required to assess human impacts, remains lacking:

a) **Lack of ecosystem understanding constrains marine assessments and monitoring in Darwin Harbour.** While many scientific and technical studies have been conducted in Darwin Harbour over the past 2 decades – there has been a strong focus on water quality, toxicants and habitat mapping – leaving major gaps in understanding of the potential biological and biodiversity impacts of development. Including:

- estuarine (and land-sea) ecosystem processes and function
- soft sediment communities, sessile epifauna
- coral reef & seagrass communities
- fish nursery and feeding areas (particularly for commercial, recreational species)
- movements and critical habitat (ie. feeding, nursery, calving, breeding areas) of key marine megafauna (sharks/rays, sea snakes, turtles, saltwater crocodiles, dugongs, cetaceans)

b) **Lack of conceptual models, collation/integration of datasets and 'ecosystem modeling' in Darwin Harbour** – these critical activities underpin ecosystem monitoring/management:

- development and integration of hydrodynamic, contaminant and trophic models (eg EcoPath)
- lack of conceptual models
- lack of a decision-support system to support monitoring, assessment and reporting

DEPWS and the IMMRP have recently highlighted the importance of conceptual models to identify individual stressors and target indicators, and also, software to link monitoring results with report carding (Radke et al 2018). And further, identify the VPSIRR model (developed by the Queensland EPA) as 'best practice'. But fail to recognize that a VPSIRR model has already been developed for the NT which would be suitable for Darwin Harbour (Edyvane & Whiting 2009), or that comprehensive, trophic modelling has already been undertaken in the harbour (Martin 2005) – but has not been incorporated or integrated into current models or monitoring [see c) below].

c) **Failure to incorporate and integrate critical and major past studies which would greatly assist with ecosystem understanding and assessments** – particularly the extensive infaunal and epifaunal surveys and decades-long research of the Darwin Harbour undertaken by the NT Museum and international researchers (Hanley et al. 1996), trophic modelling of Darwin Harbour, using 'EcoPath' (Martin 2005), and the development of water quality and environmental quality indicators for coastal and estuarine and marine environments in the NT (Edyvane & Whiting 2009).

In 2006, DEPWS (DENR) received \$600k in 2006 from the Commonwealth to specifically to develop a coastal, estuarine and marine (CEM) monitoring framework for the NT, supported by an NT indicators framework and also, a spatial database of marine datasets (NT Marine Atlas). Between 2006-2009, a CEM monitoring framework was developed for the NT (Edyvane & Whiting 2009) – incorporating nationally-agreed WQ and EQ indicators, following workshops and consultation with key NT government and non-government stakeholders. Significantly, indicators were developed based on a NT and also, bioregion-based, threat and conservation analysis (undertaken with key stakeholders).

Under this same project DENR also engaged the Queensland EPA in 2009, to develop a NT-version of VPSIRR model for the NT coastal, marine and estuarine ecosystems – the NT Marine Assessment and Reporting tool. This indicator framework and monitoring/reporting software was shown to the NT stakeholders, including DHAC and the NT EPA (2009) – specifically with a view to trialing and implementing this new framework and software for integrated marine monitoring and reporting in Darwin Harbour.

“NT MARS (Fig 1.), the NT name for the VPSIRR (Vulnerability – Pressure – State–Impact – Risk - Response) software was developed by Rissik et al 2009 and the Queensland EPA and Australian National University. The software is designed to enable consistent monitoring, evaluation and reporting of estuarine vulnerability, risk and condition. At present, this software has been developed for estuaries, but it can easily be converted to enable the assessment of other ecological systems. In other parts of Australia this software is being altered to enable similar assessment of freshwater and terrestrial systems. It is envisaged that in the near future marine and coastal will be incorporated into this software for the Northern Territory.” (Edyvane & Whiting 2009)

Neither the NT CEM indicators, monitoring and report framework (Edyvane & Whiting 2009) nor NT-MARS software, has ever been publicly released by the NTG or utilized by DENR or DHAC.

While undoubtedly many marine studies, technical reports have been undertaken in Darwin Harbour, particularly over the past decade – integrated reviews by industry or government are rare. Unlike other areas of major oil/gas development in northern Australia (ie. the Bonaparte Basin, Browse Basin, Exmouth Gulf, Gladstone Harbour) – there are no detailed technical reports of Darwin Harbour which collate, review existing technical studies, and provide a critical and holistic overview of values, pressures, impacts, monitoring activities and overall ecosystem status.

- d) **Lack of investment in baseline ecosystem understanding of Darwin Harbour.** In understanding the major knowledge and monitoring gaps in the Darwin Harbour IMMRP it is also important to consider the current very low level of public and private investment in understanding the ecosystems and monitoring the ecosystem ‘health’ of Darwin Harbour.

In other jurisdictions where there has been large-scale, oil-gas infrastructure development and activities have been undertaken ie. Western Australia (Pilbara), Queensland (Gladstone Harbour), there have been major public and private industry investment in baseline marine ecosystem understanding, ecosystem modelling and assessment studies – to enable the robust environmental impact assessments and the development of monitoring protocols, to ensure the protection of environmental values.

However in the NT, with the securing of \$20 million of funding for the IMMRP over 40 years, as part of an offset agreement between INPEX Corporation and the NT Government – the IMMRP has evolved to become the NT Government’s ‘*de facto*’ long-term marine monitoring program for Darwin Harbour. With very minimal investment in critical research, knowledge, modelling and monitoring gaps to underpin an integrated monitoring program.

The NT Government’s low level of investment and commitment to supporting integrated marine monitoring in Darwin Harbour is clearly highlighted by inspection of the INPEX website for IMMRP and comparing it with the DEPWS website for the IMMRP (which was last updated in March 2016):

- INPEX - <https://www.inpex.com.au/projects/ichthys-lng/our-commitments/darwin-harbour-integrated-marine-monitoring-and-research-program/>
- DEPWS - <https://depws.nt.gov.au/water/water-management/darwin-harbour/darwin-harbour-integrated-marine-monitoring-and-research-program>

3. The Darwin Harbour IMMRP does not meet international, national or industry ‘best practice’

As highlighted in the national review by Hallett et al (2016), the Territory’s monitoring encompass a range of limitations, including:

“a continuing lack of ecologically-relevant indicators of habitat, floral and faunal condition, and a failure to ensure that declining estuarine condition triggers practical management interventions. Common limitations include (i) over-reliance on physico-chemical elements of estuarine condition, and primarily water quality, (ii) failure to quantify pressures across varied and appropriate spatial scales, and (iii) dramatic inconsistencies in the spatio-temporal coverage of monitoring.”

Significantly, the IMMRP and Northern Territory fail to incorporate or adopt nationally-agreed standards for assessing and monitoring coastal, estuarine and marine conditions eg. ECAF (Arundal and Mount 2008), as developed under the NLWRA and CRC Coasts or the MACC R&D Working Group (2010). And more recently, specific WQ guidelines and monitoring under ANZG (2018), developed for the North

4. Sedimentation impacts and the lack of a Dredging Strategy and Plan for Darwin Harbour

Of major concern in the Santos Referral Report is the failure of the DPD and IMMRP WQ to tackle the high-priority and potential major sediment impacts in the harbour. This includes the failure to incorporate any 'predictive sediment impact modelling' (an industry standard for major coastal projects in other States).

Further the new Australia & NZ WQ Framework (ANZG 2018) provides national recommended protocols/approaches to sediment assessment/monitoring - <https://www.waterquality.gov.au/anz-guidelines/resources/guidance/biological-assessment> - which should as a priority be considered for Darwin Harbour. Particularly the recommended monitoring protocols and assessing sedimentation impacts, particularly 'multiple lines of evidence' (Simon & Batley 2016). None of this included in the DPD Referral Report or the IMMRP WQ.

Significantly, **Darwin Harbour Integrated Report Card 2021** also highlight the “*need for Dredging Strategy and Plan as a key priority item for water quality in Darwin Harbour in accordance with work currently being conducted by NT Department of Infrastructure, Planning and Logistics*”. Aswell as the “*need to adjust sampling locations for sediment metals to include more sites in Buffalo and Myrmidon Creeks. Investigate source of elevated metals identified at sites in East Arm.*”

5. Significant Impacts on Marine Megafauna

The Barossa Offshore Gas Project is in close proximity to the Timor Trough, one of the three major outflow channels of the Indonesian Throughflow, and one of the most important 'marine megafauna migration corridors' in the Western Indo-Pacific. Within the project area, an EPBC Protected Matters search has identified 18 listed threatened fauna species and 29 listed migratory species (17 of which are also listed as threatened species) that may occur or have habitat in the area. This includes four threatened and 12 migratory cetaceans.

Appendix H – the 'likelihood of occurrence assessment' - is used to discount species from the PMST (protected matters search tool) list and reduce assessment of listed marine threatened species (just 7 species) and listed migratory species (just 2, ie. turtles). Significantly, the omission of listed migratory and threatened species is primarily based on the lack of site records and relies heavily on government data which often is dated ie. NT List of Marine Protected Species (2006). Importantly there has no attempt to access data/information/advice from non-government sources, marine species experts or data from major NESP Hub activities (eg. sawfishes, sharks).

Importantly, the lack of studies and therefore information/records specifically for Darwin Harbour should not be the reason to discount critical marine species and potential marine impacts - particularly formally listed threatened and migratory species which are known to occur in the broader region. The precautionary principle should apply in all 'data-poor' assessments, with biological surveys undertaken to ensure that listed species do not occur or have habitat in the area.

6. Reliance on INPEX Ichthys Project and the IMMRP

As mentioned previously, the DPD and Referral Report relies very heavily on the INPEX Ichthys Project and the NT Government Darwin Harbour Integrated Marine Monitoring and Research Program (IMMRP).

“When evaluating the potential Project impacts, consideration was given to the extensive studies and monitoring conducted for similar projects in Darwin Harbour. These include the original Bayu-Undan to Darwin pipeline and DLNG Facility, and the more recent INPEX Ichthys project. In particular, the INPEX Ichthys project has been utilised as a proxy to assess impacts on the basis that it undertook similar work activities within a similar area (including spoil disposal) but on a greater spatial and temporal extent.”
(pp 122)

“INPEX’s Ichthys nearshore environmental monitoring program was extensive and continues to be undertaken as part of the NT Government Darwin Harbour Integrated Marine Monitoring and Research Program (IMMRP). The monitoring data provide valuable insight into ‘if’ and ‘how’ observations in the natural environmental variability within Darwin Harbour changed as a result of its activities. “ (pp 123)

“The key findings from the Ichthys monitoring program (as reported by INPEX Browse, Ltd, 2014) were:

- Upon completion of dredging activities, the turbidity concentrations at the monitoring sites closest to the dredging (i.e. Northeast Wickham Point and South Shell Island) had returned to natural conditions within a single spring-neap cycle following the completion of dredging;*
- No detectable dredging-related impacts to corals were observed at monitoring sites outside of East Arm;*
- No dredging-related impacts to seagrass habitats were observed and turbidity measured at seagrass monitoring sites were within the general range of natural variation;*
- Measurements of sedimentation levels in mangrove assemblages were below the level considered to potentially impact mangrove health;*
- No evidence of dredging-related impacts to fish health and catches;*
- No noticeable changes to the distribution of turtles and dugongs within Darwin Harbour that would indicate a potential influence of dredging; and*
- As predicted, dredging-related impacts to both infauna and epifauna were observed within the offshore spoil disposal ground following season one dredging, likely due to placement of dredge material on the seabed.” (pp. 123)*

“Based on these monitoring observations for the significantly larger program of works, it would seem unlikely that with an appropriate management and monitoring framework that there is the potential for impacts from this Project to be any greater than those observed during Ichthys.” (pp. 123)

7. Lack of a Strategic Environmental Assessment of Darwin Harbour

Darwin Harbour is currently facing major and rapid industrialization – particularly for the developing and growing oil/gas industry. However, unlike the Bonaparte Basin, Browse Basin, Exmouth Gulf, Gladstone Harbour – Darwin Harbour has NEVER been subject to a detailed formal ‘strategic environmental assessment’ (by the EPA) to consider cumulative impacts, and protect the key values and uses of the harbour - only ‘activity-based’ environmental assessments.

In this regard, the recent strategic environmental assessment of Exmouth Gulf by the WA EPA (2021) – ‘Potential cumulative impacts of proposed activities and developments on the environmental, social and cultural values of Exmouth Gulf in accordance with section 16(e) of the Environmental Protection Act 1986’ - [EPA s.16e Report -Exmouth Gulf.pdf](#) – provides an invaluable case study and useful template for a regulator to design an impact assessment framework to protect the environmental, social and cultural values of Darwin Harbour.

Significantly, any strategic environmental assess must be based on knowledge of both ecosystems and human impacts and also, current and future uses. For Exmouth Gulf, for delivery of this strategic advice, the EPA and the Department of Water and Environmental Regulation partnered with the Western Australian Marine Science Institution (WAMSI), who contributed technical and expert support on the values and pressures associated with Exmouth Gulf. The WAMSI report provides information on:

- *The key values (environmental, social and cultural) of Exmouth Gulf – including current state of the values, and level of confidence pertaining to the values – in the form of a literature review aligned with the EPA’s environmental themes of sea, land, water, air and people.*
- *The current and forecasted uses of Exmouth Gulf.*
- *A qualitative risk assessment using a consequence versus likelihood approach to evaluate the impact or risk of a pressure against a key value. A detailed list of key values was consolidated at a high-level, prior to consideration in the qualitative risk assessment.*
- *The relationship between key values and environmental pressures of Exmouth Gulf, derived from the qualitative risk assessment process.*

- *Knowledge gaps that require further consideration to improve our understanding of Exmouth Gulf, identified against each EPA theme. The WAMSI report forms the technical basis of the EPA's strategic advice and provides key information and materials that underpin the EPA's recommendations. The WAMSI report and supporting documentation have been appended to this advice."*

8. Poor Data Access & Selective Use of Supporting Technical Information

In assessing the Referral Report, it is essential that critical and relevant DENR and IMMRP-related and INPEX Ichthys and Barossa technical and baseline reports for Darwin Harbour (and offshore) are made easily accessible and available to the public, relevant organisations, and key stakeholders. This is currently NOT the case – with many of the Barossa, INPEX Ichthys, IMMRP and Darwin Harbour survey, monitoring and assessment reports currently not available or scattered across many organizational websites or scientific journals and difficult to access or find.

For some key long-term DENR monitoring activities of the IMMRP – particularly marine biodiversity monitoring - some monitoring has been extensive and well-reported, such as the coastal dolphin and dugong monitoring - <https://www.inpex.com.au/projects/ichthys-1ng/our-commitments/long-term-monitoring-of-coastal-dolphins-in-darwin-harbour-and-the-abundance-and-distribution-of-dugongs-in-the-northern-territory/>. How for other monitoring activities, publications could not be found at all. For example, for seagrass surveys and seagrass monitoring of Darwin Harbour since 2011 using the SeagrassWatch global monitoring protocol - <https://depws.nt.gov.au/news/2016/darwin-harbour-seagrass-surveys>. Further, when the SeagrassWatch site is examined - <https://www.seagrasswatch.org/northernterritory/> - its very clear that the program only ran for 3 years, and was suspended in 2013.

Further, the Referral Report, has also engaged in the selective use of supporting technical information – while omitting key information. For instance, the marine habitat map in the Referral Report (Figure 7.3, page 77) gives a significant under-estimate of the level of coral habitat and hard substrata in Darwin Harbour. And while it cites AIMS (2016) it is not clear where this figure has come from. Further, while the Referral Report cites the latest habitat mapping report by AIMS (Galaduk et al (2019) - it does not use the latest maps, figures and best estimates for the extent of coral reef in the Darwin Harbour (contained in Galaduk et al (2019). For a comparison of coral habitat map in the Referral Report (Figure 7.3) and Galaduk et al (2019 – see **Annex 1**.

Indeed, none of the excellent marine habitat maps (corals, seagrasses, mixed communities) for Darwin Harbour from the AIMS 2019 report are used in the Referral Report. Even the maps from 2015 GeoScience Australia report – which clearly defined the 'hard substrata' in Darwin Harbour using acoustic mapping - are not included.

Rather the whole 'tone' of the Referral Report appears goes to great lengths to emphasize that the Darwin Harbour is largely low-conservation sand-mud and soft sediment communities, and any rocky habitats are species-poor (and tolerant of high sediment loads).

9. Other Considerations

- 7.8.1 - maritime heritage – there are many shipwrecks in Darwin Harbour – many of which have both, significant cultural and marine biodiversity and fisheries values.
- 7.8.3 – Indigenous values - no mention of the significant Indigenous shell mounds in Darwin Harbour (Hiscock & Hughes 2001)
- Appendix D – the baseline survey is completed restricted to the pipeline only (Project Area) – no references at all to the excellent marine habitat studies of Darwin Harbour or Outer Darwin Harbour.

Recommendations for the NT EPA

In considering the DPD Project for an environmental assessment – I strongly recommend that the NT EPA give this activity the highest level of assessment – an Inquiry. Specifically, that the NT EPA should undertake a formal, detailed, 'strategic environment assessment' prior to any consideration of the DPD activity - or indeed, any other major infrastructure development activity within the harbour. The primary

objective of the strategic assessment should be the design of an environmental assessment impact framework for Darwin Harbour to:

- (i) identify the key environmental, social and cultural values of Darwin Harbour,
- (ii) identify and assess the current and projected threats and pressures
- (iii) consider the cumulative impacts of current and proposed projects within the harbour, and
- (iv) provide advice/recommendations on conservation of values, compatibility of uses/activities and the integration of land-sea management.

In undertaking this strategic environmental assessment - critical reviews/analyses, additional field research/studies, modelling and major risk assessments will likely need to be undertaken, in addition to the review, collection and collation of all relevant existing technical information. As with other strategic assessments (conducted in other jurisdictions), this information and technical advice should be provided to the EPA, to inform the design of a robust monitoring and environmental impact assessment framework that will protect significant ecosystems and values of Darwin Harbour. The reviews and assessments should also take account of the following specific issues and challenges relevant to Darwin Harbour:

1. Need for independent expert-based review of coastal, estuarine and marine conservation, monitoring and management in Darwin Harbour – particularly in light of the NT Government's inadequate IMMRP program and proposed major infrastructure developments (ie. DPD Project, Middle Arm Industrial Precinct) – including identifying indicators and monitoring protocols that meet current recommended national and industry 'best practice' standards.
2. The potential to learn major lessons from the WA and Queensland – regulating, assessing, monitoring impacts of major oil/gas industry, including the best practice monitoring and assessment protocols.
3. The critical need to identify the critical and essential science and knowledge/information requirements for ensuring a robust environmental monitoring and assessment program in Darwin Harbour, including exploring financing and governance options to promote greater public and industry partnerships and investment in monitoring and critical baseline research (eg. Exmouth Gulf - WAMSI model, Gladstone Healthy Harbour Partnership).
4. The major value and benefit of the collation/integration of all relevant Darwin Harbour technical studies. Including publicly releasing relevant past industry and government studies on Darwin Harbour - and also, relevant NT and Commonwealth-funded, coastal, estuarine and marine assessment, monitoring/reporting studies.
5. The urgent need to improve the IMMRP, particularly the lack of ecological monitoring and integrated ecosystem modelling to enable the assessment of ecosystem condition and health.
6. The urgent need to finalize and implement a Dredging Strategy and Plan for Darwin Harbour, undertake predictive sediment impact modelling – and adopt provides national recommended protocols/approaches to sediment assessment/monitoring (ANZG 2018, Simon & Batley 2016).

I hope the above technical advice and information assists the NT EPA in considering the DPD Project for referral under regulation 50 of the Environment Protection Regulations 2020 (EP Regulations).

Yours Sincerely



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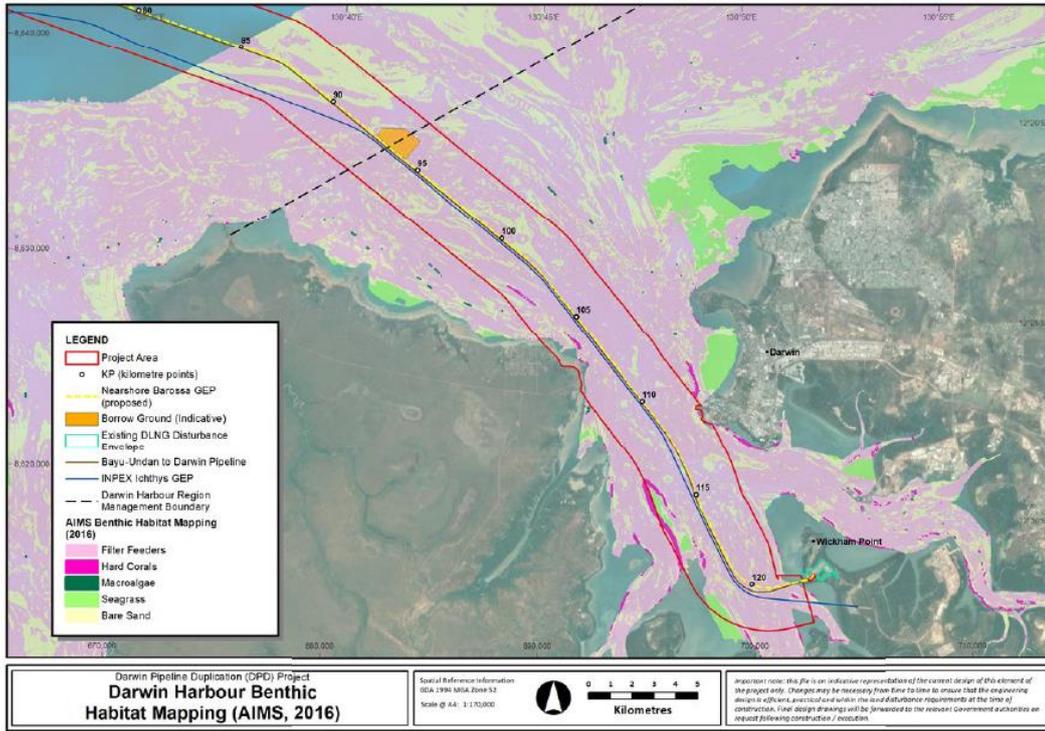
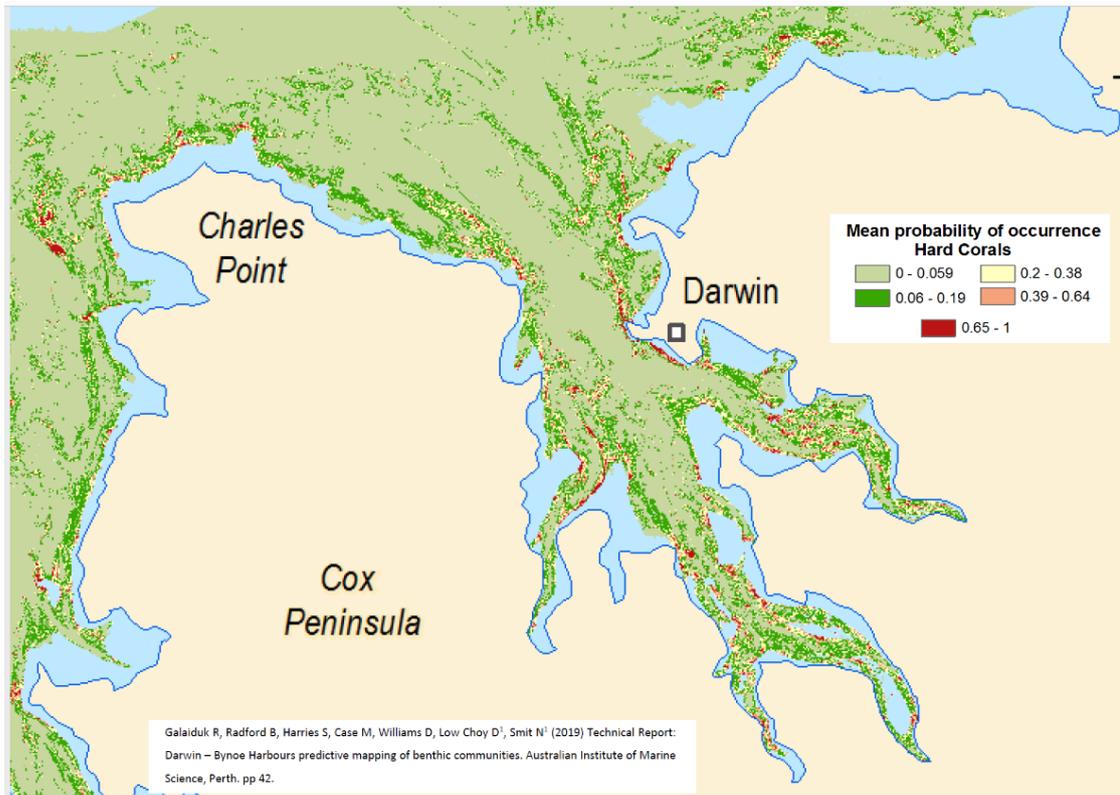


Figure 7-3 Darwin Harbour benthic habitat mapping (AIMS, 2016)



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