

Annual Compliance Report Ichthys LNG Project (EPBC 2008/4208): 2023–2024

Report

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0	10.10.2024	IFU	B Dry M Hyland B Davis	J Carle R Watkins	T Murayama	C Serginson

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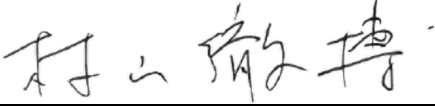
Signature	
Full name	Tetsuhiro Murayama
Position	Director
Organisation	INPEX Operations Australia Pty Ltd, ABN 48 150 217 262
Date	14 October 2024

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Abbreviations, terms and acronyms

Abbreviation, term or acronym	Meaning
ALR Act	<i>Northern Territory Aboriginal Land Rights Act 1976</i>
AOC	accidentally oily contaminated
COS	Coastal Offset Strategy (X075-AH-STR-0001)
CPF	central processing facility
CCPP	combined cycle power plant
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
EPBC 2008/4208	the Ichthys LNG Project Commonwealth approval
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)
EPL228 (as varied)	The Ichthys LNG environment protection licence issued by the NT EPA to operate the Ichthys LNG facility.
FPSO	floating production, storage and offloading (facility)
GEP	gas export pipeline
Ichthys LNG	the Ichthys LNG onshore plant
INPEX	INPEX Operations Australia Pty Ltd
LDMP	Ichthys Onshore LNG Facilities: Liquid Discharge Management Plan: Operations (L060-AH-PLN-60050)
LDMP Addendum	Onshore Operations Environmental Plan and Liquid Discharge Management Plan: Addendum 1 Firefighting training (L790-AH-PLN-70000)
LNG	liquified natural gas
LPG	liquified petroleum gas
Maintenance DSDMP	Maintenance Dredging and Spoil Disposal Management Plan (L060-AH-PLN-60010)
NATA	National Association of Testing Authorities
NCW	non-contaminated water
Nearshore OPEP	Nearshore Oil Pollution Emergency Plan (X060-AH-PLN-60003)
NLC	Northern Land Council
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
OEMP	Onshore Operations Environmental Management Plan
OSMP	Operational and Scientific Monitoring Program
PFAS	per- and polyfluoroalkyl substance

Abbreviation, term or acronym	Meaning
PoM	Plan of Management
QA/QC	Quality Assurance and Quality Control
the delegated Operator	INPEX Operations Australia Pty Ltd
the Project	the Ichthys LNG Project
this Compliance Report	Annual Compliance Report Ichthys LNG Project (EPBC 2008/4208): 2023—2024 (0000-AH-REP-70160)
TN	Total nitrogen
TPH	total petroleum hydrocarbons
TRH	total recoverable hydrocarbons
TSS	total suspended solids
cfu/100 mL	colony forming units per 100 millilitres
L	litres
mg/kg	milligram per kilogram
Mt	million tonnes
mV	millivolts
µg/L	micrograms per litre
µg N/L	micrograms of nitrogen per litre
µg P/L	micrograms of phosphorus per litre
µS/cm	microSeimens per centimetre
°C	degrees Celsius
%	percent

1 INTRODUCTION

INPEX Operations Australia Pty Ltd (INPEX) as proponent for the Ichthys LNG Project (the Project), was issued with an approval under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act; approval EPBC 2008/4208) on 27 June 2011. The EPBC 2008/4208 approval was subsequently amended by variations to conditions 1, 3, 4, 5, 7, 8, 9, 11, 13, 15, 16 and 19 made pursuant to Section 143 of the EPBC Act.

Condition 13 of EPBC 2008/4208 requires INPEX to submit a Compliance Report to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) within 15 months from commencement of operation¹, with each subsequent report submitted within 12 months from the date of the previous report. This is the sixth Compliance Report to be submitted following commencement of operations on 27 July 2018.

Specific Project details are provided in Table 1-1, with an overview and status of activities described in Section 2.

Table 1-1: Ichthys LNG Project details

Item	Project details
EPBC number	EPBC 2008/4208
Project name	Ichthys LNG Project
Approval holder	INPEX Operations Australia Pty Ltd
Approval holder ABN	ABN 48 150 217 262
Approved Action	To develop the Ichthys Field in the Browse Basin to produce liquefied natural gas, liquefied petroleum gas and condensate and including the installation and operation of offshore extraction facilities in Ichthys Field, onshore processing facilities at Bladin Point and 850-935km pipeline from Ichthys Field to Bladin Point, Northern Territory, as described in the referral (EPBC 2008/4208) and the variation to the action dated 11 May 2011.

1.1 Purpose and scope

The purpose of this Compliance Report is to meet the requirements of EPBC 2008/4208 Condition 13 (as varied 27 May 2015), which states:

The person taking the action must submit a Compliance Report detailing compliance with any plan, report, strategy, or program (however described) referred to in relation to this approval. The date of the first Compliance Report must be submitted to the Minister within 15 months from the commencement of operation with each subsequent report submitted within 12 months from the date of the previous report. The Compliance Report must be made publicly available on the person taking the action's Australian website for the operational life of the action.

¹ The Ichthys LNG Project approval (EPBC 2008/4208) defines operations as "the commencement of gas extraction and transfer from subsea wells to the floating liquefied natural gas facility and liquefied natural gas facility and liquefied natural gas tankers". The date reflected is the date the wells were first opened offshore. Onshore operations did not commence until 14 September 2018.

The Compliance Report is not required to include activities conducted within the Commonwealth Marine Area.

The person taking the action may cease complying with Condition 13 if they have written agreement from the Minister.

DCCEEW representatives² have advised that the scope of the Compliance Report is limited to the demonstration of compliance with the following EPBC 2008/4208 conditions (as varied) and their associated plans, programs or strategies:

- Condition 1 - Oil Spill Contingency Plan (as varied on 03 February 2015)
- Condition 2 - Operational and Scientific Monitoring Program
- Condition 5 - Decommissioning Management Plan (as varied on 27 May 2015)
- Condition 8 - Liquid Discharge Management Plan (as varied on 03 February 2015)
- Condition 9 - Noise Management Plan (as varied on 06 March 2014)
- Condition 10 - Dredging and Spoil Disposal Management Plan (as varied on 05 April 2013)
- Condition 11 - Offsets (Coastal Offset Strategy) (as varied on 23 June 2021).

This Compliance Report addresses compliance with above conditions and associated plans, programs or strategies during the 27 July 2023 to 26 July 2024 reporting period.

As per EPBC 2008/4208 Condition 13, this report does not address activities occurring in the Commonwealth Marine Area. These activities are regulated by the National Offshore Petroleum Safety and Environment Authority under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* and associated regulations.

1.1.1 Variations to EPBC 2008/4208 approval conditions

No variations to EPBC 2008/4208 approval conditions have been approved during the reporting period.

1.1.2 DCCEEW approved plans or strategies

Table 1-2 provides an overview of relevant DCCEEW approved plans or strategies, which were in effect during the 27 July 2023 to 26 July 2024 reporting period.

Table 1-2: DCCEEW approved plans or strategies

Title	Description
Ichthys Onshore LNG Facilities: Liquid Discharge Management Plan: Operations (LDMP; L060-AH-PLN-60050)	The LDMP describes the measures in place to mitigate the potential environmental effect of liquid discharges associated with onshore Ichthys LNG operations activities.
Onshore Operations Environmental Plan and Liquid Discharge Management Plan: Addendum 1 Firefighting Training (LDMP Addendum; L790-AH-PLN-70000)	The LDMP (Rev 4) was submitted in accordance with EPBC 2008/4208 Condition 8 and approved on 24 November 2022.

² Email correspondence received from the DCCEEW Compliance Monitoring Team on 30 July 2019.

Title	Description
	<p>The LDMP Addendum (Rev 1) was approved by DCCEEW on 23 June 2021. The LDMP Addendum was prepared, in lieu of a full revision to the LDMP, to address the requirement to undertake portable/mobile firefighting training utilising PFAS-free training foam at Ichthys LNG. The Addendum includes a description of the activity and controls and monitoring that will be undertaken. The LDMP Addendum forms part of the approved LDMP. No updates to the LDMP Addendum occurred during the reporting period.</p>
<p>Nearshore Oil Pollution Emergency Plan (Nearshore OPEP; X060-AH-PLN-60003)</p>	<p>The Nearshore OPEP describes the activities, arrangements, and framework for response to oil spills, which may occur within Northern Territory waters as a result of Ichthys LNG activities (EPBC 2008/4208, Condition 1) and the operational scientific monitoring program (EPBC 2008/4208, Condition 2), which would be implemented in the event of a spill.</p> <p>The Nearshore OPEP (Rev 1) was submitted in accordance with EPBC 2008/4208 Conditions 1 and 2 and was approved by DCCEEW on 23 February 2017. Subsequent to this, the Nearshore OPEP was updated in October 2018 (Rev 2) to incorporate administrative amendments. These amendments did not result in a new or increased risk, and as such was submitted to DCCEEW for information only in accordance with Condition 15.</p> <p>No updates to the Nearshore OPEP occurred during the 2023–2024 reporting period.</p>
<p>Coastal Offset Strategy (COS; X075-AH-STR-0001)</p>	<p>The COS provides high-level details of INPEX’s environmental offset programs.</p> <p>The COS (Rev 8) was submitted in accordance with EPBC 2008/4208 Condition 15c and was approved by DCCEEW on 22 July 2021.</p> <p>No updates to the COS occurred during the 2023–2024 reporting period.</p>

2 DESCRIPTION OF ACTIVITIES

2.1 Ichthys Project overview

The Ichthys LNG Project (the Project) is a joint venture between INPEX Operations Australia Pty Ltd (as the delegated Operator), major partner TotalEnergies, and the Australian subsidiaries of CPC Corporation Taiwan, Tokyo Gas, Osaka Gas, Kansai Electric Power, JERA and Toho Gas. Drawing on the hydrocarbon resources of the Ichthys gas and condensate field in the Browse Basin at the western edge of the Timor Sea offshore Western Australia, the Project is expected to produce 9.64 Mt of liquefied natural gas (LNG) and 1.65 Mt of liquefied petroleum gases (LPGs) per annum, along with approximately 100,000 barrels of condensate per day at peak. The Project has an expected operational life of at least 40 years.

The Ichthys Field covers an area of around 800 km² and drilling studies suggest that its hydrocarbon resources are 12.8 trillion cubic feet of sales gas and around 527 million barrels of condensate.

The extraction of natural gas and condensate is carried out via a floating semisubmersible central processing facility (CPF) at the Ichthys Field. This removes water and most of the condensate from the reservoir fluids and the separated condensate is transferred to a floating production, storage and offloading (FPSO) facility moored approximately 3.5 km from the CPF. After further processing on the FPSO, the condensate is exported directly from the field at an average rate of up to 85,000 barrels per day.

The dehydrated gas and the remainder of the condensate is compressed and exported through an approximately 890 km long gas export pipeline (GEP) to the Project's onshore processing plant at Bladin Point in Darwin Harbour in the Northern Territory (NT; see Figure 2-1).

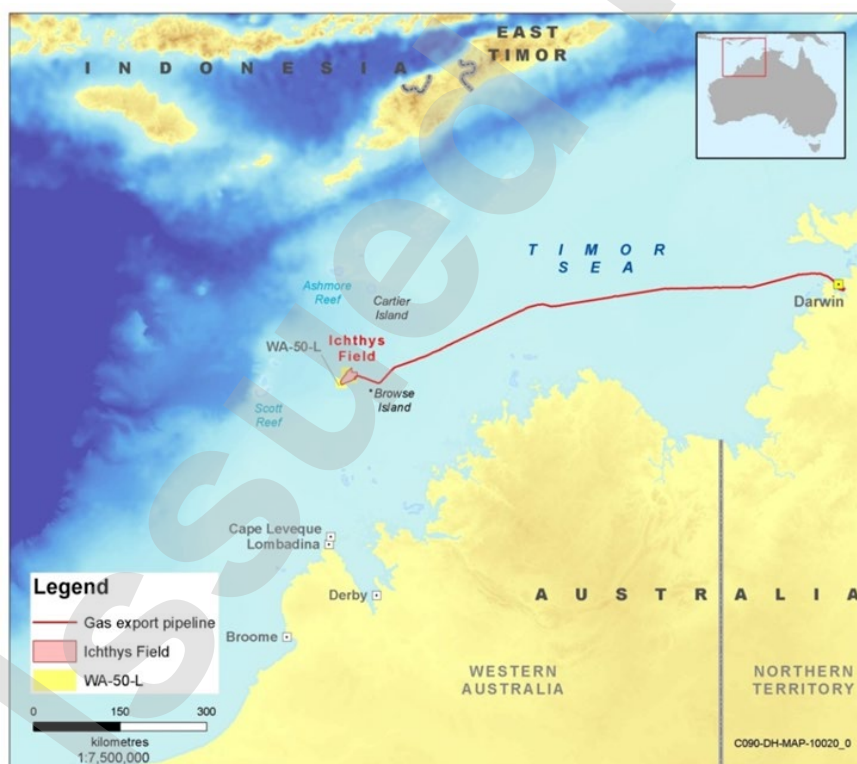


Figure 2-1: Project location

2.2 Current status of activities

Key operations activities undertaken at Ichthys LNG onshore plant (Ichthys LNG) during the reporting period were as follows:

- activities associated with the product (LNG, LPG and condensate) processing, storage, loading and offtake.
- activities associated with routine and shutdown maintenance of the onshore facilities.
- environment monitoring activities.

3 COMPLIANCE WITH EPBC 2008/4208 APPROVAL CONDITIONS

As per the requirements of DCCEEW (2023) the terms and definitions provided in Table 3-1 have been used to indicate the status of compliance with relevant EPBC 2008/4208 approval conditions.

A summary of the compliance status with relevant EPBC 2008/4208 approval conditions (Section 1.1), applicable timeframes and reference to evidence supporting the compliance status (as applicable) is provided in Table 3-3.

Table 3-1: Compliance status terms, acronyms and definitions

Term	Acronym	Definition
Compliant	C	"Compliance" is achieved when all the requirements of a condition have been met, including the implementation of management plans or other measures required by those conditions.
Non-compliant	NC	A designation of "non-compliance" should be given where the requirements of a condition or elements of a condition, including the implementation of management plans and other measures, have not been met.
Not applicable	NA	A designation of "not applicable" should be given where the requirements of a condition or elements of a condition fall outside of the scope of the current reporting period. For example, a condition which applies to activity that has not yet commenced.

3.1 Audit, reviews and exercises

A summary of the audits, reviews and exercises, as relevant to EPBC 2008/4208 conditions, undertaken during the reporting period is provided in Table 3-2. Outcomes of audits as applicable to EPBC 2008/4208 conditions are presented in Table 3-3.

Table 3-2: Summary of audits, reviews and exercises

Audit/review/exercise title	Scope	Date
Onshore Operations Environmental Management Plan – Annual Environmental Monitoring Report 2023-2024 third party review and endorsement External third-party review and endorsement – ERM on behalf of Northern Territory Environment Protection Authority (NT EPA))	The review addressed compliance with the Onshore Operations Environmental Management Plan (OEMP; inclusive of liquid discharge management relevant to the LDMP), and relevant conditions of the NT EPA-issued operations environmental protection licence (EPL228 (as varied)). The review and endorsement is required as a part of the EPL228 conditions	September 2024, for the period July 1 2023-June 30 2024

Audit/review/exercise title	Scope	Date
First strike response exercise and training.	Members of the Darwin IMT were refreshed on First Strike Actions as described in the NSOPEP. Two members of the IMT completed AMOSC IMO-1 Operations Oils Spill Response Training	Sessions held throughout June 2024 15/06/2023 and 18/03/2024

Table 3-3: EPBC 2008/4208 approval conditions compliance table

Condition No.	Condition	Timing	Status	Evidence/Comments
1.	<p>Oil Spill Contingency Plan</p> <p>The person taking the action must develop and submit to the Minister for approval, an Oil Spill Contingency Plan that demonstrates the response preparedness of the person taking the action for any hydrocarbon spills, including the capacity to respond to a spill and mitigate the environmental impacts on the Commonwealth marine area and listed species habitat within offshore areas and Darwin Harbour. The Plan must include, but is not limited to:</p> <ol style="list-style-type: none"> Oil spill trajectory modelling for potential spills from the action. This should include consideration of a well blow out or uncontrolled release. The modelling should be specific to the characteristics of the hydrocarbons contained in the Ichthys gas field, the likely volumes released in a worst case scenario spill, and the potential time over which the oil may be released in a worst case scenario spill, including a scenario of a minimum eleven (11) week uncontained spill; A description of resources available for use in containing and minimising impacts in the event of a spill and arrangements for accessing them; A demonstrated capacity to respond to a spill at the site, including application of dispersants, if required and appropriate, and measures that can feasibly be applied within the first 12 hours of a spill occurring; Identification of sensitive areas that may be impacted by a potential spill, in particular, Browse Island, specific response measures for those areas and prioritisation of those areas during a response; Details of the insurance arrangements that have been made in respect of paying the costs associated with operational and scientific monitoring, as outlined in the Operational and Scientific Monitoring Program required under condition 2 and repairing any environmental damage arising from potential oil spills, as determined necessary from the results of the Operational and Scientific Monitoring Program; Training of staff in spill response measures and identifying roles and responsibilities of personnel during a spill response; and Procedures for reporting oil spill incidents to the Department. <p>The person taking the action must not commence drilling activities until the Oil Spill Contingency Plan is approved. The approved Oil Spill Contingency Plan must be implemented.</p>	Ongoing	Compliant	<p>During the reporting period there was no oil spill event which triggered the activation of the Plan.</p> <p>INPEX maintain two Incident Management Teams (IMT). One is located in Perth and the other is located in Darwin. The Darwin IMT is primarily responsible to manage emergencies related spills in Northern Territory waters.</p> <p>The Darwin IMT continue to maintain their capability via the following activities;</p> <ul style="list-style-type: none"> Weekly IMT Handover meetings that include <ul style="list-style-type: none"> Current status of both onshore and offshore operations Any changes to Incident Management processes. This includes any changes or updates to the way we respond to Oil Spills. IMT training – This occurred on 13th and 14th June 2024. IMT refresher training – All IMT members complete this annually. training is run on a monthly basis Oil Spill Response Training for designated IMT members. No Oil Spill Response Training has been completed in the reporting period as all members are up to date. <p>Insurance arrangements were maintained in accordance with the Insurance Plan described in the Nearshore OPEP during the reporting period.</p> <p>Note, the Nearshore OPEP is still undergoing a comprehensive revision due to the following influences:</p> <ul style="list-style-type: none"> changes to Northern Territory oil spill response regulatory arrangements findings from periodic risk and capability review findings from the level 2 exercise conducted in September 2021 re-structuring to align with other internal oil spill emergency plan arrangements and expectations. <p>Revision to the Nearshore OPEP has been delayed as INPEX is awaiting the finalisation of the Northern Territory oil spill response regulatory arrangements (e.g. confirmation of Control Agency). The plan will be re-issued to DCCEEW for approval once this is finalised.</p>
2.	<p>Operational and Scientific Monitoring Program</p> <p>The person taking the action must develop and submit to the Minister for approval, an Operational and Scientific Monitoring Program that will be implemented in the event of an oil spill to determine the potential extent and ecosystem consequences of such a spill, including, but not limited to:</p> <ol style="list-style-type: none"> Triggers for the initiation and termination of the Operational and Scientific Monitoring Program, including, but not limited to, spill volume, composition, extent, duration and detection of impacts; A description of the studies that will be undertaken to determine the operational response, potential extent of impacts, ecosystem consequences and potential environmental reparations required as a result of the oil spill; Details of the insurance arrangements that have been made in respect of paying the costs associated with operational and scientific monitoring, as outlined in the Operational and Scientific Monitoring Program, and repairing any environmental damage arising from potential oil spills, as determined necessary from the results of the Operational and Scientific Monitoring Program; 	Ongoing	Compliant	<p>The Operational and Scientific Monitoring Program (OSMP) is incorporated into the Nearshore OPEP, which address the requirements of EPBC 2008/4208 Conditions 1 and 2 (refer above).</p> <p>During the reporting period there were no spill events which required activation of the OSMP. INPEX continues to maintain a contract with an external contractor to ensure OSMP readiness, in the event this is required to be implemented.</p>

Condition No.	Condition	Timing	Status	Evidence/Comments
	<p>d. Inclusion of sufficient baseline information on the biota and the environment that may be impacted by a potential hydrocarbon spill, to enable an assessment of the impacts of such a spill;</p> <p>e. A strategy to implement the Operational and Scientific Monitoring Program, including timelines for delivery of results and mechanisms for the timely peer review of studies;</p> <p>f. In the event of an oil spill the person taking the action must pay all costs associated with all operational and scientific monitoring undertaken in response to the spill, as outlined in the approved Operational and Scientific Monitoring Program and any environmental remediation determined necessary by the results of the approved Operational and Scientific Monitoring Program; and</p> <p>g. Provision for periodic review of the program.</p> <p>The Operational and Scientific Monitoring Program must be submitted at least three months prior to the commencement of drilling activities.</p> <p>The person taking the action must not commence drilling activities until the Operational and Scientific Monitoring Program is approved. The approved Operational and Scientific Monitoring Program must be implemented.</p>			
5.	<p>Decommissioning Management Plan</p> <p>The person taking the action must submit for the Minister's approval a Decommissioning Management Plan to mitigate the environmental effects of decommissioning the proposal within the Commonwealth marine area. The Decommissioning Management Plan must include a detailed risk assessment to justify leaving any infrastructure on the seafloor of the Commonwealth marine area and must be consistent with any published Commonwealth Government policy or legislation prevailing at the time. Decommissioning cannot commence until the plan is approved. The approved plan must be implemented.</p>	Prior to decommissioning activities	Not applicable	This condition was not applicable during the reporting period.
8.	<p>Liquid Discharge Management Plan</p> <p>The person taking the action must submit for the Minister's approval a Liquid Discharge Management Plan or plans to mitigate the environmental effects of any liquid discharge from the proposal, including sewerage and surface water runoff. The Liquid Discharge Management Plan(s) must be for the protection of the Commonwealth marine area and habitat for listed species in Darwin Harbour and must:</p> <ol style="list-style-type: none"> identify all sources of liquid discharge; describe any impacts associated with the discharge of liquids, including the cumulative impacts associated with the discharge of sewerage; clearly articulate the objectives of the plan and set measurable targets to demonstrate achievement of these; outline measures to avoid impacts; where impacts are unavoidable describe why they are unavoidable and measures to minimise impacts; demonstrate how any discharges into Darwin Harbour are consistent with the guidelines for discharges, and the water quality objectives for Darwin Harbour, developed under the National Water Quality Management Strategy; identify all regulatory requirements relating to the discharge of liquids and how these will be met; include a monitoring regime to determine achievement of objectives and success of measures used; outline reporting and auditing arrangements; and 	Ongoing	Compliant	<p>During the reporting period, the following compliance monitoring activities were undertaken:</p> <ul style="list-style-type: none"> monthly commingled treated effluent (in-pipe) monitoring biannual groundwater quality monitoring biennial mangrove health, intertidal sediment and bio-indicator monitoring biennial harbour sediments monitoring <p>Non-conformance were recorded where specified commingled treated effluent (in-pipe) discharge limits had been exceeded. Note, in all cases discharge limit exceedances were investigated and corrective actions implemented at the time of the event, in accordance with the LDMP. All exceedances were minor in nature, and did not result in any environmental harm or impact. Appendix A provides a summary of these exceedances.</p> <p>Results of monitoring programs demonstrate that liquid discharges associated with Ichthys LNG activities have not adversely affected the declared beneficial uses or objectives for Darwin Harbour. A description of the monitoring programs and locations is described in Section 7 of the LDMP, with a summary of the outcomes of each of these monitoring programs provided in Appendix A.</p> <p>The frequency of the monitoring programs during the reporting period are in accordance with Revision 4 of the LDMP.</p>

Condition No.	Condition	Timing	Status	Evidence/Comments
	<p>j. describe how the plan will apply the principles of adaptive management. The plan(s) must be submitted prior to the commencement of the relevant activity to which they apply. The relevant activity may not commence until the plan is approved. Separate Liquid Discharge Management plans can be submitted for the management of liquid discharges in the Commonwealth Marine Area and Darwin Harbour. The approved plan(s) must be implemented.</p>			
9.	<p>Noise Management Plan</p> <p>The person taking the action must submit for the Minister's approval a Noise Management Plan (or multiple plans) to avoid and mitigate the noise impacts on marine fauna associated with construction activities in Darwin Harbour or the Commonwealth marine area. The Noise Management Plan/s must be for the protection of listed species in Darwin Harbour or the Commonwealth marine area (whichever area the construction activities are to be undertaken) and must:</p> <ol style="list-style-type: none"> identify all sources of noise that may adversely impact fauna in Darwin Harbour or the Commonwealth marine area; describe any impacts associated with noise generated by pile driving and blasting; provide a schedule of expected pile driving and blasting activities; clearly articulate the objectives of the plan and set measurable targets to demonstrate achievement of these; outline measures to avoid impacts; where impacts are unavoidable describe why they are unavoidable and measures to minimise impacts; include a monitoring regime to determine achievement of objectives and success of measures used; provide for the involvement of an expert panel in the development of the plan and monitoring program required to detect and manage impacts; outline reporting and auditing arrangements; and describe how the plan will apply the principles of adaptive management. <p>In addition, the person taking the action is not permitted to undertake any blasting unless it can be demonstrated that all prudent and feasible alternatives have been ruled out and the Minister has given specific permission to allow blasting. If permission is granted the person taking the action must not undertake blasting activities for more than 28 days in total, without written approval from the Minister, and must not undertake blasting before sunrise or after sunset on any of these days. The plan/s must be submitted at least three months prior to the commencement of any pile driving or blasting activities to which the plan applies. Pile driving or blasting activities may not commence until the plan is approved. The approved plan must be implemented.</p>	Construction phase	Not applicable	No construction activities requiring a noise management plan occurred during the reporting period.
10.	<p>Dredging and Spoil Disposal Management Plan</p> <p>The person taking the action must submit for the Minister's approval a Dredging and Spoil Disposal Management Plan (DSDMP) for the protection of inshore dolphins, marine turtles and Dugong occupying Darwin Harbour. The DSDMP must include, but is not limited to, the following:</p> <ol style="list-style-type: none"> final methodologies for dredging including the method and timing of dredging activities; a schedule for dredging activities; a comparison of dredging methodologies proposed based on potential impacts on dolphins, turtles and Dugongs associated with individual methods, including noise and sediment plumes; 	Ongoing	Not applicable	<p>The Maintenance Dredging and Spoil Disposal Management Plan (Maintenance DSDMP; L060-AH-PLN-60010), which covered dredging activities during a five year period (January 2018 – January 2023) ceased to be in effect as of 31 January 2023.</p> <p>INPEX is currently in the process of preparing a new Maintenance DSDMP, which it will submit for Ministerial approval in Q4 2024/Q1 2025.</p>

Condition No.	Condition	Timing	Status	Evidence/Comments
	<p>d. justification of the dredging option/s chosen based on best practice at the time;</p> <p>e. mitigation measures, including measures for each type of dredge to avoid entrapment of marine turtles;</p> <p>f. methods to prevent, detect and respond to impacts on any number of marine turtles;</p> <p>g. measures that allow the alteration of dredging activities and/or implement mitigation methods in an adaptive management framework to ensure the protection of turtles, Dugongs and dolphins;</p> <p>h. the outcomes of hydrodynamic and sediment transport modelling required to predict impacts and finalise the design of the dredging campaign;</p> <p>i. contingencies to manage dredging if there is a significant departure from predicted impacts;</p> <p>j. an ecological monitoring program, which must exist either in full within the DSDMP, or as a standalone document (see Note 1 below) that is appropriately referenced in the DSDMP;</p> <p>k. the involvement of an expert panel in the development of the plan and monitoring program required to detect and manage impacts; and</p> <p>l. reporting and auditing arrangements.</p> <p>The DSDMP must be submitted at least three months prior to the commencement of dredging. Dredging for which the DSDMP has been prepared must not commence until the DSDMP is approved. The approved DSDMP must be implemented.</p> <p>Note 1: Regarding condition 10(j); if the person taking the action wishes to prepare the ecological monitoring program as a standalone document, then the ecological monitoring program must be approved in writing by the Minister. The approved ecological program must be implemented.</p>			
11.	<p>Offsets</p> <p>The person taking the action must submit for the Minister's approval a Coastal Offset Strategy for the protection of listed threatened species and listed migratory species impacted by the proposal in Darwin Harbour. The Coastal Offset Strategy must include:</p> <p>a. High level details on the implementation of the following offsets outlined in the Northern Territory Government's letter to the Acting Secretary of the Department of Sustainability, Environment, Water, Population and Communities dated 23 May 2011, including a commitment and indicative schedule for the development of detailed sub-plans for each offset program</p> <ul style="list-style-type: none"> • publication of data collected for the Browse Basin and Kimberley coastline; • an integrated monitoring and research program for Darwin Harbour; • habitat mapping for Darwin Harbour Region (including Bynoe Harbour); • funding of Australian Research Council Linkage projects; • conservation management of dugongs, cetaceans and threatened marine matters of national environmental significance in the Top End; and • research on the conservation status, distribution and habitat use of coastal dolphins. <p>b. Provision for the protection and management, for the life of the project, of approximately 2000 ha of terrestrial vegetation and mangroves, or of an area as otherwise agreed by the Minister;</p>	Ongoing	Compliant	<p>Condition 11a</p> <p>Condition 11a offset programs which have been completed and were reported on in previous Compliance Reports have been excluded from this Compliance Report. The following Condition 11a programs remain ongoing during the 2023/2024 reporting period:</p> <ul style="list-style-type: none"> • Darwin Harbour integrated marine monitoring and research program • Conservation management of dugongs, cetaceans and threatened marine matters of national environmental significance in the Top End. <p><u>Darwin Harbour integrated marine monitoring and research program</u></p> <p>During the reporting period a number of field activities and reports were completed, including:</p> <ul style="list-style-type: none"> • Sediment Monitoring: <ul style="list-style-type: none"> ○ Completion and acceptance by INPEX of the first IMMRP benthic sediment monitoring report (for 2022/23), which included a baseline for per- and polyfluoroalkyl substances in Darwin Harbour. ○ Completion and acceptance by INPEX of a brief report on updated (for 2022/23) land surface elevation and sediment accumulation time-series. ○ A new core incubation apparatus for benthic flux measurements was procured and tested for use in 2023/24. ○ Completion and acceptance by INPEX of a pressure monitoring report for 2022/23. ○ Completion and acceptance by INPEX of a report detailing the results of an exploratory investigation into statistical relationships between pressures and water quality stressors. • Mangrove Monitoring:

Condition No.	Condition	Timing	Status	Evidence/Comments
	<p>Note 1: Protection can include the acquisition and inclusion of an area in the conservation estate, covenanting arrangements on private land, other formal agreements with private landholders, or permanent changes to management regimes on Crown or Aboriginal land.</p> <p>Note 2: This condition does not limit the provision of these offsets in synergy with any conditions of any other approving party.</p> <p>c. Provision for the protection and management, for the life of the project, of marine habitat for inshore dolphins, marine turtles and Dugong that is preferably, but not necessarily, adjacent to the protected mangrove vegetation.</p> <p>Note 1: Protection can include the acquisition and inclusion of an area in the conservation estate, covenanting arrangements on private land, other formal agreements with private landholders, or changes to management regimes on Crown or Aboriginal land.</p> <p>Note 2: This condition does not limit the provision of these offsets in synergy with any conditions of any other approving party.</p> <p>The Coastal Offset Strategy must include commitments to timeframes and funding arrangements and be made available on the proponent's website. The strategy must be submitted for approval at least three months before construction activities commence in Darwin Harbour. No construction activities may commence in Darwin Harbour until the Coastal Offset Strategy is approved.</p>			<ul style="list-style-type: none"> ○ Completion and acceptance by INPEX of a mangrove monitoring report for 2022/23. • Darwin Harbour Integrated Monitoring and Research Coordination Committee meetings were held 24 October 2023 and 22 April 2024. <p><u>Conservation management of dugongs, cetaceans and threatened marine matters of national environmental significance in the Top End</u></p> <p>The third year of funding was provided during the reporting period, with applications through the Northern Territory Governments Aboriginal Ranger Grants Program. Following review of applications, the Northern Territory Government awarded eight new grants in the reporting period, with ongoing funding also provided to six existing multi-year projects awarded in the previous year. Total grant funding for the reporting period was \$1,851,874.75.</p> <p>The six new grants are summarised below:</p> <p>New Conservation Projects:</p> <ul style="list-style-type: none"> • <i>Yanyuwa sea country planning and management</i> – Yanyuwa people will be supported to engage in an Indigenous-led sea country planning process. Cultural, ecological and socioeconomic data will be synthesised to establish an understanding of issues to be addressed through management. • <i>Tiwi Islands seagrass surveys and development of ranger-led monitoring program</i> - This project supports Tiwi Islander aspirations for conservation and management, ranger employment, connection to country, participating in a blue carbon economy, and informed decision-making. The project includes: (1) baseline subtidal survey, (2) ranger equipment, (3) training, and (4) monitoring and reporting. • <i>Anindilyakwa Sea Country Management Plan</i> - SCMP will enable the Rangers to deliver a more structured and guided approach to sea country management, especially in, but not limited to, the development of annual work plans for sea country activities (e.g. the Ranger's Working on Country and IPA Annual work plans). • <i>SEAL Sea Country IPA Seagrass surveys and development of ranger-led monitoring program</i> - This three-year project is committed to delivering: (1) baseline subtidal survey extending from Roper River to southern Blue Mud Bay, (2) equipment purchase for rangers, (3) development and execution of monitoring, and (4) ranger training. • <i>Sea turtle conservation and cultural site management under the Kenbi Open Area Declaration</i> - The rangers will engage with the existing research efforts conducted by CDU Researcher Dr Mick Guinea, as well as working in collaboration with SeaDarwin tour operators to increase education and awareness for visitors about the importance of sea turtle conservation and respect for cultural values of the areas <p>Capital:</p> <ul style="list-style-type: none"> • <i>Equipment, safety and new opportunities for Sea Country management in the Laynhapuy IPAs</i> – This project will deliver long term environmental, economic and social outcomes by resourcing the Yirralka Ranger program to properly manage their land and sea country. • <i>Larrakia Rangers Offshore Vessel</i> - This vessel will be used on existing marine research projects such as the ARC linkage grant and ARGP joint ranger project marine megafauna research and Larakia biodiversity project • <i>Kenbi survey 2C vessel</i> – The vessel will have greater capability and allows for overnight stays on the vessel at anchor as well as being able to handle sea conditions within Bynoe Harbour. <p>Condition 11b and 11c</p> <p>During the reporting period, Steps 7-9 were progressed in accordance with Section 4.3 and 4.5 (Table 4-1) of the approved COS. Specifically:</p> <p><i>Step 7: Select Terrestrial and Marine Conservation sites</i></p>

Condition No.	Condition	Timing	Status	Evidence/Comments
				<p>A number of field surveys (land-based, marine and aerial) were undertaken during the reporting period. A proposed conservation area has been identified, which informed the Northern Land Council (NLC) stakeholder consultation process through the Northern Territory Aboriginal Land Rights Act 1976 (ALR Act).</p> <p>The proposed conservation area location was approved by DCCEEW as likely to be suitable (CO75-DEE-IPX-LE-70006) on 12 January 2024, which closes out Step 7.</p> <p><i>Step 8 – Develop Management Plans:</i> Drafting of a Plan of Management (PoM) by subject matter experts from Charles Darwin University, Bawinanga Aboriginal Corporation, INPEX and Jacobs, and consultations with Traditional Owners, the Northern Territory Government, Bawinanga Rangers and INPEX is complete.</p> <p>INPEX has provided the PoM to DCCEEW on the following dates:</p> <ul style="list-style-type: none"> • Rev 0: provided to DCCEEW on 1 December 2023, comments received on 22 December 2023 • Rev 1: provided to DCCEEW on 9 February 2024, comments received 28 March 2024 • Rev 2: provided on 15 April 2024, comments received 14 June 2024 <p>DCCEEW review of the PoM is ongoing. Subsequent to this reporting period, Rev3 of the PoM was provided to DCCEEW on 23 August 2024. Of note is that INPEX engaged a third-party consultant (Jacobs) for revision and input into Rev3 of the PoM to give assurance the PoM met the DCCEEW requirements.</p> <p><i>Step 9 – Establish Legally Binding Agreement with Landowners:</i> Drafts of the covenant (under Section 19 of the ALR Act) and the conservation agreement (under Section 305 of the EPBC Act) have been provided to all parties. Comments received to date from BAC and NLC have been incorporated.</p> <p>NLC executive council did not consider the covenant during the reporting period due to delays and changes in council membership. The covenant is due for consideration in September 2024.</p> <p>DCCEEW consideration of the conservation agreement is ongoing. INPEX provided the conservation agreement to DCCEEW on the following dates:</p> <ul style="list-style-type: none"> • Rev 0 – 15 December 2022 • Rev 1 – was up revved to Rev2 prior to being provided to DCCEEW • Rev 2 – 27 February 2023 • Rev 3 - 23 August 2023 • Rev 4 – 9 February 2024 <p>DCCEEW have provided the following advice in relation to their assessment of the Conservation Agreement:</p> <ul style="list-style-type: none"> • 6 April 2023 - <i>The draft CA has been passed on to a senior member of our team for review</i> • 11 April 2023 - <i>The Draft Conservation Agreement has been forwarded to the department's Chief Counsel Division for review. Once I have received CCD's comments on the CA I will be in touch to discuss them with you.</i> • 15 August 2023 - <i>DCCEEW provided verbal feedback on the Conservation Agreement termination rights, but advised that DCCEEW is not in a position to discuss agreements until site selection and offset assessment complete.</i> • 11 January 2024 - <i>DCCEEW confirmed the Conservation Agreement will be considered by DCCEEW after PoM agreed; and that review of the Conservation Agreement has not started. It was agreed INPEX would re-submit the Conservation Agreement and Covenant for consideration.</i>

Condition No.	Condition	Timing	Status	Evidence/Comments
				<ul style="list-style-type: none"> 12 February 2024: DCCEEW advise that <i>at this stage we will not be considering the conservation agreement or covenant in gross.</i> <p>Throughout these discussions INPEX has requested that the PoM and Conservation Agreement are considered in parallel, however as of 26 July 2024 DCCEEW have not advised a timeline for assessment of the Conservation Agreement.</p> <p>Delays to the proposed deadlines in Section 4.3 of the COS have occurred due to Traditional Owner availability, access to country and delays in assessment by DCCEEW. INPEX continues to proactively work to implement the conservation area in a timely manner and liaises continuously with the Post Approvals Department of DCCEEW on the project. On 19 April 2024 DCCEEW advised: <i>we currently have a high demand for our services from a broad range of EPBC approval holders, we are in not in a position to advise timeframes for post-approvals decisions.</i> Therefore, INPEX is unable to commit to a timeframe for implementation of the steps outlined in the COS.</p> <p>Project information related to this offset condition is available at https://www.inpex.com.au/projects/ichthys-lng/our-commitments/.</p>

Issued for

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APPENDIX A: SUMMARY OF OPERATIONS MONITORING PROGRAM RESULTS

A.1 Commingled treated effluent (in-pipe) monitoring

Commingled treated effluent (in-pipe) sampling was undertaken on a monthly basis throughout the reporting period. Where an exceedance was detected, additional sampling was undertaken where this was determined to be required. In addition to routine monthly sampling, ad hoc sampling was undertaken as part of the onsite laboratory National Association of Testing Authorities (NATA) Australia accreditation Quality Assurance and Quality Control (QA/QC) processes.

The results for in-pipe monitoring at sample location 750-SC-003 for the reporting period are presented in Table A-1. Results that exceeded discharge limits are shown in bold text.

During the reporting period, there were 2 occurrences where wastewater quality was above discharge limits, which are further discussed in Section A.1.1. The total number of discharge exceedances experienced in the 2023/2024 reporting period (two) decreased significantly from the number of exceedance events during the 2022/2023 reporting period. This demonstrates previous corrective actions, including the evaporation basins, were operating effectively when utilised.

Overall, there was generally little variability of the wastewater quality, with the majority of results below discharge limits described in the LDMP. The total number of discharge exceedances experienced in the 2023/2024 reporting period (two) varies significantly from the ten discharge exceedance events during the 2022/2023 reporting period. This demonstrates the wastewater treatment systems were operating effectively.

A.1.1 Limit exceedance assessment outcomes

Throughout the reporting period, there were three discharge limit exceedances (refer to Table A-1). The wastewater discharge exceedances during the 2023/2024 reporting period were Total Nitrogen, Total Suspended Solids and Thermotolerant/Faecal coliforms at the Jetty Outfall discharge location 750-SC-003. A summary table of all discharge limit exceedances, including corrective actions is provided in Table A-2.

Due to the trend of TN exceedances at ILNG, a more in-depth investigation was undertaken in Q1 and Q2, 2024 to obtain a better understanding of this issue. The TN exceedance in January 2024 was investigated in detail with a report presented to the NT EPA in Q2 2024. The report investigated all incoming waste streams originating with nitrogen and/or ammonia and the cumulative impacts each source impacts along the process to the eventual final level of nitrogen obtained at the 750-SC-003 sample point. The investigation report identified the increasing nitrogen trend during the wet season since 2018; however, the cause of the trend is still unknown. A New Environmental Impact Risk Assessment (NEIRA) was proposed to be completed by 31 December 2024 to further evaluate the wet season trend.

A Total Suspended Solid (TSS) concentration of 60 mg/L was recorded during the March 2024 monitoring from sampling location 750-SC-003, which exceeds the discharge limit of 10 mg/L. The duplicate sample collected on the same day from location 750-SC-003, as per sample collection protocol, resulted in a TSS value of <5 mg/L, which is below the discharge limit of 10 mg/L. Therefore there was no actual or potential cause for impact and no further investigation was undertaken.

A Thermotolerant Coliforms concentration of 1000 CFU/100mL was recorded during the July 2024 monitoring from sampling location 750-SC-003, which exceeds the discharge limit of 400 CFU/100mL. Two interim corrective actions were proposed whilst root cause analysis was undertaken and preventative action determined and implemented.

Table A-1: Monthly sampling results for 750-SC-003 (shaded bold values indicate an exceedance)

Date	TIME	LIMS Sample ID	pH	Electrical conductivity	Temperature	Turbidity	Dissolved oxygen	TPH as oil & grease	TRH (C6-C10)	TRH (C10-C40)	TSS	BOD	COD	Free Chlorine	Ammonia	Total nitrogen	Total phosphorus	Filterable Reactive Phosphorus	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	Enterococci	E coli	Thermotolerant/Faecal coliforms	Anionic surfactants	aMDEA	Glycol (MEG)	Glycol (TEG)	
Unit			pH units	µS/cm	°C	NTU	%	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µg N/L	mg N/L	mg P/L	mg P/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	cfu/100 mL	cfu/100 mL	cfu/100 mL	mg/L	mg/L	mg/L	mg/L	
Discharge limit			6-9	n/a	35	n/a	n/a	6	n/a	n/a	10	20	125	2	n/a	10	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	100	400	n/a	n/a	n/a	n/a	
18/07/2023	7:45	L2303366001	8	174	26.5	1	84	<1	<20	<100	<5	<2	9	0.03	3	3	0.6	<0.5	<0.1	<1	<1	<1	<0.1	<1	<1	23	33	26	28	<0.1	<5	<5	<5	
8/08/2023	8:10	L2303790001	8.1	373	27.8	1.0	73	2	<20	<100	<5	<2	9	0.04	8	8	<0.5	<0.5	<0.1	<1	3	<1	<0.1	<0.1	<1	74	4	6	18	<0.1	<5	<5	<5	
5/09/2023	8:50	L2304269001	7.9	390	28.9	1.0	68	<1	<20	<100	<5	<2	15	0.04	6	7	<0.5	<0.5	<0.1	<1	3	<1	<0.1	<0.1	<1	146	13	1	49	<0.1	<5	<5	<5	
17/10/2023	8:15	L2304825001	8.5	363	30.7	3.5	84	<1	<20	<100	<5	<2	14	0.03	7	7	0.8	0.6	<0.1	<1	3	<1	<0.1	<0.1	<1	202	<1	<1	14	<0.1	<5	<5	<5	
14/11/2023	8:55	L2305379001	8.2	380	31.7	1.0	79	<1	<20	<100	<5	<2	16	0.02	8	10	<0.5	<0.5	<0.1	<1	<1	<1	<0.1	<0.1	<1	214	8	5	10	<0.1	<5	<5	<5	
12/12/2023	7:55	L2305821001	7.9	347	31.0	1.5	63	<1	<20	<100	<5	5	16	0.03	<2	<2	<0.5	<0.5	<0.1	<1	3	<1	<0.1	<0.1	<1	458	1	3	10	<0.1	<5	<5	<5	
8/01/2024	8:10	L2400119001	8.3	472	30.9	2.0	60	1	<20	<100	<5	7	12	0.05	12	12	<0.5	<0.5	<0.1	<1	<1	<1	<0.1	<0.1	<1	77	70	10	230	<0.1	<5	<5	<5	
19/01/2024	8:10	L2400305001													<2	<2																		
13/02/2024	8:08	L2400723001	7.8	268	27.2	3.5	73	<1	<20	<100	<5	<2	14	<0.02	4	4	<0.5	<0.5	<0.1	<1	1	<1	<0.1	<0.1	<1	194	42	6	270	<0.1				
16/02/2024	8:15	L2400815001																														<5	<5	<5
12/03/2024	8:50	L2401242001	7.6	358	28.6	3.5	59	<1	<20	<100	60		15	0.03	<2	2	<0.5	<0.5													<5	<5	<5	
12/03/2024	9:15	L2401325001									<5																							
14/03/2024	8:45	L2401314001							<20	<100		<2							<0.1	<1	1	<1	<0.1	<0.1	<1	212	60	28	140	0.3				
9/04/2023	8:35	L2401805001														2																		
15/04/2024	8:50	L2401929001	7.8	354	30.4	4.5	80	<1	<20	<100	9	7	23	0.04	2	3	0.5	<0.5	<0.1	<1	3	<1	<0.1	<0.1	<1	85	18	4	35	<0.1	<5	<5	<5	
23/04/2023	10:45	L2402482001														5																		
8/05/2023	8:41	L2402279001														3																		
15/05/2024	8:22	L2402370001	7.7	366	29.0	1.0	72	<1	<20	<100	<5	4	13	0.03	<2	5	1.7	1.5	0.2	<1	6	<1	<0.1	<0.1	<1	87	2	1	100	<0.1	<5	<5	<5	
23/05/2023	15:45	L2402482001														8																		
5/06/2023	8:45	L2400279001														4																		
11/06/2024	8:35	L2402901001	8.0	396	26.3	2.0	78	<1	<20	<100	<5	2	12	0.06	<2	8	0.6	<0.5	<0.1	<1	9	<1	<0.1	<0.1	<1	40	<1	<1	51	<0.1	<5	<5	<5	
19/06/2024	11:25	L2403330001														9																		
10/07/2024	09:00	L2403330001	8.3	394	28.6	1.5	87	<1	<20	<100	<5	3	15	0.09	4	5	0.6	<0.5	<0.1	<1	5	<1	<0.1	<1	<1	226	60	2	1000	<0.1	<5	<5	<5	

Table A-2: Summary of commingled treated effluent sample point exceedance events

Date sampled	Exceedance reported	Parameter	Result	Limit	Contributing factors	Corrective actions
8 th January 2024	9 th January 2024	TN	TN 12 mg/L	TN 10 mg/L	<p>As part of the incident investigation, a detailed report was provided to the NT EPA (L060-AH-REP-70059) detailing the following:</p> <p>During the routine monthly sampling event on 08 January 2024, the following three wastewater streams were flowing into the combined jetty discharge outfall line:</p> <ul style="list-style-type: none"> • Combined Cycle Power Plant (CCPP) Neutralisation Package • Observation Basin Pump • Irrigation Tank (treated sewage) <p>Following the exceedance, an investigation into the cause of the exceedance was conducted. Non-routine sampling was undertaken across all eight sources contributing to Total Nitrogen at sample point L750-SC-003. Samples were taken from the following points:</p> <ul style="list-style-type: none"> • Filter Package L750-SC-002 • Demin Package L720-SC-016 • CCPP L630-MV-6880 • Sewage Treatment Package L750-SC-009 • Liquid Rim Vacuum Pump (LRVP) Seal Water L630-MV-99381 • Observation Basin L750-SU-404 • Irrigation Tank L750-SC-004 • Sea Loading Jetty Outfall L750-SC-003 1 OF <p>The investigation concluded that wastewater contributions (volume) from each source can vary. This is dependent on packages being online (i.e. filter package), operational requirements (i.e. maintaining levels in tanks and sumps) and other factors (i.e. wet season, Persons on site etc).</p> <p>The main source of Nitrogen was confirmed to be from within the CCPP Neutralisation Package. This source is the most stable and continuous source of Nitrogen. Within the CCPP Neutralisation Package, Nitrogen was initially identified from within the Liquid Ring Vacuum Pump (LRVP) seal water system. This sample was collected and tested which showed Ammonia as N concentrations at 0.8% (8,000 mg/L).</p> <p>Further investigation was undertaken into the operation and performance of the CCPP system to understand the root cause. The investigation revealed that an MOC 200006566 was raised in 2019 relating to Thermal Power Cycle (TPC)-line from LRVP tank to Steam Tank (ST) flash tank, which was superseded by MOC 200007253 in 2020.</p> <ul style="list-style-type: none"> • There were various attempts to deal with the condensed steam following original issues with the AOC system's inability to handle high pH liquids. • Initially the condensed steam containing high pH was directed into Intermediate Bulk Carrier (IBC), collected by a licensed waste contractor to be taken offsite. • However, this process was amended to send the condensed steam to the condensate tanks; which subsequently resulted in issues with Concentrated Acid Condensate Extract (CACE) at Condensate/Saturated Steam/Superheated Steam. 	<p>In conclusion, the main source of the elevated TN in the combine Jetty Outfall was identified in the LRVP seal water within the CCPP Neutralisation Package. Contributing factors to the increased TN levels appear to be related to lower operating temperatures of the Steam Turbine Generator (STG) Flash Separator. Routine monthly sampling of the Jetty Outfall L-750-SC-003 on 12 February 2024 confirmed that the TN concentration was back below the EPL228-05 limit (4 mg/L).</p> <p>Average TN concentrations during the wet season appear to have been increasing since Q4 2018. The cause for this gradual increase in TN is unknown and will be evaluated through a new environment information risk assessment (NEIRA). The NEIRA process will internally evaluate these increasing TN trends and consider if there are any operational implications; consider whether additional engineering controls or laboratory testing are necessary.</p> <p>ACTIONS TO PREVENT REOCCURANCE</p> <p>Confirmation of the effectiveness of operational procedures to manage TN confirmed by routine monthly sampling of the Jetty Outfall L-750-SC-003 on 12 February 2024 which returned a result of 4 mg/L. Through the incident investigation process, the following actions were identified to understand the issue and prevent reoccurrence:</p> <ul style="list-style-type: none"> • Review operational procedure for dealing with condensed steam water from the LRVP seal by increasing temperature of STG flash tank to vaporise ammonia. Temperatures in the ST Flash Tanks were increased to 130°C with the objective to improve ammonia volatilisation, thereby reducing the Nitrogen contributions originating from the CCPP Neutralisation Package. (Completed) • Fortnightly monitoring of TN at the following locations, for a period of three months, to determine contributions of all streams and variations: <ul style="list-style-type: none"> o L750-SC-004 o L750-SU-404 o L750-SC-003 (ensuring that one of the tests falls on the monthly routine testing for Jetty Outfall) • Complete a NIERA (due Q4 2024) to internally evaluate increasing TN trends and consider if there are any operational implications; consider whether additional engineering controls or laboratory testing are necessary.

Date sampled	Exceedance reported	Parameter	Result	Limit	Contributing factors	Corrective actions
					<p>Currently, the condensed steam is sent to STG flash tanks with intent to warm and vaporise dissolved ammonia to atmosphere. The flash tanks drain into the CCPP sumps and flow into the neutralisation package.</p> <p>The root cause of the TN, following the Non-Routine Request (NRR). Sampling was still not clear, so further investigations of all the sumps in the CCPP and one of the Heat Recovery Steam Generator (HRSG) Drums (Blowdown Water) was undertaken to understand the influence of temperature on TN levels, and to verify whether the LRVP seal water was the root cause. This is summarised in the corrective actions listed in this table.</p>	
12 th March 2024	14 th March 2024	Total Suspended Solids	60mg/L	10mg/L	A sample was taken from the combined jetty outfall discharge line, sampling location 750-SC-003 at 8:50am (CST) Tuesday 12 March 2024. The NATA accredited interim testing results issued on Thursday 14 March 2024 reported a Total Suspended Solid (TSS) concentration of 60 mg/L, which exceeds the discharge limit of 10 mg/L. As standard practise, the INPEX laboratory collect a duplicate sample when undertaking the required monthly sampling from location 750-SC-003. The duplicate was collected approximately at 9:15am on Tuesday 12 March after the primary TSS sample (following the sample collection protocol) and reported a TSS value of <5 mg/L, which is below the discharge limit of 10 mg/L.	The follow up sample came back within specification, therefore there was no actual or potential cause for harm. No further investigation was undertaken.
10 th July 2024	15 th July 2024	Thermotolerant Coliforms	1000 CFU	400 CFU/100mL	A sample was taken from the combined jetty outfall discharge line, sampling location 750-SC-003 at 8:50am (CST) Wednesday 10th of July 2024. The NATA accredited interim testing results issued on Monday 15 March 2024 reported a Thermotolerant Coliforms of 1000CFU/100mL which exceeds the discharge limit of 400CFU/100mL. As standard practice, the INPEX laboratory collect a duplicate sample when undertaking the required monthly sampling from location 750-SC-003. A duplicate test was conducted from the same sample and reported an E-coli = approx.. 2 CFU/100mL and Enterococci = 60 CFU/100mL.	<p>The duplicate sample and a follow up sample conducted on the 18th of July 2024, both came back within specification, therefore there was no actual or potential cause for harm.</p> <p>A number of corrective actions were undertaken, these include: emptying the Observation basin and Irrigation tank through Waste Contractor, manually dosing the Irrigation tank with chlorine.</p> <p>Irrigation tank overflow was sampled, though it is questionable of the representative nature of this sample when trying to identify Coliforms, as they may be associated with solids that are not in suspension without the Irrigation tank pump running. This sample was taken to assist in determining what actions to take next.</p> <p>The longer term action proposed to prevent reoccurrence is the rectification and service of the UV sterilisation in the WWTP.</p>

A.2 Groundwater monitoring

As per the LDMP, two groundwater surveys were completed during the reporting period, in October 2023 (Survey 12) and April 2024 (Survey 13). A high-level summary of groundwater results is provided in the following sections, with data collected during the reporting period provided in Table A-4. To date, groundwater monitoring during the operations phase of Ichthys LNG shows that there has been no change in groundwater quality.

Survey 12

Thirty-seven exceedances against both the trigger and background concentrations were recorded in the 12th groundwater monitoring event in October 2023. Exceedances include 21 for nutrients and 16 for dissolved metals. No exceedances were recorded for hydrocarbons, mercury, PH or physicochemical parameters. This is more than the 31 exceedances recorded during the tenth groundwater monitoring event undertaken during October 2022.

All exceedances have been compared to data recorded during the dry season months of May to October between May 2016 and May 2023.

Visual assessment of time plotted data indicates that several of the nutrient analyte exceedances represent short-term spikes, potentially related to seasonal environmental variables, rather than increasing trends. Visual assessment of time plotted data has indicated the following trends for nutrient exceedances:

- Ammonia: Increasing trends at BPGW40 and BPGW41.
- Total Nitrogen: Increasing trends, albeit fluctuating at VWP341 and BPGW40.
- Filterable reactive phosphorus (FRP): Increasing trend at BPGW01.

Visual assessment of time plotted data for metal exceedances has indicated the following trends:

- Arsenic: increasing trend at BPGW09
- Cobalt: Increasing trend at VWP341
- Zinc: Increasing trend at VWP341.

The following historical maximum values were recorded during the October 2023 monitoring event:

- Arsenic at BPGW28 (15.2 µg/L)
- FRP at BPGW01 (17 µg/L)
- Oxides of Nitrogen at BPGW20 (310 µg/L) and at BPGW28 (178 µg/L)

Results of the investigation into each of the exceedances are described below.

Survey 13

Twenty-eight exceedances against both the trigger and background concentrations were recorded in the thirteenth groundwater monitoring event in April 2024. Exceedances include 13 for nutrients and 15 for dissolved metals. No exceedances were recorded for hydrocarbons, mercury, PH or physicochemical parameters.

Exceedances were plotted on time series graph to compare to pre-construction and construction data and discern trends in the data.

No trigger exceedances for pH or hydrocarbons were recorded from the survey.

A review of the 13 nutrient exceedances from April 2024 monitoring event found that seven of the exceedances were consecutive for at least three surveys. Trend analysis completed by the monitoring contractor indicates:

- Ammonia:
- Increasing trends for ammonia at BPGW40
- Increasing trends for ammonia has stabilised at BPGW41 and VWP341
- Fluctuating trends for ammonia at BPGW18, BPGW20, and BPGW28
- Nitrogen: Fluctuating long-term trend for total nitrogen at BPGW40, BPGW41 and VWP341
- Oxides of nitrogen: Consistent fluctuating trend of oxides of nitrogen, with concentrations increasing in the wet season and decreasing in the dry season at BPGW38A.
- Phosphorus: Slightly increasing trend at BPGW07 has stabilised, fluctuating but stable phosphorus concentrations at BPGW08A.

Trend analysis of the 14 metals exceedances completed by the monitoring contractor indicates that:

- Arsenic: Increasing albeit fluctuating long-term trend at BPGW09 and VWP328.
- Cobalt: Stable but fluctuating at BPGW08A; and increasing trend at BPGW09, VWP328, BPGW40 and VWP341.
- Zinc: Increasing trend at VWP341.
- Copper: Fluctuating trend at BPGW07.
- Manganese: Fluctuating and increasing trend at VWP341 and BPGW09.
- Nickel: Stable overall but fluctuating at VWP341.
- Zinc: Fluctuations at BPGW07, fluctuating and increasing VWP341.

The following historical maximum values were recorded during the April 2024 monitoring event:

- Ammonia at VWP341(736 µg/L)
- Cobalt at BPGW40 (1.8 µg/L) and at VWP341 (168 µg/L)
- Zinc at VWP341(173 µg/L)

Results of the investigation into each of the exceedances are described below.

Table A-3 Summary of groundwater trigger exceedances

Survey	Date	Physio-chemical	Nutrients	Metals
Survey 12	October 2023	0	21	16
Survey 13	April 2024	0	13	15

Trigger assessment outcomes

In accordance with the receiving environment adaptive management process outlined in Section 7.4 of the LDMP, groundwater trigger exceedances were investigated. A summary of the number of trigger exceedances by survey is provided in Table A-3.

Investigations were completed for all trigger exceedances. Investigations considered multiple lines of evidence, such as rainfall, seasonal factors, Ichthys LNG operational activities and any spill events, to determine if increasing trends in groundwater analytes were likely to be as a result of Ichthys LNG.

Investigations completed following the October 2023 and April 2024 monitoring events concluded that the reported trigger exceedances were not as a result of Ichthys LNG operations and were likely natural (e.g. represent seasonal trends and natural variability). Therefore, no further evaluation or management response was required.

Table A-4: 2023-2024 LDMP Monitoring Period Groundwater Monitoring Results

Monitoring Round	LocCode	Sampled Date-Time	Ammonia as N	Nitrogen (Total)	Oxides of Nitrogen	Phosphate total (P)	Reactive Phosphorus as P	TSS	TDS	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (hexavalent) (Filtered)	Chromium (Trivalent) (Filtered)	Cobalt (Filtered)	Copper (Filtered)	Lead (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Silver (Filtered)	Vanadium (Filtered)	Zinc (Filtered)	Benzene	Ethylbenzene	Toluene	Xylene Total	TRH C6-C40	Biological <small>numbers</small>	E. coli	Dissolved Oxygen (%)	EC (field)	pH (Field)	Redox	Temp
Units	n/a	n/a	mg/l																										MPN/100mL	% sat	uS/cm	pH_Units	mV	°C	
Operations Survey 12	BPGW01	10/10/2023	0.057	0.21	0.095	0.046	0.017	-	1,430	0.238	0.0021	0.00227	<0.001	<0.001	0.0261	0.0013	0.0074	0.703	<0.00004	0.0187	0.0005	<0.0002	0.111	<1	<2	<2	<2	<100	-	-	19.9	3,000	4.69	135.8	30.3
	BPGW07	10/10/2023	0.489	0.81	0.039	0.042	0.017	-	67,100	0.008	0.0142	0.0003	<0.001	<0.01	0.0167	<0.001	0.0009	0.793	<0.00004	0.0189	<0.0001	<0.0005	0.05	<1	<2	<2	<2	<100	-	-	23.2	96,564	5.85	61.2	31.1
	BPGW08A	10/10/2023	0.123	0.17	<0.02	0.04	0.035	-	10,700	0.073	0.0144	0.00051	<0.001	<0.001	0.0564	0.0013	0.0033	4.16	<0.00004	0.0317	<0.0001	0.0005	0.048	<1	<2	<2	<2	<100	-	-	16.3	17,117	4.86	138.7	31.5
	BPGW09	10/10/2023	0.386	0.62	<0.02	<0.01	0.009	-	81,000	<0.005	0.0438	<0.0002	0.002	<0.01	0.0025	<0.001	<0.0002	0.505	<0.00004	0.0013	<0.0001	<0.0005	0.01	<1	<2	<2	<2	<100	-	-	30.2	112,692	6.21	-15.9	30.9
	BPGW18	12/10/2023	0.416	0.57	0.157	0.058	0.005	-	51,800	0.011	0.0029	<0.0002	<0.001	<0.01	<0.0002	<0.001	0.0002	0.178	<0.00004	<0.0005	<0.0001	<0.0005	0.016	<1	<2	<2	<2	<100	-	-	28.3	71,145	6.15	-26.4	30
	BPGW19A	11/10/2023	1.16	2.04	0.078	0.012	0.011	-	56,000	0.021	0.0013	<0.00005	<0.001	0.001	<0.0001	0.0014	<0.0001	0.0388	<0.00004	<0.0005	<0.0001	0.0033	0.002	<1	<2	<2	<2	<100	2.1	<1	3.8	71,895	6.06	-241.5	31.9
	BPGW20	12/10/2023	0.134	0.03	0.31	0.018	0.006	-	930	<0.005	0.0035	<0.00005	<0.001	<0.001	0.0037	<0.0005	<0.0001	0.0583	<0.00004	0.002	<0.0001	0.0002	0.011	<1	<2	<2	<2	<100	-	-	14.8	1,516	5.48	39.4	33
	BPGW26	11/10/2023	0.309	0.5	<0.02	<0.005	0.004	-	6,050	<0.005	0.004	0.00005	<0.001	<0.001	0.0097	<0.0005	0.0002	2.99	<0.00004	0.001	<0.0001	0.0002	0.008	<1	<2	<2	<2	<100	-	-	4.3	10,178	5.32	73.6	32.2
	BPGW27A	11/10/2023	0.308	0.35	<0.02	0.005	0.005	-	1,440	<0.005	0.0016	<0.00005	<0.001	<0.001	0.0019	0.0008	<0.0001	0.0233	<0.00004	<0.0005	<0.0001	<0.0002	0.006	<1	<2	<2	<2	<100	2.7	<1	5.3	2,565	5.25	57.5	33.4
	BPGW28	12/10/2023	0.876	0.9	0.178	0.076	<0.001	-	74,200	<0.005	0.0152	<0.00005	<0.001	<0.01	0.0002	<0.0005	<0.0001	0.0692	<0.00004	0.0006	<0.0001	0.001	0.003	<1	<2	<2	<2	<100	-	-	16.3	99,575	6.47	-43.1	30.9
	BPGW38A	11/10/2023	0.072	0.09	0.008	0.009	0.009	-	1,050	<0.005	0.0006	0.00401	<0.001	<0.001	0.0006	<0.0005	0.0001	0.0232	<0.00004	<0.0005	<0.0001	0.0003	0.01	<1	<2	<2	<2	<100	-	-	8.1	1,915	5.89	70.2	32.5
	BPGW40	11/10/2023	0.475	0.93	<0.02	<0.025	0.008	-	2,930	<0.005	0.0061	<0.00005	<0.001	<0.001	0.0011	<0.0005	<0.0001	0.132	<0.00004	<0.0005	<0.0001	<0.0002	0.005	<1	<2	<2	<2	<100	-	-	3.9	4,888	6.07	-40	30.9
	BPGW41	12/10/2023	0.704	0.58	0.126	0.027	0.003	-	11,800	0.005	0.0063	<0.00005	<0.001	<0.001	0.0001	0.0008	<0.0001	0.0142	<0.00004	0.0007	<0.0001	0.0006	0.014	<1	<2	<2	<2	<100	-	-	39.1	19,105	6.51	-51.3	29.9
	VWP328	12/10/2023	0.227	0.12	<0.02	<0.005	0.004	-	87,900	<0.005	0.549	<0.0002	<0.001	<0.01	0.0189	<0.001	0.0003	0.409	<0.00004	0.0027	<0.0001	<0.0005	0.007	<1	<2	<2	<2	<100	-	-	49.6	94,583	5.98	-18.9	31.1
VWP341	10/10/2023	0.638	0.9	<0.02	0.023	0.005	-	2,260	0.006	0.0071	<0.00005	<0.001	<0.001	0.124	<0.0005	0.0002	1.67	<0.00004	0.014	0.0005	0.0003	0.1	<1	<2	<2	<2	<100	-	-	19.8	4,489	5.6	45.8	32.6	
Operations Survey 13	BPGW01	2/04/2024	0.02	0.12	0.008	0.029	0.004	-	57	0.044	0.004	<0.00005	<0.001	<0.001	0.0024	<0.0005	0.0002	0.177	<0.00004	0.0006	<0.0001	0.00025	0.004	<1	<2	<2	<2	<100	-	-	2.23	120	5.27	120.2	29.6
	BPGW07	2/04/2024	0.029	0.6	0.003	0.037	0.035	-	68,000	<0.005	0.0148	0.0004	<0.001	<0.001	0.0228	0.002	0.0013	0.971	<0.00004	0.0238	<0.0001	0.0011	0.05	<1	<2	<2	<2	<100	-	-	1.95	96,126	5.69	110.2	30.9
	BPGW08A	2/04/2024	0.114	0.18	<0.002	0.037	0.014	-	3,490	0.005	0.0306	<0.00005	<0.001	<0.001	0.0606	<0.0005	<0.0001	3.26	<0.00004	0.0236	<0.0001	0.00025	0.011	<1	<2	<2	<2	<100	-	-	2.4	6,437	5.57	108.5	31.2
	BPGW09	2/04/2024	0.341	0.4	<0.02	0.017	0.013	-	108,000	<0.005	0.0787	<0.0002	<0.001	0.001	0.0056	<0.001	0.0003	0.638	<0.00004	0.0013	<0.0001	0.00138	<0.005	<1	<2	<2	<2	<100	-	-	1.8	39,675	6	67.3	30.7
	BPGW18	4/04/2024	0.554	0.64	<0.02	0.05	0.001	-	53,500	0.005	0.0107	<0.0002	0.001	<0.01	<0.0002	<0.001	<0.0002	0.0803	<0.00004	0.0015	<0.0001	0.00118	<0.005	<1	<2	<2	<2	<100	-	-	2.49	84,079	6.1	6.2	30.2
	BPGW19A	4/04/2024	1.64	1.96	<0.02	0.058	0.005	-	56,600	0.014	0.0056	<0.0002	0.002	<0.01	<0.0002	<0.001	<0.0002	0.0497	<0.00004	<0.0005	<0.0001	0.0044	0.009	<1	<2	<2	<2	<100	<1	<1	2.17	87,273	6.03	40	30.8
	BPGW20	3/04/2024	0.104	0.13	<0.002	0.007	0.005	-	442	0.005	0.002	<0.00005	<0.001	<0.001	0.0012	<0.0005	<0.0001	0.0208	<0.00004	0.0009	<0.0001	0.00025	0.003	<1	<2	<2	<2	<100	-	-	2.62	1,142	5.46	57.6	32.9
	BPGW26	4/04/2024	0.188	0.22	<0.002	0.032	0.005	-	4,670	<0.005	0.0028	<0.00005	<0.001	<0.001	0.0073	<0.0005	<0.0001	2.12	<0.00004	0.001	<0.0001	0.00025	0.004	<1	<2	<2	<2	<100	-	-	3.07	10,034	5.38	103	31.6
	BPGW27A	4/04/2024	0.182	0.18	<0.002	0.006	<0.001	-	1,260	<0.005	0.0007	<0.00005	<0.001	<0.001	0.0017	<0.0005	<0.0001	0.0249	<0.00004	0.0005	<0.0001	0.00025	0.003	<1	<2	<2	<2	<100	<1	<1	2.68	2,811	5.11	119.6	33
	BPGW28	3/04/2024	1.11	1.28	<0.02	0.024	0.007	-	78,700	0.023	0.003	<0.0002	<0.001	<0.001	<0.0002	<0.001	0.0005	0.2	<0.00004	<0.0005	<0.0001	0.00188	<0.005	<1	<2	<2	<2	<100	-	-	2.94	117,280	6.38	17.1	30.9
	BPGW38A	3/04/2024	0.04	0.48	0.412	0.02	0.003	-	197	0.005	<0.0002	0.00017	<0.001	<0.001	<0.0001	<0.0005	<0.0001	0.0005	<0.00004	<0.0005	<0.0001	0.00025	0.002	<1	<2	<2	<2	<100	-	-	3.74	4,513	6.11	106	31.5
	BPGW40	3/04/2024	0.514	0.71	<0.02	0.017	0.01	-	2,510	0.008	0.0077	<0.00005	<0.001	<0.001	0.0018	<0.0005	<0.0001	0.154	<0.00004	<0.0005	<0.0001	0.00025	0.003	<1	<2	<2	<2	<100	-	-	2.68	5,186	5.95	46.8	30.4
	BPGW41	3/04/2024	0.736	0.97	<0.02	0.012	<0.01	-	12,900	0.019	0.0046	<0.00005	<0.001	<0.001	<0.0001	<0.0005	<0.0001	0.0155	<0.00004	<0.0005	<0.0001	0.0007	0.001	<1	<2	<2	<2	<100	-	-	2.91	23,167	6.48	29.8	29.8
	VWP328	4/04/2024	0.326	0.48	<0.02	<0.005	0.001	-	73,000	<0.005	0.542	<0.0002	<0.01	<0.01	0.0223	<0.001	<0.0002	0.387	<0.00004	0.003	<0.0001	0.0009	0.006	<1	<2	<2	<2	<100	-	-	2.62	112,575	5.85	1.7	30.8
VWP341	2/04/2024	0.685	0.7	<0.002	0.015	0.004	-	1,800	0.016	0.0056	<0.00005	<0.001	<0.001	0.168																					

A.3 Harbour sediment quality monitoring

A biennial harbour sediment quality monitoring survey was completed on 4 July 2024.

Table A-5 presents the range of laboratory results of sediment samples, of each analyte for both impact and control sites. These results are compared to trigger values and background levels. Trigger values have been derived from ANZG (2018) while background levels are from Munksgaard et al. (2013). The full suite of metals and physicochemical results are provided in Table A-6.

All samples tested for hydrocarbons (total recoverable hydrocarbons (TRHs), total petroleum hydrocarbons (TPHs) and benzene, toluene, ethylbenzene and xylene (BTEX)) recorded concentrations below the limit of reporting (LOR), with the exception of TPH detected within the fraction range of C10-C36 and C10-C40 at sites I04, I05 and I06. Following these detections, sediment samples were subjected to silica gel clean-up. The subsequent results for TRH (>C10-C40 fraction) and TPH (>C10-C36 fraction) reported below the LOR (100 mg/kg and 50mg/kg respectively).

No trigger exceedances were recorded for any analyte at either control or impact sites during the July 2024 harbour sediment monitoring event. Metal concentrations in 2024 were generally lower than results recorded in 2021 and 2022 and were comparable with results recorded in 2019. Overall, there were no changes to harbour sediment quality associated with Ichthys LNG activities. As such, discharges have not adversely affected the declared beneficial users or harbour sediment objectives for Darwin Harbour. The next biennial monitoring event is scheduled to be undertaken in 2026.

Table A-5: Harbour sediment quality survey results summary

Parameter	Trigger value (mg/kg)	Background level mg/kg	Results (range)	
			Impact sites (mg/kg)	Control sites (mg/kg)
Aluminium	-	-	6,100 – 7,700	2,000 – 4,700
Antimony	2	-	<0.5* - 1.1	<0.5*
Arsenic	20	19	7.1 - 15	13 - 19
Cadmium	1.5	0.041	<0.1*	<0.1*
Chromium	80	18.5	7.1 - 33	11 - 20
Copper	65	8.6	1.4 - 7	2 – 4.5
Lead	50	15.5	3.6 - 11	3.9 – 8.5
Mercury	0.15	-	<0.1*	<0.1*
Nickel	21	8.9	1.8 – 8.6	2.4 - 5.6
Zinc	200	44.4	6.8 - 24	7.2 - 18
TRH C10-C36 (total)	280	-	<50-340	<50*
TRH C10-C40 (total)	280	-	<50-420	<50*
Benzene	-	-	<0.1*	<0.1*
Toluene	-	-	<0.1*	<0.1*

Parameter	Trigger value (mg/kg)	Background level mg/kg	Results (range)	
			Impact sites (mg/kg)	Control sites (mg/kg)
Ethybenzene	-	-	<0.1*	<0.1*
m&p Xylene	-	-	<0.2*	<0.2*
o-Xylene	-	-	<0.1*	<0.1*
Total -Xylenes	-	-	<0.3*	<0.3*
Napthalene (VOC)	-	-	<0.5*	<0.5*
Moisture	-	-	31% - 66%	34% - 46%
total organic carbon (TOC)	-	-	<1,000-85,000	16,000-48,000

* All results for analyte below LOR

A.3.1 Trigger assessment outcomes

No exceedances were reported during the reporting period.

Table A-6: Harbour sediment quality survey metal and physio-chemical results

Parameter	Aluminium	Antimony	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Moisture content (dried @ 103 oC)	TOC
Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	mg/kg
LOR	20	0.5	1	0.1	1	1	1	0.01	1	1	1	1000
Trigger Value	-	2	20	1.5	80	65	50	0.15	21	200	-	-
I01_040724	7700	<1	12	<0.1	27	6.2	11	<0.02	8.6	24	66	11,000
I02_040724	6100	<1	12	<0.1	22	4.8	9.9	<0.02	7.1	21	63	34,000
I03_040724	5500	<1	12	<0.1	21	4.4	9.5	<0.02	6.5	19	58	<1000
I04_040724	4200	<1	9.2	<0.1	15	3.7	7.3	<0.02	5	16	50	35,000
I05_040724	4900	<1	7.9	<0.1	18	4.4	8.6	<0.02	5.8	19	62	<1000
I06_040724	6100	<1	7.1	<0.1	19	4	7.2	<0.02	5.7	17	64	12,000
I07_040724	5100	<1	10	<0.1	18	7	7.8	<0.02	6	17	53	18,000
I08_040724	5800	1.1	11	<0.1	20	5	8.6	<0.02	6.5	19	55	15,000
I09_040724	6200	<1	9.8	<0.1	20	4.7	8.6	<0.02	6.4	19	59	5000
I10_040724	6000	<1	10	<0.1	21	4.9	9.6	<0.02	6.6	20	53	34,000
I11_040724	5500	<1	12	<0.1	19	4.4	9.2	<0.02	6	18	46	5000
I12_040724	5100	<1	9.6	<0.1	18	4.2	8.2	<0.02	5.6	17	53	3000

Parameter	Aluminium	Antimony	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Moisture content (dried @ 103 oC)	TOC
I13_040724	3900	<1	9.5	<0.1	17	4.5	7.1	<0.02	4.9	14	49	10,000
I14_040724	4100	<1	15	<0.1	33	3.2	10	<0.02	3.4	12	37	15,000
I15_040724	4500	<1	11	<0.1	17	4.1	8	<0.02	5.3	16	51	85,000
I16_040724	1600	<1	12	<0.1	7.1	1.4	3.6	<0.02	1.8	6.8	31	20,000
Control_1_040724	2000	<1	13	<0.1	11	2	3.9	<0.02	2.4	7.2	34	16,000
Control_2_040724	4700	<1	19	<0.1	20	4.5	8.5	<0.02	5.6	18	46	48,000

A.4 Mangrove health and intertidal sediments

A biennial mangrove health and intertidal sediment monitoring survey was undertaken in April 2024 to detect potential adverse changes in mangrove community health as an indirect result of Ichthys LNG operations. To date, mangrove health and intertidal sediment monitoring during the operations phase has shown there has been no demonstrable change to mangrove health or intertidal sediment attributable to Ichthys LNG operations.

A.4.1 Canopy cover

Canopy cover can be defined as the per cent forest area occupied by the vertical projection of tree crowns (Paletto & Tossi, 2009). This parameter is considered a useful indicator of environmental stress as leaf defoliation and leaf growth are sensitive to a wide range of environmental indicators. Canopy cover across all sites has remained relatively stable over time (Table A-7, Figure A-1). Canopy cover data recorded during Survey 5 was slightly higher at control sites ($91.6\% \pm 8.7$) than at impact sites (90.6 ± 10.7).

Canopy cover values recorded during the Survey 5 were generally slightly higher than baseline values (2012-2013), construction phase (2013-2018) and data recorded during April 2021 (Survey 3). Results were similar to values recorded during Survey 4 undertaken in 2022. Variations in mean canopy density between sampling dates at individual sites are relatively minor and were typically in the 5–18 % range, with canopy cover higher in 2024 than during the baseline and construction phase at all sites. This extent of variation, experienced at both impact and control locations, is expected to reflect natural variability and the precision of the sampling technique.

All sites were classified as healthy in 2024 with no signs of deterioration or abnormal stress based on indices of leaf colour, regeneration (i.e. seedlings and saplings), visible vertebrate fauna and infaunal bioturbation.

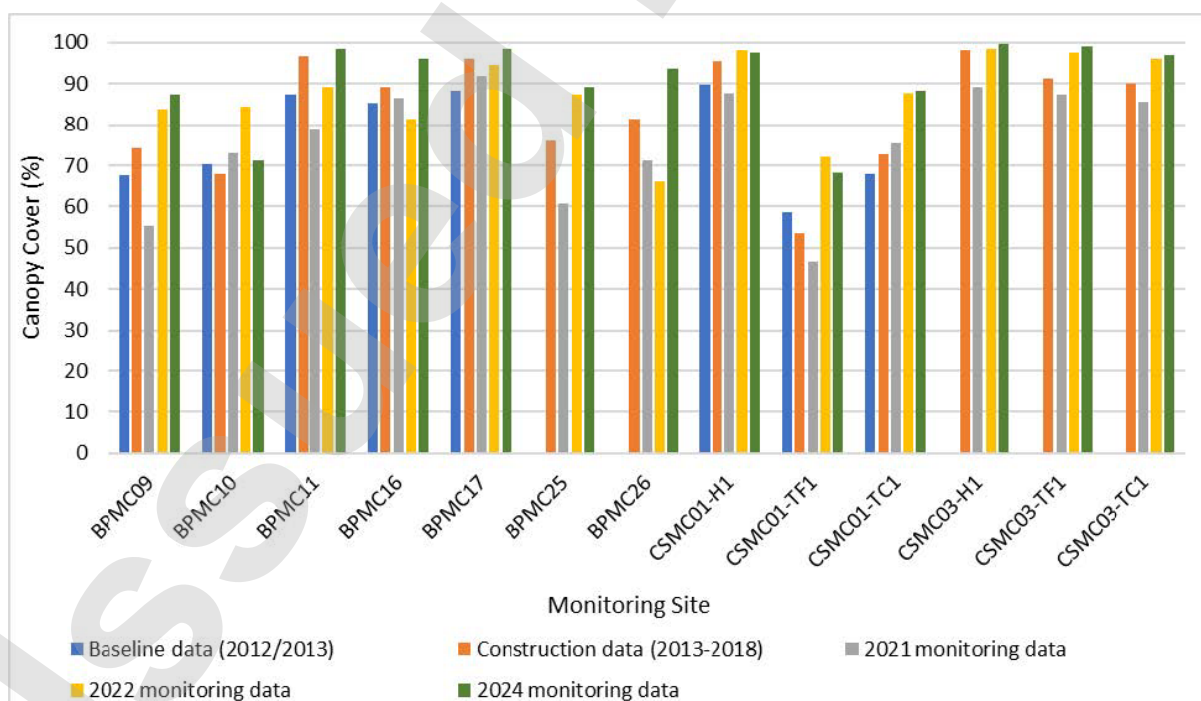


Figure A-1: Mangrove canopy cover

A.4.2 Sediment monitoring

In-situ sediment measurements

In-situ measurements of pH and redox are displayed below in Table A-7. In-situ measurements for pH at impact sites ranged from 6.27 to 7.35, with a mean value of 6.88. Measurements of pH at control sites ranged from 6.13 to 7.38 at control sites, with a mean value of 6.64. The range of pH values recorded reflects the conditions experienced by the surface sediments which are well oxygenated and regularly flushed by tidal waters. The results indicate that mangrove sediments at both impact and control sites range from being slightly alkaline to slightly acidic. Subsurface mangrove soils are typically anaerobic and microbial decomposition takes place through a series of oxygen-reduction (redox) processes. Most mangrove soils are well buffered, having a pH in the range of 6-7, but some have a pH as low as 5 (English et al., 1997).

In-situ measurements for redox potential at impact sites ranged from -7.7 mV to 141.5 mV, with a mean of 72.0. Redox potential at control sites ranged from 48.7 mV to 112.3 mV, with a mean of 93.43 mV. The predominantly positive ORP values indicate that mangrove sediments at monitoring sites in the top 5 cm are oxidising.

Table A-7: Mangrove sediment in situ monitoring results

Location	Date	pH	ORP (mV) (redox potential)
Impact sites			
BPMC09	18/04/2024	7.02	100.8
BPMC10	22/04/2024	6.64	141.5
BPMC11	17/04/2024	7.09	79.4
BPMC16	17/04/2024	6.92	109.0
BPMC17	17/04/2024	6.27	-7.7
BPMC25	17/04/2024	6.89	85.2
BPMC26	17/04/2024	7.35	-4.1
Mean		6.88	72.0
Control sites			
CSMC01 - H	19/04/2024	6.20	48.7
CSMC01 -TF	19/04/2024	6.73	112.3
CSMC01 -TC	19/04/2024	6.53	98.7
CSMC03 - H	18/04/2024	6.89	92.8
CSMC03 -TF	18/04/2024	7.38	96.1
CSMC03 -TC	18/04/2024	6.13	112.0
Mean		6.64	93.43

Sediment chemistry

A summary of the mangrove sediment chemistry results is provided in Table A-8 and Table A-9. Elevated arsenic concentrations are consistent with those recorded from the broader Darwin Harbour region and from previous monitoring undertaken during the baseline and construction phases. Elevated concentrations of arsenic in Darwin Harbour sediments have historically been attributed to local geological influence rather than anthropogenic sources (Padovan, 2003; Fortune, 2006).

One arsenic exceedance was recorded at a control site, with the next highest recording also at a control site. Therefore, the exceedance is unlikely to be due to Ichthys LNG operations, and further investigation was not warranted.

Organic results were below the limit of reporting for all sites but CSMC01-TC (Table Table A-9). Given this result (55 mg/kg) was still below the trigger level (280 mg/kg) and the result was from a control site, further investigation was not warranted.

Table A-8: Summary of inorganic mangrove sediment chemistry

Analyte	Aluminium	Antimony	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Moisture Content	Total Organic Carbon
Unit	mg/kg										%	mg/kg
LOR	10	1	2*	0.1	1	1	1	0.02	1	5	1	1000
Trigger Value	-	2	20	1.5	80	65	50	0.15	21	200	-	-
BPMC09	1,400	<1	5.1	<0.1	6.2	1.7	2.7	<0.02	1.5	9.3	25	33,000
BPMC10	12,000	<10	9.5	<0.4	27	6.4	8.1	<0.1	8.4	65	33	20,000
BPMC11	440	<1	<2	<0.1	3.1	<1	<1	<0.02	<1	<5	15	5,000
BPMC16	1,900	<1	7.9	<0.1	32	1.6	2.7	<0.02	2.9	17	16	5,000
BPMC17	2,200	<1	4.1	<0.1	40	2.1	3.9	<0.02	<1	7.1	24	15,000
BPMC25	3,600	<1	15	<0.1	15	4.6	6.6	<0.02	4.4	34	57	140,000
BPMC26	3,000	<1	13	<0.1	23	3.6	5.6	<0.02	3.5	22	35	76,000
CSMC01-TC	<20	<1	<2	<0.1	<1	<1	<1	<0.02	<1	<5	26	13,000
CSMC01-H	710	<1	4	<0.1	6.5	<1	2.2	<0.02	<1	6.9	18	12,000
CSMC01-TF	<20	<1	<2	<0.1	<1	<1	<1	<0.02	<1	<5	56	78,000
CSMC03-TC	3,900	<1	4.3	<0.1	46	7.5	22	0.02	4.7	17	25	7,000
CSMC03-H	6,200	<1	33	<0.1	26	3.4	13	0.02	6.1	20	49	130,000
CSMC03-TF	3,900	<1	20	<0.1	15	3.3	7	<0.02	4.6	11	47	78,000

*Bold value indicates trigger exceedance.

Table A-9: Summary of organic mangrove sediment chemistry (mg/kg)

Site	TPH C10-C36 (sum of total)	TRH >C10-C40 (sum of total)
Guideline value	280	100

Site	TPH C10-C36 (sum of total)	TRH >C10-C40 (sum of total)
Background	n/a	n/a
BPMC09	<50	<100
BPMC10	<50	<100
BPMC11	<50	<100
BPMC16	<50	<100
BPMC17	<50	<100
BPMC25	<50	<100
BPMC26	<50	<100
CSMC01-HM	<50	<100
CSMC01-TF	<50	<100
CSMC01-TC	55	<100
CSMC03-HM	<50	<100
CSMC03-TF	<50	<100
CSMC03-TC	<50	<100

A.4.3 Trigger assessment outcomes

There were no trigger exceedances for the 2024 mangrove health and intertidal sediment survey attributable to Ichthys LNG operations. The one exceedance for arsenic represents a decrease from the five recorded during the 2022 mangrove sediment sampling event. Exceedances for arsenic have periodically been recorded at a range of impact and control sites during the baseline and construction monitoring phases (URS 2013a, 2013b).

No further rationalisation is proposed for Mangrove Health and Intertidal Sediments, the next round of monitoring will occur in the 2025/2026 Annual Compliance Reporting period.

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