PERDAMAN INDUSTRIES

CHEMICALS & FERTILISERS

Environmental Review Document – Response to Submissions

Perdaman Urea Project

Burrup Peninsula, Western Australia

Assessment No. 2184 (WA), 2018/8383 (Commonwealth)

Prepared for Proponent:
Perdaman Chemicals and Fertilisers
ABN: 31 121 263 741

Date: 16 April 2021

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Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
Draft	23 Sept 2020	Draft Collated response to all ERD Submissions provided by EPA – MAC	PS, NW, DH, ME	DH, ME
1	30 Sept 2020	Client Review	PS, NW, DH, ME	DH, Client
2	1 Oct 2020	Final	PS, NW, DH, ME	DH
3	18 Nov 2020	Post EPA Feedback	PS,NW,DH,ME,TP,WF, ETA	DH
4	16 April 2021	Consolidation response to EPA and DAWE final issues	PS, NW, DH, ME, TP, WF	DH

Executive Summary

Perdaman is proposing to develop a Urea Project in the Burrup Strategic Estate (BSIA) at Murujuga near Karratha.

As part of the statutory Environmental Impact Assessment process, the Perdaman Urea Project Environmental Review Document (ERD) was released on 30 March 2020 for a 12 week public review, ending on 22 June 2020. The submissions received by the EPA as part of that pubic release and review stage of the Environmental Impact Assessment (EIA) process are included and discussed in this response document as part of the EIA process.

The BSIA abuts, and is in part overlain by, the Dampier Archipelago (including Burrup Peninsula) National Heritage Place (NHP). The concurrency and coincidence of these two land-use and management regimes creates, or reaffirms, an existing blended fabric of values, access arrangements, amenity, connection to country, custodianship, heritage and benefits for both current and future generations of the contemporary society, at local, State and Federal levels.

The blended fabric of the area was, and continues to be, recognised in the Australian Governments public position as part of the EPBC Act listing of the NHP cited in ERD Section 6.6.1 (p207) whereby there is discussion under the caption "***Prehistory meets the industrial age***".

Evidence of the contemporary social value (cultural and historical/heritage) of this blended fabric is also reflected in the WA Heritage Council listing of Place No. 12666 on 3 July 2000. This being recognition of the Woodside LNG North West Shelf Project, Burrup Peninsula as an Historical Site related to its industrial/manufacturing use under the historical theme of "Mining (including mineral processing)".

Further evidence in relation to the blended fabric at Murujuga and the BSIA, the establishment and operation of the Murujuga Aboriginal Corporation (MAC) is wholly predicated on achieving the harmonious blending.

In this regard, as noted on its website, MAC acknowledges that

"The three Contracting Parties (comprising the Ngarluma-Yindjibarndi, Wong-Goo-Tt-Oo, and Yaburara Mardudhunera) received land entitlements and financial benefits as compensation for surrendering their native title rights and interests, and discontinuing their Native Title Determination Applications in the Federal Court, over the land and waters of the Burrup." [referring to the Burrup Maitland Industrial Estate Agreement (BMIEA)].

The Federal Court has also determined that native title does not exist in this area.

As noted in the Integrated Heritage Services (IHS) Heritage Survey Report discussed in the ERD, during the ethnographical survey, the Traditional Custodian informants described the custodianship role and responsibility passed between generations and shared between the contracting parties and with others through story and song lines connected to Murujuga. This is regarded as a Traditional lore connection to country and this custodianship may not have been removed notwithstanding the agreed surrender of native title right and interests and the finding of the Federal Court that Native Title does not exist in the area.

MAC's adopted modus operandi demonstrates how Traditional Custodians are adaptable to the contemporary environment to pursue and deliver the Traditional lore custodianship connection to country. For example, as evidence of this adaptability, while the skills of the engraver may be rare in contemporary Aboriginal society, MAC uses contemporary technology to share information that would have been shared by the engravers in past generations. This technology was not available to those generations, so was not part of the Traditional lore tool kit. MAC is also utilising the application for World Heritage Listing as a contemporary tool to share more broadly the cultural values associated with Traditional lore at Murujuga and afford the capacity for sharing that value with future generations.

The agreed surrender as recognised by MAC's webpage does impede rights of access and possession when the State creates an interest in the Industrial Estate to another person or when the State indicates access to the land is limited or prohibited to the extent reasonably necessary for reasons of safety or security, such as the operation of a Major Hazard Facility[A].

[A] See Burrup And Maitland Industrial Estates Agreement Additional Deed (16 January 2003 Clause 8)

This is part of an acknowledged and agreed blended fabric of respect for traditional cultural values, co-operative use within the industrial objectives of the BSIA and financial benefits linked to the industrial usage in that blended fabric.

The Proponent recognises this complexity, acknowledges and respects this Traditional lore connection to country, and is committed to working with MAC to achieve a mutually beneficial future. It will pursue this objective by working together as embodied in the agreement it has executed with MAC and pursuant to supporting and augmenting the financial benefits under the BMIEA as noted on the MAC webpage.

During the ERD public review period, submissions were lodged with the Environmental Protection Authority (EPA) from:

- Public, groups or individuals 6
- Aboriginal or Aboriginal Groups 1
- Local Government 1
- WA Government Agencies 7
- Federal Government Agencies 1
- Politicians 1

Total 17

The Proponent has reviewed the submissions and considered the issues raised. Copies off each submission and the Proponent's response to each submission is contained in Appendices B – S herewith.

Where the issue is considered to have been covered in the ERD, the Proponent reaffirms that position.

If additional data, discussion or analysis is required to address the aspect being raised, this is covered in the response in the relevant Appendix.

It is not intended to revise and reissue the ERD. Addendums to correct omissions, update content and/or address transcription errors in the original ERD are included in Appendix T herewith.

Reviewed and revised environmental management plans (EMP) which substitute for the draft plans from ERD Appendix K are included in Appendix U herewith.

Throughout this Response to Submissions, relevant responses reflect changes to the proposal that have been approved by the EPA pursuant to a s43A request in January 2021 and EPBC Act s156a request submitted in January 2021 which principally reflect changes that result from ongoing dialogue during the EIA process with MAC and its Circle of Elders. The changes are included in an amended ERD Figure 2 Development Envelope and Indicative Infrastructure and amended ERD Table ES2 both in Appendix T herewith.

This dialogue has resulted in

- a slight change to the Development Envelope to accommodate a small shift to the south of the access between Site C and Burrup Road to provide greater protection to heritage Site ID 9579 with no material change to environmental impacts;
- a design review of the conveyor route between Site C and the Development WA East West Service corridor which eliminates impacts to Site ID 20037 in Site C as well as ensuring this and all other sites in the vicinity of this route and configuration are protected in situ; and
- Endorsement by MAC and its Circle of Elders of these changes.

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Appendices

Tables

1 Acknowledgement of Country for Murujuga

Perdaman Chemicals and Fertilisers, acknowledges the Ngarluma, Yindjibarndi, Yaburara, Mardudhunera and Wong-Goo-Tt-Oo people as the Traditional Custodians of Murujuga and pays respects to their Elders past, present and aspiring.

Note: ***The Integrated Heritage Services (IHS) Heritage Survey Report which has informed Perdaman Urea Projects ERD, has been provided on a confidential basis. Sensitive specific details are therefore only referred to in general terms and any more detailed information is provided for the purposes of informing the assessment personnel and the regulatory authorities and should therefore, out of respect to the Traditional Custodians, be considered confidential.***

2 Background

Perdaman is proposing to develop a Urea Project in the Burrup Strategic Estate (BSIA) at Murujuga near Karratha.

As part of the statutory Environmental Impact Assessment process, the Perdaman Urea Project Environmental Review Document (ERD) was released on 30 March 2020 for a 12 week public review, ending on 22 June 2020. The submissions received by the EPA as part of that pubic release and review stage of the Environmental Impact Assessment (EIA) process are included and discussed in this response document as part of the EIA process.

The BSIA abuts, and is in part overlain by, the Dampier Archipelago (including Burrup Peninsula) National Heritage Place (NHP). The concurrency and coincidence of these two land-use and management regimes creates a blended fabric of values and benefits for society for current and future generations, at local, State and Federal levels.

The blended fabric of the area is recognised in the Australian Governments public position cited in ERD Section 6.6.1 (p207) whereby there is discussion on achieving a balance into the future, for concurrent economic prosperity, alongside, and in harmony with, the enhanced conservation management afforded through the NHP to the advantage of all Australians. This is under the caption "*Prehistory meets the industrial age*[B]".

Perdaman views that the quoted statement reflects a cornerstone requirement that future industry must embrace as a good neighbour striving for a balance between heritage management and economic prosperity that must be realised through a collaborative partnership involving Indigenous groups, industry, governments and the community. This is an operating mantra that the Perdaman seeks to reinforce in its various corporate values and Project EMPs.

Evidence of the contemporary social value (cultural and historical/heritage) of this blended fabric is also reflected in the WA Heritage Council listing of Place No. 12666 on 3 July 2000. This being recognition of the Woodside LNG North West Shelf Project, Burrup Peninsula as an Historical Site related to its industrial/manufacturing use under the historical theme of "Mining (including mineral processing)".

Further evidence in relation to the fabric at Murujuga and the BSIA, as noted on its website, the Murujuga Aboriginal Corporation (MAC) acknowledges that

"The three Contracting Parties (comprising the Ngarluma-Yindjibarndi, Wong-Goo-Tt-Oo, and Yaburara Mardudhunera) received land entitlements and financial benefits as compensation for surrendering their native title rights and interests, and discontinuing their Native Title Determination Applications in the Federal Court, over the land and waters of the Burrup." [referring to the Burrup Maitland Industrial Estate Agreement (BMIEA)].

The Federal Court has also determined that native title does not exist in this area.

[B] See http://www.environment.gov.au/heritage/places/national/dampier-archipelago

As noted in the Integrated Heritage Services (IHS) Heritage Survey Report discussed in the ERD, during the ethnographical survey the Traditional Custodian informants described the custodianship role and responsibility passed between generations and shared between the contracting parties and with others through story and song lines connected to Murujuga. This is regarded as a Traditional lore connection to country and this custodianship may not have been wholly removed notwithstanding the agreed surrender of native title right and interests and the finding of the Federal Court that Native Title does not exist in the area. The Proponent notes that the agreed surrender as recognised by MAC's webpage does impede rights of access and possession when the State moves to enable development of the BSIA and/or creates an interest in the Industrial Estate to another person, or when the State indicates access to the land is limited or prohibited to the extent reasonably necessary for reasons of safety or security, such as the operation of a Major Hazard Facility[C].

This is part of an acknowledged and agreed blended fabric of respect for traditional cultural values, co-operative use within the industrial objectives of the BSIA and financial benefits linked to the industrial usage in that blended fabric.

The Proponent recognises this complexity, acknowledges and respects this Traditional lore connection to country, and is committed to working with MAC to achieve a mutually beneficial future. It will pursue this objective by working together as embodied in the agreement it has executed with MAC and pursuant to supporting and augmenting the financial benefits under the BMIEA as noted on the MAC webpage.

3 Submissions on Environmental Review Document

3.1 Submissions Received

During this period submissions were lodged with the Environmental Protection Authority from:

- Public, groups or individuals 6
- Aboriginal or Aboriginal Groups 1
- Local Government 1
- WA Government Agencies 7
- Federal Government Agencies 1
- Politicians 1

Total 17

[C] See Burrup And Maitland Industrial Estates Agreement Additional Deed (16 January 2003 Clause 8)

3.2 Issues Raised

Table 3-1 show key submission themes (Summarised by Key Environmental Factors) and identifying which submission included comments related to a key theme.

Table 3-1 Summary of Issues Raised in Submissions

Factor	Issue	Raise in Submission #[D]
General Comments	Supportive comments	#1, #8, #12, DPL&H
	General criticism of the Project/Government/Process/Industry	#2, #4, #6, #7, #9, #10, #11, #13
Coastal Process	Causeway aspects located in tidal flats area	#9, #12
	Port related aspects	#3
Marine Environmental Quality	Change of quality from potentially contaminated stormwater	#3
	MUBRL aspects	#9, DWER
	Changes to quality from deposition from emissions and dispersion in regional airshed	DWER, DWER (AQSB)
Marine Fauna	MNES	DAWE
Flora & Vegetation	Disturbance and offsets	#9, DAWE, DWER
	MNES aspects	DAWE
Terrestrial Fauna	Disturbance and offsets	#9, DAWE, DWER
	MNES aspects	DAWE
Inland Waters	Causeway related aspects	#9, #12
	Site hydrology	DWER
Air Quality	Modelling	#4, #9, #10, DWER (AQSB)
	Emission levels, general or specific	#3, #4, #5, #9, #10, #13, DBCA, DWER
	Impacts	#3, #4, #9, #10, DWER
	GHG	#4, #5, #9, DWER
	Rock art adverse impacts, incl MNES in NHP	#4, #7, #9, #10, #12, #13, #11, DAWE, DWER (AQSB),
	Economic social aspects	#9, #12, DAWE, DBCA

[D] Submission # as per Appendices A – S when submitter, if identified, is listed.

Factor	Issue	Raise in Submission #[D]
Social Surroundings	Noise	#3, DBCA. DAWE
	Road Realignment	#12
	Visual	#12, DAWE, DBCA
	Heritage, including MNES	#4, #6, #7, DBCA, DAWE, DWER
	National Heritage Place, including MNES and potential World Heritage Listing aspirations.	#4, #7, #10, DAWE, DBCA
EP Act Principles	Precautionary Principle	#7, #10, #13, DAWE
	Intergenerational Equity	#7, #13
	Options	#7, #9, #10, #11
	Offsets State and Commonwealth requirements	#9, #12, #13, DWER, DAWE
	Finalisation of Management Plans	#3, #9, DAWE, DWER
	Procedural/Process	#3, DAWE, DWER
	Future approvals requirements	#3, #6, DWER

4 Response to Submissions

Appendix A show a listing provided by the EPA of the submissions it received. Several additional submissions from government agencies are not shown on the listing. Copies of individual submissions and responses to each are included in Appendix B to Appendix S.

Addendums to correct omissions and/or transcription errors in original ERD Tables 4-45, 4-36 and 4-37 are included in Appendix T of this Response to Submissions.

Where comments are relevant to the review and revision of Project management plans, the Proponent has reviewed the relevant draft EMP from ERD Appendix K. Relevant finalised EMPs superseding and augmenting those from the ERD are included in Appendix U to this Response to Submissions.

The Proponent advises that while responses are provided to matters raised in the submission by Murujuga Aboriginal Corporation (MAC) and to further comments provided by MAC during discussion on initial responses, it is engaged in ongoing consultation with MAC. Ongoing discussions include matters relating to

- adaptive iterative detailed design for the purpose of optimisation within the maximum clearing nominated in ERD Table ES-2, and
- discussions relating to AHA s18 requirements across all project footprints.

This Response to Submissions includes the contemporary position/outcomes of these ongoing discussions, including outcomes agreed with MAC/Circle of Elders that will underpin application for s18 approval pursuant to the AHA.

In relation to the application of the Precautionary Principle, the Proponent notes that under section 4A of the *Environmental Protection Act 1986* (EP Act), the precautionary principle is invoked as a relevant consideration in decision-making if two criteria are met:

- there is a threat of serious or irreversible environmental damage; and
- there is an absence of 'full' scientific uncertainty as to the nature and scope of that threat.

Australian courts have made it clear that 'full' or complete scientific uncertainty is unattainable under a process of inductive logic, but that there must be 'considerable' uncertainty about the nature and scope of the threat in order for the principle to apply. In applying the precautionary principle, decisions should be guided by two considerations:

- careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and
- an assessment of the risk-weighted consequences of various options.

These two considerations are cumulative. It is sometimes asserted that the precautionary principle requires a proponent to prove that a risk does not exist, and in the absence of such proof that the project must not be approved. On the plain face of section 4A, as well as body of law established by Australian courts on how to apply the precautionary principle, this approach is wrong.

If the criteria for applying the precautionary principle are met, this simply means the EPA must assume that there is, or will be, a serious or irreversible threat of environmental damage, even though there is a degree of scientific uncertainty about the extent of that threat, or whether the threat really exists. Preventative measures must therefore be implemented without waiting until the reality and the seriousness of the threat become fully known. The objective of those preventative measures should not be to eliminate all risks, but to make a risk weighted decision about how the risks could be averted or reduced. Risk assessments should be underpinned by scientific data, as opposed to unsubstantiated speculation, hypothesis, or conjecture.

Mitigation and management measures and initiatives may demonstrate compliance with the precautionary principle. The type and level of precautionary measures that will be appropriate will depend on the combined effect of the degree of seriousness and irreversibility of the threat, and the degree of uncertainty of that threat. This involves the typical assessment of risks, namely the probability of the event occurring and the seriousness of possible consequences should it occur. The more significant and the more uncertain the threat, the greater the degree of precaution required.

On the basis of the above, the Proponent includes evidence it considers relevant to develop appropriate risk weighting for

- the understanding of the receiving environment
- the understanding of the potential for realisation of potential risks
- understanding of potential consequences where risks may be realised
- material presented in the ERD
- material presented in submission on the ERD

Throughout this Response to Submissions, relevant responses reflect changes to the proposal that have been approved by the EPA pursuant to a s43A request in January 2021 and EPBC Act s156a request submitted in January 2021 which principally reflect changes that result from ongoing dialogue during the EIA process with MAC and its Circle of Elders. The changes are included in an amended ERD Figure 2 Development Envelope and Indicative Infrastructure and amended ERD Table ES2 both in Appendix T herewith.

This dialogue has resulted in

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- Endorsement by MAC and its Circle of Elders of these changes.

5 Conclusion

Through the ERD and these responses to submissions, the Proponent has provided relevant evidence to sustain a risk weighted assessment of the Project and in those areas of remaining uncertainty that could potentially give rise to serious or irreversible damage to the environment, for an appropriately risk weighted application of the precautionary principle.

The Proponent continues to liaise with key stakeholders as part of the detailed design/preconstruction phase of the Project. This liaison will assist to optimise the Project through adaptive/iterative design and risk management.

Where risk is managed through the development and implementation of Management Plans, including those currently included as preliminary drafts in ERD Appendix K, these are considered "living documents" which will be reviewed and revised, including in response to the above ongoing consultation. The following revised plans, in substitution for the draft plans included in ERD Appendix K, are now included in Appendix U of this Response to Submissions:

- Project Environmental Management Plan (PEMP) (Perdaman Controlled Document PCF-PD-EN-PEMP)
- Surface Water Management Plan (SWMP) (Perdaman Controlled Document PCF-PD-EN-SWMP)
- Weed Management Plan (WMP) (Perdaman Controlled Document PCF-PD-EN-WMP)
- Emergency Response Management Plan (ERMP) (Perdaman Controlled Document PCF-PD-EN-ERMP)
- Threatened Species Management Plan (TSMP) (Perdaman Controlled Document PCF-PD-EN-TSMP)
- Pest Management Plan (PMP) (Perdaman Controlled Document PCF-PD-EN-PMP)
- Fauna Management Plan (FaMP) (Perdaman Controlled Document PCF-PD-EN-FaMP)
- Flora Management Plan (FMP) (Perdaman Controlled Document PCF-PD-EN-FMP)
- Air Quality Management Plan (AQMP) (Perdaman Controlled Document PCF-PD-EN-AQMP)
- Greenhouse Gas Management Plan (GHGMP) (Perdaman Controlled Document PCF-PD-EN-GHGMP)
- Aboriginal Heritage Management Plan (AHMP) (Perdaman Controlled Document PCF-PD-EN-AHMP)
- Solid and Liquid Waste Management Plan (SLWMP) (Perdaman Controlled Document PCF-PD-EN-SLWMP)

As living documents, any further review and revision of individual Plans resulting from the outcomes of detailed design and/or construction planning will be submitted for approval to the EPA, and as appropriate by DAWE, no later than two (2) months prior to the commencement of civil construction, then will be implemented from the commencement of construction and in operations. The Construction Environmental Management Plan (CEMP) is noted as a sub-plan in the Project Environmental Management Plan (PEMP), this CEMP will be prepared and included as an element of the Part V Works Approval application before construction.

The AHMP will also be subject to any requirements of any future s18 approval pursuant to the Aboriginal Heritage Act and thus may also require review and revision to meet the requirements of that future approval. A letter of endorsement for such application for approval pursuant to s18 from MAC is included as an attachment to Appendix J and as an Attachment to the AHMP herewith.

As noted in the ERD and reaffirmed in these responses to submission, it is expected that the Project will require approval as a Prescribed Premise under Part V of the EP Act.

APPENDIX

A

LISTING OF SUBMISSIONS PROVIDED BY EPA 24/06/2020

No.	Submitter	Comments	Copy of submission attached
1	Public	This project will be a significant economical boost to the Western Australia economy. The project is environmentally friendly and as you read through the attached documents the project will install leading technology to reduce greenhouse emissions. The preferred supplier for the technology is Haldor Topsoe and Stamicarbon. These two companies are global leaders in their field and will ensure green house emission are kept well below the required levels. It is a great asset that the Traditional Owners of the land the Murujuga Aboriginal Corporation are also in support of this project and can see the significant benefit to the employment of their people. The report submitted by Cardno is very comprehensive and it is great to see that a manufacturing project can be built in Western Australia.	No
2	Public	There are numerous environmental factors that should completely rule this project null and void. I do wonder if Nev Power has shares in these projects and is acting in self interest. We are now in the 21st century with many big companies still not contributing taxes. Some companies have somehow made it possible to never pay taxes - and I've yet to see a cleaned up site post extraction of gas/coal. Our carbon output should be lowering - not increasing by these extractions/projects. Please respect the environment. Anywhere else in the world these petroglyphs would be celebrated and be the subject of great tourism - not a world killing smelly industrial plant - please get your priorities right. Concerned citizen	No
3	Pilbara Ports Authority		Yes
4	Public	I attach document, summary comment is that: - On basis of the cultural heritage significance of the place this project should not proceed; - Inadequate research and assessment of impacts is presented, additional data and information is required; -The project design must ensure no physical impact the cultural heritage features; - No sites of National Heritage Significance be impacted; - All industrial emission must be at zero;	Yes
5	Regional Power Corporation		Yes

No.	Submitter	Comments	Copy of submission attached
	t/a Horizon Power		
6	Public	As a member of the public, I believe this project should be brought to the Aboriginal Cultural Material Committee (ACMC) for expert consultation with regards to the cultural heritage of the area. These areas are of national and international significance so it would not be a fair process if expert bodies, including the ACMC, were not formally invited to investigate the cultural impacts of this project. It's important to identify the impacts that this type of project would have on one of the oldest heritage sites in the world. Please approach this with intelligent, thoughtful and culturally sensitive discussion and analysis.	No
7	Public		Yes
8	Department of Jobs Tourism Science and Innovation	The Department notes Perdaman Chemicals and Fertilisers' proposal and has no comments on the Environmental Review Document.	No
9	Murujuga Aboriginal Corporation		Yes
10	Public	File uploaded	Yes
11	Robin Chapple MLC	Please see .pdf file attached	Yes

No.	Submitter	Comments	Copy of submission attached
12	City of Karratha	To Whom it may concern, Please disregard previous version of City submission (ID ANON-A4QC-RPPW-J) and replace with this submission. The date on the letter attached to the previous submission was incorrect. Apologies for having to send a second letter. Yours faithfully	Yes
13	Friends of Australian Rock Art Inc (FARA)	Our submission is also attached as a PDF PERDAMAN UREA PROJECT Submission to WA Environmental Protection Authority in response to the Perdaman Environmental Review Document Assessment No. 2184 (WA); 2018/8383 Commonwealth by Friends of Australian Rock Art, Inc (FARA) 22 June 2020 1. Introduction We write to urge the EPA to reject the Perdaman Urea Project proposed for sites C and F on the Burrup Peninsula, and in support of preserving the internationally significant and unique Murujuga petroglyphs that record ~50,000 years of Australian Indigenous culture in the region. Their importance has been widely recognised by local Indigenous elders, the Murujuga Aboriginal Corporation (MAC), well-respected archeologists and anthropologists, and the State and Federal Governments who have both supported their nomination for World Heritage listing.	Yes

No.	Submitter	Comments	Copy of submission attached
		While we realise that the Project is supported by both governments as economically "strategic" this is clearly short-sighted and does not properly consider the Precautionary Principle (PP) or the Principle of Intergenerational Equity (PIE). Nor does it recognise the heritage value of Murujuga to all Australians who want to protect this special place and its unique petroglyphs. Perdaman Chemicals and Fertiliser Pty Ltd (PCF) argues that Sites C and F are already disturbed in places and that they will be able to protect some individual important petroglyphs that have been identified within the proposed development envelope. However, industrial emissions from the Project will be added to those of other industries located on the Burrup Peninsula and this cumulative impact will continue to threaten and degrade the rock art. PCF has not provided adequate or convincing evidence that petroglyphs and Indigenous cultural sites across Murujuga can be protected by the company's very local proposed mitigation actions. If the State and Federal governments approve this Project, it would provide further evidence that they do not respect Aboriginal heritage, which is important to all Australians, and that they are not serious about their stated intention to gain World Heritage status for Murujuga. Given the very widely expressed public outrage and condemnation of Rio Tinto's destruction of the Juukan rockshelters, and the fact that neither the State or Federal governments intervened to at least delay the action so that it could be reassessed, many Australians have lost confidence in the governments' will to protect Australia's cultural heritage. Furthermore, a decision to approve the PCF Proposal would be in direct contravention of the EPA's responsibility to abide by the Precautionary Principle as stated in Part 1, Section 4A of the WA Environmental Protection Act 1986: Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. The EP Act also states that decisions applying the precautionary principle should be guided by: (a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and (b) an assessment of the risk weighted consequences of various options.	

No.	Submitter	Comments	Copy of submission attached
		PCF presents a deficient interpretation of the PP and the PIE (Section 8, Environmental Review Document; ERD) and then concludes that they are adhering to these fundamental principles (see details below). The ERD asserts that they will investigate practicable measures to mitigate the risk of the rock art being damaged, but there is no mention of how the risk will be calculated nor how this mitigation will be done. It is not sufficient for PCF to argue that they have committed to MAC to participate and contribute to the development of an Environmental Quality Management Framework (as an offset to impacts), or that future monitoring will be conducted as part of the Murujuga Rock Art Strategy (MRAS; https://www.der.wa.gov.au/images/documents/our-work/programs/burrup/Murujuga_Rock_Art_Strategy.pdf), as this will take years to complete and lacks independence from industry. This commitment to offset impacts essentially acknowledges that there will be impacts to the irreplaceable Murujuga petroglyphs, which we find unacceptable. Put simply, there is sufficient risk of serious or irreversible damage to the environment and the cultural heritage located there – clearly there is, or the MRAS would not have been deemed necessary. Furthermore, there has not been a thorough assessment of the risk-weighted consequences of this Project on the petroglyphs, especially their ability to withstand the onslaught from additional industrial emissions. How can PCF or the EPA assess the irreversible loss of irreplaceable petroglyphs? According to the PP, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation, which means that the decision to allow the proposed Project should be delayed until it is known that the petroglyphs will not be further threatened by yet another industry on the Burrup. While industry or governments may be eager to obtain economic benefits from the Project, it is not an acceptable reason to allow this Project to go ahead. 2. Specific concerns with the proposed Project Section 4.7: Inland waters, potential impacts (p. 126-138, ERD)	

No.	Submitter	Comments	Copy of submission attached
		The proponent states that as a mitigation strategy, regular inspections and audits will be undertaken to ensure the environmental protection outcomes of the Project are achieved. However, there is no information about who will conduct these inspections and audits, whether they will be made public in a timely manner (monthly, annually), or how accountability will be insured. Furthermore, why is no offset proposed if there are impacts? All of these questions need to be answered as part of the EPA assessment, and if the project is approved, specific and quantifiable conditions should be included in the Licence to insure that the public has confidence and there is true accountability. Section 4.8: Air quality, potential impacts (p. 138-180, ERD) The PCF plant will emit 319 t NO2, which forms nitric acid when it combines with atmospheric moisture (https://www.scientificamerican.com/article/acid-rain-caused-by-nitrogen-emissions/) and acids have been shown to be detrimental to the rock patina (Dragovich, 1986; Black et al., 2017) – the patina contains the petroglyphs on Murujuga, so if it is removed or degraded, they are also. Importantly, the Project proposes to substantially increase NO2 emissions on the Burrup Peninsula. This additional NO2 will exacerbate the regional air pollution which is already one of the highest emission zones in Australia (shown on satellite data and also on BOM data as persistent 'rain'), other than those recorded in major metropolitan areas. In addition, the Project will emit substantial urea and ammonia, as well as CO2. All of these air pollutants are already present locally in high concentrations, especially at some periods of the day and night. These contribute both to poor health outcomes for local communities, as well impact the rock surfaces and petroglyphs. Two of the Project's potential impacts of air emissions (Section 4.8.4) include the phrases 'where practicable' and “to practicably”. These words need to be deleted from any future Licence conditions, because they can be used to excuse the Proponent’s responsibility. PCF repeatedly states that urea is mildly alkaline, is not a nitrate and decomposes rapidly; however, they do not	

No.	Submitter	Comments	Copy of submission attached
		address the true concerns of Stakeholders including FARA who have raised the alarm that PCF's emissions of ammonia, nitrogen dioxide and urea provide sources of nitrogen under local conditions, which acts to fertilise microbes growing on the rocks, while nitrogen dioxide produces nitric acid – both acidic conditions and microbes play a significant role in breaking down the patina on the rock surfaces which are integral to the Murujuga petrolglyphs. PCF's statements to the contrary display their ongoing propensity for misdirecting their statements away from the fundamental concerns about the impacts of emissions on the rock art. Furthermore, the Proponent needs to quantify the specific locations where urea dust may or will be released, and how they would monitor and report on the actual level of emissions. This is essential, if the project is approved, so that the success of their mitigation can be evaluated on a regular basis. This would be the only way that they could be held to account and made to mitigate impacts appropriately, before the petroglyphs were further damaged. Section 8, ERD Section 8 states that the ERD provides a detailed Environmental Impact Assessment associated with the Proposal, the management strategies adopted for each environmental factor identified and assessed against EPA objectives, and that the cumulative impacts of the combined existing and planned activity occurring on the Burrup Peninsula have been taken into account in the EIA process. However, while Table 8-1 purports to contain a holistic impact assessment, PCF actually presents inadequate and misleading applications of the two primary foundational principles of the EP Act and then concludes (erroneously) that they will adhere to these two principles. Precautionary Principle: (Table 8-1) 1. PCF states that acid-scrubbing equipment will be installed to reduce ammonia emissions, but does not explicitly quantify by how much, nor indicate how much is technically feasible. These are essential questions for the EPA to have answered before this proposal can be seriously assessed. 2. The third bullet states that NH3 is not an acidic pollutant, yet this statement is deliberately misleading	

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		regarding the impact of the Project's ammonia emissions – it is another effort by Perdaman to deceive the non-discerning reader. While the ammonia is not acidic, the nitrogen in the ammonia does act as a fertiliser that stimulates microbial growth on the rocks, and these microbes play a significant role in breaking down the surficial patina on the rocks containing the Murujuga petroglyphs. So the ammonia emissions have a deleterious impact on the petroglyphs. 3. PCF also state that urea dust is mildly alkaline, decomposes rapidly, and is not a nitrate. Again, although this statement is true on the surface, it does not address the fact that urea dust from the Project will be transported and deposited on the Murujuga rocks. There the urea will be broken down by enzymes within the bacteria and lichens that live on desert varnish (outer rock surface of rocks in desert environments) to produce ammonium molecules. These molecules will act as a fertiliser to stimulate the growth of surface microbes that break down the patina and hence destroy the petroglyphs. In addition, the 319 t NO2 emitted from the PCF plant, which forms nitric acid when it combines with atmospheric moisture, will mix with urea to form a nitrate which is a fertiliser. Species of Nitrosomonas, can also assimilate the carbon dioxide the released during the reaction to make biomass (the Calvin cycle), and harvest energy by oxidizing ammonia (the other product of urease) to nitrite, a process termed nitrification. Nitrite-oxidizing bacteria, especially Nitrobacter, oxidize nitrite to nitrate. Importantly, MacLeod (2005) showed that microbial growth increased ten-fold for each increase in available nitrogen on the rock surfaces. These statements serve to deflect from the main point of the Precautionary Principle. Even though PCF acknowledges that the release of ammonia and urea also has a theoretical ability or capacity to bring about changes in the rock art patina, and that this is not fully understood (p. 168, ERD), they are making a case to proceed with the Project despite these very real uncertainties that are likely to negatively impact the rock art. As discussed previously, and by others making submissions, there is existing scientific evidence presented in published papers that explains and documents the ongoing and potential future degradation and destruction of the rock art by NO2 and other acidic emissions from industrial sources (Black et al. 2017; MacLeod, 2005), including the ships used to transport the industrial products. Furthermore, the urea dust from PCF's proposed plant will be deposited on the Murujuga rocks, including those outside the development envelope, where it can	

No.	Submitter	Comments	Copy of submission attached
		be broken down by enzymes within the bacteria and lichens to produce ammonium molecules (e.g. Dragovich, 1986; Díaz et al. 2016; Gleeson et al., 2018). These molecules can act as a fertiliser to stimulate growth of microbes on the rock surfaces and these will break down the patina and hence destroy the petroglyphs Principle of Intergenerational Equity (Table 8-1) 1. Table 8-1 (p. 250) states that 'the presence of acid forming pollutants and nitrate enhanced microbial activity are empirically considered to be a concern in relation to long-term impacts on rock art'. In response to this impact, PCF suggests they will manage the Project's emissions with the 'use of contemporary best practice pollution control technology within the plant' and that they will investigate 'practicable measures to mitigate the risk of rock art being damaged by air emissions from the Project so that it can be appreciated by local Indigenous people, the broader community, and future generations'. However, there is no mention of how this investigation will be done or who will determine whether mitigation measures are practicable. Clearly, if PCF decides that the measures are not practicable then the rock art 'will be damaged' and 'won't be appreciated' for local Indigenous people, the broader community, and future generations. This is unacceptable and there is no comfort to be taken from their motherhood statements. 2. PCF attempts to make a (dishonest) comparison between the fertiliser they will produce and the role of the rock art in assisting to feed Indigenous populations through time. There is global evidence that our shared environment cannot support ongoing unregulated high inputs of chemical fertilisers whose use releases nitrogen which in turn is converted to nitric acid (acid rain and deposition); more sustainable methods of feeding the world population must be developed and supported. It is not acceptable that the uniquely significant Murujuga rock art is sacrificed to make profits for an industry producing ammonia as urea, which is often the cause of poor health and early death in rural agricultural communities, and frequently results in water pollution (see extensive reference list: https://blogs.nicholas.duke.edu/citizenscientist/ammonia/). 3. Recommendations	

No.	Submitter	Comments	Copy of submission attached
		Before EPA assesses this Project further, much more detail should be required from the Proponent about the specific level of nitrogenous atmospheric emission reductions that is technically possible to achieve, even at some cost. We note that the concentrations of nitrogen dioxide and ammonia emissions suggested in the Perdaman proposal are well above the limits set for the existing Yara Pilbara industrial plants and well above the concentrations which can be achieved using Yara International scrubbers. This should be questioned by EPA since it seems the proposal talks about best practice and yet does not set that standard for itself. The proposal should only be allowed if technology is incorporated to reduce nitrogenous emissions into the atmosphere to near zero, since this can be achieved. The Precautionary Principle in the Western Australian Environmental Protection Act has not been adequately followed. Perdaman state that all designs 'have been established on a risk-based approach, but there is no formal 'assessment of the risk-weighted consequences of various options' for each impact on the environment or heritage. The Proponent should provide a detailed proposal of the actual impediments to building the plant on the Maitland Estate, which is also near a source of natural gas. If the Burrup site has been chosen largely by Perdaman on the basis of cost savings, then the WA Government should acknowledge that by approving this Proposal, they are putting company profit ahead of preserving irreplaceable Indigenous heritage contained in the Murujuga petroglyphs. IF this project is approved, the Licence Conditions for all emissions should include specific quantities and details, and decree that all monitoring results and reporting must be made public on a quarterly basis, and then summarised annually to ensure that the company is accountable. In particular, NO2, ammonia and urea emissions must be monitored in real time to ensure that there are no breaches in emissions limits – these could result if scrubbing technology is not properly maintained. A maximum limit for NOx emissions from the urea plant should be no more than 20 mg/m3, if the WA government is truly concerned about preserving the Murujuga petroglyphs, as scrubber technology is now available to obtain this limit.	

No.	Submitter	Comments	Copy of submission attached
		IF this project is approved, statements in the PRD containing "will be", such as those regarding offsets, rehabilitation, avoiding loss of Priority Ecological Communities, etc, should be included as part of the Licence conditions with quantifiable outcomes and dates by which these outcomes will be achieved. Publicly available and regular reporting of progress on promised outcomes ensures that PCF is accountable to the Indigenous owners, the local community, and the wider Western Australian public. IF this project is approved, phrases such as 'if practicable' should be deleted, as they are repeatedly used by industries on the Burrup and across Western Australia to avoid their responsibility to protect cultural heritage and our shared environment. The acceptance of these phrases by the EPA and DWER within licence conditions shows a disregard for the principle of public accountability required of State departments. Potential impact of proposed Perdaman urea plant on human health There is a threat to public health for those living in the Murujuga area, including the towns of Dampier and Karratha, as shown by the November 2018 results from the Pilbara Health Profile Planning and Evaluation Unit report. They showed that children have a significantly increased rate of hospitalisation for lung disorders and that there is a significant increase in heart disorders in older people in the region, as compared with the Western Australian State average (Anderson et al, 2018). Importantly Gillett (2008, p.129) showed that modelled concentrations of air quality underestimate measured values of nitrogen dioxide on Murujuga by up to five-fold, which suggests that the Proponent's modelling should be reassessed for its veracity. Given that the technology is available, the WA government could set the maximum limit for NOx emissions from the PCF plant at no more than 20 mg/m3, as this would reduce the negative health impacts to the communities. Impact of proposed Perdaman urea plant on petroglyphs Perdaman's statement that their plant contributes a relatively small extra amount of emissions compared with other industries on the Burrup is not relevant because industrial emissions on Murujuga are cumulative, both in terms of concentrations and over time. Any new industry will add further to the airshed concentrations of	

No.	Submitter	Comments	Copy of submission attached
		nitrogenous compounds (and sulphur, through shipping) and further degrade the petroglyphs. The Proponent relies on unproven conclusions of the EPA "that there is currently no compelling scientific evidence which indicates that there is an immediate material threat of serious or irreversible damage to rock art from cumulative industrial air emissions within the Murujuga airshed." However, the EPA and DWER have consistently chosen not to apply the Precautionary Principle because they have not seriously considered the existing scientific evidence which shows that the Murujuga rock art is already deteriorating – the State and the company(ies) will be held responsible when this is further shown as more data become available. FARA welcomes the proposed review of the Aboriginal Heritage Act 1972, so that Indigenous groups can identify important cultural sites across Western Australia in order to preserve those that they determine to be significant. Given their uniqueness and internationally recognised importance, the petroglyphs on Murujuga should be categorised with the highest preservation status before they are further degraded. However, we are increasingly convinced that industry, supported by the State Government, is moving to get new development proposals approved quickly before the Act is revised. How can the State claim to be an advocate for Indigenous cultural heritage or that they are acting on behalf of West Australians? PCF repeatedly displays their ongoing propensity for misdirecting their statements away from the fundamental scientific concerns about the impacts of air emissions on the rock art. This alone is reason enough for the State and Federal Governments, and the EPA, to move cautiously as called for by the Precautionary Principle – rather than race headlong into approving this flawed Project. Conclusion We are very concerned and very frustrated that industry always seem to be considered as more important than cultural and environmental heritage. West Australians respect our natural and cultural resources, so why doesn't our State government? We know that tourists from many countries value Australia as a destination because it is relatively unspoiled, and the food produced here is highly valued for its purity. And yet, the State government seems willing to risk further destruction of the petroglyphs, human health and the regional biodiversity in order to obtain royalties for a short few years. The petroglyphs were produced over thousands of years and the	

No.	Submitter	Comments	Copy of submission attached
		biodiversity that has taken millions of years to develop – both of these cannot be replaced or recreated once destroyed. Please consider our concerns carefully. References Anderson, C, Bineham, N, Lockwood, T, Mukhtar, A and Waenerberg, N, 2018. Pilbara Health Profile; Government of Western Australia, WA Country Health Service. Planning and Evaluation Unit. (http://www.wacountry.health.wa.gov.au/fileadmin/sections/publications/Publications_by_topic_type/Reports_and_Profiles/Pilbara_Health_Profile_2018.pdf) Black, JL, MacLeod, ID and Smith, BW, 2017. Theoretical effects of industrial emissions on colour change at rock art sites on Burrup Peninsula, Western Australia. Journal of Archaeological Science: Reports 12, 457-462. Díaz, EM, Sánchez-Elordi, E, Santiago, R, Vicente, C and Legaz, ME, 2016. Algal-Fungal Mutualism: Cell Recognition and Maintenance of the Symbiotic Status of Lichens. Journal of Veterinary Medicine and Research 3:1052. Dragovich, D, 1986. Weathering of desert varnish by lichens. In: Readings in Australian geography: proceedings of the 21st Institute of Australian Geographers' Conference, Perth, 10-18 May 1986, Edited by Arthur Conacher. Published by Institute of Australian Geographers (WA Branch) and Dept. of Geography, University of Western Australia, Perth. Gillett, R, 2008. Burrup Peninsula air pollution study: report for 2004/2005 and 2007/2008. Department of Environment and Conservation, Western Australia. Gleeson, DB, Leopold, M, Smith, B and Black, JL 2018. Rock-art microbiome: influences on long term preservation of historic and culturally important engravings. Microbiology Australia 39:33-36. MacLeod, ID, 2005. Effects of moisture, micronutrient supplies and microbiological activity	

No.	Submitter	Comments	Copy of submission attached
		on the surface pH of rocks in the Burrup Peninsula. In 14th Triennial Meeting, The Hague, 12-16 September 2005: Preprints (ICOM Committee for Conservation), Isabelle Verger, ed. pp. 385-393, Earthscan Ltd.	

APPENDIX

B

SUBMISSION #1 PUBLIC UNIDENTIFIED

Submission #1 Public	Perdaman Response
This project will be a significant economical boost to the Western Australia economy. The project is environmentally friendly and as you read through the attached documents the project will install leading technology to reduce greenhouse emissions. The preferred supplier for the technology is Haldor Topsoe and Stamicarbon. These two companies are global leaders in their field and will ensure greenhouse emission are kept well below the required levels. It is a great asset that the Traditional Owners of the land the Murujuga Aboriginal Corporation are also in support of this project and can see the significant benefit to the employment of their people. The report submitted by Cardno is very comprehensive and it is great to see that a manufacturing project can be built in Western Australia.	Encouraging to see positive feedback

APPENDIX

C

SUBMISSION #2 PUBLIC UNIDENTIFIED

Submission #2 Public	Perdaman Response
There are numerous environmental factors that should completely rule this project null and void. I do wonder if Nev Power has shares in these projects and is acting in self interest. We are now in the 21st century with many big companies still not contributing taxes. Some companies have somehow made it possible to never pay taxes - and I've yet to see a cleaned up site post extraction of gas/coal. Our carbon output should be lowering - not increasing by these extractions/projects. Please respect the environment. Anywhere else in the world these petroglyphs would be celebrated and be the subject of great tourism - not a world killing smelly industrial plant - please get your priorities right. Concerned citizen	Noted. Comments are directed at broader Government policies and approach to industry regulation. Second comment could be viewed as libellous. Nev Power is not a shareholder. Response should be by Government, if any is considered necessary. The Proponent notes that the reference to “a world killing smelly industrial plant” is not supported by the evidence that odour is unlikely to be an issue as indicated in the ERD (p 151) and that urea is a fertiliser used for food production (p 8) to help sustain food production globally.

APPENDIX

D

SUBMISSION #3
PILBARA PORTS AUTHORITY

Submission #3 PPA	Perdaman Response
Your Ref: CMS17373 & DWERT4375 Our Ref: A834096 Enquiries: Brad Kitchen, (08) 6217 7136 12 June 2020 Troy Sinclair A/Manager, EIA North Branch Environmental Protection Authority Submitted via EPA consultation hub: https;//consultation.epa.wa.gov. au Dear Mr Sinclair, **RE: ENVIRONMENTAL REVIEW DOCUMENT - PERDAMAN CHEMICALS AND FERTILISERS PTY LTD - PERDAMAN UREA PROJECT - ASSESSMENT NO. 2184** I refer to your letter dated 25 March 2020 seeking comment on the Environmental Review Document (ERD) associated with Perdaman Chemicals and Fertilisers Pty Ltd (Perdaman), Perdaman Urea Project (the Project). Pilbara Ports Authority (PPA) notes that the Project includes the development of material handling infrastructure within PPA's lands at the Port of Dampier, including: • A fully enclosed product conveyer within the East-West Services Corridor, as part of the conveyor network required to transfer the proposed Urea product to the proposed Product Storage Shed; • a fully enclosed Product Storage Shed (of up to 75,000 tonnes) for storage of the granular urea product; and • a urea ship-loading system, including a travelling (closed) conveyor fed cantilever arm leader with direct discharge to ship hold via chute (nominal loading capacity of 2,200 tonnes per hour). PPA notes that this infrastructure will be commissioned, owned and operated by Perdaman for the purposes of the Project. PPA has completed a review of the ERD and	The Proponent notes the covering letter and addresses specific matters as per the PPA attachment Table. The proponent has continued direct dialogue with the PPA to address the issues raised and understands the concerns are now addressed. The Proponent reaffirms its agreement with the separation of approval responsibilities as indicated in this letter and in the PPA letters included in ERD Appendix J. The Proponent also reaffirms that, as stated in the ERD (P47, 62 and 244), it will conduct all its activities within the port precinct both during the construction and operational phases wholly in compliance with the applicable approved PPA management policies, plans and procedures. Therefore, it is expected that these risks can be managed effectively during design, construction and operational activities. Also, as advised by PPA and stated in the ERD (p244), an Operational Environmental Management Plan (OEMP) is required to be prepared and submitted to PPA for review prior to any operational activities taking place on PPA's lands. It is a standard requirement of PPA's Commercial Agreements with tenants. The Proponent reaffirms its intent to meet this requirement of the PPA.

Submission #3 PPA		Perdaman Response
provides detailed comment in the attached Table 1 for consideration by the Environmental Protection Authority (EPA). PPA notes that: • The ERD is inconsistent in relation to Perdaman's responsibilities to obtain the necessary environmental approvals and manage the environmental impacts associated with construction, operation and maintenance of the proposed materials handling infrastructure within the Port environment. The ERD also contains statements about responsibilities for obtaining environmental approvals for certain infrastructure which do not accord with what has been discussed to date between Perdaman and PPA. • There is detail still to be developed on mitigation measures that assess the potential impacts to marine environment, air quality and cultural heritage values associated with operation and maintenance of the proposed Perdaman material storage, handling and loading infrastructure. • The activity being proposed by the Proponent would be regulated under Part V of the EP Act and requires more detailed assessment and approval to address operational environmental impacts within the Port environment If you would like to discuss the detailed comments raised in this submission, please do not hesitate to contact me directly on (08) 6217 7136 or Regards, Director Environment and Heritage		
Table 1: PPA feedback on Environmental Review Document, Perdaman Chemicals and Fertilisers Pty Ltd, Perdaman Urea Project (Assessment No. 2184)		See individual responses below
ERD - General Comment	For clarity throughout the document, please change all references in ERD (and appendices) from "Pilbara Port Authority" or "Pilbara Ports", to "Pilbara Ports Authority" (PPA).	Noted, relevant “living” project documents will be revised to reflect this feedback. It is not proposed to revise the ERD.

Submission #3 PPA		Perdaman Response
ERD - General Comment	The terms Proposed Development Envelope, Project Area and Project Footprint are referenced in the text and figures throughout the ERD. However, the term 'Project Area' is not clearly defined anywhere within the ERD and seems to be used interchangeably with "Development Envelope". For example, in the Executive Summary (Page xviii), text within a Table states that a "Weed Management Plan will be Implemented to prevent the spread and /or distribution of weeds within the Project Area and to surrounding areas". However, there is no clear figure, plan or other text definition that helps the reader define the geographical scope of the Project Area. This will clarify the scope of Perdaman's proposed operational environmental management as it relates to project infrastructure on PPA's lands.	The **Development Envelope** is shown in Red outline on Figure ES1 on Page xii of the ERD. This is the full extent of the area to which the assessment relates. This includes • Sites C & F • The causeway between these Sites • Relocated section of Hearson Cove Road • The Site C connection to Burrup Road • The area between Site C and Burrup road covering the N-S conveyor connection to • the E-W common user infrastructure corridor to PPA boundary • conveyor, storage shed and ship loader areas within PPA boundary. **Project Area** is the area within the Development Envelope covered by the biological surveys. The IHS report refers to a slightly different Project Area. This is also a subarea within the Development Envelope. The IHS report was prepared for MAC acting on behalf of WA Government. Thus, the different use of the same term already use in the ESD in relation to biological data is outside of the Proponent's control. **Project Footprint** is used to describe the subareas within the Development Envelope in which physical elements of the Project will be located.

Submission #3 PPA		Perdaman Response
ERD - General Comment	For clarity throughout the document, please note that: • the maximum vessel size to access the berth is a Supramax class • bulk carrier (up to 200m LOA); and the storage shed is constrained by the footprint specified by PPA — not a volume of product stored.	Noted. The ERD discussion relating to Panamax size vessels reflects the approved ESD where this vessel size was described, The Proponent notes that after approval of the ESD, PPA confirmed by email of 12 August 2019 that "*As shown the wharf extension will have capability to accommodate Supramax bulk carriers in the range of 50,000 DWT to 60,000 DWT with a draft of 12.2m to 12.5m, noting that vessels larger than 50,000 DWT will be draft restricted at times due to the depth of the channel (11m). The proposed DCW extension will be designed to allow vessels up to 225m long to berth alongside.* *Similarly, the footprint for the shed in the port area will allow development of on-port storage."*

Submission #3 PPA		Perdaman Response
		 Off takers of urea will be required to comply with all usual PPA vessel size and movement requirements.
ERD — Executive Summary, Page xvi (footnote)	States that: "Pilbara Ports has indicated it will seek any necessary approvals for expansion of its facilities, including those necessary to service the Project's requirements". PPA wishes to clarify this statement within the ERD. PPA has indicated that it will be responsible for sourcing the State and Commonwealth	Noted and agreed. To ensure that this is clear, the Port's letter to this effect of 5 March 2019 is included in ERD Appendix J and any précis of

Submission #3 PPA		Perdaman Response
	environmental approvals necessary to construct and operate a multi-user land-backed wharf facility and berths at the Port of Dampier. The Proponent will be responsible for State and Commonwealth environmental approvals associated with constructing, operating and maintaining the materials handling infrastructure necessary for the Perdaman Project within the Port environment, including product conveyors, product storage shed and ship-loader infrastructure. It is assumed that the activity being proposed by the Proponent in the port environment would also be regulated under Part V of the EP Act and therefore require further approvals to address operational environmental impacts. This should be clearly stated in the ERD.	this position is usually referenced back to this primary document. The Proponent reaffirms that that the conveyor, storage shed and ship loader facilities used solely by the project are the responsibility of the Proponent, while construction and operation of other multi-user facilities are responsibility of PPA. Agree loading of bulk materials to vessels is likely a prescribed activity (Cat 58 or 86) under Part V and is clearly noted as such in the ERD Management Plans included as Appendix K (See Table 3-1 on Page 12 of the Project Environmental Management Plan).

Submission #3 PPA		Perdaman Response
ERD - Section 1.3 (Page 3, footnote 5).	States that: "As Pilbara Ports Authority has indicated it will seek necessary approvals for expansion of facilities at the Port of Dampier for multi-user requirements, including those for multi-user requirements, including those of the project (see Appendix J)"	Noted and agreed.
	As per previous comment, PPA wishes to clarify this statement within the ERD. PPA has indicated that it will be responsible for sourcing State and Commonwealth environmental approvals required to construct and operate a multi-user land-backed wharf facility and berths at the Port of Dampier. The Proponent is responsible for State and Commonwealth environmental approvals associated with constructing, operating and maintaining the materials handling infrastructure necessary for the Perdaman Project within the Port environment, including product conveyors, product storage shed and ship-loader infrastructure.	To ensure that this is clear, the Port's letter to this effect of 5 March 2019 is included in ERD Appendix J and any précis of this position is usually referenced back to this primary document. The Proponent reaffirms that that the conveyor, storage shed and ship loader facilities used solely by the project are the responsibility of the Proponent, while construction and operation of other multi-user facilities are responsibility of PPA.
	It is assumed that the activity being proposed by the Proponent in the port environment would also be regulated under Part V of the EP Act and therefore require further approvals to address operational environmental impacts. This should be clearly stated in the ERD.	Agree loading of bulk materials to vessels is likely a prescribed activity (Cat 58 or 86) under Part V and is clearly noted as such in the ERD Management Plans included as Appendix K (See Table 3-1 on Page 12 of the Project Environmental Management Plan).

Submission #3 PPA		Perdaman Response
ERD - Section 1.4 (Page 4	States that "Approvals for the conveyor, storage and load out facilities will be the responsibility of the Proponent. Pilbara Ports Authority will be responsible for the shipping Berth". As per previous comment, PPA wishes to clarify this statement within the ERD. PPA has indicated that it will be responsible for sourcing State and Commonwealth environmental approvals required to construct and operate a multi-user land-backed wharf facility and berths at the Port of Dampier. The Proponent is responsible for State and Commonwealth environmental approvals associated with constructing, operating and maintaining the materials handling infrastructure necessary for the Perdaman Project within the Port environment, including product conveyors, product storage shed and ship-loader infrastructure.	Noted and agreed. To ensure that this is clear, the Port's letter to this effect of 5 March 2019 is included in ERD Appendix J and any précis of this position is usually referenced back to this primary document. The Proponent reaffirms that that the conveyor, storage shed and ship loader facilities used solely by the project are the responsibility of the Proponent, while construction and operation of other multi-user facilities are responsibility of PPA. Note shipping movement approvals and impacts are considered part of usual port operations, irrespective of the source of the cargos being carried and are thus not covered as part of the ERD.
ERD - Section 2.3.5 "Agreement with Pilbara Port Authority" (Page 31)	States that "Pilbara Ports Authority will be responsible for construction /maintaining the shipping berths and any necessary material handling infrastructure". This statement is not correct in relation to PPA's responsibility for material handling infrastructure. The Proponent is responsible for constructing, operating and maintaining the materials handling infrastructure necessary for the Perdaman Project within the Port environment, including	Noted and agreed. To ensure that this is clear, the Port's letter to this effect of 5 March 2019 is included in ERD Appendix J and any précis of

Submission #3 PPA		Perdaman Response
	product conveyors, product storage shed and ship-loader infrastructure. It is assumed that the activity being proposed by the Proponent in the port environment would also be regulated under Part V of the EP Act and therefore require further approvals to address operational environmental impacts. This should be clearly stated in the ERD.	this position is usually referenced back to this primary document. Agree loading of bulk materials to vessels is likely a prescribed activity (Cat 58 or 86) under Part V and is clearly noted as such in the ERD Management Plans included as Appendix K (See Table 3-1 on Page 12 of the Project Environmental Management Plan).
ERD - Section 4.3.4 "Potential Impacts" (Page 47)	States that "Potential direct or indirect impacts to marine water quality arising from product storage and loading of material to ships at Dampier Port will be managed by the PPA" and references Appendix J of the ERD. This statement is <u>not correct</u>. The Proponent is responsible for constructing, operating and maintaining the materials handling infrastructure necessary for the Perdaman Project within the Port environment, including product conveyors, product storage shed and ship-loader infrastructure. As such, is responsible for the management of potential direct or indirect impacts to marine water quality arising from this infrastructure. These impacts should therefore be considered within the context of the ERD. It is assumed that the activity being proposed by the Proponent in the port environment would also be regulated under Part V of the EP Act and therefore require further approvals to address operational environmental impacts. This should be clearly stated in the ERD	The Proponent reaffirms that storm water, and thus any consequential impacts to the marine environment, will be managed to comply with the PPA site wide stormwater management policies, plans and procedures to ensure site wide consistency. Also see discussion below. Loading of bulk materials is expected to be a prescribed activity under Part V and is clearly noted as such in the ERD Management Plans included as Appendix K (See Table 3-1 on Page 12 of the Project Environmental Management Plan).

Submission #3 PPA		Perdaman Response
ERD - Section 4.3.5.3 "Stormwater Runoff" 48)	States that 'Post-construction stormwater management is guided by the site's stormwater management plan, which includes project designs such as stormwater collection pits, stormwater basins, plus operating protocols / procedures such as maximising water reuse and water quality monitoring programs". However, there is no document entitled stormwater management plan within the ERD or associated appendices. PPA requests that a copy of this plan is made available for review as part of the ERD. PPA reiterates that it is the Proponent's responsibility to manage and treat potentially contaminated stormwater or other discharges to the marine environment as a result of the operation and maintenance of Proponent infrastructure.	This is identical to the proposed mechanism that was approved for the same issue in the Collie PER at the Bunbury Port which committed to development of this plan prior to construction. Notwithstanding, the Project Surface Water Management Plan, which includes management of stormwater aspects, has been reviewed and revised and is included in Appendix U of this Response to Submissions.
ERD - Section 4.3.6, Table 4-5 "Mitigation of Potential Impacts to Marine Environmental Quality" (Pages 53 - 56), Row titled "Water Quality".	PPA notes that this section of the ERD provides limited detail on proposed mitigation measures for management and treatment of stormwater within the Port environment. As such, it is not possible to assess the potential impacts to marine environmental quality from runoff collected from the operation and maintenance of the proposed Perdaman material handling infrastructure within the Port environment. For example, limited detail is provided on the: • proposed drainage design and guiding principles for the management of stormwater for this infrastructure; • management or treatment of potentially contaminated stormwater and other	Little to no dust is expected from the handling of granular urea from the Perdaman urea project, as the product contains resins to mitigate against the generation of urea dust during handling. Further loss of urea as dust is driven, not only to avoid potential environmental impacts, it is also driven to avoid impacts to project returns. Compared to other bulk material transported through Dampier Port e.g. iron ore (~$100/tonne) and salt (~$250/tonne), urea is a higher value product. Urea is worth >$400/t thus loss of this valuable product is a driver to mitigate losses as fugitive dust.

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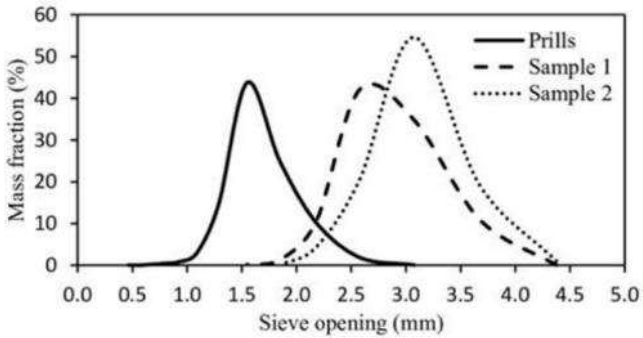
	discharges to the marine environment as a result of the operation and maintenance of this infrastructure Specific examples from this Section that highlight areas of concern by PPA include:	
	• Avoid (Page 53): States that "the design scope for a fully enclosed conveying and ship-loading system eliminates of the risk of loss of urea product as fugitive dust emissions or spills. However, no further detail is provided in the ERD regarding this design scope or whether this design scope has been achieved elsewhere.	Response on why granules are better (lower fugitive dust risk) than prilled urea: Example of shed to ship-loader operation (Beumer ASEAN, but very similar to Metso proposed to be used by The Proponent) YouTube clip from Beumer (observe no visible dust – anywhere either as product degradation while being handled ie reclaimer, conveyor or ship-loader, or as deposited fugitive dust within the operating environment) https://www.youtube.com/watch?v=EqY1IOa2ud8 Also, please note: - The particle size distribution of granules avoids small particles such as with prills. 

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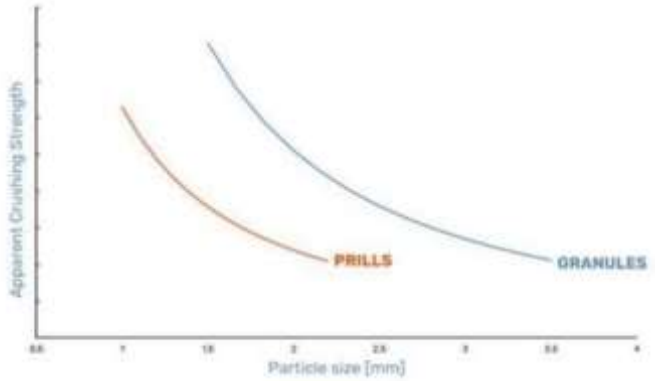
		(after Researchgate: Urea Finishing Process: Prilling Versus Granulation, June 2014) Prills show a smaller average particle size distribution, but specifically a lot wider. Granules are shown with Sample 1 and sample 2 on figure. The Sample 2 is representative of modern granulation - a tight (>95%) distribution around 3.0mm (this average can be varied if desired, with screen selection). Australian farmers demand a high particle size precision, as most of their crop application is mechanised. Using granulation, there are essentially no particles <1.5mm i.e. “coarse sand sized where such small size particles may be expected to contribute fugitive dust emissions. Further granulation adds a small amount of UF85 as ‘glue’ which strengthens the crushing strength of the urea granules as shown in the figure below; reducing potential for damage during handling.  (after Kreber.nl)

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	• Minimise (Page 53): States the "Best available technology design has been incorporated to reduce and minimize Project air emissions". However, no further detail is provided in the ERD regarding this design scope, specifically as it relates to the mitigation of fugitive air emissions from the operation and maintenance of proposed Perdaman material handling infrastructure within the Port environment.	
	• Post-Construction (Page 55-56): States that " the granular urea product is much harder than prilled urea, therefore creating less fines and dust when handled and transported, which minimises the urea fines and dust that could be accidentally released during conveying and ship-loading activities". The statement that "less fines and dust" will be created is qualitative and is not supported by evidence in the ERD. It is also inconsistent with the idea that the design has eliminated fines and dust.	
	It is assumed that the activity being proposed by the Proponent in the Port environment would also be regulated under Part V of the EP Act and therefore require further approvals to address operational environmental impacts. This should be clearly stated in the ERD.	Loading of bulk materials is expected to be a prescribed activity trigger under Part V and is clearly noted as such in the ERD Management Plans included as Appendix K (See Table 3-1 on Page 12 of the Project Environmental Management Plan).
ERD - Section 4.4.4 "Potential Impacts" Page 61)	States that "Potential direct or indirect impacts to marine water quality arising from product storage	Noted and agreed. To ensure that this is clear, the Port's letter to this effect of 5 March 2019 is included in ERD Appendix J

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	and loading of material to ships at Dampier Port will by the PPA (Appendix J)". This statement is not correct. The Proponent is responsible for constructing, operating and maintaining the materials handling infrastructure necessary for the Perdaman Project within the Port environment, including product conveyors, product storage shed (and associated hardstand areas) and shiploader infrastructure. As such, the Proponent is responsible for the management of potential direct or indirect impacts to marine water quality arising from this infrastructure. These impacts should therefore be considered within the context of the ERD. It is assumed that the activity being proposed by the Proponent in the port environment would also be regulated under Part V of the EP Act and therefore require further approvals to address operational environmental impacts. This should be clearly stated in the ERD.	and for clarity this précis of the position is specifically referenced back to this primary document. The Proponent reaffirms that the impacts to marine water quality will be managed to comply with the PPA site wide marine water quality management policies, plans and procedures to ensure site wide consistency. Loading of bulk materials is expected to be a prescribed activity trigger under Part V and is clearly noted as such in the ERD Management Plans included as Appendix K (See Table 3-1 on Page 12 of the Project Environmental Management Plan).
ERD - Section 4.4.6, Table 4-7 "Mitigation of Potential Impacts to Marine Fauna" (Page 63-67), Row Titled "Water Quality"	PPA notes that this section of the ERD provides limited detail on proposed mitigation measures for management and treatment of stormwater within the Port environment. As such, it is not possible to assess the potential impacts to marine fauna from runoff collected from the operation and maintenance of the proposed Perdaman material handling infrastructure within the Port environment. For example, limited detail is provided on the: • proposed drainage design and guiding principles for the management of stormwater for this infrastructure;	See response to comment above on Section 4.3.6, Table 4-5

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	• management or treatment of potentially contaminated stormwater and other discharges to the marine environment as a result of the operation and maintenance of this infrastructure. Specific examples from this section that highlight this concern include: • **Avoid** (Page 64): States that "the design scope for a fully enclosed conveying and ship-loading system eliminates of the risk of loss of urea product as fugitive dust emissions or spills... However, no further detail is provided in the ERD regarding this design scope. • **Minimise** (Page 65): States the "Best available technology design has been incorporated to reduce and minimize Project air emissions". However, no further detail is provided in the ERD regarding this design scope, specifically as it relates to the mitigation of fugitive air emissions from the operation and maintenance of proposed Perdaman material handling infrastructure within the Port environment. • **Post-Construction** (Page 66-67): States that ". the granular urea product is much harder than prilled urea, therefore creating less fines and dust when handled and transported, which minimises the urea fines and dust that could be accidentally released during conveying and ship-loading activities". The statement that "less fines and dust" will be	

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	created is qualitative and is not supported by evidence in the ERD. It is assumed that the activity being proposed by the Proponent in the port environment would also be regulated under Part V of the EP Act and therefore require further approvals to address operational environmental impacts. This should be clearly stated in the ERD Finally, PPA notes that the reference to "Australian Quarantine and Inspection Services (AQIS) mandatory Australian ballast water management requirements" (Page 63 under heading Marine Pests") has been superseded. Please refer to updated guidance document from Department of Agriculture, Water and the Environment (DAWE).	Loading of bulk materials is expected to be a prescribed activity trigger under Part V and is clearly noted as such in the ERD Management Plans included as Appendix K (See Table 3-1 on Page 12 of the Project Environmental Management Plan). Noted. Further, The Proponent understands that the requirements relating to Ballast water are applied to all vessels operating in the Port by PPA, not by individual sources of cargoes?
ERD - Section 4.8.4.1 "Emissions of primary concern" & Section 4.8.5.2 - "Impact on sensitive receptors cultural heritage values and amenity"	The potential for urea dust emissions to be generated during the transport, storage and shipment of urea within the Port environment, and the potential for urea dust to impact upon engraved surfaces (rock art) has not been adequately addressed. The ERD provides contradictory theoretical arguments as to the presence or absence of microflora on the rock surfaces of Murujuga, the potential for urea dust to impact microflora, and the potential for increased acidity and the corrosive impact of urea dust on the rock surfaces. The ERD needs to clearly identify the impact of urea dust on rock art and detail the controls that will be put in place by the Proponent to prevent, measure and manage	See above response in relation to sizing of urea granules and mechanical integrity of these urea granules that support the ERD position that urea dust from transport (by enclosed conveyor), storage, loading and shipment of urea will be at levels that do not represent a material risk to the environment, including to rock art. The Proponent understands that a universal EQMF is intended to be developed in accordance with the MRAS to ensure consistency of approach. The Proponent supports MRAS proposed approach being “An Environmental Quality Management Framework (management framework) will be implemented to provide a transparent, risk based and adaptive

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	any impacts as a result of the transport and shipment of urea within PPA's lands. PPA assumes it will be a condition of the Part IV approval under the EP Act that the proponent is required to: • Develop an Environmental Quality Management Framework (EQMF) as per the Murujuga Rock Art Strategy (MRAS) in consultation with Murujuga Aboriginal Corporation (MAC); and Monitoring undertaken under the EQMF is able to contribute to the Murujuga Rock Art Monitoring Program being undertaken with MAC into anthropogenic impacts upon the rock art of Murujuga.	framework for monitoring and managing environmental quality to protect the rock art on Murujuga from anthropogenic emissions (emissions caused by humans)." The Proponent has indicated it will contribute to the development and implementation of this universal EQMF developed pursuant to the MRAS, including an industry wide Murujuga Rock Art Monitoring Program. The Proponent considers that requiring disparate, separate monitoring by individual projects • introduces potential inconsistencies (and thus inconclusive outcomes), • introduces unnecessary and costly duplication of efforts • which leads to suboptimal application of resources • that could otherwise be applied to enhance understanding of relevant issues and developing outcomes-based solutions.
ERD - Section 4.8.6 "Mitigation", Table 4-43 "Mitigation of Potential Impacts to Air Quality" (Page 177)	This section of the ERD provides limited detail on proposed mitigation measures for management and treatment of stormwater within the Port environment. As such, it is not possible to assess the potential impacts to air quality from the operation and maintenance of the proposed Perdaman material handling infrastructure within the Port environment. Specific examples from this section that highlight PPA's concern include: • **Avoid** (Page 177): States that "Urea product is formed through granulation rather than prilling to provide superior properties that are less susceptible to particle attrition and	This comment is confusing. The management of stormwater does not materially impact on air quality, anywhere in the Development Envelope? In relation to air quality and potential impacts relating to fugitive dust, see above response in relation to sizing of urea granules and mechanical integrity of these urea granules that support the ERD position that urea dust from transport (by enclosed conveyor), storage, loading and shipment of urea will be at levels that do not represent a material risk to the environment.

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	therefore significantly reduce the potential for fugitive dust emissions from material handling activities from product conveying, storage and export". The statement is qualitative and is not supported by evidence in the ERD. • **Avoid** (Page 177): References several broad design features that are stated to minimise the potential for fugitive dust emissions (i.e. enclosed conveyor system, fully enclosed storage shed, telescopic chute and shroud) but provides no further detail on these features. Without more detail it is difficult to comment on the effectiveness of the proposed mitigation measures to address urea dust emissions which may be generated during the transport, storage and shipment of urea within the port environment	The Proponent considers that the above demonstrates that there is a low risk of significant fugitive or other dispersed emissions of urea dust that could then contaminate stormwater. Arrangements to manage port area stormwater are discussed in the response below on the Surface Water Management Plan.
ERD - Section 4.9.5.4 "Noise Impact Assessment" (Page 193)	The noise impact assessment referred to in this section fails to consider and address noise generated from: • Conveyor operations during out-loading, and • The operation of the ship-loader itself.	As the nature and design of the Proponent's port facilities is an adaptation of those proposed for the approved Collie Urea Project's export via the Port of Bunbury, The Proponent has drawn on the noise understanding presented for approval of that Project. The recommended noise reduction actions included in that setting will be incorporated during detailed design for the facilities in the PPA area. The Proponent expects that verification of noise aspects will be a usual part of commissioning close out pursuant to Part V approvals.

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ERD - Section 6.8.3 "Potential impacts" (Page 243)	States that "Letters from Pilbara Ports and Water Corporation included in Appendix J, provided that these bodies will be responsible for securing amendment to existing or any additional approvals required to provide contracted support to the Project'. PPA wishes to clarify this statement within the ERD. PPA has indicated that it will be responsible for sourcing State and Commonwealth environmental approvals required to construct and operate a multi-user land-backed wharf facility and berths at the Port of Dampier. The Proponent will be responsible for State and Commonwealth environmental approvals associated with constructing, operating and maintaining the materials handling infrastructure necessary for the Perdaman Project within the Port environment, including product conveyors, product storage shed and ship-loader infrastructure. It is assumed that the activity being proposed by the Proponent in the port environment would also be regulated under Part V of the EP Act and therefore require further approvals to address operational environmental impacts. This should be clearly stated in the ERD.	Noted and agreed. To ensure that this is clear, the Port's letter to this effect of 5 March 2019 is included in ERD Appendix J and for clarity this précis of the position is specifically referenced back to this primary document. Loading of bulk materials is expected to be a prescribed activity trigger under Part V and is clearly noted as such in the ERD Management Plans included as Appendix K (See Table 3-1 on Page 12 of the Project Environmental Management Plan).
Appendix K - Surface Water Management Plan	Section 5.1.4 "Conveyor" (Page 8) — states that "the EWSC is a bitumen sealed corridor which already includes the Yara Pilbara Fertiliser's ammonia pipeline which extends to the bulk liquids jetty adjacent to the Project's Port	Noted any future reference in "living" documents will incorporate this comment, the ERD however, is not being revised.

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	facilities'. Change reference from "bulk liquids jetty" to "Dampier Bulk Liquids Berth (DBLB)" to be consistent with PPA's port facility naming conventions.	
	Section 5.1.5 (Page 8) - states that "Urea will remain isolated from rainfall and stormwater which will be managed through existing surface water channels". The ERD provides little to no detail on site stormwater management strategies to be adopted to support this statement. The Proponent will be responsible for all on-site stormwater management prior to discharge into the existing stormwater infrastructure, including management or treatment of potentially contaminated stormwater and other discharges to the marine environment as a result of the operation and maintenance of this infrastructure. Section 5.4-5 "Port Area" (Page 10) - states that the "floor level of the Port storage shed located in the existing quarry will be built up from natural ground level of 5m AHD up to approximately 10m AHD". However, this Section and the broader Surface Water Management Plan do not provide any detail (drainage design or guiding principles to be adopted) of the proposed drainage associated with the Port storage shed and conveyor.	Port area specific stormwater management actions for inclusion in the Project Surface Water Management Plan (SWMP) will be developed in consultation with the PPA to align with Port's EMP. The SWMP follows the guidance and adopted the practices of the Stormwater Management Manual for Western Australia and Water Quality Protection Note 52: Storm Water Management at Industrial Sites[E]. On-site and off-site stormwater management will minimise the export of pollutants from the site and adopt the following stormwater quality improvement targets as compared to untreated stormwater: • *Eighty percent (80%) reduction in Total Suspended Solids* • *Ninety (90%) reduction in Gross Pollutants* • *As a guide peak flows must be retained on-site to allow management of stormwater quantity and quality by treating the first flush. The first flush treatment systems should be designed to treat a volume equivalent to a 1 in 3 month event ARI.*

[E] Department of Water 2010 guideline

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	As per earlier (general) comment, the proposed product storage shed and access must be contained within the footprint specified by PPA.	Reductions in contaminant concentrations (by example heavy metals, pathogens, nutrients and hydrocarbons) consistent with ANZECC and other pertinent guidelines for marine water quality. Any roads especially dedicated to the Perdaman Urea Project must meet the following with respect to the SMP: • Level of serviceability of 1 in 10 year event ARI • Design and construction to MRWA standards • When not conveying stormwater by pit and pipes, include adequate protection from scour or erosion by using concrete lining or stone pitching or equivalent protection in a manner
	General Comment: The Surface Water Management Plan recognises that stormwater at the Perdaman Urea Plant (Sites C and F) could be contaminated by spills or leaks from process activities and this will be directed to holding ponds for pretreatment, prior to reuse as a component of the seawater used on site for cooling. However, there is no recognition within the Plan that the Port site could be contaminated by spills or leaks from proposed product storage and conveying activities. As such, there is no information presented on the proposed management of urea contaminated stormwater within the Port site. The Proponent's Surface Water Management Plan should consider these impacts and include a similar level of detail.	See above response on SWMP.

APPENDIX

E

SUBMISSION #4 PUBLIC UNIDENTIFIED

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# Perdaman Urea Project-Burrup Peninsula, Western Australia **Environment Review Document Public Review Comment** 14th June 2020 I have been a resident in the town of Dampier since 2003, although I first worked on Burrup Peninsula in 1980-82. Employed as both an archaeologist and anthropologist in regional Australia since 1980. My doctoral research and subsequent publications are based on the study of the Murujuga petroglyphs. From 2000-2009 I was the President of the Australian Rock Art Association and have been a member of the Australian Institute of Aboriginal and Torres Strait Islander Studies since the mid- 1980s. In 2007, the Dampier Archipelago including Burrup Peninsula was added to Australia's National Heritage List. Providing national recognition of the cultural heritage values, particularly the rock art present. Early in 2020, UNESCO accepted the area as nominated onto the World Heritage Tentative List. The place is of outstanding universal values in terms of the evidence of creative human endeavour spanning some 50,000 years. The place is also of spiritual significance to the Aboriginal people of the area, not least evidenced by the petroglyphs and stone arrangements. It is not a place where industry should be encouraged as industry does not belong in such a culturally sensitive area. Not only the footprint of infrastructure but air borne emissions impact the preservation of this globally significant and irreplaceable cultural heritage. Perdaman proposed development should not be sited on the Burrup Peninsula, this would ensure that this rock art and other cultural features are there for future generations. Rather the infrastructure should be located on the mainland, away from culturally sensitive features. Project benefits could still be achieved, just without compromise to the cultural heritage values of Murujuga, but with more straightforward native title issues and simple heritage process. That being said I make certain observations on the content of the ERD.	The respondent's issues are noted. The Proponent views align with the WA Government's strategic policy position on the suitability of the Burrup Peninsula for industrial development. This policy position and framework for industry in WA is a matter for the State Government to determine. The Proponent is proposing a development within the existing legal and policy framework that applies in WA. The Proponent notes that the WA Government entered into contractual arrangements, the BMIEA, in 2003 for the purposes of providing a framework under which industrial development could be pursued in the BSIA, while at the same time making provisions for enhanced conservation amenity and access in Murujuga outside of the BSIA. The Proponent notes the respondent's comments that parts of Murujuga were added to Australia's National Heritage List six years after the BMIEA was concluded. As indicated in the ERD (Section 6.6.1 p 209), the Proponent also notes the Australian Government's policy position on **protecting both** industrial prosperity in the BSIA alongside the enhanced conservation afforded through the NHP, as expressed on the Government's NHP website for Murujuga – see quote below and link http://www.environment.gov.au/heritage/places/national/dampier-archipelago) ***"Pre-history meets the industrial age*** *The Dampier Archipelago is home to the most ancient works created by man, as well as a multi-billion-dollar resource industry.*

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	The Archipelago is located near significant reserves of natural gas, petroleum and iron ore resources. Industries have already invested in excess of $35 billion in developments, while trade to and from the Dampier Port reached 88.9 million tonnes for 2003-04, making Dampier the second largest tonnage port in the country. The area has also created thousands of jobs. *A balance between heritage management and economic prosperity is being achieved through a collaborative partnership involving Indigenous groups, industry, governments and the community. Careful, long-term management of the Dampier Archipelago and Burrup Peninsula will see both our heritage and economy protected into the future, to the advantage of all Australians."* The Proponent also views that the quoted statement reflects a cornerstone requirement that future industry must embrace as a good neighbour striving for a balance between heritage management and economic prosperity that must be realised through a collaborative partnership involving Indigenous groups, industry, governments and the community. This is an operating mantra that the Proponent seeks to reinforce in its various corporate values and Project EMPs.
1. Air quality-to maintain air quality and minimize emissions; the document acknowledges that air emissions from the proposed urea plant have the potential to impact on air quality, nearby rock art, and National Heritage values in the region (p.xx), but go on to state that: • Use of natural gas power-reducing levels compared to coal. This is true but would still be higher than no development on Burrup. • Reuse in process of CO_2 reduces GHG emissions by 1.5Mtpa. Yes but still 0.7Mtpa [0.65 Mtpa C02-e (p.xxi) but 0.7 Mtpa C02-e (p.xv)]. This raises questions on validity of data contained in the ERD.	**1** Recognition of a potential to impact in the ESD/ERD is part of the input to environmental risk assessment and the development of evidence-based risk weighting for the purposes of considering the precautionary principle as part of the EIA process. Through the ERD the Proponent has examined the risk level (likelihood of actual realisation of the risk), and the consequence (materiality) where the potential risk is expected to be realised then applied the hierarchy of control for such risks where there is a likelihood of material impact/consequence.

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• Basis of Design has incorporated requirements for emissions avoidance, reduction and minimization. As a statement, these are platitudes without substantive evidence and without any specific level controls that this project could be measured against. • Much that is included about potential impacts is quotes from Black in the senate enquiry (p.152-153). However, then the document goes on to discuss evidence of plants and ecosystems, not rock art, which is exactly the same flaw with the original CSIRO studies • To make statement: therefore, urea dust is not demonstrably a contributor source to identified environmental impacts of current recognised concern for rock art integrity, (p.154) is spurious and without scientific data to substantiate such a sweeping statement - the risk still remains in relation to rock art and other sensitive cultural material such as shell remains. **All industrial emission must be at zero**	In terms of management of potential air emission risks, the Proponent supports: • *continuing research into potential emissions environmental consequences in the regional and local setting,* • *an enhanced industry wide understanding of the regional airshed,* • *an enhanced understanding in relation to potential impacts on rock art;* • *mutually sharing relevant stakeholder data relating to its specific operations once this work has been finalised;* • *application of BAT in process design, including no flaring during normal operation – the oxygen blown approach minimizes inert build up, and trace combustible streams are recovered and used to supply heat to the process fired heater;* • *a program of continuous improvement and operational optimisation; and* • *review of new/alternative technologies and feasibility of opportunities for retrofit those that could potentially enhance overall emissions, including GHG, performance.* In response to specific points raised: The no development and other location option is addressed in Section 2.2.3 on P9 of the ERD.

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	On CO_2 reuse, 0.65Mtpa is an estimate that when rounded to 1 decimal place is 0.7Mtpa. This rounding raises no question in relation to validity of the discussion in the ERD, as the comment suggests. The use of the rounded number reflects that there is a degree of statistical uncertainty in quoting such estimated numbers which could otherwise induce an unjustified sense of precision which can be confused with accuracy. The Proponent's Basis of Design has achieved base CO_2 at only 0.5 t CO_2/t ammonia, compared with over 1.7 t CO_2/t ammonia for the neighbouring Yara ammonia plant, which is smaller and therefore does not gain the same levels of performance advantage per unit of product achievable through scale and applied BAT in 2005. As noted in the ERD Review of Technology, the proponent reaffirms that the typically hot and dry Pilbara climate and use of seawater both add some penalty to the process efficiency, and as such some contribution to CO_2 emissions. The 5 yearly technology review included as part of the GHGMP emissions reduction strategy, will include examination of these penalties and opportunities to redress these through technology or other advances. In ERD Table 4-31, the Proponent has demonstrated that Project emissions will fall well within established relevant international BAT parameters. The Proponent has recognised in the ERD that there is uncertainty in relation to the level of potential risk, either at a high or low level and/or consequence, for adverse impact on the integrity of rock art at Murujuga. In order to address the risks associated with this uncertainty, the Proponent reaffirms it has committed, as part of the

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	implementation of the approved project, to be a contributing participant in the MRAS. Further, the Proponent does not consider the statement relating to potential rock art impacts attributable to urea is either spurious or without scientific data, based on: • the work and conclusions of Dr Ian MacLeod in the 2005 paper quoted by Black at the Senate inquiry as cited in the ERD and again quoted in a number of submissions on the ERD, were based on the analytical concentration of nitrate ions recovered from the washed surfaces of rocks in the Burrup (Dr Ian MacLeod pers comm) • the 2005 report by MacLeod only discussed soluble nitrates found on the rock surfaces and made no comment on ammonia or ammonium ions or urea (Dr Ian MacLeod pers comm) • the material presented to the Senate Committee specifically sought to demonstrate acidic emissions, and used the term “acidic”, as an area of concern for rock art integrity • the Proponent is not aware of submissions to the Senate Committee or elsewhere demonstrating that urea deposition was a specific contributor source to the concerns • scientific data confirms that urea is alkaline, not acidic • as biological ecosystem responses in the nitrogen cycle are being suggested to be an underlying concern being raised, it is relevant for the current understanding to review and consider the relevant risk weighting to apply to the quoted evidence relates to urea in the nitrogen cycle or solely to other specific constituents i.e. nitrates, of the nitrogen cycle. • knowledge/data on variable biological responses in ecosystems to different elements of the nitrogen cycle as

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	cited in the ERD (Section 4.8.4.1 P154), are potentially relevant, with appropriate risk weighting, to current and future considerations, whether at the microflora or macrofloral scale. Notwithstanding the above, the Proponent acknowledges that there are possibilities of the urea providing some form of stimulation of the combined biological response associated with the natural microflora living on Murujuga rocks. Being part of the complete nitrogen cycle, it is possible that specific microorganisms on the rocks may utilise this additional source of nitrogen reservoir. However, the normal chemical reaction of urea undergoing hydrolysis (reaction with moisture, water) is shown below, with the intermediate step of carbamic acid being only stable at -23^{o}C, before hydrolysis releases the second ammonia molecule and releases the carbon dioxide, from which the process began. It should be noted in this hydrolytic breakdown the oxidation state of the nitrogen is still (-III) in the urea and in the ammonia gas. $CO(NH_2)_2 + H_2O \rightarrow CO(NH_2)OH + NH_3$ and then $CO(NH_2)OH + H_2O \rightarrow CO_2 + NH_3$ With ambient temperatures of the rocks at Murujuga being at least 50^{o}C above the decomposition point of the carbamic acid the second reaction would be spontaneous. It is very unlikely that sufficient urea will become biologically available to facilitate biological interaction and so become oxidized to the (+III) state of nitrite or the (+V) state of nitrate ions. The above is relevant to an appropriately risk weighted consideration of the precautionary principle.

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	In relation to the comment on zero emissions, the Proponent reaffirms that this is not practicably achievable for any process to be undertaken with zero emissions/discharges. The Proponent considers it is appropriate to recognise that if an emission does not leave site as a saleable or useable product, it must leave or be managed as a waste, either as a long-term legacy onsite or as a discharge (emission) offsite. The Proponent reaffirms the application of BAT in design and operation to reduce emission risks to ALARP. In terms of the EP Act "Polluter Pays" principle, the Proponent reaffirms that the site will be a Prescribed Premise subject to approvals including emission related fees pursuant to Part V of the EP Act. In relation to the final comment on zero emissions, the Proponent reaffirms that this is not practicably achievable for any process to be undertaken with zero emissions/discharges. The reduction of residual NO_x emissions is at diminishing returns – lower NO_x numbers in one process area, and; • can result in greater use of resources to manufacture and install any necessary equipment; • with greater power and water draw demands in operation; • both of which results in increased NO_x and other product of combustion emissions; and • that can be disproportionate to the initial reduction being sought. Notwithstanding the considerable work to date on identifying and implementing vendor solutions that deliver BAT performance, especially in relation to air emission, as part of its approach to

Submission #4 Public unidentified	Perdaman Response
	the Precautionary Principle and to continuous environmental improvement, during the Detailed Design phase, the proponent is committed to continuing to explore BAT opportunities where the application of alternative vendor solutions for urea production can practicably deliver equal or better environmental performance, including air emissions. Where such is achievable, the Proponent will include in its application for Part V Works Approval a third party reviewed report demonstrating equal or better environmental performance.
2. Issue of public access to Hearson Cove and heritage places in the surrounding National Park area are not adequately address in the document. Impacts that construction and subsequent running of the plant will have, are not assessed. Therefore, the ERD downplays the potential disruption to public amenity. In addition, the plant will have high visual and audio impact on public usage of the general area. 3. As the ERD identifies, a section of Hearson Cove Road will need to be moved to avoid the proposed construction and infrastructure. However, there is no justification to shift north the existing junction of Burrup Road and Hearson Cove Road. To ensure reduce impact on public users and to the immediate environment, all that is required is a small section realignment east of the existing junction in relation to the proposed ERD route (see Figure attached). Road junction to remain at current location with only minor realignment of road section. 4. Much of what is presented in section 2 is on economic benefits of the project and potential revenue loss if project does not proceed; it has nothing to do with environmental impact or mitigation. It appears as padding to a poorly researched and under considered document. • With personal knowledge of the proposed development area, Figure 4.5 seems to be a down play of proximity of both rock pile and rock pool communities in relation to the lease area (p 76). Locations that will be impacted as a consequence of progressing this development proposal.	**2**. As the project has no direct footprint impacts at Hearson Cove or the nearby National Park, public access to Hearson Cove and heritage places is dependent on the ability get to the locations. This aspect is considered in the Traffic Impact Assessment in ERD Appendix H. **3**. The ERD recognises that the precise position of the relocation is to align with the State Government's gazetted road reserve. The ERD also records that Stakeholder feedback preferred the northern option to a previously proponent suggested option along the southern boundary of Site F. Preliminary design works to relocate into the gazetted road reserve undertaken by the WA State government in the consideration of this road relocation, placed a priority on safety for road users and ensuring that all appropriate standards are met for the intersection design with Burrup Road. To achieve this, a new, upgraded intersection between Hearson Cove Road and Burrup Road is required, and keeping this intersection as close to perpendicular as possible will allow better visibility for turning traffic.

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5. This document uses the finding of the EPA in relation to the Yara TAN project, basing assessment of project impacts on discredited studies and presenting data that is not in line with the requirement of 'the precautionary principle'. That the ERD then uses this same flawed logic as justification for the Perdaman project is indicative of lack of appropriate investigation and assessment (p.140). • Published pH levels on the rock surfaces of Murujuga show a marked shift from neutral to highly acidic. Industrial emissions are changing the natural condition. No suitable studies have been undertaken to validate that Perdaman will not have impact. **Inadequate research and assessment of impacts is presented, additional data and information is required**	4. Section 2 meets the requirements as set out in the approved ESD and should therefore not be considered "padding". Societal prosperity is a relevant social value as noted by the Commonwealth Government NHP website[F] for Murujuga and as recognised in the WA Government's MRAS. **5**. The proponent notes that it is sometimes asserted that the precautionary principle requires a proponent to prove that a risk does not exist, and in the absence of such proof that the project must not be approved. On the plain face of section 4A of the EP Act, as well as body of law established by Australian courts on how to apply the precautionary principle, this approach is wrong. The Proponent reaffirms that to develop a risk weighted approach to the Precautionary Principle in relation to the potential for adverse impacts from anthropogenic emissions on rock art, it is relevant to draw on recent outcomes and analysis of monitoring undertaken for the purposes of rock art integrity evaluation that is required pursuant to EPBC Act Approval 2008/4546. As part of the approval conditions, this information is to be available in the public domain. The Proponent notes that in evidence to the Senate Murujuga Enquiry[G], Department of Environment and Energy Assistant Secretary, Compliance and Enforcement Mrs Monica Collins, at paragraph 2.48 comments on non-compliance by Yara Pilbara in terms of the not having *"the full set of monitoring data for the total suspended particulates"* but did not offer any suggestion of non-compliance with any other aspect of the monitoring condition such as the requirement to have the monitoring conducted by a

[F] See http://www.environment.gov.au/heritage/places/national/dampier-archipelago
[G] See https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/BurrupPeninusla/Report/c02

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	suitably qualified person. It is therefore reasonable to conclude that the data collected is "fit for purpose". Mrs Collins also at paragraph 2.49 reinforced to the Committee that that the "*purpose of the licence is to ensure the protection of rock art in the national heritage place"* The subsequent EPBC Approval 4546 approval compliance monitoring results, supports the EPA risk weighted "precautionary principle" assessment in relation to Yara that are being challenged in this comment. This suggests that the EPA logic may not be flawed as the comment is suggesting and thus in applying a similar logic the ERD may not be flawed either as is being suggested in this comment. The Proponent notes that this monitoring and rock art observations are undertaken in close co-operation and collaboration with MAC Murujuga rangers[H] who have a core interest in ensuring the robustness of this protective approach for rock art integrity. Given, as noted above, that this work is conducted for compliance with an EPBC approval condition whose purpose is clearly to address the potential uncertainty of the risk posed by anthropogenic emissions to the integrity of rock art, it must be regarded as being "fit for purpose" to address that objective. This monitoring and concurrent rock art observations, including

[H] See: https://www.yara.com.au/siteassets/about-yara/pilbara-photos/2018-rock-art-monitoring-with-mac-252.mp4
The Proponent assumes MAC provided the free, prior and informed consent to be part of this documentation of the monitoring and observational data gathering for the purpose of enhanced understandings about rock art and potential emission impacts and for the requirements of EPBC Approval 2008/4546.

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	principle emissions from the proposal, including NO_x (as NO_2) and ammonia. The results of this monitoring and rock art observations, provide robust indication that the perceived risk is not demonstrably realised. As this monitoring is; • conducted for the purpose of compliance with the EPBC act approval and • intended to inform whether or not anthropogenic emission, including principle emissions from the proposal, result in adverse impacts The Proponent considers that the collected data is relevant to current considerations, whether reported in a scientific congress or through other mechanisms. In that respect, this monitoring, as it is explicitly targeted, it enhances the understanding of potential detrimental impacts to rock art integrity from anthropogenic emissions. It is therefore an important element of evidence available for a risk weighted application of the Precautionary Principle to the potential for adverse impacts to rock art. In relation to the comment about “discredited studies”, the Proponent notes comments on Page 1 in the 2016-2017 compliance report for EPBC Approval 4546[I], prepared for the WA Department of Water and Environmental Regulation, but funded by Yara as Condition 10 stipulates. That compliance

[I] See https://www.yara.com.au/siteassets/about-yara/reports/rock-art-monitoring-reports/analysis-of-burrup-peninsula-rock-art-2017-daa.pdf/

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	report indicated that, in relation to the "disputed" reports that review of the relevant reports *"highlighted several statistical issues"*. Further, it is noted that in Section 1.4 (p5) in relation to utilising the information that underpinned the "disputed" reports, the current report states: *"While the original monitoring design was not ideal, it did follow basic principles of experimental design in that in each year both industry affected sites and the control sites were measured, until 2016. This ensured that any year specific measurement factors could be corrected for, essentially by assuming that the control sites should remain unchanged. The analysis method required the control data for this purpose.* *In 2017, only the Yara related industry sites were measured, with no control sites.9 This necessitates changes to the analysis method to utilise the 2017 data. This required making the assumption that the year specific effects would take the form of a trend, allowing the trend estimated for the industry sites using data including 2017 to be compared against the trend estimated for the control sites using data up to 2016. In adopting this assumption, Data Analysis Australia examined the data to ensure that it was reasonable.* *In the analysis presented in this report, we were cognisant of the importance of the Yara plants and the changes that have taken place over the period of the monitoring. For that reason, it was considered appropriate to use a quadratic trend model, to allow not only for changes, but also for possible increasing or decreasing rates of change.* *Upon closer examination, the 2004 ASD data was considered systematically different from the data from*

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	2005 onwards. It is not uncommon for the first year of data collection to be different in a context such as this, with refinements and lessons learned being implemented for the second year, so this should not be considered as a criticism. With the previous year's analyses considering each year separately, rather than as a trend, the statistical models could handle this appropriately. With the shift to a trend model, it is inappropriate to retain such data, and all 2004 data has been removed from this year's analysis. *This trend based approach to analysis is particularly effective as the length of the monitoring period increases – the statistical power with respect to estimating trends increases substantially with each addition year of data."* The Proponent considers that the data robustness analysis in the 2016-2017 EPBC Approval 2008/4546 compliance reporting is relevant evidence for developing a risk weighted understanding of the potential for adverse risks to rock art and the application of the Precautionary Principle, i.e. while the manner in which the data is interpreted is in dispute, the data when interpreted in an alternative manner is used to draw alternative conclusions. In relation to the potential for changes to rock art, the Proponent notes Gazettal Notice s127 describes one reason for inclusion of Murujuga on the National Heritage list relates to observations related to changes. Against Criteria (C) it is noted that *"…. The different degrees of weathering and the large number of super-positioned engravings provides an outstanding opportunity to establish a relative chronology for motifs characteristic of the major style provinces in*

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	the Pilbara (Lorblanchet 1992; Vinnicombe 2002; McDonald and Veth 2005).” While this provides opportunity to explore evidence as to the chronological sequence, it also provides evidence as to degradation of engravings before industrialisation related anthropogenic emissions were present. This degradation may either be i) due to natural degradation rendering the earlier engraving so degraded as to be un-recognisable and the rock surface thus considered as a clean canvas, or ii)be as a pragmatic act if later engravers considered the message being shared was no longer “fit for purpose” for their contemporary society, e.g. mega fauna is now extinct ie no longer around as a food source, look for this (newly engraved) different food to hunt and eat. This is partially reflected in IHS Heritage Report Figure 3 which chronicles the changes over time of the petroglyph phases illustrating changing subject (including animal, food source, types) In either case, this could be an avenue for further research as it suggests that intrinsic preservation of engravings may not be an immutable cultural tenant. This should also be considered in any risk weighting applied for the purposes of the Precautionary Principle relating to rock art changes. The Proponent reaffirms its commitment, as part of the implementation of the approved Project to be a contributing participant to the MRAS, under which work is being conducted to assess and mitigate potential adverse impacts on rock art at Murujuga.

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	As discussed in relation to other submissions, the Proponent also reaffirms that it is amenable to be part of a JTSI initiated "Cultural Study" as a good will gesture and as an industry participant, subject to FID and to all parties agreeing TOR. The Proponent is liaising with MAC and JTSI to support work in this regard which can augment the World Heritage listing application. The Proponent considers that any support ultimately agreed is also an appropriate future offset for potential impacts to connection to country. The matters raised in this submission associated with intrinsic cultural values, could be examine more closely in that study for Murujuga more generally.
6. Aboriginal Heritage sites • It is unacceptable that the ERD uses the Aboriginal Heritage Information System in relation to cultural sites rather than provide the relevant geospatial and cultural information as obtained by the heritage consultants. Insufficient data is presented to correctly comprehend the impact to cultural heritage. • The ERD is reliant on the IHS consultant report, yet no substantive data or the report is provided so adequate assessment and comment can be made. • It is noted that petroglyphs are of high significance to the senior traditional owners and it would be culturally inappropriate in Traditional Law, that any rock art sites be moved or disturbed. This in line with my own knowledge of such culturally significant items and is in line with worlds best practice. • Accordingly, the first recommendation and preference of the Traditional Owners that best efforts are made to ensure all Aboriginal cultural heritage sites are protected in-situ (p. 192). • Yet it acknowledges that if future disturbance or damage to an Aboriginal heritage site is unavoidable, then Section 18 consent under the AHA should be sought (p.192). This counters the stronger position of traditional custodians and heritage management practice	The geospatial and cultural information was gathered under commission from MAC and on behalf of the WA State Government. These data sets are not the property of the Proponent and have been provided to the Proponent on a confidential basis, as stipulated in Clause 19 of the BMIEA, to inform the discussion but not for release of the detail being sought. The confidential data is available on a confidential basis to the assessing authorities but not for release in the public domain. As noted in the revised AHMP in Appendix U, the Proponent has continued its ongoing liaison with MAC and the Circle of Elders to gain agreement to progress necessary s18 applications.

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The project design must ensure no physical impact the cultural heritage features. • Of the 31 sites with recorded boundaries in the AHIS database intersecting the Project Area, only four (4) sites are located within the proposed plant footprint (IDs 18615, 19239, 19874/20036 & 20037). Three of these have been assessed by IHS as having a high significance to the Traditional Owners and one has low significance (p.192). Basis for this being that these sites contain petroglyphs. • In fact, although these sites are outside the National Listed Place, at least one of these sites displays National Heritage values. Considering the recent national and international coverage of site destruction in the inland Pilbara, no such outcome of site destruction should be sanctioned. • The ERD put weight into statements that the project will have no impact through emissions on the rock art. Yet they downplay the fact that they intend the destruction of four sites. Relocation of petroglyphs is not an acceptable solution; it destroys both the physical and cultural associations of the image.	As discussed in the ERD Section 4.9.2 (p181) and above, the WA Government has undertaken cultural heritage surveys with Traditional Owners and has collected sufficient information to provide confidence on the heritage values of the design footprint. This information is the intellectual property of Traditional Owners. Pursuant to Clause 19 of the BMIEA, the information was provided confidentially to the Proponent. The proponent has liaised with MAC in relation to design refinement in relation to Sites C and F as well as the conveyor alignment between Site C and the Common User Corridor, including where the conveyor passes through the NHP area. A s43A amendment to the Project proposal being assessed has been approved by the EPA and is reflected in the EIA, A comprehensive draft Aboriginal Heritage Management Plan was included in Appendix K of the ERD. This is considered a “living” document and has been reviewed and revised to incorporate the outcomes and requirements identified as part of ongoing liaison with MAC relating to s18 processes since the ERD was prepared and circulated for public comment. The revised Plan forms part of this Response to Submissions Appendix U. As noted in the revised AHMP in Appendix U, the Proponent has continued its ongoing liaison with MAC and the Circle of Elders to gain agreement to progress necessary s18 applications.
No sites of National Heritage Significance be impacted. Redesign of infrastructure placement is required.	This has occurred. See Revised AHMP in Appendix U.The conveyor footprint and the use of Site F have been adaptively redesigned to avoid impact to heritage sites in NHP areas. This

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	has included liaison with MAC in relation to design adaptations and conveyor route alternatives. Through adaptive redesign of the conveyor, no heritage sites in the NHP areas will be physically impacted. Through a S.43a EP Act amendment to the Development Envelope (which is reflected in the ERD, when compared to the ESD Development Envelope), the Proponent has excised the south western corner of the former project footprint of Site F. This ensures there is no physical impact on the culturally important Yatha site. This excision from the project footprint is in line with the recommendations of the IHS heritage report.
Extract from ERD with amendment (green) to show a more suitable alignment without need to move intersection; this would have less impact on public access and project costs.	The suggestion is noted – see response above.

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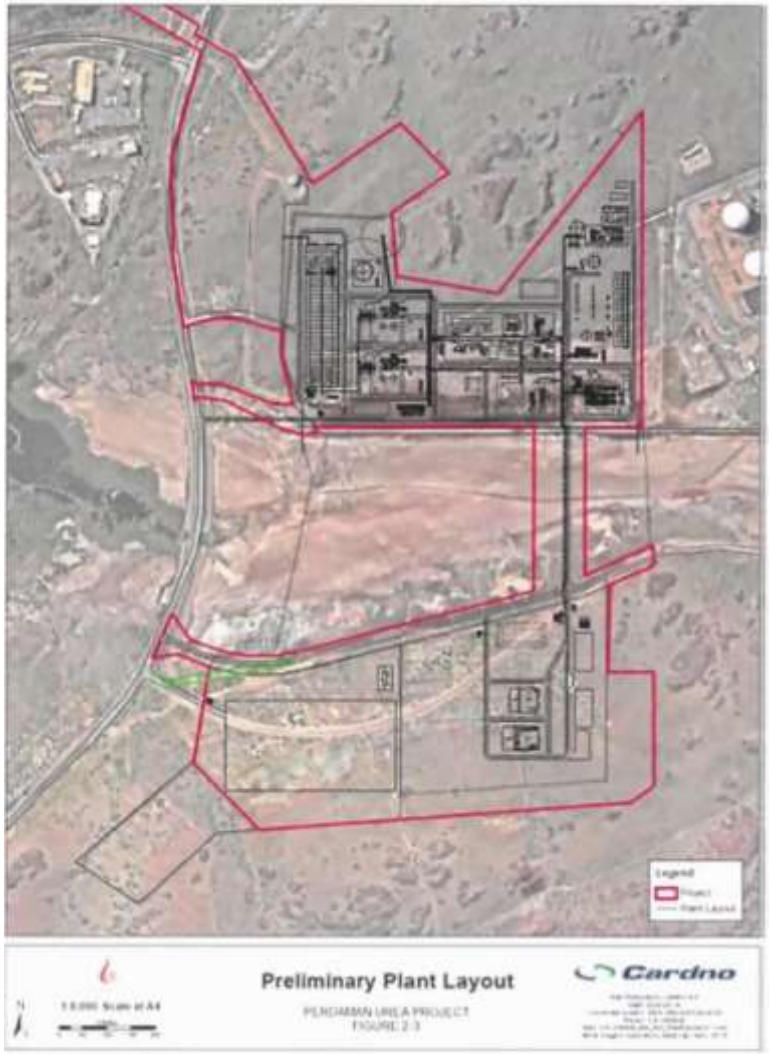	

APPENDIX

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SUBMISSION #5 HORIZON POWER

Submission #5 Horizon Power	Perdaman Response
18 June 2020 Environmental Protection Authority Prime House 8 Davidson Terrace Joondalup WA 6027 Electronic submission to: https://consultation.epa.wa.gov.au Dear Sir / Madam **Perdaman Urea Project – Public Environmental Review** Horizon Power welcomes the opportunity to respond to the Perdaman Urea Project (the Project) Public Environmental Review. Horizon Power operates across regional Western Australia, servicing more than 48,000 residential homes and businesses across a service area of approximately 2.3 million square kilometres, including the Pilbara region. Horizon Power notes the proponent intends to install ~100MW onsite generation utilising non-renewable energy (natural gas) as the fuel source. The Pilbara region of Western Australia offers the opportunity for greater utilisation of renewable energy sources to provide power supply to the Project. It is noted that renewable generation such as solar has a greater requirement for land and therefore is restricted on the Burrup Peninsula due to the significant heritage values of the area. Horizon Power is of the view that the environmental and heritage impacts of the Project could be reduced through greater utilisation of off-site renewable energy generation at a less sensitive location such as the Maitland Industrial Estate. Power supply to the Project can then be provided through a common user Transmission Line from the Maitland Industrial Estate to the Project site.	The Proponent notes Horizon Power's submission. Please note that the Proponent has explored the potential to utilise solar power generated at Maitland Industrial Estate to support its urea production requirements. Several factors render such an option impracticable at the present time including • the project's power island uses combined cycle GTGs where exhaust heat is recovered to provide essential process steam as well as supplemental steam turbine generation, to enhance the process energy efficiency in line with the application of BAT. • The output from any solar source is only electricity, it has no capability to deliver the project steam requirements for reforming. • In order to supply the steam that would be lost if Combined Cycle GTGs are not used, requires an alternative (or considerably larger) fired heater. ○ This would result in addition product of combustion emissions from that fired facility instead of emissions from the GTGs which incorporate DLN and waste heat recovery in line with best industry practices. • Notwithstanding the issues of meeting project's full steam requirements through the application of combined cycle generation, there is no "off the shelf" 3rd party source with available capacity to deliver 100MW solar power, with necessary planning, development and financial approval that could meet project timeframes.

Please do not hesitate to contact the undersigned on 08 6310 1815 should you require any further information. Yours faithfully Manager Sustainability HORIZON POWER	• As a conceptual greenfields potential initiative, Horizon's suggestion has no guarantee of being able to provide the suggested alternative within a feasible time frame that aligns with the Proponent's requirements. • The aspects raised can be re-evaluated as part of the 5 yearly technology and energy efficiency review processes outline the GHGMP in Appendix U. Perdaman has committed to incorporating solar power generation during the detailed design of the project to progress the project toward a zero net emission target by 2050. Solar design is only conceptual at this stage, however, the project will include the installation of 3.5MW solar generating capacity with the potential to expand rapidly. This system is not linked to battery storage, so would only be available during daylight hours. It is envisaged that final locations of proposed solar infrastructure will be detailed during final design and through Part V Works Approval process. The intent is to integrate this power generating capacity with the planned 100MW combine cycle gas turbine (CCGT) power generation system, with the inclusion of a solar power feeder line to the power station. As noted above, the purpose of the solar generating capacity is to supplement daytime peak energy demand without increasing demand on the CCGT. This is an initial step to reverse the Project's 100% reliance on natural gas and CCGT for project power demand in future. It is proposed that solar collectors will be installed opportunistically as an architectural adaptation on proposed infrastructure such as roofs on buildings / sheds and on top of conveyors if safe and practical. Perdaman will also explore other practical locations within the approved project development envelope during detailed design (i.e. within Site C and/or on Site F). This would avoid the necessity to clear

	additional land and vegetation, and the inherent GHG emissions associated with land clearing. It is envisaged that limited to nil impacts on the project's key environmental factors will result in the installation of solar power infrastructure at the project site. Further to the solar power commitment, Perdaman commits to continue to evaluate further opportunities to develop and implement practicable GHG emissions reduction and offset initiatives in order to achieve these interim and long-term emission targets.

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SUBMISSION #6 PUBLIC UNIDENTIFIED

Submission #6 Public unidentified	Perdaman Response
As a member of the public, I believe this project should be brought to the Aboriginal Cultural Material Committee (ACMC) for expert consultation with regards to the cultural heritage of the area. These areas are of national and international significance so it would not be a fair process if expert bodies, including the ACMC, were not formally invited to investigate the cultural impacts of this project. It's important to identify the impacts that this type of project would have on one of the oldest heritage sites in the world. Please approach this with intelligent, thoughtful and culturally sensitive discussion and analysis.	The Proponent reaffirms that as indicated in the ERD, all requisite heritage approvals will be sought in the development of the Perdaman Urea Project. The Proponent notes and is committed to complying with the requirements of the AHA and reaffirms the requirements of Clause 19 of the BMIEA in that same regard. The ACMC will be involved if a s.18 consent is sought under the provisions of the WA Aboriginal Heritage Act. The AHMP in Appendix U provides further information on this aspect.

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SUBMISSION #7 PUBLIC UNIDENTIFIED

Submission #7 Public	Perdaman Response
Submission regarding **Perdaman's Proposal to Construct an Urea Fertilizer Plant on the Burrup Peninsula** **Why I am making a submission:** I have been following the events that are taking place on the Burrup Peninsula since 2015, when I took a tour of the petroglyph art in the Murujuga National Park. The cultural heritage that exists on this remote peninsula is astounding and of world-class importance. It is the oldest mark of man on planet Earth, and demonstrates a continuous occupation of the region by the Aboriginal people for at least 50,000 years. There are more than one million works of art, in the form of etchings scratched into the surface of the patina on the rock surface that expose a lighter rock colour underneath. The patina grows on the surface of the rock, in the dark reddish colouration that we see on the surface of every piece of rock on the Burrup.	The respondent's concern is noted. As the State allocated the site in the BSIA under its industry development policy to the Proponent, it chooses not comment on the suitability of the Burrup Peninsula for industrial development. This is a matter for the State Government. State Government has through the Murujuga Rock Art Strategy (MRAS), commissioned modelling and monitoring relating to enhanced understanding about industrial emissions on the Burrup, including what effect they may or may not have on petroglyphs. The Proponent supports the objective of this work and commits as part of the implementation of the approved Project to be a contributing participant to the MRAS, under which this work is being conducted. See detailed response on patina below.
The rock art Patina is a living organism This patina is a living, growing microorganism. It thrives in a neutral pH environment, which is 7pH. Due to the dry climate and the remoteness of the area, this has been the air quality on the Burrup since the formation of the world. However, since the of the LNG plant, the port of Dampier, the explosive plant at the fertilizer plant on the Burrup, the air quality is now half that (approximately 3.7pH) which means that the microorganism can no longer grow, and in fact, it is dissolving in the acid rain environment. If the patina dissolves, the art disappears because it only exists as a colour contrast between the dark reddish hue of the patina and the lighter coloured rock surface below.	The Proponent provides the following to outline a relevant summary of patina development at Murujuga that is based on the experiences of expert conservation scientist conducting work alongside MAC to enhance understandings relevant to safeguarding the integrity of Murujuga rock art and the cultural values associated with it. The physical microenvironments of the rock surfaces, which control the chemical and potential for biodeterioration of the engraved images, are complex. The complexity is due in part to the differences in the underlying geology of the rocks (both gabbro and granophyre) and the way they retain moisture needed to facilitate the chemical processes associated with

Submission #7 Public	Perdaman Response
	the maturation of the patina (mineral formation) and the diminution of the rock patina, through solution weathering. As noted in responses to other submissions, the Proponent notes that a suite of work has previously been imposed as conditions of EPBC Act approval and endorsed by MAC for the monitoring works associated with assessing the environmental impact of emissions from the Yara Pilbara Fertiliser (Yara) ammonia and Yara TAN ammonium nitrate production facilities, which are proximally located with the Project. As a contributing participant in the MRAS, to ensure industry wide consistency, the Proponent would support expansion of the suite of works endorsed by MAC appropriately to address any specific risks associated with the Project and to share resourcing for future continuation of work targeted at aspects where the Project may affect cumulative risks. The Proponent considers this is consistent with Sections 5.4 and 5.5 of the MRAS. Specific aspects for consideration include: Since the amount of water is interdependent on seasonal temperature variation and the inclination of the sun striking the rock surfaces, to confirm a relevant baseline for comparative purposes, the monitoring regime during construction and before commissioning will need to occur at least twice in a yearly cycle that considers the hot and the cooler months on the Burrup. The regime should include measurement of the surface pH of the rocks, the amount of salt deposited with the prevailing winds coming across the ocean and the redox potential of the

Submission #7 Public	Perdaman Response
	rock surfaces where relevant representative sites are selected in consultation with the Murujuga Aboriginal Corporation (MAC). Relevantly, the Proponent has been advised that long before any apparent chemical change on the rocks, the surface reactivity of the minerals can be assessed through measurement of the voltage of the surface-reactive species as they respond to the application of moistened sponges. This methodology is understood to be endorsed by MAC for the purpose of potential early indication of potential adverse effects. In addition, at the times of the surface assessment of the designated rocks, samples of the surfaces can be collected through irrigation of the surfaces with ultra-pure water supplied by the ChemCentre of WA or qualified alternative commercial supplier of pure water to the same standard, and who also analyse the washings (or a suitable NATA accredited laboratory with the same capability). The water is analysed by inductively coupled plasma mass spectrometry for all the metal ions and by ion chromatography for all negative ions (anions) such as chloride, sulphate, nitrate, ammonia, ammonium, nitrite, oxalate and sulphite. The ability to analyse for urea should also be reviewed and could be incorporated if shown to be practicable.

History revealed in extinct species in the rock art and human archaic faces The art depicts animals that are now extinct: a fat-tailed kangaroo and a thylacine. It depicts the white man's ships sailing into the region. It depicts climbing men, and archaic faces that are likely to be the oldest depiction of man's image on the planet. There are images of marine life, land animals, and symbols and patterns that we have no understanding of today. All of this represents a culture of deep spiritual meaning, and how mankind lived on this place, even before the Ice Age came and went. It is awe-inspiring. **Chronology of Sites of Importance on the Earth** To put it into context of importance in the history of the world, we celebrate World Heritage Areas such as: Taj Mahal—a couple of hundred years old Pyramids in Egypt—2,000 years old Cave Paintings in France—8,000 years old Rock Art on the Burrup—40,000+ years old. Yet, very few people know anything about this rock art!! How can this be? Surely the petroglyphs on the Burrup are some of the most important markings of mankind on the planet. **Longevity of Investment in the Region** From a business perspective, if permission were given to develop the fertilizer plant on the Burrup, this would have a lifespan of say, 50-100 years. In that time, it would significantly add to the acidic emissions on the peninsula, which will further dissolve the patina of the rock art, and thus eradicating the art gallery altogether. All for this short period of time.	The Proponent understands that the subjects recorded in the petroglyphs were recorded as they impacted on contemporary society. The proponent understands that while the images may represent a record of the past, they were not necessarily intended as an historical record by the original engravers. The proponent notes that in the criteria for inclusion of the Place on the National Heritage list, there is discussion of the observation and relevance of superposition of engravings, ie later engravings being made over the top of pre-existing engravings. This is noted to be useful evidence in the study of the chronology and of the change of style and subject over time. The Proponent suggests that the superposition may be useful evidence in the understanding of other aspects as well. Some workers suggest (Joe McDonald pers comm) that as natural weathering may have rendered old engraving indistinguishable, subsequent generations of engravers considered the rock face a “clean canvas”. This is therefore evidence of pre-industrialisation degradation of petroglyphs by natural processes with no contribution of anthropogenic influences. Alternatively, if the purpose of the petroglyphs was to provide instruction for contemporary society, e.g. the types and location of food sources to sustain contemporary society, if the contemporary environment changed, e.g. mega fauna became extinct and thus were no longer a food source to be hunted, the pre-existing information was no longer “fit for purpose”. In this case the superposition may be evidence that later engravers may have effectively “redacted” the previous information by over engraving with updated contemporary information. In either case superposition is evidence that the tenant that all petroglyphs are a permanent element of the environment is not immutable.

Submission #7 Public	Perdaman Response
World Heritage Listing pending: an investment for future generations Alternatively, if the petroglyphs receive World Heritage Listing, (as is currently proposed that they receive this protecting listing), it will then be the responsibility of the WA and Federal Government to ensure that the rock art is protected. It will be an ongoing tourist attraction far into the future, and become more valued as time passes. As a tourist destination, it will generate clean, healthy jobs for the locals, and a cash flow income for the region, long after the fertilizer plant ceases to operate.	As noted in the ERD (pp xxii, 8, 32 and 198) the Proponent has an Agreement in place for support which will be provided to assist MACs application for World Heritage Listing in relation to Murujuga. This is not a prescribed requirement condition set out in the BMIEA but goes beyond as an element of the application of the hierarchy of control for this identified potential impact to this aspirational element of the social surrounding. The Proponent also reaffirms its ERD view (p xxiii, and Section 4.9.5.6 p198) that implementation of Project Environmental Management Plans, compliance with the EPA requirements embodied in Ministerial conditions, through its agreement with MAC, and implementation of its Project Destiny Heritage Charter will assist to preserve the heritage values of Murujuga and that its activities are not a threat for achieving the aspiration of a World Heritage listing of Murujuga from the recently lodged application.
Choice of where to locate the Perdaman Urea Plant What confuses me is the duplicity of the WA Government, where on the one hand, they nominate the rock art and the Burrup for World Heritage Listing, and then in the next instance, they are proposing to locate an acid-spewing plant immediately adjacent to the area. I cannot understand the logic of this. Admittedly, it is the proponent who has chosen this site, but it is the WA Government that has offered this location in the first instance for the project. The bottom line is that the rock art cannot be removed or relocated, but the fertilizer plant can. There is already another industrial site, Maitland Industrial Estate, located south of Karratha, which is away from the rock art, and will still be able to access the port of Dampier from that location. If the government is sincere in supporting the World Heritage Listing for the Burrup, then this plant, and all future industrial proposals for expansion on the Burrup should only be considered at the Maitland Industrial Estate. That way, all	Why not Maitland Strategic Industrial Area? See ERD Section 2.2.4 re location options consideration. One alternative site which was considered was the Maitland SIA. While potentially feasible for the engineering construction of a urea plant, Maitland SIA lacks the necessary “project ready” infrastructure to underpin a viable operating project at this time. Significant public investment would be required in common user facilities such as those already available at the BSIA. Further, establishment of such facilities at Maitland SIA pose additional environmental and cultural impacts that would need to be addressed. For example, locating the urea plant at Maitland SIA, would require new port facilities and/or a new common user service corridor. Transhipment of urea would require a significant increase in truck movements, with associated transport

Submission #7 Public	Perdaman Response
parties come away with a win-win situation. The rock art will hopefully be preserved and the industry will occur within the region, bolstering the WA economy.	emissions, and larger storage sheds at both the port and plant site. Maitland SIA would also require new infrastructure for sea water supply and brine disposal.
Precautionary Principle of Intergenerational Equity will be tested in court Currently, the WA Government has awarded a tender to a contractor to assess whether or not the rock art is disappearing due to the dissolving of the patina on the surface of the rocks due to increased acid rain caused by existing industrial developments on the Burrup. Unfortunately, the work has come to a halt due to the Covid-19 pandemic, and without scientific proof that this increase in acidity in the air is rapidly dissolving the patina, is gives the WA Government the loophole they are seeking to allow more industrial development to occur on the Burrup. However, the Precautionary Principle of Intergenerational Equity is yet to be tested in a court of law here, and it will be done in the very near future. If the Government is seen to be negligent in carrying out its duties in assessing projects such as this one, there will be a day in court when the proverbial hits the fan. No longer are people willing to sit back and allow industries that contribute to Climate Change to rule the day, based on the almighty profit for business owners, and not the health and welfare of the generations yet to come. There must be a moral compass in decision-making in the Government from now on. If we are to meet the Paris Agreement targets, Perdaman (and all other future developments) should only be allow to construct their plants on the clear understanding that only zero emissions will be tolerated, and this will be closely monitored for the health and welfare of the people who live here. It can be done; it is done in other places around the world, and industry itself touts that it is achievable, it just eats into the bottom profit line of the developer and shareholders. Shareholders are no longer sitting back and allowing things like air quality emissions going unchecked to be a part of where they will be investing their money. Look at the Woodside AGM, as an example of dissatisfaction in lack of controlling what is being done to prevent Climate Change. This is a very small price for the project to pay for a cleaner, healthier environment, and controlling pollution in the atmosphere which we all breathe. If you look at the map in the Cardno document of Sites C and F, you see that they immediately about the Murujuga National Park. How can it NOT affect the rock art? How can it not affect the application for World Heritage Listing? How can the government	The proponent notes that it is sometimes asserted that the precautionary principle requires a proponent to prove that a risk does not exist, and in the absence of such proof that the project must not be approved. On the plain face of section 4A, as well as body of law established by Australian courts on how to apply the precautionary principle, this approach is wrong. As noted in the Holistic Assessment in the ERD Section 8 (pp 248-251), to address the principle of Intergenerational Equity is addressed, the Proponent has incorporated design, management and mitigation measures to reduce potential impacts to the environment to ALARP levels. As indicated in the ERD Section 2.2.1.3 (p 8) the Proponent and Woodside have agreed to co-operate on a hydrogen and gas technology park that is to be powered by renewable energy. The park would support the Burrup Hub and the development of a broader renewable energy economy in Western Australia targeting the domestic and export markets. The park, to be used for trials and field testing could support future Project emission reduction aspirations. A core objective of this initiative will be investigation of technology enhancements that can be applied to Project Destiny (the current Perdaman Urea Project). Relevantly to the consideration of intergenerational equity in relation to industrial activity more generally, the Proponent notes that the societal value of industrial enterprise is reflected in the WA Heritage Council Place Number 1266 listing on 3 July 2000 of Australia's North-West Shelf LNG Project as an

Submission #7 Public	Perdaman Response
employees reviewing the submission not see how ludicrous locating the Perdaman Urea plant on the site is NOT AN ACCEPTABLE LOCATION for a fertilizer plant?	Historic Site used for Industrial/manufacturing purposes with the Historical Theme – Occupations – Mining (including mineral processing). In relation to the comments suggesting only zero emissions should be tolerated, the proponent notes that this is not practicably achievable for any process. The Proponent recognises that if an emission does not leave site as a saleable or useable product, it must leave or be managed as a waste, either as a long-term legacy onsite or as a discharge offsite. The reduction of residual NO_x emissions is at diminishing returns – lower NO_x numbers in one process area, and • can result in greater use of resources to manufacture and install any necessary equipment, • with greater power and water draw demands in operation, • both of which results in increased NO_x and other product of combustion emissions • that can be disproportionate to the initial reduction being sought. To manage potential environmental impacts to ALARP levels, as indicated in the ERD Section 4.8.4.1 the Project is utilising best applicable technology in design (Table 4-31) to minimise emissions as discussed in Section 4.8.5 (p160). As indicated on p250, the ERD notes that the Project will also contribute to sustaining current and future generation across multiple global settings viz:

Submission #7 Public	Perdaman Response
	"Increased crop yields through utilization of the produced urea as fertilizer will assist to sustain current and future generations globally. The Project is estimated to enable food production to feed approximately 90 million people."
Reputation of the Money/Investors behind the Project And who is financing this project? Just look at his history of projects, expenditures, and reputation, and you know that this project will be cut to the bone as far as expenditure on reducing emissions, if not forced to do so by the approving authority. The governments and approving authorities around the world have been far too lax in the past in understanding what polluting air emissions are doing to contribute to Climate Change. It's time to take back that authority, deal with people who want to make money, but allow them only to do so without adding to air emissions, climate change or contamination of sites any longer. I hope and pray that our children's children will be able to live with the legacy that we have left for them. It's an opportunity to lead the way, to set a precedent in approvals of this kind, and the WA Government should take the lead.	The Proponent notes this potentially libellous comment.

Summary ONLY approve the Perdaman Urea Plant at the Maitland Estate, if at all, based on sound scientific evidence that all the requirements for a clean, non-polluting plant can actually be built and maintained for the life of the plant. Only approve the Perdaman Urea Plant with zero emissions from their plant. ONLY approve the Perdaman Urea Plant when Government has established an assessing body to determine that the emissions are indeed zero at all times, both during the construction of the plant, and the on-going operations of the plant. This should be done now, to monitor all other industries currently operating in WA. both on the Burrup and elsewhere, like Barrow Island, Onslow, Port Hedland, Esperance, Kalgoorlie, Rockingham and Cockburn, and all other industrial estates in WA, regardless if this project proceeds or not. ONLY give them one chance of breaching these conditions, and their licence will be revoked to continue to operate. It is compliance or shutdown—it cannot be anything else. ONLY approve the plant on the basis that they are a stand-alone facility, and responsible for their emissions. They cannot buy carbon-offsets to allow them to pollute. It is zero emissions, full stop. Yours sincerely,	Why not Maitland Strategic Industrial Area? See ERD Section 2.2.4 re location options consideration. One alternative site which was considered was the Maitland SIA. While potentially feasible for the engineering construction of a urea plant, Maitland SIA lacks the necessary “project ready” infrastructure to underpin a viable operating project at this time. Significant public investment would be required in common user facilities such as those already available at the BSIA. Further, establishment of such facilities at Maitland SIA pose additional environmental and cultural impacts that would need to be addressed. For example, locating the urea plant at Maitland SIA, would require new port facilities and/or a new common user service corridor. Transhipment of urea would require a significant increase in truck movements and larger storage sheds at both the port and plant site. Maitland SIA would also require new infrastructure for sea water supply and brine disposal. In relation to the comment on Zero emissions, the Proponent reaffirms that this is not practicably achievable for any process. The Proponent recognises that if an emission does not leave site as a saleable or useable product, it must leave or be managed as a waste, either as a long-term legacy onsite or as a discharge offsite. The reduction of residual NO_x emissions is at diminishing returns – lower NO_x numbers in one process area, and • this can result in greater use of resources to manufacture and install any necessary equipment, • with greater power and water draw demands in operation,

Submission #7 Public	Perdaman Response
	• both of which results in increased NO_x and other product of combustion emissions • that can be disproportionate to the initial reduction being sought.

APPENDIX

I

SUBMISSION #8 DEPARTMENT OF JOBS, TOURISM, SCIENCE AND INNOVATION

Submission #8 JTSI	Perdaman Response
The Department notes Perdaman Chemicals and Fertilisers' proposal and has no comments on the Environmental Review Document.	Noted

APPENDIX

J

SUBMISSION #9 MURUJUGA ABORIGINAL CORPORATION

Perdaman Response to Submission #9 (MAC)

In relation to the submission provided by Murujuga Aboriginal Corporation (MAC), Perdaman addressed the issues raise in this submission through direct engagement and a continuation of the ongoing dialogue with MAC and the Circle of Elders that had commenced well before the Project was referred pursuant to s.38 of the EP Act by a third party.

Through this dialogue and engagement, MAC has confirmed - see Attachment 1 below, that it "is satisfied that Perdaman continues to address MAC's concerns as expressed in our ERD review." And that further ongoing dialogue is expected to resolve any outstanding aspects "prior to the commencement of any major civil works on site". Some of the issues raised are mutually recognised in principle, but it is accepted can only be resolved to finality through detailed design post Part IV approval. In a similar manner to the approach implemented in relation to the separate application for s18 consent, Perdaman will liaise with MAC on the application for Part V Works Approval prior to the commencement of any major civil works.

A core outstanding issue relates to additional information relating to further cultural study to more fully examine and record intrinsic cultural values across the entirety of Murujuga. As agreed during consultation with MAC this is not part of EIA process.

As a good will gesture the Proponent as an industry participant and, subject to FID and all stakeholders agreeing TOR, is amenable to be part of a "Cultural Study" (Commercial in confidence correspondence with MAC in relation to this study has been provided directly to the EPA to inform its consideration for this aspect). Perdaman is continuing to liaise with MAC and JTSI to support work in this regard to augment the World Heritage listing application, as well as augment resources that can underpin the operation of the proposed Living Knowledge Centre.

Through this dialogue, the Circle of Elders has also agreed to Perdaman lodging an application for s18 consent under the Aboriginal Heritage Act to impact three heritage sites in Site C that cannot practicably be avoided.

Also through this dialogue, MAC has endorsed the Perdaman Project Destiny Heritage Charter which forms Attachment A to the Aboriginal Heritage Management Plan included in RtS Appendix U herewith.

In relation to the World Heritage listing application for the broader Murujuga area, in accordance with its agreement of November 2020 as noted in the ERD, Perdaman has agreed to provide support for MAC's efforts to progress and secure this listing.

In relation to project emissions and potential impact on rock art, Perdaman has committed to being a contributing participant in the Murujuga Rock Art Strategy which MAC and the State Government are jointly implementing for the purpose of ensuring relevant and appropriate measures are pursued for the purpose of ensuring the continuing integrity of rock art at Murujuga.

In relation to GHG issues, Perdaman has prepared a separate GHG Management Plan (see RtS Appendix U) to reflect the EPA GHG guidance statement which was

finalised and released in April 2020 after the ERD was released for public review and is reflected in MAC's submission.

In relation to the causeway related issues, Perdaman has provided further briefing to MAC and the Circle of Elders in relation to the issue of concern, including the requested independent third party review who also presented to the Circle of Elders in support of that review. Figures CW105560-CI-SK01 to SK13, included in Attachment 2 below, showing modelled drainage performance under a range of meteorological scenarios, were presented to the Circle of Elders after independent 3rd party review (also included in Attachment 2), to address the concerns raised.

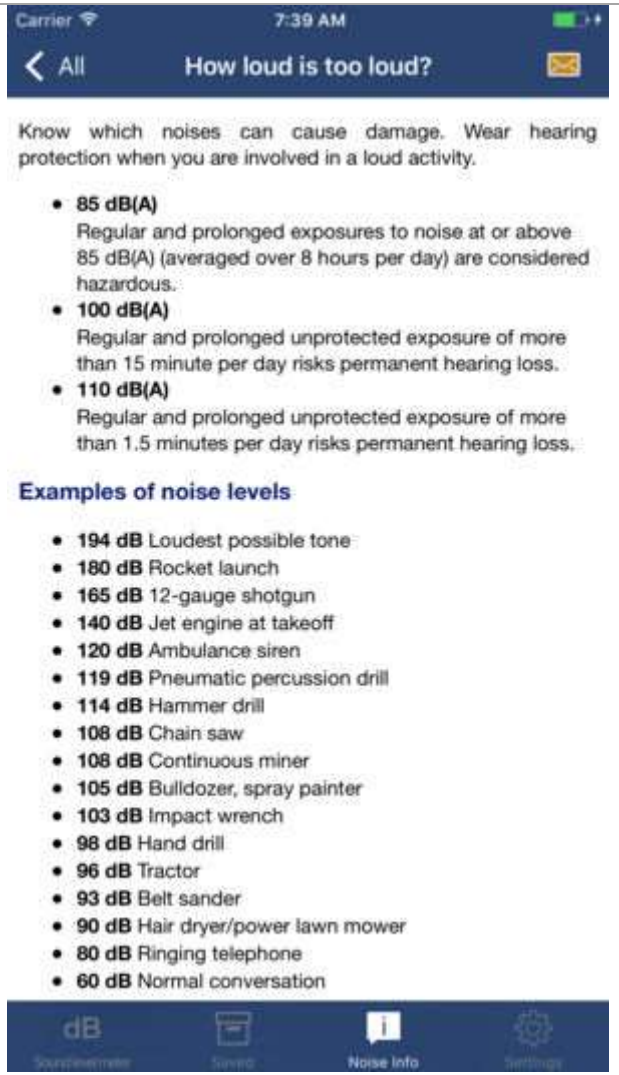
In summary, the table below show MAC's Summary of its Key Recommendations together with Perdaman's Summary of Responses from the extensive meaningful dialogue to address identified issues acknowledged in Attachment 1.

8. Key recommendations from MAC in its submission	Perdaman Summary of Responses
8.1. Factors: Coastal Processes and Inland Waters 1. Consultation to identify relevant environmental values is required. 2. The proponent needs to further demonstrate application of the mitigation hierarchy of the plant layout. 3. Consider alternative options to building the causeway between Sites C and F to minimise and avoid potential impacts.	Addressed as part of ongoing consultation see above and Attachment 1. Perdaman reaffirms that its design considerations have evolved from a situation of potential high impacts for this factor ie total infill with underflow drainage, between Sites C and F, to an elevated Causeway design with significantly reduced footprint and associated footprint impacts incorporating large diameter, short culverts with significantly larger flow capacity compared to the flow limits imposed in this area by the existing Burrup Road culvert installation. This design mitigates the risk of material impacts to geomorphic coastal processes, inland waters and associated identified cultural heritage values in this vicinity.
8.2. Factor: Marine Environmental Quality 1. Consultation with MAC is required to identify relevant Environmental Values for the EQMF. 2. An EQMF needs to be developed with clear, measurable, and auditable EQCs for each EQO and appropriate monitoring requirements. 3. Need to include the potential impact of the MUBRL outfall within assessment of potential impacts to MEQ.	As indicated in the ERD and as confirmed by the Water Corporation letter included in ERD Appendix J, Perdaman will utilize available approved capacity in the MUBRL. If additional approvals are required in relation to operation of the MUBRL, this letter confirms that Water Corporation is responsible for such matters.
8.3. Factor: Flora and Vegetation 1. Implement the mitigation hierarchy to avoid clearing of vegetation for use as a laydown area. 2. Define revegetation objectives and demonstrate whether revegetation is achievable within the project area. 3. Update the Weed and Flora Management Plans to include meaningful monitoring, reporting, and contingency actions and commitments. 4. Clearly define proposed offsets and include offset requirements within the conditions of approval	Addressed as part of ongoing consultation see Attachment 1. Responses to other submissions on this Environmental Factor eg by DAWE and/or DWER also address the matters raised. A specific consolidated response re offsets is included as Appendix V in this Response to Submissions.

8.4. Factor: Terrestrial Fauna 1. Due to the biological survey being limited, MAC believes that a comprehensive understanding of the terrestrial fauna occupying this site has not been achieved. 2. MAC requests this port development area be explicitly detailed on a map and the size of the proposed clearing provided, so that potential impacts can be assessed given the lack of biological surveys undertaken for these areas. 3. MAC does not believe that the proponent has sufficiently considered avoidance as part of the evaluation process within the mitigation hierarchy for the samphire shrublands/supra-tidal flats habitat. MAC does not consider the current proposed disturbance (through creation of the causeway) to this area as acceptable. 4. It is unclear what rocky outcrops are proposed to be disturbed, MAC therefore require additional clarification and detail surrounding the location and surface area size of the rocky outcrops proposed to be removed. 5. In addition to the independent licensed fauna handler, MAC requests that Aboriginal Fauna monitors also be present during all construction and salvage works, for the duration of the construction phase of the project. If the EPA decides to grant approval for this project, it is recommended this is made a condition of approval. 6. MAC considers the current proposed habitat clearing has the potential to have a significant impact to fauna. It is recommended that an alternative temporary laydown area be identified and used as part of the scope of this project. 7. The proponent needs to provide further evidence that actions to reduce impacts of noise and light pollution on fauna are sufficient. 8. More details are required on the Fauna Management Program, to include meaningful monitoring, reporting, and contingency actions and commitments. 9. The Introduced Predator Control Program and Cane Toad Monitoring Program should be developed prior to approval, to ensure they are sufficient to mitigate potential impacts on terrestrial fauna.	Addressed as part of ongoing consultation see Attachment 1. Responses to other submissions on this Environmental Factor eg by DAWE and/or DWER also address the matters raised.
8.5. Factors: Air Quality and Greenhouse Gas Emissions 1. Potential health impacts from particulate matter emissions need to be accurately identified and assessed, with appropriate management actions outlined. 2. Verify the findings of the air quality modelling assessment through peer-	Addressed as part of ongoing consultation see Attachment 1. Separate updated AQMP and GHGMP provided in RtS Appendix U herewith. Perdaman has reaffirmed that as part of the implementation of the approved project, it commits to being a contribution participant in the MRAS which is jointly overseen by DWER on behalf of the state government and MAC.

review by an independent expert. Include a more accurate 'worst-case scenario' for assessment. 3. Formalize arrangements to support a long-term air monitoring network on the Burrup Peninsula. 4. Provide complete and accurate estimates of all greenhouse gas emissions resulting from project activities. 5. Update emissions reductions targets to align with current government policy. 6. Demonstrate the use of BAT with comparison to contemporary sources and technological options. 7. Consider alternative feedstock such as green hydrogen.	
8.6. Factor Social Surroundings 1. Apply the Precautionary Principle to the assessment of potential impacts and the management of rock art. 2. It is not appropriate to portray economic benefits of the project in assessment of the potential impacts of the project, or as offsets, and so this should be removed. 3. The scope and purpose of the existing commercial agreement with MAC needs to be more accurately represented. 4. Arrange a separate, unimpeded access pathway to the heritage site remaining within the development envelope (Site ID 9439). Identify the location of the *Fish Thalu* site and assess any potential impacts to it, including access restrictions. 5. Aboriginal Heritage monitors need to be present for all construction activities with the potential to impact cultural heritage. An implementation plan and procurement contract need to be arrangedto formalize these and additional employment arrangements. 6. Recommendations for the improvement of the Heritage Charter resulting from previous consultation with MAC need to be implemented. 7. Potential impacts from noise emissions need to be further assessed, and an appropriate noise management plan developed.	Addressed as part of ongoing consultation see Attachment 1 and discussion above in relation to a Cultural Survey. Perdaman confirms that the roles of Aboriginal Heritage monitors is an area of in principle alignment, the precise numbers and specific roles for construction activities will be confirmed and formalised prior to the commencement of major civil works. As noted above MAC has co-signed the reviewed and revised Heritage Charter which forms Attachment A of the revised AHMP in Appendix U herewith. In relation to noise emissions, Perdaman reaffirms its ERD position that DWER Noise Branch has reviewed the assessment in the ERD and confirmed that it is fit for purpose. Perdaman also reaffirms that all construction and operations activities will be conducted within the standard set out in the ERD. A specific consolidated response re offsets is included as Appendix V in this Response to Submissions. **Confidential aspects of the following responses to specific issues raised directly by MAC with the EPA contain sensitive site specific information shared in confidence by MAC which while provided to inform the EPA consideration are redacted for public release** **Specific Issue raise by MAC directly with EPA - the relocation and exclusion of aboriginal heritage sites within Sites C and F;** In relation to Site C, four (4) sites were originally identified for relocation – Site # 19239, 19874, 20037 and 18615 would require consent from MAC and its Circle of Elders to seek s18 consent under the Aboriginal Heritage Act for this purpose (see figure REDACTED below). However, through extensive liaison, the Circle of Elders has consented to Perdaman preparing and lodging a s18 application to relocate three (3) of those sites identified in the ERD in Site C. The Circle of Elders consented to the preparation and lodgement of a s.18 application including sites #18615, 19239 and 19874. Through adaptive design, Site # 20037 will be preserved and protected in situ with the conveyor passing over rather than

	through the site. These three sites will be relocated (subject to s18 Ministerial consent), to an agreed location identified as part of the s18 Ministerial consent. Figure Redacted For Site F, please see figure REDACTED below. This shows that all heritage sites in the vicinity of Site F will be avoided and preserved in situ. It is planned that the lease from Development WA will follow the black line at the southern edge around sites #9296, 26008 and MAC 004 and will follow the black line to the west, south and east of the NHP area including Site # 9439. For safety and operational security purposes, the lease boundary will be fenced which will provide protection from Project operations by a physical barrier. As the fence installation will be a ground disturbing activity, it will be subject to the provisions of a Ground Disturbance Permit (GDP) as required by the Project's Environmental Management Plan (PEMP) and Aboriginal Heritage Management Plan (AHMP). Figure Redacted **Specific Issue raise by MAC directly with EPA - the commitment for ethnographic surveys to be undertaken;** Commercial in confidence letter provided directly to EPA outlining Perdaman's commitment to undertake additional cultural study works. **Specific Issue raise by MAC directly with EPA -** the need for information on predicted noise levels at the Yatha and Fish Thalu sites within Site F (The EPA Services Directorate suggests that you should also include the National Heritage Listed (NHL) area within Site F); The assigned noise level can be derived from the assessment report in ERD Appendix F. From Table 2-2 of that report, the assigned noise levels applicable at either Yatha or the National Heritage Listed Area sites within Site F would be 60 dB LA10, on the basis that these may be considered 'noise sensitive premises' but without a building associated with a sensitive use. Empirically, a noise level of 60 dB can be equated to a normal conversation. See below.



By way of further comparison, Figure 4-1 from the ERD report shows LA10 contours over the area in question also – see below.

The above contour information shows predicted noise levels during operation of between 50-55 dB LA10 for the Yatha, ~55 dB LA10 for the NHP place in Site F and between 55-60 dB LA10 in the vicinity of the Fish Thalu to the north east of Site F outside the Development Envelop.

This can be compared to the historic background noise observations detailed for a site approximately 12 metres south of Hearson Cove Road and approximately 100 metres west of Burrup Road in Site F that was included in Section 4.10 of the 1999 CER for Syntroleum's use of Site F – see snip below. This shows a change of daytime LA10 background from 46-47 dB LA10 in this vicinity. It is noted that these observations predate the development of both Yara facilities and Pluto in the region and the associated likely increase in traffic related background noise, as well as the increase traffic related background noise associated with increase tourist visitation to Murujuga National Park and Hearson Cove.

4.10 Noise

A noise assessment was undertaken by HLA-Envirosciences for the Project. Background noise monitoring was undertaken between 28 April 1999 and 6 May 1999 at a location within the proposed Syntroleum GTS plant site, approximately 12 metres South of Hearsor Cove Road and approximately 100 metres east of Burrup Road.

Noise monitoring was carried out using an Acoustic Research Laboratories Environmental Noise Logger, which meets the requirements of AS1259.1 (1990) and the *Environmental Protection (Noise) Regulations 1997*. The logger was set to A-weighted, fast response and noise levels were recorded continuously over 15 minute sampling periods. The logger was calibrated both before and after the monitoring session using a Bruel and Kjaer Type 4230 calibrator.

Background noise levels presented below in **Table 4.2**.

Table 4.2: Background Noise Monitoring Results, 28 April 1999 to 6 May 1999

Day	Time	LA_{10} - dB(A)	LA_{90} dB(A)
Weekday	07:00 – 18:00	46	35
	18:00 – 07:00	50	42
Weekend	07:00 – 18:00	47	36
	18:00 – 07:00	48	41

The monitoring indicates that the average day-time, weekday background noise level (LA_{10}) for the site is 46dB(A). Background noise levels on the proposed Syntroleum site are very low. The site boundary to the west is the Burrup Road. Within 50 metres of the Burrup Road L_{A10} noise levels range between 40 and 60 dB(A) depending on the traffic volumes. Hearson Cove Road which travels through the north of the site carries much less traffic, and at reduced traffic speeds than the Burrup Road. Within 50 metres of the Hearson Cove Road L_{A10} noise levels range from 38 to 50 dB(A). The other areas of the site are very remote from noise sources. The L_{A10} noise levels in all other areas range from 35 to 45 dB(A).

Specific Issue raise by MAC directly with EPA the causeway design, the provision of a copy of the peer review of the design, and clarification in regard to whether the recommendations from the peer reviewer have been incorporated into the design of the causeway;

By way of background, the independent 3rd party review was provided to EPA by email on 1st October, 2020 accompanying the Response to Submissions. The 3rd party reviewer presented to the MAC Board and Circle of Elders on 11th November, 2020 (see attached summary by the reviewer). This presentation by the reviewer proceeded and informed the position expressed in the MAC letter of 6th January, 2021, which was included in Appendix J of the Response to Submissions provided to the EPA on 14th January, 2021.

The Peer reviewer concluded:

> *"I reaffirm that in my professional opinion, based on more than 40 years of experience in relevant fields, I conclude that the installation of the causeway as proposed by Perdaman will have minimal adverse effects on the current receiving environment in the intertidal areas between site C and F or the adjoining higher ground."*

Perdaman will ensure that the outcomes of the peer review are incorporated into the final detailed design and construction of the causeway.

Specific Issue raise by MAC directly with EPA proposed rehabilitation of the construction laydown area in Site F once construction activities has been completed. Will it be rehabilitated, and if so, how soon after construction has been completed?

Sites C and F are integral parts of the project. An explanation regarding rehabilitation of this area was provided in Perdaman's response to submissions to MAC. See excerpt below from Perdaman's RtS Document Appendix J (Submission #9 MAC – responding to response 4.1) relating to Site F Laydown area. The response below was provided following meetings with MAC on 11/09/20 and 25/09/20 at Perdaman offices. Perdaman will undertake any required rehabilitation earthworks / erosion control within the laydown area to ensure the site is safe and stable following construction activities, and plan to rehabilitate the site to pre-disturbance state after expiry of the lease or at the end of project life.

The Proponent's lease will be a long-term allocation for use throughout the project life. Laydown will be a temporary activity, but throughout the project life, such temporary use could recur during shut down and maintenance activities or project related activities. Therefore, while the use is temporary rather than continuous in nature, laydown should not be considered short term. The Proponent will rehabilitate the site after the expiry of the lease or end of the Project life. Disturbed areas / habitats will be returned to their pre-disturbance state to reduce the overall impact of habitat loss.

	Further, Site F will be used for construction laydown for equipment, storage and other matters within the development envelope. During operations, Site F will have permanent facilities such as administration building(s), maintenance sheds and warehouse etc. Site F will also have water management facilities. Other parts of Site F will be used for preventive maintenance, overhauling of equipment, and potential research development facilities for additional solar and technology enhancement to adhere to Greenhouse gas commitments. See Figure Above. **Specific Issue raised by MAC directly with EPA -** the configuration of the disturbance footprint within Site F, how does this interact with the three Aboriginal heritage sites that the MAC has identified. Please see latest plot plan of Site F below (REDACTED) showing how heritage sites interact with proposed infrastructure. As noted above the three heritage sites MAC has identified, viz Sites # 9296, 26008 and MAC 004 will lie outside of the Project lease area. As noted above the only project activity in near proximity to these three sites will be the Project lease boundary fence which will provide a physical protective mechanism to avoid interaction of project disturbance with these sites. As discussed above, no heritage sites will be within the Project disturbance footprint on Site F, the only Project infrastructure to be constructed near or adjacent to heritage sites will be the project lease boundary fence, which will then provide a physical protective mechanism from interactions with Project activities. As the fence installation will be a ground disturbing activity, it will be subject to the provisions of a Ground Disturbance Permit (GDP) as required by the Project's Environmental Management Plan (PEMP) and Aboriginal Heritage Management Plan (AHMP). Figure Redacted

Attachment1: MAC correspondence to update EPA on resolution of submission issues.

6 January 2021

Daniel Hunter
Manager - Environmental Planning and Approvals
CARDNO
11 Harvest Terrace
West Perth WA 6872
via email: daniel.hunter@cardno.com.au

Dear Daniel,

UPDATE - CONSULTATION WITH PERDAMAN - PROJECT DESTINY

In relation to the Perdaman Urea Project, Project Destiny (the Project), Environmental Impact Assessment (EIA), I would like to update the Environmental Protection Authority (EPA) on the consultation and interaction Murujuga Aboriginal Corporation (MAC) has achieved with Perdaman.

MAC reaffirms the views expressed in my previous letter to the EPA Chairman included in Perdaman's Environmental Review Document (ERD) Appendix, summarising Perdaman's efforts to engage and keep MAC informed throughout the EIA process.

Since our last update to the EPA in early September 2020, I can advise that Perdaman has continued to liaise with MAC and has sought to meaningfully address the matters raised during our public submission review of the ERD.

Through this dialogue, MAC is satisfied Perdaman continues to address MAC's concerns as expressed in our ERD review submission. It is noted that some issues have only been addressed in-principle and therefore remain outstanding. However, Perdaman has assured MAC they are committed in addressing these outstanding issues through ongoing and meaningful consultation with MAC prior to any major civil work on site.

A secure foundation for continuing dialogue has therefore been established and MAC looks forward to continued engagement with Perdaman as it works to implement its Project.

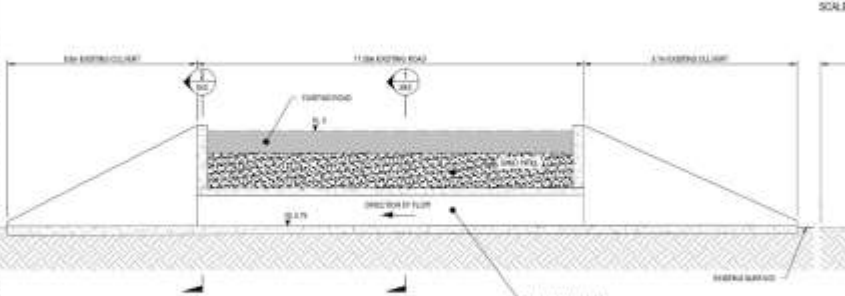
Kind regards,

Peter Jeffries
Chief Executive Officer
Murujuga Aboriginal Corporation

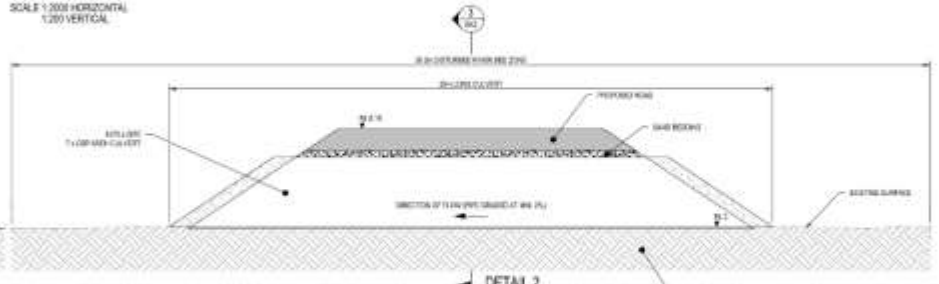
Attachment 2: Causeway MAC Comment 2 (including 2.2) Figures: CW105560-CI-SK01 - CW105560-CI-SK08 Presented to MAC Circle of Elders after 3rd party independent review (included below).

PLAN
SCALE 1:2000

SECTION A
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL



DETAIL 1
SCALE 1:100



DETAIL 2
SCALE 1:100

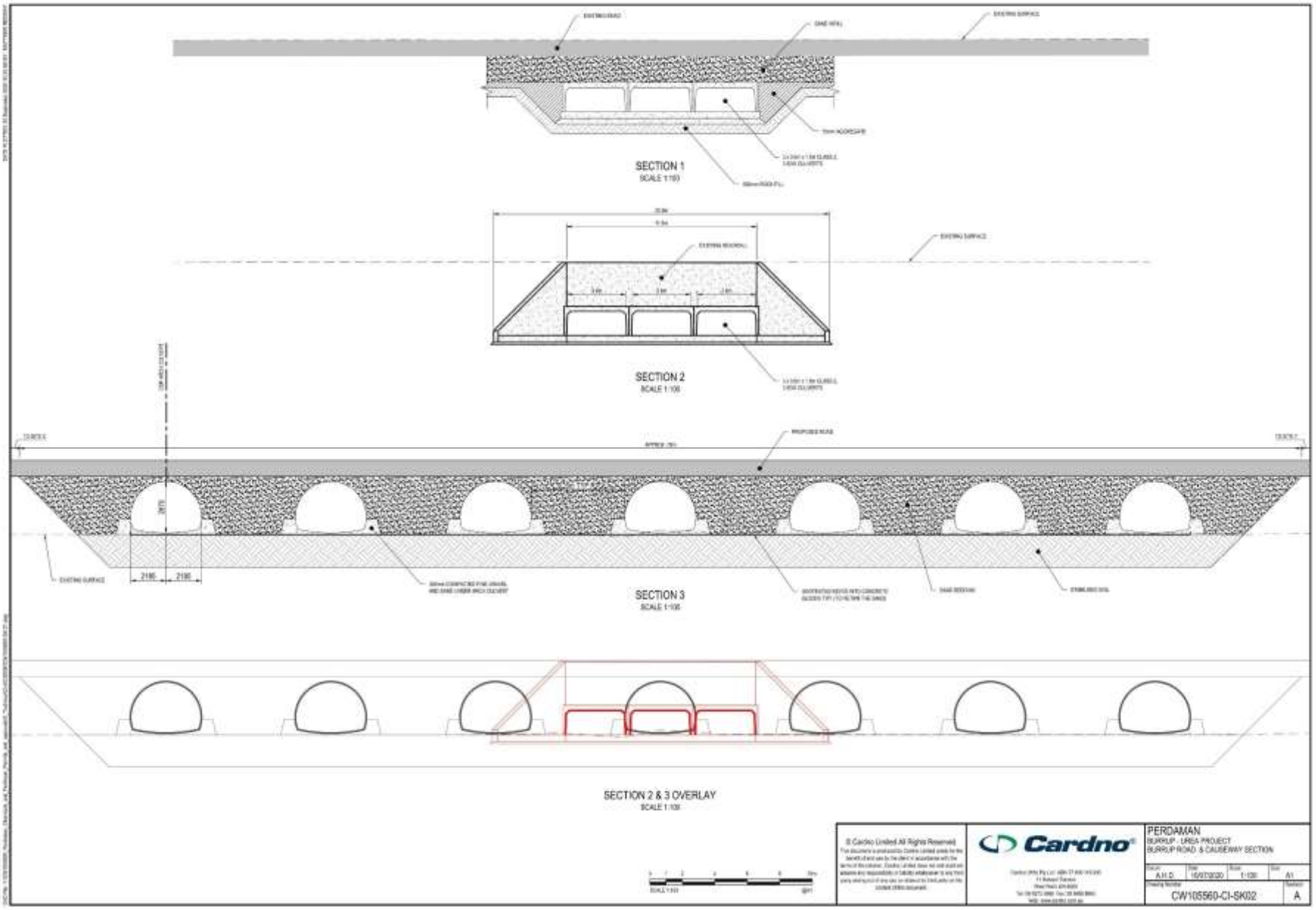
LEGEND

Cardno

PERDAMAN
BURRUP - UREA PROJECT
PLAN PROFILE

DESIGN	DRAWN	SCALE	SIZE
A.H.D	10/07/2020	AS SHOWN	A1

Drawing No/Rev: CW105560-CI-SK01 | Revision: A

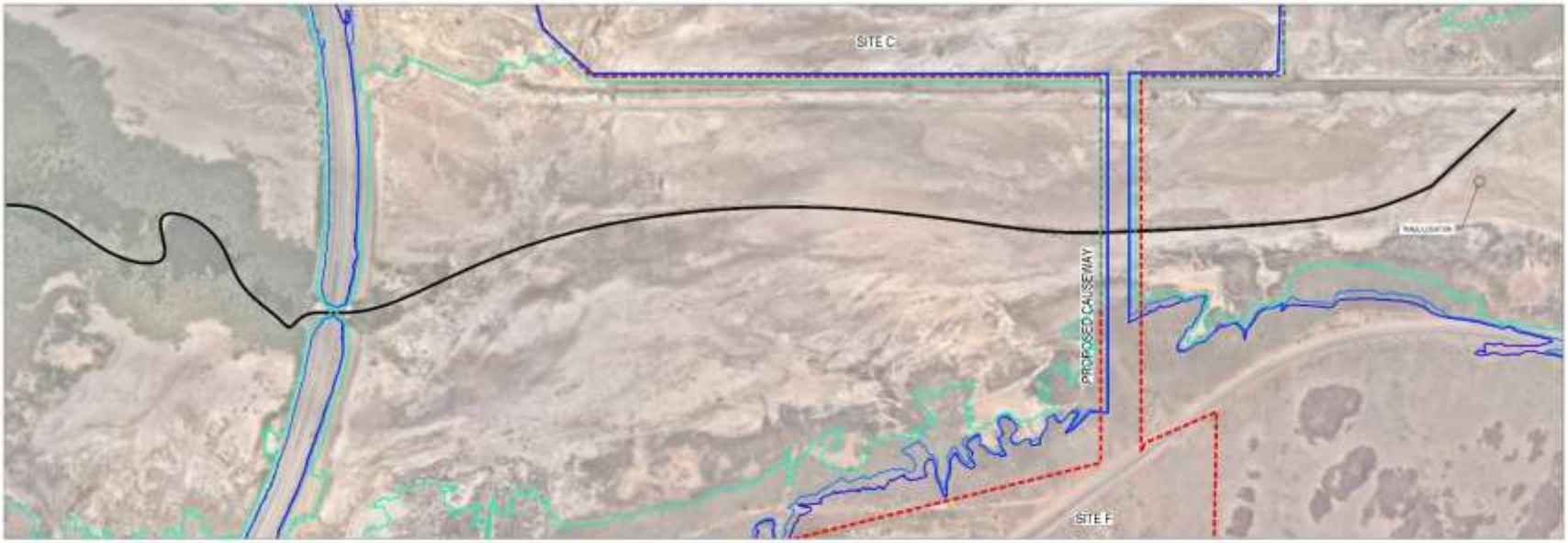


Cardno

PERDAMAN
BURRUP - URSA PROJECT
BURRUP ROAD & CAUSEWAY SECTION

Drawn	Date	Scale	Size
A.H.D.	16/07/2020	1:100	A1

Drawing Number	Revision
CW105560-CI-SK02	A



PLAN
SCALE 1:2000

1% AEP RAINFALL EVENT WITH HIGHEST ASTRONOMICAL TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

1% AEP RAINFALL EVENT WITH MAXIMUM AVERAGE TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

1% AEP RAINFALL EVENT WITH AVERAGE TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

RARE STORM

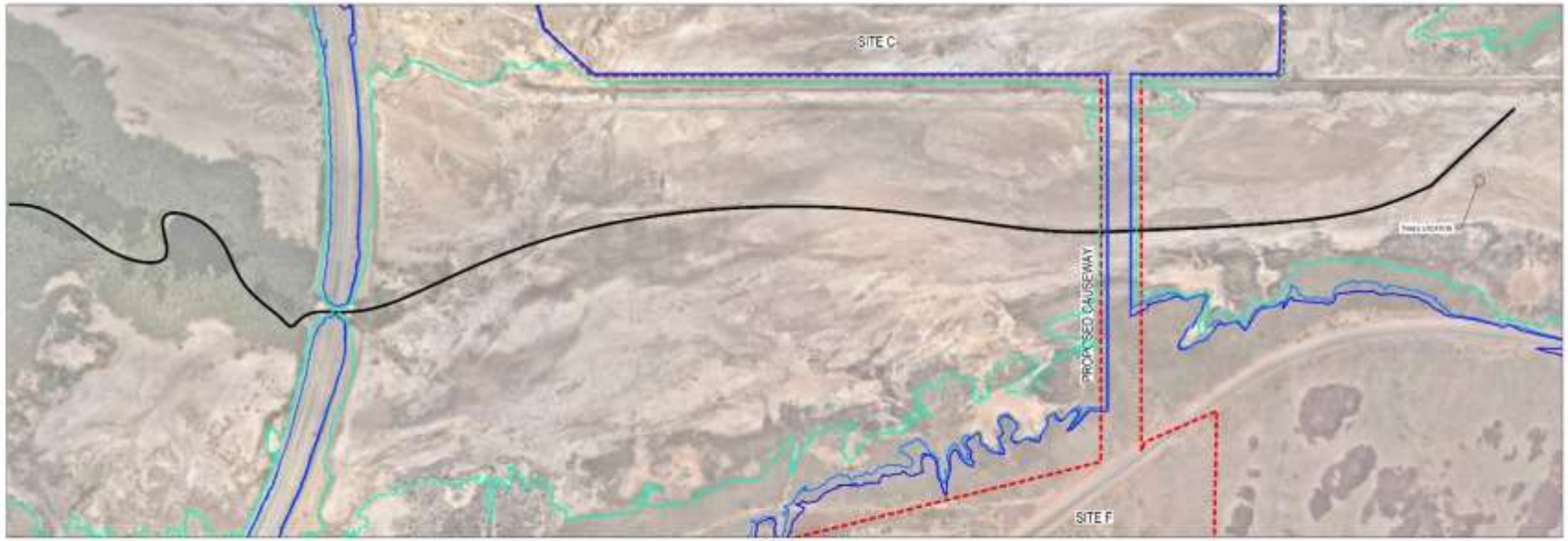
LEGEND

Cardno

PERDAMAN
BURRUP - UREA PROJECT
WATER EXTENTS PLAN PROFILES (1% AEP)
SHEET 1 OF 3

Drawn	Date	Scale	Size
A.H.D.	16/07/2020	AS SHOWN	A1

Drawing Number: CW105560-CI-SK03
Revision: B



PLAN
SCALE 1:2000

5% AEP RAINFALL EVENT WITH HIGHEST ASTRONOMICAL TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

5% AEP RAINFALL EVENT WITH MAXIMUM AVERAGE TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

5% AEP RAINFALL EVENT WITH AVERAGE TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

UNCOMMON STORM

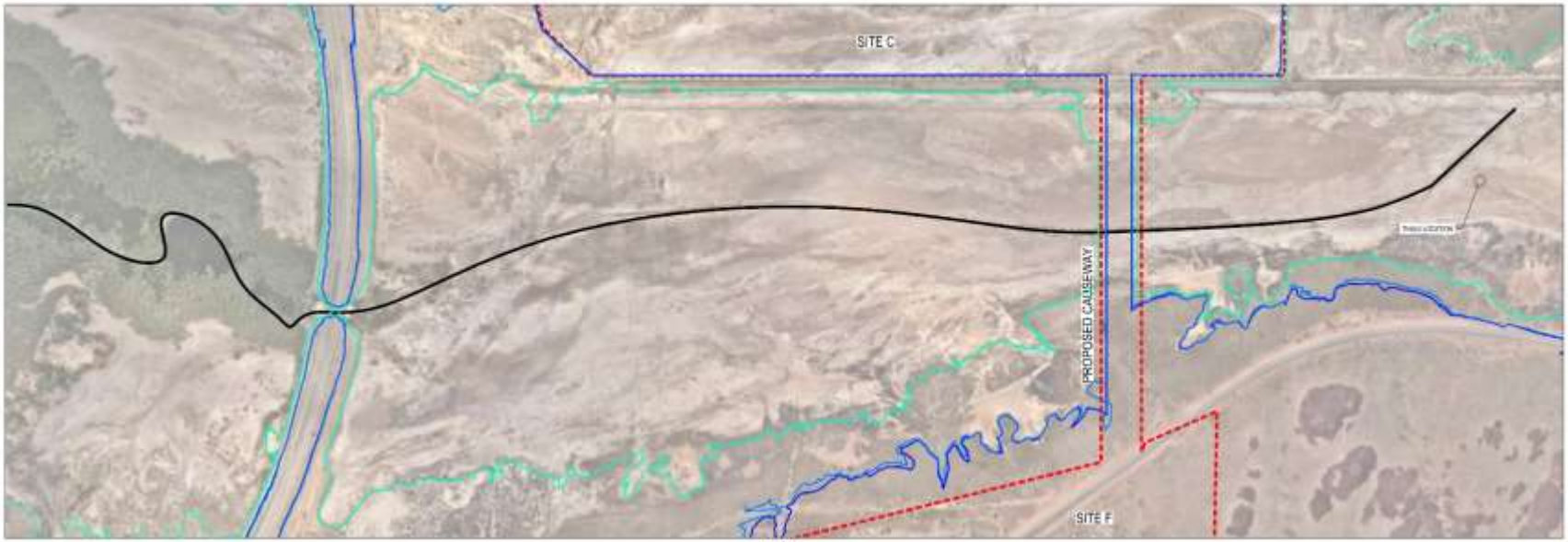
LEGEND

Cardno

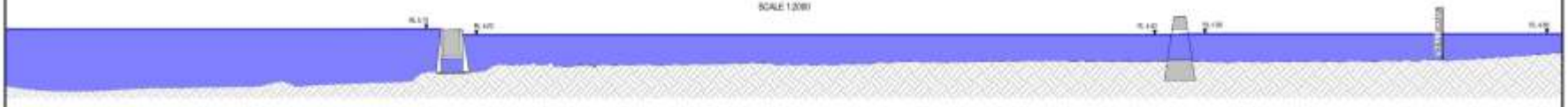
PERDAMAN
BUMIRUP - UREA PROJECT
WATER EXTENTS PLAN PROFILES (5% AEP)
SHEET 2 OF 3

DRAWN	DATE	SCALE	SIZE
A.H.D.	27/07/2020	AS SHOWN	A1

Drawing Number	Revision
CW105560-CI-SK04	A



PLAN
SCALE 1:2000



20% AEP RAINFALL EVENT WITH HIGHEST ASTRONOMICAL TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

20% AEP RAINFALL EVENT WITH MAXIMUM AVERAGE TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

20% AEP RAINFALL EVENT WITH AVERAGE TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

FREQUENT STORM

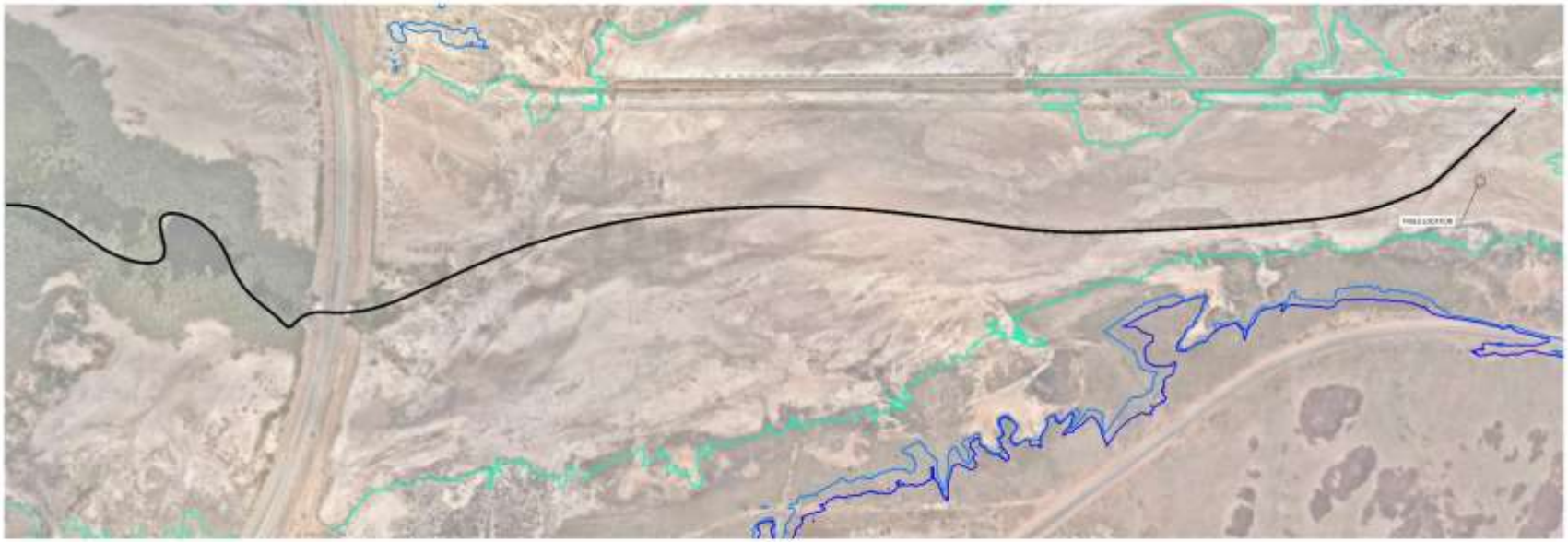
LEGEND

Cardno

PERDAMAN
BURRUP - UREA PROJECT
WATER EXTENTS PLAN PROFILES (20% AEP)
SHEET 3 OF 3

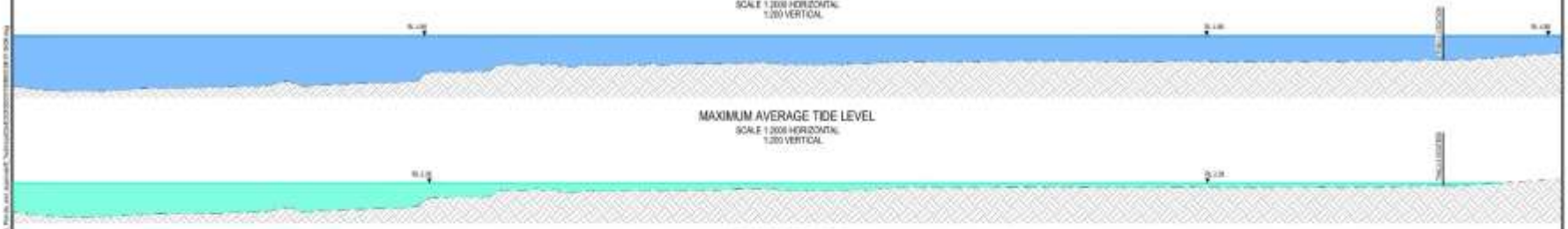
Drawn	Date	Scale	Size
A.H.D.	27/07/2020	AS SHOWN	A1

Drawing Number: CW105560-C-SK05
Revision: A

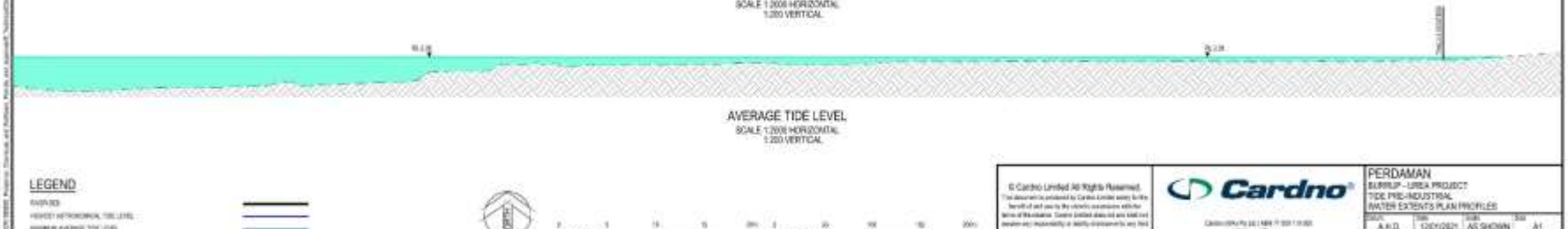


PLAN
SCALE 1:2000

HIGHEST ASTRONOMICAL TIDE LEVEL
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL



MAXIMUM AVERAGE TIDE LEVEL
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL



AVERAGE TIDE LEVEL
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

LEGEND

Cardno

PERDAMAN
BURRUP - UREA PROJECT
TIDE PRE-INDUSTRIAL
WATER EXTENTS PLAN PROFILES

DRAWN	DATE	SCALE	SIZE
A.H.D	12/01/2021	AS SHOWN	A1

Drawing Number: CW105560-CI-SK06
Revision: B

PLAN
SCALE 1:1250

LEGEND

NORTH

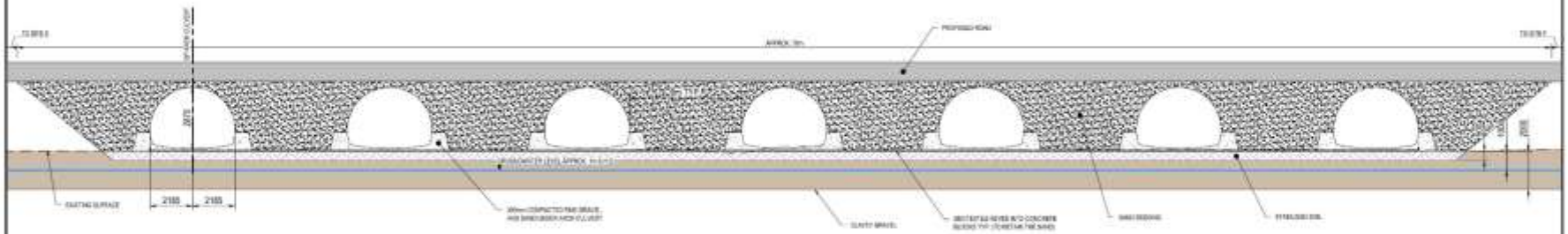
Cardno

PERDAMAN
BUKIT LIPIS - LIPIS PROJECT
ROAD WIDENING

Drawn	Date	Scale	Size
A.H.D.	24/09/2020	AS SHOWN	A1

Drawing Number: CW105560-CI-SK07

Revision: A



SECTION 3
SCALE 1:100

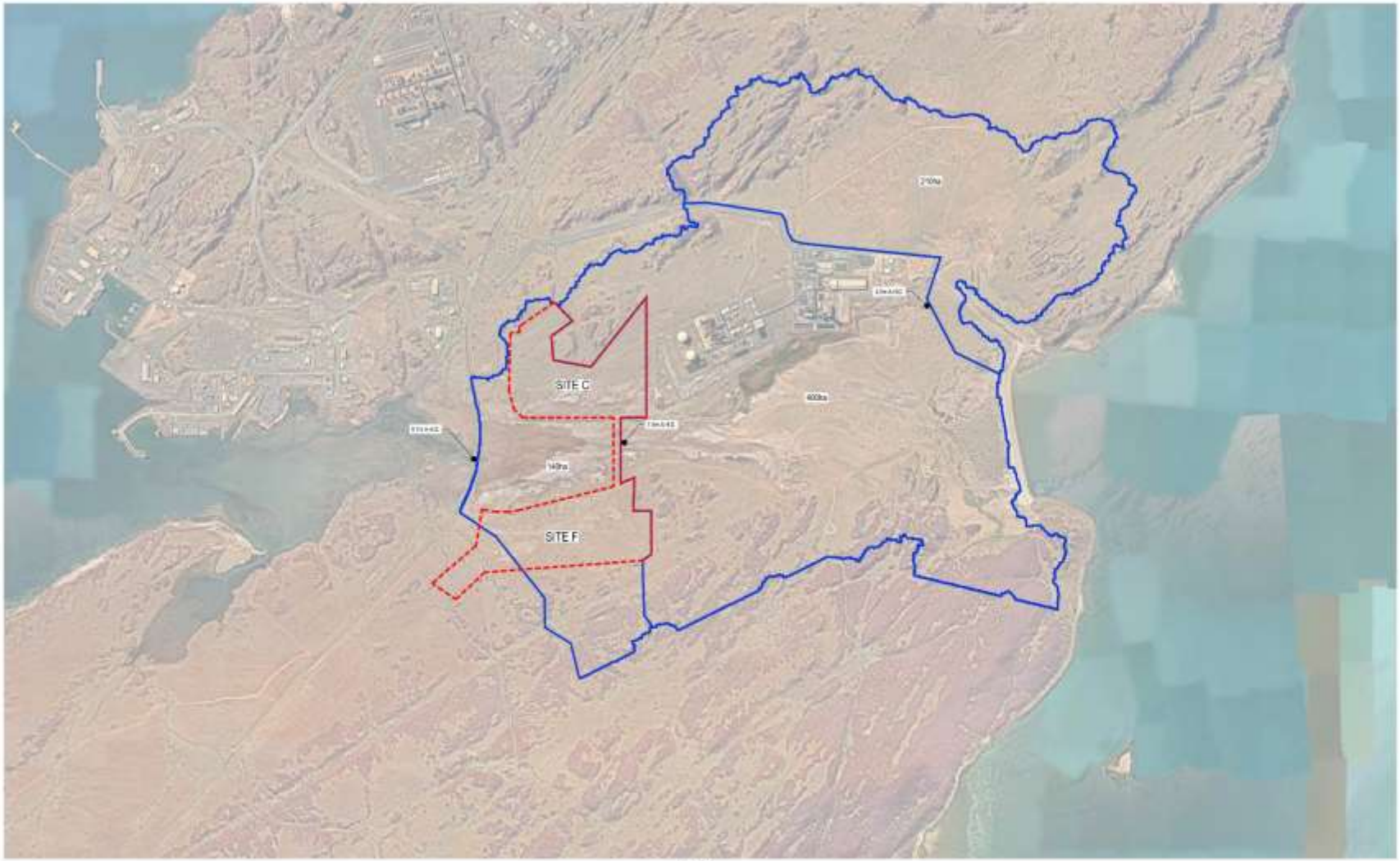
Cardno

PERDAMAN
SURRUP - UREA PROJECT
CAUSEWAY SECTION

Drawn	Date	Scale	Size
A.H.D.	10/07/2023	1:100	A1

Drawing No./Rev.
CW105560-CI-SK08

Revision
A



PLAN
SCALE 1:10000

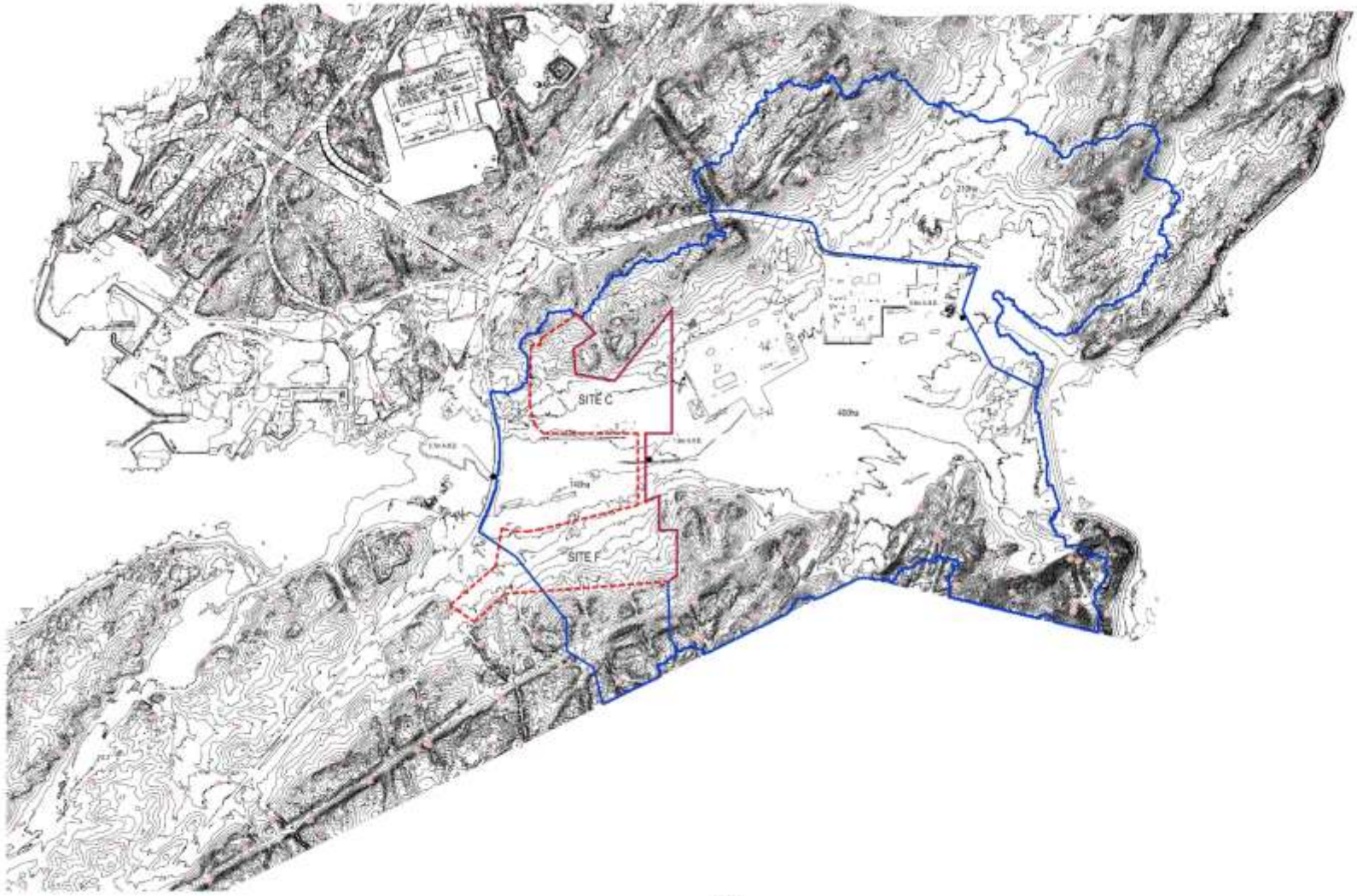
LEGEND
SITE BOUNDARY
CATCHMENT BOUNDARY
CATCHMENT AREA 1303ha

Cardno

PERDAMAN
BURRUP - UREA PROJECT

Drawn	Date	Scale	Size
A.H.D.	08/10/2020	1:10000	A1

Drawing Number: CW105560-CI-SK09
Revision: A



PLAN
SCALE 1:10000

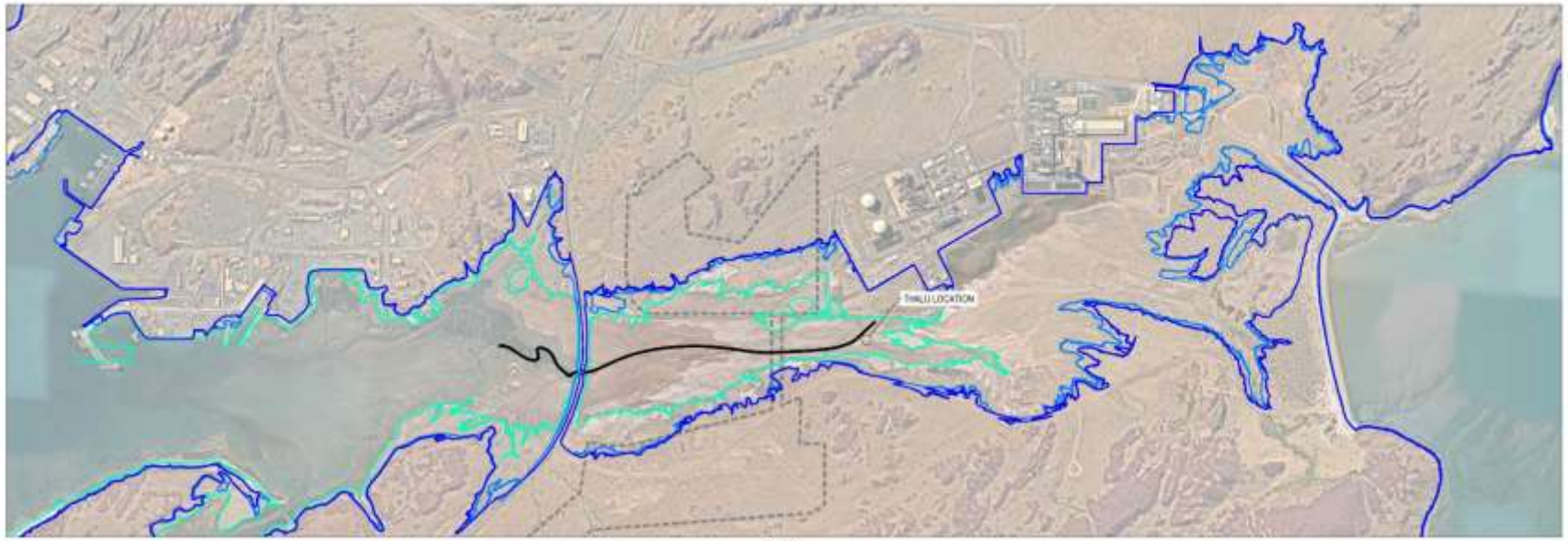
LEGEND
SITE BOUNDARY
CATCHMENT BOUNDARY
CATCHMENT AREA 100ha

Cardno

PERDAMAN
BURRUP - UREA PROJECT

Drawn	Date	Scale	Size
A.H.D	06/10/2020	1:10000	A1

Drawing Number: CW105560-CI-SK10
Revision: A



PLAN
NOT TO SCALE

HIGHEST ASTRONOMICAL TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

MAXIMUM AVERAGE TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

AVERAGE TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

PRE-DEVELOPMENT

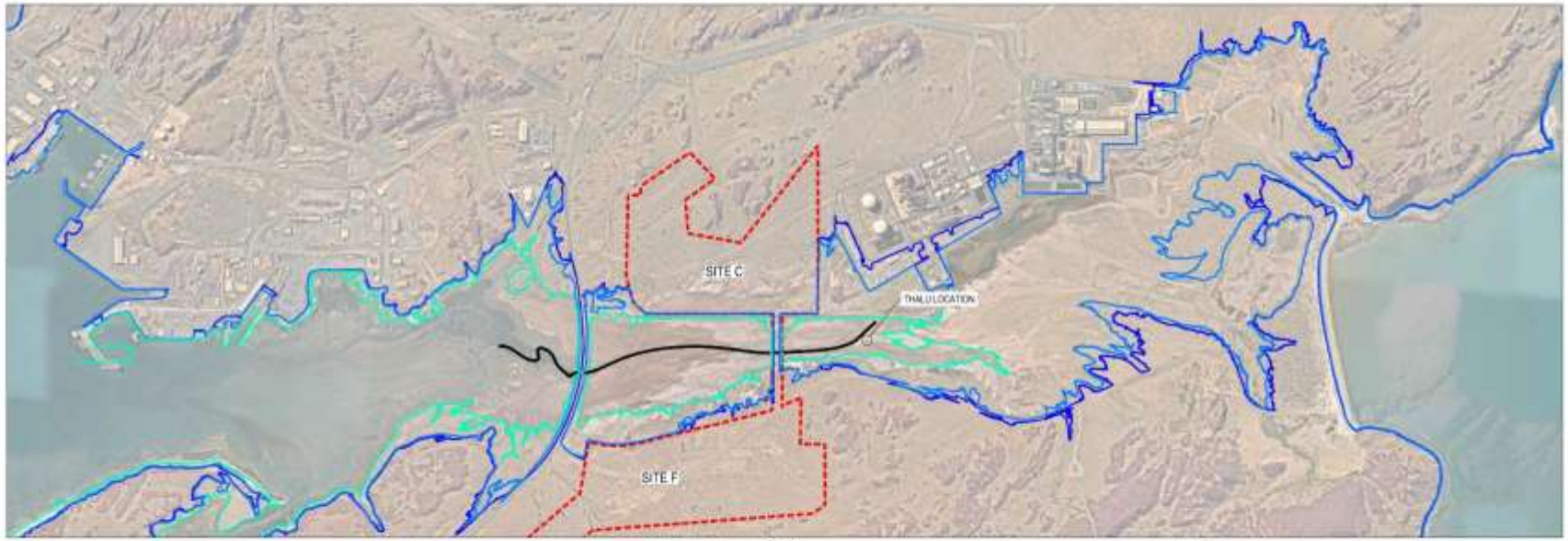
LEGEND

Cardno

PERDAMAN
BURRUP - UREA PROJECT
WATER EXTENTS PLAN PROFILES
PRE-DEVELOPMENT

Drawn	Date	Scale	Size
A.H.D	09/11/2020	AS SHOWN	A1

Drawing Number: CW105560-CI-SK11
Revision: A



PLAN
NOT TO SCALE

HIGHEST ASTRONOMICAL TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

MAXIMUM AVERAGE TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

AVERAGE TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

POST-DEVELOPMENT

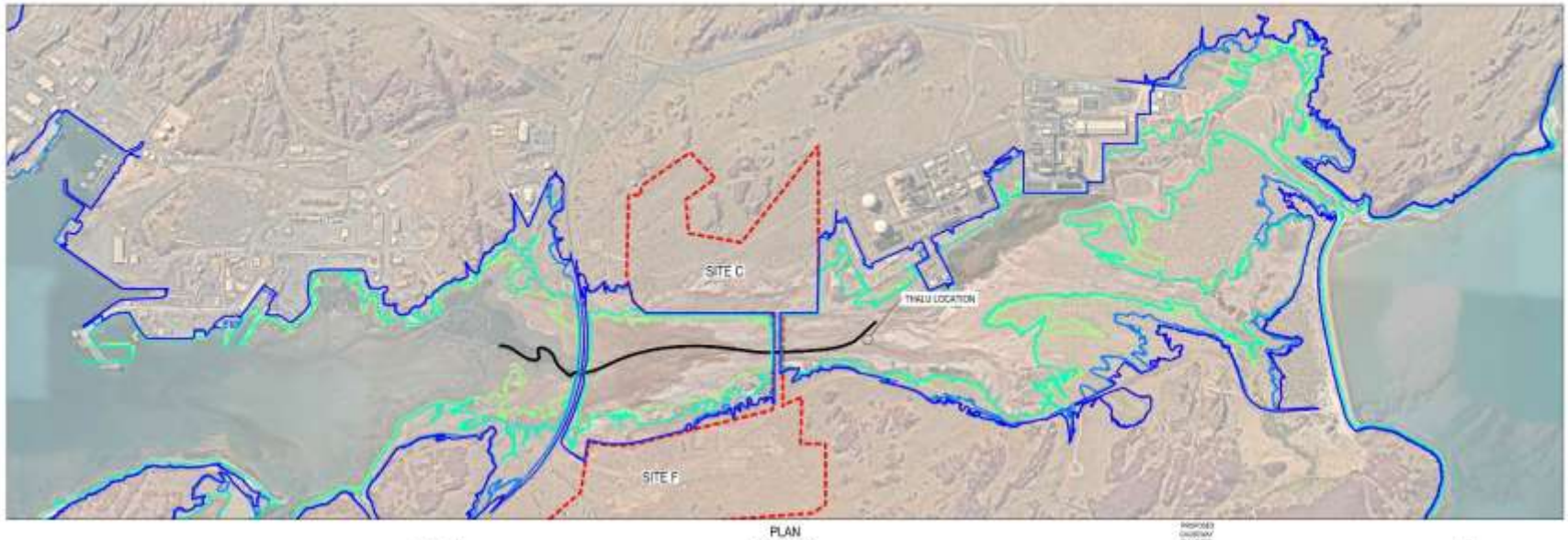
LEGEND

Cardno

PERDAMAN
BUMRUP - UREA PROJECT
WATER EXTENTS PLAN PROFILES
POST-DEVELOPMENT

DRAWN	DATE	SCALE	SIZE
A.H.D	09/11/2020	AS SHOWN	A1

Drawing Number: CW105560-CI-SK12
Revision: A



PLAN
NOT TO SCALE

1% AEP RAINFALL EVENT WITH HIGHEST ASTRONOMICAL TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

1% AEP RAINFALL EVENT WITH MAXIMUM AVERAGE TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

1% AEP RAINFALL EVENT WITH AVERAGE TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

POST-DEVELOPMENT

LEGEND

1% AEP RAINFALL EVENT WITH AVERAGE MINIMUM TIDE TAILWATER
SCALE 1:2000 HORIZONTAL
1:200 VERTICAL

Cardno

PERDAMAN
BURRUP - UREA PROJECT
WATER EXTENTS PLAN PROFILES (1% A.E.P.)
POST-DEVELOPMENT

DRAWN	DATE	SCALE	SIZE
A.R.D.	09/11/2020	AS SHOWN	A1

Drawing Number: CW105560-CI-SK13
Revision: A

3rd party Peer Review Outcome:

From: Jerome Goh and Associates

To: The CEO and Board of Directors, Murujuga Aboriginal Corporation, through Perdaman Chemicals and Fertilisers Pty Ltd.

To whom it may concern,

Murujuga Aboriginal Corporation (MAC), Perdaman Chemicals and Fertiliser Pty. Ltd (PCF) has sought my independent peer review of suitability of the evaluation of proposed causeway interconnection of Industrial Sites C and F in the Burrup Strategic Industrial Area (BSIA) which forms part of its Project Destiny Urea Project (the Project) provided to MAC for its decision making.

As a former Manager, Waterways for Main Roads Western Australia, I have considerable first-hand knowledge of road design and the consideration of hydrological and hydraulic ramifications as well as the application of relevant mitigations through design. I have relevant understanding of the historic and contemporary setting at the Pilbara that I have applied this in my review.

Additionally, the following past experience is also relevant to the review that has been requested of me.

- Past Chairman and current member of Hydrology Panel WA Branch IE Aust.
- Member of working group in the preparation of the 1987 Australian Rainfall and Run-off publication.
- Member of working group for the revision of Book 4 of the Australian Rainfall Run-off 2000 publication. • Member of the working group overseeing the development of the CRC – FORGE techniques of predicting large to rare rainfall events in WA. Upon completion of this project there was major revision in the polynomials for preparation of the rainfall intensity frequency duration relationships for WA.
- Deputy Chairman of the First National Salinity Conference organising committee held in Perth in November 2004
- Research into identification and quantification of hydraulic forces acting on floodways and road embankments at Centre for Water Research, University of Western Australia.
- Research of losses and storage parameters in catchment modelling techniques
- On going study of the hydrology and river geomorphology of the Fitzroy River in the Kimberley Region of WA
- On going catchment study and research of the major rivers and streams in the Kimberley, Pilbara, Gascoyne and the Arid Zone Regions of WA.

Review Objective:

The subject causeway has been proposed as an optimized solution to address potential risks arising from the need for Project personnel and equipment to relocate over the full Project life between Project facilities located on Site F (south of the proposed realignment of Hearson Cove Road into the formal gazette road reserve at the southern extent of the Project), and the Project urea manufacturing and utilities areas located on Site C to the north.

As a new infrastructure element crossing the tidal flats between Sites C and F, there is a concern that the proposed causeway may have adverse consequences on the hydrological regime (EPA - Coastal Processes and Inland Waters key environmental factors) in that system.

The objective of my review has been to assess the validity of the concern expressed by MAC.

Review Process:

I have interviewed Cardno personnel that conducted the evaluation presented in the Project ERD and in response to MAC's submission on the ERD to inform my review. I have also reviewed the set of drawings developed that present the evaluation outcome shared with MAC in response to its concerns.

In this exercise I have examined:

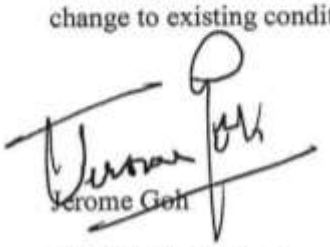
- The pre-industrialization setting in this area between Sites C and F, including tidal inundation under a range of scenarios ranging from normal to extreme (catastrophic)
- The identification of the setting post the installation (circa 1980s) of the current Burrup Road culverts in this area between Sites C and F, ie the current "receiving environment.
- The identification of the setting, including any potential adverse changes compared to the above two settings, likely post installation of the proposed causeway.

For this purpose, I reviewed the suitability of:

- sources of the data utilized
- the relevance of the data utilized
- the evaluation methodologies applied to address the identified risks/submission comments relating to potential adverse impacts
- the choice of hydrological/hydraulic (ie tidal and rainfall events) scenarios selected for comparative purposes, and
- the suite of drawings presenting the evaluation outcomes to assist MAC's understanding.

Review Conclusion:

On the basis of the review outlined above, I am satisfied that there is an appropriate level of rigour and robustness in the work conducted to address the concerns that have been raised. Further I am of the view that there is low likelihood that the proposed causeway will result in material adverse change to existing conditions.



Jerome Goh

25 September, 2020

3rd Party Peer Review Report after Briefing MAC Board and Circle of Elders:

BURRUP PENINSUAL-MURUJAGA ABORIGINAL COMMUNITY (MAC)

PRESENTATION BY JEROME GOH ON WATERWAYS ISSUES ON

PROPOSED CAUSEWAY PROJECT AT THE BURRUP PENINSULA

This short note is a record of my presentation to the Murujuga Community at the Burrup Peninsula on Wednesday 11 November 2020. It comprises of the content of my presentation, and the response and comments from the community (MAC).

1 CONTENT OF MY PRESENTATION

The content of my presentation includes the following:

- Introduction of myself and background, qualification, and experience.
- The scope of my role is limited to the review of the hydrological, surface water hydraulic and tidal analysis of the Cardno/and other consultants' reports for the Perdaman Urea Project of the tidal flat area between King Bay and the Hearson Cove and the impact of the proposed causeway connecting site C and site F in the Burrup Strategic Industrial Estate.

2 STATEMENTS I MADE DURING THE PRESENTATION.

During the presentation, I made the following statements

- Initially I reviewed the Cardno report and discussed with Marino and the Cardno waterway engineering team. I informed them that I was not able to fully understand some of the salient detail and requested that they recalculate some of the detail and reformat the report. This was carried out to my agreement.
- The relevant revised data/calculations/presentation that Cardno presented to me for review which I AGREED are relevant and appropriate to the task include the following:

  -Tidal information/data including HAT, HHWST, LLWST and averages of them that was used in the analysis.

  -Techniques used for rainfall analysis for the range of recurrence interval

  -Hydrological and hydraulic software used in the computation.

  -Computed numbers, long sections and plans showing extent of flooding.

  -Explained to the board members in layman's term the information in table 5 to table 14 in the Cardno Report.

- In clear unambiguous terms I explained the following:

  -That the existing culvert under the Burrup Road constructed 40 years ago which has an opening in the order of 16 square metres has changed both the tidal and catchment flow regimes compared to the natural, predevelopment flow regimes.

  -The proposed Perdaman causeway has an opening in the order of 87 square metres will not impact both the tidal and catchment discharge under all the four pre and post single and double crossings scenarios as presented by Marino on behalf of Perdaman.

3 COMMENTS FROM THE MURUJUGA BOARD (MAC)

The following are comments from the Murujuga board

- They agreed with me that the existing culvert under the Burrup Road is too small and has changed the flow regime in the tidal flat in the last 40 years.
- They accepted my statements that the proposed causeway with the proposed opening of 87 square metres will not change the current tidal and run-off flow regime in the tidal flat.
- However, they categorically made a statement that regardless of my presentation and assurance to them that the proposed causeway will not impact the tidal flat, they still do not want the causeway to be built.
- They explained to me, apart from the impact of water in the tidal flat, there are numerous overarching issues associated with their objections to the construction of the causeway.
- The main objection is that they disagree with the development of site C and site F because of the existence of Aboriginal Rock Art at both sites.
- I reiterate the fact that my role is purely associated with waterways issues and will not make any comments on other issues. They understand and agreed.

4 SPECIFIC REQUEST FROM MURUJUGA (MAC)

Specifically, they have requested me to give them a validating written statement to record my comments on the waterways related issues, and to include those stated in (2) above.

5 CONLUSION

I reaffirm that in my professional opinion, based on more than 40 years of experience in relevant fields, I conclude that the installation of the causeway as proposed by Perdaman will have minimal adverse effects on the current receiving environment in the intertidal areas between site C and F or the adjoining higher ground.

Jerome Goh

12 November 2020

APPENDIX

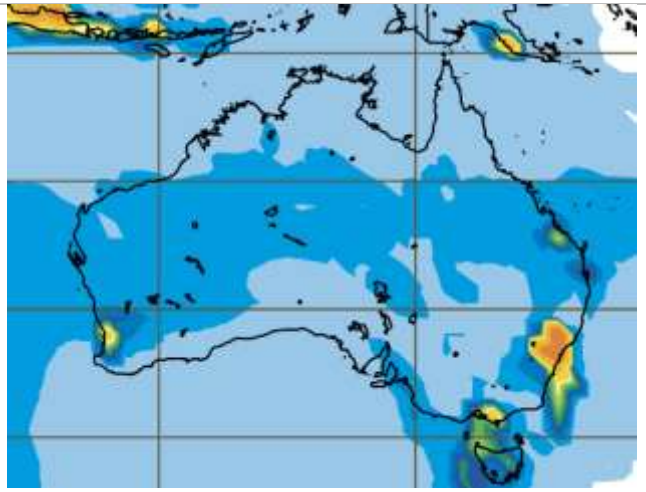
K

SUBMISSION #10 PUBLIC UNIDENTIFIED

Submission #10 Public unidentified	Perdaman Response
Government responsibility	Noted. The policy aspects raised in this submission are for consideration by Government. The Proponent reaffirms that it is pursuing its proposals in accordance with current State Government policies and the applicable statutory framework, at all levels of government. The WA government has recognised the project as a Project of State Significance and in recognition of the societal merits, the Australian Government has afforded the project MPFS.
• The Burrup Peninsula (Murujuga) is the Juukan Caves debacle in slow motion. Over 50,000 years of continuous culture and spiritual beliefs of indigenous Australians engraved in stone petroglyphs are being destroyed by removal for industrial development and by associated emissions.	
• No Government, with the current state of knowledge, could approve the placement of more pollution emitting industries on Murujuga if they were truly concerned about preservation of these world-unique, beautiful, priceless and irreplaceable petroglyphs of enormous significance to the Australian indigenous community.	
• I suspect making this submission is futile and that the decision to proceed has already been made. Although the project has not officially been approved, it has been named a 'Project of State Significance' by the Western Australian government, received 'Major Project Status' from the Commonwealth government, and Perdaman and the Murujuga Aboriginal Corporation (MAC) have signed an agreement with $11 million being promised by Perdaman to MAC. • The second reason why I feel this submission is most likely futile is because the EPA and the government, when reviewing the impact of emissions on rock art and when providing reasons for licences granted to Yara Pilbara, ignored all previously peer-reviewed published scientific papers showing significant changes to the rock surface patina, which is essential for preservation of the rock art.	
• The government claims to be concerned about preservation of the petroglyphs through establishment of the Murujuga Rock Art Strategy and the nomination for World Heritage Listing. However, from an 'outsiders' view, these actions appear to be traditional governmental obfuscation. Ignore the current science, but set up a research program that will take 3-5 years to produce results and nominate for World Heritage listing which cannot occur before 2024, but in the meantime place more industry on Murujuga.	
• No person or position in either the Western Australian or Commonwealth governments has ultimate responsibility for ensuring long-term survival of the Murujuga petroglyphs. This arrangement is disastrous for the rock art because of competing goals between	

Submission #10 Public unidentified	Perdaman Response
departments. Blame for any destruction of the petroglyphs can be readily passed to other departments or organisations. No person or organisation controls all activities that are likely to impose damage to this heritage. Some individual person must have ultimate responsibility, through whom all proposed activities on Murujuga that may impact on the rock art must be passed and approved.	
• The proposed review of the Aboriginal Heritage Act 1972, provides the ideal opportunity to categorise the significance of Aboriginal sites across Western Australia and appoint the most appropriate person for each site to oversee the preservation of the site in relation to the significance of proposed economic development. Sites as significant as the petroglyphs on Murujuga should be categorised with the highest preservation status and be 'untouchable'.	
Perdaman urea proposal	
• The Perdaman proposal adds to the concentrations of nitrogen dioxide on Murujuga and surrounds, which are already near the highest recorded in Australia. The European Copernicus Sentinel-5P satellite shows, on most days, the highest concentrations of nitrogen dioxide in Australia to be Sydney-Newcastle-Wollongong, Melbourne, Perth and the Burrup Peninsula. The high concentration of nitrogen dioxide is documented to be detrimental to the public health of people in the Burrup region and has been the major reason for rock surface acidity increasing by more than 10,000-fold in some places.	The Proponent feels the claims re the Burrup are not supported by evidence available publicly online[J]. Further, see screen shot of Copernicus Data covering Australia showing *"Total column of nitrogen dioxide [10^15 molecules / cm2] (provided by CAMS, the Copernicus Atmosphere Monitoring Service)"* for Tuesday 11 Aug, 2020 00:00 UTC T+24 Valid: Wednesday 12 Aug, 2020 00:00 UTC

[J] See https://atmosphere.copernicus.eu/charts/cams/nitrogen-dioxide-forecasts?facets=undefined&time=2020081100,24,2020081200&projection=classical_global&layer_name=composition_no2_totalcolumn

Submission #10 Public unidentified	Perdaman Response
	 In addition to the above, a scan of satellite data for tropospheric NO_2 for the Pilbara from June 2019 to the present, as measured by TROPOMI equipment aboard the Copernicus Sentinel-5P satellite, indicates NO_2 in the Pilbara usually exists in concentrations too low to be detected by this modern satellite equipment. Road vehicle traffic in cities is a far more significant NOx source for satellite-mounted equipment such as TROPOMI.
• The Perdaman proposal also adds a new pollutant to the area in urea.	Urea is not a new pollutant in the area. As indicated in ERD (p150) the Proponent reaffirms that urea is not typically a significant component in the background airshed but is found extensively across the area, including in marine areas. It should be noted that urea is a common naturally occurring substance. It serves an important role in

Submission #10 Public unidentified	Perdaman Response
	the metabolism of nitrogen-containing compounds by animals and is the main nitrogen-containing substance in the urine of mammals, including marine mammals. As the ERD acknowledges, the Project will however be a principals industrial emitter of urea to the airshed in the region.
• Perdaman argue that because urea does not form nitrate, it will not stimulate microbial growth on rock surfaces to increase the production of organic acids and dissolve the outer patina. This argument is false. Although urea does not produce nitrate, bacteria and lichens that live on desert varnish (outer rock surface of rocks in desert environments) possess urease enzymes, which breakdown urea into ammonium molecules that are metabolites for, and stimulate growth, of these organisms. MacLeod (2005) showed that microbial growth increased ten-fold for each increase in available nitrogen on the rock surfaces. • The concentrations of nitrogen dioxide and ammonia emissions suggested by Perdaman are well above the limits set for the Yara Pilbara industrial plants and well above the concentrations which can be achieved using Yara International scrubbers.	On the basis of direct liaison with the author, the Proponent notes that the 2005 report by MacLeod only discussed soluble nitrates found on the rock surfaces and made no comment on ammonia or ammonium ions. At the natural pH of the acidic minerals on the rock surfaces (6.5<pH>5.5) any ammonia vapour will be converted to ammonium ions. At present there is no rock art literature that demonstrates the in-situ biological responses of anthropogenic microflora, including yeasts, moulds and fungi, so urease metabolites, to the presence of ammonium ions acting as a growth stimulant. The 2017 CSIRO report on extreme weathering conditions on the granophyre and gabbro rocks in the Burrup showed that even at elevated temperatures there was no discernible mobilisation of minerals from the rock surfaces when exposed to 10-3 M (45 ppm) ammonium hydroxide solutions for several months. The test solutions had a pH range from 8.3 to 9.1 (Ramanaidou et al. 2017) and under these conditions human health would be seriously compromised. The Proponent's NO_x is minimised by applying catalytic reforming, which results in 67% less than the neighbouring (Yara) ammonia plant per tonne of ammonia produced. Likewise for enhanced environmental performance, applying GTCC technology has 33% less NO_x than the neighbouring open cycle for power generated. Further the

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	Proponent's gas turbines are vendor guaranteed performance at 32 mg/Nm^3 NO_x compared with Woodside Pluto with a comparable maximum is 100mg/Nm^3 NO_x. The Fired heater 150mg/Nm^3 NO_x is the guarantee value per EU standards; this performance guarantee is an upper limit where ~90-110mg/Nm^3 NO_x may be achievable during normal operation. The Yara reformer fired heater was set at max 180mg/Nm^3 (PER1036). Compared to comparable current installations in the region such as Woodside (gas turbines) or Yara's ammonia plant, the proposed design utilises better low NO_x burners which result in reduced NO_x concentrations for the Perdaman plant. In addition, it should be noted that the utilisation of combined cycle gas turbines for power generation results in approximately 1/3 of the plant power requirements being sourced from steam generated from waste heat rather than from additional open cycle gas turbines or a requirement to raise steam by burning additional natural gas. This also significantly reduced project product of combustion emissions including particularly NO_X and GHG. Further, removal of very small quantities is largely a zero - sum gain - additional scrubbing and temperature control and equipment increase power/heat required, which results in increased NO_x from power generation. The Proponent has applied a newer technology layout to reduce the g/s rate of discharge of NO_x by over 50% compared with Yara. SCR is not appropriate technology for type of fired heater applied to urea production - the SCR is applied to the Nitric

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	acid emissions which contain the potent GHG N_2O, which is not present in the Project plant, and which contains in the order of 1500 mg/Nm^3 NOx before SCR. The above demonstrate considerable efforts have been applied by the Proponent to the application of BAT in implementation of the project. Notwithstanding the considerable efforts to date on identifying and implementing vendor solutions that deliver BAT performance including as outlined above, as part of its approach to the Precautionary Principle and to continuous environmental improvement, during the Detailed Design phase, the proponent is committed to continuing to explore BAT opportunities where the application of alternative vendor solutions for urea production can practicably deliver equal or better environmental performance, including air emissions. Where such is achievable, the Proponent will include in its application for Part V Works Approval a third party reviewed report demonstrating equal or better environmental performance.
• The Precautionary Principle in the Western Australian Environmental Protection Act has not been adequately followed. Perdaman state that all designs "have been established on a risk-based approach", but there is no formal 'assessment of the risk-weighted consequences of various options' for each impact on the environment or heritage. The Proponent uses a scientifically inaccurate statement from EPA report 1648 to justify compliance with the Precautionary Principle.	The proponent notes that it is sometimes asserted that the precautionary principle requires a proponent to prove that a risk does not exist, and in the absence of such proof that the project must not be approved. On the plain face of section 4A, as well as body of law established by Australian courts on how to apply the precautionary principle, this approach is wrong. As noted in ERD Section 4.8.3.3 (p 139) the Proponent reaffirms that in its recent Inquiry under section 46 of the EP

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	Act on the Yara Technical Ammonium Nitrate Production Facility, Burrup Peninsula, the EPA stated: *"In considering the above principle, the EPA has noted that there is currently no compelling scientific evidence which indicates that there is an immediate material threat of serious or irreversible damage to rock art from cumulative industrial air emissions within the Murujuga airshed. As the TANPF utilises contemporary best practice pollution control technology to minimise air emissions within the Murujuga airshed, the EPA considers that the risk of rock art being damaged due to the operation of the TANPF has also been minimised, whilst recognising the lack of full scientific certainty in regard to whether cumulative industrial air emissions within the Murujuga airshed are damaging rock art. On the above basis, the EPA considers that there is sufficient time for the monitoring and evaluation activities associated with the Murujuga Rock Art Monitoring Program to be undertaken and for definitive information in regard to whether cumulative industrial air emissions within the Murujuga airshed are adversely affecting rock art to be obtained." (EPA Report 1648, September 2019)* The Proponent noted this relevant context with respect to considering the precautionary principle and its applicability to assessment of air emissions potential cumulative impacts on the integrity of rock art. The Proponent does not agree with the submission view that the EPA conclusion is scientifically inaccurate. The Proponent considers in risk weighting submissions which include statement such as being made here without evidence, it is important to recognise that if there is no deleterious impact or change, the only evidence is a lack of evidence of change across one or more parameters.

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	Therefore, from a risk weighted perspective, there is a zero probability of detecting change, with no increase in the probability of obtaining conclusive evidence being generated by additional monitoring or alternative investigative techniques, just a greater degree of confidence that probabilistically, the lack of evidence does in fact reflect an absence of change. Statistically, if ΔC is the measure of change being considered/monitored, where there is "no change" then by definition, Mean ΔC=0 and the standard deviation ΔC=0. In contrast, the probability of detecting evidence of change where deleterious impacts are occurring is positive, even if low, especially where multiple observations are made and/or multiple investigative techniques are applied. Statistically, where there is change then by definition ΔC Mean >0 and ΔC standard deviation >0.
• The government must impose strict and enforceable limits on all nitrogenous emissions to the atmosphere. Measurements of emissions must be made in real-time by the Proponent and be made available to the public for scrutiny.	Comment is addressed to Government for response, not the Proponent.
Recommendations	
• Preservation of the petroglyphs on Murujuga is of such enormous heritage significance to Australia and the world that the proposed urea plant should not be approved.	As indicated in the ERD (Section 6.6.1 p 209), the Proponent also notes the Australian Government's reference to concurrent industrial prosperity in the BSIA alongside the enhanced conservation afforded through the NHL, as expressed on the Government's NHP website for Murujuga – see quote below and link http://www.environment.gov.au/heritage/places/national/dampier-archipelago) ***"Pre-history meets the industrial age"***

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	The Dampier Archipelago is home to the most ancient works created by man, as well as a multi-billion-dollar resource industry. *The Archipelago is located near significant reserves of natural gas, petroleum and iron ore resources. Industries have already invested in excess of $35 billion in developments, while trade to and from the Dampier Port reached 88.9 million tonnes for 2003-04, making Dampier the second largest tonnage port in the country. The area has also created thousands of jobs.* *A balance between heritage management and economic prosperity is being achieved through a collaborative partnership involving Indigenous groups, industry, governments and the community. Careful, long-term management of the Dampier Archipelago and Burrup Peninsula will see both our heritage and economy protected into the future, to the advantage of all Australians."* The Proponent also views that the quoted statement reflects a cornerstone requirement that future industry must embrace as a good neighbour striving for a balance between heritage management and economic prosperity that must be realised through a collaborative partnership involving Indigenous groups,
o Application of the Precautionary Principle under the Environmental Protection Act (1986) precludes the addition of new pollutant emitting industrial plants on Murujuga because there is already immediate material threat of serious or irreversible damage to petroglyphs being caused by industry,	The proponent notes that it is sometimes asserted that the precautionary principle requires a proponent to prove that a risk does not exist, and in the absence of such proof that the project must not be approved. On the plain face of section 4A, as well as body of law established by Australian courts on how to apply the precautionary principle, this approach is wrong.

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	The proponent notes that the Environmental Protection Act (1986) requires that considerations in relation to the Precautionary Principle should be based on a risk weighted understanding of the available evidence. As discussed above the Proponent considers the EPA Precautionary Principle view expressed in its recent Inquiry under section 46 of the EP Act on the Yara Technical Ammonium Nitrate (TAN) Production Facility, Burrup Peninsula is robust and relevant to the current considerations. Further, the Proponent also notes that one of the criteria identified as part of consideration for inclusion of Murujuga on the National Heritage list was evidence of superposition of petroglyphs. This was identified as an important source of evidence of chronological sequencing as well as changes to motif styles and subject matter. Beyond that evidentiary role, superposition is evidence of other historical/environmental factors. Superposition is evidence that potentially; • natural, pre-industrial changes to the rock surface may have rendered pre-existing petroglyphs un-recognisable to succeeding generations of engravers, who thus saw the surface as a “blank canvas” for later engravings, or alternatively • succeeding generations of engravers considered that the existing petroglyphs were no longer “fit for purpose” to pass relevant knowledge between generations or to their contemporary society. Thus

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	they effectively redacted the information that was no longer relevant in the contemporary setting by over printing with an alternative more relevant engraving. In either case superposition of petroglyphs may be considered evidence that petroglyphs are not intrinsically permanent in the environment and can be subject to change from a variety of causes over a range of timeframes.
o A company with any social responsibility would not place a new polluting industrial operation in such a sacred heritage area because it will add to the destruction of the petroglyphs.	The Proponent believes that the Project can be implemented and meet the objective of conserving the heritage value of Murujuga.
• If the economic value is considered to be so imperative (which is difficult to agree with because there are other sites where natural gas is available in Western Australia), the proposal should only be approved if technology is incorporated to reduce emissions into the atmosphere to near zero for nitrogen dioxide, ammonia and urea.	The Proponent notes the analysis conducted by Woodside in relation to the current and future cumulative airshed[K]

[K] See: https://www.woodside.com.au/our-business/burrup-hub/burrup-hub-environmental-topics-and-approvals/burrup-hub-air-quality

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	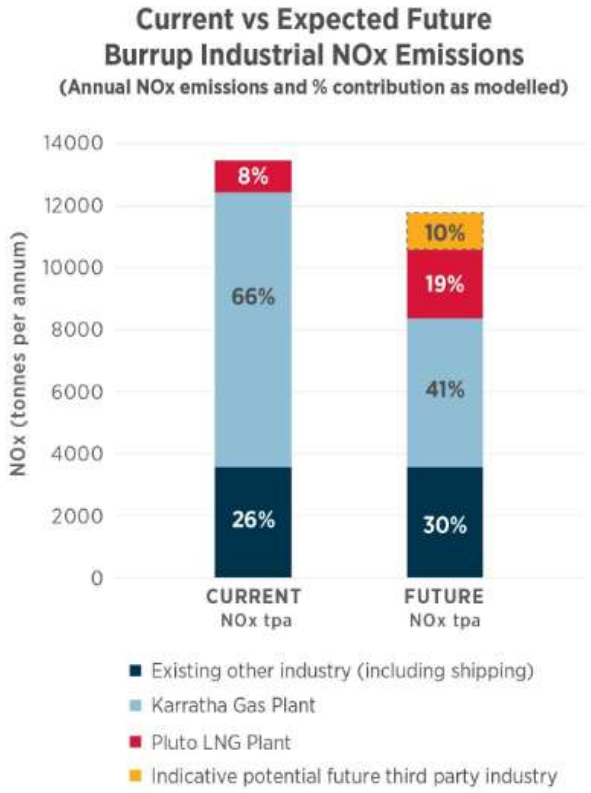 From this analysis, the Proponent reaffirms • The current regional airshed includes approximately 13,000 tpa of NOx, and • By comparison, the Project NOx emissions are comparatively small at 319tpa (~2.54% of the current annual regional airshed loading).

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	The emissions have been engineered to BAT for urea manufacture, GTCC for power requirements and scrubbed urea granulation. The site benefits are existing domestic gas & ammonia production related infrastructure for export and access to existing seawater infrastructure with available approved capacity for process cooling. The Project has better low NO_x burners so NOx emissions are reduced for the current plant. Further removal of very small quantities is largely a zero-sum gain - additional scrubbing and temperature control and equipment increase power/heat required, which results in increased NO_x, GHG and other emissions from power generation. The Proponent has applied a newer technology layout to reduce the g/s NO_x loading to the regional airshed by over 50% compared with Yara. SCR is not appropriate technology for this type of fired heater - the SCR is applied to the Nitric acid emissions which contain the potent GHG N_2O which is not present in the Project's plant, and in the order of 1500 mg/Nm^3 NO_x before SCR. Notwithstanding the considerable efforts to date on identifying and implementing vendor solutions that deliver BAT performance including as outlined above, as part of its approach to the Precautionary Principle and to continuous environmental improvement, during the Detailed Design phase, the proponent is committed to continuing to explore BAT opportunities where the application of alternative

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	vendor solutions for urea production can practicably deliver equal or better environmental performance, including air emissions. Where such is achievable, the Proponent will include in its application for Part Works Approval a third party reviewed report demonstrating equal or better environmental performance.
COMMENTS ON THE PERDAMAN ERD	
An additional source of NOx emissions into the atmosphere	As a basis for discussions the Proponent notes the following context: • Industrial generated NO_2 is <NEPM current and mooted future criteria (1hr and annual) • Natural sources are a major cause • Woodside is the majority source (~70%) of regional additive industry NO_x
The proposed urea plant is reported to release 319 t/year of NOx into the atmosphere (Table 2- 3, p 23). This adds further to the high concentrations of nitrogen dioxide already present on Murujuga and the surrounding towns. The European Copernicus Sentinel-5P satellite shows, on most days, the highest concentrations of nitrogen dioxide in Australia to be Sydney- Newcastle-Wollongong, Melbourne, Perth and the Burrup Peninsula. These high concentrations of nitrogen dioxide on Murujuga are having detrimental effects on the petroglyphs and on human health.	The Project will contribute additional amounts of NO_2 to the airshed (<1% of the current NEPM criteria as discussed on ERD p162). The Proponent reaffirms that its NO_x is minimised by applying catalytic reforming to produce ammonia, which results in 67% less NO_x than the neighbouring (Yara) plant per tonne of ammonia produced. Likewise for enhanced environmental outcomes, applying GTCC technology has 33% less NO_x than the neighbouring open cycle for generated power. Further the Project's gas

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	turbines are vendor guaranteed performance[L] at 32 mg/Nm^3 compared with Woodside Pluto where a comparable maximum is 100mg/Nm^3. The Fired heater 150mg/Nm^3 is the guarantee NO_x value per EU standards; this performance guarantee is an upper limit where usually a lower concentration is expected to be achievable during normal operation. The Yara reformer fired heater was set at max 180mg/Nm^3 (PER1036). As an example of the implementation of BAT, better low NO_x burners have reduced this emission level for the Project plant. Further it must be acknowledged that removal of further very small incremental emission quantities is largely a zero sum gain – i.e. incorporating additional scrubbing and temperature control and equipment to reduce emissions in one process area, each increase power/heat required in that targeted process area, which results in increased NO_x and other product of combustion emissions from the associated additional power generation required to run those additional aspects. The Proponent has applied a newer technology layout to reduce the mass rate of discharge of NO_x by over 50% compared with Yara.

[L] Note these are Guaranteed Maximum emissions where the usual operating emissions can be expected to be less than this guaranteed maximum.

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	Selective Catalytic Reduction (SCR) is not appropriate technology for the type of fired heater applied to urea production - the SCR for Yara is applied to the Nitric acid emissions which contain the potent GHG N_2O, which is not present in the Project plant or emissions, and which at Yara contains in the order of 1500 mg/Nm^3 NOx before SCR. The above demonstrate considerable efforts have been applied by the Proponent to the application of BAT in implementation of the project. Based on the above design considerations, the Proponent reaffirms that NO_2 has then been considered for its environmental impact – for a number of sensitive receptors outcomes including: • Human health and well-being; and • Heritage / cultural (rock surface integrity) The NO_2 assessment criteria adopted by the Proponent is based on the NEPM for the protection of human health and well-being. It is noted that the NEPM is currently being reviewed, however to date it has not been amended. Comparison with both the current and future anticipated NEPM NO_2 criteria is discussed below. Appropriate assessment criteria for evaluation of impact to Heritage/cultural values are not definitive, and therefore the proponent has approached emission reductions through design of the plant as critical. Similar to PM, NO_2 concentrations vary temporally and spatially due to a variety of influencing factors, noting that NO_2 undergoes complex chemical reactions in the atmosphere. These influencing factors include weather,

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	climate, and other sources (e.g. fire) and the scale of human activity in the area. Therefore, NO_2 concentrations will be variable across the day and year. It is noted that under the MRAS, the WA Government is developing a cumulative impact air quality model for the region, to inform predicted change, however at the time of assessment this was not available. The proponent has therefore utilised modelling which as discussed in ERD Appendix D, has a statistically robust correlation with observed ambient air quality for the model year adopted. Dispersion modelling is a means of estimating potential ground level concentrations of NO_2, considering the variability in the influencing factors. It is an approximation, and generally incorporates a degree of conservatism to account for the uncertainties inherent in modelling, including the temporal and spatial variations. The estimated NO_2 emission contribution by the Project is well below the adopted national assessment criteria. Assessment criteria for NO_2 are based on existing NEPM values. NO_2 emissions from the Project result in a non-significant contribution to the airshed with the maximum predicted concentration in the area being less than 1% of the assessment criteria[M]. The maximum cumulative impact (i.e. Perdaman Urea Project with other sources) is estimated to around 30% of the assessment criteria.

[M] As the anticipated project contribution to the regional airshed NO_2 levels is only 1% of the current NEPM criteria, it is not anticipated that the Project will exceed mooted future changes to the NEPM criteria currently in the public consultation stage.

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	Based on the modelling results, the likely change to air quality from the project contribution is not demonstrated to be significant. The existing air quality sources (background air quality) remain the dominant feature. Based on comparison to the adopted assessment criteria, the environmental values (human health, and ecological) are not significantly altered by the change in predicted air quality emissions of NO_2 due to the Project. The concentrations at which NO_2 is considered to be detrimental to rock surface continues to be investigated, and therefore a conservative approach needs to be taken with regard to the assessment of potential impact on heritage value. In that regard, the Proponent reaffirms its commitment in the ERD to be a contributing participant in the MRAS and supports the monitoring approach as outlined in Sections 5.4 and 5.5 of the MRAS. As noted in response to other submissions making the same claims about evidence from the Copernicus Sentiel-5P satellite, a scan of satellite data for tropospheric NO_2 for the Pilbara from June 2019 to the present, as measured by TROPOMI equipment aboard the Copernicus Sentinel-5P satellite, indicates NO_2 in the Pilbara usually exists in concentrations too low to be detected by this modern satellite equipment. Road vehicle traffic in cities is a far more significant NOx source for satellite-mounted equipment such as TROPOMI. Notwithstanding the considerable efforts to date on identifying and implementing vendor solutions that deliver BAT performance including as outlined above, as part of its approach to the Precautionary Principle and to continuous environmental improvement, during the Detailed Design

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	phase, the proponent is committed to continuing to explore BAT opportunities where the application of alternative vendor solutions for urea production can practicably deliver equal or better environmental performance, including air emissions. Where such is achievable, the Proponent will include in its application for Part V Works Approval a third party reviewed report demonstrating equal or better environmental performance.
As explained in my earlier submission (11 June 2019) to the Perdaman Environmental Scoping Document Public Review, acid forming emissions from industry and shipping have already resulted in a fall in pH of some rock surfaces from 6.8±0.2 during pre-industry times to as low as 2.98. This extreme change in pH represents a 10,000-fold increase in acidity of rock surfaces, which geochemists conclude from basic chemistry will dissolve the manganese and iron compounds in the outer patina of the rock. Destruction of the patina results in loss of the petroglyphs. The University of Western Australia, Centre for Rock Art Research and Management, has been comparing pre-industrialisation photographs of individual petroglyphs taken during the 1960s and 1970s with recent photographs of the same petroglyphs and has found several with substantial changes in patina coverage (Professor Ben Smith, personal communication). The cumulating release of additional acid forming nitrogen dioxide from the urea plant is likely to hasten the demise of the rock art.	The accuracy of the pH readings reported here does not consider the experimental records that show a typical standard deviation on any one rock in any particular year of ± 0.4, so a pH of 2.98 should be reported as a pH of 3.0 i.e. to one decimal point (or at least the error should be recorded in the same way as it is shown for the pre-industrial pH). The Proponent understands that this quoted extreme pH value was found on a rock surface a few hundred metres from the main NW shelf gas production facility flare tower and is generally not considered regionally representative. The accumulation of sea salts on the rock surfaces from transport by prevailing or intermittent winds will ameliorate the acidity, owing to the alkaline reserve associated with the evaporites noted on P140 of the ERD. As noted below, Gou et al (2017) while conducting work unrelated to anthropogenic emission of urea as dust, also recognises the alkalinity carbonate buffer associated with airborne sea salt. Research on colour mapping of the same rock art images over time has shown that variations in the colour

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	temperature of the computer monitor, the response of digital camera or scanner of slide film or transparencies and the amount of light fading that has taken place in the colour prints of the images, with the reference colour scales in them has shown that it is not a reliable method to determine that colour change has taken place (Ford 2005). This is the core reason why the CSIRO scientists used a Minolta Chromameter to monitor the colour changes associated with engraved and background surfaces of the representative rocks (Lau et al. 2008).
The Perdaman proposal (p 168) argues that the release of 400 t/year of ammonia, may neutralise the impact of nitrogen dioxide induced acidity because of its alkalinity. This proposal sounds feasible, however the research by Gou et al (2017) in China suggests that high concentration of ammonia does not reduce the acidity of acidic particles in the air.	As noted previously the Proponent understands that soon to be published research[N] has demonstrated that the acidity "clock" is significantly reset during cyclonic rainfall events. The Proponent acknowledges the cited work of Gou et al, and notes that the work relates to a different airshed setting that may have both similarities and differences to the Murujuga airshed. The Proponent notes that several references cited in this paper draw an alternative conclusion in relation to airshed pH modification which may(?) be related to specific airshed variability. It is also noted that the study is conducted in highly polluted airsheds where the airshed pH ranges from 0 to 5 and that

[N] "Determining decay mechanisms on engraved rock art sites using pH, chloride ion and redox measurements including an assessment of the impact of cyclones, sea salt and nitrate ions on acidity." Authors Ian D MacLeod*[1] and Warren Fish[2]

[1]Western Australian Museum, Fremantle, Western Australia 6160, [2]CBG Solutions, Kingsley, Perth, Western Australia 6026
Pre-prints of the International Council of Museums - Committee for Conservation, Conference, Beijing May 2021, - in press

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	the study finding is that "*High levels of ammonia do not raise fine particle pH* ***sufficiently*** *to yield nitrogen oxide-dominated sulfate production" (emphasis added)*[O] as compared to the comment suggestion*," … that high concentration of ammonia does not reduce the acidity of acidic particles in the air*" Thus, the theoretical capacity suggested in the ERD and the divergence of views between the various papers would therefore warrant greater examination. Further, Gou's other finding that "*The limited alkalinity from the carbonate buffer in dust and seasalt can provide the only likely set of conditions where NO_2-mediated oxidation of SO_2 outcompetes with other well-established pathways*." is potentially relevant to consideration of the buffering role of sea salt noted on p140 of the ERD as a natural moderator for acidic emissions in the Murujuga airshed.
The high concentrations of nitrogen dioxide are also a threat to the health of the public on Murujuga and in the towns of Dampier and Karratha. Results from the Pilbara Health Profile Planning and Evaluation Unit report in November 2018 show children aged between 0 and 14 years, are hospitalised for lung disorders of asthma and bronchiectasis, which is damage and widening of the airways, 1.7 and 11.5 times more, respectively, than the Western Australian State average (Anderson et al, 2018). The report also showed there was a	As noted previously, the estimated NO_2 emission contribution by the Project is well below the adopted national assessment criteria. Assessment criteria for NO_2 are based on existing NEPM values. The Proponent notes the "Notice of Intention to Vary the National Environment Protection (Ambient Air Quality) Measure" in

Figure 2

From: High levels of ammonia do not raise fine particle pH sufficiently to yield nitrogen oxide-dominated sulfate production

[O] screenshot from cited paper

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significant increase in heart disorders in older people in the region. These results suggest there is a detrimental impact of air quality on the health of people living under the Murujuga airshed as confirmed by Gudka (2020).	Commonwealth Gazette -C2019G00039[P] published on 18 January 2019. The NO_2 emissions from the Project result in a non-significant contribution to the airshed with the maximum predicted concentration in the area being less than 1% of the assessment criteria. The maximum cumulative impact (i.e. Perdaman Urea Project with other sources) is estimated to around 30% of the assessment criteria. This maximum cumulative impact would rise to around 47% if compared to the recommended amendment to NEPM for NO_2 is implemented. Based on the modelling results, the likely change to air quality from the project contribution is not demonstrated to be significant. The existing air quality sources (background air quality) remain the dominant feature. Based on comparison to the adopted assessment criteria, the environmental values (human health, and ecological) are not significantly altered by the change in predicted air quality emissions of NO_2 due to the Project.
However, the Proponent argues when using the Ambient Air Quality National Environment Protection Measure (NEPM) air quality measures established for public health established in 1998, that nitrogen dioxide concentrations are below the proposed maximum hourly value of 120 ppb at all modelled locations. There are two potential problems with this analysis. First, it is now recognised that there is no safe level of air pollution, particularly nitrogen dioxide, ozone and PM10-2.5 particles for human health (Barnett 2014). Doctors for the Environment in Australia (2019) now believe that the maximum one-hour exposure concentration for nitrogen dioxide should be less than 9 ppb. Thus, all sites in the Murujuga-	It is important to acknowledge that the body of scientific/health literature discussing the adverse health effects associated with exposure to nitrogen dioxide, ozone and PM is continuing to expand. These facts are not being refuted. Health effects from both short-term exposure (daily) and longer term (annual) exposure to nitrogen dioxide, ozone

[P] See https://www.legislation.gov.au/Details/C2019G00039

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Dampier-Karratha area modelled in the Proposal exceed the safer concentration of nitrogen dioxide for human health.	and PM concentrations are noted as being of importance, as is the fact that increasing concentrations of nitrogen dioxide, ozone and PM are associated with increasing incidents of health effects. The nitrogen dioxide, ozone and PM assessment criteria adopted by the Proponent are based on the NEPM. The NEPM considers for PM that there is no evidence for a threshold concentration below which adverse health effects of PM are not observed. The form of the PM NEPM criteria shows that the intent is to minimise the community's exposure as far as practicable. In setting the NEPM criteria the government had considered the constraints and capabilities of a jurisdiction to achieve this outcome. PM concentrations vary temporally and spatially due to a variety of influencing factors. PM concentrations will also be variable across the day. These influencing factors include weather, climate, natural events and sources (i.e. fire, sea spray) and the scale of human activity in the area. Dispersion modelling is a means of estimating potential ground level concentrations of nitrogen dioxide, ozone and PM, considering the variability in the influencing factors. It is an approximation, and generally incorporates a degree of conservatism to account for the uncertainties inherent in modelling. The dispersion modelling should not be interpreted as being representative of an individual's or the population's exposure to nitrogen dioxide, ozone and PM. This is best determined through a human health risk assessment (HHRA) that ideally also incorporates actual ambient air quality monitoring data. This is an appropriate means by which to assess the relative change in air quality (pre and

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	post introduction of the project). Human health risk assessment can consider the specific health outcomes, for specific age groups and sectors of the community, who may be more susceptible to exposure to PM. It should be noted that a HHRA was not a requirement of the ESD approved for the project. Comparison of the modelled results to the assessment criteria is used as a means by which to assess the potential risk of an (unacceptable) impact. Given the way in which assessment criteria are derived, there are generally layers of conservatism incorporated. The derivation of the NEPM nitrogen dioxide, ozone and PM standards by the Federal and State Governments has considered both environmental, health and economic considerations. In terms of the modelling undertaken for the Project, there is one scenario under which there is a predicted potential for PM_{10} some modelled ground level concentrations to be higher than the annual assessment criteria. It is noted that modelling indicates that the baseline PM_{10} grid maximum is already close to (~99%) of the annual criteria (short term average i.e. 24-hour basis) in the modelled area: • BPNO (cumulative baseline with Perdaman Normal Operations) It should be noted that a transcribing error in the Baseline Scenario (Table 4-36) inaccurately shows the Baseline scenario to produce results above the assessment criteria. This is not the case. The modelled concentrations shown in the corrected Table 4-36 are correct; however, the 24-hour results were compared in error to the annual criteria (25µg/m^3) rather than the 24-hour criteria (50µg/m^3). The

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	maximum concentration on grid for the Baseline scenario should read 71%. Modelled concentrations at the representative receptor locations range from 68% to 69% of the assessment criteria. A revised Table 4-36 is provided to correct this error in Appendix T of this response to submissions. On an annual average basis, the existing Baseline scenario for PM_{10} predicts concentrations close to the criteria (ie. 95% to 99%). The two scenarios shown (BPNO and FPNO) both predict the maximum concentration on the grid to be above the assessment criteria. The Baseline $PM_{2.5}$ annual average scenario predicts concentrations higher than the assessment criteria, and is mainly a result of the existing emissions from shipping berths, as noted by the dispersion modellers. There are two scenarios under which there is a predicted potential for $PM_{2.5}$ modelled ground level concentrations to be higher than the assessment criteria. It is noted that modelling indicates that the baseline $PM_{2.5}$ grid maximum already exceeds (~105%) the annual criteria: • BPNO (cumulative baseline with Perdaman Normal Operations) and • FPNO (cumulative baseline with Perdaman Normal Operations plus other proposed projects)

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	The Proponent's contribution is estimated to be less than 15% of the maximum grid receptor result. It should be noted that a transcribing error in the Baseline Scenario (Table 4-36) for $PM_{2.5}$ inaccurately shows this scenario to produce results above the assessment criteria. When corrected, the 24-hour average modelled range for PM2.5 is between 58% and 62%. The maximum PM_{10} and $PM_{2.5}$ contributions from the Project under normal operations, within the modelled area, are less than 20% of the 24-hour PM_{10} assessment criteria and less than 10% of the 24-hour $PM_{2.5}$ criteria. These emissions present a relatively low risk of impact in isolation of other emission sources in the airshed. Based on the modelling results, the likely change to air quality from the project contribution is not demonstrated to be significant. The existing air quality sources (background air quality) remains the dominant feature. Based on comparison to the adopted assessment criteria, the environmental values (human health, cultural and ecological) are not significantly altered by the change in predicted air quality emissions and subsequent PM ground level concentrations from the introduction of the project. As shown in ERD Section 4.8.5.1 including Tables 4-35 and 4-37, the Project NO_2 emissions are expected to be well below statutory requirements for short-term and long-term protection of human health.

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The second issue with the modelling of NOx concentrations at different locations relates to the discrepancy in predicted values shown in Table 4-35 compared with the model quoted in the Yara Pilbara Fertiliser, licence Decision Report (L9224/2019/1) Table 13. The Perdaman document states that during normal operations, the concentration of nitrogen dioxide at Hearson Cove would be 33 ppb, but the Modelling for the Yara fertiliser plant suggests it is 92 pg/m3 or 48 ppb. These differences between the modelled concentrations of nitrogen dioxide cast doubt on the reliability of the modelling. Gillett (2008, p.129) showed that models of air quality underestimate measured values on Murujuga by up to five-fold.	The air quality modelling for Yara Pilbara Fertilisers referred to by DWER (2020)[Q] was completed by Environ in 2015. According to DWER (2020), the modelling was undertaken using AERMOD. AERMOD is a Gaussian model; i.e., it has no variable-trajectory capability, and it is not a 3-dimensional model. Also, AERMOD has no photochemistry modelling capability. Given the complexity of the Murujuga industrial emissions environment, AERMOD is unsuited to the determination and assessment of NO_2 and O_3 concentrations in the study area. Models such as TAPM-GRS or Calpuff should be used, as a minimum. The true test of model performance is by comparisons with monitoring data, not by comparisons with another model. ERD Appendix D showed the TAPM-GRS predictions showed 'good' agreement with measurements obtained at Woodside's air quality monitoring stations at Burrup Road, Dampier and Karratha (Section 8, 'Comparisons with Air Pollutant Monitoring'). The comment by Gillett (2008, p. 129), was related to model predictions for annual average NO_2 deposition fluxes. Gillett (2008) provided a detailed review of Calpuff and TAPM modelling results completed by SKM in 2003, including comparisons with monitoring. The current TAPM modelling completed by ERD Appendix D includes many improvements since SKM (2003), as detailed in ERD

[Q] DWER reference: *Application for Licence, Licence Number L9224/2019/1, Applicant Yara Pilbara Fertilisers Pty Ltd*, File Number DER2019/000563, 20 April 2020.

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	Appendix D. Inspection of the results shows there is very good agreement between the ERD Appendix D model results for NO_2 deposition on Murujuga with monitoring, except for two sites that were over-estimated by the model (Section 7.1.2, Figure 7-2, p. 115). This demonstrates the ERD Appendix D modelling is a significant improvement since SKM (2003) (again by inspection of the figures and key results from both reports).
Suggested limits for NOx emissions in the Proposal are considerably higher than is now possible to obtain. Table 4-31 indicates the upper limit to NOx emissions from the Fired Heater will be 150 mg/m^3. This value is higher than permitted in the licence L9223/219/1 for the Yara Pilbara TAN plant, which is 103 mg/m^3, but is not listed in the Table. Technology is available through Yara International for the Selective Catalytic Reduction (SCR), which is claimed can reduce emissions by 98% from an industrial plant. I have argued before in submissions to EPA relating to the Yara plants that placing several SCR scrubbers in series would reduce NOx emissions to zero. Similarly, at the Murujuga Rock Art Stakeholder Reference Group committee meeting on 9 July 2019, Jarrod Pittson, a guest representative from Woodside Energy Ltd, stated that scrubber technology was now available to reduce nitrogen dioxide emissions from industrial stacks to 20 mg/m^3. If the Western Australian government is truly concerned about preservation of the Murujuga petroglyphs, the maximum limit for NO_x from the Perdaman Fired Heater stack should be no more than 20 mg/m^3. I believe this limit of 20 mg/m^3 should be placed on all industrial stacks and outlets emitting NO_x on Murujuga to clean the airshed for the sake of the petroglyphs and to improve human health outcomes. It is unbelievable to me that the Western Australian government knowingly allows industries on Murujuga to emit so much poisonous nitrogen dioxide, which has been proven to have a highly significant (P<0.01) detrimental impact on human health, when technologies are available to reduce these emissions to near zero. A review of the Woodside Energy North West Shelf Environmental Review Document (ERD), the Decisions Reports for the licences for the Yara Pilbara fertiliser and TAN plants and the Perdaman (ERD) show that NOx emissions on Murujuga are 8,900 t/year from	The Proponent reaffirms that its NO_x is minimised by applying catalytic reforming at the process front end, which results in 67% less at the process back end (emissions) than the neighbouring (Yara Pilbara Fertiliser) plant per tonne of ammonia produced. Yara TAN licence L9223/219/1 involves a different industrial process which does not involve reforming and therefore BAT is not comparable. It is for this reason Yara TAN is not shown in Table 4-31 which only includes comparable, benchmarkable, processes. Likewise, in relation to enhancing environmental performance, applying GTCC technology has 33% less NO_x than the neighbouring open cycle for power generated. Further the Project's gas turbines are vendor guaranteed performance at 32 mg/Nm^3 compared with Woodside Pluto with a comparable maximum is 100mg/Nm^3. The fired heater 150mg/Nm^3 is the Vendor guarantee value to meet EU standards; this performance guarantee is an upper limit where ~90-110mg/Nm^3 may be achievable average during normal operation. The Yara ammonia plant reformer fired heater approval was set at max 180mg/Nm^3 (PER1036).

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Woodside, 7,200 t/year from Yara Fertilisers, 188 t/year from Yara TAN and 319 t/year from the Urea plant proposal.	Better low NO_x burners have reduced this for the Proponent's plant. As an example of the implementation of BAT, the Perdaman Urea Project design is based on BAT where vendors can currently provide better (lower emissions) NOx burners, including performance guarantees, with respect to their proposed uses in various fired processes across the Project than are currently implemented in comparable processes in the region, e.g. gas turbines and the fired heater. Further, removal of very small quantities is largely a zero - sum gain - additional scrubbing and temperature control and equipment increase power/heat required, which results in increased NO_x from power generation. The Proponent has applied a newer technology layout to reduce the g/s rate of discharge of NO_x by over 50% compared with Yara. Using the annual NO_x emissions in t/year quoted in the comment, the g/s rate of discharge of NO_x the Proponent rate is 10.1g/s vs Yara's combined discharge NO_x rate of 234.3g/s It should also be noted that SCR is not appropriate technology for the type of fired heater applied to urea production - the SCR is applied to the Nitric acid emissions which contain the potent GHG N_2O, which is not present in the Proponent's plant, and which contains in the order of 1500 mg/Nm^3 NOx before SCR. The above demonstrate that considerable efforts have been applied by the Proponent to the application of BAT in implementation of the project.
Impact of urea on the rock art	

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The Proponent is to emit 353 t/year of urea dust into the atmosphere. Urea will be a new pollutant for Murujuga. I have argued that urea, being a source of nitrogen in the nitrogen-deprived natural environment of Murujuga, will stimulate microbial and lichen growth on the rocks and these organisms produce organic acids that will dissolve the outer rock surface patina and lead to destruction of the petroglyphs. Perdaman refute this claim. The Proposal document rightly claims on page xx of the Executive Summary that urea is not an acid forming compound and is not a nitrate, but claims. urea dust does not contribute to nitrate enhancement of microbial activity in any stand-alone analysis of the project emissions "...urea dust emissions could be considered not to contribute to cumulative impacts in these two aspects of potential concern." ... "Residual impacts to the integrity of rock art and associated NHL values/amenity at Murujuga, if any, as a result of limited urea dust emissions are not considered to be significant." This analysis that urea will not contribute to increased microbial activity on rock surfaces is not correct. Macleod (2005) measured microbial activity on Murujuga rock surfaces and states on p 391: " ...there is a logarithmic (ten-fold) increase in the number of bacteria per millilitre associated with a linear increase in nitrate concentrations ..." MacLeod also showed increases in bacteria, yeasts, moulds and fungi with increasing nitrate on rock surfaces. On page 168, the Proponent states: "Dr MacLeod clarified that any change of micronutrients may in theory have the possibility of activating a group of microflora that have hitherto been dormant, owing to the lack of suitable niche nutrients. If such theoretical reactivation occurs this could also potentially lead to acidification through metabolic processes." "The Proponent notes that there is currently no definitive data on the presence or otherwise of such microflora at Murujuga." The latter statement is incorrect. O'Hara (2008) showed there were substantial populations of chemoorganotrophic and chemo lithotrophic bacteria at a range of sites on Murujuga, while Gleeson et al. (2019) have reviewed evidence for types of microorganisms that inhabit rock varnish in deserts with climates similar to Murujuga. Plants and microorganisms cannot use urea directly as a nitrogen source and require urease to decompose the urea into ammonium ions for uptake and metabolism. The Proponent states on p 391. "... there is a strong probability that given the lack of naturally occurring urea, through processes of natural selection such microflora may never have	As noted in the ERD, research in other nitrogen deprived natural environments, indicates that native species in such an environment have evolved without a capacity to process increased nitrogen levels. (See ERD p154). Research indicated in this setting, that native species may tolerate high N-loadings although showing negligible growth response (Franklin et al., 2015). Thus, the comment is perhaps based on supposition rather than peer reviewed research. The proponent also notes that in relation to the quoted 2005 work of Dr Ian MacLeod used to support such suppositions, the author indicates that the quoted work and conclusions • were based on the analytical concentration of nitrate ions recovered from the washed surfaces of rocks in the Burrup and • only discussed soluble nitrates found on the rock surfaces and made no comment on ammonia or ammonium ions. (Dr Ian MacLeod, pers comm) Thus, the Proponent considers it is only appropriate to rely on the quoted work within the confines of the source s sampled and the researcher's focused discussion. Further research would be required to examine the broader conclusions being inferred by others across other aspects of the nitrogen cycle and the alternative microbial growth scenarios being advanced. The Proponent acknowledges the work by Dr O'Hare of Murdoch University on microflora identification of rock surfaces in the Burrup but notes that the results were inconclusive in terms of being able to readily get them to plate up and then test for positive identification.

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evolved or if they evolved may not have a genetic predisposition for this type of nitrogen micronutrient uptake. ” There is evidence of microbes having urease enzymes residing on rocks with desert varnish similar to Murujuga. Northup et al. (2010) examined rocks in the desert of New Mexico and conclude that Chloroflexi and Ktedobacteria dominated one varnish site, while the other varnish site was dominated by Cyanobacteria. While not all bacteria produce urease, Veaudor et al. (2019) show that cyanobacteria contain genes encoding one or several enzymes, urease, urea carboxylase and allophanate hydrolase, which catabolize urea into ammonia and carbon dioxide. Many fungi and lichens (Diaz et al. 2016) are also known to contain urease and can utilise urea as a nitrogen source. Lichens are known to produce acids that remove desert varnish (Dragovich, 1986). Therefore, the interpretation by the Proponent that urea will not contribute to microbial growth on Murujuga rock surfaces is not supported by scientific evidence. Urea enhanced microbial growth will increase the production of organic acids that will reduce pH of rock surfaces and dissolve the outer patina (Black et al. 2017).	The Proponent also notes that the Executive Summary of the quoted work of O’Hare states: “*During the sampling period all seven sites had rock surfaces with similar very low populations of cultivable chemoorganotrophic and chemo lithotrophic bacteria, usually <10 viable bacteria/cm^2.”* (confirmed and expanded in discussion on p9 of that report) This seems at odds with the submission suggestion that this study identified *“substantial populations of chemoorganotrophic and chemo lithotrophic bacteria at a range of sites on Murujuga”* Relevantly to the current considerations, the Proponent also notes that the Executive Summary of the quoted O’Hare report indicates that: *“Lichens were never observed to have colonised petroglyphs. “,* *“,,,,, there appeared to be no relationship between presence of lichens and proximity to sources of industrial emissions.”,* and *“There were no evident differences in the gross number and broad diversity of microorganisms associated with samples collected from sites close to and distant from industrial emissions on the Burrup Peninsula.”* The Proponent understands that further work on genomic studies is currently underway at Murdoch. The Proponent considers that this may be a relevant research avenue that could be considered for further support as a contributing participant to the MRAS as part of the implementation of the approved proposal to establish an enhanced understanding of potential impacts to rock art at Murujuga.

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	The comments on microflora on desert varnish in other locations, such as New Mexico, is noted. This serve to point out that a range of organisms live on the rock surfaces, as part of the natural weathering processes, but is not evidence of direct applicability to Murujuga at this time. The Proponent recognises MRAS Section 5.3.3 "Revised monitoring program" recognises as a key design principle that "*The program should be based on specified possible causes of change that may be of concern and the possible nature of that change. The specific cause of concern relates to anthropogenic emissions."* Therefore, consistent with this principle, the Proponent considers that an applied research program on the response of the microflora from Murujuga to urea in the millimolar range and building on work at Curtin and Murdoch Universities may be a relevant research avenue. This could be considered for further support as a contributing participant to the MRAS as part of the implementation of the approved proposal to establish and enhance understanding of potential impacts to rock art at Murujuga.
Table 4.31 of the Proposal (pi57) suggests the maximum limit for urea emissions into the atmosphere from the two Granulator facilities will be 25 mg/m3 being a total of 50 mg/m3 from the two facilities. Controlling urea emissions of urea into the atmosphere is not a simple process and particularly for removing submicron particles as shown by the 2016 International Patent No WO 2016/099267 A1 - titled: REMOVAL OF DUST IN UREA FINISHING. This patent suggests there are methods to reduce emissions well below Best Available Control Technologies. https://patentscope.wipo.int/search/en/detail.isf?docId=WQ2016099267&tab=PCTDESCRIPTION	The Proponent notes that this comment relates to a concentration i.e. mass per volume, not mass per unit time. The concentration is not additive – the anticipated **maximum** for each stack is 25 mg/Nm^3. The expected output during normal operation typically averages 20mg/Nm^3 (this from operating plant data). The planned dual scrubbing system is applied by all modern leading plants such as the USA as well as Middle East.

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	Additional scrubbing is applied in the layout which has comparable results to the referenced (Stamicarbon) patent.
Urea emissions must be monitored in real time to ensure the limits are not breached as maintenance of the scrubbing technology is critical. This monitoring data must be available to the public.	For the purposes of process control, management and quality control purposes, continuous monitoring is applied to the urea, gas turbine and fired heater stacks. This is not NATA accredited, and would not necessarily be conducted to recognised regulatory standards such as USEPA methods as it is not intended for regulatory purposes. Yara reports similar data on quarterly/annual basis. The Proponent commits to undertaking similar periodic stack testing for compliance purposes as is conducted at the Yara facility. The Proponent reaffirms that as part of the implementation of the approved project, it will be a contributing participant to the MRAS, and supports the monitoring approach as outlined in Sections 5.4 and 5.5 of the MRAS.

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Precautionary Principle	
In Table 4-1 (p. 41), the Proponent states: “The Proponent has applied, through the EIA process, and will continue to apply the precautionary principle to avoid, where practicable, serious or irreversible damage to the environment. All design considerations have been established on a risk-based approach” I cannot find publicly available information on the Environmental Impact Assessment claimed to have been undertaken by Perdaman. The Precautionary Principle under the EP Act states: Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. The EP Act also states that decisions applying the Precautionary Principle should be guided by: (a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and (b) an assessment of the risk weighted consequences of various options.	As noted in the submission, under section 4A of the EP Act, the precautionary principle is invoked as a relevant consideration in decision-making if two criteria are met: • there is a threat of serious or irreversible environmental damage; and • there is an absence of ‘full’ scientific uncertainty as to the nature and scope of that threat. The Proponent notes that Australian courts have made it clear that ‘full’ or complete scientific uncertainty is unattainable under a process of inductive logic, but that there must be ‘considerable’ uncertainty about the nature and scope of the threat in order for the principle to apply. As noted in the submission, in applying the precautionary principle, decisions should be guided by two considerations: • careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and • an assessment of the risk-weighted consequences of various options. The proponent notes that these two considerations are cumulative, not separate. It is sometimes asserted that the precautionary principle requires a proponent to prove that a risk does not exist, and in the absence of such proof that the project must not be approved. The Proponent notes that on the plain face of section 4A, as well as body of law established by Australian courts on how to apply the precautionary principle, this approach is wrong.

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	The project engineer maintains an environmental Risk Register which has been utilised to inform the Basis of Design which then is reflected in: • footprint/layout; • constructability/construction and operability/operating; and • considerations as part of the design process as indicated in the ERD reference in this submission. The ESD/ERD are the referenced public documents informing the EIA process. "*Through*" is used in the sense of "during" the process.
There is clear published scientific evidence that the petroglyphs on Murujuga are in the process of serious or irreversible damage, which I presented in my previous submission in relation to the Proponents Environmental Scoping Document Public Review on 11 June 2019. The Proponent attempts to justify application of the Precautionary Principle by quoting a section from the EPA Report 1648 (p. 140): "....there is currently no compelling scientific evidence which indicates that there is an immediate material threat of serious or irreversible damage to rock art from cumulative industrial air emissions within the Murujuga airshed."	The Proponent reaffirms that it notes and concurs with the EPA's view in the quoted section of as quoted EPA Report 1648.
From a scientist's perspective this statement by EPA is farcical. There is no definition of 'compelling scientific evidence' in Report 1648. Scientifically, what makes evidence compelling or not is statistical significance of measurements relating to changes in the patina, or a thorough logical analysis of electrochemical theoretical principles in the case of Murujuga Petroglyphs. The comment "no compelling scientific evidence" was made without reference to any of the previously peer-reviewed scientific papers. There is a published paper which shows statistically significant changes to rock surface pH from 6.8 preindustrialisation to as low as 3.5, and associated with the change in acidity, was a statistically significant log (ten-fold) increase in the dissolution of manganese and iron compounds from the surface patina of Murujuga rocks (MacLeod 2005). There is also a peer-reviewed published paper showing from electrochemical theoretical principles that	The Proponent is following a risk weighted approach to the Precautionary Principle in relation to the potential for adverse impacts from anthropogenic emissions on rock art. Further, it is able to draw on recent outcomes and analysis of monitoring undertaken for the purposes of rock art integrity evaluation that is required pursuant to EPBC Act Approval 2008/4546. This information is available in the public domain. The Proponent notes the quoted material from the 2005 work of Macleod then also draws on soon to be published research, by the same quoted author, building on the

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manganese and iron ions will be dissolved from the compounds composing the Murujuga rock patina once pH falls below 6.0 (Black et al. 2017). Contrary to the conclusions in EPA Report 1648, these published papers provide clear and compelling evidence that the petroglyphs on Murujuga are in 'immediate material threat of serious or irreversible damage'. In application of the Precautionary Principle, Perdaman states the principle is guided by 'an assessment of the risk weighted consequences of various options. ' There is no evidence of a serious and formal risk-based analysis of various options relating to the impact of the proposed urea plant on Murujuga petroglyphs. Application of the Precautionary Principle would, therefore, dictate that the proposed urea plant should not be placed on Murujuga.	quoted earlier work, based on recent monitoring data associated with the above cited EPBC approval[R] and work conducted in association with MAC, especially in relation to an understanding of regional acidity factors. This EPBC Approval 4546 approval compliance monitoring, supports the EPA risk weighted "precautionary principle" assessment in relation to Yara that are being challenged in this comment. This suggests that the EPA logic may not be flawed as the comment is suggesting and thus in applying a similar logic the ERD may not necessarily be flawed either as is being suggested in this comment. The Proponent observes that the 2017 "Analysis of Burrup Peninsula Rock Art" EPBC Approval 2008/4546 Condition 10 compliance report for rock art monitoring notes[S] *"In interpreting the results, in must be remembered that "the absence of evidence is not evidence of absence". If the monitoring does not show statistically significant change then it is appropriate to say that either "the data is consistent with no change" or that "if a change has occurred, it is below the level detectable by the monitoring program"."*

[R] Pre-prints of the International Council of Museums - Committee for Conservation, Conference, Beijing May 2021, - in press "Determining decay mechanisms on engraved rock art sites using pH, chloride ion and redox measurements including an assessment of the impact of cyclones, sea salt and nitrate ions on acidity." Authors Ian D MacLeod*[1] and Warren Fish[2]

[1]Western Australian Museum, Fremantle, Western Australia 6160, [2]CBG Solutions, Kingsley, Perth, Western Australia 6026

[S] See p32 of https://www.yara.com.au/siteassets/about-yara/reports/rock-art-monitoring-reports/analysis-of-burrup-peninsula-rock-art-2017-daa.pdf/

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	The above statement while a useful reminder, is not wholly correct. The absence of evidence **MAY** be evidence of absence, but it is not necessarily of itself conclusive evidence of absence, but may be useful evidence to inform risk weighted application of the Precautionary Principle. The proponent considers in risk weighting such results, it is important to recognise that if there is no deleterious impact, the only evidence is a lack of evidence of change across one or more parameters. Therefore, there is a zero probability of detecting change, with no increase in the probability of obtaining conclusive evidence being generated by additional monitoring or alternative investigative techniques, just a greater degree of confidence that probabilistically, the lack of evidence does in fact reflect an absence of change. Statistically, if ΔC is the measure of change being considered/monitored, where there is "no change" then by definition, Mean $\Delta C=0$ and the standard deviation $\Delta C=0$. In contrast, the probability of detecting evidence of change where deleterious impacts are occurring is positive, even if low, especially where multiple observations are made and/or multiple investigative techniques are applied. Statistically, where there is change then by definition ΔC Mean >0 and ΔC standard deviation >0. The Proponent notes that this EPBC Approval 2008/4546 monitoring and rock art observations are undertaken in close co-operation and collaboration with MAC Murujuga

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	rangers[T] who have a core interest in ensuring the robustness of this protective approach for rock art integrity. Given that this work is conducted for compliance with an EPBC approval condition whose purpose is clearly to address the potential uncertainty of the risk posed by anthropogenic emission to the integrity of rock art, it must be regarded as being "fit for purpose" to address that objective. The results of this monitoring and rock art observations, provide an enhanced indication that the perceived risk is not demonstrably realised. The proponent also notes that in relation to the quoted 2005 work of Dr Ian MacLeod used to support such suppositions, the author indicates that the quoted work and conclusions • were based on the analytical concentration of nitrate ions recovered from the washed surfaces of rocks in the Burrup; and • only discussed soluble nitrates found on the rock surfaces and made no comment on ammonia or ammonium ions. (Dr Ian MacLeod, pers comm). Thus, the Proponent considers it is only appropriate to rely on the quoted work within the confines of the sources sampled and the researcher's focused discussion. Further research would be required to examine the broader

[T] See: https://www.yara.com.au/siteassets/about-yara/pilbara-photos/2018-rock-art-monitoring-with-mac-252.mp4 The Proponent assumes MAC provided the free, prior and informed consent to be part of this documentation of the monitoring and observational data gathering for the purpose of enhanced understandings about rock art and potential emission impacts and for the requirements of EPBC Approval 2008/4546.

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	conclusions being inferred by others across other aspects of the nitrogen cycle and the alternative microbial growth scenarios being advanced. The Proponent acknowledges the work by Dr O'Hare of Murdoch University on microflora identification of rock surfaces in the Burrup but notes that the results were inconclusive in terms of being able to readily get them to plate up and then test for positive identification. The Proponent understands that further work on genomic studies is currently underway at Murdoch. The Proponent considers that this may be a relevant research avenue that could be considered for further support as a contributing participant to the MRAS as part of the implementation of the approved proposal to establish and enhance understanding of potential impacts to rock art at Murujuga.
The Proponent outlines other potential gas supply sources and sites in Western Australia that could accommodate the urea plant, but choses Murujuga because of infrastructure cost considerations. The economic benefits for the State would remain if one of the other options were chosen. Surely, the heritage value of the Murujuga petroglyphs is so high that it must override additional costs to the company locating at another site.	The submission statement in relation to other gas supplies, does not accurately reflect that just because there is a gas supply, feasibility/viability of such an alternative location is not guaranteed. Thus, this sole criteria does not guarantee these benefits as claimed in this comment. The infrastructure cost of a new greenfields site (outside current) can be in order of 20-30% of the project – namely around $0.8-1b. This cost is borne by the taxpayers of WA/Australia. The Burrup Industrial precinct was proposed more than 20 years ago and suitable infrastructure was developed allowing for such expansions as proposed (seawater, port etc).

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DESTRUCTION OF ABORIGINAL HERITAGE BY INDUSTRY Following the Rio Tinto obliteration of the Juukan Caves and its world-wide condemnation, the Black Lives Matter campaign and the Australian community awakening to the atrocities Europeans inflicted on the existing Aboriginal population through massacres and stealing of their land, surely it is time to respect the wonderful heritage produced by what was, for tens of thousands of years, the most sophisticated society on earth (Pascoe, 2014; McKenna, 2018). This proposal to place a urea plant on Murujuga cannot be approved by a caring Government given: i) thinking of today as explained by Waleed Aly in an article in the Sydney Morning Herald in relation to defacement of monuments and the Juukan caves issue ("And yet, for those truly concerned with history, it's worth noting that only the Indigenous sites represent the true destruction of history and cannot be replaced. What's being defaced in the case of those statues is not history itself but rather commemoration. That's quite a different thing" (https://www.smh.com.au/national/lack-of-reconciliation-remains-our-crowningfailure-20200618-p553tp.html), and; ii) growing respect for the wonderful heritage of the original custodians of Australia. Who is responsible for preserving Murujuga petroglyphs? I have long been concerned that no person or position within governments has ultimate responsibility for ensuring preservation of the petroglyphs on Murujuga. When I asked a Western Australian government person, 'who has ultimate responsibility for preservation of the rock art', the response was: 'It is a shared responsibility involving the State, Commonwealth and industry, under a number of different statutes, and in partnership with MAC as the Traditional Custodians'.	These are philosophical and policy issues and addressed to Government to consider and respond, not the Proponent.
There is strong evidence that the primary concern of industry is profit and not preservation of the rock art. When I asked Yara International personnel in Norway to reduce emissions from their Murujuga plants, they answered 'we are simply doing what your governments allow'. This statement is reinforced by Yara personnel at Murujuga saying to other people that the emissions from the Pilbara TAN plant are not as low as other plants they operate around the	These are philosophical and policy issues and addressed to Government to consider and respond, not the Proponent. The Proponent reaffirms this opportunity is being advanced within the existing statutory environment in WA and the

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world. Norway places a tax on nitrogen dioxide emissions, which had a clear impact in industry response.	Commonwealth.
It is also clear that MAC have no legal powers to prevent industry development or to change the levels of emissions from industrial plants. In fact, the Aboriginal groups surrounding Murujuga were pressured to sign away their rights to complain about industrial development on the Burrup Peninsula in exchange for a 99-year lease over part of the peninsula as part of the Burrup Maitland Estates Industrial Agreement in 2003. The arrangement where no person or position has responsibility for preservation of the petroglyphs is potentially disastrous for the rock art, because blame can be passed to other organisations when damage occurs and no person or organisation controls all activities that are likely to impose damage to this magnificent heritage. Although development on Murujuga is partly controlled by the State government and partly by the Commonwealth, due to the National Heritage listing over a section of the peninsula, the State government first makes an approval decision. I believe it is essential for the state government to create a permanent position to have ultimate responsibility for all activities that may impact on the Murujuga Petroglyphs. This approach should apply more broadly to both European and Aboriginal heritage. With any development proposal there is frequently conflict between the economic value of the proposal and its negative effects on the environment, heritage (social) or racial/religious/inter- generational (equitable) issues. These competing aims are currently facilitated by separate departments within government including at least: State Development and Jobs; Mining and Petroleum; Environment; Aboriginal Affairs; Health; and Culture and Arts. I believe there needs to be a formal process for allocating a relative score to the economic advantage and the negative effects of a proposal. The aim of a scoring system should be to put a relative value on each ‘place’ that could be negatively affected by a proposed development. For example, the petroglyphs on Murujuga should have an extremely high score because they are unique in the world and are irreplaceable. Whereas, a specific environment, such as a native grass-land, may have a lower score because it occurs in different places and its destruction may be less significant in the overall protection of that type of environment. Offsets imposed on a company, for a similar environment, may be considered adequate in the latter case, but never for a high scoring heritage site.	These are philosophical and policy issues and addressed to Government to consider and respond, not the Proponent.

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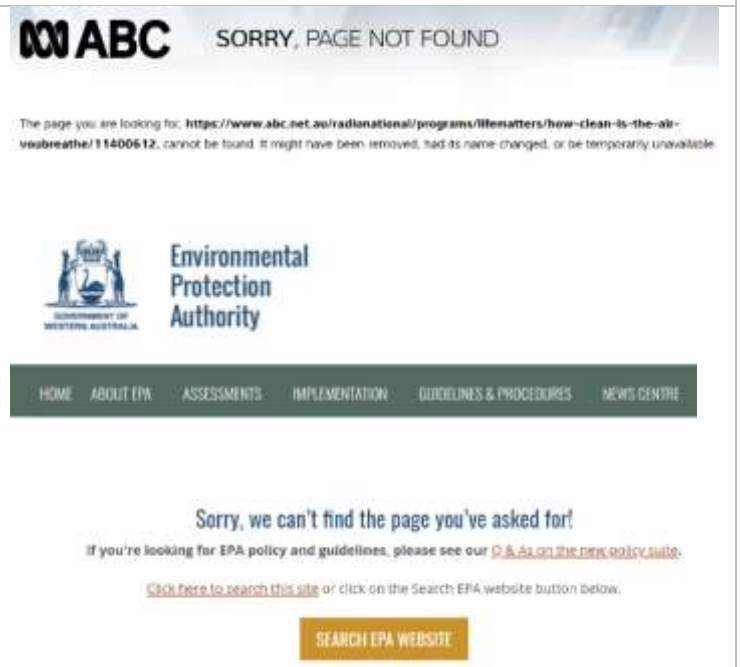
Rules for developing a score would need to be determined. Places with high scores may mean no industrial development or extremely strict limits on activities that would have negative impact. Whereas, limits on industry may be less with 'places' that have a lower score. As outlined, preservation of the petroglyphs on Murujuga is greatly hampered by the lack of someone taking ultimate responsibility for their survival. An individual person needs to be appointed to have final determination on all approval decisions, conditions of approval and compliance with those conditions, as well as the application of penalties. The most appropriate person for Aboriginal heritage sites would come from the Aboriginal community. The 'buck' would stop with that person. If that person allowed the 'place' to be damaged, sanctions may be considered appropriate. Contingencies would be needed to pass the role to another person in the case of retirement, death or other circumstances. I regard this proposal as being similar to the 'totem' system adopted within Aboriginal communities. The responsible person should be the most 'expert' for the particular 'place' and can be selected from the community. I believe the government needs to give serious thought into how best to protect Western Australian heritage and put a workable system into legislation.	
References (useful to be consulted in preparing responses, especially where these have scientific rigors and applicability to enhanced environmental understanding and performance) Anderson, C., Bineham, N., Lockwood, T., Mukhtar, A. and Waenerberg, N. 2018. Pilbara Health Profile; Government of Western Australia, WA Country Health Service. Planning and Evaluation Unit. http://www.wacountrv.health.wa.gov.au/fileadmin/sections/publications/Publications by topic type/Reports and Profiles/Pilbara Health Profile 2018.pdf Barnett, A.G. 2014. It's safe to say there is no safe level of air pollution. Australian and New Zealand Journal of Public Health. 38:407-408. doi: 10.1111/1753-6405.1226. Black, J.L., MacLeod, I.D. and Smith, B.W. 2017. Theoretical effects of industrial emissions on colour change at rock art sites on Burrup Peninsula, Western Australia. Journal of Archaeological Science: Reports 12, 457-462.	Noted. Attempts to go to references listed here returned numerous failed searches e.g. see screen shots of attempts 

Submission #10 Public unidentified	Perdaman Response
Diaz, E.M., Sanchez-Elordi, E., Santiago, R., Vicente, C. and Legaz, M.E. 2016. Algal-Fungal Mutualism: Cell Recognition and Maintenance of the Symbiotic Status of Lichens. Journal of Veterinary Medicine and Research 3:1052. Doctors for the Environment in Australia (2019) radio interview. https://www.abc.net.au/radionational/programs/lifematters/how-clean-is-the-air-voubreathe/11400612. Dragovich, D. 1986. Weathering of desert varnish by lichens. In: Readings in Australian geography: proceedings of the 21 st Institute of Australian Geographers' Conference, Perth, 10-18 May 1986, Edited by Arthur Conacher. Published by Institute of Australian Geographers (WA Branch) and Dept, of Geography, University of Western Australia, Perth. EPA. 2019. Technical Ammonium Nitrate Production Facility, Burrup Peninsula - inquiry under section 46 of the Environmental Protection Act 1986 to amend Ministerial Statement 870. https://www.epa.wa.gov.au/sites/default/files/EPA Report/1728-19%20%20Technical%20Ammonium%20Nitrate%20Production%20Facility%20%20EPA%20Report O.pdf Gillett, R. 2008. Burrup Peninsula air pollution study: report for 2004/2005 and 2007/2008. Department of Environment and Conservation, Western Australia Gleeson, D. B., Leopold, M., Smith, B. and Black, J. L. 2018. Rock-art microbiome: influences on long term preservation of historic and culturally important engravings. Microbiology Australia 39:33-36. Gudka, S. 2020. Living with uncertainty: every breath you take in the Burrup Peninsula. Urban Impact Project, Fremantle, Western Australia. Guo, H., Weber, R.J. & Nenes, A. 2017. High levels of ammonia do not raise fine particle pH sufficiently to yield nitrogen oxide-dominated sulfate production. Scientific Reports 7:12109. https://doi.org/10.1038/s41598-017-11704-0. MacLeod, I. D. 2005. Effects of moisture, micronutrient supplies and microbiological activity on the surface pH of rocks in the Burrup Peninsula. In 14th Triennial Meeting, The Hague, 12-16 September 2005: Preprints (ICOM Committee for Conservation), Isabelle Verger, ed. pp. 385-393, Earthscan Ltd. McKenna, M. 2018. Moment of Truth: History and Australia's future. Quarterly Essays. Scribe Australia. ISBN: 9781760640507.	

Submission #10 Public unidentified	Perdaman Response
Northup, D.E., Snider, J.R., Spilde, M.N., Porter, M.L., van de Kamp, J.L., Boston, P.J. Nyberg, A.M. and Bargar, J.R. 2010. Diversity of rock varnish bacterial communities from Black Canyon, New Mexico. Journal of Geophysical Research, Biological Sciences. 115:G02007. doi:10.1029/2009JG001107, 2010. O'Hara, G. 2008. Monitoring of microbial diversity on rock surfaces of the Burrup Peninsula. Monitoring of microbial diversity on rock surfaces of the Burrup Peninsula. https: //web. archive, org/web/2009100213520l/http:/www. dsd. wa.gov. au/documents/Micro bial_Diversity_on_Rock Surfaces_Sept2008(.l). doc. Pascoe, B. 2014. Dark Emu. Magabala Books Aboriginal Corporation Broom. Veaudor T, Cassier-Chauvat C and Chauvat F (2019) Genomics of Urea Transport and Catabolism in Cyanobacteria: Biotechnological Implications. Frontiers in Microbiology 10:2052. doi: 10.3389/fmicb.2019.02052.	

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SUBMISSION #11

Submission #11	Perdaman Response
Member for the Mining & Pastoral Region in the Western Australia Legislative Council E mining-pastoral@mp.wa.gov.au P (08) 9486 8255 | 1800 138 610 (regional freecall) W www.robinchapple.com A 41 Havelock Street, West Perth WA 6005 P PO Box 94, West Perth WA 6872 HON. ROBIN CHAPPLE MLC Dr Tom Hatton, Chairman Environmental Protection Authority Locked Bag 10 Joondalup DC WA 6919 [Submitted online via EPA Consultation Hub] Dear Dr Hatton, Re: Perdaman Urea Proposal, BMIEA I would like to take this opportunity to give comment on the proposal by Perdaman Chemicals & Fertilisers Pty Ltd to establish a state-of-the-art Urea Production Plant within the proposed Burrup Strategic Industrial Area, approximately 8 km from Dampier and 20 km north-west of Karratha on the Burrup Peninsula of Western Australia (WA). As you are no doubt aware, the expansion of any industry on the Burrup is of great personal concern; with only provisional commitments towards its preservation – both culturally and environmentally - and with increasing suspicion of the activities of the existing proponents. With that being said, I must concede that the Environmental Review Document prepared by Cardno is exemplary in its treatment of those concerns I raised to the EPA last year. Perhaps most pleasing is its treatment of the proposal as part of the increasing industry on the Burrup. Again, I must argue that any industry on the Burrup cannot be taken as a stand-alone project, and the effects on the living and abiotic environment must be viewed cumulatively and over time.	The Proponent notes and welcomes this submission from the referrer. In terms of the risks in the case of accident, the Proponent acknowledges that these are relevant and pertinent concerns. The Proponent also reaffirms that the site will be a Major Hazard Facility (MHF) and that the Project will not operate until and unless it prepares an appropriate Safety Case that is approved then implemented for the operation of the plant. The cumulative risk of proximity to stored quantities of ammonium nitrate, including lessons learnt from the recent disaster in Beirut, will be important elements of that Safety Case. In this regard, the design has already located the product storage shed at the western boundary of Site C to maximise the separation distance from product storage associated with the proximal Yara site.

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Additionally, Cardno's treatment of marine fauna – vertebrates but especially invertebrate species – was a welcome addition that went a long way in conveying the thoroughness of their research. In similar vein, the Proponent's address to the Murujuga petroglyphs was exemplary, and the stringency and accountability would prove a sound benchmark for future EPA assessments. My only outlying concerns for the project come from regard for human life and natural integrity, and it is pertinent to repeat now those comments I made last year. It has been noted that the Perdaman plant will sit within 1.5km of the Yarra Pilbara Nitrates plant, and within one kilometre of the Yarra Pilbara Fertilisers plant. Given the sheer volume of volatile and potentially explosive chemical species upon the peninsula, it's imperative that the proponent deliver a draft protocol for environmental management in the instance of industrial accident at either its own premises, or at those adjacent premises. Considering the immediate adjacency of the several plants, a large-scale issue such as fire poses serious risk to all proponents on the Burrup, and even greater risk to the surrounding lands and waters. This is especially relevant when one considers the BFPL Ammonia Plant and its history of ammonia leaks, and the greater issue of sustaining industry's interest in environmental protection past the approvals stage. Obviously, this is worst-case-scenario – I have no desire to be macabre but such events do occur and could prove disastrous if not anticipated. I'd like to thank the Chairman for his time and consideration. The Hon Robin Chapple MLC Member for the Mining and Pastoral Region 22nd June 2020	

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SUBMISSION #12 CITY OF KARRATHA

Submission #12	Perdaman Response
City of Karratha Your Ref: CMSI 7373 & DWERT4375 Chairman Environmental Protection Authority LOCKED BAG 10 JOONDALUP DC WA 6919 Attention: John Güld Dear Sir/Madam ENVIRONMENTAL REVIEW DOCUMENT - PERDAMAN CHEMICALS AND FERTILISERS PTY LTD - PERDAMAN UREA PROJECT - ASSESSMENT NO. 2184 I refer to your correspondence of 25 March 2020 inviting submissions on the Environmental Review Document (ERD) for the Perdaman Urea Project. The City of Karratha (the City) has reviewed the ERD and provides the following comments:	
1 The City supports the Perdaman Chemicals and Fertilisers Pty Ltd Perdaman Urea Project.	Comment noted.
2 The ERD largely addresses the environmental factors and scope of works contained within the approved Environmental Scoping Document.	Comment noted.

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3 The City notes that consultation has been undertaken with the community and that an agreement has been reached between the proponent and Murujuga Aboriginal Corporation (MAC). The City expects that the proponent will continue to engage with the local community and MAC as the project progresses.	Comment noted.
Impacts on Hearson Cove Road 4 A key concern for the City is the proposed realignment of Hearson Cove Road. Hearson Cove Road is a local road maintained by the City. Hearson Cove Road provides access to: a. Hearson Cove: a popular recreational area with the local community and visitors; b. Deep Gorge: a place with significant Aboriginal heritage values and cultural significance within the Murujuga National Park.	The Proponent notes the comment and feels these are appropriately and adequately addressed in the ERD.
5 The proponent has previously advised the City of the need to realign Hearson Cove Road. The ERD shows Hearson Cove Road on a new alignment. Limited information has been provided on the design specifications for the proposed new road and implications for public access to Hearson Cove. The City expects that convenient access to Hearson Cove will be retained at all times during construction and operational phases of the project. Further information including but not limited to technical specifications for the road and fill levels, a construction management plan and traffic management plan shall be prepared and submitted to the City prior to construction commencing.	The State Government will be responsible for the realignment of the Hearson Cove Road, including the relevant design aspects being raised.
6 The proponent shall be responsible for the construction of Hearson Cove Road in accordance with the relevant specifications. Given that the proponent is proposing to utilise Hearson Cove Road for construction and operational purposes, the City expects the proponent to prepare and enter a road maintenance agreement with the City for the relevant section.	The State Government will be responsible for the realignment of the Hearson Cove Road. The Proponent will work with the City of Karratha and the State government to ensure these matters are addressed. The State has confirmed this in writing. A copy of this correspondence is included Appendix T herewith as an addendum to ERD Public Correspondence Appendix J.

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7 The City expects the proponent to continue consultation with the local community prior to and during construction of the realigned Hearson Cove Road. This is considered a priority due to the public interest that will be generated as a result of the proposed works and potential disruptions to access.	Further consultation is envisaged during detailed design and construction planning of the road realignment. This consultation will include the State Government, City of Karratha and MAC as a minimum. It is anticipated the State Government will lead this consultation as it will have ultimate responsibility for this element - see response to Comment #6 above, but the Proponent will support this consultation. .
Impacts on Social Surroundings and Amenity 8 The City acknowledges that there is already strategic industry in this area and that mitigation measures are proposed to reduce visual impacts. However, the City's view is that the project could have a significant lasting impact on the landscape and visual character of the area, particularly for people visiting Hearson Cove and the Murujuga National Park. This needs to be further considered.	The comment seems significantly inconsistent with Australian Government's view. As cited in ERD Section 6.6.1 (p 209) statements on Department's website relating explicitly to National Heritage Listing for Murujuga recognise the societal value attributed to industry alongside heritage, ie a "blended fabric" (see quote below and link http://www.environment.gov.au/heritage/places/national/dampier-archipelago). ***"Pre-history meets the industrial age*** *The Dampier Archipelago is home to the most ancient works created by man, as well as a multi-billion-dollar resource industry.* *The Archipelago is located near significant reserves of natural gas, petroleum and iron ore resources. Industries have already invested in excess of $35 billion in developments, while trade to and from the Dampier Port reached 88.9 million tonnes for 2003-04, making Dampier the second largest tonnage port in the country. The area has also created thousands of jobs.* *A balance between heritage management and economic prosperity is being achieved through a collaborative partnership involving Indigenous groups, industry, governments and the community. Careful, long-term management of the Dampier Archipelago and Burrup Peninsula will see both our heritage*

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	and economy protected into the future, to the advantage of all Australians." The Proponent also views that the quoted statement reflects a cornerstone requirement that future industry must embrace as a good neighbour striving for a balance between heritage management and economic prosperity that must be realised through a collaborative partnership involving Indigenous groups, industry, governments and the community. This is an operating mantra that the Proponent seeks to reinforce in its various corporate values and Project EMPs. The Proponent further notes that the MRAS at Page 8 records *"The Western Australian Government considers that with appropriate management, industry and tourism can successfully co-exist with the cultural heritage and environmental values of the area. While it acknowledges that Traditional Owners have expressed a preference for new industry to be located where possible at the Maitland Strategic Industrial Area, the Western Australian Government is also cognisant of the commercial and logistical challenges in establishing certain industries away from key export infrastructure"* Thus, the visual amenity associated with this industrial development within Crown Reserves R49120 and R49121, which are reserved for the explicit purposes development of Industrial development and Industrial infrastructure that form the BSIA is wholly consistent with the purpose and societal expectations in the establishment of the Crown Reserves and the WA State Government's express policies.
9 The extent and visual impact of infrastructure proposed within the conveyor and gas pipeline easements is unclear from the information provided in the ERD.	Visual amenity of the conveyor in corridor is harmonious with the intended use and amenity of Crown Reserve for Industrial Infrastructure R49121 and the tenure of the existing cleared bitumen State Multi-user infrastructure corridor. As noted above

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	the area is recognised as a blend of uses associated with cultural heritage and also with industrial use. Thus, the visual amenity is a blended amenity also described by the Federal Government under the caption "***Pre-history meets the industrial age."*** In both these areas current visual amenity includes large scale installed industrial infrastructure in the form of water and ammonia pipelines plus a large industrial water storage tank. The Proponent notes that on the "Attractions"[U] page of the City's website, the this blended visual amenity is prominently referenced: "Burrup Peninsula" *The Burrup Peninsula was named after Mount Burrup during the planning stage of the North West Shelf Gas Project in 1979. Woodside Petroleum Pty Ltd onshore operations are located on the peninsula.* *Mount Burrup was named by the Government Surveyor, FS Brockman, after Henry Wood Burrup, one of two men mysteriously murdered at the Union Bank in Roebourne in 1885.* *The North West Shelf Gas Project is the largest resource project ever undertaken in Australia. Gas is drilled at an offshore platform 130 km north of Dampier and piped to the onshore treatment plant on the Burrup Peninsula. From here the gas is carried in a 1450km pipeline to domestic and industrial gas users in the south of the State.*

[U] See: https://karratha.wa.gov.au/attractions#Burrup%20Peninsula

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	Construction has now been completed in the Liquefied Natural Gas [LNG] phase of the project which involves the export of LNG gas to Japan, which commenced in October 1989. King Bay Supply Base services the offshore operations and onshore treatment plant. *Burrup Lookout overlooks the north west shelf onshore operations on the Burrup near the Visitors Centre offering a great view at night.* *For the adventurous, a trip further out along the Burrup Peninsula towards Withnell and Conzinc Bays will reward you with untouched scenery, amazing rock formations and pristine, sandy beaches. Access is however strictly 4WD and only for experienced drivers with caution, especially through the mangroves and over a short very rough and steep incline called the Jump Up. On the way back at the junction of the Burrup and Dampier roads, take the unmarked track to the left to the Burrup Lookout on the hill with a radio transmitter for fantastic 360 degree views of the Burrup Peninsula and surrounds. This track is a little bumpy towards the top but is accessible with a two wheel drive vehicle with care."*
10 Point 8.11 of the approved Environmental Scoping Document requires the proponent to propose 'appropriate offsets'. There are no offsets proposed in the ERD. It is not clear if the proponent is considering and proposing appropriate offsets for impacts of the project on the social surroundings and amenity.	Noted and offsets are a matter of ongoing discussion with State and Federal representatives. A specific consolidated response re offsets will be provided to the EPA under separate cover. The Proponent also notes that pursuant to the "polluter pays" principle of the WA EP Act as the Project will be a Prescribed Premises, fees will be levied for all licenced discharges under Regulation 5D(1a) of the EP regulations. The proponent notes that pursuant to s.3A of the EP Act

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	"pollution means direct or indirect alteration of the environment — (a) to its detriment or degradation; or (b) to the detriment of an environmental value; or (c) of a prescribed kind, that involves an emission"
11 Council's adopted Local Planning Policy DP20 — Social Impact Assessments requires preparation of a Social Impact Assessment (SIA) and Social Impact Management Plan (SIMP) for major projects. The City expects a SIA and SIMP to be prepared for this development.	Noted and this will be addressed as part of any requisite Development Application.
<u>Impacts on Natural Environment</u> 12 The project would adjoin the Murujuga National Park. There is potential for the project to contribute to the introduction of weeds and pests by disturbing and developing land. The City considers it essential to manage weeds and pests through appropriate planning and monitoring and to work with MAC and the Department of Biodiversity, Conservation and Attractions in these efforts.	Please note that the project does not adjoin, but is proximal to, Murujuga National Park at the south of Site F– see Figure 1-1 on page xiii of the ERD. The Proponent corrects the ESD suggestion that the project is adjacent to the Park. Notwithstanding there is no direct connection between the Project sites and the Murujuga National Park, The Proponent believes that its approach to integrated weed and pest management (in partnership with existing regional programs (i.e. with MAC and Pilbara Port Authority)) will ensure the integrity of the national park is not impacted.
<u>Impacts on Rock Art</u> 13 It is noted that the Air Quality Impact Assessment in the ERD does not assess potential impacts of emissions on Aboriginal rock art (petroglyphs) because 'there are no accepted or commonly applied standards for assessing deposition of air pollutants on land surfaces'. The City supports the proponent's commitment to contribute to the ongoing monitoring and analysis	The Proponent notes the comment, but refers to the discussion on P152 -154 of the ERD from "Emissions on Cultural Heritage" and Section 4.8.5 "Assessment of Impacts" from P160.

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of Aboriginal Rock Art in accordance with the Murujuga Rock Art Strategy. The City encourages the proponent to continue to engage with MAC as custodians of the rock art.	
<u>Proposed Causeway</u> 14 The City does not support construction of a causeway to provide direct access between 'Site C' and 'Site F'. The City recommends Burrup Road be used for access between the sites instead of building the causeway. Burrup Road already exists as part of the RAVIO network. The cost of constructing the causeway could be avoided if Burrup Road is utilised, there would be less environmental impact on the tidal flats and there does not appear to be sufficient need for a 4-way intersection between the causeway and Hearson Cove Road.	The Proponent reaffirms that its design considerations have evolved from a situation of potential high impacts i.e. total infill with underflow drainage, between Sites C and F, to an elevated Causeway design with significantly reduced footprint and significantly reduced associated footprint impacts incorporating large diameter, short culverts with significantly larger flow capacity compared to the flow limits imposed in this area by the existing Burrup Road culvert installation. This design mitigates the risk of material impacts to geomorphic coastal processes, inland waters and associated identified cultural heritage values in this vicinity. It also significantly reduces traffic risks compared to the alternative extended routing along public roads between Sites C and F. The Proponent considers that the single 4-way intersection on a relatively low volume road significantly reduces traffic risks associated with the alternative use of the alternative public road route via three separate T junctions, two of which would be on the comparatively higher volume Burrup Road.
Should you wish to discuss this matter or require further information please contact the City's Senior Planner, Josh Allbeury on 9186 8673 or at joshua.allbeury@karratha.wa.gov.au.	

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Yours faithfully DIRECTOR DEVELOPMENT SERVICES 22 June 2020	

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SUBMISSION #13 FRIENDS OF AUSTRALIAN ROCK ART, INC (FARA)

Submission #13 FARA	Perdaman Response
Our submission is also attached as a PDF PERDAMAN UREA PROJECT Submission to WA Environmental Protection Authority in response to the Perdaman Environmental Review Document Assessment No. 2184 (WA); 2018/8383 Commonwealth by Friends of Australian Rock Art, Inc (FARA) 22 June 2020	Submission information
1. Introduction We write to urge the EPA to reject the Perdaman Urea Project proposed for sites C and F on the Burrup Peninsula, and in support of preserving the internationally significant and unique Murujuga petroglyphs that record ~50,000 years of Australian Indigenous culture in the region. Their importance has been widely recognised by local Indigenous elders, the Murujuga Aboriginal Corporation (MAC), well-respected archaeologists and anthropologists, and the State and Federal Governments who have both supported their nomination for World Heritage listing. While we realise that the Project is supported by both governments as economically "strategic" this is clearly short-sighted and does not properly consider the Precautionary Principle (PP) or the Principle of Intergenerational Equity (PIE). Nor does it recognise the heritage value of Murujuga to all Australians who want to protect this special place and its unique petroglyphs.	Introductory commentary and a position statement by the submitter
Perdaman Chemicals and Fertiliser Pty Ltd (PCF) argues that Sites C and F are already disturbed in places and that they will be able to protect some individual important petroglyphs that have been identified within the proposed development envelope. However, industrial emissions from the Project will be added to those of other industries located on the Burrup Peninsula and this cumulative impact will continue to threaten and degrade the rock art.	No NHP heritage sites within the Development envelope will be impacted. Any petroglyphs within the project footprint will be salvaged and relocated under procedures endorsed by the MAC Circle of Elders in the IHS Heritage

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	Survey report in relation to seeking s.18 consent for such salvage where disturbance of the site is unavoidable. Therefore, the petroglyphs may not be retained in-situ, however their physical integrity will be protected and the material will be relocated to an agreed site. In this manner, access and amenity for the totemic and ceremonial purposes, which are essentially impaired through agreement to surrender native title rights and interests as noted on MAC's website and specifically pursuant to the safety provisions in Clause 8 of the BMIEA, Additional Deed, but are associated with Traditional lore, can be re-established.
PCF has not provided adequate or convincing evidence that petroglyphs and Indigenous cultural sites across Murujuga can be protected by the company's very local proposed mitigation actions.	The project management of impacts, through the range of applicable Management Plans included in ERD Appendix K, is strongly focussed on ensuring that project activities are undertaken within the project tenures. In this way impacts are primarily constrained within that footprint. As indicated in the ERD, including the Aboriginal Heritage Management Plan in Appendix K, the Proponent is committed to work with MAC to ensure its project is implemented in a respectful manner that ensure that indigenous cultural sites and petroglyphs across Murujuga are respected and protected.

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If the State and Federal governments approve this Project, it would provide further evidence that they do not respect Aboriginal heritage, which is important to all Australians, and that they are not serious about their stated intention to gain World Heritage status for Murujuga. Given the very widely expressed public outrage and condemnation of Rio Tinto's destruction of the Juukan rockshelters, and the fact that neither the State or Federal governments intervened to at least delay the action so that it could be reassessed, many Australians have lost confidence in the governments' will to protect Australia's cultural heritage.	Statement directed at Government policy, not for the Proponent to respond.
Furthermore, a decision to approve the PCF Proposal would be in direct contravention of the EPA's responsibility to abide by the Precautionary Principle as stated in Part 1, Section 4A of the WA Environmental Protection Act 1986: Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.	Statement directed at Government policy, not for the Proponent to respond.
The EP Act also states that decisions applying the precautionary principle should be guided by: (a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and (b) an assessment of the risk weighted consequences of various options.	This submission quotes from the EP Act on the precautionary principle. The proponent notes that under section 4A of the EP Act, the precautionary principle is invoked as a relevant consideration in decision-making if two criteria are met: • there is a threat of serious or irreversible environmental damage; and • there is an absence of 'full' scientific uncertainty as to the nature and scope of that threat. In addition, the proponent notes that Australian courts have made it clear that 'full' or complete scientific uncertainty is unattainable under a process of

	inductive logic, but that there must be 'considerable' uncertainty about the nature and scope of the threat in order for the principle to apply. In applying the precautionary principle, decisions should be guided by two considerations: • careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and • an assessment of the risk-weighted consequences of various options. The Proponent notes that these two considerations are cumulative. It is sometimes asserted that the precautionary principle requires a proponent to prove that a risk does not exist, and in the absence of such proof that the project must not be approved. The Proponent notes that on the plain face of section 4A, as well as body of law established by Australian courts on how to apply the precautionary principle, this approach is wrong. If the criteria for applying the precautionary principle are met, this simply means the EPA must assume that there is, or will be, a serious or irreversible threat of environmental damage, even though there is a degree of scientific uncertainty about the extent of that threat, or whether the threat really exists. Preventative measures must therefore be implemented without waiting until the reality and the seriousness of the threat become fully known. The objective of those preventative measures should not be to eliminate all risks, but to make a risk weighted decision about how the risks could be averted or reduced. Risk assessments should be underpinned by scientific data, as opposed to unsubstantiated speculation, hypothesis, or conjecture.

	In considering the scientific uncertainty related to the potential adverse effect of anthropogenic emissions on rock art at Murujuga, the Proponent considers the suggestion that ammonia and urea emissions will have a deleterious effect is based on supposition that any nitrogenous material is bad, but does not recognise • The often quoted 2005 report by MacLeod relied upon to support this supposition, including to the Senate enquiry, only discussed soluble nitrates found on the rock surfaces and not on ammonia, ammonium ions nor urea; and • made no comment that measurements on the Yara monitoring sites have demonstrated the ammonia levels on the at Ngajarli (Deep Gorge) are not statistically different to established baseline levels. As noted previously, the Proponent acknowledge that there are possibilities of the urea providing some form of stimulation of the combined biological response associated with the natural microflora living on Murujuga rocks. Being part of the complete nitrogen cycle, it is possible that specific microorganisms on the rocks may utilise this additional source of nitrogen reservoir but the normal chemical reaction of urea undergoing hydrolysis (reaction with moisture, water) is shown below, with the intermediate step of carbamic acid being only stable at -23^{o}C, before hydrolysis releases the second ammonia molecule and releases the carbon dioxide, from which the process began.

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	It should be noted in this hydrolytic breakdown the oxidation state of the nitrogen is still (-III) in the urea and in the ammonia gas. $CO(NH_2)_2 + H_2O \rightarrow CO(NH_2)OH + NH_3$ and then $CO(NH_2)OH + H_2O \rightarrow CO_2 + NH_3$ With ambient temperatures of the rocks at Murujuga being at least 50^oC above the decomposition point of the carbamic acid, it is very unlikely that sufficient urea will become biologically available to facilitate biological interaction and so become oxidized to the (+III) state of nitrite or the (+V) state of nitrate ions. The Proponent also notes that recent research by Chinese scientists have confirmed the presence of the same type of rock varnish in the Gobi Desert which has been produced abiotically i.e. through a suite of oxidation and reduction reactions catalysed by the presence of titanium dioxide (Xu et al. 2019)[V]. The Proponent considers that the above should be recognised in any risk weighted precautionary principle consideration of the submission to the Senate Murujuga enquiry as noted on P153 of the ERD, which "highlighted" the 2005 work of MacLeod that "Of particular note is the finding that these

[V] Reference: Xu, X., Wang, C. and Li, Y, 2019, Characteristics of desert varnish from nanometer to micrometer scale: a photo-oxidation model on its formation. *Chemical Geology,* May 2019, DOI: 10.1016/j.chemgeo.2019.05.016

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	organisms will overrun, and outcompete varnish forming micro-organisms and produce organic acids which increase the acidity of rock surfaces." Further research would be required to examine the broader conclusions being inferred across other aspects of the nitrogen cycle and the alternative microbial growth scenarios being advanced.
PCF presents a deficient interpretation of the PP and the PIE (Section 8, Environmental Review Document; ERD) and then concludes that they are adhering to these fundamental principles (see details below). The ERD asserts that they will investigate practicable measures to mitigate the risk of the rock art being damaged, but there is no mention of how the risk will be calculated nor how this mitigation will be done. It is not sufficient for PCF to argue that they have committed to MAC to participate and contribute to the development of an Environmental Quality Management Framework (as an offset to impacts), or that future monitoring will be conducted as part of the Murujuga Rock Art Strategy (MRAS; https://www.der.wa.gov.au/images/documents/our-work/programs/burrup/Murujuga_Rock_Art_Strategy.pdf), as this will take years to complete and lacks independence from industry. This commitment to offset impacts essentially acknowledges that there will be impacts to the irreplaceable Murujuga petroglyphs, which we find unacceptable. Put simply, there is sufficient risk of serious or irreversible damage to the environment and the cultural heritage located there – clearly there is, or the MRAS would not have been deemed necessary. Furthermore, there has not been a thorough assessment of the risk-weighted consequences of this Project on the petroglyphs, especially their ability to withstand the onslaught from additional industrial emissions. How can PCF or the EPA assess the irreversible loss of irreplaceable petroglyphs?	The Proponent recognises that the WA Government considers the appropriate way to address the potential risk discussed in this comment is through the MRAS. This is proposed as a co-ordinated approach to ensure relevant targeted risk management and directed to development of an enhanced knowledge set is available based on robust monitoring and targeted observations. This is recognising uncertainty related to "Potential" risk, not acknowledgement of demonstrated actual detriment. The Proponent commits in the ERD to be a contributing participant in the MRAS, as a co-ordinated, targeted approach to the risk weighted assessment and adaptive management of adverse impacts to Murujuga rock art based on robust scientific monitoring and observation.

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According to the PP, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation, which means that the decision to allow the proposed Project should be delayed until it is known that the petroglyphs will not be further threatened by yet another industry on the Burrup. While industry or governments may be eager to obtain economic benefits from the Project, it is not an acceptable reason to allow this Project to go ahead.	
2. Specific concerns with the proposed Project Section 4.7: Inland waters, potential impacts (p. 126-138, ERD) The proponent states that as a mitigation strategy, regular inspections and audits will be undertaken to ensure the environmental protection outcomes of the Project are achieved. However, there is no information about who will conduct these inspections and audits, whether they will be made public in a timely manner (monthly, annually), or how accountability will be insured. Furthermore, why is no offset proposed if there are impacts? All of these questions need to be answered as part of the EPA assessment, and if the project is approved, specific and quantifiable conditions should be included in the Licence to ensure that the public has confidence and there is true accountability.	The Proponent will include this level of detailed planning in its applications pursuant to Part V of the EP Act. Annual reporting and audit of environmental performance is a usual element of Part V approvals. This reporting cycle to regulatory authorities is included in the applicable Environmental Management Plans included in ERD Appendix K.
Section 4.8: Air quality, potential impacts (p. 138-180, ERD) The PCF plant will emit 319 t NO_2, which forms nitric acid when it combines with atmospheric moisture (https://www.scientificamerican.com/article/acid-rain-caused-by-nitrogen-emissions/) and acids have been shown to be detrimental to the rock patina (Dragovich, 1986; Black et al., 2017) – the patina contains the petroglyphs on Murujuga, so if it is removed or degraded, they are also.	This quoted 2010 non-peer reviewed opinion piece from popular media is noted. The Proponent notes that the quoted paper by Dragovich examined desert varnish on carbonate rocks, not the on the granophyre and gabbro rocks in the Burrup. The Proponent considers in potentially relying on this paper to sustain application of the precautionary principle, it is relevant to understand the role of the specific geological setting researched.

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	In risk weighting the relevance to a potential comparable risk at Murujuga, the common geological phenomenon of carbonate rocks to dissolve in acids is significantly different to the underlying non-carbonate geological setting at Murujuga. Also, as noted on P140 of the ERD and supported by the work of Gou et al (2017) cited in another submission, the accumulation of sea salts on the rock surfaces from transport by prevailing or intermittent winds will ameliorate the acidity, owing to the alkaline reserve associated with the evaporites. As noted in response to other submissions, the Proponent understand that the acidity "clock" is also significantly reset during cyclonic rainfall events such as those experienced in this region.
Importantly, the Project proposes to substantially increase NO_2 emissions on the Burrup Peninsula. This additional NO_2 will exacerbate the regional air pollution which is already one of the highest emission zones in Australia (shown on satellite data and also on BOM data as persistent 'rain'), other than those recorded in major metropolitan areas. In addition, the Project will emit substantial urea and ammonia, as well as CO_2. All of these air pollutants are already present locally in high concentrations, especially at some periods of the day and night. These contribute both to poor health outcomes for local communities, as well impact the rock surfaces and petroglyphs.	The proponent reaffirms that the Project will contribute additional amounts of NO_2 to the airshed. NO_2 has been considered for its environmental impact – for a number of sensitive receptors outcomes: • Human health and well-being ERD Section 4.8.5.1 (p161-166) • Heritage / cultural (rock surface integrity) ERD Section 4.8.5.2 (p167-168) Some preliminary technical notes are provided in the following points, for clarification: • Most nitrogen dioxide (NO_2) is formed in the atmosphere through a complex photochemical

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	process; i.e., not by direct emissions from industrial sources. • NO_2 gas, and all other gases, are insignificant as scatterers of radio waves emitted by, for example, Bureau of Meteorology (BoM) rainfall radars. Even cloud droplets; e.g., with sizes approximately 10-20 microns, are too small to be detected by BoM radar. The BoM rainfall plots available online show rain droplets, large dust and smoke particles, sometimes animal life e.g. insects and birds, and sometimes the ground or sea surface if atmospheric conditions scatter the radio waves towards these surfaces (BoM). • Satellite imagery is limited in terms of how NO_2 concentrations are reported at ground level, and in time. High-resolution measurements at ground level are preferred, which were available on Murujuga and used by ERD Appendix D. A scan of satellite data for tropospheric NO_2 for the Pilbara from June 2019 to the present, as measured by TROPOMI equipment aboard the Copernicus Sentinel-5P satellite, indicates NO_2 in the Pilbara usually exists in concentrations too low to be detected by this modern satellite equipment. Road vehicle traffic in cities is a far more significant NO_x source for satellite-mounted equipment such as TROPOMI. The increase in NO_x emissions due to the Project, modelled as running normally at 11.7 g/s, is a small fraction (at most 2.7%) of the total NOx emissions on Murujuga; see ERD Appendix D Sections 4.4 and 4.5. The ERD Appendix D results and assessments of ammonia (NH_3) were presented in Appendix D

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	Section 6.4 (airborne NH_3), and Section 6.9 (NH_3 deposition). Model results for particulate urea deposition were provided and assessed in Appendix D Section 6.10. The NO_2 assessment criteria adopted is based on the NEPM for the protection of human health and well-being. It is noted that the NEPM is currently being reviewed however to date it has not been amended. It is noted however that the predicted NO_2 from the Proposal will still be well under the suggested revision NEPM levels that have been circulated. Appropriate assessment criteria for evaluation of impact to Heritage / cultural values is not definitive, and are focussed on assessment of actual detriment to rock art rather than assessment against emission targets or limits. Emission reductions through design of the plant have been pursued through application of BAT. Similar to PM, NO_2 concentrations vary temporally and spatially due to a variety of influencing factors, noting that NO_2 undergoes complex chemical reactions in the atmosphere. These influencing factors include weather, climate, and other sources (ie fire) and the scale of human activity in the area. Therefore, NO_2 concentrations will be variable across the day and year. It is noted that the State Government is developing a cumulative impact air quality model for the region, to inform predicted change, however at the time of assessment this was not available.

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	Dispersion modelling is a means of estimating potential ground level concentrations of NO_2, considering the variability in the influencing factors. It is an approximation, and generally incorporates a degree of conservatism to account for the uncertainties inherent in modelling, including the temporal and spatial variations. The estimated NO_2 emission contribution by PU is well below the adopted assessment criteria. Assessment criteria for NO_2 are based on existing NEPM values. NO_2 emissions from PU result in a non-significant contribution to the airshed with the maximum predicted concentration in the area being less than 1% of the assessment criteria. The maximum cumulative impact (i.e. the Project with other sources) is estimated to around 30% of the assessment criteria. Based on the modelling results, the likely change to air quality from the project contribution is not demonstrated to be significant. The existing air quality sources (background air quality) remain the dominant feature. Based on comparison to the adopted assessment criteria, the environmental values (human health, and ecological) are not significantly altered by the change in predicted air quality emissions of NO_2 due to the project. The concentrations at which NO_2 is considered to be detrimental to rock surface continues to be investigated, and therefore a conservative approach

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	needs to be taken with regard to the assessment of potential impact on heritage value.
Two of the Project's potential impacts of air emissions (Section 4.8.4) include the phrases 'where practicable' and “to practicably”. These words need to be deleted from any future Licence conditions, because they can be used to excuse the Proponent’s responsibility.	Note that these are terms defined and used in the EP Act and therefore are wholly appropriate to reflect the nature of relevant and reasonable considerations.
PCF repeatedly states that urea is mildly alkaline, is not a nitrate and decomposes rapidly; however, they do not address the true concerns of Stakeholders including FARA who have raised the alarm that PCF's emissions of ammonia, nitrogen dioxide and urea provide sources of nitrogen under local conditions, which acts to fertilise microbes growing on the rocks, while nitrogen dioxide produces nitric acid – both acidic conditions and microbes play a significant role in breaking down the patina on the rock surfaces which are integral to the Murujuga petroglyphs. PCF’s statements to the contrary display their ongoing propensity for misdirecting their statements away from the fundamental concerns about the impacts of emissions on the rock art.	The submission suggests that ammonia and urea stimulate microbial growth but offer no references for the processes taking place at Murujuga. The statement that ammonia and urea emissions will have a deleterious effect is based on supposition that any nitrogenous material is bad, but does not recognise • The often quoted 2005 report by MacLeod that is relied upon to support this supposition, including to the Senate inquiry, only discussed soluble nitrates found on the rock surfaces and made no comment on ammonia or ammonium ions, nor urea, The Proponent acknowledges that as indicated in the Compliance report on 2016-17[W] it was notes that “In interpreting the results, in must be remembered that “the absence of evidence is not evidence of absence”. If the monitoring does not show statistically significant change then it is appropriate to say that either “the

[W] See: https://www.yara.com.au/siteassets/about-yara/reports/rock-art-monitoring-reports/analysis-of-burrup-peninsula-rock-art-2017-daa.pdf/

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	data is consistent with no change" or that "if a change has occurred, it is below the level detectable by the monitoring program" However, while an appropriate note of caution, the above statement is not wholly correct. The absence of evidence **MAY** be evidence of absence, but it is not necessarily of itself conclusive evidence of absence, but may be useful evidence to inform appropriately risk weighted application of the Precautionary Principle. Further research would be required to • examine the broader conclusions being inferred by others across other aspects of the nitrogen cycle and the alternative microbial growth scenarios being advanced; and • continue to monitor for potential evidence of adverse impacts.
Section 8, ERD Section 8 states that the ERD provides a detailed Environmental Impact Assessment associated with the Proposal, the management strategies adopted for each environmental factor identified and assessed against EPA objectives, and that the cumulative impacts of the combined existing and planned activity occurring on the Burrup Peninsula have been taken into account in the EIA process. However, while Table 8-1 purports to contain a holistic impact assessment, PCF actually presents inadequate and misleading applications of the two primary foundational principles of the EP Act and then concludes (erroneously) that they will adhere to these two principles.	Table 4-11 of ERD Appendix D shows the MGA94 co-ordinates of each of the Project emission sources.
Precautionary Principle: (Table 8-1)	Table 4-31 indicates the accepted level of ammonia emissions to achieve BAT performance for urea

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1. PCF states that acid-scrubbing equipment will be installed to reduce ammonia emissions, but does not explicitly quantify by how much, nor indicate how much is technically feasible. These are essential questions for the EPA to have answered before this proposal can be seriously assessed.	granulation and shows that the Project meets that objective with acid scrubbing. Table 4-43 quantifies the reduction achieved by acid scrubbing, both for urea dust and ammonia. "*The scrubbing system will remove approximately 99.5% of the entrained urea dust, and approximately 80% compared to the granulator base case expected ammonia emissions."* As demonstrated in Table 4-31, the Project is achieving BAT performance. At BAT level of performance, further reduction in emissions of ammonia and/or urea may be possible, but not demonstrably practicable (feasible). Further, such additional efforts would result in additional environmental consequences related to requirements for additional water demands and requirements for additional energy inputs, with resulting increase in product of combustion emissions such as NO_x and CO_2.
2. The third bullet states that NH_3 is not an acidic pollutant, yet this statement is deliberately misleading regarding the impact of the Project's ammonia emissions – it is another effort by Perdaman to deceive the non-discerning reader. While the ammonia is not acidic, the nitrogen in the ammonia does act as a fertiliser that stimulates microbial growth on the rocks, and these microbes play a significant role in breaking down the surficial patina on the rocks containing the Murujuga petroglyphs. So, the ammonia emissions have a deleterious impact on the petroglyphs.	The Proponent again notes that the submission suggests that ammonia stimulates microbial growth but offer no references for the processes taking place at Murujuga. The statement that ammonia and urea emissions will have a deleterious effect is based on supposition that any nitrogenous material is bad, but does not recognise • The often quoted 2005 report by MacLeod relied upon to support this supposition, including to the Senate inquiry, only

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	discussed soluble nitrates found on the rock surfaces and made no comment on ammonia or ammonium ions; and • that measurements on the Yara monitoring sites have demonstrated the ammonia levels on the at Ngajarli (Deep Gorge) are not statistically different to established baseline levels. Further, the Proponent acknowledge that there are possibilities of the urea providing some form of stimulation of the combined biological response associated with the natural microflora living on Murujuga rocks. Being part of the complete nitrogen cycle, it is possible that specific microorganisms on the rocks may utilise this additional source of nitrogen reservoir but the normal chemical reaction of urea undergoing hydrolysis (reaction with moisture, water) is shown below, with the intermediate step of carbamic acid being only stable at -23^{o}C, before hydrolysis releases the second ammonia molecule and releases the carbon dioxide, from which the process began. It should be noted in this hydrolytic breakdown the oxidation state of the nitrogen is still (-III) in the urea and in the ammonia gas. $CO(NH_2)_2 + H_2O \rightarrow CO(NH_2)OH + NH_3$ and then $CO(NH_2)OH + H_2O \rightarrow CO_2 + NH_3$ With ambient temperatures of the rocks at Murujuga being at least 50^{o}C above the decomposition point of the carbamic acid, it is very unlikely that sufficient

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	urea will become biologically available to facilitate biological interaction and so become oxidized to the (+III) state of nitrite or the (+V) state of nitrate ions.
3. PCF also state that urea dust is mildly alkaline, decomposes rapidly, and is not a nitrate. Again, although this statement is true on the surface, it does not address the fact that urea dust from the Project will be transported and deposited on the Murujuga rocks. There the urea will be broken down by enzymes within the bacteria and lichens that live on desert varnish (outer rock surface of rocks in desert environments) to produce ammonium molecules. These molecules will act as a fertiliser to stimulate the growth of surface microbes that break down the patina and hence destroy the petroglyphs	The Proponent again notes that the submission suggests that ammonia stimulates microbial growth but offers no references for the processes taking place at Murujuga. The statement that ammonia and urea emissions will have a deleterious effect is based on supposition that any nitrogenous material is bad, but does not recognise • The often quoted 2005 report by MacLeod relied upon to support this supposition, including to the Senate enquiry, only discussed soluble nitrates found on the rock surfaces and not on ammonia, ammonium ions nor urea; and • made no comment that measurements on the Yara monitoring sites have demonstrated the ammonia levels on the at Ngajarli (Deep Gorge) are not statistically different to established baseline levels. As noted previously, the Proponent acknowledge that there are possibilities of the urea providing some form of stimulation of the combined biological response associated with the natural microflora living on Murujuga rocks. Being part of the complete nitrogen cycle, it is possible that specific microorganisms on the rocks may utilise this additional source of nitrogen reservoir but the normal chemical reaction of urea undergoing hydrolysis (reaction with moisture, water)

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	is shown below, with the intermediate step of carbamic acid being only stable at -23oC, before hydrolysis releases the second ammonia molecule and releases the carbon dioxide, from which the process began. It should be noted in this hydrolytic breakdown the oxidation state of the nitrogen is still (-III) in the urea and in the ammonia gas. $CO(NH_2)_2 + H_2O \rightarrow CO(NH_2)OH + NH_3$ and then $CO(NH_2)OH + H_2O \rightarrow CO_2 + NH_3$ With ambient temperatures of the rocks at Murujuga being at least 50^oC above the decomposition point of the carbamic acid, it is very unlikely that sufficient urea will become biologically available to facilitate biological interaction and so become oxidized to the (+III) state of nitrite or the (+V) state of nitrate ions. The Proponent also notes that recent research by Chinese scientists have confirmed the presence of the same type of rock varnish in the Gobi Desert which has been produced abiotically i.e. through a

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	suite of oxidation and reduction reactions catalysed by the presence of titanium dioxide (Xu et al. 2019)[X]. The Proponent considers that the above should be recognised in any risk weighted precautionary principle consideration of the submission to the Senate Murujuga enquiry as noted on P153 of the ERD, which "highlighted" the 2005 work of MacLeod that "Of particular note is the finding that these organisms will overrun, and outcompete varnish forming micro-organisms and produce organic acids which increase the acidity of rock surfaces."
In addition, the 319 t NO_2 emitted from the PCF plant, which forms nitric acid when it combines with atmospheric moisture, will mix with urea to form a nitrate which is a fertiliser. Species of Nitrosomonas, can also assimilate the carbon dioxide the released during the reaction to make biomass (the Calvin cycle), and harvest energy by oxidizing ammonia (the other product of urease) to nitrite, a process termed nitrification. Nitrite-oxidizing bacteria, especially Nitrobacter, oxidize nitrite to nitrate. Importantly, MacLeod (2005) showed that microbial growth increased ten-fold for each increase in available nitrogen on the rock surfaces.	The proponent has been advised by the author that the quoted 2005 report by MacLeod only discussed nitrogen available from soluble nitrates found on the rock surfaces and made no comment on ammonia or ammonium ions nor urea. Thus, on the basis of the quoted reference, the comment re 10-fold increase in growth is demonstrably relevant only to nitrogen from the investigated sources, not necessarily other material in the nitrogen cycle. Further, the Proponent notes that measurements on the Yara EPBC approval 2008/4546 monitoring sites

[X] Reference: Xu, X., Wang, C. and Li, Y, 2019, Characteristics of desert varnish from nanometer to micrometer scale: a photo-oxidation model on its formation. *Chemical Geology,* May 2019, DOI: 10.1016/j.chemgeo.2019.05.016

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	have provided results that are consistent with a benign impact of ammonia on the monitored rock at Ngajarli (Deep Gorge). Recognising the merits of further monitoring to enhance understanding to ensure the continuing integrity of rock art at Murujuga, the commits in the ERD that as part of the implementation of the approved project, it will be a contributing participant in the MRAS, including the development of EQMF environmental quality criteria in accordance with Section 4 and monitoring programs in accordance with Sections 5.3, 5.4 and 5.5.
These statements serve to deflect from the main point of the Precautionary Principle. Even though PCF acknowledges that the release of ammonia and urea also has a theoretical ability or capacity to bring about changes in the rock art patina, and that this is not fully understood (p. 168, ERD), they are making a case to proceed with the Project despite these very real uncertainties that are likely to negatively impact the rock art.	The EP Act provides that the Precautionary Principle should be applied through a risk weighted evaluation. The details provided in the ERD are material and relevant to developing a weighting to the likelihood that hypothesised risk, being inferred as “likely” in this comment, will arise through ammonia and urea emissions from the Project. The Proponent reaffirms that it is able to draw on recent outcomes and analysis of monitoring undertaken for the purposes of rock art integrity evaluation that is required pursuant to EPBC Act Approval 2008/4546. This information is available in the public domain. This approval compliance monitoring, tends to support the EPA “precautionary principle” findings in relation to Yara that are being challenged in this comment. This suggests that the EPA logic may not be flawed as the comment is suggesting and thus in

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	applying a similar logic the ERD may not be fundamentally flawed either as is being suggested in this comment. The Proponent notes that this monitoring and rock art observations are undertaken in close co-operation and collaboration with MAC Murujuga rangers[Y] who have a core interest in ensuring the robustness of this protective approach for rock art integrity. As this work is conducted for compliance with an EPBC approval condition whose purpose is explicitly[Z] to address the potential uncertainty of the risk posed by anthropogenic emission to the integrity of rock art, it must be regarded as being "fit for purpose" to address that objective. The Proponent therefore reaffirms that this monitoring and concurrent rock art observations, are intended to inform whether or not anthropogenic emission, including principle emissions from the proposal, are demonstrably having detrimental impacts to in situ rock art at Murujuga. The results of this monitoring and rock art observations, provide enhanced indication that the

[Y] See: https://www.yara.com.au/siteassets/about-yara/pilbara-photos/2018-rock-art-monitoring-with-mac-252.mp4
The Proponent assumes MAC provided the free, prior and informed consent to be part of this documentation of the monitoring and observational data gathering for the purpose of enhanced understandings about rock art and potential emission impacts and for the requirements of EPBC Approval 2008/4546.
[Z] See https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/BurrupPeninusla/Report/c02 paragraph 2.49

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	observations are consistent with a view that the perceived risk is not demonstrably realised. As this monitoring is • conducted for the purpose of compliance with the EPBC act approval and • intended to inform whether or not anthropogenic emission, including principle emissions from the proposal, result in adverse impacts the Proponent considers that the collected data relevant to current considerations, whether reported in a scientific congress or through other mechanisms. In that respect, this monitoring, targeted at enhancing the understanding of potential detrimental impacts to rock art integrity from anthropogenic emissions, is an important element of a risk weighted application of the Precautionary Principle to the potential for adverse impacts to rock art.
As discussed previously, and by others making submissions, there is existing scientific evidence presented in published papers that explains and documents the ongoing and potential future degradation and destruction of the rock art by NO_2 and other acidic emissions from industrial sources (Black et al. 2017; MacLeod, 2005), including the ships used to transport the industrial products. Furthermore, the urea dust from PCF's proposed plant will be deposited on the Murujuga rocks, including those outside the development envelope, where it can be broken down by enzymes within the bacteria and lichens to produce ammonium molecules (e.g. Dragovich, 1986; Díaz et al. 2016; Gleeson et al., 2018). These molecules can act as a fertiliser to stimulate growth of microbes on the rock surfaces and these will break down the patina and hence destroy the petroglyphs	The Proponent again notes that the submission suggests that ammonia and urea stimulate microbial growth but offer no references for the processes taking place at Murujuga. The statement that ammonia and urea emissions will have a deleterious effect is based on supposition that any nitrogenous material is bad, but does not recognise • The often quoted 2005 report by MacLeod relied upon to support this supposition,

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	including to the Senate inquiry, only discussed soluble nitrates found on the rock surfaces and made no comment on ammonia or ammonium ions; and • that measurements on the Yara monitoring sites have provided results that are consistent with a benign impact of ammonia on the monitored rock at Ngajarli (Deep Gorge). The Proponent notes that the quoted paper by Dragovich examined desert varnish on carbonate rocks, not the on the granophyre and gabbro rocks in the Burrup geological setting. There is a marked difference in the reactivity of such carbonate rock types generally to acidic condition that is likely to have ramifications to varnish integrity as well in such a setting. This may not be directly comparable where the underlying host is geologically different in composition.
Principle of Intergenerational Equity (Table 8-1) 1. Table 8-1 (p. 250) states that 'the presence of acid forming pollutants and nitrate enhanced microbial activity are empirically considered to be a concern in relation to long-term impacts on rock art'. In response to this impact, PCF suggests they will manage the Project's emissions with the 'use of contemporary best practice pollution control technology within the plant' and that they will investigate 'practicable measures to mitigate the risk of rock art being damaged by air emissions from the Project so that it can be appreciated by local Indigenous people, the broader community, and future generations'. However, there is no mention of how this investigation will be done or who will determine whether mitigation measures are practicable. Clearly, if PCF decides that the measures are not practicable then the rock art 'will be damaged' and 'won't be appreciated' for local	As noted in the Holistic Assessment in ERD Section 8 (pp 248-251), to ensure the principle of Intergenerational Equity is addressed, the Proponent has incorporated management and mitigation measures to reduce potential impacts to the environment to ALARP levels. The comment suggests that ammonia stimulates microbial growth but offer no references for the processes taking place at Murujuga. The statement that ammonia and urea emissions will have a deleterious effect is based on supposition that

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Indigenous people, the broader community, and future generations. This is unacceptable and there is no comfort to be taken from their motherhood statements.	any nitrogenous material is bad. The comment does not recognise that the often quoted 2005 report by MacLeod relied upon to support this supposition, including to the Senate Murujuga Rock Art inquiry, only discussed soluble nitrates found on the rock surfaces and made no comment on ammonia or ammonium ions nor urea. As a contributing participant to MRAS, the Proponent is demonstrating its commitment to work with MAC, the WA Government, other industry participants and stakeholders to the mutual goal of safeguarding the integrity of rock art at Murujuga for current and future generations. As notes in ERD Table ES3 (P xxi) the Proponent has committed to MAC to participate and contribute to the development of an Environmental Quality Management Framework as detailed in the Murujuga Rock Art Strategy. The MRAS Section 6 (p 43) outlines management responses, both where EQMF environmental quality objectives are met and where they are not. Sections 6.1.1 and 6.1.2 outline investigation aspects and potential response avenues. Through its agreement concluded with MAC, the Proponent is also demonstrating its commitment to the longevity of societal prosperity outcomes for current and future generations which are importantly recognised in the MRAS and also by the

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	Commonwealth Government when the region was included to the list of National Heritage Places[AA].
2. PCF attempts to make a (dishonest) comparison between the fertiliser they will produce and the role of the rock art in assisting to feed Indigenous populations through time. There is global evidence that our shared environment cannot support ongoing unregulated high inputs of chemical fertilisers whose use releases nitrogen which in turn is converted to nitric acid (acid rain and deposition); more sustainable methods of feeding the world population must be developed and supported. It is not acceptable that the uniquely significant Murujuga rock art is sacrificed to make profits for an industry producing ammonia as urea, which is often the cause of poor health and early death in rural agricultural communities, and frequently results in water pollution (see extensive reference list: https://blogs.nicholas.duke.edu/citizenscientist/ammonia/).	In making the comparison that is being challenge in this comment, the Proponent accurately notes • the quote from respected Traditional Custodian representatives in the IHS heritage survey report (p51), highlighting the role of rock art in guiding contemporary and future generation about "*They knew the solar calendar, the tidal calendar, lunar calendar, they knew the waterholes, they left some of these images as signs to other people, to future generations, describing where you find things, what seasons they are available. ….*" • the Gazettal Notice S127 for the inclusion of Murujuga on the National Heritage List assessment criteria (b) and (d) note the rock art includes images of marine and terrestrial animals, large birds and macropods with spears in their back, and/or hunting scenes. Which supports the role noted by the senior Traditional Custodian representatives about where to find things; • expanding the ERD discussion (p250), the World Heritage Listing nomination

[AA] See http://www.environment.gov.au/heritage/places/national/dampier-archipelago)

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	submission[BB] notes "…. These figures are known to relate to Aboriginal culture in complex ways. There are open, public understandings of these images that relate to the rules for butchering animals and distributing the various parts to different categories of people for food …."; and • As cited in the ERD (p250) the title and content of the published work of Ken Mulvaney on Murujuga, "Rock Art of the Macropod Hunters and Mollusc Harvesters" in which he notes a recurring theme in much Murujuga rock art, or to the types of tools being manufactured, while at first glance whimsical, accurately relates to the use of natural resources to feed the contemporary society. The proponent considers that the role of urea as a fertiliser in feeding contemporary society through enhanced agricultural productivity should not be subject to dispute. Thus, the comparison that in each case natural resource from the region can be utilised to sustain the contemporary society is based on sound observations both in relation to rock art/Traditional lore and the current Proposal.

[BB] See https://whc.unesco.org/en/tentativelists/6445/

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3. Recommendations Before EPA assesses this Project further, much more detail should be required from the Proponent about the specific level of nitrogenous atmospheric emission reductions that is technically possible to achieve, even at some cost. We note that the concentrations of nitrogen dioxide and ammonia emissions suggested in the Perdaman proposal are well above the limits set for the existing Yara Pilbara industrial plants and well above the concentrations which can be achieved using Yara International scrubbers. This should be questioned by EPA since it seems the proposal talks about best practice and yet does not set that standard for itself.	The Proponent's NO_x emissions are considerably lower per tonne of product/MWh than comparable existing plants in the region. The fired heater for ammonia production is -67% NO_x of the Yara Pilbara Fertilisers' ammonia plant per tonne NH_3, and the Combined cycle gas turbines used for power generation are -67% NO_x to Woodside Pluto open cycle gas turbines. Further, as noted in the ERD and above, the Proponent uses combined cycle gas turbines, recovering steam to generate a significant portion of the project power, which further reduces the overall NOx per MWh used and thus also per tonne of urea produced by the proposed urea plant. In addition, the Proponent's use of combined cycle power generation, recovering heat for raising steam reduces the amount of steam raised by direct natural gas firing, which further reduces the overall NOx per tonne of urea produced.
The proposal should only be allowed if technology is incorporated to reduce nitrogenous emissions into the atmosphere to near zero, since this can be achieved.	In relation to the comment on Zero emissions, the Proponent reaffirms that this is not practicably achievable for any process. The Proponent recognises that if an emission does not leave site as a saleable or useable product, it must leave be managed as a waste, either as a long-term legacy onsite or as a discharge offsite. The reduction of residual NO_x emissions is at diminishing returns –

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	• lower NO_x emissions in one process area • can result in greater use of resources to manufacture and install any necessary equipment, • with greater power and water draw demands in operation, • both of which results in increased NO_x and other product of combustion emissions that can be disproportionate to the initial reduction being sought.
The Precautionary Principle in the Western Australian Environmental Protection Act has not been adequately followed. Perdaman state that all designs 'have been established on a risk-based approach, but there is no formal 'assessment of the risk-weighted consequences of various options' for each impact on the environment or heritage. The Proponent should provide a detailed proposal of the actual impediments to building the plant on the Maitland Estate, which is also near a source of natural gas. If the Burrup site has been chosen largely by Perdaman on the basis of cost savings, then the WA Government should acknowledge that by approving this Proposal, they are putting company profit ahead of preserving irreplaceable Indigenous heritage contained in the Murujuga petroglyphs.	Key infrastructure benefits are that the Burrup site has been pre-developed for industry. Why not Maitland Strategic Industrial Area? As outlined in ERD Section 2.2.4 (p 9), one alternative site which was considered was the Maitland SIA. While potentially feasible for the engineering construction of a urea plant, Maitland SIA lacks the necessary "project ready" infrastructure to underpin a viable operating project at this time. Significant public investment would be required in common user facilities such as those already available at the BSIA. Further, establishment of such facilities at Maitland SIA pose additional environmental and cultural impacts that would need to be addressed. For example, locating the urea plant at Maitland SIA, would require new port facilities and/or a new common user service corridor. Transhipment of urea would require a significant increase in truck movements and larger storage sheds at both the port

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	and plant site. Maitland SIA would also require new infrastructure for sea water supply and brine disposal. For the Maitland site the WA/Federal government would need to contribute ~$1,000m, with no material net tangible benefits to society nor the project.
IF this project is approved, the Licence Conditions for all emissions should include specific quantities and details, and decree that all monitoring results and reporting must be made public on a quarterly basis, and then summarised annually to ensure that the company is accountable. In particular, NO2, ammonia and urea emissions must be monitored in real time to ensure that there are no breaches in emissions limits – these could result if scrubbing technology is not properly maintained.	The Proponent recognises that Operational licencing is pursuant to Part V of the EP Act. It is therefore relevant and appropriate that process emissions levels and compliance monitoring is dealt with in that usual regulatory process to avoid unnecessary and potentially conflicting duplication. Real time monitoring is applied for the key emissions for process control and management. Loss of process components and products such as ammonia and urea increase cost of replacing lost inputs and reduce revenue due to reduction of saleable product. As well as managing potential environmental impacts, there are economic incentives for process monitoring and reducing losses through emissions to the airshed. For these purposes, the monitoring would not have to meet NATA or USEPA regulatory standards and is not suited for regulatory purposes. As noted above, the Proponent has strong commercial interest to ensure that no product is lost as any product lost through emissions is lost revenue. The AQMP included in Appendix U herewith outlines monitoring aspects which are proposed to inform DWER in order to determine and incorporate appropriate monitoring requirements into the Licence that will be issued under Part V of the EP Act.

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A maximum limit for NOx emissions from the urea plant should be no more than 20 mg/m^3, if the WA government is truly concerned about preserving the Murujuga petroglyphs, as scrubber technology is now available to obtain this limit.	The Proponent's potential NO_x emissions are considerably lower per tonne of product/MWh than comparable existing plants in the region. The fired heater is -67% of Yara per tonne of produced NH_3, the Gas turbines are -67% to Woodside Pluto turbines. Further the Proponent will use combined cycle power generation, recovering heat for raising steam thereby reducing the amount of steam raised by direct natural gas firing, which further reduces the overall NO_x per tonne of urea produced. (Note that this steam raising capacity is lost if the option of solar power as suggested in some submissions, is utilised. Additional energy would then need to be sourced, with associated emissions, to substitute additional steam raising.) The reduction of NO_x emissions is at a diminishing environmental return – lower numbers result in greater power and water draw, which potentially results in increased NO_x and/or other potential environmental impacts associated with the large footprints often associated with potential alternative energy source.
IF this project is approved, statements in the PRD containing "will be", such as those regarding offsets, rehabilitation, avoiding loss of Priority Ecological Communities, etc, should be included as part of the Licence conditions with quantifiable outcomes and dates by which these outcomes will be achieved. Publicly available and regular reporting of progress on promised outcomes ensures that PCF is accountable to the Indigenous owners, the local community, and the wider Western Australian public.	The Proponent also notes that pursuant to the "polluter pays" principle of the WA EP Act the Project will be a Prescribed Premises. Fees will be levied for all licenced discharges under Regulation 5D(1a) of the EP regulations. The proponent notes that pursuant to s.3A of the EP Act

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	"pollution means direct or indirect alteration of the environment — (a) to its detriment or degradation; or (b) to the detriment of an environmental value; or (c) of a prescribed kind, that involves an emission" The Proponent also notes the WA Offsets guidelines indicate: "**Interaction between State and Commonwealth processes** Where projects impact on matters of national environmental significance (MNES) listed under the EPBC Act, the Commonwealth Government may also require environmental offsets. Where projects are assessed, this may be in parallel with State approvals (i.e. separate processes) or under an assessment bilateral agreement. To occur under a bilateral agreement, the proponent must refer the proposal concurrently to both the State and the Commonwealth. The MNES that are considered by the Commonwealth Government (for example threatened species and ecological communities) are only a subset of the matters that the State considers (e.g. biodiversity, wetlands). As such, the State may require offsets to other environmental values which are not relevant to the EPBC Act. Where there are values that overlap, Western Australian government agencies will endeavour to work cooperatively with the Commonwealth

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	Government to align offsets and avoid duplication to the fullest extent practicable. • Where the project has already been assessed by the Commonwealth Government and offsets have been applied, the State will consider these offsets as contributing to the State's requirements. • Where the project is being assessed under a bilateral agreement, formal consultation mechanisms exist for interaction between the agencies to align any offset requirements as far as possible. • Where the project is being assessed in parallel under the EP Act and EPBC Act, agencies will consult to align offset requirements as far as possible. Further opportunities to align offsets exist through the use of strategic approaches (such as the Perth-Peel strategic assessment). Strategic approaches can set out the framework for a coordinated approach to offsets in an area. Impacts from individual projects can then contribute to achieving the activities and objectives identified in the framework. This allows for State and Commonwealth matters to be consistent and removes duplication in offsets requirements." A specific consolidated response re offsets will be provided to the EPA under separate cover.
IF this project is approved, phrases such as 'if practicable' should be deleted, as they are repeatedly used by industries on the Burrup and across Western Australia to avoid their responsibility to protect cultural heritage and our shared environment. The acceptance of these phrases by the EPA and DWER within licence conditions shows a disregard for the principle of public accountability required of State departments.	The use of the term "practicably" reflects the use of this term in the EP Act (refers.3 of the Act).

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Potential impact of proposed Perdaman urea plant on human health There is a threat to public health for those living in the Murujuga area, including the towns of Dampier and Karratha, as shown by the November 2018 results from the Pilbara Health Profile Planning and Evaluation Unit report. They showed that children have a significantly increased rate of hospitalisation for lung disorders and that there is a significant increase in heart disorders in older people in the region, as compared with the Western Australian State average (Anderson et al, 2018). Importantly Gillett (2008, p.129) showed that modelled concentrations of air quality underestimate measured values of nitrogen dioxide on Murujuga by up to five-fold, which suggests that the Proponent's modelling should be reassessed for its veracity. Given that the technology is available, the WA government could set the maximum limit for NO_x emissions from the PCF plant at no more than 20 mg/m^3, as this would reduce the negative health impacts to the communities.	The comment by Gillett (2008, p. 129), was related to model predictions for annual average NO_2 deposition fluxes. Gillett (2008) provided a detailed review of Calpuff and TAPM modelling results completed by SKM in 2003, including comparisons with monitoring. The current TAPM modelling completed by ERD Appendix D includes many improvements since SKM (2003), as detailed in ERD Appendix D. Inspection of the results shows there is very good agreement between the ERD Appendix D model results for NO_2 deposition on Murujuga with monitoring, except for two sites that were over-estimated by the model (Section 7.1.2, Figure 7-2, p. 115). This demonstrates the ERD Appendix D modelling is a significant improvement since SKM (2003) (again by inspection of the figures and key results from both reports). This demonstrates that that the findings being referenced in the submission, are not a reliable reflection on the veracity of the ERD modelling estimates. In response to the comment “Given that the technology is available, the WA government could set the maximum limit for NOx emissions from the PCF plant at no more than 20 mg/m^3”, the Proponent understands that this suggestion is based on a comment at a Murujuga Rock Art Stakeholder Reference Group meeting. The Proponent is not sure of the specific context or universal applicability of the referenced technology to urea production processes. Current BAT standards are reflected in the proposal. On this basis it is apparent that the informant

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	responsible for this suggesting the availability of such is not necessarily familiar with specifics of technology that can be applied for urea production. The Proponent notes that this submission referred to NO_2 level in units of mg/m^3, and that this relates to a concentration not a mass loading rate to the air shed where emission rates are expressed as g/s. The Proponent commits to implementing the emission mass discharge rates presented in ERD Table 4-27 during normal operations. Note these are • the key source emissions criteria that underpin the air quality modelling presented in ERD Appendix D, and • the principal design criteria used to derive emissions concentrations presented in ERD Tables 4-29 and 4-31. In these regards it is appropriate to note that in relation to air shed loading, the mass emission rate to the airshed from an emission point is more relevant than the concentration from that emission point. The concentration is variable with discharge flow volume ie varies subject to dilution, but the mass loading will be constant irrespective of flow volume and ultimately influence the ambient concentration in the regional airshed, e.g. $20mg/m^3$ at a flow rate of $1000m^3/hr$ releases significantly more material to the regional air shed that $20mg/m^3$ at a flow rate of $10m^3/hr$.

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Impact of proposed Perdaman urea plant on petroglyphs Perdaman's statement that their plant contributes a relatively small extra amount of emissions compared with other industries on the Burrup is not relevant because industrial emissions on Murujuga are cumulative, both in terms of concentrations and over time. Any new industry will add further to the airshed concentrations of nitrogenous compounds (and sulphur, through shipping) and further degrade the petroglyphs.	The Proponent considers that this comment does not recognise reputable data that shows that deposition of emissions at Murujuga, while potentially cumulative in the short term, are not universally accretive over longer time frames, such as those timeframes associated with protection and impact to rock art. For example, the Proponent understands that soon to be published work demonstrates[CC] that the acidity "clock" is significantly reset during cyclonic rainfall events. In this circumstance, accumulated deposition from emissions can be flushed off surfaces and off rock art.
The Proponent relies on unproven conclusions of the EPA "that there is currently no compelling scientific evidence which indicates that there is an immediate material threat of serious or irreversible damage to rock art from cumulative industrial air emissions within the Murujuga airshed." However, the EPA and DWER have consistently chosen not to apply the Precautionary Principle because they have not seriously considered the existing scientific evidence which shows that the Murujuga rock art is already deteriorating – the State and the company(ies) will be held responsible when this is further shown as more data become available.	The Proponent acknowledges that it has quoted the EPA where the EPA has applied the Precautionary Principle in its evaluation of an analogous proposal in this region and to analogous potential impacts. The Proponent reaffirms that it is able to draw on recent outcomes and analysis of monitoring undertaken for the purposes of rock art integrity evaluation that is required pursuant to EPBC Act

[CC] Pre-prints of the International Council of Museums - Committee for Conservation, Conference, Beijing May 2021, - Dr Ian D MacLeod*[1] and Warren Fish[2] "Determining decay mechanisms on engraved rock art sites using pH, chloride ion and redox measurements including an assessment of the impact of cyclones, sea salt and nitrate ions on acidity."

[1]Western Australian Museum, Fremantle, Western Australia 6160, [2]CBG Solutions, Kingsley, Perth, Western Australia 6026 - in press.

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	Approval 2008/4546. This information is available in the public domain. This approval compliance monitoring, tends to support the EPA risk weighted "precautionary principle" findings in relation to Yara that are being challenged in this comment. This suggests that the EPA logic may not be flawed as the comment is suggesting and thus in applying a similar logic the ERD should not be viewed as flawed either as is being suggested in this comment. The Proponent notes that this monitoring and rock art observations are undertaken in close co-operation and collaboration with MAC Murujuga rangers[DD] who have a core interest in ensuring the robustness of this protective approach for rock art integrity. As this work is conducted for compliance with an EPBC approval condition whose purpose is clearly to address the potential uncertainty of the risk posed by anthropogenic emission to the integrity of rock art, it must be regarded as being "fit for purpose" to address that objective. This monitoring and concurrent rock art observations, are conducted for the purpose of compliance with the EPBC act approval and intended to inform whether or not anthropogenic emission, including principle emissions

[DD] See: https://www.yara.com.au/siteassets/about-yara/pilbara-photos/2018-rock-art-monitoring-with-mac-252.mp4
The Proponent assumes MAC provided the free, prior and informed consent to be part of this documentation of the monitoring and observational data gathering for the purpose of enhanced understandings about rock art and potential emission impacts and for the requirements of EPBC Approval 2008/4546.

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	from the proposal, are demonstrably having detrimental impacts to in situ rock art at Murujuga. The results of this monitoring and rock art observations, provide robust indication that the perceived risk is not demonstrably realised. As this monitoring is • conducted for the purpose of compliance with the EPBC act approval and • intended to inform whether or not anthropogenic emission, including principle emissions from the proposal, result in adverse impacts the Proponent considers the collected data relevant to current considerations, whether reported in a scientific congress or through other mechanisms. The Proponent also considers that the development and implementation of EQMF environmental quality criteria as envisaged through the MRAS is prudent to enhance the regional understand and management of potential adverse impacts to rock art at Murujuga. The Proponent reaffirms its ERD commitment to be a contributing participant to the MRAS as part of the implementation of the approved Project.
FARA welcomes the proposed review of the Aboriginal Heritage Act 1972, so that Indigenous groups can identify important cultural sites across Western Australia in order to preserve those that they determine to be significant. Given their uniqueness and internationally recognised importance, the petroglyphs on Murujuga should be categorised with the highest preservation status before they are further degraded. However, we are increasingly convinced that industry, supported by the	This is a comment unrelated to the EIA process and therefore does not require a technical response from the Proponent.

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State Government, is moving to get new development proposals approved quickly before the Act is revised. How can the State claim to be an advocate for Indigenous cultural heritage or that they are acting on behalf of West Australians?	
PCF repeatedly displays their ongoing propensity for misdirecting their statements away from the fundamental scientific concerns about the impacts of air emissions on the rock art. This alone is reason enough for the State and Federal Governments, and the EPA, to move cautiously as called for by the Precautionary Principle – rather than race headlong into approving this flawed Project	The Proponent notes that the EP Act indicates that the Precautionary Principle should be applied on the basis of risk weighted evaluation. The Proponent does not consider presenting alternative information for consideration in the ERD, should be regarded as "misdirecting"
Conclusion We are very concerned and very frustrated that industry always seem to be considered as more important than cultural and environmental heritage. West Australians respect our natural and cultural resources, so why doesn't our State government? We know that tourists from many countries value Australia as a destination because it is relatively unspoiled, and the food produced here is highly valued for its purity. And yet, the State government seems willing to risk further destruction of the petroglyphs, human health and the regional biodiversity in order to obtain royalties for a short few years. The petroglyphs were produced over thousands of years and the biodiversity that has taken millions of years to develop – both of these cannot be replaced or recreated once destroyed. Please consider our concerns carefully.	Comment is directed to the EPA. As noted in response to previous submissions, the Proponent reaffirms its view that the Proposal is consistent with the State and Federal Governments' views in relation to a blended fabric at Murujuga captured by the Federal Government "caption" noted in ERD Section 6.6.1 (p209) as "*Pre-history meets the industrial age*".
References Anderson, C, Bineham, N, Lockwood, T, Mukhtar, A and Waenerberg, N, 2018. Pilbara Health Profile; Government of Western Australia, WA Country Health Service. Planning and Evaluation Unit. (http://www.wacountry.health.wa.gov.au/fileadmin/sections/publications/Publications_by_topic_type/Reports_and_Profiles/Pilbara_Health_Profile_2018.pdf) Black, JL, MacLeod, ID and Smith, BW, 2017. Theoretical effects of industrial emissions on colour change at rock art sites on Burrup Peninsula, Western Australia. Journal of Archaeological Science: Reports 12, 457-462.	References Noted

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Díaz, EM, Sánchez-Elordi, E, Santiago, R, Vicente, C and Legaz, ME, 2016. Algal-Fungal Mutualism: Cell Recognition and Maintenance of the Symbiotic Status of Lichens. Journal of Veterinary Medicine and Research 3:1052. Dragovich, D, 1986. Weathering of desert varnish by lichens. In: Readings in Australian geography: proceedings of the 21st Institute of Australian Geographers' Conference, Perth, 10-18 May 1986, Edited by Arthur Conacher. Published by Institute of Australian Geographers (WA Branch) and Dept. of Geography, University of Western Australia, Perth. Gillett, R, 2008. Burrup Peninsula air pollution study: report for 2004/2005 and 2007/2008. Department of Environment and Conservation, Western Australia. Gleeson, DB, Leopold, M, Smith, B and Black, JL 2018. Rock-art microbiome: influences on long term preservation of historic and culturally important engravings. Microbiology Australia 39:33-36. MacLeod, ID, 2005. Effects of moisture, micronutrient supplies and microbiological activity on the surface pH of rocks in the Burrup Peninsula. In 14th Triennial Meeting, The Hague, 12-16 September 2005: Preprints (ICOM Committee for Conservation), Isabelle Verger, ed. pp. 385-393, Earthscan Ltd.	

APPENDIX

O

DEPARTMENT OF PLANNING, LANDS AND HERITAGE SUBMISSION

The Proponent notes the comments re the suitability of the Aboriginal Heritage Management Plan (AHMP), the adequacy of the management of Aboriginal heritage aspects and requirements of the Aboriginal Heritage Act.

Notwithstanding this comment a reviewed and revised AHMP is included in Appendix U herewith.

P

DEPARTMENT OF WATER AND ENVIRONMENTAL REGULATION SUBMISSION

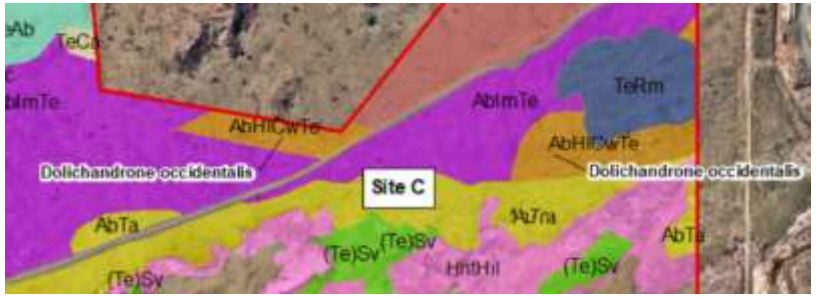
DWER Submission

Marine Environmental Quality	Response
1) The ERD advises that the proposed Urea Plant will discharge wastewater into the Water Corporation's Multi-User Brine Return Line (MUBRL). The DWER advises that the MUBRL is currently not a prescribed premise and therefore its emissions and discharges cannot be regulated under Part V of the *Environmental Protection Act 1986* (EP Act). However, the Part V licence for the Urea Plant can include conditions relating to the discharge of wastewater from the Urea Plant into the MUBRL. Such conditions could include monitoring at a suitable monitoring point within the Urea Plant boundary, together with appropriate limits. Industry Regulation Division aims to avoid regulatory duplication where possible in accordance with *Guidance Statement: Setting Conditions* and it is noted that MS 594 already includes limits for discharges from the MUBRL.	The Proponent notes this comment, but considers that any "at boundary" limits must align wholly with the criteria in MS 594. The Proponent understands that in setting these quality requirements, the EPA has considered that where discharge from the MUBRL meet these quality and quantity requirements, such discharge will not materially compromise its objectives for the Marine Environmental Quality key environmental factor. Further the Proponent understands that such discharge therefore also accords with the EPA Environmental Quality Management Framework (EQMF) as discussed in Section 2 of the Technical Guidance – Protecting the Quality of Western Australia's Marine Environment. As Water Corporation cannot rely on dilution by wastewater to improve the quality of existing discharge in the MUBRL at any time, this means that any existing effluent being discharged in compliance with MS 594, must therefore when input to the MUBRL, also be compliant with MS 594 requirements. Therefore, simple arithmetic to determine the average concentrations (see below), demonstrates that the Proponent's input to the MUBRL, at or better than the requirements of MS 594, will not alter the compliance of the total outfall from MUBRL with MS594 requirements i.e.: $$\frac{Volex\ x\ Concex + Volp\ X\ Concp}{Volex + Volp} < Conc549$$ Where; • Vol_{ex} and $Conc_{ex}$ are the existing volume and concentration in the MUBRL and both are compliant to MS 549 limits (Vol_{549} and $Conc_{549}$ respectively);

	• Vol_p and $Conc_p$ are the volume and concentration of the Proponent's discharge and both are compliant to MS 549 limits; and • $Vol_{ex} + Vol_p < Vol_{549}$.
2) Work Requirement 2.5 in the ESD requires the proponent to prepare a monitoring and management plan prior to construction that establishes acceptable water quality targets for the urea plant discharge to the MUBRL and the monitoring locations, frequency, measurement protocols, assessment protocols, management commitments and reporting arrangements for demonstrating the water quality targets are met. The proponent has still not prepared an environmental management plan. In the response to DMA comments the proponent has accepted that a monitoring and management plan will be developed before construction but that it doesn't form part of the ERD. The proponent commits to preparing and lodging the plan for approval prior to construction as part of conditions of approval. It is noted that this environmental management plan for air and water quality is mentioned in Appendix K but does not appear to be a component of the overarching Project Environmental Management Plan (PEMP). The proponent commits to the following in relation to water quality: Prior to construction an Environmental Monitoring Plan will be developed to manage the Project's monitoring regime for air and water quality. This will include monitoring locations, monitoring frequency, measurement protocols, assessment protocols, discharge limits, management commitments and internal and external reporting requirements. This plan will address emission parameters such as: • water quality monitoring of plant process water and treated wastewater discharged from the sewage treatment plant, prior to discharge to the Multi User Brine Release Line (MUBRL); and • monitoring of stormwater run-off from all project areas to onsite storage ponds and discharges to the supra-tidal flat and marine environment.	As per the ESD requirement, construction has not started and will not start till a works approval is granted. Therefore, the comment is noted, but not actioned at this time. In relation to the effects of atmospheric deposition of nitrogen in marine waters see response to this issue in Appendix S, Attachment 3 of this response to submissions. The Proponent notes there are no explicit approved reference deposition rates from industrial activity on the Burrup Peninsula. In term of consideration in context of the cumulative nitrogen emissions, the proponent gross emissions of nitrogenous species will be approximately 1100tpa. This represents an increase of the current airshed loading of nitrogenous species of approximately 10% and in

Although the timing requirement for this EMP is pre-construction, the ERD should have included a description and commitment to developing the plan and set out the basic purpose and scope as it is the key document for managing wastewater discharges, and for demonstrating that the water quality targets are met. It is also recommended that the EMP should consider the effects of atmospheric deposition of nitrogen in marine waters, particularly if this is found to be significant. Atmospheric deposition of nitrogen should be considered within the context of already existing or approved deposition rates from industrial activity on the Burrup Peninsula. This information should now be provided in the Response to Submissions. The proposed plan should also be a key EMP listed within the PEMP.	terms of NO_2 the increase, compared to the current cumulative loading, in the airshed is approximately 3%. Further, as a contributing source, the Project is located at a greater distance from the marine environment than the major regional contributors of nitrogenous species to the regional airshed, therefore the likely contributions to deposition in the marine environment are also likely to be comparatively low in the suggested context. This is shown in the various contour plots for nitrogenous emissions in the ERD Appendix D which cover both deposition across the model grid in terrestrial and marine environments.
3) It is noted that the proponent will use of best practice pollution control technology within the plant and that the use of an enclosed conveyor system should remove approximately 99.5% of the entrained urea dust and approximately 80% of the ammonia (NH_3). However, the ERD confirms the proposal will be the significant regional contributor of NH_3 and urea dust air emissions. The proponent has modelled the emissions and deposition of NH_3, NO_2, SO_2 and particulate urea dust from Perdaman in relation to impacts to air quality and vegetation. The proponent was also required to assess the potential impact from the proposal's air emissions on marine water quality through atmospheric deposition, using the marine environment as a sensitive receptor. Although the level of deposition to the marine environment is described as low, the marine environment is very sensitive to small increases in nutrient load.	The Proponent clarifies that the quoted % removal of urea dust and NH_3 relates to stack emissions, not to the enclosed conveyor. In relation to conveyor fugitive dust, see example of shed to ship loader operation (Beumer ASEAN layout, but very similar to the Metso layout, and identical product specs/dusting resistance) refer to You-tube clip from Beumer (observe no visible dust - anywhere) https://www.youtube.com/watch?v=EqY1IOa2ud8 The plant to port enclosed conveyor is similar design and operational/performance specification to the conveyor from the shed to ship loader. Thus, fugitive dust is similarly negligible to no existent. In relation to marine water quality and dispersion of project emissions, please see the Appendix S Attachment 3 in this Response to Submissions which provides further details in the Cardno memo "*Perdaman Urea Project - King Bay Water Quality"* and accompanying 2 figures.

From the model the proponent has determined that deposition from these emissions (as shown on contour plots) are not likely to result in significant impacts in the marine environment especially when considered with the secondary dispersion through large tidal water movements in the region. However, this statement is not supported by any specific assessment of nitrogen deposition in the marine environment. There is also the: potential increase in nitrogen loading to the marine environment from deposited nitrogen in land run-off during heavy rain to consider. This prediction needs to be supported by a more detailed assessment. This may include a level of hydrodynamic modelling to determine whether secondary dispersion from the relatively large tidal movements in the region is sufficient to mitigate the likely significance and consequences of the additional nitrogen load in the local bays and coves. It is noted that there is uncertainty in the proponent's air quality model for deposition. Therefore, there is uncertainty in the proponent's determination that the "potential for impacts to the marine environment, if any, are negligible to low". If cumulative atmospheric nitrogen deposition is sufficient to lead to eutrophication of these sheltered environments it could lead to increased algal growth (including potentially harmful species), reduced light conditions and low dissolved oxygen amongst other things. It is recommended that the proponent's Response to Submissions should provide a more detailed assessment of the potential impacts from the deposition of NO_2, NH_3 and particulate urea dust on marine water quality using the existing modelling, and that this is discussed within the context of cumulative effects from other industrial sources of nitrogen deposition on the Burrup Peninsula. It is also recommended that the proponent review the results from the modelling undertaken for the *Study of the Cumulative Impacts of Air Emissions within the Murujuga Airshed* once the Study has been completed to see if it can be used to undertake a more robust assessment of the potential impacts to the marine environment.	

Flora and Vegetation	
1) The ERD has not adequately addressed previous issues identified in the draft ERD. Uncertainty remains about the impacts from the proposal on Flora and Vegetation because there is limited quantitative regional assessment presented in the ERD, as per ESD requirements. Improved information and analysis would increase confidence and assist in determining the potential significance of impacts (see Comment 3 below regarding ESD Work Requirement 4.4).	Regional vegetation assessment is provided in the ERD under section 4.5.3 and subsequent maps (Figure 4-3, Figure 4-4 and Figure 4-5). Further information regarding vegetation communities within the Burrup region has been provided to DWER via series of Memos (Memo dated 08/07/2020).
2) Work Requirement 4.1 in the ESD has not been met. Discussion of the regional flora and vegetation values should be provided in assessment of the proposal's impacts.	Please see above.
3) Work Requirement 4.4 in the ESD has not been met. More information is required on quantitative and regional impacts to flora and vegetation. Indirect impacts from potential changes to surface or groundwater regimes should be detailed. *Dolichandrone occidentalis* is locally significant, known from one occurrence on the Burrup Peninsula, despite having widespread distribution on the mainland. The ERD suggests the "study area intersects with small pockets of *Dolichandrone occidentalis*; however, the majority of its distribution is to the north of the study area and will not be impacted" but this is not supported with data or maps. The ERD should include the number of individuals, populations, area of occupancy, and proportional impact (local and regional %). The total cover of the P1 Rockpiles of the Burrup Peninsula PEC in the study area is 1.8 ha. Five small rock outcrops, totalling 0.13 ha, will potentially be impacted by the proposal. The ERD suggests that there are "large, undisturbed areas of this PEC to the north and south of the study area, with a large proportion of the total area on the Burrup Peninsula occurring in reserve (National Park)", but this is not supported with data or maps.	Potential direct and indirect impacts to surface and groundwater is discussed in ERD Section 4 and 4.7.4. Vegetation community mapped as AbHlCwTe contains *Dolichandrone occidentalis* as scattered shrubs, it is shown in the maps in ERD – Section 4.5, Figure 4-7 and Figure 4-8 (also see below). APM recorded 15 shrubs during biological surveys (APM, 2019).  Figure 1-1 Locations of the vegetation unit AbHlCwTe which contains *Dolichandrone occidentalis* shrubs Five small Burrup Peninsula rock pile communities listed as Priority 1 under Priority Ecological Communities (PEC) with a total area of 0.103 ha will be impacted by the Proposed Site C Footprint, Conveyor and access roads. This is supported in the ERD Section 4.5.3.5 and Figure 4-9.
4) Work Requirement 4.6 in the ESD has not been met. Table 4-13 requires detailed information to be inserted about contingency measures proposed if decline in health observed, including thresholds and trigger levels. Visual monitoring is insufficient. Exclusion areas should be explicitly indicated as 'no vegetation clearing or laydown areas'.	Detailed designs (including detailed information on delineation of exclusion areas) of the Project are still being finalised. As part of the project's CEMP requirements, a post-construction monitoring program will be implemented to assess and cover the following:

	• effective implementation of the safeguards and mitigation measures; • identify any unexpected or inadvertent impacts; and • identify recommended revisions or improvements to support the protection of native flora and fauna.
5) Work Requirement 4.7 in the ESD has not been met. Expansion of Work Requirement 4.6 in the ESD is required before discussion of potential offsets is appropriate.	Project proposes to contribute to Pilbara Offset fund for potential offsets. A specific consolidated response re offsets will be provided to the EPA under separate cover.
Terrestrial Fauna	
1) Work Requirement 5.2 in the ESD has only been partially addressed. The desktop study has been updated with WA Museum records. However, the SRE survey does not meet EPA guidance. A single targeted survey was undertaken for one SRE component (land snails) and no details specific to the land snail survey have been provided in the APM 2019 report (Appendix B). The most recent survey, which also only targeted land snails, was conducted in 2006 (more than 10 years ago) and no additional survey has been presented. Without adequate survey to determine the composition of the SRE fauna assemblage, it is not possible to adequately assess the potential impacts to SREs.	SRE Memo is attached as an appendix to the Appendix B.
2) Work Requirement 5.4 in the ESD has only been partially addressed. There are two relevant P1 PEC communities: a) Burrup Peninsula Rock Pool Communities; and b) Burrup Peninsula Rock Pile Communities. There appears to be some confusion between the two communities in the information provided in the ERD and the proponent's response only references the Rock Pool communities, not the Rock Pile communities. While the Burrup Peninsula Rock Pool Communities are outside the project footprint and may not be impacted by development, the Burrup Peninsula Rock Pile Communities occur in patches inside the development area and within the footprint of the planned infrastructure area in Site C (see ERD page 106, Figure 4-	SRE Memo is attached as an appendix to the Appendix B.

16). The potential impacts to the Burrup Peninsula Rock Pile Communities have not been adequately discussed. The sites that were surveyed for land snails are illustrated (Figure 5-2) but the sites that recorded specimens are not shown. To reduce the level of uncertainty and determine the potential impacts regarding SRE's the following would be required: a) conduct a survey for SRE invertebrates, in addition to land snails; b) present the details for the initial land snail survey; c) present survey sites on a map showing positive (where specimens were collected) and nil (no specimens collected) results for SRE fauna; and d) contact the Species and Communities program at the DBCA to report additional occurrences of the Burrup Rock Pile community.	

3) Work Requirement 5.6 in the ESD has not been met. The surveys for SRE invertebrates do not meet EPA Guidance (2016c). The ERD (page 112) references the Murujuga National Park Management Plan 78, 2013 (page 45), which states: "It is highly likely that short-range endemic species will be identified among the invertebrate fauna of the Burrup Peninsula" and recommends that further survey is undertaken for SRE groups. Given the potential for a high diversity of SRE invertebrates and numerous developments in the area, the survey is required to adequately assess the potential and cumulative impacts of the proposed development on the SRE taxa. Page xviii in the ERD states that there will be a **"**loss of 0.13 ha of vegetation considered representative of the P1 PEC Burrup Peninsula Rock Pile communities", which could represent a loss of habitat and/or individuals for P1 SRE invertebrates associated with this PEC. The ERD does not discuss this impact. Section 4.6.5.6 (page 121) states that "The Project may reduce habitat available for invertebrate fauna associated with rocky outcrops" but does not specifically mention the PEC Burrup Peninsula Rock Pile communities. The proponent should clarify whether the statement above refers to the general rocky outcrop habitat type or the PEC. Additionally, the proponent should discuss the possibility of a loss of SRE fauna due to the removal of rocky outcrop habitat. Without undertaking a survey to determine the SRE assemblage in the development envelope, the proponent does not have sufficient information to provide an informed risk assessment on potential impacts to SREs in the Development Envelope. Based on current information provided, an assessment of potential and cumulative impacts to the PEC Burrup Peninsula Rock Piles Community and SRE taxa found in the Development Envelope would result in a high level of uncertainty and a low level of confidence based on the limited information. Management and mitigation measures for any restricted SRE taxa that may be adversely affected by the proposal need to be outlined based on survey information.	SRE Memo is attached as an appendix to Appendix B of the ERD. Five small Burrup Peninsula rock pile communities listed as Priority 1 under Priority Ecological Communities (PEC) with a total area of 0.103 ha will be impacted by the Proposed Site C Footprint, Conveyor and access roads. This is supported in the ERC Section 4.5.3.5 and Figure 4-9. This P1 PEC 0.103 ha area does not include rocky outcrop habitats. In total, 0.1 ha of rocky outcrops will be impacted by the Project Footprint. Table 21-1 Appendix P-Fauna habitat types within the Project Footprint clearance area

Fauna Habitat	Potential Species	Likelihood of Occurrence	Site C construc-tion footprint	Site F construc-tion footprint	Other * (ha)	Total (ha)
Rocky Outcrops	a- Pilbara Olive Python	a. High	0.1	-	0.02	0.1
	b- Northern Quolls	b. Moderate				
Hummock Grasslands on Mid Slopes			21.9	26.1	3.69	51.7
Samphire Shrubland / Supratidal Flats	c- Curlew Sandpiper	c. Moderate	10.1	0.2	1.48	11.8
	d- Red Knot	d. Moderate				
	e- Lesser Sand Plover	e. Low				
	f- Bar-tailed Godwit	f. Moderate				
	g- Australian Fairy Tern	g. Low				
	h- Great Knot	h. Low				
	i- Eastern Curlew	i. Moderate				
Drainage Lines	j- Ghost Bat	j. Recorded	0.9	1.5	0.06	2.4
Disturbed			1.1	2.2	1.23	4.5
Total			**34.0**	**30.0**	**6.48**	**70.5**

	* Causeway, access roads, and clearing for conveyor a- Pilbara Olive Python - This species has been historically recorded on Dolphin Island in the Dampier region and in King Bay, Hearson's Cove and in many locations around the Karratha Gas Plant and Pluto LNG facility, particularly where artificial water sources occur (open water pit) It is often recorded around the built environment and highly disturbed areas. APM did not record the species on either of the biological surveys (APM, 2019), however this species has a high likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan). b- Northern Quoll - This species has been previously recorded on Dolphin Island in the Dampier region and on the Burrup Peninsula in various locations, including a sighting at the port area of King Bay warehouse. They require well-developed and extensive rocky outcrops which is not present within the Footprint (APM, 2019). They have a moderate likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan). c- Curlew Sandpiper - This species has been recorded in the Dampier region (DBCA, 2018) and historically on the Burrup (Worley Astron, 2006). This species may use the Project Area during the wet season, though records suggest that the species prefers undisturbed islands and islets. They have a moderate likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan). d- Red Knot - This species has been recorded in the Dampier region (DBCA, 2018) and less recently on the Burrup Peninsula (Worley Astron, 2006). The species is known to follow tide edges when foraging, and can be seen with many other shore birds within the samphire habitat. Given the proximity to Hearson's Cove, and the presence of open flats within the Project Area, this species may use the area for both foraging and roosting. This species was not recorded on either of APM's biological surveys (APM, 2019), however, they have a moderate likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan). e- Lesser Sand Plover - This species has been historically recorded on Dolphin Island in the Dampier region. This species sometimes overwinters in northern Australia. It is abundant in Queensland, and uncommon elsewhere in Australia. This species is not expected to rely on habitats present in the Project Area, especially as this species does not breed in Australia. They have a low likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

	f- Bar-tailed Godwit – This species has been recorded in the Dampier region on Dolphin Island and Hearson's Cove (DBCA, 2018). This species may forage over the salt ponds and mud flats present in the Project Area. They have a moderate likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan). g- Australian Fairy Tern - This species has been recorded on Egret Island on the Dampier archipelago (DBCA, 2018). This species would be more inclined to use the sheltered and undisturbed bays within the islands and islets of the archipelago. They have a low likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan). h- Great Knot - This species has been historically recorded on the Burrup Peninsula (Worley Astron, 2006). It was not recorded during either of Biological surveys (APM, 2019). The samphire/mudflat habitat occur within the PDE is likely to open for this species, and it does not that contain the mangrove swamps it prefers. i- Eastern Curlew - Predominately found in estuarine systems, saltmarshes, tidal mudflats and mangroves. Can be found in brackish or freshwater lakes. This species has been recorded at Nickol Bay (east coast of Burrup) (DBCA, 2018). They are a common migrant to the north, northeast and southeast of Australia. They have a moderate likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan). j- Ghost Bat - This species has been recorded on the Burrup Peninsula about 4 km northeast of the Project Area (DBCA, 2018) and more recently by APM during the post-wet season survey. The drainage line in the south west of PDE was identified as an important habitat for Ghost Bats and therefore eliminated from the current footprint. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).
4) Work Requirement 5.9 in the ESD has been met. There is a population of the northern quoll on Dolphin Island off the Dampier Archipelago and historical (c1990s) records of the species at the Burrup Peninsula (A. Whittington, DBCA 2020, pers. Comm., 15 June). Management of the northern quoll in relation to reporting sightings and mortalities has been adequately addressed in the management plans (Appendix K). Comments regarding habitat fragmentation and the potential impacts this would have on the genetic exchange for the northern quoll have been removed from the ERD without being adequately addressed. However, it is noted that the proponent	As per the Commonwealth Listing Advice and National Recovery Plan for the Northern Quoll, the loss of important habitat and habitat fragmentation are some of the main factors contribute to the decline in quoll populations. The initial layout of the Site C, Site F and the amalgamation area was around 105 ha. This initial layout required clearing of approximately 80 ha and significant earthworks in the amalgamation area (tidal flats) to reclaim the site. The Project will be located within the Burrup Strategic Industrial Area (BSIA), which was established since 1990's. Various industries have been operating in

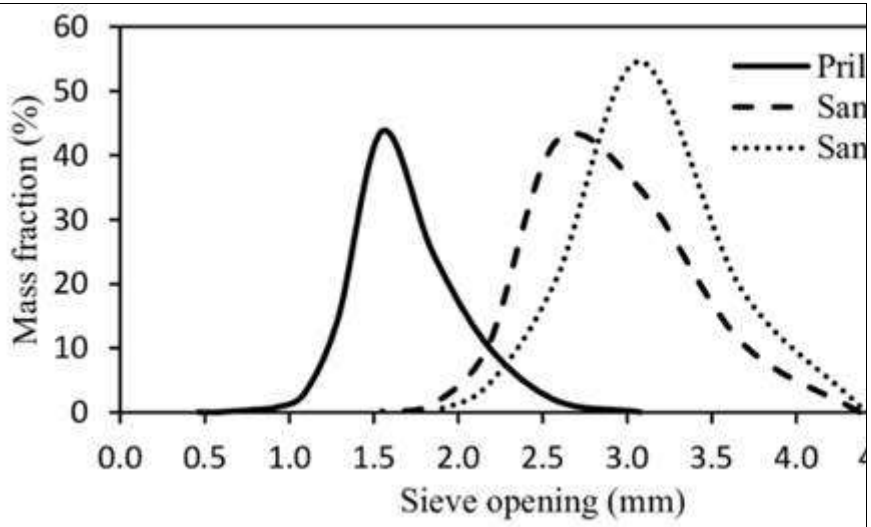
would contribute to a genetic diversity study either in agreement with the Murujuga Aboriginal Corporation or as a joint study with other industries.	the BSIA since then, including establishing a Multi User Brine Return Line (MUBRL). Constructing the MUBRL effectively fragmented the habitats within Site C from Site F. Habitats within Site F has been again fragmented by the establishment of the Hearson Cove Road. Therefore, the Project Footprint has been largely fragmented with the developments occurred in the immediate area. The Project is committed to not exacerbate the habitat fragmentation as much as practicable within the Project area by redesigning the entire Project layout. The causeway design will contain large diameter, short culverts with significantly larger flow capacity to maintain hydrological and tidal flows and also allow fauna to freely and safely move through the structure between Hearson Cove and King Bay. The elevated causeway is designed to reduce the disturbance to small mammals. The Proponent is willing to consider contributing to further studies of Northern Quolls in liaison and agreement with MAC.
Inland Waters	
1) The previous review identified that there was insufficient information supplied related to the hydrology of the site; specifically, the peak rainfall and streamflow expected and how this was determined. The hydrology component of the Surface water report (Section 5.2) uses regional Geoscience Australia hydrology mapping data to identify stream lines near the site. There is no quantification of potential peak flow rates, volumes or flow paths from the site and how this will be managed post development. The rainfall characteristics component of the surface water report (Section 5.5) includes mean, median and highest daily rainfall from the nearby Karratha Aero rain gauge directly from the Bureau of Meteorology's website. There is no further analysis of rainfall data. The period of record or an infilled dataset has not been supplied at a minimum. There has been no quantification of potential maximum rainfall from the site.	The ERD Appendix K Surface Water Management Plan has been reviewed and revised see Appendix U of this Response to Submissions . The revision includes a chapter to record 'Design Criteria' from the Basis of Design, which deals with the following with respect to design: 1. Adopt the guidance from Water Quality Protection Note 52[EE]; 2. Minimise the impact of flooding on structures and as a general principle storms of 1 in 20 year ARI or less, the post-development flows should meet pre-development flows off the project site; 3. With respect to environmental flows, to prevent erosion, scouring and sedimentation in natural or unlined channels velocities of minor/regular storm flows should be limited to velocities of less than 0.8 m/sec; and 4. Major storms of up to 1 in 100 year ARI and up to 24 hour duration should be stored and treated on the plant site and recycled, all storms

[EE] Available at: https://www.water.wa.gov.au/__data/assets/pdf_file/0019/5284/93700.pdf

In summary the original comments made in December 2019 have not been addressed. RSD recommends that the above information is supplied by the proponent.	of a greater duration will be released in a controlled fashion through spillways.
Air Quality	
1) Section 4.9.5.6 in the ERD states: "*Rock art and its continuing integrity are prime underlying aspects of importance to the world heritage listing justification. As noted in Section 4.8.3.4, 4.8.4.1, 4.8.5.2 and 4.8.5.3, as well as in Tables ES3 and 4-44 Project air emissions are likely to have little or no impact in relation to acid forming pollution regionally or nitrate induced microbial activity which are recognised as prime potential aspects of concern related to the integrity of rock art at Murujuga."* (page 198), and *"There are currently no recognised quantitative criteria suitable for the assessment of air quality impacts upon Burrup rock art."* (page 152). It is noted elsewhere in the ERD that processes affecting the integrity of the rock art are still relatively unknown. The Department is currently working with the Murujuga Aboriginal Corporation (MAC) on a rock art monitoring program to determine whether the rock art is subject to accelerated change. Given the development of the monitoring program has only recently commenced, the national (and likely future world) heritage significance of the area and the significant community interest in Murujuga's rock art, it is recommended that this proposal be subject to similar monitoring and reporting requirements for emissions as other industry proposals on the Burrup (e.g. Yara Pilbara, Woodside, and Rio Tinto).	The Proponent recognises that the physical microenvironments of the rock surfaces, which control the chemical and biodeterioration of the engraved images, are complex. The complexity is due in part to the differences in the underlying geology of the rocks (both gabbro and granophyre) and the way they retain moisture needed to facilitate the chemical processes associated with the maturation of the patina (mineral formation) and the diminution of the rock patina, through solution weathering. Since the amount of water is interdependent on seasonal temperature variation and the inclination of the sun striking the rock surfaces, the monitoring regime during construction and before commissioning will need to occur on a twice in a yearly cycle that considers the hot and the cooler months on the Burrup. The regime will be developed in consultation with MAC but is anticipated could include: - • measurement of the surface pH of the rocks, selected in consultation with MAC; • the amount of salt deposited with the prevailing winds coming across the ocean; and • the redox potential of the rock surfaces. Long before any apparent chemical change on the rocks, the surface reactivity of the minerals can be assessed through measurement of the voltage of the surface-reactive species as they respond to the application of moistened sponges. This suite of work has previously been endorsed by MAC for the monitoring works associated with assessing the environmental impact of emissions from the Yara Pilbara Nitrates (Yara) ammonia and ammonium nitrate production facilities, which are proximally located with the proposed developmental area outlined in the proposal. In addition, subject to dialogue with MAC, at the times of the surface assessment of the designated rocks, samples of the surfaces could be collected through

	irrigation of the surfaces with ultra-pure water potentially supplied by the ChemCentre of WA or an appropriate alternative with capability to provide the same standard of ultra-pure water. Subject to suitable commercial arrangements and MAC concurrence, the ChemCentre or an appropriate NATA accredited alternative may also be utilised to analyse the washings. It is envisaged that the water is analysed by inductively coupled plasma mass spectrometry for all the relevant metal ions and by ion chromatography for all negative ions (anions) such as chloride, sulphate, nitrate, ammonia, ammonium, nitrite, oxalate and sulphite. The analysis would be undertaken in compliance with relevant USEPA or other agreed standards applicable to the species being monitored. Owing to its widespread use in agriculture and as a waste product of mammalian metabolism the decomposition of urea as a minor pollutant of waterways has been extensively studied. It has been noted that urea reacts catalytically with NOx pollutants and reduces the valency of the nitrogen in the gaseous phase while being oxidized itself (Urbańczyk et al. 2016). The Proponent considers it would be appropriate that detailed monitoring of the model rocks that are chosen to represent the before and after modelling positions or sites be cognisant of the possible side reactions of urea with NOx and with clay like minerals in the rock patina, such as kaolinite {Al2Si2O5(OH)4} which may well alter the surface chemistry of the weathered rocks (Unuma et al. 1998). The Proponent proposes that this work would be a co-ordinated effort building on and supporting other industry participant programs through a contributing participation in the MRAS. Consistent with the MRAS approach to transparency, the results of the surveys in the pre-and post-construction phases could be made available in a public forum and format so that they can be subject to peer review as well as government scrutiny.
2) The ERD states in several places that the proponent has committed to the MAC to participate and contribute in the development of an EQMF as detailed in the Murujuga Rock Art Strategy. Further detail on this commitment is required. For example, other industry on Murujuga are contributing to the State's rock art monitoring and atmospheric monitoring programs. Is the proponent proposing to contribute to these programs? The ERD currently only contains high level references to the Murujuga Rock Art Strategy, and there is no linkage between the	The Proponent has initiated dialogue with the WA government on how and what level of participation it will commit as part of the implementation of the approved Project.

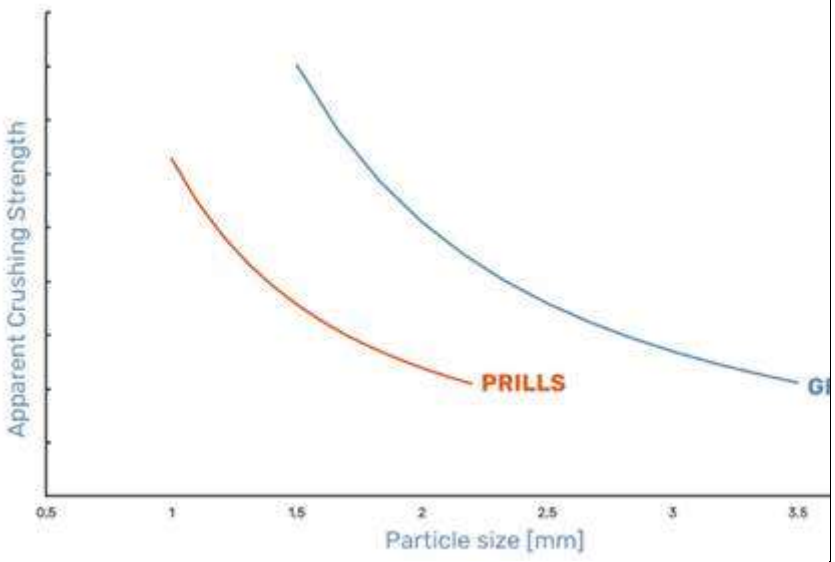
	management plans and the strategy in terms of the monitoring and management framework.	
3)	Information regarding control of air emissions under Part V of the proposed Urea Plant is adequate, but it is not clear from the ERD what the intended Part V Prescribed Premises boundary will be. This has implications as to what air emission sources can be regulated under Part V of the EP Act.	Noted as being a Part V issue.
4)	Part V of the EP Act through a works approval can regulate air emissions (dust) generated from the construction works of the Prescribed Premises aspect of the Urea Plant. Part V of the EP Act cannot regulate air emissions from disturbance/construction works occurring outside the Prescribed Premises boundary.	Noted
5)	Part V of the EP Act through a licence can regulate both point source and fugitive air emissions from the Prescribed Premises aspect of the Urea Plant. It cannot regulate air emissions generated from infrastructure and operations occurring outside of the Prescribed Premises boundary, which may include ship loading infrastructure and conveyors. NOTE: Due to the nature of the product to be shipped, it is uncertain at this stage if ship loading infrastructure and conveyors would be regulated under Part V of the EP Act.	The Proponent understands that ship loading may be a prescribed activity. While all conveyors are enclosed to the ship loader, it is unclear whether the final design will trigger Cat 58 or Cat 86 as loading of bulk material to a vessel of more than 100 tpd. Conveyor and Port storage will probably not be prescribed activities pursuant to Schedule 1 of the EP Regs, as the conveyor is fully enclosed the Proponent considers operational environmental impacts for conveyor will be low The potential 'dust' issue: Urea granules are engineered hard and tough to resist breakage and sized (in the granulation plant) to eliminate fines in the product (dust). There is thus only 1 collected dust point emission in the urea chain. 1. **Why granules are better than prills**. The particle size distribution of granules avoids small particles such as with prills.



(Researchgate: Urea Finishing Process: Prilling Versus Granulation, June 2014)

Prills show a smaller average particle size distribution, but specifically a lot wider. Granules are shown with Sample 1 and Sample 2 on the figure.

The Sample 2 is representative of modern granulation -a tight (>92%) distribution around 3.0mm (this average diameter can be adjusted if desired, with screen selection). Australian farmers demand a high particle size precision, as most of their crop application is mechanised. There are essentially no particles <1.5mm. Further granulation adds a small amount of UF85 as 'glue' which strengthens the crushing strength of the urea granules; reducing potential for damage during handling.



(Kreber.nl)

The Proponent transfer of urea form the shed to conveyor to port shed and port conveyor is mechanised operation it is not with front end loader which drive over the urea granules as is found with many Australian sheds. Even this operation results in minimal dust formation.

The above enhanced urea dust performance between prills and granules is also shown in the paper “Control of ammonia and urea emissions from urea manufacturing facilities of Petrochemical Industries Company (PIC), Kuwait”, (Khan et al 2016)[FF]

2. Example of shed to ship loader operation (Beumer ASEAN, but very similar to the Metso layout), see you-tube clip from Beumer (observe no visible dust - anywhere) https://www.youtube.com/watch?v=EqY1IOa2ud8

[FF] A.R. Khan, L. Al-Awadi & M.S. Al-Rashidi (2016) Control of ammonia and urea emissions from urea manufacturing facilities of Petrochemical Industries Company (PIC), Kuwait, Journal of the Air & Waste Management Association, 66:6, 609-618, DOI: 10.1080/10962247.2016.1145154

	3. Closed Conveyor design. Guaranteed delivered product values are applied for avoiding spillage - urea is worth >$400/t - it is not a low value mining product or coal.
6) The estimated emissions from the Perdaman Urea Project 0.65 million tonnes carbon dioxide equivalent (CO_2-e) per annum. While emissions from the proposal are relatively low in proportion to State and national emissions, the proponent acknowledges they are still of significance within the context of an increasing trend in Western Australia's greenhouse gas (GHG) emissions. In August 2019, the State Government released the *Greenhouse Gas Emissions Policy for Major Projects* (GHG Policy). The GHG Policy sets an aspiration for Western Australia to achieve net zero emissions by 2050 and creates requirements for the State's major emitters to set interim and long term targets to contribute to the State's aspiration. In regards to the GHG Policy, it is noted that: • major projects assessed under Part IV of the *Environmental Protection Act 1986* (EP Act) include the State's largest emitters of greenhouse gases; and • significant residual emissions from major projects in 2050 are incompatible with Western Australia's net zero emissions 2050 goal. The proponent's greenhouse gas management plan (GGMP) establishes interim and long-term targets to avoid, reduce or offset 32,500 tpa CO_2-e by 2035 and 65,000 tpa CO_2-e by 2050 from the project. These targets are equivalent to a 5% reduction in emissions below 2024 levels in 2035, and 10% reduction below 2024 levels in 2050. The proponent's GGMP notes that: • beyond technology selection and choice of feedstock, the opportunity for	The Proponent notes this comment, but considers the proposed reduction target is reasonable, practicable and appropriate given the level of reuse of waste CO_2 as a process input is already significantly higher than other industries covered by the State's policy. Updated reduction targets are included in the separate GHGMP now included as part of Appendix U herewith. In relation to the contribution of fertiliser use to global GHG levels, Khan et al 2016[GG], indicate: *"A critical analysis of greenhouse gas (GHG) emissions from agriculture between 1961 and 2005 showed the positive role of enhanced agricultural productivity in reducing total GHG emissions and increased emissions from rising fertilizer production playing a positive role in controlled conversion of forests, wetlands, and other natural habitat to croplands."* This further reinforces the information from IFIA 2009 on Urea Life-cycle referenced in relation to GHG on page 175 of the ERD. Further, the accuracy and completeness of GHG emissions estimates have been reviewed and revise as necessary in a separate Greenhouse Gas Management Plan to address the requirements of the EPA Guidance released in April 2020 after the release of the ERD for public comment. The estimates relate to Scope 1 and Scope 3 emissions and are appropriate for purposes of the assessment. In line with the requirements of the EPA Guidance released in April 2020 after the release of the ERD for public comment, interim and long-term GHG emission targets have been established for the Project, set out in the Environmental Management Plan (EMP) for GHP (Appendix U).

[GG] See https://www.tandfonline.com/doi/pdf/10.1080/10962247.2016.1145154

further significant improvement in energy efficiency and GHG emissions over the life of the project is limited; and • further opportunities will be evaluated to develop and implement practicable GHG emissions reduction and offset initiatives in order to achieve these interim and long-term emission targets. Based on the GGMP, the proponent's emissions in 2050 will be 90% of baseline (2024) emissions. This constitutes a significant residual emissions burden which, in lieu of enhanced offset commitments by the proponent, will need to be borne by another sector of economy if the State's aspiration is to be achievable. This is inconsistent with the polluter pays principle of the EP Act which states that those who generate pollution and waste should bear the cost of containment, avoidance or abatement. It is both possible and practicable for the proponent to set targets such that the Perdaman Urea Project contributes minimal or no residual emissions to global emissions in 2050 through the procurement of offsets, including either Australian Carbon Credit Units or voluntary international offsets meeting suitable integrity standards.	Revised GHG targets have been established in the GHGMP in Appendix U. This is consistent with current government policy, as outlined in the recently published Environmental Factor Guideline for GHG emissions (EPA, 2020) and the Western Australian Government's Greenhouse Gas Emissions Policy for Major Projects released in August 2019. The Project's energy efficiency has been benchmarked against the relevant international performance benchmark for ammonia production (refer to Section 4.3 of the GHG Assessment). Equivalent international performance benchmarks for GHG emissions were not identified. In relation to the potential utilisation of green hydrogen as an avenue for GHG reduction, the Proponent notes the 2019 study by Wood Mackenzie highlighted in public submissions. As indicated in ERD Table 4-43, the Proponent has committed that at 5 yearly intervals after the completion of Project commissioning, the Proponent will conduct a study to identify potentially applicable technologies for reduction of project air emissions and assess the practicability of the application of those technologies to enhance the overall environmental performance of the Project. The potential to incorporate solar and/or hydrogen-based inputs will be part of that review. *Wood Mackenzie study 2019 (referenced from website)* *Their key summary is below:* 

	The current status is that whilst renewable energy costs have significantly reduced over the past decade, and further reduction is anticipated, the 2030 cost is likely be competitive in select markets only. *The current cost is prohibitive for the fertiliser market:* *"Green hydrogen today is expensive compared to the production of hydrogen via fossil fuels. According to our analysis, with sub-US$30/MWh electricity prices, green hydrogen production can be competitive with fossil-fuel-based hydrogen in Australia, Germany and Japan by 2030".* The Proponent's separate investigations support the Wood Mackenzie conclusion re the "cost is prohibitive for the fertiliser market" and suggests that sub $20/MWh green hydrogen could be competitive (if a competitive alternative source of necessary clean CO_2 is also available at the location.) As indicated in ERD Table 4-43, the Proponent has committed that at 5 yearly intervals after the completion of Project commissioning, the Proponent will conduct a study to identify potentially applicable technologies for reduction of project air emissions and assess the practicability of the application of those technologies to enhance the overall environmental performance of the Project. The potential to incorporate solar and or hydrogen-based inputs will be part of that review. This is reflected in the GHGMP and AQMP which are now separate plans in Appendix U.
Social Surroundings	
1) Section 4.9.7 in the ERD states: *"Four Aboriginal heritage sites have been identified following a detailed archaeologic survey, as intersecting with the proposed plant footprint. Disturbance of these sites is considered likely impracticable and Section 18 consent will be thought for these sites in accordance with the mitigation measures outlined in Section 4.9.6."* (page 203). This error was identified in previous advice on the draft ERD and has not been corrected in the ERD. Clarification is sought whether the proponent proposes an impact to the 4 heritage sites identified, noting that three of these 4 sites are considered to be of high significance (Table 4-45, page 190). It is noted that the proponent's management for rock art under the Social Surroundings factor is largely based on obtaining s.18 consent under the *Aboriginal Heritage Act 1972*. It	The Proponent is working closely with MAC in relation to the appropriate management of potential impact to sites identified in the heritage site survey commissioned by MAC and involving Traditional Custodians with direct connection to the project area. If it is demonstrated that it is impracticable to avoid a site, the Proponent has agreed to follow the processes defined in the MAC commission survey report and endorsed by the MAC Circle of Elders in that report. This is detailed in the AHMP, including a letter from MAC endorsing Perdaman's liaison and actions in this regard. The Proponent notes that this comment could be viewed as at odds with the views expressed by the Director, Aboriginal Heritage Operations at the

does not appear that the proponent has specifically addressed the EPA's objective for social surroundings.	Department of Planning, Lands and Heritage to the EPA on 3 June 2020 (refer to Appendix O of this Response to Submissions). However, it is noted that the EPA's Environmental Factor Guideline -Social Surroundings, is broader than Aboriginal heritage matters administered by the DPLH under the Aboriginal Heritage Act 1972. This guideline states: "In addition to Aboriginal heritage, matters of Aboriginal cultural associations, including traditional Aboriginal customs, directly linked to the physical or biological aspects of the environment, may also be considered significant." (EPA, 2016, p2). The Proponent is advised that the Scope of Work for the surveys commissioned by the State and executed by MAC across the Project footprint, in the BSIA included that these matters should be recorded and reported on. The Proponent understands from the WA State Government, who as noted above commissioned these investigations, that the report by IHS met that requirement. Thus, it has been used to inform the ERD and this EIA process on such matters.
2) Section 4.8.5.2 in the ERD states *"The Proponent, in consultation with MAC as endorsed in the recommendations of the IHS heritage survey report (see Section 4.9 .5.2.1), will undertake monitoring during construction and before commissioning to establish a robust baseline against which to compare its contribution to the regional airshed for ammonia and urea and impacts from its contribution to deposition of these species which may impact rock art."* (page 168). It is noted that the ERD provides a theoretical argument for urea dust not being a significant contributor source to impacts to Murujuga's rock art (pages 152-154; and page 168). However, it is recommended that further investigation or monitoring is required to verify this argument. It is noted that the proponent proposes to undertake monitoring (page 168). It is recommended that this monitoring is conditioned and the results are made public.	The Proponent recognises the need for enhanced understanding in relation to anthropogenic emissions and potential impacts on rock art. It supports the State Government's strategic approach and is prepared to be a contributing participant towards this strategy as part of the Project implementation.
3) The ERD refers to monitoring and adaptive management being aligned with the Murujuga Rock Art Strategy, and that monitoring will be detailed in the Aboriginal Heritage Management Plan (AHMP). This has not been included in Appendix K.	The draft Aboriginal Heritage Management Plan (AHMP) was included in ERD Appendix K. As living documents, the draft management AHMP in ERD Appendix K has been reviewed and revised on the basis of stakeholder and regulator feedback and

Comments previously provided on the draft ERD relating to the AHMP have not been considered. This includes incorrect or unclear statements about the Murujuga Rock Art Strategy, unclear responsibilities and reporting processes and sections with content potentially missing. It is recommended that the AHMP is revised to address the previous comments that were provided on the draft ERD.	through extensive direct liaison with MAC and the Murujuga Traditional Custodians. In referring to the Murujuga Rock Art Strategy and committing, that as part of the implementation of the approved project to be a contributing participant, the Proponent acknowledges and supports the merits of adopting a consistent, industry wide, community relevant approach to understand and manage the risk of potential adverse impacts to rock art at Murujuga. This is based on recognising that scope of the strategy is to: • establish an Environmental Quality Management Framework (EQMF), including the derivation and implementation of environmental quality criteria. • develop and implement a robust program of monitoring and analysis to determine whether change is occurring to the rock art on Murujuga. • identify and commission scientific studies to support the implementation of the monitoring and analysis program and management. • establish governance arrangements to ensure that: • monitoring, analysis and reporting are undertaken in such a way as to provide confidence to the Traditional Owner, the community, industry, scientists and other stakeholders about the integrity, robustness, repeatability and reliability of the monitoring data and results. • government is provided with accurate and appropriate recommendations regarding the protection of the rock art, consistent with legislative responsibilities. • develop and implement a communication strategy in consultation with stakeholders. The proponent acknowledges the EQMF set out in the MRAS (pp 24- 29).The MRAS has not yet finalised EQMF environmental quality criteria, it is considered pre-emptive at this time to propose such monitoring and adaptive management measure that would then need to be reviewed and potentially revised to be compatible with MRAS EQMF provisions in that area. The Proponent acknowledges Section 5.0 of the MRAS discussing Monitoring and analysis for the purpose of the MRAS. Particularly noting Section 5.2,

	Opportunities for improvements, the Proponent in committing to being a contributing participant in the MRAS, supports this holistic consistent approach. If the MRAS EQMF environmental quality criteria are not finalised before the Proponent seeks Part V construction approval, the proponent will include interim environmental quality criteria based on comparable criteria applied in approvals for comparable industrial development at Murujuga in its Part V application.

APPENDIX

Q

DEPARTMENT OF AGRICULTURE, WATER AND THE ENVIRONMENT SUBMISSION

Note: Throughout this Response to Submissions Appendix Q, relevant responses reflect changes to the proposal that have been approved by the EPA pursuant to a s43A request in January 2021 and EPBC Act s156a request submitted in January 2021 which principally reflect changes that result from ongoing dialogue during the EIA process with MAC and its Circle of Elders. The changes are included in an amended ERD Figure 2 Development Envelope and Indicative Infrastructure and amended ERD Table ES2 both in Appendix T of the Response to Submissions.

The extensive dialogue has resulted in

- a slight change to the Development Envelope to accommodate a small shift to the south of the access between Site C and Burrup Road to provide greater protection to heritage Site ID 9579 with no material change to environmental impacts;
- a design review of the conveyor route between Site C and the Development WA East West Service corridor which eliminates impacts to Site ID 20037 in Site C as well as ensuring this and all other sites in the vicinity of this route and configuration are protected in situ; and
- Endorsement by MAC and its Circle of Elders of these changes.

Responses to additional matters raised in ongoing dialogue with DAWE in correspondence of 3rd March 2021 are summarised in Attachment 5 to this RtS Appendix Q.

Threatened and Migratory Species

Page ref	Section	Comments on Draft ERD	Comments on ERD	Perdaman Proposed Response
	Marine Fauna			Responses to DAWE comments on the Biological responses listed as “Not Satisfied” or “Partially Satisfied” in Attachment 2 to the EPA letter to Perdaman on 17/11/2021 are included as **Attachment 3** of this RtS Appendix (Q).
56 - 59	4.4	The *Recovery Plan for marine turtles in Australia* (2017) states that the Dampier Archipelago (with an inter-nesting buffer) contains *Habitat critical to the survival of a species* for the Green turtle (*Chelonia mydas*), Flatback turtle (*Natator depressus*) and Hawksbill turtle (*Eretmochelys imbricate*). In addition, the Dampier Archipelago forms part of the Biologically Important Area for the above-mentioned species and the Olive Ridley turtle (*Lepidochelys olivacea*), Loggerhead turtle (*Caretta caretta*) and Leather back (*Dermochelys coriacea*). Therefore, the Department considers impacts on these species, or their habitat, as a result of the proposed action significant impacts.	The Department notes this Section now states Policy and guidelines documents considered under the EPBC Act - Matters of National Significance are listed under Section 6.2. This is satisfactory.	Comment Noted
		1. Section 4.4.2 Policy and guidance does not include the following documents which were requested by the Department to be included within the scoping document: Department of the Environment, Water, Heritage and the Arts, 2013, Significant Impact Guidelines 1.1 - Matters of National Environmental Significance. Available from: https://www.environment.gov.au/epbc/publications/significant-impact- guidelines-11-matters-national-environmental-significance Department of the Environment and Energy (2017). *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs* (Sus scrofa) *(2017*). Canberra, ACT: Commonwealth of Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/f eral-pig-2017.	The Department notes the additional documents have been added to the Policy and Guidance documents list. This is satisfactory.	Comment Noted
			The Department notes Section 6.2 does not provide a discussion on how these documents have been considered. If the documents are discussed throughout the draft ERD then the proponent should provide a list of the relevant sections for reference (Table format would be useful). If not discussed then the proponent needs to provide a discussion as requested.	**Policy and guidance documents** / **How these documents have been considered in the ERD and the Section of the ERD** Department of the Environment, Water, Heritage and the Arts, 2013, Significant Impact Guidelines 1.1 - Matters of: Protected Matters Tool – Section 6.5 Assessment of impacts to the controlling provisions has been undertaken with regard to the DEWHA (2013) Significant Impact Guidelines. DEWHA (2013) Significant Impact Guidelines have been referred to in Section 6.7.7 to

Threatened and Migratory Species				
Page ref	**Section**	**Comments on Draft ERD**	**Comments on ERD**	**Perdaman Proposed Response**
		Department of the Environment and Energy (2018). *Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (2018*). Canberra, ACT: Commonwealth of Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/ marine-debris-2018. Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008). *Threat abatement plan for predation by the European red fox*. DEWHA, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/p redation-european-red-fox. Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012). *Marine bioregional plan for the North- west Marine Region*. Prepared under the *Environment Protection and Biodiversity Conservation Act 1999*. Available from: http://www.environment.gov.au/topics/marine/marine-bioregional- plans/north-west. Please discuss how all above Policy and Guidance documents have been considered. That is, having regard to and providing a discussion on the objectives of the documents. For example, the *Recovery Plan for marine turtles in Australia* states a Recovery Objective of: '*The long-term recovery objectives for marine turtles is to minimise anthropogenic threats to allow for the conservation status of marine turtles to improve so that they can be removed from the EPBC Act threatened species list'* Please provide a discussion on how the proposed action is consistent with this objective or alternatively, how the proposed avoidance, mitigation/management and offsetting will compensate for any residual significant impact, thereby ensuring consistency with the objective for relevant EPBC Act listed marine turtles.		National Environmental Significance.	assess whether the proposed action will have, or is likely to have a significant impact on threatened species. DEWHA (2013) Significant Impact Guidelines was used to identify that the project area does not support an 'important population' of any of the identified migratory species by PMST (Section 6.8.6)
				Department of the Environment and Energy (2017). *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs* (*Sus scrofa*) *(2017*). Canberra, ACT: Commonwealth of Australia.	Feral Pigs are not currently ranked as a high threat to the biodiversity in the Pilbara region. According to the Western Australian Feral Pig Strategy 2020-2025 report, Department of Primary Industries and Regional Development (2019), feral pig populations in the Pilbara are restricted to localized densities closely associated with major river systems or large year-round water bodies. According to current distribution maps within this report feral pig populations in the Pilbara region are restricted to Port Hedland region, not in the Karratha/Dampier region. However, the Threatened Species Management Plan (Chapter 9) in Appendix K discussed the *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (DoEE, 2017)* and its objectives against the mitigation measures that will be applied by the project.
				Department of the Environment and Energy (2018). *Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (2018*). Canberra, ACT: Commonwealth of Australia.	Chapter 9 of the Threatened Species Management Plan in Appendix K discussed the *Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (DoEE, 2018)* and its objectives against the mitigation measures that will be applied by the project
				Department of the Environment, Water, Heritage and the Arts (DEWHA)	Chapter 9 of the Threatened Species Management Plan in Appendix K discussed the *Threat abatement plan for predation by the European red fox (DEWHA, 2008)* and its

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Page ref	Section	Comments on Draft ERD	Comments on ERD	Perdaman Proposed Response		
				(2008). *Threat abatement plan for predation by the European red fox*. DEWHA, Canberra.	objectives against the mitigation measures that will be applied by the project. As per the *Threat abatement plan for predation by the European red fox* Appendix A, turtle species are affected by the European red fox. Turtles are at most risk from impacts during nesting, hatchling emergence and at-sea dispersal. Very low-level turtle nesting is expected at proximity of the Proposal Development Envelope. The project will implement the objectives and actions set by the *Threat abatement plan for predation by the European red fox*. For example, as mentioned in the ERD Threatened Species Management Plan in Appendix K, predator control (including red foxes *Vulpes vulpes*) has been identified as an absolute priority to minimise the impact of the Project. That involves initiating a feral fauna trapping and euthanisation program to reduce the number of feral fauna around the site, reducing food waste around the processing facility to ensure that feral predators are not attracted to the facility and, developing and implement an introduced predator control program. Perdaman will ensure all feral animal management measures on site are integrated and coordinated with existing regional/local control programs (i.e. Pilbara Ports Authority and MAC).
				Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012). *Marine bioregional plan for the North-west Marine Region*. Prepared under the *Environment Protection and Biodiversity Conservation Act 1999*.	ERD - Section 6.9 and Chapter 9 of the Threatened Species Management Plan in Appendix K discuss *Marine bioregional plan for the North- west Marine Region (*DSEWPaC, 2012*)*. In the ERD *Marine bioregional plan for the North- west Marine Region (*DSEWPaC, 2012*)* was used as a guide in Section 4.4.4 to discuss potential impacts to marine turtles and in Table 4-7 to discuss mitigating measures. As above, *Marine bioregional plan (*DSEWPaC, 2012*)* was used as a guide in Section 6.8.3 to discuss potential impacts to listed migratory species and used in Section 6.8.5 to discuss mitigation measures. The *Marine bioregional plan (*DSEWPaC, 2012*)* was used as a guide to discuss migratory marine species in Table 4-7 and

Threatened and Migratory Species				
Page ref	**Section**	**Comments on Draft ERD**	**Comments on ERD**	**Perdaman Proposed Response**
				used in Table 4-20 to discuss mitigation measures. The *Marine bioregional plan (*DSEWPaC, 2012*)* was used as a guide to discuss mitigation measures to manage potential impacts to threatened species in Table 6-4
			The Department notes the letter at Appendix J of the ERD from the Pilbara Ports Authority outlining they will be seeking approval to develop new port infrastructure at the Port of Dampier to support multiple users including Perdaman's proposed Urea proposal. This is satisfactory	Comment Noted
		2. The Potential Impacts (section 4.4.4) and Assessment of impacts (section 4.4.5) discuss impacts which the proponent has claimed they are not responsible for, such as shipping movements and associated impacts (i.e. introduction of marine pests and biofouling etc). Within the referral information the proponent provided documentation where the Pilbara Port Authority have stated that they will be responsible for these actions. Please outline the arrangements between the proponent and the Pilbara Port Authority in the ERD. The Department notes the proponent has been made aware that additional shipping movements required to collect and distribute the resources from the proposed action is dependent on the Pilbara Port Authority having an existing approval or submitting a referral to the Department if required. These particular actions do not form part of the proponent's assessment or any subsequent approval. The revised ERD must reference that the Department is not undertaking an assessment of the actions/impacts associated with shipping movements/activities. The Department continues to disagree with the statement that a 1% increase in shipping movements is not significant without having undertaken an assessment of this action – which as stated above, will not be undertaken given it is not part of the proposed action. Please revise the ERD to remove this sentence as it may potentially be considered to be misleading.	The Department notes the additional wording in Section 6.3 which states that "the Commonwealth Department of Energy and the Environment is not undertaking an assessment under the EPBC Act of the actions/impacts associated with shipping movements/activities. Therefore, those aspects are not covered in this section". This is satisfactory.	Comment Noted

Threatened and Migratory Species				
Page ref	**Section**	**Comments on Draft ERD**	**Comments on ERD**	**Perdaman Proposed Response**
		3. In addition, as provided as part of the EPBC Act referral information, the proponent has stated that they are not responsible for seawater uptake and brine disposal. The proponent has an arrangement with Water Corporation for this action. The Department acknowledges that the Water Corporation has current approval under the *Environmental Protection Act 1986* EP (Act). Please outline the arrangements between the proponent and the Water Corporation in the ERD. Further information is required to clarify the adequacy of this approval for the protection of relevant Matters of National Environmental Significance. While the Department acknowledged that the proponent may not be responsible for this action, without additional information the Department is not assured that Water Corporation have sufficient approval under Commonwealth legislation. This may have implications for the proposed action. Please revise the ERD to reference that the Department is not undertaking an assessment of the actions/impacts associated with seawater uptake and brine disposal.	The Department notes the additional wording in Section 6.3 "Water Corporation has indicated it will seek any necessary approvals for its MUBRL facilities required to accommodate further multiuser requirements, including those of the Project (see Appendix J), therefore the Commonwealth Department of Energy and the Environment is not undertaking an assessment of the actions/impacts associated with seawater uptake and brine disposal from the MUBRL facility. Accordingly, those aspects are not covered in this section". This is satisfactory	Comment Noted
			In addition to this, the Department will not be undertaking an assessment of, or approving the input or extraction of 'water' from the MUBRL as these have been previously been discussed as being out of scope, and are to be covered by WA approvals.	Comment Noted
		4. Noting the Pilbara Port Authority and Water Corp have claimed responsibility for the additional shipping movement/activities and water intake/discharge associated with the proposed action, the Department considers that the following threats identified within the *Recovery Plan for marine turtles in Australia* are relevant to the impact assessment for this proposed action*:* • Chemical and terrestrial discharge (from land sources); and • Light pollution. The Department notes the proponent's commitment to undertake mitigation measures (Table 4-7 Mitigation of Potential impacts to Marine Fauna) including the development and implementation of a Construction Environmental Management Plan (CEMP). Given the critical habitat for EPBC Act listed species that exists within the proposed action area and is likely to be impacted by the proposed action, the Department requires a Management Plan specific for EPBC Act listed threatened species potentially impacted as a result of the proposed action (that is marine turtles and listed threatened species discussed below under Terrestrial Fauna) to be provided as part of the assessment documentation. The plan should note the potential impacts outlined in section 4.7.4 and if required, provide sufficient mitigation to ensure that there will be no significant residual impacts on EPBC Act listed species including EPBC Act listed marine turtles and their habitat. The Department recommends the proponent engage a species expert to prepare this document.	The Department notes the proponent's commitment to develop a Fauna Management Plan and a Threatened Species Management Plan (Section 4.4.6 with drafts at Appendix K). See comments below. The documentation indicates that the Fauna Management Plan would be able to sufficiently address potential impacts to turtles, as the impacts to turtles will be minor. The Department requests that a specific Marine Turtle Management Plan be prepared by a species expert in order to more effectively mitigate potential impacts to marine turtles.	Comment Noted The Proponent views this comment as an appropriate and useful element of stakeholder feedback to be considered for integration into the next revision of the Threatened Species Management Plan, along with other feedback from stakeholders no later than 2 months prior to civil construction. A specific Marine Turtle Management Plan will be prepared by a Marine Turtle specialist prior to construction and will be submitted to the Department for review and approval no later than 2 months prior to civil construction.

Threatened and Migratory Species				
Page ref	**Section**	**Comments on Draft ERD**	**Comments on ERD**	**Perdaman Proposed Response**
		Please note that, when reviewing Environment Management Plans/Action Plans, the Department will take into consideration the Department's *Environmental Management Plan Guidelines* (2014) (Guidelines) available at http://www.environment.gov.au/epbc/publications/environmental-management-plan-guidelines which provides general guidance to stakeholders preparing environmental management plans for environmental impact assessments and approvals under Chapter 4 of the EPBC Act. Please ensure that both the CEMP and EPBC Act listed species management plans are consistent with the Guidelines. At this stage, the Department considers that the CEMP is not consistent with the Guidelines. Specifically, many of the mitigation measures referenced in the CEMP are not measurable, auditable or timely. Additionally, when committing to management actions, the proponent should refrain from using terminology of 'where possible/practical', 'it is anticipated', 'as required', 'should' or 'may' and use terms "will" and "must".		
Terrestrial Fauna				
77 - 93	4.6	1. Section 4.6.2 Policy and guidance does not include the following documents which were requested by the Department to be included within the scoping document: Threatened Species Scientific Committee (2016). *Conservation Advice* Calidris canutus *Red knot.* Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/855-conservation-advice-05052016.pdf.	Conservation advices, threat abatement plans and listing advice have not been included in this section. However, on checking Section 6.2 (similar to above) the following have been noted to have been be considered. Included in Section 6.7.7.7 Mentions conservation advice but focuses on significant impact criteria. Also Table 9-1 of the Threatened Species Management Plan.	Comments Noted The ERD Section 6.7.7.7 and Chapter 9 of the Threatened Species Management Plan in Appendix K discuss the *Conservation Advice Calidris canutus Red knot* and its objectives against the mitigation measures that will be applied by the project. The *Conservation Advice* has been integral in identifying potential impacts to Red Knots (ERD, Section 4.6.4 and Section 4.6.5 page 119) and subsequently identifying strategies to minimise and mitigate impacts (Section 4.6.6, Table 4-20). As per the *Conservation Advice*, the loss of important habitat reduces the availability of foraging and roosting sites for Red Knot. The original processing facility layout was forecast to impact 21.3 ha of the tidal flats and Samphire Shrubland/Saltplains habitat. Following Project design optimization, proposed clearing of this habitat type has been significantly reduced to 11.8 ha. The entire Project layout has been redesigned to minimise habitat fragmentation and minimise impacts to potential Red Knot feeding grounds. Potential impacts to mudflats have been minimised as much as practicable during the design phase and the causeway design will contain large diameter, short culverts with significantly larger flow capacity to maintain hydrological and tidal flows and also allow fauna to freely and safely move through the structure. The causeway has been designed considerably higher, further reducing the disturbance to Red Knots during feeding.

Threatened and Migratory Species				
Page ref	**Section**	**Comments on Draft ERD**	**Comments on ERD**	**Perdaman Proposed Response**
		Threatened Species Scientific Committee (2016). *Conservation Advice* Macroderma gigas *ghost bat*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/174-conservation-advice-05052016.pdf.	Included in Section 6.7.7.2 Mentions conservation advice but focuses on significant impact criteria. Also Table 9-1 of the Threatened Species Management Plan.	ERD, Section 6.7.7.2 and Chapter 9 of the Threatened Species Management Plan in Appendix K discuss the *Conservation Advice Macroderma gigas ghost bat (Threatened Species Scientific Committee, 2016b)* and its objectives against the mitigation measures that will be applied by the project. The *Conservation Advice* has been used as a guide to identify habitats suitable for Ghost Bats, potential impacts and identifying methods to minimise and mitigate impacts. As per the *Conservation Advice*, one of the key threats to Ghost Bats is habitat loss (destruction of, or disturbance to, roost sites and nearby areas) due to mining. There are no suitable roosting caves/ breeding sites for Ghost Bats recoded within the Project Footprint that will be impacted. Ghost Bats have been recorded during post-wet season surveys (APM, 2019). The drainage line in the south west of PDE was identified as an important habitat for Ghost Bats. Modification to foraging habitat is identified as a major threat to Ghost Bats in the *Conservation Advice*. This impact is avoided by eliminating that portion of the PDE from the current PDE (see below Figure 1-1).  Figure 1-1 Drainage line habitats important for Ghost Bats excised from the Project Development Envelope As mentioned in the *Conservation Advice,* Ghost Bats often fly at about fence height and substantial numbers are known to be killed when colliding with fencing wire. This has been identified as a moderate threat to the species in the *Conservation Advice*, therefore, no barbed/razor wire will be used on any fences during the construction and/or operation phases of the Project to minimise and mitigate potential impacts (ERD Section 6.7, Table 6-4). The *Conservation Advice* notes “poisoning by cane toads, competition for prey with foxes and feral cats poses a threat to Ghost Bats”. Therefore, mitigation and management measures are designed to avoid and minimise introduced fauna on site (ERD Section 6.7, Table 6-4).
		Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008). *Threat abatement plan for predation by the European red fox*. DEWHA, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/publi	Included in table 6.4 which discusses initiating a feral fauna trapping and euthanisation program to reduce the number of feral fauna around the site. Also Table 9-1 of the Threatened Species Management Plan.	ERD, Section 4.6.6 and Table 4-20; and Chapter 9 of the Threatened Species Management Plan in Appendix K discuss the *Threat abatement plan for predation by the European red fox (DEWHA, 2008a)* and its objectives against the mitigation measures that will be applied by the project.

Threatened and Migratory Species				
Page ref	**Section**	**Comments on Draft ERD**	**Comments on ERD**	**Perdaman Proposed Response**
		cations/t ap/predation-european-red-fox.		As per the *Threat abatement plan for predation by the European red fox,* they pose direct impacts on a range of native animal species. They prey particularly on small to medium sized, ground-dwelling and semi-arboreal mammals, ground-nesting birds and chelid tortoises. Therefore, the project will implement the objectives and actions set by the *Threat abatement plan for predation by the European red fox*. For example, as mentioned in the Threatened Species Management Plan in Appendix K, predator control (including red foxes *Vulpes vulpes*) has been identified as an absolute priority to minimise the impact of the Project. That involves initiating a feral fauna trapping and euthanisation program to reduce the number of feral fauna around the site, reducing food waste around the processing facility to ensure that feral predators are not attracted to the facility and, developing and implement an introduced predator control program. Perdaman will ensure all feral animal management measures on site are integrated and coordinated with existing regional/local control programs (i.e. Pilbara Ports Authority and MAC).
		Department of the Environment, Water, Heritage and the Arts (2008). *Approved Conservation Advice for* Liasis olivaceus barroni *(Olive Python - Pilbara subspecies*). Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/66699-conservation-advice.pdf.	Included in 6.7.7.3 Mentions conservation advice but focuses on significant impact criteria. Also Table 9-1 of the Threatened Species Management Plan.	ERD, Section 6.7.7.3 Table 4-20 and Chapter 9 of the Threatened Species Management Plan in Appendix K discuss the *Approved Conservation Advice for Liasis olivaceus barroni*, *Olive Python - Pilbara subspecies* (DEWHA, 2008b) and its objectives against the mitigation measures that will be applied by the Project. The *Conservation Advice* has been used to identify potential impacts to the Pilbara Olive Python (ERD, Section 4.6.4 and Section 4.6.5.2 page 120) and subsequently identifying strategies to minimise and mitigate impacts (Section 4.6.6 Table 4-20). As per the *Conservation Advice*, “the main identified threats to the Olive Python (Pilbara subspecies) include predation by feral cats (*Felis catus*) and foxes (*Vulpes vulpes*), particularly of juveniles”. Therefore, as recommended by the *Conservation Advice*, the Project will undertake the following priority recovery and threat abatement actions to support the recovery of the Pilbara Olive Python. As mentioned in the Threatened Species Management Plan in Appendix K, predator control (including red foxes *Vulpes vulpes*) has been identified as an absolute priority to minimise the impact of the Project. That involves initiating a feral fauna trapping and euthanisation program to reduce the number of feral fauna around the site, reducing food waste around the processing facility to ensure that feral predators are not attracted to the facility and, developing and implement an introduced predator control program. Perdaman will ensure all feral animal management measures on site are integrated and coordinated with existing regional/local control programs (i.e. Pilbara Ports Authority and MAC). The habitat loss, disturbance and modification to habitat are minimised by the more condensed Project design, limit clearing to that what is absolutely necessary and land clearing will be undertaken progressively and incrementally during construction, in order to minimise the pressure on the carrying capacity of native vegetation surrounding the site. Native vegetation is retained where possible, such as around carparks and infrastructure, and landscaped areas.

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		Department of the Environment (2015). *Threat abatement plan for predation by feral cats*. Canberra, ACT: Commonwealth of Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/t ap/threat-abatement-plan-feral-cats.	Included in table 6.4 which discusses initiating a feral fauna trapping and euthanisation program to reduce the number of feral fauna around the site. Also Table 9-1 of the Threatened Species Management Plan	ERD, Section 4.6.6 and Table 4-20; and Chapter 9 of the Threatened Species Management Plan in Appendix K discuss the *Threat abatement plan for predation by feral cats* and its objectives against the mitigation measures that will be applied by the project. As per the *Conservation Advice*, feral cats have "direct negative impacts on native fauna through predation". Following the main objective of the *Conservation Advice*, the Project considers introduced predator control (including feral cats) is as an absolute priority to minimise the impact of the Project. As mentioned in the Threatened Species Management Plan in Appendix K, that involves initiating a feral fauna trapping and euthanisation program to reduce the number of feral fauna around the site, reducing food waste around the processing facility to ensure that feral predators are not attracted to the facility and, developing and implement an introduced predator control program. Perdaman will ensure all feral animal management measures on site are integrated and coordinated with existing regional/local control programs (i.e. Pilbara Ports Authority and MAC).
		Threatened Species Scientific Committee (2005). *Commonwealth Listing Advice on Northern Quoll* (Dasyurus hallucatus). Available from: http://www.environment.gov.au/biodiversity/threatened/species/dasy urus-hallucatus.html. Hill, B.M. & S.J. Ward (2010). *National Recovery Plan For the Northern Quoll* Dasyurus hallucatus. Department of Natural Resources, Environment, The Arts and Sport, Darwin. Available from: http://www.environment.gov.au/resource/national-recovery- plan-northern-quoll-dasyurus-hallucatus.	Section 6.7.7.1 mentions it but only discusses significant impact criteria. Also Table 9-1 of the Threatened Species Management Plan. Included but not listed in Section 6.7.7.1 (see above). Also Table 9-1 of the Threatened Species Management Plan.	ERD, Section 6.7.7.1 and Chapter 9 of the Threatened Species Management Plan in Appendix K discuss *Commonwealth Conservation Advice on Northern Quoll* (*Dasyurus hallucatus*) (Threatened Species Scientific Committee, 2005) and, *National Recovery Plan for the Northern Quoll Dasyurus hallucatus* (Hill & Ward, 2010). The *Conservation Advice* has been used to identify habitats suitable for Northern Quolls, potential impacts and identifying methods to minimise and mitigate impacts. Section 4.6.5.1 (page 120) discuss the distribution of the Northern Quolls in Pilbara and Burrup region (Threatened Species Scientific Committee, 2005). As per the *Conservation Advice*, *"*altered fire regimes may have played an important role" in declining populations of Northern Quolls in Western Australia. Therefore, fire management is a priority of the Project. As mentioned in ERD Section 4.5.6 Table 4-11, the project will endeavour to manage fire to reduce frequency and intensity around the Project area and the local area. The Objective 3 of the *National Recovery Plan* is "halt northern quoll declines in areas recently colonised by cane toads". The quolls may be killed when ingesting toxin while attempting to eat toads. Cane Toads are currently absent in the Burrup Peninsula. However, as per Appendix K of Threatened Species Management Plan, the project will develop Cane Toad Monitoring Program as well as Cane Toad Control Program before the construction phase. Perdaman will ensure all feral animal management measures on site are integrated and coordinated with existing regional/local control programs (i.e. Pilbara Ports Authority and MAC). The Objective 7 of the *National Recovery Plan* is "reduce the impact of feral predators on Northern Quolls". Feral predators may have impacts on quoll populations through competition for food or direct predation, and these impacts may be exacerbated after fire. The Project considers introduced predator control (including wild dogs *Canis lupus familiaris*, feral cats *Felis catus*, red foxes *Vulpes vulpes*) as a priority to minimise the impact of the Project. As mentioned in the Threatened Species Management Plan in Appendix K, that involves initiating a feral fauna trapping and euthanisation

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				program to reduce the number of feral fauna around the site, reducing food waste around the processing facility to ensure that feral predators are not attracted to the facility and, developing and implement an introduced predator control program. Perdaman will ensure all feral animal management measures on site are integrated and coordinated with existing regional/local control programs (i.e. Pilbara Ports Authority and MAC).
		Department of Sustainability, Environment, Water, Population and Communities (2011). *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads*. Canberra, ACT: Commonwealth of Australia. Available from: http://www.environment.gov.au/resource/threat-abatement-plan- biological-effects-including-lethal-toxic-ingestion-caused-cane-toads.	Table 6.4 discusses developing a cane toad monitoring program. Also Table 9-1 of the Threatened Species Management Plan. Included. Also Table 9-1 of the Threatened Species Management Plan.	While the population is continuing to spread, to date Cane Toads are yet to be recorded on the Burrup Peninsula. Therefore, potential impacts of this species have not been addressed in the ERD. As per the *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads* identified Cane Toads (if present) will present higher degree of impact and cause negative population level threats to Northern Quolls. Therefore, as the Project evolves towards detailed design phase and closer to the construction phase, an update of all Management Plans will be conducted including developing a Cane Toad Monitoring Program as well as Cane Toad Control Program for potential future implementation (as per Appendix K: Threatened Species Management Plan). This plan will include the management measures listed on the Department of Agriculture, Water and the Environment cane toad webpage (http://www.environment.gov.au/biodiversity/invasive-species/feral-animals-australia/cane-toads). Perdaman will ensure all feral animal management measures and monitoring on site are integrated and coordinated with existing regional/local control programs (i.e. Pilbara Ports Authority and MAC).
		Department of Sustainability, Environment, Water, Population and Communities (2012). *Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses*. Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/resource/threat-abatement-plan- reduce-impacts-northern-australias-biodiversity-five-listed-grasses. As mentioned above (see Marine Fauna 4.4. comments) please discuss how all above Policy and Guidance documents have been considered (i.e. having regard to and providing a discussion on the specifics of the documents).	The Department notes the addition of: Curlew Sandpiper conservation advice (Section 6.7.7.4) Great Knot conservation advice (Section 6.7.7.5) Eastern Curlew conservation advice (Section 6.7.7.6) Lesser Sand Plover conservation advice (Section 6.7.7.8) Bar-tailed Godwit conservation advice (Section 6.7.7.9) Australian Fairy Tern Listing advice (Section 6.7.7.10) The Department notes Section 6.2 does not provide a discussion on how these documents have been considered. If the documents are discussed throughout the draft ERD then the proponent should provide a list of the relevant sections for reference (Table format would be preferred). If not discussed, then the proponent needs to provide a discussion as requested. (Need to take into consideration the above comments that a simple assessment against the significant impact criteria may not be sufficient. The discussion should include reasons why the project is not	*Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses:* The five species for which this guidance exists, gamba grass (*Andropogon gayanus*), para grass (*Urochloa mutica*), olive hymenachne (*Hymenachne amplexicaulis*), perennial mission grass (*Cenchrus polystachios syn. Pennisetum polystachion*) and annual mission grass (*Cenchrus pedicellatus syn. Pennisetum pedicellatum*), were not recorded in the PDE (ERD Appendix B: Biological Survey Report, APM, 2019:). ERD Section 4.5.6, Table 4-13 weeds/introduced flora management strategies have been addressed. Documents related to the following is addressed below in Section 4: Curlew Sandpiper conservation advice Great Knot conservation advice Eastern Curlew conservation advice Lesser Sand Plover conservation advice Bar-tailed Godwit conservation advice Australian Fairy Tern Listing advice

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			inconsistent with, or has had regard to, relevant statutory documents)	
		2. The Biological Survey (and therefore the vast majority of the fauna assessment within the ERD) is limited to sites C and F. Please include a fauna assessment for the entire development envelope (that is the port infrastructure and conveyor belts) in the ERD.	Appendix B is the Biological Survey Dated June 2019. The Department does not consider this point to be sufficiently addressed and requires further survey information covering the entire development envelope.	 Figure 1-2 Storage shed and shiploader at the Dampier Port APM (2019) surveyed the entire Project Footprint area. Through communications with the Department it was agreed that the assessment of conveyor corridor and Pilbara port storage shed area was not necessary as they are all cleared and bituminous sections (See above Figure 1-2). This was verified by the photos and satellite imageries provided to the Department.
		3. Please include a breakdown of fauna habitat, the species that utilise this habitat and the amount of hectares that are proposed to be impacted as a result of the proposed action in the ERD. For example: Fauna habitat | Species | Hectares to be impacted Rocky outcrops | Ghost Bat | XXX In addition, the Department notes that Figure 4-7 of the ERD is only for Sites C and F. Please provide a revised figure for the entire development envelope in the ERD.	Table ES2 breaks down the clearing by physical element but does not present the information as per the example table. It is important that we know how much of each fauna habitat for nationally listed species is being impacted, and to what extent.	Table 1-1 Fauna habitat types within the Project Footprint clearance area Fauna Habitat | Potential Species | Likelihood of Occurrence | Site C construction footprint | Site F construction footprint | Other * (ha) | Total (ha) **Rocky Outcrops** | a- Pilbara Olive Python | a. High | 0.1 | - | 0.02 | 0.1 | b- Northern Quolls | b. Moderate | | | | | **Hummock Grasslands on Mid Slopes** | | | 21.9 | 26.1 | 3.69 | 51.7 **Samphire Shrubland/** | c- Curlew Sandpiper | c. Moderate | 10.1 | 0.2 | 1.48 | 11.8

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		Additionally, please provide a discussion on how surveying fits with appropriate surveying timing, techniques and effort for impacted EPBC Act listed threatened species. Where relevant, please ensure that this discussion has regard to the Department's appropriate policy and guidance documentation.		

Supratidal Flats	d- Red Knot	d. Moderate				
	e- Lesser Sand Plover	e. Low				
	f- Bar-tailed Godwit	f. Moderate				
	g- Australian Fairy Tern	g. Low				
	h- Great Knot	h. Low				
	i- Eastern Curlew	i. Moderate				
Drainage Lines	j- Ghost Bat	j. Recorded	0.9	1.5	0.06	2.4
Disturbed			1.1	2.2	1.23	4.5
Total			**34.0**	**30.0**	**6.48**	**70.5**

* Causeway, access roads, and clearing for conveyor

a- Pilbara Olive Python - This species has been historically recorded on Dolphin Island in the Dampier region and in King Bay, Hearson's Cove and in many locations around the Karratha Gas Plant and Pluto LNG facility, particularly where artificial water sources occur (open water pit) It is often recorded around the built environment and highly disturbed areas. APM did not record the species on either of the biological surveys (APM, 2019), however this species has a high likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

b- Northern Quoll - This species has been previously recorded on Dolphin Island in the Dampier region and on the Burrup Peninsula in various locations, including a sighting at the port area of King Bay warehouse. They require well-developed and extensive rocky outcrops which is not present within the Footprint (APM, 2019). They have a moderate likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

c- Curlew Sandpiper - This species has been recorded in the Dampier region (DBCA, 2018) and historically on the Burrup (Worley Astron, 2006). This species may use the Project Area during the wet season, though records suggest that the species prefers undisturbed islands and islets. They have a moderate likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

d- Red Knot - This species has been recorded in the Dampier region (DBCA, 2018) and less recently on the Burrup Peninsula (Worley Astron, 2006). The species is known to follow tide edges when foraging, and can be seen with many other shore birds within the samphire habitat. Given the proximity to Hearson's Cove, and the presence of open flats within the Project Area, this species may use the area for both foraging and roosting. This species was not recorded on either of APM's biological surveys (APM, 2019), however, they have a moderate likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

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				e- Lesser Sand Plover - This species has been historically recorded on Dolphin Island in the Dampier region. This species sometimes overwinters in northern Australia. It is abundant in Queensland, and uncommon elsewhere in Australia. This species is not expected to rely on habitats present in the Project Area, especially as this species does not breed in Australia. They have a low likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan). f- Bar-tailed Godwit – This species has been recorded in the Dampier region on Dolphin Island and Hearson's Cove (DBCA, 2018). This species may forage over the salt ponds and mud flats present in the Project Area. They have a moderate likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan). g- Australian Fairy Tern - This species has been recorded on Egret Island on the Dampier archipelago (DBCA, 2018). This species would be more inclined to use the sheltered and undisturbed bays within the islands and islets of the archipelago. They have a low likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan). h- Great Knot - This species has been historically recorded on the Burrup Peninsula (Worley Astron, 2006). It was not recorded during either of Biological surveys (APM, 2019). The samphire/mudflat habitat occur within the PDE is likely too open for this species, and it does not that contain the mangrove swamps it prefers. i- Eastern Curlew - Predominately found in estuarine systems, saltmarshes, tidal mudflats and mangroves. Can be found in brackish or freshwater lakes. This species has been recorded at Nickol Bay (east coast of Burrup) (DBCA, 2018). They are a common migrant to the north, northeast and southeast of Australia. They have a moderate likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan). j- Ghost Bat - This species has been recorded on the Burrup Peninsula about 4 km northeast of the Project Area (DBCA, 2018) and more recently by APM during the post-wet season survey. The drainage line in the south west of PDE was identified as an important habitat for Ghost Bats and therefore eliminated from the current footprint. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).
			Figure 4-7 has not been updated.	See the **Attachment 3**: Fauna Habitat within the Proposal Development Area

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			This has not been sufficiently addressed. The document should provide details of surveying methods (based on the guidance documentation) for each of the species and a discussion of survey adequacy and/or limitations.	Detailed survey methodology is included in the ERD Appendix B: *Perdaman Urea Project Pre and Post-wet Season Biological Survey*, Section 3.4 and Section 3.5 (APM, 2019)
		4. Given the information provided within the EPBC Act referral, the EPBC Act listed Curlew Sandpiper (*Calidris ferruginea*), Great Knot (*Calidris tenuirostri*) and Eastern Curlew (*Numenius madagascariensis*) were not considered during the referral. Given the new information within the assessment documentation, the Department requires the following Policy and Guidance documents be included within the ERD: Department of the Environment (2015). *Conservation Advice* Calidris ferruginea *curlew sandpiper*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/856-conservation-advice.pdf. Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012). *Marine bioregional*	Section 6.7.7.4	ERD Chapter 9 of the Threatened Species Management Plan in Appendix K discuss *Conservation Advice Calidris ferruginea* Curlew Sandpiper and its objectives against the mitigation measures that will be applied by the project. *Conservation Advice* has been important in identifying their habitat (ERD Section 6.7.4.1) potential impacts to Curlew Sandpiper (ERD Section 6.7.7.4 page 225) and subsequently identifying strategies to minimise and mitigate impacts (Section 6.7.8, Table 6-4). This species may use the Project Area during the wet season, and they have a moderate likelihood of occurrence within the Project area (Table 1-1 above). As per the *Conservation Advice*, “ongoing human disturbance, habitat loss and degradation from pollution, changes to the water regime and invasive plants” pose a threat to Curlew Sandpiper. Therefore, the following management and mitigation measures have been applied by the Project to reduce impacts. As mentioned above, the original processing facility layout was forecast to impact 21.3 ha of the tidal mudflats and samphire shrubland/ saltplains habitat. Following design optimization, proposed clearing of this habitat type has been significantly reduced (11.8 ha). The entire project layout has been redesigned to minimise habitat fragmentation and minimise impacts to potential Curlew Sandpiper feeding ground. Potential impacts to mudflats have been minimised as much as practicable during the design phase and the causeway design will contain large diameter, short culverts with significantly larger flow capacity to maintain hydrological and tidal flows and also allow fauna to freely and safely move through the structure. The elevated causeway design will reduce the disturbance to Curlew Sandpiper during feeding (Appendix K: Threatened Species Management Plan, Page 22 and Page 41). The habitat loss, disturbance and modification to Curlew Sandpiper habitat are minimised by the more condensed project design, limit clearing to that which is absolutely necessary and land clearing will be undertaken progressively and incrementally during construction, in order to minimise the pressure on the carrying capacity of native vegetation surrounding the site. The above management and mitigation measures are in line with the Conservation Actions Objective 2 and 3 of the *Conservation Advice*: “maintain and enhance important habitat” and “disturbance at key roosting and feeding sites reduced” respectively.

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		plan for the North-west Marine Region. Prepared under the *Environment Protection and Biodiversity Conservation Act 1999*. Available from: http://www.environment.gov.au/topics/marine/marine-bioregional- plans/north-west. Threatened Species Scientific Committee (2016). *Conservation Advice* Calidris tenuirostriss *Great knot*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs /862-conservation-advice-05052016.pdf.	Section 6.2 Also Table 9-1 of the Threatened Species Management Plan.	ERD - Section 6.9 and Chapter 9 of the Threatened Species Management Plan in Appendix K discuss *Marine bioregional plan for the North-west Marine Region* (DSEWPaC, 2012). *Marine bioregional plan* and *Species group report card – seabirds and migratory shorebirds: Supporting the marine bioregional plan for the North-west Marine Region* has been used as a guide to identify migratory seabird and shorebird habitat and distribution (ERD Section 6.7.4, Section 6.8.1) potential impacts to seabirds and shorebirds (ERD Section 6.7.7 and 6.8.3) and subsequently identifying strategies to minimise and mitigate impacts (Section 6.7.8, Section 6.8.5). As per the *Marine bioregional plan* and *Species group report card,* climate change, light pollution, physical habitat modification, human presence at sensitive sites and invasive species listed as some of the major pressures (and potential concerns) experienced by migratory seabirds and shorebirds found in the Project area. Therefore, the following management and mitigation measures are applied by the Project. The habitat loss, disturbance and modification to migratory shorebird habitat are minimised by the more condensed project design, lighting spill will be minimised as practicable and implementation of introduced flora and fauna management measures (Appendix K: Threatened Species Management Plan Table 8-1).
			Section 6.7.7.5	*Conservation Advice Calidris tenuirostriss Great knot* has been important in identifying Great Knot habitats (ERD Section 6.7.4.2) potential impacts to Great Knot (ERD Section 6.7.7.5 page 226) and subsequently identifying strategies to minimise and mitigate impacts (Section 6.7.8, Table 6-4). As per the *Conservation Advice*, in Australia, Great Knots prefer sheltered coastal habitats with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. Great Knots have been historically recorded on the Burrup Peninsula (Worley Astron, 2006), however, they were not recorded during either of Biological Surveys (APM, 2019). The samphire/ mudflat habitat occur within the PDE is likely too open for this species, and it does not that contain the mangrove swamps it prefers. The *Conservation Advice* lists the main threats to the global population of Great Knots include “habitat loss and habitat degradation (e.g. through land reclamation, industrial use and urban expansion; changes to the water regime; invasive plants; water quality deterioration; environmental pollution); pollution/contaminants; disturbance; diseases; direct mortality e.g. hunting; and climate change impacts”. Therefore, the following management and mitigation measures have been applied by the Project to reduce impacts (Appendix K: Threatened Species Management Plan, Table 8-1 page 22). Habitat loss, disturbance and modification to Great Knot habitat are minimised by the more condensed project design, limit clearing to that which is absolutely necessary and land clearing will be undertaken progressively and incrementally during construction, in order to minimise the pressure on the carrying capacity of native vegetation surrounding the site. Implementation of strict traffic speed limits to avoid collision with fauna, flora and fauna pest

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		Commonwealth of Australia (2015). *Wildlife Conservation Plan for Migratory Shorebirds*. Canberra, ACT: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/publications/wildlife- conservation-plan-migratory-shorebirds-2016.		management measures as well as implementation of the Weed Management Plan is expected to minimise impacts by the Projects. The Project design scope for the fully enclosed conveying and ship loading system eliminates of the risk of loss of urea product as fugitive dust emissions or spills there by avoiding potential environment impacts of degradation of water quality in the terrestrial and marine environments. The above management and mitigation measures are in line with the Conservation and Management Actions identified by the *Conservation Advice*: • Protecting important Great Knot habitat in Australia – by redesigning the whole Project layout to minimise habitat fragmentation and minimise impacts to potential Great Knot feeding ground. • Managing important sites to identify, control and reduce the spread of invasive species – by implementing Weed Management Plan and measures to control pest flora and fauna species.
		Department of the Environment (2015). *Conservation Advice* Numenius madagascariensis *eastern curlew*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs /847-conservation-advice.pdf. Please discuss how all Policy and Guidance documents have been considered. That is having regard to and providing a discussion on the specifics of the documents.	Section 6.2	*Wildlife Conservation Plan for Migratory Shorebirds* includes 35 species of migratory shorebirds that regularly visit Australia not listed as threatened species under the EPBC Act. These species are discussed in the Section 4.6.3.11. About 20 species out of 35 species listed under the *Wildlife Conservation Plan* are observed in the Project area by studies done by Worley Astron (2006) and APM (2019) combined. *Wildlife Conservation Plan* rates main threats to migratory shorebirds identified in Australia from Very High threat, which require immediate mitigation action to low threats, which require monitoring the threat occurrence and reassess threat level if likelihood or consequences change. As discussed in the ERD Section 4.6.4, potential impacts to migratory shorebirds from the Project include, habitat loss and habitat disturbance (very-high level threat); anthropogenic disturbance and invasive species (High level threat); and acute pollution (low level threat). To avoid and minimise the above impacts, the following management and mitigation measures will be applied by the Project. As discussed in the ERD Section 4.6.6 Table 4-20, the entire Project has been redesigned to significantly reduce the impacts to tidal mudflats and samphire shrubland/ saltplains habitat. These are potential migratory shorebird feeding grounds. Implementation of introduced flora and fauna management measures as well as implementation of the Weed Management Plan, measures to reduce lighting spill as practicable are expected to minimise impacts by the Project. The Project design scope for the fully enclosed conveying and ship loading system eliminates of the risk of loss of urea product as fugitive dust emissions or spills there by avoiding potential pollution event in the terrestrial and marine environments.

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			Section 6.7.7.6 As discussed above it is not clear how these have been addressed. If the documents are discussed throughout the draft ERD then the proponent should provide a list of the relevant sections for reference (Table format would be preferred). If not discussed then the proponent needs to provide a discussion as requested.	*Conservation Advice Numenius madagascariensis eastern curlew* has been important in identifying Eastern Curlew habitats (ERD Section 6.7.4.3) potential impacts to Eastern Curlew (ERD Section 6.7.7.6 page 227) and subsequently identifying strategies to minimise and mitigate impacts (Section 6.7.8, Table 6-4). This species may use the Project Area during the wet season, and they have a moderate likelihood of occurrence within the Project area (Table 1-1 above). As per the *Conservation Advice*, "ongoing human disturbance, habitat loss and degradation from pollution, changes to the water regime and invasive plants" pose a threat to Eastern Curlew. Therefore, the following management and mitigation measures have been applied by the Project to reduce impacts (Section 6.7.8, Table 6-4). As discussed in the ERD Section 4.6.6 Table 4-20, the entire Project has been redesigned to significantly reduce the impacts to tidal mudflats and samphire shrubland/ saltplains habitat. These are potential Eastern Curlew feeding grounds. The habitat loss, disturbance and modification to Eastern Curlew habitat are minimised by the more condensed project design, limit clearing to that which is absolutely necessary and land clearing will be undertaken progressively and incrementally during construction, in order to minimise the pressure on the carrying capacity of native vegetation surrounding the site. The above management and mitigation measures are in line with the Conservation and Management Actions identified by the *Conservation Advice*: • Maintain and improve protection of roosting and feeding sites in Australia – by redesigning the entire Project layout to minimise habitat fragmentation and minimise /avoid impacts to potential Eastern Curlew feeding ground. Rehabilitating any degraded mudflat habitats within the PDE once the causeway is constructed. • Managing important sites to identify, control and reduce the spread of invasive species – by implementing Weed Management Plan and measures to control pest flora and fauna species within the PDE.
		5. The Department does not have sufficient information at this stage to determine if the proposed action will result in a residual significant impact for the Pilbara Olive Python (*Liasis olivaceus barroni*), Northern Quoll (*Dasyurus hallucatus*), and Ghost Bat (*Macroderma gigas*) (for example the ERD does not appear to specify how many hectares of habitat for these species will be impacted as a result of the proposed action). Please provide further information on the likely impacts on these species as a result of the proposed action.	Northern Quoll Section 6.7.2.1 states clearing 0.1 ha of rocky outcrops however the Department wishes to know if all relevant Northern Quoll habitat types have been considered. The *EPBC Act referral guidelines for the endangered Northern Quoll* Dasyurus hallucatus say "any land comprising predominantly native vegetation in the immediate area (i.e. within 1 km) of shelter habitat, quoll records or land comprising predominantly native vegetation that is connected to shelter habitat within the range of the species" is considered foraging and dispersal habitat. Ghost Bat Section 6.7.2.2 does not mention what habitat is being cleared.	The Table 1-1 provides an estimate of types of fauna habitat areas impacted by the Project. Appendix B: Perdaman Urea Project Pre and Post-wet Season Biological Survey (APM, 2019) discuss the terrestrial vertebrate fauna survey methodology (Section 3.5) in detail. As per the Appendix B, all relevant Northern Quoll habitat types have been considered.

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			Olive Python Section 6.7.3.1 does not mention what habitat is being cleared. In order for the Department to make a recommendation to the Minister on the acceptability of the project, this information must be complete.	
		6. The Department notes the proponent's commitment to undertake mitigation measures (Table 4-14) and the Construction Environmental Plan. However, the Department requires a Management Plan specific for listed threatened species potentially impacted as a result of the proposed action. This plan is to form part of the Assessment Documentation. Please see discussion above in Marine Fauna for the requirements of a management plan.	Section 4.6.6, proposed Environmental Management Plan, Fauna Management Plan and a Threatened Species Management Plan Drafts at Appendix K. Please see below for further comments on the proposed management plans.	Environmental Management Plans are considered to living document that will be reviewed and revised during the Project lifecycle. It is noted that the comments relate to Draft Plans that formed Appendix K in the ERD. Appendix U to this Response to Submissions includes reviewed and revised Environmental Management Plans that supersede and augment those in ERD Appendix K.. The Construction Environmental Management Plan is a sub plan of the Project Environmental Management Plan (PEMP) which will be prepared before construction to form an element of the Part V Works Approval application.
		7. The Management Plan should address, but not be limited by, the following impacts: • anthropogenic activities (such as noise, vibrations, light and dust) • vehicle impacts • water impacts (such as run off) • weed management • pest management • fire management • landscape connectivity will be maintained to minimise fragmentation	See comments on Management Plan below	Appendix U to this Response to Submissions includes reviewed and revised Environmental Management Plans that supersede and augment those in ERD Appendix K.
		8. Should a significant residual impact remain following avoidance and mitigation, please note that the Department will likely require compensatory measures (such as an environmental offset) to be implemented under the EPBC Act. See discussion below in Environmental Offsets	See comments below under Offsets	A specific consolidated response re offsets in attached as Appendix V herewith.
		9. Please provide further analysis on the impacts associated with habitat fragmentation and possible isolation for EPBC Act listed threatened species as a result of the proposed action.	Section 4.6.5.1 Table 4-20 When addressing the significant impacts to listed species the proponent has considered the significant impact criteria, fragment an existing important population into two or more populations, however, a better understanding of the total area of impact for each species is required before the Department can fully understand fragmentation impacts. As discussed above please provide additional information on the areas to be cleared with regards to surrounding habitat and potential for fragmentation impacts.	The Table 1-1 provides an estimate of types of fauna habitat areas impacted by the Project. The Project will be located within the Burrup Strategic Industrial Area (BSIA), which was established since 1990's. Various industries have been operating in the BSIA since then, including establishing a Multi User Brine Return Line (MUBRL). Constructing the MUBRL effectively fragmented the habitats within Site C from Site F. Habitats within Site F has been again fragmented by the establishment of the Hearson Cove Road. Therefore, the Project footprint has been largely fragmented with the developments has occurred within the immediate area. The Project is committed to not exacerbate the habitat fragmentation within

Threatened and Migratory Species				
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				the Project area by redesigning the entire Project layout. Potential impacts to mudflats have been minimised as much as practicable during the design phase and the causeway design will contain large diameter, short culverts with significantly larger flow capacity to maintain hydrological and tidal flows and also allow fauna to freely and safely move through the structure between Hearson Cove and King Bay. Elevated causeway (6ft) will minimise disturbance to reptiles, small mammals and wading birds.  Figure 1-3 Burrup Strategic Industrial Area (BSIA) and its service infrastructure (Landcorp, https://www.landcorp.com.au/Industrial-and-Commercial/Burrup-SIA/)

Matters of National Environmental Significance

Page ref	Section	Comments on Draft ERD	Comments on ERD
152	6.3	The predicted outcome (section 6.3.6) is not justified within the ERD. There is not sufficient information provided for the Department to agree with this conclusion. Please provide further justification for our consideration.	No longer at Section 6.3.6
153/6.3	Perdaman Response Please see Section 6.7.9		
152	6.4	As discussed above in Marine Fauna, the Potential impacts (section 6.4.1) and Assessment of Potential Impacts (section 6.4.2) includes impacts which are not part of this assessment. As per the Department's comments above, please revise the ERD to accurately reference the scope of the assessment under the EPBC Act. The predicated outcome (section 6.4.4) is not justified within the ERD. There is not sufficient information provided for the Department to agree with this conclusion. Please provide further justification for our consideration.	No longer Section 6.4
152/6.4	Perdaman Response: Please see Section 6.8.6, Potential impacts to marine fauna is discussed Section 4.4.4 and predicted outcome is discussed in Section 4.4.7		
Environmental Offsets			
155	7	The Department notes that the proponent proposes to provide funding to the Pilbara Environmental Offset Fund (PEOF) in order to compensate for the residual significant impacts of this proposed action on EPBC Act listed species. Please note that the Department has not yet endorsed the PEOF as a suitable conservation offset fund for EPBC Act listed species. On this basis, please outline alternative arrangements that may be used to compensate for the residual significant impact of the proposed action on EPBC Act listed species for our consideration.	Section 7 continues to propose to contribute to Pilbara Offset fund for good to excellent vegetation, however, the Proponent notes that the Department has yet to endorse the fund for use in EPBC Act offsets. As indicated previously, the proponent should consider alternative means of providing an offset. Additionally, EPA should note that if it requires use of the PEOF in WA conditions, this could place the proponent in a position of having conflicting state and C'wth conditions. The proponent considers implementation of mitigation measures will ensure any potential environmental impact is avoided or mitigated such that they are not significant. In this case offsets are not being proposed. The proponent is yet to provide sufficient information to support this argument. In the absence of a convincing case (and it would seem unlikely that one could be provided) alternative offset arrangements need to be provided. A specific consolidated response re offsets in attached as Appendix V herewith.
155	Perdaman Response Clearing related offsets have been calculated in accordance with guidelines provided by the EPA and with reference to Commonwealth guideline. In relation to offsets for potential impacts to the connection to country as a part of social values, the proponent considers that re-establishment of a statutory right to the three identified significant sites which are noted as recommendations in the IHS Heritage Survey Report as part of the Project land assembly actions is a relevant and appropriate offset for potential residual impacts. This support is above and beyond the requirements of an agreement prescribed for the purposes of the BMIEA. Further, as a result of ongoing dialogue with MAC and in consultation with JTSI, the Proponent understands that gaining a greater appreciation of the intrinsic connection to country can augment the case supporting World Heritage Listing for Murujuga. Therefore, as a sign of good faith and as a committed neighbour at Murujuga, as part of the implementation of the approved Project, the Proponent has agreed with MAC and JTSI to support JTSI initiated work in this regard which can support the World Heritage listing aspirations. The Proponent considers that any support ultimately agreed is also an appropriate future offset for potential impacts to connection to country. Further, the Proponent's support, identified and quantified in the agreement concluded with MAC in November 2019, that provides support specifically for MAC's application for World Heritage Listing at Murujuga, provides resources that would not otherwise be available to MAC to pursue this aspiration. This includes, but is not limited to resources that may be necessary to address any issue related to the blended fabric of Murujuga as recognised by the Commonwealth Government's position of "Prehistory meets the industrial age", at the time of the addition of the Dampier Archipelago (including the Burrup peninsula) to the national heritage list in 2007. While it has been expressed that this government statement is not an endorsement of future development in the BSIA, the Proponent notes that the statement and position is compatible with the decision to grant the Project located in the BSIA by Federal Minister, the Honourable Karen Andrews MP on 13 March 2019. The Proponent is advised by the Commonwealth's Major Projects Facilitation Agency that the decision followed broad consultation across Commonwealth agencies including • Office of Northern Australia, Department of Industry, Science, Energy and Resources • Australian Industry Participation Authority, Department of Industry, Science, Energy and Resources • Office of the Chief Economist, Department of Industry, Science, Energy and Resources • Resources, Department of Industry, Science, Energy and Resources • Department of Agriculture and Water Resources (Now Department of Agriculture, Water and the Environment) • Department of the Environment and Energy (Now Department of Agriculture, Water and the Environment) • Department of Home Affairs (Import/Export, Customs, Biosecurity, Critical Infrastructure) • Foreign Investment Review Board, Department of the Treasury The Proponent also views that the quoted statement reflects a cornerstone requirement that future industry must embrace as a good neighbour striving for a balance between heritage management and economic prosperity that must be realised through a collaborative partnership involving Indigenous groups, industry, governments and the community. This is an operating mantra that the Proponent seeks to reinforce in its various corporate values and Project EMPs. The Proponent therefore considers that as this directly targets potential impacts arising in relation to the world heritage listing that may arise as a consequence of the Project being part of that blended fabric, this is a relevant and appropriate	

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		offset. This support is above and beyond the requirements of an agreement prescribed for the purposes of the BMIEA. In addition, the agreement to support MAC's aspirations to establish a Living Knowledge Centre at Conzinc Bay provides support to augment MAC's, the Circle of Elders' and other constituents' ability to pass knowledge connected to country between past, present and future generations of traditional custodians, as well as the broader contemporary society. This augments, and build upon "on country" delivery of, these objects that may potentially be impacted by the Project and thus is a relevant and appropriate offset for any residual impact in this regard. The BMIEA provides that the State will support the development of the Burrup Non-Industrial Land Buildings (BMIEA Clause 4.6(c)(ii)) which includes a visitor and cultural centre for the purposes of facilitating and promoting the cultural activities of the Traditional Custodians. The proponent's support is above and beyond the requirements prescribed for a Future Proponent under the BMIEA but is in harmony with, and augments the potential realisation of, this objective. The proponent would like to discuss a holistic approach to Offsets, which results in a single agreed basis that provides a single offset for any single impacts and does not result in separate offsets (State and Commonwealth) for the same potential impact. A specific response re offsets in attached as Appendix V herewith.

Heritage Section Comments:

Heritage				
Reference	**Page Reference**	**Proponent Comment**		**DAWE&A Submission June 2020**
1	xx	Table ES3 – Summary of environmental impact assessment of key environmental factors – Air quality	"It is noted that increased emission of acid forming pollutants and potential for increase of nitrate enhanced microbial activity have intrinsically been suggested to be prime causes of potential impacts to the integrity of rock art and associated NHL values and amenity at Murujuga."	Accuracy would be improved if read 'increased emission of acid forming pollutants and potential for increase of nitrate enhanced microbial activity have been suggested to be a potential cause of impact to the integrity of rock art and associated NHL values and amenity at Murujuga. Reputable evidence regarding the impact of anthropogenic emissions on the integrity of the rock art is yet to be determined. A non-contested acceptable limit of emissions once determined (via the Murujuga Rock Art Strategy and monitoring program implementation) will be implemented for this proposal in amendment of emissions output, if required. As outlined in the Murujuga Rock Art Strategy, the implementation of the Murujuga Rock Art Strategy is in consultation with industry (MRAS, p.3). As per Minister Dawson's media statement of 13 February 2020, industry (Woodside, Rio Tinto and Yara Pilbara) have committed to participation in the implementation of the MRAS via participation in the Murujuga Rock Art Stakeholder Reference Group, and via providing funding for the monitoring program. Participation of Perdaman in this program is strongly encouraged.
1	Perdaman Response The Proponent agrees that to enhance a robust understanding that mitigates potential for adverse impacts to rock art at Murujuga, further investigation is warranted in relation to the impact of anthropogenic emissions on the integrity of the rock art. The Murujuga Rock Art Strategy seeks to address this requirement through the development and implementation of an Environmental Quality Management Framework (EQMF). As noted on ERD p168, the Proponent has committed to MAC to participate and contribute to the development of an EQMF as detailed in the MRAS. This would include participating in the Rock Art, Deposition and Ambient Air Quality monitoring programs – MRAS Section 5, as well as the development and implementation of Environmental Quality Criteria – MRAS Section 4.1. In regard to the relevant knowledge set, the Proponent notes • that there is an expanding body of reputable monitoring data, both in relation to the level of anthropogenic emissions as well as concurrent (spatially and temporally) monitoring of the condition of rock art[1]. • that there is also a growing understanding of potentially applicable techniques and technologies that can be applied to meet the objective of managing risks to rock art integrity. The Proponent notes that some of this monitoring is conducted pursuant to conditions of EPBC Approval 2008/4546 where conditions are explicitly set for the purpose of protecting the integrity of rock art. • The Proponent also understands that monitoring is being conducted by appropriately qualified experts, and in conjunction with MAC rangers and is applying a range of techniques and technologies endorsed by MAC and regulatory authorities.[2] and • The Proponent presumes that in order to be compliant with the approval conditions, such monitoring must be scientifically robust and thus considered reputable[3]. The Proponent understands that the competency of those undertaking the Yara compliance work and the suitability of the applied techniques has been endorsed by the regulator as well as by MAC. While the compliance report prepared by Data Analysis Australia Pty. Ltd for 2017 rock art monitoring notes[4] *"In interpreting the results, in must be remembered that "the absence of evidence is not evidence of absence". If the monitoring does not show statistically significant change then it is appropriate to say that either "the data is consistent with no change" or that "if a change has occurred, it is below the level detectable by the monitoring program"."* the statement in the first sentence is not wholly correct, as the absence of evidence **MAY** be evidence of absence, but it is not necessarily of itself conclusive evidence of absence and it is important to recognise the second sentence alluding to this caveat. The proponent considers in risk weighting such results, it is important to recognise that if there is no deleterious impact, the only evidence is a lack of evidence of change. Therefore, there is a zero probability of detecting change, with no increase in the probability of obtaining conclusive evidence being generated by additional monitoring or alternative investigative techniques, just a greater degree of confidence that		

[1] See: https://www.yara.com.au/siteassets/about-yara/reports/rock-art-monitoring-reports/analysis-of-burrup-peninsula-rock-art-2017-daa.pdf/
[2] See: https://www.yara.com.au/siteassets/about-yara/pilbara-photos/2018-rock-art-monitoring-with-mac-252.mp4 The Proponent presumes that MAC has provided free, informed and prior consent to being part of this publicly disseminated video on rock art monitoring at Murujuga.
[3] The Proponent notes Yara TAN was issued with a non-compliance notice in relation to a failure to collect some required parameters. It is understood that this does not relate to the quality or robustness of the data that was collected in accordance with the condition requirements.
[4] See p32 of https://www.yara.com.au/siteassets/about-yara/reports/rock-art-monitoring-reports/analysis-of-burrup-peninsula-rock-art-2017-daa.pdf/

probabilistically, the lack of evidence does in fact reflect an absence of change. In contrast, the probability of detecting evidence of change where deleterious impacts are occurring, even if small, is positive, even if low, especially where multiple observations are made and/or multiple investigative techniques are applied.

Thus, the Proponent does not agree that the suggested “new text” would improve accuracy, in fact it could be misleading in view of the growing body of scientifically robust monitoring data, some acquired in compliance with approval conditions, other through government, MAC and/or industry supported programs to support informed risk weighted application of the precautionary principle.

The Proponent, remains of the view that reputable information has been, and continues to be, gathered through this monitoring, however additional data to further enhance understanding is valuable as a robust understanding of whether this data is evidence of impact/no material impact by anthropogenic emissions or other factors, so must continue to be assessed and re-assessed into the future.

The Proponent considers that this is reflected in the MRAS which is based on continuing robust monitoring both of ambient airshed conditions and rock art integrity, accompanied by analysis of this robust monitoring data with the objective of enhanced understanding of potential causal links, if any, whether spatial, functional and temporal in character and whether relatable to anthropogenic emissions or other mechanisms.

The Proponent notes that the current level and potential associated impact of ambient (combined from natural and anthropogenic sources) ammonia emissions is currently being gauged through the monitoring conducted by Yara Pilbara Nitrates (Yara) as part of its compliance with approval conditions. Perdaman notes that ambient levels of ammonia in the airshed has been monitored for some time at three nominated sites under Condition 9 of EPBC Approval 2008/4546, viz:

- Site 5 - Burrup Road site;
- Site 6 - Water tanks site; and
- Site 7 - Deep Gorge site

The Proponent considers that this data is relevant for developing a risk weighted assessment of the potential for adverse impacts from the Project’s ammonia emissions to the regional airshed.

Thus, the remaining major uncertainty around Project emissions to the regional airshed, relates to potential new impact that may need to be understood then managed associated with the urea, both as a component of the observed regional PM loading and any potential reactive impacts either directly by deposition and/or chemical degradation, or through biological factors in the nitrogen cycle.

As noted in the ERD, research in other environments where there is similarly a low background level of urea, studies show that some lithophilic organisms, such as lichens, may utilise urea, whereas many other biotas do not readily react with the substrate.

In order to enhance relevant understanding on applicable anthropogenic emissions, the Proponent would, as part of implementation of the approved project in consultation with the EPA and MAC, commission agreed surveys of the potentially impacted areas before the construction phase begins. The Proponent would ideally look to pursue this as a part of a coordinated MRAS process.

This demonstrates the Proponent’s commitment to respect the views of MAC and to address members’ legitimate concerns.

Whilst not in the business of commissioning research into the possible impact of the PM10 and PM2.5 urea dust on the rock art and subsequent changes in the surface acidity of the rocks, Perdaman acknowledge that there are possibilities of the urea providing some form of stimulation of the combined biological response associated with the natural microflora living on the Murujuga rocks. Being part of the complete nitrogen cycle, it is possible that specific microorganisms on the rocks may utilise this additional source of nitrogen reservoir. Relevantly to this understanding, the normal chemical reaction of urea undergoing hydrolysis (reaction with moisture/water) is shown below, with the intermediate step of carbamic acid being only stable at -23oC, before hydrolysis releases the second ammonia molecule and releases the carbon dioxide, from which the manufacturing process began.

It should be noted in this hydrolytic breakdown the oxidation state of the nitrogen is still (-III) in the urea and in the ammonia gas.

$CO(NH_2)_2 + H_2O \rightarrow CO(NH_2)OH + NH_3$ and then $CO(NH_2)OH + H_2O \rightarrow CO_2 + NH_3$

With ambient temperatures of the rocks in the Murujuga being at least 50^{o}C above the decomposition point of the carbamic acid, it is very unlikely that sufficient urea will become biologically available to facilitate biological interaction and so become oxidized to the (+III) state of nitrite or the (+V) state of nitrate ions.

Recent research by Chinese scientists have confirmed the presence of the same type of rock varnish in the Gobi Desert which has been produced abiotically i.e. through a suite of oxidation and reduction reactions catalysed by the presence of titanium dioxide (Xu et al. 2019). This should be considered when evaluating the risk weighting applied to submissions to the Senate Murujuga Rock Art enquiry that “*Of particular note is the finding that these organisms will overrun, and outcompete varnish forming micro-organisms and produce organic acids which increase the acidity of rock surfaces*.” (Commonwealth of Australia 2018).

In relation to applying an appropriate risk weighting to material submitted to the Senate Committee, the Proponent also notes that the author has confirmed that the 2005 report by MacLeod only discussed soluble nitrates found on the rock surfaces and made no comment on ammonia or ammonium ions. On that basis, the Proponent concludes that broader inferences drawing on this quoted work should be viewed as suppositions rather than actual reputable evidence of potential detrimental impacts from sources not studied as was inferred. This should then be reflected in an appropriate risk weighting application of the Precautionary Principle.

	As indicated in the ERD (Sections 4.8.5.2, p168 and 4.9.5.3, p193), the Proponent is committed as part of implementation of the approved project to be a contributing participant through the MRAS to development of an overarching Environmental Quality Management Framework, which will drive coordinated monitoring and protection of rock art. Notwithstanding the commitment to the MRAS, the Proponent is of the view that any future emission limit must be reasonable and practicable, and that natural justice must be applied in its future application. The Proponent cannot commit to accepting the imposition of an unknown (a potentially unachievable) non-contested emission limit where significant capital investments are then put at risk, especially where this is inconsistent with the approach to rock art integrity risk management identified in the MRAS EQMF – MRAS Section 4.1 "Proposed Approach". In line with discussion in the ERD (Section 4.8.3.4, p147), the proponent notes that Section 4.1 "Proposed Approach" of the MRAS does not include discussions of "emission limits" or imposition of emission limits whether contestable or non-contestable. Instead the proposed approach centres around the utilisation of "environmental quality criteria" relating to changes to rock art, where investigation of potential causes and appropriate management responses/actions are developed and implemented. The environmental quality criteria are envisaged as being at two levels *"There are two types of criteria: environmental quality **guidelines** and environmental quality **standards**. Criteria should be established using a risk-based approach. Guidelines provide early warning of potential environmental effects; while standards, located further along the pressure/response (cause/effect) pathway, indicate when the level of risk is no longer acceptable, triggering a management response to prevent environmental harm or pollution. In keeping with the risk-based approach, several standards should be established to give greater certainty that an effect has or has not occurred (multiple lines of evidence)."* As indicated in the ERD (p168) the Proponent has committed to participate and contribute to the development of the MRAS EQMF specifically the environmental quality criteria including the approach outlined in the MRAS where environmental quality standards triggering an appropriate management response indicated in the MRAS (p26) *"…… to prevent environmental harm or pollution and restore environmental quality to within acceptable levels. The response would normally focus on identifying the cause (or source) of the exceedance and reducing the loads of the contaminant of concern (i.e. source control). The response may also require in situ conservation or intervention work to be undertaken." and* *"It is important to note that criteria define the scientifically-based limits of 'acceptable' change to environmental quality. They do not represent pollution levels that trigger enforcement action if exceeded….."* Being required to commit to an unknown, non-contestable limit is considered an unacceptable sovereign risk if the Australian Government is proposing to require this "non-contestable" requirement of a project investing $bns. (Ref: Xu, X., Wang, C. and Li, Y, 2019, Characteristics of desert varnish from nanometre to micrometre scale: a photo-oxidation model on its formation. *Chemical Geology,* May 2019, DOI: 10.1016/j.chemgeo.2019.05.016)			
2	xx	Table ES3 – Summary of environmental impact assessment of key environmental factors – Air quality	"In addition, monitoring results and other scientific work presented in 2019 at the DoEE convened Murujuga Annual Strategic Meeting, provide an enhanced scientific basis for understanding and evaluating the impact of anthropogenic emissions in the region (Warren Fish pers comm). Residual impacts to the integrity of rock art and associated NHL values/amenity at Murujuga, if any, as a result of limited urea dust emissions are not considered to be significant."	The Annual Strategic Meeting not convened by Department of Agriculture, Water and the Environment. It is a collaborative event driven largely by the Murujuga Aboriginal Corporation with the support of the Australian Government, Rio Tinto, Woodside and Yara Pilbara. The Annual Strategic Meeting is not a scientific congress. The Department's preference is for the proponent not to reference personal communications (Warren Fish) or reflections of the materials presented at the ASM to draw conclusions that NHL values will or will not be impacted, or to what level they will be impacted.
2	Perdaman Response: Thank you for clarifying the composition and status of this event. The proponent was made aware of this event and the potential relevance of material disseminated at the event, by other stakeholders. The status description was based on that feedback. The Proponent is grateful as the Department subsequently provided access to the session material. However, this was provided by the Department after the ERD was submitted to the WAEPA for approval to release. Thus, the ERD could not reflect any later provided information. Equally, the Proponent also confirms that the ERD does not reflects discussions or potentially relevant material from the most recent Murujuga Rock Art Stakeholder Reference Group held on 7 May 2020, after the release of the ERD for public comment. The Proponent notes the Department has referenced that meeting in some comments herewith.			

	While not a "scientific congress" the Proponent understands that potentially relevant scientific information in relation to monitoring acquired for EPBC approval compliance requirements in the region, was shared by participants. The proponent is also now advised that relevant material based on the work referred to in the ERD is currently in press and is expected to be shared at a "scientific congress" shortly.[5] When noting that relevant data being acknowledged in the ERD is based on monitoring conducted for the purposes of compliance with EPBC Act approval conditions (see response to Heritage Comment #1 also), the Proponent considers that it is therefore reasonable, and relevant, to presume that the data is scientifically robust, and thus reputable. Given the condition's explicit role *"To protect the values of the **Dampier Archipelago (including Burrup Peninsula) National Heritage Place,** particularly the rock art sites, ……,, must undertake an air quality monitoring program. "* (EPBC 4546, Condition 9) was reaffirmed in evidence to the Senate Murrujuga Enquiry in evidence by Department of Environment and Energy Assistant Secretary, Compliance and Enforcement Mrs Monica Collins[6], reference to this data, irrespective of its mode of dissemination, in the ERD to inform the assessment of the current proposal is wholly in line with this explicit objective. Whether the forum where the information was disseminated is a scientific congress or not, is not material to the scientific robustness or relevance of the data that was disseminated or for the purposes of achieving a more fully informed understanding for the ERD and appropriate for evidence based risk weighted application of the Precautionary Principle. As recommended by the Department, the Proponent is engaging with those who presented, and those who are contributing to the monitoring and enhancement of the regional understanding on anthropological emissions and potential interactions of emissions with rock art at Murrujuga, including those species emitted by the Proposal. In this regard the Proponent acknowledges the work done by Dr Graham O'Hara of Murdoch University on microflora identification of rock surfaces in the Burrup but understands that the results were inconclusive in terms of being able to readily get them to plate up and then test for positive identification. The Proponent also acknowledges that work on potentially relevant genomic studies is currently underway at Murdoch University. The Proponent would be interested to engage with these researchers and/or similar potentially relevant work being conducted at Curtin University, to explore the relevance and potential to contribute where relevant as part of the implementation of the approved Project. The Proponent reaffirms that the ERD reflects relevant stakeholder feedback it received in relation to the nature of material that was shared at the session and the relevance to risk weighted application of the Precautionary Principle.			
3	xxi	Table ES3 – Summary of environmental impact assessment of key environmental factors – Social surroundings (Potential impacts)	"Potential impacts: • The construction of the urea plant and port located infrastructure have the potential to impact on some aspects of the visual amenity of Murujuga (particularly aspects associated with societal amenity in the proximal NHL area and Murujuga National Park). • The construction of the plant and site access easements have the potential to impact on heritage sites. • The Proposal has the potential to impact on public safety and recreational activities as a result of increased road traffic. • The construction and operation of the urea plant has the potential to impact upon the ambient noise levels of the surrounding environment. • Cumulative noise levels due to the additional noise emissions from the urea plant may impact on people visiting Hearson Cove or the NHL area."	Assessment of potential impacts noted and agreed.
3	Perdaman Response Comment Noted These are considered in the Proponent's risk register. These identified potential impacts have informed the Proponent's risk considerations and thus project designs/layout as well as the various management plans included as draFTS IN erd Appendix K and revised and updated in Appendix U of this Response to Submissions.			

[5] "Determining decay mechanisms on engraved rock art sites using pH, chloride ion and redox measurements including an assessment of the impact of cyclones, sea salt and nitrate ions on acidity." Authors Ian D MacLeod*[1] and Warren Fish[2]

[1]Western Australian Museum, Fremantle, Western Australia 6160, [2]CBG Solutions, Kingsley, Perth, Western Australia 6026
Pre-prints of the International Council of Museums - Committee for Conservation, Conference, Beijing May 2021, - in press

[6] See https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/BurrupPeninusla/Report/c02 at paragraph 2.49

4	xxii	Table ES3 – Summary of environmental impact assessment of key environmental factors – Social surroundings (Avoid)	• "As highlighted during stakeholder consultation, a societal desire for enhanced access to the Murujuga National Park and NHL area and region more generally for those who wish to visit by sea can result. This will avoid existing impacts to societal amenity associated with the current lack of this capacity."	Context for this statement is not provided in the ERD. What aspect of the proposal will be enhanced access to Murujuga National Park and NHL area result from? Clarification/elaboration requested from proponent on meaning of statement "*this will avoid existing impacts to societal amenity associated with the current lack of this capacity".* Statement unclear.
4	Perdaman Response The City of Karratha has reaffirmed that recognition of a potential tourist benefit accruing from enhanced capacity at the Dampier Port to received cruise ships which can act as an expanded gateway for regional tourism has been the subject of discussion with PPA on a number of occasions. The City has clarified its previous comment to indicate that, while the port can currently physically accommodate cruise ships, the current competition with other users of the same berthing capacity means that such an alternative use would deliver marginal benefit compared to those competing users and is thus an impediment to realising any potential benefit. Thus, the opportunity is not currently pursued. The WA Minister for Regional Development recognised the contribution to regional prosperity generated by the Perdaman Urea Project when announcing conditional support in Karratha on 18 August 2020.[7] The proponent stands corrected, as the availability of additional berthing capacity may enhance the potential for broader alternative tourism benefits rather than eliminate a current lack of capacity as previously suggested.			
5	xxii	Table ES3 – Summary of environmental impact assessment of key environmental factors – Social surroundings (Minimise)	"Where suitable local indigenous species can practicably be used, fast growing trees and shrubs will be established along the property boundary (where safe to do so) and/or along Hearson Cove road reserve to provide a vegetative screening. Species suitability will be examined in consultation with MAC."	Out of scope from a heritage assessment on the impact on NHL values, however fast-growing trees and shrubs are not generally native to this region. Foreign or pest species should not be introduced. Murujuga climate is arid (semi-desert) tropical. The proponent is requested to specify details of the tree/shrub species and to include flora experts in those to be consulted. This comment has previously been provided to the proponent.
5	Perdaman Response Comment Noted. The suitability and availability of potential fast-growing native species will be reviewed in consultation with MAC and appropriate flora experts as part of detailed design and construction planning.			
6	xxiii	Table ES3 – Summary of environmental impact assessment of key environmental factors – Social surroundings (Outcomes)	"Four Aboriginal heritage sites have been identified following a detailed archaeologic survey, as intersecting with the proposed plant footprint. Avoiding disturbance of these sites is considered impracticable and Section 18 consent will be sought for these sites in accordance with the mitigation measures outlined above."	These sites are not within the National Heritage List boundary, however noting that the Integrated Heritage Services report advises that three out of four of the sites are of 'high significance and would be culturally inappropriate in Traditional Law, that any rock art sites can be moved or disturbed', it may be that these sites have NHL or WHL values that may be worth considering in future. To ensure all possible mitigation and avoidance options have been considered, the proponent is requested to provide evidence that all reasonably possible options have been considered that may result in non-impact/non-movement of the three high significance sites within the project area. Salvage of the three high significance sites, under a Section 18 consent and permit, may have significant impact.

[7] See: https://www.mediastatements.wa.gov.au/Pages/McGowan/2020/08/Conditional-support-for-job-creating-gas-manufacturing-project.aspx

6	Perdaman Response This response includes heritage material provided on a confidential basis as per Clause 19 of the BMIEA and should not be shared outside of Department officers required to assess the information. A single response is provided here to similar issues/themes arising in Heritage Comments #9, #13, #14, #15, #16, #19 and #20 As key aspects of its work to understand and undertake a risk weighted review of its potential impacts on NHP values, the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place (NHP), the provisions of the BMIEA including the Aboriginal Heritage Policy cited in Clause 19 and the Aboriginal Heritage survey information provided by the State under Clause 19 and the WA Government's Murujuga Rock Art Strategy (MRAS). To understand how the Proponent has evolved its consideration of issues being raised, see below for the Design Evolution Chronology. This demonstrates where changes have been applied to avoid, reduce and mitigate impacts on heritage and environmental values across the project, including proximal NHP areas: • Prior consideration of alternative sites, including Maitland in consultation with WA Government at both administrative and Ministerial levels • Following consideration by the WA Government at all levels indicated above, WA Government recognised the Project as a Project of State Significance. • JTSI allocated BSIA Sites C & F plus entire intervening tidal flats. • Mid 2018, Project referred by 3rd party, The Hon. Robin Chapple MLC, under s.38 of WA EP Act. • Initial conceptual design layout included process facilities across entire site with product being transferred across entire C, F & infill areas. • JTSI undertook assessment of the option of infill between Sites C and F. • November 2018, WA EPA decided to assess referred project by ERD with 12 week public review period based on 3rd party supplied information and development concept. • December 2018, Perdaman submitted EPBC Act referral. • The State Government developed and released (February 2019) the Murujuga Rock Art Strategy (MRAS) – "A monitoring, analysis and decision-making framework to protect Aboriginal rock art located on Murujuga (the Dampier Archipelago and Burrup Peninsula)" • Q1 2019, Commonwealth Government granted the Project MPFS • March 2019, Commonwealth decision on accreditation of WA assessment of controlled action. • In 2019, JTSI arranged and paid ~$2m for MAC to undertake a thorough heritage site identification survey in H2 2019. This survey information was subsequently provided confidentially to the Proponent pursuant to Clause 19 of the BMIEA along with the Heritage Policy[8] identified in that BMIEA clause. • Heritage consultant IHS conducted the field work in conjunction with Senior Traditional Custodian representative selected with the concurrence of the MAC Circle of Elders (see Section 4.0, P29 of the confidential IHS report for the complete details of the survey methodology while Appendix C of the IHS report shows those informants who participated in both the archaeological, anthropological and ethnographic elements) • The Proponent's stakeholder consultation indicates; o Infill of entire tidal flats between Sites C and F is likely to result in some significant heritage and environmental impacts.

[8] See: https://www.dplh.wa.gov.au/DepartmentofPlanningLandsHeritage/media/Documents/Information_services/Aboriginal%20heritage/AH-Due-diligence-guidelines.pdf

- The remaining area of Site C (after removal of the significant northern portion which was incorporated into the Dampier Archipelago NHP area) had previously been heritage surveyed and while some sites were known, these had been assesses by the AMC previously and a s18 granted in consultation with the custodians.
- The inclusion of the northern portion of the original Site C (P042282/3016 within R49120 see map) into the Dampier Archipelago NHP area, meant that Site C no longer had a direct connection to the common-user E-W infrastructure corridor to the port for bulk movement of products for export or site access from Village Road at the north.
- After the listing of the northern portion of the original Site C as a national Heritage Place in 2007, any bulk transfer of product for export via the port would need to traverse a portion of the NHP area unless transferred by road with the inherent cost and traffic safety concerns.
- The State indicated that there was an alternative Crown Infrastructure Reserve on the western side of site C that was intended for this purpose, notwithstanding that this had been included in the NHP area. This inclusion was after the conclusion of the BMIEA with the contracting parties whereby they consented to surrender of Native Title.
- To provide a complete and robust context, the MRAS considers it is also relevant to record at page 7[9],” *The Burrup Agreement enabled the State Government to acquire native title rights and interests on the Burrup Peninsula and Maitland Estates industrial land, ….*”
- MAC webpage records[10] “*The three Contracting Parties (comprising the Ngarluma-Yindjibarndi, Wong-Goo-Tt-Oo, and Yaburara Mardudhunera) received land entitlements and financial benefits as compensation for surrendering their native title rights and interests, and discontinuing their Native Title Determination Applications in the Federal Court, over the land and waters of the Burrup*”
- Stakeholders preferred that the Proponent consider relocation of Hearson Cove Rd into the existing northern gazetted road reserve location to avoid traffic risks associated with a design at the south of Site F. The southern option required a number of bends and approached Burrup road at an angle that looked to the NW and potentially into the setting sun.

- The first preference of MAC and the Circle of Elders is that identified sites be preserved in situ. However, they also recognise and endorsed that where avoidance of sites is not practicable, an agreed consultation-based process to optimise salvage through the statutory s.18 process, could be implemented to allow respectful salvage.
- Section 7 of the IHS report records that there were no previously recorded or previously unrecorded Aboriginal ethnographic sites within the Project area.

- The Proponent used this feedback to review the project layout to;
  - Constrain the processing elements solely to Site C where the entire footprint had previous approval for a similar industrial development in keeping with the intent of the BSIA and with the existing purpose of Crown Reserve 49120 when the northern portion of the original Site C was nominated for inclusion in the NHP area.
    - This also enabled the removal of infill of the area between Sites C & F and product transfer requirements between these sites.
- The alternative design incorporating a significantly lower impact causeway design to provide construction and operational interconnection between sites C&F was adopted.
  - Identified reduction of impacts included:
    - Significant reduction in impacts on coastal processes and inland waters as the causeway culvert design has significantly larger E-W & W-E flow exchange capacity than the rate limiting for such environmental and peak flows at the Burrup Road culvert.
    - Significantly reduced flora & fauna and heritage site impacts that would be associated with the complete infill civil works.
    - Removal of processing across the entire Site F and infill meant consideration of relocation of Hearson Cove Rd into the existing gazetted road reserve location was practical as requested during stakeholder consultation.
    - Traffic risks associated with a four-way intersection on Hearson Cove road was considered to be significantly less than the alternative to use Hearson Cove Rd and Burrup Rd.
      - The Alternative of routing construction and operational traffic involved
        - Travelling from Site F onto Hearson Cove Road,
        - passing through the intersection with Burrup Road,
        - proceeding along Burrup Road to a new turn off across Burrup Road (eastern side) into Site C

[9] See: https://www.der.wa.gov.au/images/documents/our-work/programs/burrup/Murujuga_Rock_Art_Strategy.pdf
[10] See: https://www.murujuga.org.au/our-land/bmiea/

- This alternative to the causeway route was considered a significant public (safety/societal) and project risk both in construction and operation phases, plus would require substantial upgrades to handle the increased volume and frequency of heavy traffic between Sites F and C. This with potentially equal or greater environmental impacts in the catchment.

- Commit in the ERD, where an identified site could not reasonably be avoided, and notwithstanding the recognised first preference of the MAC Circle of Elders that sites be preserved in situ, that it would follow the s.18 process identified in the IHS report as endorsed by the Circle of Elders. This is also compatible with the Heritage Policy provided in accordance with BMIEA Clause 19.
- Perdaman's engineer has liaisied with MAC and the Circle of Elders on avoidance and in relation to the potential s.18 requirements for such sites in line with the endorsed IHS report recommendations.
- Three separate consultation meetings were held. Perdaman provided design engineers, specialist archaeologist with 20+ years' experience on Murujuga and project managers. MAC representatives included CEO, Chairperson, Circle of Elders and World Heritage Officer.
- These meetings were each followed up with design changes to minimise impact to heritage sites and this material provided to MAC at the next meeting. There were thus various iterations of design that were guided by MAC advice, specifically on mitigating impact to heritage sights.
- Site ID 20037 was proposed for salvage and relocation due to potential impact by the conveyor system. Innovative engineering solutions were explored and the site will not be impacted by proposed development.
- On 11 November 2020 the MAC Circle of Elders ratified and supported the position that all reasonable endeavours had been made in this regard and supported a S18 Notice that seeks the salvage and relocation of Site ID 19239, 19874 and 18615.

Therefore, in relation to the four specific Site C heritage sites noted in this comment, Perdaman reaffirms that the ERD reflected the recommendations of the IHS survey report commissioned by MAC and endorsed by the Circle of Elders. It is noted that the four sites identified in the ERD to be impacted have been reduced through this consultative process to three.

ERD Table 4-45 has been revised to correctly record the 32 sites from the IHS work that lie within the Development Envelope. The AQMP Table 5.1 in Appendix K correctly recorded the 32 sites. The ERD then discusses the four of those listed sites which also lie within the Project plant footprint, specifically within the plant area in Site C. The Project footprint in Site C will also be a Major Hazard Facility operating under a Safety Case with access restricted for health and safety risk management purposes consistent with the acknowledged and agreed safety related impairment of access pursuant to Clause 8 of the BMIEA, Additional Deed.

The four relevant sites are:

- ID 18615 towards the east of Site C – not within NHP area (see IHS report discussion on p 137)
- ID 19239 midway up Site C Slightly W of centre – not in NHP area (see IHS report discussion on p 145)
- ID 19874 towards SW corner of Site C – not in NHP area (see IHS report discussion on p 172)
- ID 20037 at western edge of Site C where traversed by conveyor options – not in NHP area (see IHS report discussion on p 198). This site will no longer be impacted and will be preserved in-situ.

There are several heritage sites noted inside Site F as indicated in ERD table 4-45. Consultation with MAC has led to various design iterations on Site F which has resulted in the proponent quarantining heritage sites from the proposed development.

There is no proposed impact to heritage sites on Site F.

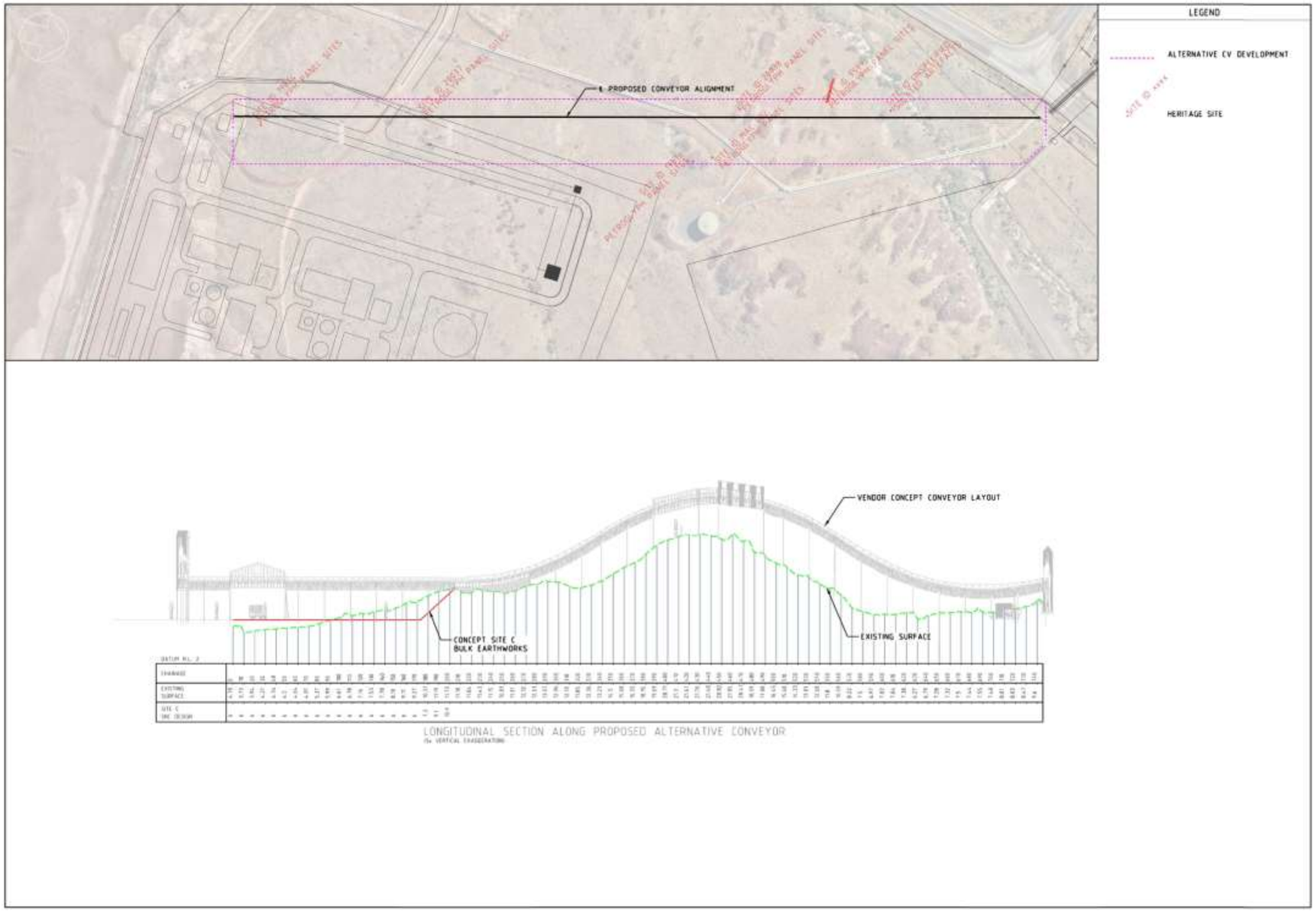
Where sites were noted during the IHS work as potentially lying within the proposed preferred conveyor corridor option, as foreshadowed in the ERD Section 6.6.3 (p209), the conveyor design and constructability was reviewed then revised to avoid impacts. (see more detailed discussion below). In addition, as part of the current ongoing dialogue with MAC, an alternative conveyor route/alignment/design is being reviewed within the Development Envelope. This is discussed further below.

The initially preferred conveyor alignment would be covered by a lease within Crown Reserve for Infrastructure R49121 (see below). The single lease will traverse either within the portion of Crown Reserve R49121 outside of the NHP area or within the portion of Crown Reserve R49121 that is coincident with the NHP area. This lease will not include any identified heritage sites.

Design and engineering modifications have been implemented such that Site ID 20037 will be preserved in-situ and thus not be impacted by the proposed development. Indeed, no sites in the conveyor corridor will be impacted (see below).

Construction/maintenance access will be routed to avoid identified heritage sites. It is envisaged that preassembled conveyor sections will be craned into their final elevated position to land on the support towers located away from heritage sites.

The Draft AHMP from ERD Appendix K has now been reviewed and revised to reflect the above liaison with Mac and the Circle of Elders in relation to an application for s18 consent as well as other feedback from the ERD submissions The revised AMHP is in Appendix U herewith.



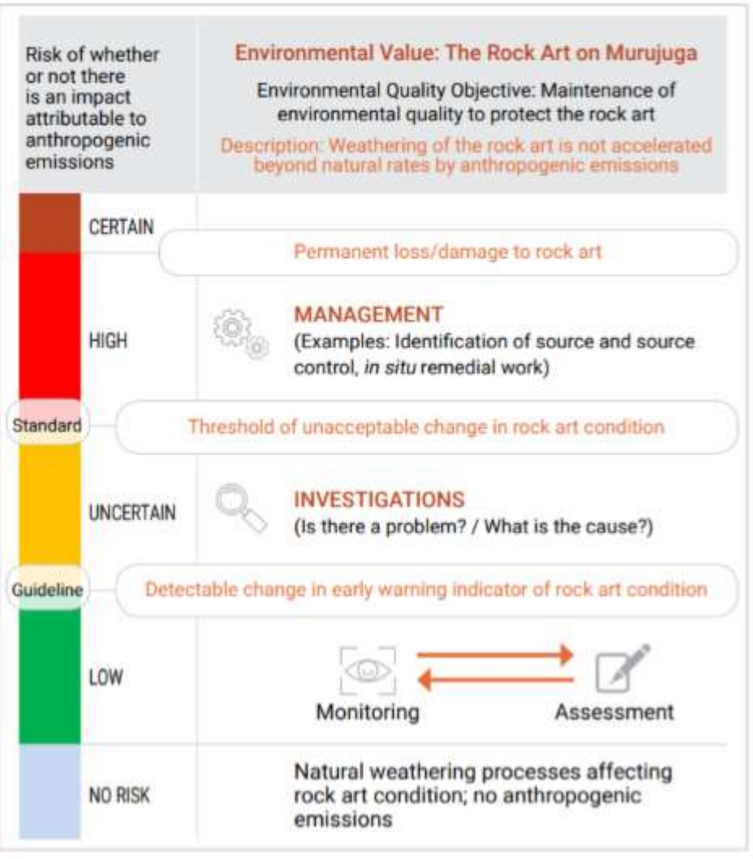
Design and engineering modifications have been implemented such that Site ID 20037 will not be impacted by the proposed development. Indeed, no sites in the conveyor corridor will be impacted.

Construction/maintenance access will be routed to avoid existing heritage sites.

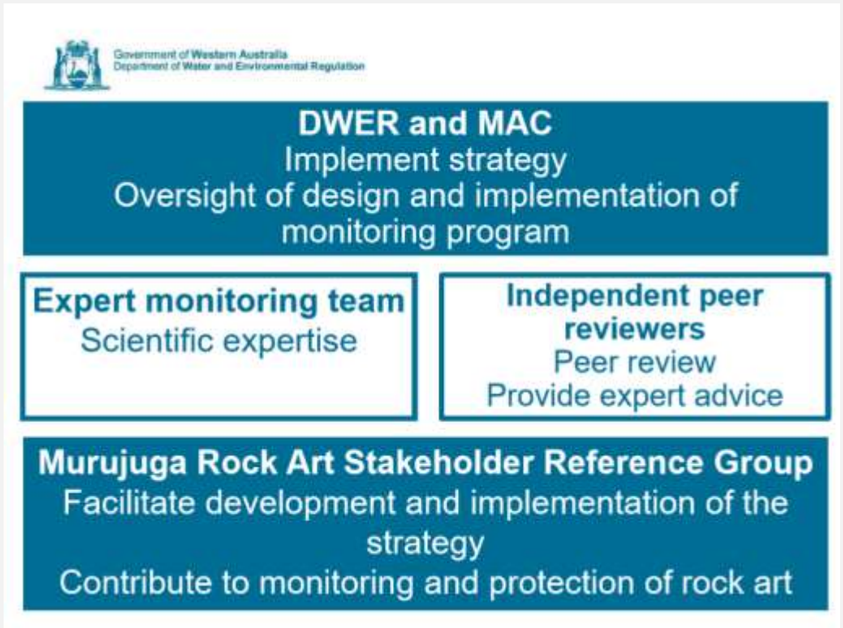
In operation, as the conveyor is fully enclosed with maintenance access by personnel also via an elevated walkway, there is no material likelihood of the Project activities impacting the site. The design and construction will be configured to retain integrity during extreme cyclonic weather events to manage risks to structural integrity (where failure could present a risk of impact to proximal heritage sites) to ALARP.

The Proponent notes that during liaison with MAC, there is concern by MAC to avoid sites being “behind a Woodside compound type of enclosing protective fence”. Equally it is mutually recognised, that fencing may attract attention from 3rd parties that may therefore introduce a risk to sites. Therefore, alternative protective measures to prominent hard fencing will continue to be explored in consultation with MAC.

7	xxiii	Table ES3 – Summary of environmental impact assessment of key environmental factors – Social surroundings	"Perdaman is implementing actions in accordance with the Burra Charter that sets out a step to follow in planning and managing places of cultural significance. In accordance with step 3 of the Burra Charter, the Proponent has prepared an overarching position for heritage interaction and management, including rock art and Murujuga (Project Destiny Heritage Charter). MAC has endorsed this Charter in principle, pending final Part IV Ministerial Approval."	Whilst broadly in support of the implementation of a Heritage Charter, can the proponent advise how/who will regulate the Charter.
7	Perdaman Response The Project Heritage Charter is a living internal Proponent document. The Proponent has continued to liaise with MAC to refine and has obtained endorsement from MAC. The Charter is included as an element to guide the Aboriginal Heritage Management Plan (ERD Appendix K then as reviewed and revised, in Appendix U in this Response to Submissions). Under the Burra Charter processes, such a step to develop an internal policy (ie Charter) is not a regulatory process, but a logical indication of intent and provides a direction toward the desired end outcomes that are then delivered and auditable through management plans, in the current case the Project AHMP, and procedures. Regulatory control is envisaged through audit of approved plans (AHMP) and procedures developed under and in line with this framework Charter.			
8	7	2.2.1.2 – Social benefits	"Projected economic costs and benefits of establishing a urea plant was clearly demonstrated in a study by the Allen Consulting Group "The Collie Coal-to-Urea Project" (Allen Consulting Group, 2010). This study was based on a similar order of magnitude capital investment for the production of the same quantity of urea but using coal rather than natural gas as the feedstock. As the current project is based on the evolution of this coal-based plant at Collie to the current natural gas based plant, the fundamental cost benefits related to a greenfield urea development are also transferrable in terms of the order of magnitude outcomes from such a study. The Proponent has therefore based evaluation of project benefits on that study with updates attributable to specific project changes such as coal to natural gas feed, proximity to export port, regional specifics and availability of government pre-investment in multiuser industrial support facilities in a dedicated strategic industrial estate."	Not in agreement with use of the 2010 "The Collie Coal-to-Urea Project" analysis as a form of social impact assessment, given both the time lapse since this study was undertaken, and the differences between the Collie community, geographic location and economy, and the Karratha/Dampier/Roebourne community, geographic location and economy. Analysis specific to the proposal should be provided.
8	Perdaman Response In amplification of the ERD information, the Proponent notes that consultation on the Project MPFS application was undertaken internally within the Commonwealth government, not by the Proponent, the Proponent is advised by the Commonwealth's Major Projects Facilitation Agency that the following Commonwealth stakeholders were consulted on the MPFS submission: • Office of Northern Australia, Department of Industry, Science, Energy and Resources • Australian Industry Participation Authority, Department of Industry, Science, Energy and Resources • Office of the Chief Economist, Department of Industry, Science, Energy and Resources • Resources, Department of Industry, Science, Energy and Resources • Department of Agriculture and Water Resources (Now Department of Agriculture, Water and the Environment) • Department of the Environment and Energy (Now Department of Agriculture, Water and the Environment) • Department of Home Affairs (Import/Export, Customs, Biosecurity, Critical Infrastructure) • Foreign Investment Review Board, Department of the Treasury A copy of the MPFS application and documentation upon which social and economic merits have already been accepted by core Commonwealth Government decision makers after the above consultation forms Attachment 2 to this RtS Appendix Q. An updated Social Impact Assessment is provided at Attachment 4 to this RtS Appendix Q.			

	Further, the Proponent notes the comments by the City of Karratha (Submission #12) that these aspects are required to be addressed as part of the usual Development Application processes for Major Projects. It is noted that the comment draws a distinction that the social impacts are most relevant at a local scale due to specific local variability rather than as MNES. The Proponent recognises this distinction and commits to complying with the Council's adopted Local Planning Policy DP20 — Social Impact Assessments of relevance to the local setting.			
9	168	4.8.5.2 – Impact on sensitive receptors – cultural heritage values and amenity	"While there has been a focus on the impacts of acidic and acid forming emission, the release of ammonia (strongly alkaline) and urea (mildly alkaline) also has a theoretical ability or capacity to bring about changes in the rock art patina and so alter the perception of colour differences, as this is not fully understood the proponent has committed to MAC to participate and contribute to the development of an EQMF as detailed in the MRAS where it would suggest these theoretical impact pathways be examined."	We seek further clarification on the methodology of perceived limited impacts of ammonia and urea. The proponent is advised to consider inclusion of content indicating that 'the impact of anthropogenic emissions and associated by-products, such as ammonia and urea, to the rock art and NHL values are not widely understood. The proponent has committed to MAC to participate and contribute to the development of an EQMF as detailed in the MRAS where it would suggest these theoretical impact pathways be examined".
9	Perdaman Response Comment is Noted. As indicated the Proponent has committed in the ERD that as part of the implementation of an approved project, to be a contributing participant the MRAS, including the future MRAS EQMF and future monitoring/research. Figure 3 from the MRAS setting out the MRAS EQMF approach is reproduced below. The Proponent reaffirms its understanding that this approach is focused on monitoring for, then investigating for cause to then target appropriate action to address, changes to rock art, not specifically to monitoring and imposing targets or limits on emissions. This recognises the prime objective to protect rock art irrespective of the cause of change and equally that if emissions are not the cause, imposition of targets and limits will not remedy the change issue. Please also refer to response to Heritage Comment #1.  MRAS Figure 3	

	See response to Heritage Comment #4 in relation to the availability of data of relevance to enhanced understanding of the potential and actual impact on rock art from anthropogenic emissions. The data reference in response to Heritage Comment #4 is acquired pursuant to EPBC Approval 2008/4546, including ammonia which is an issue raised in the comment. During implementation of the approved Project, the Proponent will engage with MAC and Yara for the objective of implementing a co-ordinated approach to develop a robust, enhanced, verified, understanding of the potential impact of anthropogenic industrial emissions on the integrity of Murujuga rock art. The 2017 CSIRO report on extreme weathering conditions on the granophyre and gabbro rocks from Murujuga showed that even at elevated temperatures there was no discernible mobilisation of minerals from the rock surfaces when exposed to 10-3 M (45 ppm) ammonium hydroxide solutions for several months. In terms of the impacts of the alkaline emissions, as noted in the ERD in view of the alkaline nature of the emission, detrimental impacts from acid emissions may be reduced. The Proponent notes that work by Gou et al (2017) suggests that in some circumstances this buffer may not be significant. The same work by Gou et al does however reaffirm the carbonate buffering role of sea salt. It is worth noting that urea that deposits on the rock surfaces may well reduce the environmental impact of the NOx through reduction of the nitrate to nitrite ions, which will alter the impact of these emissions on the reproduction rate of the bacteria and the concomitant acidification of the rock surfaces (Urbańczyk et al. 2016). The Proponent considers matters raised could be a specific targeted aspect for it to consider as a direct commitment/offset to as part of MRAS participation. References: Guo, H., Weber, R.J. & Nenes, A. 2017. High levels of ammonia do not raise fine particle pH sufficiently to yield nitrogen oxide-dominated sulfate production. Scientific Reports 7:12109. Available at https://doi.org/10.1038/s41598-017-11704-0. Ramanaidou, E., Walton, G. & Winchester, D., 2017, Extreme Weathering Experiments on the Burrup Peninsula / Murujuga Weathered Gabbros And Granophyres, CSIRO Mineral Resources, p 34 Urbańczyk, E., Sowa, M. & Simka, W. 2016, Urea removal from aqueous solutions—a review, Journal of Applied Electrochemistry 46, 1011–1029.			
10	177	Table 4-43	“At 5 yearly intervals after the completion of Project commissioning, the Proponent will conduct a study to identify potentially applicable technologies for reduction of project air emissions and assess the practicability of the application of those technologies to enhance the overall environmental performance of the Project.”	Once every five years is insufficient from a heritage management perspective. Proponent to consider more frequent reviews of best practice technology to keep up to date with technological change (i.e. every 1-2 years). Proponent to implement a best practice monitoring program and investigate the effects of air emissions in response to the findings of the Murujuga Rock Art Strategy monitoring program, as they become available.

10	Perdaman Response The 5-year time frame is considered appropriate for urea industrial technology as it does not move in the 1-2 year time frame suggested for reviews. The Proponent will install and apply best practice urea production technology, where performance improvement is achieved through continuous improvement in the application and utilisation of current installed technology. This is achieved through the application of "in use" learnings and experience. As a continuous process, this would be reviewed and reported as part of usual routine annual environmental reporting. This is routinely required pursuant to approval conditions and EMPs. The proponent considers that a "best practice monitoring program and the investigation of the effects of air emissions" is one that is based on holistic, integrated monitoring that is designed to monitor the cumulative ambient airshed loading from all sources. In relation to the Monitoring issue raised see the response to Heritage Comment #9. As indicated in the ERD, the Proponent envisages engagement with the MRAS monitoring program as a contribution participant in line with the conceptual arrangements shown below (as presented at Murujuga Annual Strategic Meeting in 2019 discussed in Heritage Comment #2 above)  The Proponent notes that while the MRAS monitoring approach is focussed on environmental quality criteria related to the condition of rock art, not emission levels specifically, the Proponent considers that a complimentary "best practise monitoring program and the investigation of the effects of air emissions" is one that is based on holistic, integrated monitoring that is designed to monitor the cumulative ambient airshed loading from all sources. Thus, this must be undertaken on a co-ordinated, industry wide basis, not as disparate, unco-ordinated monitoring by individual proponents to meet separate approval conditions. The Proponent would therefore look agreement to join with the existing cumulative ambient airshed monitoring program, preferably as a contributing participant to the MRAS monitoring, that is currently being conducted for the express objective "To protect the values of the Dampier Archipelago National Heritage Place, particularly the rock art." Modelling confirms that the Project will be a significant (in terms of % contribution in the regional airshed) source of ammonia and urea emissions but a relatively low incremental contributor to other species including PM (other than urea). Therefore, noting that there are existing programs in place to monitor cumulative ambient emissions in the regional airshed, the Proponent's envisaged monitoring strategy recognises the existing cumulative ambient monitoring represent an appropriate baseline for comparison after commissioning of the Project to gauge potential changes associated with the Project. In addition, the Proponent will seek to establish, preferably through a contributing participation in MRAS monitoring, a baseline for urea in the existing regional ambient airshed before start-up/commissioning of the Project. Post commissioning urea concentrations could then be statistically compared to this baseline to assist understand of the Project contribution and to assess the veracity of modelled predictions. The Proponent notes that as part of EPBC Approval 2008/4546, Yara conducted baseline monitoring and subsequent operational monitoring, including for ammonia. The baseline monitoring was reported to the Department on 16 June 2017, including at Deep Gorge (Site 7), Water Tanks (Site 6) and Burrup Road (site 5). The Proponent notes that NPI data records for the period covered by the current baseline monitoring shows significant variability in relevant fugitive emissions from established industrial sources. This established publicly available baseline and existing industry datasets, the Proponent proposes that as part of the implementation of an approved project, the existing data could be augmented by additional monitoring at these established monitoring sites prior to Project start-up. This will establish a more fully informed "pre-production" baseline without a Project contribution for comparative purposes. This monitoring program should also be designed to develop a baseline for the natural levels of urea in the ambient

	airshed before the commencement of urea production by the Project. The ERD draft AQMP has been be reviewed and revised to outline the design and implementation of this strategy with an objective to establish a pre-operation regional ambient airshed background of relevant emission species to be available for comparative purposes after the completion of Project commissioning in Appendix U of this Response to Submissions. As indicated in the revised AQMP in Appendix U of this Response to Submissions, source emissions verification will be conducted as part of commissioning, to establish the veracity of the project discharge to the regional airshed are in line with the expected BAT performance criteria set out in the ERD. The Proponent acknowledges that if emissions performance is not verified to be in line with the basis of the assessment for approval, modifications will be required to be implemented to the plant to enhance performance to achieve the forecast performance levels. The Proponent notes that this is expected to be a condition of any Part V approvals. Perdaman envisages contributing to the existing regional ambient monitoring at established sites. For common species with a diversity of emission sources in the region, the Proponent envisages that this would be on a shared cost basis. Capacity for ambient monitoring of ammonia may need to be augmented with Perdaman contributing to this augmented capacity. As the principal source of urea emissions, Perdaman will initially develop and implement a baseline monitoring program targeting determination of the existing airshed urea concentrations before commissioning. For urea dust, as part of implementation of an approved project, it may be appropriate to undertake speciation studies of the collected ambient dust sample with Perdaman contributing to this speciation work. This will inform the future emissions verification monitoring and particulate monitoring requirements during Project operation.			
11	177	Table 4-43	"The Proponent will liaise with the EPA with the objective of applying best practicable endeavours to implement technology that the report confirms can be practicably applied to improve overall environmental performance in an agreed timeframe."	The proponent is requested to define/elaborate upon 'applying best practicable endeavours'.
11	Perdaman Response The term is used in line with the definition in s3. of the WA EP Act -. ***"practicable*** means reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current state of technical knowledge;" ***i.e. the ERD passage reflects that the Proponent's consideration, actions and efforts will be reasonable and have regards to the sort of matters embodied in the definition.***			
12	186	4.9.4 – Potential impacts	"The construction of the urea plant and port infrastructure have the potential to impact on the visual amenity of Murujuga (including the NHL area and Murujuga National Park). • The construction of the plant and site access easements have the potential to impact on heritage sites. • The Proposal has the potential to impact on public safety and recreational activities as a result of increased road traffic. • The construction and operation of the urea plant has the potential to impact upon the ambient noise levels of the surrounding environment. Cumulative noise levels due to the additional noise emissions from the urea plant may impact on people visiting Hearson Cove. • The cumulative impact of an increased industrial presence may be a potential threat in relation to the aspiration for a World Heritage listing of Murujuga."	Noted. Heritage branch in agreement with identified potential impacts to both the NHL values and possible WH site.
12	Perdaman Response Noted. This records the feedback issues that may need to be risk evaluated as these are recognised as "potential impacts". Perdaman has recorded and considered these risks. • *The construction of the plant and site access easements have the potential to impact on heritage sites.* **Response:** See Table 4-45 which identifies the four heritage sites that lie within the footprint of the plant in Site C with no sites impacted in the connecting conveyor (which in traverse through the NHP area for approximately 300m). The proposed approach to dealing with these sites is discussed on P192 of the ERD. • *The Proposal has the potential to impact on public safety and recreational activities as a result of increased road traffic.*			

	Response: See Traffic management issue on P15, in table 4-50 and in Appendix H – Traffic Impact Assessment. • *The construction and operation of the urea plant has the potential to impact upon the ambient noise levels of the surrounding environment. Cumulative noise levels due to the additional noise emissions from the urea plant may impact on people visiting Hearson Cove.* **Response:** See Appendix F (Noise Assessment) and ERD Section 4.9.3.3 (P185). DWER Noise Branch were consulted during design of the noise investigations and reviewed this noise evaluation in the Draft ERD and the assessment was determined to be technical competent, appropriate and noise coverage/assessment in ERD is robust. Thus, Perdaman feels that this demonstrates that noise is not a significant potential impact. The Proponent expects that verification of noise aspects will be a usual part of commissioning close out pursuant to Part V approvals. • *The cumulative impact of an increased industrial presence may be a potential threat in relation to the aspiration for a World Heritage listing of Murujuga* **Response**: See ERD Section 4.9.5.6 from p 198 of ERD.			
13	189	4.9.5.2 – Aboriginal Heritage	"Integrated Heritage Services Pty Ltd (IHS) was engaged by MAC to undertake Aboriginal cultural heritage surveys of an area comprising Sites C and F, the proposed causeway between Sites C and F, the conveyor route east of Burrup Road, and the realignment of Hearson Cove Road to the north of Site F. The outcomes of the Aboriginal Cultural Heritage Surveys are presented in a confidential report (IHS, 2019) which formed the basis of the impact assessment and mitigation measures presented in the Sections below. The IHS report describes and maps a total of 60 Heritage Places."	The Department has previously requested the Integrated Heritage Services reports to understand the proponent's heritage management methodology. This is yet to be provided. To undertake a thorough and effective assessment of heritage impact assessment and mitigation measures to ensure they are best practice in respect to the NHL site and surrounding NHL listed areas, the Department requests the Integrated Heritage Services report. The Department notes some of the material included in the report may be sensitive, both culturally and from a gender perspective. For this reason, we would be satisfied with an abridged report that only includes non-sensitive information regarding the perceived impacts, and management strategies as advised by IHS.
13	Perdaman Response: Clause 19 of the BMIEA provides that the State provides relevant current heritage survey data to proposed developers on a confidential basis. Therefore, as indicated previously when the report was originally requested, any provision of such data to a third party has to also acknowledge and accept that confidentiality and be approved by the State. This acknowledgement was never received. Actioned with JTSI/MPF office with permission again obtained to supply the relevant report to DAW&E but conditional upon the report remaining confidential solely for the purposes of the EPBC assessment. See also Heritage Comment #15 below. Figures 3 and 4 of the IHS report define a "Project area" that was surveyed. All Site C, all Site F, the Conveyor corridor including in the NHP area and the causeway foot print as well as the zone to the west up to and including Burrup Road were included in the survey ground coverage and report. The report identifies the Traditional Owner representative informants engaged in the "on ground" site identification and their relevance to country. IHS executive summary states in part *"……* *There are no previously recorded or previously unrecorded Aboriginal ethnographic sites within the Project Area.* *Several areas have been identified as featuring potential for the presence of subsurface archaeological sites, objects or burials.* *In reference to the petroglyphs, the senior traditional owner representatives stated that it would be culturally inappropriate in Traditional Law, that any rock art sites can be moved or disturbed in any of the proposed works programs for the proposed development of the Project Area. The petroglyphs are of high significance to them.* *These results are considered along with a range of other findings as discussed throughout Section 5.0 of this report whereby commensurate recommendations are provided in Section 6.3 for consideration in the future management of Aboriginal cultural heritage sites and values for the Project Area.* *By following the recommended procedures provided in Section 6.3 the proponent will be undertaking due diligence in relation to the responsible management of and legal obligations to Aboriginal heritage sites, objects and cultural values in the Project Area. Importantly, the recommendations in this report are endorsed by MAC.* *Further, by committing to a regular, diligent and collaborative approach with traditional owners, the heritage values of the Project Area will be managed effectively through greater understanding, awareness and appreciation."*			

	The Proponent has based its approvals and implementation planning to accord with the views expressed in this Executive summary, noting that while it is the first preference of senior traditional owner representatives and MAC that rock art sites not be moved or disturbed, they recognise that sites may not be able to be avoided, and the recommended procedure in Section 6.3 are therefore appropriate and will be implemented. The Proponent also considers that the approach adopted is compatible with the Heritage Policy provided by the State pursuant to Clause 19 of the BMIEA. Noting this senior traditional owner preference, the Proponent has continually reviewed the design of the Conveyor to ensure that no site is impacted and as a result, no sites in the conveyor corridor will need to be salvaged. When reviewed in the context of the five National Heritage Listing Criteria applied to this NHP, avoidance of physical impact to petroglyphs is fundamental in the hierarchy of control to managing potential impact risks as each of the criteria justifications is supported on the basis of the physical nature, purpose, density, content, expressed creativity and local/regional/national natural or historical context of the preserved individual petroglyphs represent. The IHS survey has increased or reaffirmed the available contemporary knowledge for sites in the NHP area. See also response to Heritage Comment #6 above.			
14	192	4.9.5.3 – Summary of findings	"Three of these (sites) have been assessed by IHS as having a high significance to the Traditional Owners and one has low significance. IHS also identified landform that has the potential to feature subsurface archaeological sites, objects or burials. Isolated artefacts were recorded throughout the survey area, especially within the salt flats north of Site F and across Site C. IHS notes that these were often situated within disturbed contexts with a ground surface visibility ranging from about 10% (i.e. middle of Site C) to 100% (southern inundation zone in Site C and Perdaman Site Corridor). This IHS report notes that the petroglyphs are of high significance to the senior traditional owners and it would be culturally inappropriate in Traditional Law, that any rock art sites can be moved or disturbed." Accordingly, it is the first recommendation and preference of the Traditional Owners that best efforts are made to ensure all Aboriginal cultural heritage sites are protected in situ. Further, the IHS report states if future disturbance or damage to an Aboriginal heritage site is unavoidable, then Section 18 consent under the AHA should be sought. Any Section 18 consent should include: • A detailed salvage assessment be undertaken to produce a plan for each physical component of the site requiring salvage (this may also require Section 16 consent under the AHA); Consultation and agreement be made with MAC to delineate a suitable area for relocated heritage items; and The salvage works are undertaken under the guidance of senior traditional owner monitors and a qualified and experienced archaeologist."	The proponent is requested to advise if alternatives have been considered to allow for the three high significance heritage sites to remain in situ, as per the recommendation of the Traditional Owners. Although these are not NHL sites, it is the preference (given these sites *may* have NHL/WHL values for future consideration, and as it is the preference of the TOs that the deposits not be moved) that all avenues possible are considered to allow for these sites to remain in situ. The proponent notes (page 210) the possibility of seeking S.18 consent under WA heritage legislation to salvage heritage deposits within the NHL site in the transport corridor. The proponent is requested to provide more information on the salvage considerations, the management strategies, and all avoidance mitigation strategies considered. The proponent is requested to note that seeking consent under WA heritage legislation does not constitute an approval under the EPBC Act. The Department's preference is that heritage sites within the NHL site are left in situ, as per the TO's wishes and to reduce impact on NH values to the maximum extent possible. Any action that may have impact on the heritage values of Murujuga, within a designated NHL area, must have the proposed action clearly articulated to the Department in the ERD, and be referred to the Department under the EPBC Act regardless of the proponent's intention to seek Section 18 consent
14	Perdaman Response See response to Heritage Comment #6, especially noting that no sites will be impacted in the NHP area traversed by the revised conveyor design and construction approach. This is an example of the heritage sympathetic adaptive approach to design evolution adopted by the Proponent for the Project.			
15	192	4.9.5.3 – Summary of findings	"MAC and its Circle of Elders have endorsed the recommendations in the IHS report and agreed to processes as describe above. In relation to each of the above recommendations, the proponent notes: Where an identified site cannot practicably be avoided, approval pursuant to s.18 of the AHA will be sought. The s.18 application will include:	The proponent is requested to provide evidence of MAC and Circle of Elders' endorsement of the recommendations of the IHS report and their agreement to the processes above.

			• A detailed salvage assessment undertaken to produce a plan for each physical component of the site requiring salvage (this may also require Section 16 consent under the AHA); • Consultation and agreement with MAC to delineate a suitable area for relocated heritage items; and • The salvage works will be undertaken under the guidance of senior traditional owner monitors and a qualified and experienced archaeologist."	Proponent requested to define/clarify 'cannot be practicable be avoided'. This would enable the Department to understand/assess the salvage methodology and provide assurance that all possible avoidances have been considered.
15	Perdaman Response See the Proponent Response to Heritage Comment #6 which provides details of ongoing consultation with MAC and the Circle of Elders, as well as design optimisation progressed as part of that consultation. This consultation has: • reduced the number of sites impacted in Site C from four to three • demonstrated to the satisfaction of the Circle of Elders that even through extensive exploration of design options those three sites cannot practicably be avoided • gained endorsement from the Circle of Elders to lodgement of an application for s 18 consent in relation to these three sites in line with the procedures outlined in the IHS heritage report and as noted in the ERD • agreed a realigned access road from Burrup Road to Site C to provide a greater separation distance and in-situ preservation of a site that may have been at risk of inadvertent impacts, and • ensured that no sites within Site F are impacted,			
16	203	4.9.7 – Predicted outcome	"In relation to the NHL area within Site F, corresponding to the sacred site "Fish Thalu" it is noted that while the physical heritage material associated with the Fish Thalu is located outside the boundary of the NHL area and outside of Site F and the PDE, the NHL site has other recognised heritage and amenity values. The general public does not currently have unfettered access to this site. Access restrictions for those without a connection will continue. The NHL area will be fenced with an appropriate buffer to prevent accidental access from Site F. The requirement to implement safe access processes and protocols has been discussed with MAC. It has been agreed that Proponent will ensure all reasonable efforts are made to ensure any impediment to access for MAC and those with traditional connection to the site is minimised."	The Department is in agreement with this approach. Proponent requested to provide similar mitigation/management strategy for all other NHL sites within the project area (for example, the NHL area in the conveyer corridor of Site C).
16	Perdaman Response: This is positive feedback re Fish Thalu efforts to work collaboratively with MAC, however it is noted that Heritage Comment #20 conflicts with the views contained in this comment? In relation to other sites noted in this comment please refer to the consolidated response to Heritage Comment #6. Subsequent liaison with MAC has clarified a concern that MAC does not want to see the site become a repeat of the historic "Woodside Compound" – located on BSIA Site E. The Proponent reaffirms that it has also advocated to the State that as part of the land assembly process for the Project, the State should consider implementation of the IHS Heritage Survey report recommendations in relation to providing MAC secure long term access arrangements for the Traditional Custodians to i) NHP Site ID 9439 including unimpeded connection to the realigned Hearson Cove Road noting that no access route currently forms part of the NHP area, ii) the Yatha which is now excised from the Development Envelope and is not part of the NHP, and iii) the actual Fish Thalu site on the tidal flats to the east of the project Development Envelope and is not part of the NHP. In this manner all decisions on what access is available, who it is available to and how it would be controlled would be wholly at MAC's discretion. Any shared boundary with Site F will have a fence suited to the usual requirements of an industrial site safety and access standards. The additional area to which MAC may acquire secure long term access could be considered for addition to the NHP and should therefore be considered as potential offsets due to the proponents actions to secure the outcome as a consequence of the implementation of the approved proposal. A specific response re offsets in attached as RtS Appendix V herewith.			

17	203	4.9.7 – Predicted outcome	"The Project benefits are discussed in Section 2.2.1 above. The overall social impacts of the Project are expected to be positive. The impact of the Project on the local economy and community services will be maximised. This has been recognised and is reinforced by the Commonwealth Government in its decision to grant MPFS to the project and by the State Government in designating the Project as a Project of State Significant. The confidential commercial agreement between MAC and Perdaman will also assist delivery of economic and social benefits accruing to that part of the community with direct traditional and cultural links to Murujuga."	The Department is seeking evidence to be attached to the statement that the 'overall social impacts of the Project are expected to be positive' beyond the MPFS and the 2010 Collie assessment. Suitable evidence could include a contemporary social impact assessment relevant to the Karratha/Dampier/Roebourne area. This comment has previously been provided to the proponent. It is not possible to assess the positive economic and social benefits that will eventuate as a part of the Perdaman and MAC confidential agreement without oversight or further understanding of what the agreement entails, or details of what the agreement will fund.
17	Perdaman Response: See response to Heritage Comment #8 A copy of the Perdaman - MAC Agreement and other relevant commercial in confidence correspondence between Perdaman and MAC have been confidentially provided to the Department.			
18	203	4.9.7 – Predicted outcome	"Within Sites C and F access for MAC members with traditional connection to country across those sites has been a core element of extensive discussions and agreement between Perdaman and MAC."	Not satisfied. Proponent requested to provide tangible evidence that outlines that 'discussions' have eventuated into a recognised agreement to ensure Traditional Owner access is upheld in an appropriate manner.
18	Perdaman Response: Commercial agreement with MAC (Financial Figures redacted) provided previously to the Department as evidence of this matter. While this agreement stems from requirements of Clause 10.1 of the BMIEA, the Proponent considers that the scope and extent of the included provisions not only addresses reparation for traditional rights stemming from Clauses 5.2 and 5.3 of the BMIEA as envisaged through Clause 10.1, but also provides a foundation, based on mutual respect and co-operation, for mutual benefits to accrue through the implementation of the approved project. MAC's letter to the Chairman of the EPA is included in ERD Appendix J "Project Correspondence". This provides tangible evidence in line with what is being sought, as does the copy of the concluded agreement between Perdaman and MAC which was provided previously to the Department.			
19		6.6 – National Heritage Place (6.6.4 – Mitigation)	"The design and layout of the plant facility has taken into account the known location of heritage sites within the plant lease including the rectangular NHL area located near the northern boundary of Site F which has been excluded from the plant footprint and will be protected from any construction or operational impacts with a suitable buffer zone (in the order of 0.3 ha). Access to this site for Traditional Owners will be preserved."	Proponent's information is comprehensive for the southern NHL site (e.g. in addressing potential impacts and providing comprehensive mitigation strategies to ensure protection of the NHL values), however no mitigation/management strategies are provided in the ERD for the northern NHL site.
19	Perdaman Response: Contradiction, the comment here says information relating to the NHP Fish Thalu site aspects is comprehensive, yet later Heritage Comment # 20 suggests the level of information is insufficient? See consolidated response to Heritage Comment #6. Appendix U to this Response to Submissions includes reviewed and revised Environmental Management Plans including the AHMP, that supersede and augment those in ERD Appendix K..			
20	210	6.1.1 – Dampier Archipelago (including Burrup	"The NHL area sits adjacent to Sites C and F on their northern and southern/eastern boundaries respectively; the conveyor moving product from Site C and connecting to the East-west Service Corridor (EWSC) passes through part of the NHL area; and a small rectangular area	The site known as "Fish Thalu Incres" is outside the Perdaman development lease. However, the area within the NHL has a registered site with stone features and a motif (according to University of Western Australia).

		Peninsula)	corresponding to the sacred site “Fish Thalu” is situated within Site F is part of the NHL area (Figure 2, Appendix M).”	The proponent has not provided sufficient information regarding management and mitigation strategies for the protection of the NHL sites specifically. The proponent is requested to provide this information, e.g. specific heritage management plans for the NHL sites both within Site C and Site F
20	This comment is not consistent with Heritage Comment #16 above, which agrees that information provided on the Proponent’s approach proposed for the only NHP area in either Site C or F is comprehensive. Note also that the northern NHP area is wholly external to Site C, thus there is no discussion in the ERD in relation to NHP sites in Site C. There is appropriate discussion of other heritage sites identified within Site C. (see consolidated Response to Heritage Comment #6) Also see responses to Heritage Comments #6, #15, #16 and #19 The Proponent reaffirms the ERD position that it is committed to this process for maintaining access to the NHP site #9439. Appendix U to this Response to Submissions includes reviewed and revised Environmental Management Plans, including the AHMP that supersede and augment those in ERD Appendix K..			
21	210	6.3.3 – Assessment of impacts	“With respect to the conveyor connection between site C and the EWSC passes through NHL area to the northwest of Site C the following; • The confidential Heritage Survey executed through MAC on behalf of JTSI also covers this area and has been used to inform this Project designs and the ERD; • It is noted that the heritage surveying identified two sites in the NHL area within the preferred conveyor corridor where this traverses the NHL area; and The proponent has initiated discussions with MAC on the management of potential impacts on those sites as well as the four identified sites within Site C that it may be impracticable to avoid. If it is impracticable to avoid these sites, a s.18 consent to take the sites may be sought pursuant to processes outline in Section 4.9.4 and the AHMP.”	Section 18 consent and salvage for heritage deposits within the NHL sites is of concern and avoidance is encouraged. Proponent requested to provide information on management/mitigation strategies and considerations regarding these NHL areas, and to provide more information (e.g. have alternative arrangements been considered?) regarding salvage within the NHL area. The proponent needs to be aware of their responsibilities under the EPBC Act to the NHL values within these areas, and to advise the Department in the ERD by outlining the specific management plans for the NHL sites. If salvage is deemed necessary, then a full assessment of the impacts of this action against the listed heritage values of the Place should be undertaken. If the details of any salvage activities are not provided and the impact is not considered as part of this assessment, or through management plans approved by the Department then the activity may be included in the scope of allowed activities should the Minister chose to approve this project. Additional referrals under the EPBC Act may therefore be required. With unclear indication of the management proposals for the NHL values in the causeway (and indication that that may result in Section 18 salvage) Heritage Branch considers alteration and/or modification to the NHL Values may occur and therefore significant impact possible. Additionally, access restrictions, or the availability to access these sites for TOs has not been made clear.
21	Perdaman Response: See response to Heritage Comments#6, #15, #16 and #19 Appendix U to this Response to Submissions includes reviewed and revised Environmental Management Plans, including the AHMP that supersede and augment those in ERD Appendix K.			

	The proponent also reaffirms that Table 4-45 identifies 31 sites identified during the IHS survey as lying within the Development Envelope. Four of these sites are identified as being within the plant footprint, viz #18615, 19239, 19874 and 20037. See also Response to Heritage Comment #6 Site #9599 comprises a number of individual elements (IHS 9599a-g see Table on p 315 of IHS report) is close but outside the reviewed and revised preferred conveyor alignment. This is discussed in detail in the consolidate response to Heritage Comment #6. The Proponent reaffirms that as a result of this adaptive, heritage sympathetic design review for the Conveyor, it does not expect to need to seek s.18 consent or to salvage any NHP sites.			
22	210	6.6.3 – Assessment of impacts	"Stakeholder feedback has identified the following specific potential impacts: • desecration of NHL; • values and reduction of integrity of the NHL site; • reduction of cultural access of Traditional Owners and general public to NHL values; and • reduction of Traditional Owner connection to NHL values (6.6.3 – 210)"	Proponent to note stakeholder concerns. The Department considers that salvage of heritage deposits within NHL sites would result in all four impacts listed by stakeholders. The proponent is to advise how these impacts have been communicated to concerned stakeholders, and to provide evidence that the proposal, and specifically the possible s.18 desecration has been clearly articulated to stakeholders, and stakeholders have had ample opportunity to ask questions and have those questions clearly answered.
22	Perdaman Response: See response to Heritage Comment #6 The Proponent reaffirms no salvage is now envisaged within the NHP area, so the resulting suggested impacts from any salvage do not arise.			
23	210	6.6.3 – Assessment of impacts	"Reduction in cultural access to NHL areas by TOs – see Section 4.9 including • Yatha site (although not in an NHL listed area but with recognised heritage and cultural significance) has been removed from Proposal Development Envelope • For the NHL area within Site F, traditional owner aspects have been discussed with MAC. • The site will be fenced at the commencement of construction to provide a physical separation from development activities. • It has been agreed that as safety for TOs during access is important for all parties, access will be retained under an agreed protocol. Access to the location for the general public is currently constrained as there is no direct access, access would be across the Government Industrial reserve which includes Site F which is not publicly accessible without first obtaining a s.91 licence under the land Administration Act and consulting with TOs via MAC. • If a 3rd party desires access, this should first be through the relevant statutory authority to obtain a s.91 licence and liaison with MAC which could chose to implement the agreed protocols. • Thus there will be no significant change to this existing constraint on public access."	Proponent requested to clarify what they mean by 'traditional owner aspects'?
23	Perdaman Response: Traditional owner aspects discussed have included: • Intrinsic cultural connection to country • Custodian's association with the land, past, present and future • Dreamtime/creation stories and connections associated with the land • Traditional lore relating to Murujuga			

	• The process and role of stories • Rock art role and value, potential for adverse impacts and desire to understand efforts to achieve lowest practical emissions and eliminate possible adverse impacts • Alternative “canvas” for visual presentation of knowledge and stories, including potential for murals on Perdaman buildings & structures • Gathering bush onions, hunting kangaroos and other bush tucker • Passing of traditions and knowledge between generations both in the past and for the future • Aspirations for future engagement and prosperity through MAC • Sadness/disappointment at unfulfilled promises, heard it before from projects but not been delivered • Desire to grow the appreciation of culture through project wide cultural awareness training delivered by MAC and Circle of Elders • A desire to regain land title (ownership), or at least a long term statutory right of access, and control, to the Yatha after any Native Title at that site was surrendered previously under the terms of the BMIEA (also recorded as Recommendation 12 of the IHS report) • A desire to establish structures such as toilets and a shade structure at the Yatha site • Continuing access to NHP site (#9439) in Site F • Long term caring for the Fish Thalu outside of the development envelope • Tidal flats hydrology, including changes observed from past industrial activity			
24	210	6.6.3 – Assessment of Impacts	• “It has been agreed that as safety for TOs during access is important for all parties, access will be retained under an agreed protocol.”	Proponent requested to outline the access schedule (e.g. how often will TOs be able to visit the site?).
24	Perdaman response: As indicated in the ERD, the Proponent agreed the principle of retained access to this site with MAC. See response to Heritage Comment #16 re MAC’s future secure tenure and access to this site.			
25	211	6.6.5 - Predicted outcome	“With the implementation of the avoidance and mitigation strategies outlined in section 6.6.4 and the Heritage Management Plan (Appendix K) it is not likely that the Proposal will cause the loss of one or more of the National Heritage values of the Dampier Archipelago (including Burrup Peninsula). A Section 18 consent will be sought for any disturbance which cannot practicably be avoided to an Aboriginal heritage site. The Proponent will therefore ensure that the Heritage cultural values of the NHL Area are not degraded or damaged. Through the implementation of the Environmental Management, Aboriginal Heritage and Air Quality Management Plans (Appendix K), it is unlikely that the cultural values of Murujuga would be notably altered, modified, obscured or diminished.”	Not satisfied by proponent’s conclusions (given possible salvage within an NHL site) that the proposal will not cause the loss of one or more of the NHL values. Proponent requested to clarify how a decree under Section 18 of the *WA Aboriginal Heritage Act 1972* does not provide adequate assurance that the cultural heritage values of the NHL area are not degraded or damaged?
25	Perdaman Response: See response to Heritage Comment #6 and #22. The Proponent reaffirms no salvage is now envisaged within any NHP area.			

26	211	6.6.5 - Predicted outcome	"With the implementation of the avoidance and mitigation strategies outlined in section 6.6.4 and the Heritage Management Plan (Appendix K) it is not likely that the Proposal will cause the loss of one or more of the National Heritage values of the Dampier Archipelago (including Burrup Peninsula). • A Section 18 consent will be sought for any disturbance which cannot practicably be avoided to an Aboriginal heritage site. The Proponent will therefore ensure that the Heritage cultural values of the NHL Area are not degraded or damaged".	Not satisfied. Section 18 consent for disturbance to NHL sites (as would be the case in the northern NHL area, site C) may result in movement/degradation of rock art, and therefore may constitute degradation or damage to NHL values.
26	Perdaman Response: See response to Heritage Comment #6, #15, #16, #19, #21, #22 and #25 above. The Proponent reaffirms that through adaptive design, no salvage is now envisaged within any NHP area. The Proponent also notes that as reported by IHS (p50 and in Section 7.0) there are no previously recorded or previously unrecorded Aboriginal ethnographic sites within the Project area. This observation by IIHS covers the Project area that coincides with the NHP area. Therefore, the Project will not impact on either ethnographic or archaeological sites in the NHP area within the Development Envelope. See also response to Heritage Comment #6.			
27	211	6.6.5 (Predicted outcome)	"Access to significant cultural sites for the Traditional Owners will not be restricted by the Proposal. In November 2019, Perdaman and MAC concluded a confidential agreement covering a range of aspects related to the Perdaman fertiliser plant development and operation, including heritage aspects and broader community related matters. A joint statement by Perdaman and MAC in relation to this agreement on 27 November 2019 was reported in WA media."	Not satisfied. Information provided does not evidence how Traditional Owner access rights will be upheld and maintained. Heritage Branch does not have oversight of the Confidential Agreement. Statement of ongoing access, and access schedules to the NHL sites from TOs remains unclear.
27	Perdaman Response: See response to Heritage Comments #6, #24 and #26 The specific NHP site being referenced (site ID #9439) will not be within the Project lease area. Therefore, there will be no impact (change) to the current level of access rights for the Traditional Owners or any other member of the public. The Proponent also reaffirms that as discussed in the IHS report (p53) while site ID #9439 has sometimes been thought to be associated with the Fish Thalu Site, the Thalu site actually lies outside of the Project area and Development Envelope. This site does not form part of the NHP area. Being outside the Project area, the risk of direct impacts is low. In terms of potential impacts to the hydraulic regime on the tidal flats resulting from the project causeway between Sites C and F, the Proponent reaffirms that the hydraulic flow capacity of the causeway design is significantly greater that the hydraulic flow capacity currently installed under Burrup Road which lies between the Fish Thalu Site and King Bay. Thus, the current limitation for water flow into and out of the tidal flats, including the Fish Thalu site, is flowrate limited by the existing capacity of the Burrup Road culvert. This situation is not expected to materially change as a result of the causeway, now or in the future. The Proponent also notes that as identified in Recommendation 12 of the IHS report, the Yatha site at the south western corner of Site F is considered culturally significant for Traditional Owners. In line with the report discussion (p53) and recommendation relating to the Yatha site, in order to recognise and respect the cultural value attached to the Yatha site, the Proponent has removed the south western corner of Site F from its future lease area and Development Envelope. As noted previously, the Proponent has also advocated to the State that as part of the land assembly process for the Project, the State should consider implementation of the IHS Heritage Survey report recommendations in relation to providing secure long term access arrangements for the Traditional Custodians to i) NHP site #9439 including unimpeded connection to the realigned Hearson Cove Road, ii) the Yatha, and iii) the actual Fish Thalu site on the tidal flats to the east of the project Development Envelope. The proponent, supported by the State, believes as this redresses an impediment to the enjoyment of intrinsic cultural connection to country that this should be regarded as an action offsetting any potential impact in this regard from the Project. In this manner all decisions on what access is available, who it is available to and how it would be controlled would be wholly at MAC's discretion. Any shared boundary with Site F would have a fence suited to the usual requirements of an industrial site safety and access standards.			

28	211	6.6.5 (Predicted outcome)	"The Project's facilities will be consistent with existing and intended industrial character of the BSIA, and due to the topographic nature of the site there will be no significant impacts on the visual amenity of the NHL area."	Not in agreement. Visual amenity is not included in the NHL values so therefore cannot be assessed under NHL values as a controlling provision, however, proposal indicates that visual amenity (for example at Deep Gorge) will be impacted by development.

28

Perdaman Response:

Comment noted in relation to relevance to assessment of NHL values.

Notwithstanding that visual amenity is not included in the NHP values and therefore cannot be assessed, the position seems inconsistent with Australian Government's view, cited at ERD Section 6.6.1 (p209), where statements on Department's website for the National Heritage Place listing for Murujuga, explicitly recognise the merits and need to **protect both** the societal value attributed to industry alongside protecting the value attributed to heritage and conservation into the future, to the advantage of all Australians (see quote below and link http://www.environment.gov.au/heritage/places/national/dampier-archipelago).

"Pre-history meets the industrial age

The Dampier Archipelago is home to the most ancient works created by man, as well as a multi-billion-dollar resource industry.

The Archipelago is located near significant reserves of natural gas, petroleum and iron ore resources. Industries have already invested in excess of $35 billion in developments, while trade to and from the Dampier Port reached 88.9 million tonnes for 2003-04, making Dampier the second largest tonnage port in the country. The area has also created thousands of jobs.

A balance between heritage management and economic prosperity is being achieved through a collaborative partnership involving Indigenous groups, industry, governments and the community. Careful, long-term management of the Dampier Archipelago and Burrup Peninsula will see both our heritage and economy protected into the future, to the advantage of all Australians."

Perdaman further notes that the MRAS at Page 8 records

"The Western Australian Government considers that with appropriate management, industry and tourism can successfully co-exist with the cultural heritage and environmental values of the area. While it acknowledges that Traditional Owners have expressed a preference for new industry to be located where possible at the Maitland Strategic Industrial Area, the Western Australian Government is also cognisant of the commercial and logistical challenges in establishing certain industries away from key export infrastructure"

While it has been expressed that this government statement is not an endorsement of future development in the BSIA, the Proponent notes that the statement and position is compatible with the decision to grant the Project located in the BSIA MPFS by Federal Minister, the Honourable Karen Andrews MP on 13 March 2019.

The Proponent is advised by the Commonwealth's Major Projects Facilitation Agency that the decision followed broad consultation across Commonwealth agencies including

- Office of Northern Australia, Department of Industry, Science, Energy and Resources
- Australian Industry Participation Authority, Department of Industry, Science, Energy and Resources
- Office of the Chief Economist, Department of Industry, Science, Energy and Resources
- Resources, Department of Industry, Science, Energy and Resources
- Department of Agriculture and Water Resources (Now Department of Agriculture, Water and the Environment)
- Department of the Environment and Energy (Now Department of Agriculture, Water and the Environment)
- Department of Home Affairs (Import/Export, Customs, Biosecurity, Critical Infrastructure)
- Foreign Investment Review Board, Department of the Treasury

The Proponent also views that the quoted statement reflects a cornerstone requirement that future industry must embrace as a good neighbour striving for a balance between heritage management and economic prosperity which must be realised through a collaborative partnership involving Indigenous groups, industry, governments and the community. This is an operating mantra that the Proponent seeks to reinforce in its various corporate values and Project EMPs.

The Proponent considers the quoted statement from the ERD is not inconsistent with the above position expressed in the MRAS by the WA State Government, as well as by the Department and the Australian Government's policy position represented in the above statement as they clearly relate to Australian Government's recognition of the industrial character of the BSIA.

Relevantly to the compatibility with the above recognition of the regional character, the Proponent notes that the societal value of industrial enterprise to intergenerational equity is reflected in the WA Heritage Council Place Number 1266 listing on 3 July 2000 of Australia's North-West Shelf LNG Project as an Historic Site used for Industrial/manufacturing purposes with the Historical Theme – Occupations – Mining {including mineral processing}.

A comprehensive Landscape and Visual Impact Assessment is included in Appendix G and discussed in ERD Section4.9.3.2.

VP06 in the Landscape and Visual Impact Assessment in Appendix G specifically examines Ngajarli (Deep Gorge) see page 38. The level of impact identified at Ngajarlia (Deep Gorge) in Appendix G is minimal (Flare stack only is visible).

	Perdaman does not consider that level of visual impact to be significant and therefore is not incompatible with the above position expressed by the Department and the Australian Government's policy position represented in the above statement.			
29	247	7 – Environmental Offsets	"In addition, Perdaman and MAC have concluded a confidential agreement covering a comprehensive range of commercial, technical, heritage and social aspects. Under the agreement, both Perdaman and MAC will mutually explore enhancement opportunities for business, heritage as well as social and community benefits available as a result of the Project development. This will directly address any potential significant residual environmental impacts or risks of the project in relation to the environmental values of social surroundings especially relating to heritage values, cultural aspects and amenity, with those directly impacted by those potential residual outcomes though their traditional connection to country."	Feedback previously provided to proponent advising that confidential agreements may not be able to be considered as an offset under national environmental law. Proponent to note that offsets, under national environmental law, can only be applied for impacts from this proposal to matters of national environmental significance (MNES). The proponent has advised that this proposal will have minimal impacts on the NHL values. Given the undetermined nature of the potential impact to NHL values and the possible WH values, 'offsets' not appropriate as a default. If offsets were appropriate, a confidential agreement is not practical as an offset to the heritage values, as offsets need to improve the heritage values, and this improvement cannot be ascertained via a confidential agreement. The use of environmental offsets will not replace proper on-site environmental practices, such as avoidance and mitigation. For WA's environmental offset policy, please see here. For the Commonwealth's environmental offset policy, please see here.
29	Perdaman Response: The Proponent considers it is reasonable that a single offset for any single impacts should embraced across all levels of Government. It is unreasonable that inconsistent policy positions result in duplication of burden for separate offsets (State and Commonwealth) for the same potential impact. Multiple offsets across multiple levels of Government for a single potential impact, is also considered incompatible with the current strong position of the Australian Government recognising the value industrial development brings to prosperity and the delivery of social benefits at local, state and national levels. In this regard, the Proponent relevantly notes from the Commonwealth's policy Guideline *"6. be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action, see section 7.6)"* In terms of determining the materiality of impacts on NHP values, the proponent reaffirms the position put in ERD Section 6.6.5 (p 211) that there will be minimal impacts on the NHP. The Proponent considers that Attachment 1 herewith: Assessment Against Significant Impact Guidelines on the Dampier Archipelago (including Murujuga) National Heritage Place, further support that position. In this regard the Proponent notes that Gazette Notice No. S127 describes the values of the National Heritage Place. This description looks to affirm the heritage value of the rock art in the National Heritage Place, with particular emphasis on the: • weathering of the petroglyphs • history depicted in the petroglyph illustrations • diversity of the petroglyphs, including for example subject matter, spatial density, engraving techniques amongst other things • unique complexity of the illustrations on the petroglyphs • contribution that the illustrations on the petroglyphs have made to understanding Australia's cultural history • contribution that the illustrations on the petroglyphs have made to understanding Australia's natural history. Gazette Notice No. S127 also recognises the high density of standing stones, stone pits, and circular stone arrangements in the NHP, which contribute to the significance that the NHP has for Aboriginal cultural heritage.			

	The Proponent also notes that in the assessment of the merits of including the Dampier Archipelago (including the Burrup Peninsula) as a national heritage place, the National Heritage List database entry, citing 2006 work of McDonald and Veth, indicates that notwithstanding that 16.4square kilometre of the area was subject to high levels of impact from industrial development and activities such as construction of towns and work camps (this including substantial parts of Site F, some of Site C and parts of Crown Reserve R49121), the assessment concludes "*Despite this, the natural and cultural heritage in Dampier Archipelago and its surrounding waters is in good condition."* The Proponent also notes that notwithstanding the range and scale of industrial activity, particularly since the first implementation of the North West Shelf Project in 1975, associated with this clearing and the cumulative emissions to the airshed in that time, the assessment was able to reach this conclusion that the natural and cultural heritage associated with Murujuga is in good condition. Further, the Proponent notes that, as cited in the ERD (p 140) the EPA in its recent Inquiry under section 46 of the EP Act on the Yara Technical Ammonium Nitrate Production Facility, Burrup Peninsula, stated: *"In considering the above principle (sic the Precautionary Principle), the EPA has noted that there is currently no compelling scientific evidence which indicates that there is an immediate material threat of serious or irreversible damage to rock art from cumulative industrial air emissions within the Murujuga airshed. As the TANPF utilises contemporary best practice pollution control technology to minimise air emissions within the Murujuga airshed, the EPA considers that the risk of rock art being damaged due to the operation of the TANPF has also been minimised, whilst recognising the lack of full scientific certainty in regard to whether cumulative industrial air emissions within the Murujuga airshed are damaging rock art. On the above basis, the EPA considers that there is sufficient time for the monitoring and evaluation activities associated with the Murujuga Rock Art Monitoring Program to be undertaken and for definitive information in regard to whether cumulative industrial air emissions within the Murujuga airshed are adversely affecting rock art to be obtained." (EPA Report 1648, September 2019) "* The Proponent also notes that in Gazette Notice No. S127, the presence of superposition of later engraving over pre-existing is recognised. The relevance to research is noted. While this characteristic is valuable to understanding of chronology and evolution of artistic styles embodied in the engravings, it is equally useful as evidence that either natural processes or preindustrial anthropogenic processes have caused significant degradation to some petroglyphs. It is also potential evidence that Traditional Law may not consider universal preservation of engravings is essential where societal circumstances or values change and can be adapted. The proponent therefore considers that the ERD reasonably demonstrates that additional potential impacts from the Project, with clearing of no more that 73ha as indicated in ERD table ES-1 (p xiv), will not materially change (degrade) the NHP values or the condition and integrity as assessed at the time of listing of the place. In terms of uncertainty related to the potential for adverse effects on rock art from anthropogenic emissions, the Proponent reaffirms it commitment that as part of the implementation of the approved Project, it will be a contributing participant in the MRAS, including the EQMF being developed pursuant to MRAS and applicable regional ambient airshed monitoring, and as appropriate, targeted work where the proponent is the sole or principal source in the regional airshed. A specific response re offsets in attached as Appendix V herewith.			
30	1	Introduction	"Perdaman's goal is to construct and operate the urea production plant in a manner that will minimise the industrial footprint and the impact on National Heritage Values. During construction, indigenous monitors will be involved to ensure that Aboriginal heritage values within the site are protected and preserved or where disturbance is authorised, managed in accordance with such authorisations. All work in sensitive areas will be carried out strictly in accordance with any conditions imposed by the State Minister for Indigenous Affairs and the Federal Minister for Sustainability, Environment, Water, Population and Communities."	Amend to read Commonwealth 'Minister for the Environment', rather than 'Minister for Sustainability, Environment, Water, Population and Communities'.
30	Perdaman Response: Noted, but the ERD is not being amended. Ministerial responsibilities are likely to change on numerous occasions and the reference to a specific Minister is intended to reflect the relevant Minister of the day which has changed during the course of this EIA already. Future reference to Ministers will be expressed generically.			

31	1	Introduction	"In harmony with the MRAS and in-line with the Burra Charter (which largely underpins the MRAS), Perdaman recognises and values the richness of Aboriginal culture in the Murujuga, where Indigenous communities have lived for thousands of years."	Statement would increase accuracy if it indicated that the Burra Charter 'influences the protection and management of rock art', rather than underpins. The MRAS advises: "*Various other agreements also influence the protection and management of rock art on Murujuga.* *For example, Australia is a participant in the* *International Council on Monuments and Sites (ICOMOS), a non-governmental professional organisation closely linked to UNESCO (the United Nations Educational, Scientific and Cultural* *Organization), particularly in its role as UNESCO's principal adviser on cultural matters related to World Heritage. The Burra Charter, first adopted by the* *Australian National Committee of ICOMOS (Australia ICOMOS) in 1979 and updated in 2013,26 provides guidance on the conservation and management of all types of places of cultural significance in Australia*."
31	Perdaman Response: Noted the use of these statements from MRAS may be useful going forward as this charter matures as a living document. MAC has also provided feedback on potential ways to improve the charter. The Proponent understands that processes of stakeholder consultation and feedback is essential for this charter to be effective and relevant. As noted previously, consultation with MAC is ongoing with MAC in relation to the suitability and its endorsement.			
32	1	Introduction	"Perdaman has concluded an Agreement with MAC in relation to the Perdaman Urea Project (PUP) which covers a range of aspects of the development, including agreed management of heritage aspects."	Unclear which Agreement the proponent is referring to (possibly the Confidential Agreement)? Proponent requested to provide referenced Agreement so Department can review/understand the agreed management of heritage aspects.
32	Perdaman Response: The Proponent provided the agreement previously with confidential financial aspects redacted. See also response to Heritage Comment #18			

33	NA	Heritage Charter	"Perdaman Chemicals and Fertilisers Pty Ltd • Is committed to implementing for Project Destiny policies, procedures and actions that accord with the Burra Charter and harmonise with the West Australian government's Murujuga Rock Art Strategy. • Will engage with Murujuga Aboriginal Corporation (MAC) relevant stakeholder to o enhance its understanding of the heritage and cultural history, use and fabric of Murujuga; o identify and understand obligations relevant to its use of land at Murujuga; o identify and understand future needs and resources; o identify and understand constraints, including potential to practicably ameliorate these; o identify and understand opportunities, including potential to practicably avail of these. • Will develop and implement Heritage management plans, procedures and actions that are consistent with the above. • Will monitor the outcomes to review and revise these plans, procedures and actions where practicable to enhance heritage outcomes."	Proponent to consider inclusion of the Australian Government as a stakeholder in the development of Heritage management plans, specific to the NHL listed areas. Heritage Charter would be strengthened via the inclusion of NHL heritage listed values for which they are responsible for. Suggest addition to heritage charter of 'Perdaman to understand the National Heritage values of their listed place, observe the National Heritage management principles when preparing and implementing management plans and programs, and understand their responsibilities and obligations under the EPBC Act when operating within, near or adjacent to NHL areas'. Please refer to: Working Together: Managing National Heritage Places and Developing Management Plans.
33	Perdaman Response: See response to Heritage Comment #31 Noted as a stakeholder. The Heritage Charter is a living document and can be revised on the basis of this and other stakeholder feedback. When revising relevant documents, the Proponent will include the Australian Government as a stakeholder in the development of Aboriginal Heritage Management Plans, especially in relation to management of specific aspects relevant to NHP areas.			

General

ESD Requirement	Agency Advice	Discussion on draft ERD	Discussion on ERD
Comments from the Department on the draft Environmental Scoping Document (letter dated 9 May 2019) which were not included into the Final ESD.	Not Met	1. The Department request that the lifespan of the project is outlined within the ESD and subsequent descriptions in the ERD. 2. The ERD must include how the action relates to any other actions (of which the proponent should reasonably be aware) that have been, or are being, taken or that have been approved in the region affected by the action. 3. The ERD must include any feasible alternatives to the action to the extent reasonably practicable, including: a. if relevant, the alternative of taking no action;	1. The Department notes that the in the executive summary the proponent has stated a project life up to 80 years. This is satisfactory. 2. This is not obvious in the ERD. If included, please highlight. This should specifically relate to MNES. 3. The Department notes section 2.2 discusses alternatives, however not as they relate to MNES. Please include.

General

ESD Requirement	Agency Advice	Discussion on draft ERD	Discussion on ERD
		b. a comparative description of the impacts of each alternative on the triggered MNES protected by controlling provisions of Part 3 of the EPBC Act for the action; and c. sufficient detail to make clear why any alternative is preferred to another. Short, medium and long-term advantages and disadvantages of the options must be discussed. 4. The ERD must provide details of: a. the likely residual impact on MNES that are likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account: i. Include the reasons why avoidance or mitigation of impacts are not reasonably achieved; and ii. Identify any significant residual impacts on MNES 5. The ERD must include details of an offset package proposed to be implemented to compensate for any residual significant impact of the proposed action (if relevant), as well as an analysis about how the offset meets the requirements of the Department's *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy October 2012* (EPBC Act Offset Policy). This information should include an appropriate reference to the Offset Guide (i.e. offset calculator and justification of figures used in the calculation). 6. For the EPBC referral matters, provide an overall conclusion as to the environmental acceptability of the proposal on each MNES, including: a. discussion on the consideration with the requirements of the EPBC Act, including the objects of the EPBC Act, the principles of ecologically sustainable development and the precautionary principle; b. reasons justifying undertaking the proposal in the manner proposed, including the acceptability of the avoidance and mitigation measures; and c. if relevant, a discussion of residual impacts and any offsets and compensatory measures proposed or required for significant residual impacts on MNES, and the relative degree of compensation and acceptability.	4. The ERD does not identify the residual impacts as a result of the action or if any significant residual impacts will occur. This must be addressed for the Department to undertake an assessment. 5. This is not addressed. Note comments on the Pilbara Offset Fund above. 6. Not sufficiently addressed.

General

ESD Requirement	Agency Advice	Discussion on draft ERD	Discussion on ERD

Perdaman Response:

1. Noted
2. Other actions (of which the proponent should reasonably be aware) that have been, or are being, taken or that have been approved in the region affected by the action have been considered and are addressed.

- The AQ modelling and analysis has included other actions likely to impact MNES and cumulative aspects are discussed.
- The ERD Traffic Study considered analysis of traffic including that associated with existing approved actions plus the cumulative when combined with projected Project traffic during both construction and operation.
- The noise study has similarly addressed existing approved actions through ambient background noise monitoring at Ngajarli (Deep Gorge), Hearson Cove and at the Yarra Plant boundary.
- Adoption of a causeway considered cumulative traffic risks/impacts associated with the alternative use of Hearson Cove Rd/Burrup Rd for interconnection of Sites C & F

3. s3. of the WA EP Act defines:
   practicable "means reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current state of technical knowledge;"

   Perdaman also notes the MRAS also reflects and understanding of the application of practicable, where at page 11 the MRAS records:

   > *"Reasonable and practical' measures include those that are reasonably practicable, having regard to, among other things, local conditions and circumstances (including costs) and the current state of technical knowledge."*

   Thus. the term is used in this context.

   a. The no development option case is presented in section 2.2.3 on Page 9 of the ERD
   b. It is impracticable and unreasonable to expect discussion of MNES on alternatives that are demonstrated to be impracticable on higher level aspects ie the circumstances do not warrant additional cost to evaluate MNES when the option is excluded on other aspects already
   c. Perdaman is of the view that an appropriate level of detail is provided for options considered see Sections 2.2.3 and 2.2.4 of the ERD.

4. Residual impacts.
   - MHES
     - Listed Threatened Species & Communities see ERD Section 6.7 pp 211- 238 and Appendix B and response to comments above.
     - Listed migratory species – see ERD Section 6.8 pp 239-245 and Appendix B and response to comments above.
     - Commonwealth Marine Areas – see ERD section 6.9 P246
     - NHP areas – See ERD Section 6.6 pp 209-211 with further discussion now included in response to earlier specific comments. See ERD Section 6.6.5 Predicted outcomes(p211) discusses the level of residual impacts.

     The Proponent reaffirms the analysis of the level of resulting and residual impact presented in the ERD section 6.6.1 and provides the following in further support of that analysis.

     Direct impacts

     - Heritage & cultural
       - No direct impacts & thus not direct residual impacts.
         - Risk of physical direct impacts to sites is managed through
           - All project activities will occur on leases granted to the Proponent for the purposes of implementing the proposal
           - There will be no heritage sites within the project tenures where they coincide with NHP areas.
           - Project implementation will be in accordance with the Project EMP, GDP, AHMP. These plans and procedures will be applicable to all project activities in construction and operation across all the industrial footprint including the 300m conveyor section traversing the northern NHP area to the north-west of Site C.
       - Dust and other Site F usage impacts on NHP heritage site #9439 have potential for physical across the boundary deposition and impact.
         - These potential risks will principally arise during the construction phase, during operations Site F is principally used for administrative and support functions where dust and other usage impacts are anticipated to be minimal.
         - The potential impact risks are managed through the EMP, GDP, AHMP processes applicable to all project activities in construction and operation across all the industrial footprint

General

ESD Requirement	Agency Advice	Discussion on draft ERD	Discussion on ERD
	▪ potential indirect impacts to proximal NHP areas ○ Visual, the Proponents has considered this against the relevant State and Commonwealth government shared view that conservation management and industrial development are part of a shared social setting in this region. Thus, the visual amenity is of a balanced, blended cocktail, not one societal use to the exclusion of the other or hidden from the other. On that basis, there is no residual visual amenity impact. ○ Noise – noise study which has been reviewed by the DWER Noise Branch during review of the Draft ERD and considered robust, indicates this is not expected to be a material issue. ○ Air – see ERD discussion in Section 4.8 pp 138-181, Appendix D, Section 4.8.7 p180 and responses to Heritage Comments #1, #9 & #10 above. 5. Offsets: In line with the residual impacts discussion above offsets against each MNES are as follows: • Listed Threatened Species & Communities see ERD Section 6.7 pp 211- 238 and Appendix B and response to comments above. • Listed migratory species – see ERD Section 6.8 pp 239-245 and Appendix B and response to comments above. • Commonwealth Marine Areas – see ERD Section 6.9 p246 • NHP areas – nil significant residual impact, no offsets – see ERD Section 6.6.5 p211 and Section 4.8.7 p180 A specific consolidated response re offsets will be provided to the EPA under separate cover. 6. For each MNES the Proponent reaffirms ERD Section 6 (pp 205-246) A) EPBC discussion including precautionary principle. Risk weighted evaluation of potential environmental damage. B) Alternatives – Addressed - see ERD Section 2.2 pp7-21 C) Residual impacts and offsets – discussed above In relation to potential NHP impacts the Proponent includes at Attachment 1 herewith, an Assessment of Significant Impact Guidelines on the Dampier Archipelago (including Murujuga) National Heritage Place		
Not requested as part of the scoping document, but required by the Department in order to undertake an assessment of the proposed action.		**Environmental Offsets** The information must include details of an offset package proposed to be implemented to compensate for any residual significant impact of the project (if relevant), as well as an analysis about how the offset meets the requirements of the Department's *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy October 2012* (EPBC Act Offset Policy). This information should include an appropriate reference to the Offset Guide (i.e. offset calculator and justification of figures used in the calculation). In the event that offsets are proposed then the following should be addressed. • the type of offsets proposed • extent to which the proposed offset actions correlate to, and adequately compensate for, EPBC Act listed species • suitability of the location of any proposed offset site for EPBC Act listed species • conservation gain to be achieved by the offset i.e. positive • management strategies that improve the site or averting the future loss, degradation or damage of the protected matter	Environmental offsets are not addressed.

General

ESD Requirement	Agency Advice	Discussion on draft ERD	Discussion on ERD
		• time it will take to achieve the proposed conservation gain • level of certainty that the proposed offset will be successful • current land tenure of any proposed offset and the method of securing and managing the offset for the life of the impact. **Economic and Social Impacts** The economic and social impacts of the action, both positive and negative, must be analysed. Matters of interest may include: • details of any public consultation activities undertaken, and their outcomes; • projected economic costs and benefits of the project, including the basis for their estimation through cost/benefit analysis or similar studies; • employment opportunities expected to be generated by the project (including construction and operational phases). Economic and social impacts should be considered at the local, regional and national levels. Details of the relevant cost and benefits of alternative options to the proposed action, as identified in section 3 above, should also be included.	The Department notes that the economic and social impacts are included in sections 2.2.1.1 and 2.2.1.2.
	Perdaman Response: **Offsets:** A specific response re offsets in attached as RtS Appendix V herewith. **Economic and Social Impacts:** The Proponent notes, Heritage Branch recommends “strong encouragement” to undertake contemporary SIA rather than the approach currently adopted in the ERD. Perdaman reaffirms, based on feedback from other relevant high level Commonwealth and State Government Stakeholders and decision makers who have already assessed and accepted the considerable level and nature of social and economic ramifications of the project. Perdaman provides the MPFS application and submissions used by relevant Commonwealth Government decision makes to assessed and accepted the considerable level and nature of social and economic ramifications of the project. An updated Social Impact Assessment is provided at Attachment 4 to this RtS Appendix Q.		

DAWE General Comments:

As discussed on numerous occasions, the Department does not yet understand the level of impact likely to arise from this proposal and therefore is not in a position to undertake a comprehensive analysis of the proposed Mitigation, Management and Offsets given the acceptability of the project has not yet been established.

The Department yet to be clear on the extent and location of all clearing. Please provide detailed maps showing the areas which will be impacted by clearing and the type and quality of habitat within them. Please also identify other Matters of National Environmental Significance within or in close proximity to these areas, including National Heritage Place boundaries.

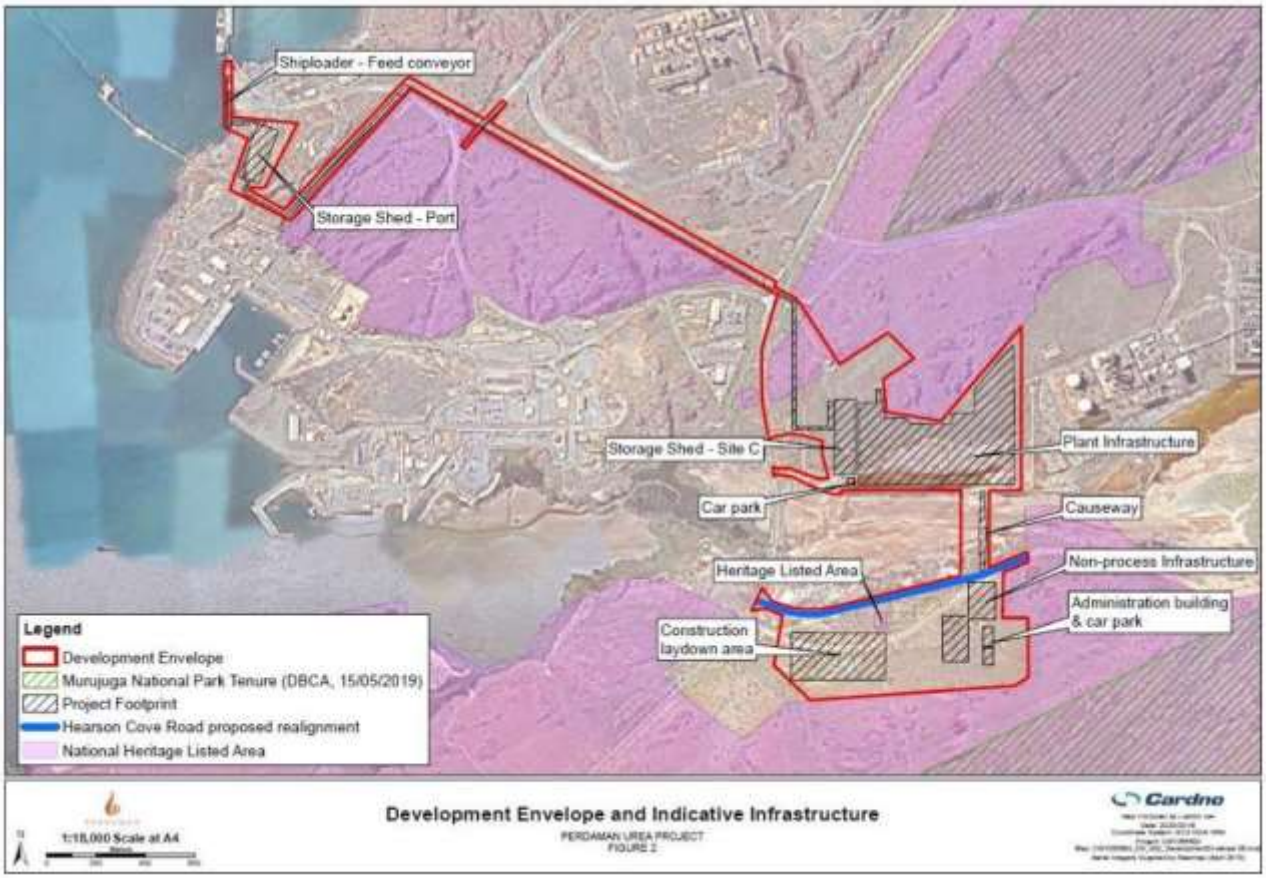
Perdaman Response:
The types of fauna habitats impacted and the area impacted is outlined in Table 1-1 above. other Matters of National Environmental Significance listed fauna habitats are shown in the Figure A (Appendix A). The quality of the habitats inside the Project Footprint is shown in ERD Section 4.5.3, Figure 4-10. National Heritage Listed area adjacent to the Project Development Envelope is depicted in ERD Section 4.9.3, Figure 4-24 and Figure 4-25. Precise clearing within the footprint are determined on the basis of “for construction” plans. The Project is not sufficiently mature to be able to provide information in this level of detail. In the ERD the Proponent has provided worst case estimates of footprints to be cleared. Information on habitat impacts is provided.

Heritage Specific Summary Comments:

These comments have been prepared by the Department’s Heritage Branch and provide a high-level summary of issues, a number of which have also been included above. The following comments should be read having regard to the issues raised in the table above.

Management and mitigation of impacts to two NHL sites within the project boundary:

- There are two NHL sites within the Perdaman project boundary – one smaller pocket south in Site F (smaller southern NHL site) and a larger pocket in the North West corner of Site C (larger NHL site).



- Noted in the Perdaman ERD, stakeholder feedback has identified concerns for the following heritage-specific impacts:
    - o desecration of National Heritage List (NHL) values
    - o values and reduction of integrity of the NHL site
    - o reduction of cultural access of Traditional Owners and general public to

    NHL values; and

    - o reduction of Traditional Owner connection to NHL values.

Perdaman Response:
The NHL area corresponding with mapped heritage site #9439 is comprehensively discussed. • desecration of National Heritage List (NHL) values – the site will be preserved in-situ • values and reduction of integrity of the NHL site – values and integrity of site will be maintained • reduction of cultural access of Traditional Owners and general public to NHP values; - current level of access is controlled by 1. Clause 8 of the BMIEA, Additional Deed Clause 8 where the State acknowledged and agreed to provide access to land in the Industrial Estate until it is subject to an interest granted or transferred by the State to another party, when it (the State) gives a direction limiting or prohibiting access to the land to enable development of the Industrial Estate or for reasons of safety; and 2. the status of the place as part of Crown Reserve R49120 for industrial purposes As the site will not form part of Perdaman's sublease of Site F, this status will be unchanged. and

- reduction of Traditional Owner connection to NHL values – the connection to NHL values will be unchanged as the site will remain in-situ and the status of accessibility as part of Crown Reserve R49120 will not change, Perdaman is committed to ensuring existing connection remains intact.

There is no NHP area within the Proponent's proposed lease area of Site C which is part of Crown Reserve R49120 for Industrial Use.

The proposed conveyor corridor to the west and north-west of Site C lies in Crown Reserve R49121 for Infrastructure. The proposed conveyor corridor will traverse the NHP area in this vicinity for approximately 300m.

- desecration of National Heritage values – no sites will be physically impacted as a result of adaptive design of the conveyor and the approach to constructability.
- values and reduction of integrity of the NHP site – values and integrity of site will be maintained consistent with the pre-existing purpose of the Crown Reserve at the time of NH listing. This is consistent with the Australian Government articulated position on the societal values associated with a balance of industrial prosperity and management of cultural heritage.
- reduction of cultural access of Traditional Owners and general public to NHP values; - current level of access is controlled by
    1. Clause 8 of the BMIEA, Additional Deed where the State acknowledged and agreed to provide access to land in the Industrial Estate until it is subject to an interest granted or transferred by the State to another party, when it (the State) gives a direction limiting or prohibiting access to the land to enable development of the Industrial Estate or for reasons of safety; and
    2. the status of the place as part of Crown Reserve R49120 for industrial purposes

    This access status will be unchanged.

    and
- reduction of Traditional Owner connection to NH values – the connection to NH values will be unchanged as no heritage sites will be physically impacted and the status of accessibility outside of the Project lease area as part of a Crown Reserve is unchanged.

- The proponent proposes management of impacts via:
    - heritage awareness training, implemented via inductions and a ground disturbance permit system before undertaking any ground-breaking activities
    - declaration of proponent's non-accountability for desecration by the general public
    - commitment to continued dialogue with MAC
    - execution of a confidential agreement between Perdaman and MAC
    - fencing of certain heritage sites at the commencement of construction to provide a physical separation from development activities, and
    - retention of Traditional Owner access to sites, under an agreed protocol.

Perdaman Response:

Perdaman notes that through its assessment, the WA Department of Planning, Lands and Heritage (DLPH), the proposed approach and mechanisms are considered relevant and appropriate.

Under the proposed mechanisms, each individual ground disturbing action would require a ground disturbing permit underpinned by a site-specific evaluation of the risks and site-specific processes and actions to address these. Perdaman considers these offer an approach that is appropriately targeted and focused on the relevant heritage outcomes.

- Heritage Branch considers the management strategies outlined by the proponent are insufficient in their current form and has specific concerns over the potential impacts specifically to the values of the NHL areas within the project boundary.

Perdaman Response:
Perdaman notes that this view is at odds with the WA DLPH in its submission on the ERD following review, including of the AHMP in Appendix K.

Management of the smaller southern NHL site in Site F:

- The proponent has advised there will be no disturbance to the smaller NHL site, however there will be infrastructure (e.g. office areas, and a construction laydown area) immediately adjacent to the NHL site.

- In previous engagements between the Department and Cardno (representative for the proponent, Perdaman), notably a teleconference on 6 February 2020, the proponent agreed to develop a specific management plan for this site. This approach was supported by Heritage Branch however such management plans have not yet been developed or provided as a part of the ERD documentation.

- The proponent advises (page 211, '6.6.5 National Heritage Place - Predicated outcome) '*The design and layout of the plant facility has taken into account the known location of heritage sites within the plant lease including the rectangular NHL area located near the northern boundary of Site F which has been excluded from the plant footprint and will be protected from any construction or operational impacts with a suitable buffer zone (in the order of 0.3 ha). Access to this site for Traditional Owners will be preserved*.'

- Whilst Heritage Branch is in support of this approach, a specific management plan for the NHL sites is preferable so the Department can best understand how the site will be protected from construction or operational impacts.

Perdaman Response:
The Proponent reaffirms that no heritage sites within Site F will be impacted by the proposed development. This site-specific plan is being developed as part of consultation with MAC as indicated previously. See the revised AHMP in Appendix U to this Response to Submissions for more detail of the current outcomes of that consultation. ERD Figure 7 in ERD Appendix A show the extent of activity in Site F. This figure shows a perimeter stormwater ditch (drain) will be constructed to the east of, and approximately 1 m below, the NHL site with a buffer of approximately 10m from the NHL boundary which is itself some distance from Site ID 9439. Site ID 9439 is also located on an elevated rocky outcrop which of itself serves to protect the site from accidental incursion by vehicles. As the contours in this figure show, this drain approximately follows the current land profile and is located to the west and above the eastern portion of Site F where relatively unstable scree material will be won to provide additional fill material to Site C and at the same time providing the flat, level, stable site above the normal flood zone for the infrastructure noted above and shown on the figure. This means that to the east of the drain, there will be a batter down to the levelled laydown area as shown in ERD Figure 7. Thus between areas where laydown is planned, the batter, the ditch and the natural rock outcrop provide barriers to accidental incursions from site F to the NHL place and Site ID 9439. To the west of the NHL site, the construction laydown use, does not require the similar extent of removal, levelling and engineering of the scree material. In this portion of Site F, site preparation for

construction laydown will comprise clearing and grubbing with smoothing of the existing surface and only minor levelling requirements.

Perdaman has obtained in principal approval from the State to secure long term direct lease for MAC to this site as well as other cultural sites to MAC. Subject to approval of the Perdaman project.

Therefore, the NHL area will be an external land holding to Site F and will be managed as a neighbouring land parcel in consultation with MAC, which will be the long-term tenure holder for the NHL site as part of the approved project land assembly program to be undertaken by the WA government.

As the perimeter of the lease of Site F will be fenced to ensure project security, all project activities on Site F will be physical constrained within that perimeter fence and thus physically separated from the NHL place.

Management of the larger northern NHL site in Site C:

- This NHL site is not mentioned in the ERD as a 'receiving environment' (p. 181, Environmental Review Document). The only NHL areas identified in the 'receiving environment' is the small rectangular NHL designation area, and the adjacent NHL areas to site C and F on their northern and southern/eastern boundaries respectively.

- The first mention of the second larger site is on page 209 of the ERD (6.6.1 - National Heritage Place). Cardno advises 'the conveyor moving product from Site C and connecting to the East-west Service Corridor (EWSC) passes through part of the NHL area'.

- The proponent further advises (page 210 – 6.6.3 – Assessment of Impacts):

'*With respect to the conveyor connection between site C and the EWSC passes through NHL area to the northwest of Site C the following;*

  - *Flora, Fauna, Noise and Air Quality surveys/studies informing this ERD all cover this area. (see Appendices B, D and F and Sections 4.5, 4.6, 4.8 and 4.9);*
  - *The confidential Heritage Survey executed through MAC on behalf of JTSI also covers this area and has been used to inform this Project designs and the ERD;*
  - *It is noted that the heritage surveying identified two sites in the NHL area within the preferred conveyor corridor where this traverses the NHL area; and*
  - *The proponent has initiated discussions with MAC on the management of potential impacts on those sites as well as the four identified sites within Site C that it may be impracticable to avoid.*
  - *If it is impracticable to avoid these sites, a s.18 consent to take the sites may be sought pursuant to processes outline in Section*

    4.9.4 and the Aboriginal Heritage Management Plan (AHMP).

- The proponent identifies within the ERD that two heritage sites have been identified within this NHL area, via the Integrated Heritage Services surveys (Heritage Branch does not have oversight of this report, refer to point 4). The proponent advises that these two sites may be moved/salvaged under a section 18 consent (under the WA Aboriginal Heritage Act 1972), if they

are deemed impractical to avoid for the project's conveyer connection to the port. The proponent has advised they are engaging with MAC on the management of these sites within the NHL, area however have not included Heritage Branch or the broader Department in these conversations to date. Whilst Heritage Branch encourages the inclusion of MAC as representatives of the Traditional Owners in this discussion, there remain requirements, for example referring specific actions which may result in impact under the Environment Protection and Biodiversity Conservation Act 1999, which the proponent must adhere to however, has not noted within the ERD.

- Heritage Branch has concern with the proponent's approach to management of this site for the following reasons
    - there is little to no detail on what salvage may occur, and the management of the heritage sites following salvage (i.e. will the sites be moved under the guidance of TOs? Will the sites be destroyed?), giving no assurance that the NHL values in this site will not be damaged or destroyed
    - Section 18 consent, under the *WA Aboriginal Heritage Act 1972*, does not provide approval for disturbance or impact to NHL sites under the *Environment Protection and Biodiversity Conservation Act 1999*
    - Section 18 approval, under the *WA Aboriginal Heritage Act 1972*, does not constitute a guarantee that the NHL values of the NHL area are not degraded or damaged
    - Heritage Branch considers that actions under Section 18 approval could result in degradation and impact to National Heritage values listed under the *Environment Protection and Biodiversity Conservation Act 1999*, and
    - if a heritage site within an NHL area is approved under Section 18 consent and approval for disturbance, a referral must still be made under the *Environment Protection and Biodiversity Conservation Act 1999.* Approval under S.18 of the *WA Aboriginal Heritage Act 1972* does not constitute approval or remove the requirement for the proponent to refer actions (that are not articulated effectively in this ERD) that may have significant impact to the NHL place, under the *Environment Protection and Biodiversity Conservation Act 1999.*

- A key concern is the lack of information provided by the proponent to provide clarity for this particular action (activities within and adjacent to the preferred conveyor corridor). It remains uncertain whether S.18 consent will or will not be sought, whether salvage is intended and brings into question whether the proponent will meet their responsibilities under the Environment Protection and Biodiversity Conservation Act 1999 to the two NHL heritage sites. For Heritage Branch to comment on the potential impact to the values of the NHL area, the proponent must be explicit about the proposed activities and proposed management, mitigation and avoidance. This is not effectively articulated by the proponent.

Perdaman Response:
See response to Comment #6. Also see further discussion below. The northern part of the original Site C that is coincident with the NHP area south of Village Road does not form part of the Development Envelope or Project Footprint. The Proponent advises that no NHP sites in that portion the original Site C will be physically impacted and there will be no changes to current access or amenity in that part of the NHP area.

While approximately 300m of the project conveyor route traverses a part of Crown Reserve for Infrastructure R49121 where it is coincident with the NHP area, the Proponent reaffirms that no NHP heritage sites will be part of the project leases sought from the State.

Therefore, the Proponent will have no access right that cover any NHP sites and confirms that it will not seek any approval pursuant to s.18 of the WA AHA for salvage of any NHP heritage site.

In terms of impacts to NHP areas in proximity to the Project, the Proponent's project execution plans focus on ensuring all project activities only take place on land to which Perdaman has a legal right of access ie

- within leases sought from the State within the Crown Reserves;
- in the E-W multiuser service corridor and
- within the PPA port precinct.

As those areas do not cover any identified NHP heritage sites, this is a primary protective measure to mitigate against the risk of physical interaction, and thus impact to NHP heritage sites. Other measures are secondary to augment and enhance this primary risk control measure.

In terms of potential for loss of access "impacts", the Proponent reaffirms that the Project will not change NHP area access.

During any assessment of potential impacts to access and amenity that is reliant on a right of access, the Proponent considers this should be benchmarked against the current statutory rights of access for relevant parties. In that regard the Proponent reaffirms it understanding that

- as recognised by MAC on its webpage,

  "The three Contracting Parties (comprising the Ngarluma-Yindjibarndi, Wong-Goo-Tt-Oo, and Yaburara Mardudhunera) received land entitlements and financial benefits as compensation for surrendering their native title rights and interests, and discontinuing their Native Title Determination Applications in the Federal Court, over the land and waters of the Burrup."
- subsequently the Federal Court found that native title does not exist on the Burrup Peninsula,
- within the BSIA which comprises Crown Reserves for Industry (R49120) and for Industry Infrastructure (R49121), and pursuant to the statutory provisions of the Land Administration Act (LAA) there is not a current statutory right of unfettered access to the land that will be utilised by the Project, however
- pursuant to Clause 8 of the BMIEA, Additional Agreement, the State acknowledged and agreed to provide access for the Contracting Parties to land in the Industrial Estate until it is subject to an interest granted or transferred by the State to another party, when it (the State) gives a direction limiting or prohibiting access to the land to enable development of the Industrial Estate or for reasons of safety;

This current status will not change. Through its liaison with the Murujuga Traditional Custodians, the Proponent observed that the above may already statutorily impede enjoyment of connection to country pursuant to Traditional lore where that connection relies on permanent unimpeded access. This potential impediment is reflected both in comments made to the Proponent by Traditional Custodians during consultation as well as in several recommendations in the IHS Heritage Survey report. The Proponent has approached the State in relation to the State's preparedness to consider these relevant IHS Report recommendations relating to access arrangements which facilitate Traditional lore connection to country.

Therefore, there is no impact attributable to the Project in relation to enjoyment of traditional access or amenity where the contracting parties previously agreed and acknowledged a potential to limit or prohibit access to the extent reasonably required to enable development of the Industrial Estate or for reasons of safety and be compensated for through BMIEA mechanisms.

The Proponent therefore agrees with the MAC's position that agreement concluded to address prescribed BMIEA aspects should not be considered for the purpose of offsets for the prescriptive BMIEA requirements. However, as the Agreement covers aspects not prescriptively identified

under the BMIEA, but which may redress potential impacts attributable to its development, these may be relevant as offsets directly linked to impacts on a like for like basis.

A specific response re offsets in attached as Appendix V herewith.

While the long-term location of access to Hearson Cove and Ngajarli will be relocated to the gazetted road reserve, public access will be maintained comparable to that currently available. Thus, access to NHP areas which are also part of Murujuga National Park in this area will be unchanged.

Access to the northern parts of the NHP area comprising Murujuga National Park, ie those parts north of Village Road will also not change due to the Project.

Inclusion and incorporation of the Murujuga Rock Art Strategy into the ERD:

- Heritage Branch remains partially satisfied in how the proponent has incorporated the Murujuga Rock Art Strategy (MRAS) and monitoring program into its ERD management/mitigation strategy.

- Whilst acknowledging the proponent notes their participation in the MRAS process, Heritage Branch would prefer for the proponent to commit to 'adjust/scale/modify emissions with baseline data/emissions thresholds defined and established in the MRAS and monitoring program'. As acknowledged at the recent Murujuga Rock Art Monitoring Program Stakeholder Workshop held 7 May 2020, the threshold,

i.e. the acceptable level of pollution, is yet to be determined. It is anticipated that the MRAS and associated monitoring program and EMFQ will be able to clearly determine levels that would cause concern. Puliyapang, the successful tenderer to deliver the MRAS and monitoring program, has advised that initial data sets would not be determined until Q2 or Q3 2021, at the earliest. The proponent's full engagement, participation, and commitment to implement the findings of the MRAS and monitoring program, is critical to Heritage Branch's satisfaction with the proponent's response.

- The precautionary principle is designed to provide a framework for the Australian Government to set preventive policies where existing science is incomplete or where no consensus exists regarding a threat. In the case of the Perdaman proposal, the precautionary principle is critical. Without robust scientific data to answer the question of 'does proximal industrial activity have a significant impact on the nearby NHL values', the proponent must include flexible and adjustable clauses in the ERD/its conditions of construction and operation so there is a requirement to scale emissions/pollution outputs, once the threshold can be defined and set.

- Clarification of language is also requested in reference to the MRAS. Proponent uses language such as 'best practical endeavours' to align their operations with the findings of the rock art monitoring program. It is requested the proponent define the scope of 'best practical endeavours.

Perdaman Response:

The Proponent considers it commitment in the ERD is in line with the principles underpinning MRAS where all stakeholders explore an appropriately balanced way forward.

The Proponent is interested to note the quoted position in relation to an expectation from the recent Murujuga Rock Art Monitoring Program Stakeholder Workshop held 7 May 2020 of being able to "clearly determine levels that would cause concern".

However, as this workshop was held after the release of the ERD, it is unreasonable to expect the position of that workshop to be reflected in the ERD.

If this expectation is met, this will provide significantly greater clarity for all parties.

As indicated in ERD Section 6.6.1 (p209), the Proponent considers its approach also reflects the Australian Government position articulated on the NHP webpage relating to Murujuga which recognises the societal value attributed to industry alongside heritage (see quote below and link http://www.environment.gov.au/heritage/places/national/dampier-archipelago).

"Pre-history meets the industrial age

The Dampier Archipelago is home to the most ancient works created by man, as well as a multi-billion-dollar resource industry.

The Archipelago is located near significant reserves of natural gas, petroleum and iron ore resources. Industries have already invested in excess of $35 billion in developments, while trade to and from the Dampier Port reached 88.9 million tonnes for 2003-04, making Dampier the second largest tonnage port in the country. The area has also created thousands of jobs.

A balance between heritage management and economic prosperity is being achieved through a collaborative partnership involving Indigenous groups, industry, governments and the community. Careful, long-term management of the Dampier Archipelago and Burrup Peninsula will see both our heritage and economy protected into the future, to the advantage of all Australians."

The s.3 of the WA EP Act acknowledges and defines practicability which embraces the concept of reasonableness and a range of considerations including costs.

The Proponent does not consider beyond no-regrets requirements and imposition of limits or conditions without contestability or rights of appeal to be reasonable or potentially practicable.

Assurances that urea and ammonia (key outputs from the plant's operations) will have minimal impact on the rock art and NHL values:

- It is preferred that the proponent note evidence is inconclusive regarding the impact of anthropogenic emissions on the rock art (including by-products such as urea and ammonia). It is the Heritage Branch's preference that the proponent note their mitigation strategy for the acceptable limit of emissions output for the project will be amended in line with the future findings of the Murujuga Rock Art Strategy and monitoring program implementation.

Perdaman Response:

Attachment 1 below provides an evaluation by the Proponent against the Significant Impact Guidelines on the Dampier Archipelago (including Murujuga) National Heritage Place.

The Proponent is engaged with consultants with significant knowledge and experience in relation to these aspects. The consultants are currently working closely with MAC to monitor potential observable impacts to rock art from anthropogenic emissions and well as examining hypothetical longer term pathways for impacts, such as via microbial activity or changes to microbial activity.

The Proponent is also drawing on recent outcomes and analysis of monitoring for the purposes of rock art integrity evaluation that is required pursuant to EPBC Act Approval 2008/4546. As this work is conducted for compliance with an EPBC approval condition whose purpose is clearly to address the potential uncertainty of the risk posed by anthropogenic emission to the integrity of rock art, it must be regarded as being "fit for purpose" to address that objective.

If the observation based scientific works based on the requirements for such work under an EPBC Approval condition does not identify impacts that are hypothesised by some, this is not necessarily materially "inconclusive" evidence.

Thus, this monitoring, targeted at enhancing the understanding of potential detrimental impacts to rock art integrity from anthropogenic emissions, is an important element of a risk weighted application of the Precautionary Principle in this aspect.

Access to the Integrated Heritage Services (IHS) heritage surveys and impact assessment:

- The proponent has not yet provided Heritage Branch with the report and surveys undertaken by Integrated Heritage Services (IHS).

- As noted by the proponent '*the outcomes of the Aboriginal Cultural Heritage Surveys are presented in a confidential report (IHS, 2019) which formed the basis of the impact assessment and mitigation measures presented in the Sections below. The IHS report describes and maps a total of 60 Heritage Places'* (4.9.5.2 – Assessment of Impacts - Aboriginal Heritage - 189).

- This report has been requested by the Department on previous occasions (email correspondence outlining requests can be provided on request). Whilst noting there may be sensitive information (either gender sensitive, or culturally sensitive) in the report, gaining oversight of a redacted version of the report is critical to understand the proponent's methodology for mitigation and management of impacts to the heritage areas, especially within the NHL area.

- It is further noted by the proponent that *'the IHS report notes that the petroglyphs are of high significance to the senior traditional owners and it would be culturally inappropriate in Traditional Law, that any rock art sites can be moved or disturbed. Accordingly, it is the first recommendation and preference of the Traditional Owners that best efforts are made to ensure all Aboriginal cultural heritage sites are protected in situ. Further, the IHS report states if future disturbance or damage to an Aboriginal heritage site is unavoidable, then Section 18 consent under the AHA should be sought'* (4.9.5.2 – Assessment of Impacts - Aboriginal Heritage - 189). Two NHL sites are within the project area, and therefore it is critical to have oversight of the report that has informed the ERD methodology.

Perdaman Response:
As previously advised in response to earlier requests, the report was provided to Perdaman on a confidential basis (pursuant to Clause 19 of the BMIEA) and it was therefore not at liberty to pass on without confirmation that the same confidentiality would be honoured by the Department. The report custodian again agreed to allow the report to be provided on a confidential basis. Perdaman facilitated Departmental access to download the report on that basis. It is advised by the report custodian that the Department has downloaded the report and therefore is taken to have accepted the confidentiality terms required by the report custodian.

MAC and Circle of Elders endorsement of the Integrated Heritage Services (IHS) report:

- Proponent advises that MAC and Circle of Elders have endorsed the IHS report and have agreed to the proposal to the Section 18 consent and salvage on three high significance heritage sites in Site F. The Heritage Branch has not seen evidence of this agreement. It remains unclear whether the Circle of Elders have agreed to the proposal to seek Section 18 consent and salvage for the two heritage deposits in the NHL area in Site C.

- Given the importance of the agreement of Traditional Owners on matters of economic development that can occur through s.18 consent and approval, and potential cultural heritage salvage, the proponent is requested to provide evidence of this claim. This would enable the Department to understand/assess the salvage methodology, have assurance of Traditional Owner agreement, and provide assurance that all possible avoidance to NHL sites have been considered. Regardless, Heritage Branch will have a view on the potential impact to National Heritage values.

Perdaman Response:

Perdaman considers that the processes, procedures and mechanisms outlined in the AHMP in Appendix K provide an appropriate framework to achieve that outcome.

Perdaman also advises that amendment of the relocation of Hearson Cove Road to the northern gazetted alignment, avoids potential impacts that may have arisen if the road was relocated to the original proposed location at the southern edge of Site F in close proximity to the NHP area in that vicinity.

In terms of Heritage sites within Site C, while Perdaman acknowledges the Traditional Owners' first preference for in-situ preservation, it also notes that the Circle of Elders has endorsed

> *"If future disturbance or damage to the site is absolutely unavoidable, then Section 18 consent under the AHA should be sought under the recommendations that:*
>
> *• A detailed salvage assessment be undertaken to produce a plan for each physical component of the site requiring salvage;*
>
> *• Consultation and agreement be made with MAC to delineate a suitable area for relocated heritage items;*
>
> *• The salvage works are undertaken under the guidance of senior male traditional owner monitors and a qualified and experienced archaeologist."*

as specifically noted in the IHS report for the relevant sites on pages 144, 150, 178 and 203.

Heritage deposit salvage and removal under Section 18 of the WA Aboriginal Heritage Act 1972:

- The proponent has advised that there are three high significance heritage sites (non-NHL listed) that have been earmarked for Section 18 (WA Aboriginal Heritage Act 1972) salvage and movement in both Site F (southern site). In addition, the proponent has advised of two heritage deposits within the larger northern NHL site in project site C for which they may seek Section 18 consent for salvage. Please refer to response to point 1 - consent under section 18 of the *WA Aboriginal Heritage Act 1972* does not replace the need for assessment and approval of actions under the EPBC Act.

- As noted in the ERD, the recommendation provided by the Traditional Owners is for the heritage deposits to remain in situ. Proponent is requested to provide evidence that alternatives have been considered in accordance with Traditional Owner preferences.

Perdaman Response:

There are several heritage sites noted inside Site F as indicated in ERD table 4-45.

The Proponent notes that only site ID 9439 is in an NHP area. No other identified sites within Site F are within an NHP area. As noted earlier, the NHL place and an access corridor connecting this place to the realigned Hearson Cove road will be excluded from the project lease of Site F and the WA Government has indicated that as part of the land assembly process for an approved Perdaman project, long term secure tenure to those lands will be provided to MAC.

The specific protection measures for each site are also being discussed as part of this liaison. The proponent acknowledges and respects MAC's desire to avoid a protective outcome that replicates the historic "Woodside Compound" fenced area. This is an ongoing dialogue and the measures will be designed then finalised with MAC during the detailed design and construction planning ahead of the commencement of construction

Where sites were noted during the IHS work as potentially lying within the proposed preferred conveyor corridor option, as foreshadowed in the ERD Section 6.6.3 (p209), the conveyor design and constructability have been reviewed then revised to avoid impacts. In addition, as part of the

current ongoing dialogue with MAC, an alternative conveyor route/alignment/design is being reviewed within the Development Envelope.

The conceptual initially preferred proposed conveyor corridor in Crown Reserve for Infrastructure R49121 includes approximately <300m where it traverses the northern NHP area. A number of heritage sites were potentially going to be impacted under this design iteration. In consultation with MAC redesign work was undertaken resulting in an alternative, optimised, alignment and configuration. The results of this are that no sites will be impacted.

In terms of Heritage sites within Site C, Perdaman reaffirms that while it acknowledges and respects the Traditional Owners' first preference for in-situ preservation, it also notes that the Circle of Elders has endorsed the salvage of three heritage sites (Site ID 19239, 19874 and 18615) in line with the processes endorsed in the IHS heritage report ie

> *"If future disturbance or damage to the site is absolutely unavoidable, then Section 18 consent under the AHA should be sought under the recommendations that:*
>
> *• A detailed salvage assessment be undertaken to produce a plan for each physical component of the site requiring salvage;*
>
> *• Consultation and agreement be made with MAC to delineate a suitable area for relocated heritage items;*
>
> *• The salvage works are undertaken under the guidance of senior male traditional owner monitors and a qualified and experienced archaeologist."*

Perdaman reaffirms that these sites are not within an NHP area.

MAC's letter consenting to grant of s18 following extensive further liaison is included as Attachment E in the revised AHMP included in Appendix U of this RtS.

Relevant social impact assessment:

- Heritage Branch has twice requested the proponent to conduct a contemporary, and geographically relevant social impact assessment. Proponent continues to rely on the 2010 'Collie Coal-to-Urea Project' analysis as a referenced social impact assessment.

- Heritage Branch notes that Collie is located 60 kilometres from Bunbury and 200 kilometres from Perth in the South West of Western Australia. Heritage Branch does not consider the 2010 'Collie Coal-to-Urea Project' analysis satisfactory to form the basis of a social impact assessment for this proposed action.

- To illustrate the difference between the Collie community and the Roebourne community (where the Traditional Owners of the National Heritage listed place mostly reside), according to the 2016 Census:

  (https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2006/quickstat/036)

  - In Collie - the most common ancestries were Australian 34.9%, English 29.5%,Scottish 6.4%, Irish 6.1% and Italian 3.7%.

  - In Collie - 87.8% of people only spoke English at home. Other languages spoken at home included Italian 0.7%, Polish 0.3%, Vietnamese 0.2%, Mandarin 0.2% and German 0.2%.

  - In Roebourne - the most common ancestries were Australian Aboriginal 30.1%, Australian 26.4%, English 11.6%, Irish 2.3% and Scottish 1.8%.

  - In Roebourne - 38.9% of people only spoke English at home. Other languages spoken at home included Yindjibarndi 26.8%, Ngarluma 1.3%, Banyjima 1.1%, Martu Wangka 0.5% and Maori (New Zealand) 0.5%.

- The proponent is using Major Project Status, and the 2010 Collie assessment to justify the claim that 'overall social impacts of the Project are expected to be positive'. Heritage Branch considers that the proponent should be strongly encouraged to undertake a contemporary social impact assessment relevant to the Karratha/Dampier/Roebourne area, to justify this claim.

Perdaman Response:
Perdaman notes the strong encouragement. The Project MPFS application and supporting material which was considered to relevantly demonstrate social and economic benefits of sufficient national merit is Attachment 2 herewith. An updated Social Impact Assessment is provided at Attachment 4.

Indigenous participation in the ERD public review process:

- Given COVID19 restrictions on public gatherings, Heritage Branch is concerned that the ERD public review timelines may not have allowed for adequate Traditional Owner consultation, engagement and consent to the proposal. Heritage Branch has raised this with Mr Peter Jeffries, CEO Murujuga Aboriginal Corporation, and awaits a response.

- It would be appreciated if proponent could outline how they have mitigated against accessibility disadvantages faced by the local community in having access and appropriate opportunity to responding to the ERD in the current COVID19 environment.

Perdaman Response:
MAC provided a comprehensive submission to the WA EPA in response to the request for public review. This indicates that this comment does not reflect the actual circumstances. Perdaman is working with MAC to address the aspects raised in its submission.

<u>Threatened Species Management Plan:</u>

- States that the plan will be reviewed and updated as necessary throughout the construction, operation and decommissioning phases of the project. This plan will require approval noting the Department supports adaptive management to benefit species.

- States that a survey undertaken by Pendoley Environmental in 2006 determined that Holden Beach located approximately 1.5km northeast of the Project's Port area, did not support a major green or flatback sea turtle nesting rookery, though evidence of flatback turtles was recorded. The Department considers that nesting beaches within the region may still be of some significance even if activity levels are low. The Department would also prefer more up to date information be provided about Holden Beach, turtle activity on that beach and potential impacts to the species or species habitat, noting that a 2006 survey may no longer be accurate.

- The plan suggests that light spill and other direct interference of the coastal rocky habitat is not expected to have any impact on protected sea turtles, given that there is such a low level of nesting activity within the bay north of this site, and that the bay present just southwest appears to be of poor habitat quality and too small to be of value to turtles (based on dated surveys). According to the documentation it is unlikely either flatback or green turtles are, or have been, using the bay adjacent to the Project area for nesting. Given the evidence which has been provided to date the Department is not comfortable in accepting this assertion.

- The Threatened Species Management Plan continues to use terminology of 'where possible/practical', 'it is anticipated', 'as required', 'should' or 'may'. The Department requires that the proponent makes commitments to management actions using terms such as terms "will" and "must" or it is unlikely that this plan will be approved.

- As mentioned above, when reviewing Environment Management Plans/Action Plans, the Department will take into consideration the Department's *Environmental Management Plan Guidelines* (2014) (Guidelines) available at http://www.environment.gov.au/epbc/publications/environmental-management-plan-guidelines which provides general guidance to stakeholders preparing environmental management plans for environmental impact assessments and approvals under Chapter 4 of the EPBC Act. Please ensure the Threatened Species Management Plan is consistent with the Guidelines. At this stage, the Department considers that the Threatened Species Management Plan is not consistent with the Guidelines. Specifically, many of the mitigation measures referenced in the Threatened Species Management Plan are not measurable, auditable or timely.

- Does not outline what the impact to Threatened Species is, for example, how much habitat is going to be impacted (in ha).

- Section 6 Fauna Habitat should include a table which breaks down the amount of habitat types (in ha) within the development envelope comparable to the amount of habitat types (in ha) which will be impacted as a result of the action.

- Table 7-1 notes construction disturbance, rehabilitation after construction and operational footprint. The Department requires the impact area to be specified when providing ha amounts. Rehabilitation, while beneficial, does not account for lag time and it is the Department's understanding that rehabilitation will not use endemic species. Alternatively, if it does, the Department considers the information provided does not sufficiently account for the fact endemic species are particularly slow growing.

- Changes to water quality (Table 8-1) relates to MUBRL. If MUBRL facilities are not included in the scope of works considered under this assessment, this should be made clear in Table 8-1.

- Changes to water quality (Table 8-1) states '*Where practicable avoid the use of larvicides and adulticides for chemical control of mosquitoes in on-site storage ponds. Should larvicide or adulticide be applied, Perdaman shall develop a management plan to ensure the protection of native fauna'*. The Department requires more information on this matter, including but not limited to, what permits will be sought to facilitate the application of larvicides and adulticides and what are the criteria for use.

- Section 10 touches on the impact area for MNES (4.29 ha of rocky outcrop), however this is considered to constitute only part of the species habitat. Please review the policy and guidance documents and update the impact areas accordingly.

- Section 10 states '*There are no proposed impacts to key ecological features or protected places of the Commonwealth Marine Areas CMA). Hence, it is not likely that the Project will have a significant impact on the environment in the CMA*'. This is not justified as the Department remains unconvinced that no impacts to turtles as a result of the proposed action are likely to occur.

- Section 10 states *'The assessment of potential impacts on Matters of National Environmental Significance (MNES), including threatened species, demonstrates that the Project will not represent a significant risk to these MNES. The surveys and studies undertaken provide sufficient information to form the basis of the impact assessment. The implementation of the mitigation measures described above will ensure any identified environmental impact is avoided or*

appropriately mitigated such that they are not significant'. This is inaccurate. The Department is still unsure of the level of impact.

- Section 13 notes that 'major environmental incidents' such as offsite discharge of contaminates into the environment will be reported to relevant agencies. The Department notes that any instances whereby a MNES is impacted outside the scope of approval must be formally reported.

Perdaman Response:
Recent consultation with Kellie Pendoley, who completed the 2006 marine turtle surveys at the Holden Beach, revealed that she conducted a more recent marine turtle surveys at the Holden Beach on behalf of Woodside in 2018. The Proponent will request access to this report and undertake a comparison assessment of the recent data. The Proponent views these comments are appropriate and useful element of stakeholder feedback to be considered for integration into the next revision of the Threatened Species Management Plan, along with other feedback from stakeholders.

The Fauna Management Plan is a broader version of the Threatened Species Management Plan. That is, it encompasses species not protected under the EPBC Act in addition to relevant MNES. The Department questions whether both documents are needed or if they could be made into one. However, the comments above for the Threatened Species Management Plan remain the same for this document.

Perdaman Response:
The proponent views the Fauna Management Plan as the overarching plan, where the Threatened Species Management Plan includes specific targeted management and mitigation for Federally listed threatened species. The proponent intends to keep these documents separate as it facilitates more efficient and adaptive revision to maintain currency of applicability.

Attachment 1: Assessment Against Significant Impact Guidelines on the Dampier Archipelago (including Murujuga) National Heritage Place[11]

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
Permanently remove, destroy, damage or substantially alter the fabric of a National Heritage place in a manner which is inconsistent with relevant values	Some interaction which is not a material change to the fabric at the time of NH listing of the place in 2007.	The Proposal traverses approximately 300m of the Dampier Archipelago (including Burrup Peninsula) National Heritage Place where it coincides with Crown Reserve 49121 – which is reserved for Infrastructure Corridor use. Where the NHP overlies Crown Reserve 49121 the Crown reserve is already utilised for a range of support infrastructure servicing industry in the Burrup Strategic Industrial area and region more generally and is available and intended to be used primarily for that purpose. This coincident and concurrent land status as Crown Reserve for industrial infrastructure with existing use for this purpose and a National Heritage Place results in a "blended" fabric. The blended fabric of the area is recognised in the Australian Governments public position cited in ERD Section 6.6.1 (p207) whereby there is discussion under the caption "Prehistory meets the industrial age". The Proponent also views that the quoted statement reflects a cornerstone requirement that future industry must embrace as a good neighbour striving for a balance between heritage management and economic prosperity that must be realised through a collaborative partnership involving Indigenous groups, industry, governments and the community. This is an operating mantra that the Proponent seeks to reinforce in its various corporate values and Project EMPs. In relation to this blended fabric, as noted on its website, the Murujuga Aboriginal Corporation (MAC) acknowledges that *"The three Contracting Parties (comprising the Ngarluma-Yindjibarndi, Wong-Goo-Tt-Oo, and Yaburara Mardudhunera) received land entitlements and financial benefits as compensation for surrendering their native title rights and interests, and discontinuing their Native Title*

[11] See: https://www.environment.gov.au/system/files/resources/42f84df4-720b-4dcf-b262-48679a3aba58/files/nes-guidelines_1.pdf

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
		Determination Applications in the Federal Court, over the land and waters of the Burrup." This prior action already agreed to the impairment in 2003 when the BMIEA was concluded prior to the inclusion of this area on the National Heritage list in 2007. The Proponent recognises this complexity, acknowledges and respects this Traditional lore connection to country and is committed to working with MAC to achieve a mutually beneficial future by working together as embodied in the agreement it has executed with MAC. The Federal Court has also determined that native title does not exist in this area. Thus, the Proposal cannot remove, destroy or damage that value or the existence of Native title rights and interests which is already impeded or has been found by the Federal Court does not exist. The Proponent notes that Gazette Notice No. S127 describes the values of the National Heritage Place. This description looks to affirm the heritage value of the rock art in the National Heritage Place, with particular emphasis on the: • weathering of the petroglyphs • history depicted in the petroglyph illustrations • diversity of the petroglyphs, including for example subject matter, spatial density, engraving techniques amongst other things • unique complexity of the illustrations on the petroglyphs • contribution that the illustrations on the petroglyphs have made to understanding Australia's cultural history • contribution that the illustrations on the petroglyphs have made to understanding Australia's natural history. The Proposal activities will not physically impact any heritage sites in the Dampier Archipelago (including Burrup Peninsula) National Heritage

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
		Place. Therefore, the following aspects of the heritage values are unlikely to be materially impacted by the Proposal • history depicted in the petroglyph illustrations • diversity of the petroglyphs, including for example subject matter, spatial density, engraving techniques amongst other things • unique complexity of the illustrations on the petroglyphs • contribution that the illustrations on the petroglyphs have made to understanding Australia's cultural history All the sites in the Dampier Archipelago (including Burrup Peninsula) National Heritage Place area will continue to be available, subject to meeting appropriate usual statutory access requirements under the LAA, as a record to inform present and future generations in relation to the recognised relevant heritage values and knowledge. The Proponent notes that in the assessment as part of the nomination for inclusion on the National Heritage list, it was recognised that notwithstanding a long period of industrial activity in the region, citing 2006 work of McDonald and Veth, the National Heritage List database entry indicates that notwithstanding that 16.4square kilometre of the area was subject to high levels of impact from industrial development and activities such as construction of towns and work camps (the proponent notes that this includes substantial parts of Site F, some of Site C and parts of Crown Reserve R49121), the assessment concludes "*Despite this, the natural and cultural heritage in Dampier Archipelago and its surrounding waters is in good condition."* The blended fabric is also recognised as part of the commentary on the Dampier Archipelago (including Burrup Peninsula) National Heritage Place area on the Department's website cited in ERD Section 6.6.1 (p207) whereby "Prehistory meets the industrial age".

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
		The Proponent also views that the quoted statement reflects a cornerstone requirement that future industry must embrace as a good neighbour striving for a balance between heritage management and economic prosperity that must be realised through a collaborative partnership involving Indigenous groups, industry, governments and the community. This is an operating mantra that the Proponent seeks to reinforce in its various corporate values and Project EMPs. Against this background, the Proposal will not materially alter the existing fabric being a mix of industrially designated and utilised footprints together with spatially separated mixes of individual or clustered heritage sites, principally petroglyphs, in a blended landscape albeit with some of that landscape being a National Heritage Place in a manner which is not consistent with that current blended fabric.
Extend, renovate, refurbish or substantially alter a National Heritage place in a manner which is inconsistent with relevant values	No	The Dampier Archipelago (including Burrup Peninsula) National Heritage Place is not a built environment. This criterion is interpreted to apply to the built environment, whether involving aboriginal or non-aboriginal structures. The Proposal will not extend, renovate, refurbish or substantially alter a National Heritage place in a manner which is inconsistent with relevant values.
Permanently remove, destroy, damage or substantially disturb archaeological deposits or artefacts in a National Heritage place	Some interaction which is not considered material	The Proposal has been specifically designed to exclude the Dampier Archipelago (including Burrup Peninsula) National Heritage Place area associated with Site #9439 that lies within Site F which is part of Crown Reserve R49120 for Industry. As noted above, the Proposal will traverse a 300m portion the Dampier Archipelago (including Burrup Peninsula) National Heritage Place where that NHP coincides with Crown Reserve 49121 which is reserved for industry infrastructure corridor use. Indirect impacts will be limited to potential for dust generation and vibration from construction works. These will be managed through the

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
		implementation of mitigation measures implemented through Construction Environmental Management Plans that will be finalised for approval before civil construction. In finalising these plans, the proponent will liaise with MAC. As indicated in the ERD Table ES3– Summary of environmental impact assessment of key environmental factors (p xxi), Section 4.3.5 (p 47), Table 4-5 (p 53), Sections 4.8.5 (p 160), 4.86 (p 175), Table 4-43 (p 177), Section 4.8.7 (p 180), and Table 4-50 (p 200), the conveyor will be fully enclosed and elevated which will manage fugitive dust and vibration during operation to ALARP levels which are not expected to materially impact both the NHP area where the conveyor will traverse or the NHP area adjacent to the conveyor in the current common-user infrastructure corridor to the port. In relation to the potential for Project emissions to materially impact archaeological deposits or artefacts in the Dampier Archipelago (including Burrup Peninsula) National Heritage Place, in the ERD Section 4.8.5.2 (p 167), Table 4-43 (p177) and Section 4.9.5.3 (p 193) the Proponent commits to be a contributing participant in the Murujuga Rock Art Strategy. This commitment supports the Strategy's purpose to protect the Aboriginal rock art located on Murujuga by providing a long-term framework for the monitoring and analysis of changes to the rock art and a process by which management responses will be put in place to address observed adverse impacts (if any) on the rock art. The Proponent recognises that successful implementation of the MRAS management framework will require a collaborative approach involving all stakeholders and is committed to pursuing that collaborative approach as a contributing participant.
Involve activities in a National Heritage place with substantial and/or long-term impacts on its values	Some interaction which is not considered material	The Proposal involve activities over a potential project life of up to 80 years, thus the described impacts will be long-term impacts on the Dampier Archipelago (including Burrup Peninsula) National Heritage Place values for this project life.

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
		These impacts will be managed to levels that are as low as reasonably practicable (ALARP) through the development, approval before civil construction, then implementation as part of the project construction, then operations, management system of the project environmental management plans included as working drafts in ERD Appendix K.
Involve the construction of buildings or other structures within, adjacent to, or within important sight lines of, a National Heritage place which are inconsistent with relevant values	Construction which is not considered material	As noted previously, the Proposal traverses approximately 300m of the National Heritage Place where it coincides with Crown Reserve 49121 – which is reserved for Infrastructure Corridor use. As notes above, where the NHP overlies Crown Reserve 49121, the Crown reserve is already utilised for a range of support infrastructure servicing industry in the Burrup Strategic Industrial Area and in the region more generally. The Crown Reserve is available and intended to be used primarily for that purpose and was included in the BMIEA in 2003 recognising the same. In relation to the 300m of the northern NHP area traversed by the preferred conveyor alignment, as noted above, an alternative alignment has been developed in consultation with MAC and the Circle of Elders which allows preservation of Site ID 20037 in-situ and does not impact any other sites between Site C and the East-West Service Corridor. This alignment also removes one transfer station with a resultant potential reduction in conveying related noise and the associated impacts in the NHL place. More generally, the Proposal will involve the construction of a urea manufacturing plant and associated infrastructure adjacent to the Dampier Archipelago (including Burrup Peninsula) National Heritage Place adjacent to the NHP along the Site C northern boundary Both the Project footprint and the NPR area in this vicinity are part of Crown Reserve 49120 for Industry. Access to the northern part of Site C with coincided with the NHP area is currently restricted by the above ground ammonia export pipeline in the common-user infrastructure corridor that is situated between the northern boundary of Site C and Village Road. Thus, there is no line of sight from

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
		any current publicly accessible point that would be materially impacted by the construction of the project. Whilst the Proposal is not consistent with the some of the relevant values for the Dampier Archipelago (including Burrup Peninsula) National Heritage Place, the Proposal is located within the Burrup SIA which occurs adjacent to National Heritage place areas. To the extent practicable, construction of the Proposal will minimise visual amenity impacts through site design and layout, as well as colouring buildings to blend into the surrounding terrain, where possible. Visual amenity aspects are discussed in ERD Sections 4.9.4, 4.9.5.1, 4.9.5.6, 4.9.7, 6.6.3 and Appendix G. The Proposal is not expected to significantly impact upon the Dampier Archipelago (including Burrup Peninsula) National Heritage Place.
Make notable changes to the layout, spaces, form or species composition of a garden, landscape or setting of a National Heritage place in a manner which is inconsistent with relevant values.	No	The Proposal will not make notable changes to the layout, spaces, form or species composition of the Dampier Archipelago (including Burrup Peninsula) National Heritage Place which are inconsistent with relevant values. As noted previously, the Proposal traverses approximately 300m of the National Heritage Place where it coincides with Crown Reserve 49121 – which is reserved for Infrastructure Corridor use. Where the NHP overlies Crown Reserve 49121 the Crown reserve is already utilised for a range of support infrastructure services supporting industry in the Burrup Strategic Industrial Area and region more generally and is available and intended to be used primarily for that purpose. The overarching blended fabric of the area is recognised in the Australian Governments public position cited in ERD Section 6.6.1 (p207) whereby there is discussion under the caption “Prehistory meets the industrial age”. This will not be notably changed by the Proposal. The Proponent also views that the quoted statement reflects a cornerstone requirement that future industry must embrace as a good neighbour striving

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
		for a balance between heritage management and economic prosperity that must be realised through a collaborative partnership involving Indigenous groups, industry, governments and the community. This is an operating mantra that the Proponent seeks to reinforce in its various corporate values and Project EMPs.
Restrict or inhibit the continuing use of a National Heritage place as a cultural or ceremonial site causing its values to notably diminish over time • permanently diminish the cultural value of a National Heritage place for a community or group to which its National Heritage values relate,	No	As noted above, the Proposal will not change the current ability to use the Dampier Archipelago (including Burrup Peninsula) National Heritage Place as a cultural or ceremonial site.
Destroy or damage cultural or ceremonial, artefacts, features, or objects in a National Heritage place	No	As noted above, avoidance of cultural or ceremonial, artefacts, features, or objects in the Dampier Archipelago (including Burrup Peninsula) National Heritage Place has been implemented through adaptive design. As a result all identified heritage sites in the Dampier Archipelago (including Burrup Peninsula) National Heritage Place are avoided.
Notably diminish the value of a National Heritage place in demonstrating creative or technical achievement.	No	All the sites in the Dampier Archipelago (including Burrup Peninsula) National Heritage Place area will continue to be available, subject to meeting appropriate usual statutory access requirements under the LAA, as a record to inform present and future generations in relation to the recognised relevant heritage values and knowledge.
NATIONAL HERITAGE PLACES WITH INDIGENOUS HERITAGE VALUES		
Restrict or inhibit the continuing use of a National Heritage place as a cultural or ceremonial site causing its values to notably diminish over time	No	The Proposal traverses approximately 300m of the Dampier Archipelago (including Burrup Peninsula) National Heritage Place where it coincides with Crown Reserve 49121 – which is reserved for Infrastructure Corridor use. Where the NHP overlies Crown Reserve 49121 the Crown reserve is already utilised for a range of support infrastructure servicing industry in

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
		the Burrup Strategic Industrial area and region more generally and is available and intended to be used primarily for that purpose. As noted on its website, the Murujuga Aboriginal Corporation acknowledges that *"The three Contracting Parties (comprising the Ngarluma-Yindjibarndi, Wong-Goo-Tt-Oo, and Yaburara Mardudhunera) received land entitlements and financial benefits as compensation for surrendering their native title rights and interests, and discontinuing their Native Title Determination Applications in the Federal Court, over the land and waters of the Burrup."* This prior action already agreed to the restriction of statutory rights of legal access in 2003 when the BMIEA was concluded prior to the inclusion of this area on the National Heritage list in 2007. Traditional lore connection to country may not have been removed, but the extent to which that relied access continuing use as a ceremonial or cultural site, may have been impaired at that time. The Proponent recognises this complexity, acknowledges and respects this Traditional lore connection to country and is committed to working with MAC to achieve a mutually beneficial future by working together as embodied in the agreement it has executed with MAC. The IHS Heritage survey report completed commissioned by MAC at the request of JTSI examined the Traditional lore ethnographic use of the surveyed area, including those parts of the Dampier Archipelago (including Burrup Peninsula) National Heritage Place within the Development Envelope. The Executive Summary on p iv records," There *are no previously recorded or previously unrecorded Aboriginal ethnographic sites within the Project Area."* Section 5.2 (p45) provides fuller details in support of this finding.

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
		The Federal Court has also determined that native title does not exist in this area. Thus the Proposal cannot remove, destroy or damage that value which is already materially impaired. The Proponent notes that Gazette Notice No. S127 describes the values of the National Heritage Place. This description looks to affirm the heritage value of the rock art in the National Heritage Place, with particular emphasis on the: • weathering of the petroglyphs • history depicted in the petroglyph illustrations • diversity of the petroglyphs, including for example subject matter, spatial density, engraving techniques amongst other things • unique complexity of the illustrations on the petroglyphs • contribution that the illustrations on the petroglyphs have made to understanding Australia's cultural history • contribution that the illustrations on the petroglyphs have made to understanding Australia's natural history. The Proposal activities will not physically impact any heritage sites in the Dampier Archipelago (including Burrup Peninsula) National Heritage Place. Therefore, the following aspects of the heritage values are unlikely to be materially impacted by the Proposal • history depicted in the petroglyph illustrations • diversity of the petroglyphs, including for example subject matter, spatial density, engraving techniques amongst other things • unique complexity of the illustrations on the petroglyphs • contribution that the illustrations on the petroglyphs have made to understanding Australia's cultural history

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
		All the sites in the Dampier Archipelago (including Burrup Peninsula) National Heritage Place area will continue to be available, subject to meeting appropriate usual statutory access requirements under the LAA, as a record to inform present and future generations in relation to the recognised relevant heritage values and knowledge. The Proponent notes that in the assessment as part of the nomination for inclusion on the National Heritage list, it was recognised that notwithstanding a long period of industrial activity in the region, citing 2006 work of McDonald and Veth, the National Heritage List database entry indicates that notwithstanding that 16.4square kilometre of the area was subject to high levels of impact from industrial development and activities such as construction of towns and work camps (the proponent notes that this includes substantial parts of Site F, some of Site C and parts of Crown Reserve R49121), the assessment concludes "*Despite this, the natural and cultural heritage in Dampier Archipelago and its surrounding waters is in good condition."* The blended fabric is also recognised as part of the commentary on the Dampier Archipelago (including Burrup Peninsula) National Heritage Place area on the Department's website cited in ERD Section 6.6.1 (p207) whereby "Prehistory meets the industrial age". The Proponent also views that the quoted statement reflects a cornerstone requirement that future industry must embrace as a good neighbour striving for a balance between heritage management and economic prosperity that must be realised through a collaborative partnership involving Indigenous groups, industry, governments and the community. This is an operating mantra that the Proponent seeks to reinforce in its various corporate values and Project EMPs. Against this background, the Proposal will not materially alter the existing fabric being a mix of industrially designated and utilised footprints together with spatially separated mixes of individual or clustered heritage sites, principally petroglyphs, in a blended landscape albeit with some of

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
		that landscape being a National Heritage Place in a manner which is not consistent with that current blended fabric.
Permanently diminish the cultural value of a National Heritage place for an Indigenous group to which its National Heritage values relate	No	At the conclusion of the project life the built structures will be decommissioned, including the 300m section of conveyor that is the only built aspect of the project physically located in the Dampier Archipelago (including Burrup Peninsula) National Heritage Place area. The Proponent commits to prepare for approval no later than 10 years before the end of the project life, a detailed Decommissioning and Site Hand Back Plan. This plan will be developed in consultation with MAC, the relevant WA, Commonwealth and local government stakeholders with interests at Murujuga and the Dampier Archipelago (including Burrup Peninsula) National Heritage Place area.
Alter the setting of a National Heritage place in a manner which is inconsistent with relevant values	No	The existing coincident and concurrent land status of the BSIA with existing use for industrial purposes and a National Heritage Place results in a “blended” fabric. The blended fabric of the area is recognised in the Australian Governments public position cited in ERD Section 6.6.1 (p207) whereby there is discussion under the caption “Prehistory meets the industrial age”. The Proponent also views that the quoted statement reflects a cornerstone requirement that future industry must embrace as a good neighbour striving for a balance between heritage management and economic prosperity that must be realised through a collaborative partnership involving Indigenous groups, industry, governments and the community. This is an operating mantra that the Proponent seeks to reinforce in its various corporate values and Project EMPs. The Proposal will not alter this recognised setting and therefore create any changed inconsistency with relevant values of the Dampier Archipelago (including Burrup Peninsula) National Heritage Place.

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
Remove, destroy, damage or substantially disturb archaeological deposits or cultural artefacts in a National Heritage place	No	As noted above, avoidance of archaeological deposits or cultural in the Dampier Archipelago (including Burrup Peninsula) National Heritage Place has been implemented through adaptive design. As a result all identified heritage sites in the Dampier Archipelago (including Burrup Peninsula) National Heritage Place are avoided.
Destroy, damage or permanently obscure rock art or other cultural or ceremonial, artefacts, features, or objects in a National Heritage place		As noted above, avoidance of archaeological deposits or cultural in the Dampier Archipelago (including Burrup Peninsula) National Heritage Place has been implemented through adaptive design. As a result all identified heritage sites in the Dampier Archipelago (including Burrup Peninsula) National Heritage Place are avoided.
Notably diminish the value of a National Heritage place in demonstrating creative or technical achievement	No	The existing coincident and concurrent land status of the BSIA with existing use for industrial purposes and a National Heritage Place results in a “blended” fabric. The blended fabric of the area is recognised in the Australian Governments public position cited in ERD Section 6.6.1 (p207) whereby there is discussion under the caption “Prehistory meets the industrial age”. The Proposal will not alter this recognised setting and therefore create any changed inconsistency with relevant values of the Dampier Archipelago (including Burrup Peninsula) National Heritage Place. As noted above, all the sites in the Dampier Archipelago (including Burrup Peninsula) National Heritage Place area will continue to be available, subject to meeting appropriate usual statutory access requirements under the LAA, as a record to inform present and future generations in demonstrating creative or technical achievement.
Permanently remove, destroy, damage or substantially alter Indigenous built structures in a National Heritage place,	No	The IHS heritage survey commissioned by MAC at the request of JTSI listed a Site ID 9439 in the Dampier Archipelago (including Burrup Peninsula) National Heritage Place area within Site F as a “man made structure”.

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
		The report provides significant discussion on previous recording of the site as containing “man made” elements. And concludes *“Site Description* *Site ID 9439 is recorded as comprising at least four man-made structures (one standing stone and three ‘stone circles’) and possibly two other standing stones, now no longer in situ. An archaeological inspection of the site established that the site contains only one standing stone which is an oblong slab of granophyre positioned at atop the southern extremity of the boulder outcrop and easily seen from Hearson Cove Road (see figure above). All other previously recorded cultural features are assessed here as naturally formed structures (see above for discussion). Additionally, the current survey recorded a single petroglyph, not previously recorded.”* This site will be excluded from the project lease. On behalf of MAC and in line with the recommendations of the IHS heritage report, the Proponent has obtained support from the WA Government that as part of any land assembly for the approved project, secure long-term arrangements in relation to this site, and a connection to the realigned Hearson Cove Road, will be provide by the WA Government for MAC. As indicated in the ERD table ES3 (p xxi), , protective measures will be developed and agreed with MAC as part of detailed design and construction planning. The agreed measures will be implemented under the Aboriginal Heritage Management Plan – see Appendix U of this Response to Submissions.
Involve activities in a National Heritage place with substantial and/or long-term impacts on the values of the place	No	As noted above, the existing coincident and concurrent land status of the BSIA with existing use for industrial purposes and a National Heritage Place results in a “blended” fabric.

Criterion	Significant impact	Assessment (the Proponent has reviewed Gazette Notice No. S127 which describes the values of the National Heritage Place to develop its evaluation)
		The blended fabric of the area is recognised in the Australian Governments public position cited in ERD Section 6.6.1 (p207) whereby there is discussion under the caption “Prehistory meets the industrial age”. The Proposal will not alter this recognised setting and therefore create any changed inconsistency with relevant values of the Dampier Archipelago (including Burrup Peninsula) National Heritage Place.

Attachment 2: Perdaman MPFS Application.

PERDAMAN

CHEMICALS & FERTILISERS

Sandra Ryan

National Manager

Major Projects Facilitation Agency

Level 1 - Cornwall Square Transit

12-16 St John Street

Launceston TAS 7250

Dear Ms Ryan

SUBJECT: MAJOR PROJECT STATUS – PERDAMAN CHEMICALS AND FERTILISERS PTY LTD ("PCF")

I am writing to apply for Major Project Status ("MPS") for the Perdaman Urea Project ("Project") to be located in the Burrup Strategic Industrial Area on the Burrup Peninsula, approximately 20km northwest of Karratha, Western Australia. Set out below is a summary of the project, its broad economic benefits, the details of the Proponents and our rationale for undertaking this significant new investment.

PCF has, to date, invested approximately US$175 million on the potential to develop a urea plant using coal gasification. The plant was initially planned to be located in Collie, Western Australia. However, in May 2011, PCF's coal supply contract was terminated by Griffin Coal. At the time, PCF had contracts for EPC, offtake, technology licenses and access to infrastructure, and project funding was well underway. The Project has been on hold since 2013.

Over the past 18 months, PCF has focused on the viability of constructing a gas-fired urea plant in the Karratha region of Western Australia due to the proximity to potential gas supply and existing infrastructure. On 20 November 2018, PCF signed a gas supply and purchase agreement with Woodside Petroleum Ltd for the supply of 125TJ of gas per day for a minimum supply term of 20 years.

The Project will produce 2 million tonnes per annum of urea. It is expected to cost approximately US$3.3 billion. PCF has entered into an exclusive EPC agreement with SNCLavalin which will be based on a lump sum turnkey contract.

The Project has strong support from the Western Australian State Government and has been granted "Project of State Significance" status, which has been confirmed in a letter dated 6 August 2018 from the Honourable Mark McGowan as Premier of Western Australia.

There is strong demand globally for urea. Urea is a preferred nitrogen fertiliser, and is a vital input for healthy and productive agricultural crops. This implies urea is vital for global food supply, and the Project is estimated to enable food production to feed approximately 90 million people. Urea can be viewed as a means of substituting 'land' in agriculture by increasing crop yields demand for additional farm land is avoided – either reducing land clearing or supporting reforestation. In addition, Australia is a substantial agricultural producer, yet imports substantial quantities (> 2 million tonne per annum) of urea.

Key project milestone dates are:

► Planning / development activity	Ongoing
► Environmental approvals	Quarter 1 2020
► Financial close	March 2020*
► Construction	January 2020 – December 2022
► Commissioning	January 2023 - June 2023
► Commercial production start	July 2023

**Subject to Woodside having taking FID on Scarborough gas field development*

Project Proponents;

- **PCF**: PCF is a wholly owned subsidiary of Perdaman Industries, the key Project Sponsor. Perdaman Industries has extensive experience in delivering large scale fertiliser production facilities, including the existing Burrup Fertiliser Project (now owned by Yara International). Perdaman Industries is a wholly owned subsidiary of the multinational Perdaman Group;
- **Woodside**: Woodside is an ASX-listed oil and gas company with a market capitalisation of approximately US$20 billion. Under the gas supply and purchase agreement, Woodside is obligated to supply 125TJ of gas per day for a minimum supply term of 20 years. Woodside is based in Perth and operates the Pluto and North

  West Shelf gas operations on the Burrup Peninsula, as well as other assets;
- **SNC-Lavalin**: SNC-Lavalin signed a binding Heads of Agreement with PCF in November 2018 as EPC (Engineering, Procurement and Construction) contractor for the Project. SNC-Lavalin is based in Canada with global operations. It is listed on the Toronto Stock Exchange with a market capitalisation of more than US$6 billion;
- **Technology Partners:** Technology partners include **Haldor Topsøe** (Copenhagen, Denmark), **Stami Carbon** (Limburg, the Netherlands) and **Honeywell UOP** (Des Plaines, US)*;*
- **EY**: Engaged as Lead Advisor to PCF, with the scope of work including procuring equity partner/s (US$1.1 billion) and finalising the offtake agreement. The core EY team advising PCF are located in Perth;
- **Societe Generale**: Engaged to lead the procurement of project debt financing of approximately US$2.2 billion. Located in Sydney;

- **White & Case**: Engaged as Legal Advisors to PCF. Located in Melbourne; and
- **Cardno:** Engaged as Environmental Consultant to PCF and responsible for assisting PCF with obtaining environmental approvals. The core Cardno team is located in Perth with supporting technical specialists available from the global business as required.

The following key points outline the many economic benefits from the Project:

- The Project has strong support from the Western Australian State Government and has been awarded "Project of State Significance" status;
- A Construction workforce of 2,000 over a 3 year period from a targeted start date of January 2020;
- Permanent, skilled workforce of approximately 200 people will be required during operations;
- Indirect employment opportunities for a further 500 people;
- PCF is committed to employing and training local indigenous people, along with the pledge to employ locally to limit a FIFO workforce;
- Total Project cost: US$3.3 billion;
- Total revenue over the life of the Project: US$14 billion;
- Economic stimulus to supplier businesses over the 3 year construction phase: NPV US$6 billion;
- Economic stimulus to supplier businesses over a 20 year operational phase: NPV US$10 billion;
- Total stimulated income to Australian business and workers: NPV more than US$15 billion (i.e. the sum of stimulus in construction and operation phases);
- Government tax revenues: more than US$1.5 billion over 20 years
- Once completed, the Project will be the most competitive in the Australian market due to lower shipping costs to key Asia-Pacific export markets, and lower cost gas feedstock;
- The urea plant will be based on low emission;
- The Project will work with Woodside to develop a green hydrogen pilot plant and will utilise existing infrastructure within the Burrup Strategic Industrial Area (i.e.

  Services Corridor, Seawater Pipeline, Port and Loading Berth).

MPF status criteria - summarise how the project meets the eligibility criteria for MPF status. The criteria are:

- *Capital investment of A$50 million or more*: Capital investment in the Project during its 3 year construction phase is estimated to be US$3.3 billion;
- *Or the strategic significance of the project*: The Project has been awarded "Project of State Significance" status by the State Government; and,
- *Or the significant net economic benefits for regional Australia*: See the above commentary (economic benefits).

- *Requirement for Australian Government approvals and/or other involvement*: Currently seeking a number of State and Federal approvals, with all approvals expected by Quarter 1 2020; and
- Project is commercially ready to proceed through the approvals process and there is demonstrated reasonable commercial viability of the project: contracted 20 year gas supply at gas price which results in Project being commercially viable even at "worst case" urea price forecasts, and positive feedback from parties during early stage of project financing process.

Note any involvement with or support from:

► In addition, PCF and its advisors, including EY and Cardno, are currently engaged with a number of State and Federal agencies to ensure that necessary approvals are received to progress the Project to Financial Close by the 31st of March 2020. These include, Department of Premier and Cabinet, Department of Jobs, Tourism, Science and Innovation (JTSI), Department of Environment, LandCorp, WaterCorp and the Pilbara Ports Authority.

Yours sincerely

Vikas Rambal

Chairman

Perdaman Chemical and Fertilisers Pty Ltd

17 December 2018

Enc. Supporting Information for the Application.

Attachment: Perdaman MPFS Additional Information

SUBJECT: MAJOR PROJECT STATUS – PERDAMAN CHEMICALS AND FERTILISERS PTY LTD ("PCF")

Additional Information Requested

Based on the email dated 19th December 2018, please find attached the additional information requested to append to the Major Project Status application for Perdaman Urea Project ('Project'):

1.2 Perdaman's business activities and experience

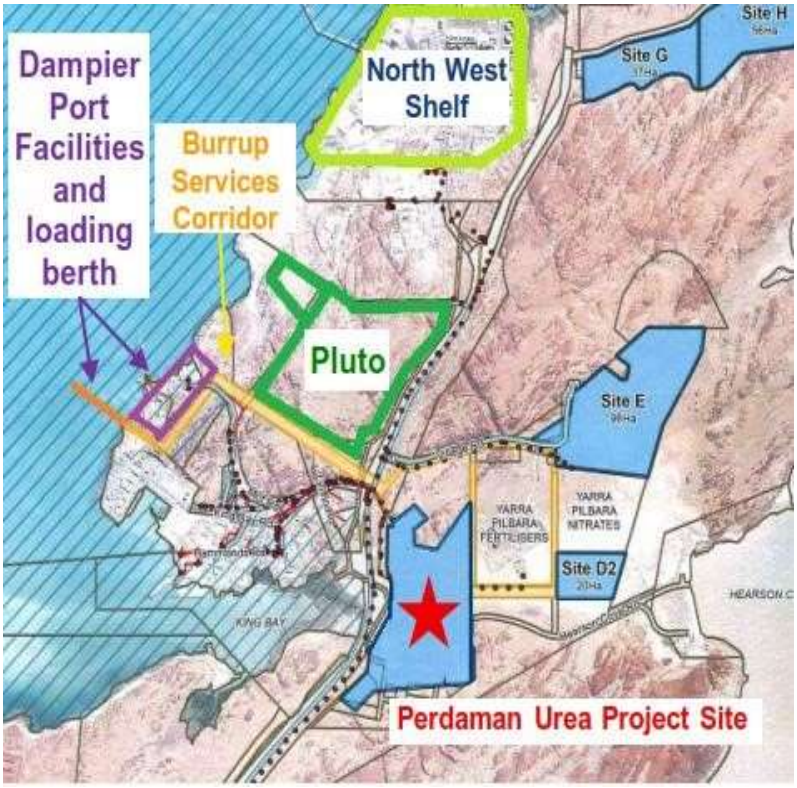
PCF is a subsidiary of the Perdaman Group. Perdaman Group is a multinational group based in Western Australia with a long standing track record in involvement within a diverse range of markets. From investments in fertiliser production, to the ownership and management of shopping centres; from the production and distribution of pharmaceuticals, to migration services and advanced energy solutions. Please see the addition presentation of the Perdaman Group (*Perdaman Group Profile_190110.pptx*).

The principal sponsor of PCF is Perdaman Industries which is 100% owned by the Rambal family based in Perth. Mr Vikas Rambal has more than 25 years' experience in business and a proven track record in delivering world-class fertiliser plants. Mr Rambal and the majority of the PCF project management team were key figures in the development of the A$700m Burrup Fertilisers Project (now owned by Norwegian multination, *Yara International*).

1.3 Processing methods

The proposed project plant footprint will be approximately 50ha with the product conveyor footprint through to the port of up to 5ha and the input gas pipeline footprint of 1ha. The road and infrastructure corridor easement connecting Site C and Site F is approximately 30m wide and 500m long (1.5ha). The diagram below highlights the Project site within the Burrup Strategic Industrial Area (BSIA) precinct:

Perdaman Urea Project Site – BSIA



The following components broadly describe this scope:

- 130 terajoules per day of natural gas to be supplied by Woodside LNG facilities as feedstock;
- Natural gas supply lateral;
- 3,500 tonnes per day ammonia synthesis unit;
- 6,200 tonnes per day urea synthesis and granulation plant;
- Acid Gas Recovery unit to extract carbon dioxide from the raw synthesis gas;
- Air Separation unit to extract 2,200 tonnes per day of oxygen from the atmosphere;
- Gas turbine power plant to produce electricity using natural gas fuel;
- Seawater circulation system for cooling the process units;
- Water treatment plant to produce desalinated and demineralised water for plant use;
- Wastewater treatment plant;
- Flare and vent stacks;
- Intermediate storages for chemicals, ammonia, oxygen and nitrogen;
- Urea storage shed and conveyor loading facilities;
- Urea export facilities including storage shed, ship loader and conveyor at Dampier Port; and
- Associated support facilities.

The granulated urea product will be transported by closed conveyor along the East West Service through to Dampier Port, where new facilities will include a stockpile and loading arm. Approvals for the conveyor, storage and loadout facilities will be the responsibility of the Proponent. Dampier Port Authority will be responsible for the shipping berths. Off-site infrastructure includes the sea water supply pipeline, natural gas pipeline from the Woodside LNG facilities to the site and the saline wastewater pipeline connecting the Urea Plant to the existing Water Corporation Brine discharge pipeline.

The conversion of natural gas (NG) to urea is a five step process

1. **Gas reforming:** The NG is catalytically reformed with oxygen and steam to syngas, which is purified to a hydrogen rich and CO_2 stream.
2. **Ammonia synthesis:** The hydrogen and nitrogen mixture are compressed and reacted (with help of a catalyst) to form ammonia. This chemical reaction releases heat which is recovered as steam which improves the overall process thermal efficiency, and consequently lowers emissions.
3. **Urea Synthesis:** Ammonia and CO_2 are reacted to form urea (solution) in a two stage process which includes a carbamate intermediate. The urea solution is concentrated to over 95 per cent.
4. **Urea granulation:** The concentrated urea solution is dried and granulated (prilled). Granules are a strong, easily handled product, which minimises potential dust formation during the logistics chain of taking the urea from the plant to the paddock.
5. **Storage and warehousing:** The urea granules are cooled and stored in a shed before being loaded on a conveyor and transported to Dampier Port. Here the urea granules are unloaded into a second storage shed and then loaded onto Panamax ships for export.

Proven technology underpins each of the key stages of this project. The technologies being considered for the plant are equivalent to the industry best for the specific applications and successfully operate elsewhere in the world. EPC contractor *SNC-Lavalin* will use world leading technology from *Haldor Topsøe* (Denmark) and *Stamicarbon* (The Netherlands).

The technology being utilised recovers much of the energy generated at various stages of the process and re-uses this energy in the process.

1.4 Conditions of meeting FID

Aside from the key State/Federal approvals and offtake agreement for urea, the key conditions precedent for meeting FID, with reference to the gas supply agreement with *Woodside Energy Ltd*, is:

- Woodside having taken the final investment decision to proceed with the development of the Scarborough LNG project.

This is currently planned for early calendar year 2020.

1.5 Project funding summary

The funding structure is subject to ongoing optimisation. However, it is expected that the Project will be funded primarily by senior debt (approximately 2/3's of total funding required).

The debt and equity processes are underway and expected to be completed by December 2019. EY is mandated to raise equity, and Societe Generale is leading the senior debt raising process.

1.6 Expected product market

Offtake process also currently underway (EY mandated) so too early to know but Asia Pacific is an importer and due to close proximity to Project this is likely to be a key region.

1.7 Key approvals and agency interfaces

The table below highlights the key approvals and associated federal agencies which the Project will be required to interface with during the course of its development:

Issue	Description / Comments	Agency
EPBC Act Environment and heritage issues	EPBC Act assesses matters of national environmental significance. Most likely that project will be assessed by WAEPA and Commonwealth will accredit EPAs assessments. Project referred on 21/12/18. Referral response is pending.	Department of Environment and Energy
National Greenhouse Energy Reporting Scheme (NGERS)	Reporting GH emissions under National Greenhouse and Energy Reporting Act 2007.	Clean Energy Regulator
National Pollutant Inventory (NPI)	Reporting all substance emissions. Need to register and report annually on line.	Department of Environment and Energy
Tax	Tax issues including payment or exemption of GST.	Australian Taxation Office
Native title	Assessment of native title.	Attorney Generals Department
Regulated industries / Competition	Third party access arrangements to gas network Clarification of competition issues.	Australian Competition and Consumer Commission
Industrial relations	Workplace relations issues. Work place agreements.	Department of Employment / Fair Work Ombudsman
Immigration / Work visas	Visas / immigration for foreign workers.	Department of Home Affairs
Customs requirements	Import permits to facilitate clearance of imported goods.	Department of Home Affairs
Biosecurity	Biosecurity associated with importing machinery and equipment.	Department of Agriculture and Water Resources
Foreign investment	Formal submission of a proposal may be required subject to approval by FIRB.	Foreign Investment Review Board

Maritime security	Security regulated ports and port facilities. Will need to undertake risk assessments, develop and implement appropriate security measures. Security access regulated by State.	Department of Infrastructure, Regional Development and Cities

Appendix Q (DAWE Comments) Attachment 3 for Response to Submissions

Perdaman Urea Project

Assessment No: 2184 (WA), 2018/8383 (Commonwealth)

Prepared for

Perdaman Chemicals and Fertilisers

21 January 2021

Cardno

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Draft	11/01/2021	Draft Appendix Q, Attachment 3, Response to Submissions	NW, DH	DH, ME
1	12/01/2021	Revised	NW	DH
2	19/01/2021	Response to Submissions	NW	DH

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1 Introduction

Cardno (WA) Pty Ltd has been engaged by Perdaman Chemicals and Fertilisers to provide a response to further clarification requested by the DAWE (EPBC Ref: 2018/8383) in relation to the Response to Public Submissions document (October 2020) prepared for the Perdaman Urea Project.

1.1 Issues Raised by DAWE

Each item requested in Attachment 2 to the WA EPA letter dated 17/11/2020 relating to biological aspects that were shown as "Not Satisfied" or "Partially Satisfied" (see Table 1-1 below) are addressed in separate sections of this document, as outlined below:

Table 1-1 Issues raised by DAWE

Reference	Assessment of Perdaman's submission response: Satisfied/Not Satisfied	Perdaman Response
1. Significant Impact guidelines 1.1	Satisfied	
2. Policy and Guidance - additional documents list	Satisfied	
3. Policy and guidance documents ERD – Section 6.2 - SIG	Not Satisfied The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation to the impact on migratory species.	Section 2
4. Policy documents - TAP for red fox	Not satisfied > The proponent has only partially addressed the objectives in the Threat abatement plan for predation by the European red fox. > Proponent states that it will implement a fox control - trapping and euthanisation program. **Note** > The Department advises that a separate Pest management plan be submitted.	Section 3
5. Policy documents for feral pigs	Not Satisfied > The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation to the impact on the species. **Note** > The proponent lists the objectives in the TSMP but does not provide a discussion.	Section 4
6. Policy documents for feral cats	Not Satisfied > The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation to the impact on the species. **Note**	Section 5

Reference	Assessment of Perdaman's submission response: Satisfied/Not Satisfied	Perdaman Response
	> Proponent states that they will initiate a feral cat management plan. The feral fauna trapping and euthanisation program should be discussed in the Pest Management plan.	
7. Policy documents for Cane toads	Partially Satisfied > The Department notes the proponent's response to cane toad management. The Cane Toad MP and Cane Toad Control Program should be included in the Pest Management Plan. **Note** > The Department suggests including a monitoring program for the species in the pest management strategy.	Section 6
8. TAP for marine debris	Not Satisfied > The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation to the impact on migratory species.	Section 7
9. Marine bioregional plan for the North- west Marine Region plan	Satisfied	
10. Red Knot	**Not satisfied** > The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation to the impact on migratory species. > The Department notes that *The Wildlife Conservation Plan for Migratory Shorebirds* was referenced in the policy document list, however it was not considered. (e.g. shorebirds are most at risk from bioaccumulation of human-made chemicals such as organochlorines from herbicides and pesticides and industrial waste. How will the project manage this and mitigation measures?) > ….migratory shorebirds are not directly affected by oil spills, but important habitat may be affected for many years through catastrophic loss of marine benthic food sources…How will the project protect habitat and what mitigation measures will be undertaken to address chemical spills? > ….migratory shorebirds are not directly affected by oil spills, but important habitat may be affected for many years through catastrophic loss of marine benthic food sources…How will the project protect habitat and what mitigation measures will be undertaken to address chemical spills? **Note** > A map to show the potential feeding grounds for migratory birds (e.g. Red knot) in relation to the DE would give a better insight into the potential impact to species. > Is there scientific evidence to support the assumption that fauna will move safely and freely under the causeway structure and	Section 8

Reference	Assessment of Perdaman's submission response: Satisfied/Not Satisfied	Perdaman Response
	that there will not be a reduction to the Red Knots' feeding ground?	
11. Curlew Sandpiper	**Partially satisfied** > The Department notes that this has been partially addressed with Objectives 2 and 3	Section 9
12. Great knot	**Not satisfied** > The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation to the impact on migratory species.	Section 10
13. Eastern Curlew	**Not satisfied** > The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation to the impact on migratory species. **Note** > The Department requests that scientific evidence is required to support the statement "…*Rehabilitating any degraded mudflat habitats within the PDE once the causeway is constructed*."	Section 11
14. Ghost Bat CA	**Not satisfied** > The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation. **Note** > The map supplied shows the excluded drainage lines (identified as important foraging habitat for the GB) from the project development envelope. > The map supplied in the document is insufficient in size. Proponent needs to provide a detailed A4 size map with scale and legend. **Satisfied** > The Department notes the Table 1-1 shows a breakdown of Ghost Bat habitat to be impacted.	Section 12
15. Olive Python	**Not satisfied** > The Department notes the information provided does not provide a discussion on how these documents have been considered. **Note** > The Department notes the Table 1-1 shows a breakdown of Olive Python habitat to be impacted.	Section 13
16. Northern Quoll	**Partially satisfied** > The Department notes the information provides some discussion on how the documents have been considered e.g. Objective 3 and 7 of the NQ NRP. **Note** > The Department notes the Table 1-1 shows a breakdown of Northern Quoll habitat to be impacted.	Section 14

Reference	Assessment of Perdaman's submission response: Satisfied/Not Satisfied	Perdaman Response
17. TAP – 5 listed grasses	**Not satisfied** • The Department notes that the *Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses* has not been discussed as required.	Section 15
18. Pilbara Ports Authority	Satisfied	
19. PPA	Satisfied	
20. Water Corp	Satisfied	
21. PPA and Water Corp	Satisfied	
22. Management Plans	**Note** The proponent will need to update all management plans. A management plan should address, but not be limited to the following: > anthropogenic activities (such as noise, vibrations, light and dust) > vehicle impacts > water impacts (such as run off) > weed management > pest management > fire management > how landscape connectivity will be maintained to minimise fragmentation.	
23. CEMP	> Words such as "as practicable" and "should" must be replaced with firmer commitments, eg "will". > In regard to activities such as drilling and blasting near rock art the Department would like to see more involvement of MAC in the process, including pre-inspection of the art before drilling and monitoring of the activity. There is also currently no indication of what reporting will take place. Will there be a before and after condition of art report? > The Department questions the use of saline water for dust suppression. Will this not affect vegetation? In addition, further details on water source needs to be provided. > Risk rating diagrams could be included to improve the plans.	
24. Fauna Management Plan	> "Limit clearing to what is necessary" – please state exact hectares > "Avoid clearing of rocky/boulder" – please define on a map with clear markings > Define hectares to be cleared across the development envelope > "Impact on creek line" – Site F – define on a map. > Define on a map the location of the construction fenceline. > Delete the words where practicable throughout the Management plans.	

Reference	Assessment of Perdaman's submission response: Satisfied/Not Satisfied	Perdaman Response
	> "Bury concrete or steel structures to a suitable size and depth" – define the size and depth. > "Clearing will be planned to a max the 'area to perimeter' ratio of remnant vegetation" – needs a clear definition. > "Clearing of vegetation will be kept to a minimum necessary" – define what minimum is. > "Following construction, ensure that any disturbed habitats (laydown areas) are returned to their pre-disturbance state" – how will this be measured? > Is there a revegetation management plan? How will revegetation success be monitored and measured? > Enforcing speed limits? Define the limit > Further justification should be given for the use of larvicides – these can be detrimental to frogs and other small fauna around ponds which may form habitat or foraging resources for MNES. An assessment of any potential impacts should be included. > How often will the fauna reports be submitted to DAWE? > Define minimum practical working area? Map?	
25. Appendix K – Biological survey	**Not satisfied** > The Department notes that there are no surveys for the entire footprint included in the Biological Survey. Only Sites C and F have been surveyed. > The Department does not have evidence that there was a mutual decision that the conveyor corridor and Pilbara port storage shed area was to be excluded from biological surveys.	Section 16
26. Fauna Habitat across the DE	**Not satisfied** > The table includes Site C, F and other (causeway, access roads and clearing for conveyor). > The table does not include the port area (storage shed and ship loader - feed conveyor). Total area to be disturbed = 70.5 ha. Site C = 34 ha; Site F = 30 ha; Other (causeway, access roads and clearing for conveyor) = 6.48 ha	Section 17
27. Biological Survey techniques	**Not satisfied** > The Department notes that this has not been addressed in Appendix B – Biological Survey. The survey methods are discussed, but do not reference DAWE policy documentation nor WA EPA documentation.	Section 18
28. Environmental Offsets	Satisfied	
29. Impacts associated with habitat fragmentation and possible isolation for	**Not satisfied** > The Department notes that there is insufficient detail in the supplied map and does not include the surrounding fauna habitat.	Section 19

Reference	Assessment of Perdaman's submission response: Satisfied/Not Satisfied	Perdaman Response
EPBC Act listed TS.	> The map should show the available fauna habitat in and outside the project area, including areas and number of hectares to be cleared and connectivity to the project area.	

1.2 Changes to the Project Development Area and Project Footprint

Throughout this Response to Submissions, where relevant, responses reflect changes to the proposal that have been approved by the EPA pursuant to a s43A request in January 2021 and EPBC Act s156a request submitted in January 2021 which principally reflect changes that result from ongoing dialogue during the EIA process with Murujuga Aboriginal Corporation and its Circle of Elders.

Total clearing area for the Project footprint - 73.4 ha

Updated Project Development Envelope - 106.6 ha

1.2.1 Project Clearance Area

Table 1-2 Project clearance area by component

Project Component	Area (ha)
Site C	31.1
Site F	32.5
Causeway	1.4
Conveyor Corridor	2.6
Hearson Cove Rd re-alignment	4.0
Site C Access Road	1.4
Total area to be cleared	**73.02**

1.2.2 Vegetation Communities Potentially Cleared

Table 1-3 Vegetation communities found within the Project Footprint (2021) as mapped by APM in May 2019

	Vegetation Community Abbreviations by Trudgen & Associates (2002) and *Additional Vegetation Associates Mapped by APM (2019) Study* [1]	Vegetation Distribution within the Burrup Peninsula (ha) in 2002	Vegetation Distribution within the Murujuga National Park (ha) in 2002	Vegetation Distribution within the PDE Area[2] (ha) - 2019 data	Estimated Vegetation Requiring Clearance for the 2020 Project Footprint (ha) [2]	Vegetation Distribution within the 2021 PDE Area [3] (ha) - APM (2019) data	Estimated Vegetation Requiring Clearance for the 2021 Project Footprint (ha) [3]	Vegetation Distribution within the 2021 Project Footprint[3] (APM,2019) as a Percentage of the Distribution in Burrup Peninsula (2002 data)
1	(Te)Sv	29.8	3	1.86	1.7	1.86	1.70	6%
2	*CcTs	0.6	-	0.44	0.4	0.44	0.44	73%
3	AbCwTe	64.3	3.2	-	-	-	-	1%
	AbHlTe[1]	-	-	0.90	0.9	0.90	0.46	
4	AbImTe	26.8	1.8	6.36	6.3	6.36	6.30	27%
	AbHlCwTe[1]	-	-	0.93	0.9	0.93	0.93	

	Vegetation Community Abbreviations by Trudgen & Associates (2002) and *Additional Vegetation Associates Mapped by APM (2019) Study* [1]	Vegetation Distribution within the Burrup Peninsula (ha) in 2002	Vegetation Distribution within the Murujuga National Park (ha) in 2002	Vegetation Distribution within the PDE Area[2] (ha) - 2019 data	Estimated Vegetation Requiring Clearance for the 2020 Project Footprint (ha) [2]	Vegetation Distribution within the 2021 PDE Area [3] (ha) - APM (2019) data	Estimated Vegetation Requiring Clearance for the 2021 Project Footprint (ha) [3]	Vegetation Distribution within the 2021 Project Footprint[3] (APM,2019) as a Percentage of the Distribution in Burrup Peninsula (2002 data)
5	AbTa	11.5	0.2	6.04	5.7	6.04	5.43	47%
6	AbTe	68.4	52.2	-	-	-	-	-
7	AbWaTe	14.1	1.9	-	-	-	-	-
8	AcImTe	670.4	424.2	1.06	-	-	-	-
9	Rock outcrop, including rock pocket vegetation	2086.34	1669.2	-	-	-	-	0.01%
	BaAcIc[1]	-	-	-	-	0.12	-	
	P1 Rockpiles of the Burrup Peninsula with BaAcIC vegetation [1]	-	-		0.1	0.92	0.13	
	P1 Rockpiles of the Burrup Peninsula with FbBaTsAc [4] *vegetation* [1] [4]	-	-	0.27	-	0.27	0.03	
	FvRpAc [1]	-	-	0.03	-	0.03		
10	ChAbSg	3.4	0.5	0.92	0.9	0.92	0.75	22%
11	ChTh	56.9	43	0.54	0.5	0.54	0.54	1%
12	CpTe	24.2	6.6	-	-	-	-	-
13	CwTe	13.9	-	-	-	-	-	-
14	EvAa	3.3	1.9	0.16	0.04	0.16	-	-
15	EvAbTa	23.3	10.5	0.53	-	0.53	0.18	1%
16	EvDsTa	13.4	5.7	0.64	0.6	0.64	0.64	5%
17	ImTeAc	242	141	-	-	-	-	-
18	ImTrTe	116.5	93.3	-	-	-	-	-
19	ItTa	70	45.1	-	-	-	-	-
20	RC - Rocky coast	76.1	43.6	0.20	-	0.20	-	-
21	SgTeTa	2.1	1.1	-	-	-	-	-
22	Sm	104.8	23.8	-	-	-	-	5%
	Hht [1]	-	-	0.61	0.3	0.61	0.14	
	HhtHil [1]	-	-	4.97	4.8	4.97	4.82	
23	Sv	1.1	0.3	-	-	-	-	-
24	TaTsRm	0.3	-	0.20	0.2	0.20	0.20	66%
25	TcEtSe	4.5	2.1	0.01	0.01	0.01	0.01	0.1%

	Vegetation Community Abbreviations by Trudgen & Associates (2002) and *Additional Vegetation Associates Mapped by APM (2019) Study* [1]	Vegetation Distribution within the Burrup Peninsula (ha) in 2002	Vegetation Distribution within the Murujuga National Park (ha) in 2002	Vegetation Distribution within the PDE Area[2] (ha) - 2019 data	Estimated Vegetation Requiring Clearance for the 2020 Project Footprint (ha) [2]	Vegetation Distribution within the 2021 PDE Area [3] (ha) - APM (2019) data	Estimated Vegetation Requiring Clearance for the 2021 Project Footprint (ha) [3]	Vegetation Distribution within the 2021 Project Footprint[3] (APM,2019) as a Percentage of the Distribution in Burrup Peninsula (2002 data)
26	Te	386.7	341	2.11	0.5	2.11	0.56	0.1%
27	TeAb	86.3	15.4	8.21	5.7	8.21	4.56	5%
28	TeCa	36	1.5	0.07	0.1	0.07	0.07	0.2%
29	TeEtSg	1.2	-	-	-	-	-	-
30	TeRm	52.9	10.5	1.28	1.3	1.28	0.99	6.3%
	AiGpTe [1]	-	-	4.24	2.7	4.24	2.34	
31	TeTh	567.6	319.3	16.46	13.1	16.46	15.51	3%
	ChAbTe [1]	-	-	0.13	-	0.13	-	
	ChImTe [1]	-	-	0.49	0.3	0.49	0.49	
32	Ts'Ac'Te	0.4	-	-	-	-	-	-
33	Tw	82.4	57.2	0.25	0.3	0.25	0.25	0.3%
34	D - Disturbed area	675.2	25.5	-	-	-	-	-
	**Cc*AjTt* [1]	-	-	0.73	0.7	0.90	0.89	
	*AbTe*Cc* [1]	-	-	13.05	13	13.01	12.77	
	TeAtSd [1]	-	-	0.12	0.1	0.08	0.06	
	Roads, Infrastructure and Cleared Land [1]	-	-	23.90	3.8	24.29	5.03	
35	MF - Mud flats	188.2	11.5	7.81	5.5	7.77	6.82	-
	Jetty Construction	-	-	0.70	-	0.7	-	-
	Total area (ha)	**8574.6**	**4890.6**	**106.19**	**70.45**	**106.62**	**73.02**	
	Number of vegetation communities / associations	**212**	**180**	**35**	**26**	**32**	**27**	

* Weed species

(1) APM Biological Survey in 2019 found few instances where vegetation associations found in the PDE not adequately described by M. E. Trudgen & Associates (2002) and APM (2019) study used appropriate classification and abbreviations.

(2) Calculated using March 2020 Project Footprint. The Project requires clearing of no more than 70.5 ha land within a Proposal Development Envelope of 106 ha.

(3) Calculated using January 2021 Project Footprint. The Project requires clearing of no more than 73.4 ha land within a Proposal Development Envelope of 106.6 ha.

The above changes to clearing will be reflected in an updated Environmental Offsets Report as part of Perdaman's revised response to public submissions.

1.2.3 Fauna Habitat Types within the Project Footprint

Table 1-4 Fauna habitat types within the Project Footprint clearance area

Fauna Habitat	Potential Species	Likelihood of Occurrence	Site C construction footprint	Site F construction footprint	Causeway	Conveyor Corridor	Hearson Cove Road Re-Alignment	Access Road to Site C	Total (ha)
Rocky Outcrops	a- Pilbara Olive Python	a. High	0.05	0.05	-	0.06	-	-	0.16
	b- Northern Quolls	b. Moderate							
Hummock Grasslands on Mid Slopes			19.1	28.4	0.6	1.9	2.3	0.04	52.4
Samphire Shrubland / Supratidal Flats	c- Curlew Sandpiper	c. Moderate	10.2	0.2	0.7	-	0.9	0.9	12.81
	d- Red Knot	d. Moderate							
	e- Lesser Sand Plover	e. Low							
	f- Bar-tailed Godwit	f. Moderate							
	g- Australian Fairy Tern	g. Low							
	h- Great Knot	h. Low							
	i- Eastern Curlew	i. Moderate							
Drainage Lines	j- Ghost Bat	j. Recorded	0.8	1.7	-	0.2	-	-	2.6
Disturbed			1.0	2.2	0.1	0.5	0.8	0.5	5.05
Total			**31.1**	**32.5**	**1.4**	**2.6**	**4.0**	**1.4**	**73.02**

a- Pilbara Olive Python - This species has been historically recorded on Dolphin Island in the Dampier region and in King Bay, Hearson's Cove and in many locations around the Karratha Gas Plant and Pluto LNG facility, particularly where artificial water sources occur (open water pit) It is often recorded around the built environment and highly disturbed areas. APM did not record the species on either of the biological surveys (APM, 2019), however this species has a high likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

b- Northern Quoll - This species has been previously recorded on Dolphin Island in the Dampier region and on the Burrup Peninsula in various locations, including a sighting at the port area of King Bay warehouse. They require well-developed and extensive rocky outcrops which is not present within the Footprint (APM, 2019). They have a moderate likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

c- Curlew Sandpiper - This species has been recorded in the Dampier region (DBCA, 2018) and historically on the Burrup (Worley Astron, 2006). This species may use the Project Area during the wet season, though records suggest that the species prefers undisturbed islands and islets. They have a moderate likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

d- Red Knot - This species has been recorded in the Dampier region (DBCA, 2018) and less recently on the Burrup Peninsula (Worley Astron, 2006). The species is known to follow tide edges when foraging, and can be seen with many other shore birds within the samphire habitat. Given the proximity to Hearson's Cove, and the presence of open flats within the Project Area, this species may use the area for both foraging and roosting. This species was not recorded on either of APM's biological surveys (APM, 2019), however, they have a moderate likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

e- Lesser Sand Plover - This species has been historically recorded on Dolphin Island in the Dampier region. This species sometimes overwinters in northern Australia. It is abundant in Queensland, and uncommon elsewhere in Australia. This species is not expected to rely on habitats present in the Project Area, especially as this species does not breed in Australia. They have a low likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

f- Bar-tailed Godwit – This species has been recorded in the Dampier region on Dolphin Island and Hearson's Cove (DBCA, 2018). This species may forage over the salt ponds and mud flats present in the Project Area. They have a moderate likelihood of

occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

g- Australian Fairy Tern - This species has been recorded on Egret Island on the Dampier archipelago (DBCA, 2018). This species would be more inclined to use the sheltered and undisturbed bays within the islands and islets of the archipelago. They have a low likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

h- Great Knot - This species has been historically recorded on the Burrup Peninsula (Worley Astron, 2006). It was not recorded during either of Biological surveys (APM, 2019). The samphire/mudflat habitat occur within the PDE is likely too open for this species, and it does not that contain the mangrove swamps it prefers. Therefore the habitat requirement has not met.

i- Eastern Curlew - Predominately found in estuarine systems, saltmarshes, tidal mudflats and mangroves. Can be found in brackish or freshwater lakes. This species has been recorded at Nickol Bay (east coast of Burrup) (DBCA, 2018). They are a common migrant to the north, northeast and southeast of Australia. They have a moderate likelihood of occurrence within the Project area. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

j- Ghost Bat - This species has been recorded on the Burrup Peninsula about 4 km northeast of the Project Area (DBCA, 2018) and more recently by APM during the post-wet season survey. The drainage line in the south west of PDE was identified as an important habitat for Ghost Bats and therefore eliminated from the current footprint. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

2 Significant Impact Guidelines 1.1

2.1 Main issues raised by DAWE

Not Satisfied

The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation to the impact on migratory species.

2.2 Perdaman Response

Department of the Environment, Water, Heritage and the Arts, 2013, Significant Impact Guidelines 1.1 - Matters of National Environmental Significance. Available from: https://www.environment.gov.au/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance

The Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (DEWHA, 2013) provide overarching guidance on determining whether an action is likely to have a significant impact on a matter of national environmental significance protected by the Environment Protection and Biodiversity Conservation (**EPBC**) Act 1999. It defines a 'significant impact' as an impact which could be considered important, notable or of consequence, in terms of the context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. To be likely, it is sufficient that a significant impact on the environment is a real and not a remote chance or possibility.

The EPBC Act Significant Impact Guidelines 1.1 identify the key considerations that should inform whether or not a proposed action should be referred. These considerations include whether protected matters are present in the area of interest, whether they may be impacted (directly or indirectly), and whether there are measures that could be taken to avoid or mitigate any impacts to reduce those impacts to below the significance threshold. Consideration should also be given to the sensitivity, value and quality of the environment, as well as the intensity, duration, magnitude and geographic extent of the impacts. There are a range of assessment processes which must then be followed for actions determined as having significant impacts.

The Proposal has been referred to the Commonwealth Minister for the Environment in January 2019 and subsequently determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and is being assessed by the Commonwealth of Australia and the State of Western Australia as an accredited assessment.

The relevant controlling provisions for this Proposal are:

- The heritage values of a National Heritage Property (sections 15B & 15C);
- Listed Threatened Species and Communities (sections 18 & 18A);
- Listed Migratory Species (sections 20 & 20A); and
- Commonwealth Marine Areas (sections 23 & 24A).

A screening assessment was conducted using the Significant Impact Guidelines 1.1 (DEWHA, 2013) to understand the matters of National Environmental Significance (**NES**) that may be impacted by the Proposal. The screening assessment considered the ecology, habitat requirement and other factors relevant to the MNES.

The EPBC Act Protected Matters Search Tool (**PMST**) was used to search for matters of national environmental significance in the Proposal area. As a result, species or ecological communities that were not relevant to the Proposal was removed. For example, no threatened ecological communities listed under the EPBC Act and no plants declared rare or threatened under the EPBC Act are known from the Burrup Peninsula, or within 100 km of the Proposal Development Envelope (**PDE**).

2.2.1 Listed Migratory Species

The **PMST** identified 58 migratory species established under section 209 of the EPBC Act in a 10 km search radius from the study area (Table 6-5 and Table 6-6 in ERD):

> Migratory Marine Birds (Table 6-5 in ERD) – 8 species

> Migratory Terrestrial Species (Table 6-5 in ERD) – 3 species

> Migratory Wetlands Species (Table 6-5 in ERD) – 28 species

> Migratory Marine Species (non-avian) (Table 6-6 in ERD)- 19 species

From the total of 39 migratory bird species identified (marine, terrestrial and wetland birds), about 30 bird species are listed as “known to occur” within the 10km buffer area and 2 species are identified as “likely to occur”. Further 7 have been identified as “may occur” within the area.

Migratory Marine fauna presence in the Dampier Archipelago is described in Marine Fauna Desktop Assessment (Pendoley, 2019) in ERD Appendix C.

2.2.2 Field assessments

Bird surveys were conducted during the November 2018 and March 2019 survey periods. Dedicated bird surveys for diurnal birds was conducted visually and aurally on mornings and in the evening in each 2 ha plots for 20 minutes. Around 8-12 plots spread throughout all habitat types present at the site were searched each day. In order to sample migratory waders and shorebird species, focus was placed on the floodplain and fringing habitat within the study area. Additionally, opportunistic records were noted during other biological surveys conducted at the study area.

The survey timing was appropriate to target migratory shorebird species since they are mostly present in Australia during the non-breeding period, from as early as August to as late as April/May each year (DoEE) 2017a). The field survey was conducted according to the following guidelines:

> Survey Guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA 2010)

> EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (DoE, 2015a)

> Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE, 2015b)

2.2.3 Likelihood of occurrence assessment

The information acquired through the desktop and field assessments was used to characterise the existing terrestrial and aquatic ecological values of the area around the Proposal, as relevant to matters of NES. All potential impacts to each matter of NES identified as a controlling provision for the Proposal was then considered and assessed.

For conservation significant species, a likelihood of occurrence assessment was undertaken to filter listed migratory species that could potentially occur at the site to focus assessment on those taxa that are known, and likely to occur at the site. This was used to inform the impact identification process.

A likelihood of occurrence assessment considered information relating to:

> Habitat preferences

> Distribution

> Relative abundance

> Previous records from the region

> The occurrence of suitable habitat at the Proposal area based on field observations

> The confirmed presence of conservation significant species at the Proposal area during field observations

Seven migratory bird species listed under the EPBC Act have been recorded within the Study Area. Further Ten have a moderate likelihood of presence in the Study Area. 23 species observed are listed as Marine and are covered under international agreements.

Table 2-1 Migratory species recorded within the study area and have a moderate likelihood of presence within the study area

Recorded Species at the Study Area	Moderate likelihood of occurrence at the study area (threatened species listed under the EPBC Act are highlighted)
▪ Caspian Tern (*Hydroprogne caspia*)	▪ Barn Swallow (*Hirundo rustica*)
▪ Common Greenshank (*Tringa nebularia*)	▪ **Bar-tailed Godwit (*Limosa lapponica baueri*) (VU)**
▪ Eastern Osprey (*Pandion cristatus*)	▪ Broad-billed Sandpiper (*Limicola falcinellus*)
▪ Grey-tailed Tattler (*Tringa brevipes*)	▪ Crested Tern (*Thalasseus bergii*)
▪ Pacific Golden Plover (*Pluvialis fulva*)	▪ **Curlew Sandpiper (*Calidris ferruginea*) (CR)**
▪ Red-necked Stint (*Calidris ruficollis*)	▪ **Eastern Curlew (*Numenius madagascariensis*) (CR)**
▪ Whimbrel (*Numenius phaeopus*)	▪ **Greater Sand Plover (*Charadrius leschenaultii*) (VU)**
	▪ **Red Knot (*Calidris canutus*) (EN)**
	▪ Ruddy Turnstone (*Arenaria interpres*)
	▪ White- winged Black Tern (*Chlidonias leucopterus*)

* EPBC Act listed species are highlighted in **Bold** letters.

2.2.4 Impacts of the proposed action

Summary of potential impacts associated with the proposed project activities include:

> habitat loss and habitat degradation. Where habitat is retained, degradation from adjacent works could result in a loss of habitat quality through secondary effects such as sedimentation.

> edge effects such as the introduction of pest and weed species could result in the degradation of habitat. Additionally, noise and light may result in the displacement of individuals.

> land clearing activities could increase soil erosion, inadvertently causing silting or sedimentation of riverine habitats and waterholes downstream. Soil erosion could trigger a loss of nutrients to one area, causing a disruption of natural nutrient cycling.

> Oil spills and hydrocarbon spills can heavily impact migratory species.

Section 6.7.13 and 6.7.14 of the ERD describes the potential impacts associated with the proposed project activities in detail.

2.2.5 Avoidance and mitigation measures

Key mitigation measures proposed by the proponent to address potential impacts to the listed migratory birds include:

> minimisation of the proposed disturbance footprint in order to retain the intrinsic values of local native vegetation and associated fauna habitat.

> prior to disturbance, vegetation would be surveyed to identify any fauna that may be present in order to minimise impacts on fauna communities. If any fauna is present, the fauna would be given the opportunity to move away naturally prior to clearing. Staff or contractors responsible for land clearing would be made aware of the possible presence of migratory species.

> staff induction programme would contain information on the project area's conservation values in order to increase staff awareness of the potential presence of the migratory species.

> photographs, descriptions and the management requirements for any migratory species encountered within the project area would be developed as part of the induction package.

> final rehabilitation would include the restoration of wetland habitat to support migratory species which may have been impacted by project actions.

Mitigation measures to manage the potential impacts to the migratory marine species have been summarised in Table 4-7 in the ERD and mitigation measures to manage the potential impacts to the

migratory terrestrial species have been summarised in Table 4-20 in the ERD. Mitigation measures to manage potential impacts to threatened species are summarised in Table 6-4 in the ERD.

2.2.6 Significant impact assessment

Impacts on the migratory species were assessed according to the 'significant impact criteria' (DEWHA, 2013), which are:

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it would:

1. Substantially modify (including fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of **important habitat** for a migratory species;
2. Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
3. Seriously disrupt the life cycle (breeding, feeding, migration, or resting behaviour) of **an ecologically significant proportion** of the **population of a migratory species**.

Under the 'significant impact criteria' (DEWHA, 2013) guidelines, an area of '**important habitat'** for a migratory species is:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

Important habitats in Australia for migratory shorebirds under the EPBC Act include those recognised as nationally or internationally important. *EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE, 2015a), defines nationally important habitat for migratory shorebirds are defined as if the habitat regularly supports:

- at least 0.1 per cent of the flyway population of a single species of migratory shorebird OR
- 2000 migratory shorebirds OR
- 15 migratory shorebird species.

Further 'significant impact criteria' (DEWHA, 2013) guidelines defines the 'ecologically significant proportion' and 'population of a migratory species'.

A detailed assessment was conducted to determine whether the prosed Project activities cause a significant impact on migratory species based on the following guidelines:

- Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (DEWHA, 2013)
- EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (DoE, 2015a)
- Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE, 2015b)
- Revision of the East Asian-Australasian Flyway Population Estimates for 37 listed Migratory Shorebird Species (Hansen et al., 2016)

The results of these assessments are presented in Table 2-2. In summary, it was concluded that the Project is not likely to significantly impact any listed migratory species under the EPBC Act, on the basis of the following:

- no 'important habitat' exists within the Project area for any listed migratory species;
- the Project would not result in an invasive species that is harmful to any migratory species becoming established in an area of important habitat; and
- the Project would not disrupt the life cycle of an ecologically significant proportion of any population of any migratory species

The migratory species that have been detected on site are all highly mobile species which may visit periodically. The PDE does not include significant or locally uncommon habitat values and these species are therefore unlikely to utilise the site for breeding purposes. While individuals may occasionally visit the project site, it is considered unlikely that the habitat on-site would represent important habitat; or that a population would be dependent on the project area.

Table 2-2 Impacts on the migratory species assessed according to the 'significant impact criteria'

Common Name / Scientific Name	Conservation Status	Likelihood of Occurrence	Habitat, distribution and behaviour	Significant Impact Criteria			Conclusion
				Substantially modify, destroy or isolate an area of important habitat?	Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat?	Seriously disrupt the lifecycle of an ecologically significant proportion of the population?	
Caspian Tern (*Hydroprogne caspia)*	M, IA	Recorded	The species flies over the surf line and inshore waters and prefers sheltered estuaries, inlets, bays, harbours, lagoons with muddy or sandy shores. Will also utilise fresh and saltwater lakes and large rivers. This species has been recorded on Keast Island in the Dampier Archipelago (DBCA, 2018) and more recently by APM during the post-wet season survey.	a) Only one individual was observed, so not a significant proportion of the national population. The species would be more inclined to use the undisturbed islets and islands off the archipelago and the individual recorded by APM was likely only an opportunistic visitor. May use the area sparingly, so not a significant proportion of the national population. b) No breeding or roosting sites occurs in the study area, so habitat not important for a significant proportion of the national population. c) Widely distributed species, not at the limits of their ranges. d) Species are not listed as threatened and therefore are not considered to be in decline.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project
Common Greenshank (*Tringa nebularia)*	M, IA	Recorded	This species requires open swamps, and therefore may only use smaller water bodies opportunistically. However, records have been made in dams and sewage ponds. Typically associated with saltmarshes, estuaries and shallow waters such as clay pans and mudflats, it prefers wet and flooded mud and clay, rather than sandy ground. This species has been recorded on Roly Rock islet within Dampier and King Bay (DBCA, 2018) and more recently by APM during the post-wet season survey.	37 birds were observed (0.1% Flyway population is 110) a) Only small, widely dispersed numbers potentially in the Study Area, so not a significant proportion of the national population. This species use diverse habitats, which means that it is likely to not be reliant on habitats present in the Project Area. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) Widely distributed species, not at the limits of their ranges. d) Species are not listed as threatened and therefore are not considered to be in decline.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project

Common Name / Scientific Name	Conservation Status	Likelihood of Occurrence	Habitat, distribution and behaviour	Significant Impact Criteria			Conclusion
				Substantially modify, destroy or isolate an area of important habitat?	Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat?	Seriously disrupt the lifecycle of an ecologically significant proportion of the population?	
Eastern Osprey (*Pandion cristatus)*	M, IA	Recorded	Inhabits coastal waters and estuaries, islets and exposed reefs. The species follows major rivers inland and even to large pools and gorges in arid regions. More common across northern coasts along rocky shorelines, islands and reefs. This species has been recorded on Roly Rock islet in Dampier (DBCA, 2018) and more recently by APM during the post-wet season survey. Important habitat for this species as listed in Commonwealth of Australia (2015): Bays, estuaries, along tidal stretches of large coastal rivers, mangrove swamps, coral and rock reefs, terrestrial wetlands and coastal lands of tropical and temperate Australia and off shore islands. They feed primarily in the sea or nearby estuarine waters and nest in trees (often dead or with dead tops), rocky coastlines and on artificial structures such as telecommunication towers. Ospreys are generally found on or near the coast but also range inland along large rivers, mainly in northern Australia.	a) Only 2 birds were observed, so not a significant proportion of the national population. The species would be a transitory visitor, foraging or flying over site and would be more inclined to forage over the vast undisturbed rocky islets and islands across the Dampier archipelago, north and northwest of the Burrup. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) Widely distributed species, not at the limits of their ranges. d) Species are not listed as threatened and therefore are not considered to be in decline.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project
Grey-tailed Tattler (*Tringa brevipes)*	M, IA	Recorded	Coastal habitats including inter-tidal pools, shallows, soft surfaces of mudflats and sand beaches, but also rocky ledges and reefs. This species has been recorded on Roly Rock islet in the Dampier archipelago (DBCA, 2018) and more recently by APM during the post-wet season survey. There are about 20 records within the Murujuga National Park (Atlas of Living Australia, 2020).	57 birds were observed (0.1% Flyway population is 70) a) Only small, widely dispersed numbers potentially in the Study Area, so not a significant proportion of the national population. This species utilises the mudflats present in the Project Area for foraging. Suitable habitat is vast outside of the Project Area. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) Widely distributed species, not at the limits of their ranges. d) Species are not listed as threatened and therefore are not considered to be in decline.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project
Pacific Golden Plover (*Pluvialis fulva)*	M, IA	Recorded	Occupies coastal habitats in small flocks or large flocks within estuaries, intertidal mudflats, salt marshes. reefs and offshore islands. The species disperses around suitable habitat areas on the coast. This species has been recorded on Roly Rock islet within Dampier (DBCA, 2018) and more recently by APM during the post- wet season survey	a) Only one individual was observed (0.1% Flyway population is 120), so not a significant proportion of the national population. The species would be more inclined to inhabit the islands on the west side of Dampier and Burrup, where suitable habitat is vastly available, and especially where it is quieter, as the species is quite shy and wary. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) Widely distributed species, not at the limits of their ranges. d) Species are not listed as threatened and therefore are not considered to be in decline.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project

Common Name / Scientific Name	Conservation Status	Likelihood of Occurrence	Habitat, distribution and behaviour	Significant Impact Criteria			Conclusion
				Substantially modify, destroy or isolate an area of important habitat?	Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat?	Seriously disrupt the lifecycle of an ecologically significant proportion of the population?	
Red-necked Stint (*Calidris ruficollis)*	M, IA	Recorded	Inhabits a diverse range of habitats, both tidal and inland, mudflats, salt marshes, beaches, salt fields, temporary floodwaters. Is a very common migrant in areas that are most favoured and scattered elsewhere.	a) Only one individual was observed (0.1% Flyway population is 475), so not a significant proportion of the national population. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) Widely distributed species, not at the limits of their ranges. d) Species are not listed as threatened and therefore are not considered to be in decline.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project
Whimbrel (*Numenius phaeopus)*	M, IA	Recorded	Inhabits mudflats of estuaries, lagoons containing mangroves. Less often in sandy beaches, reefs and salt lakes.	a) Only 5 birds were observed (0.1% Flyway population is 65), so not a significant proportion of the national population. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) Widely distributed species, not at the limits of their ranges. d) Species are not listed as threatened and therefore are not considered to be in decline.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project
Barn Swallow (*Hirundo rustica)*	M, IA	Moderate	Visits northern Australia from September to March, in close proximity to towns and wetlands including salt ponds and swamps. Important habitat for this species as listed in Commonwealth of Australia (2015): Non-breeding habitat only occurs in the air above open vegetated areas including native and agricultural grasslands as well as over open water areas.	a) This species may utilise artificial water bodies at the Project Area and natural areas containing the mudflats and clay pans, however none observed at the Study Area. The Study Area does not support a significant proportion of the national population. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) Widely distributed species, not at the limits of their ranges. d) Species are not listed as threatened and therefore are not considered to be in decline.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project
Bar-tailed Godwit (*Limosa lapponica bauera)*	VU, M, IA	Moderate	This species forages over coastal dunes. Has been observed amongst sand and mud flats in estuarine and beach areas, as well as near-coastal salt ponds and salt lakes. This species has been recorded in the Dampier region on Dolphin Island and Hearson's Cove (DBCA, 2018).	a) This species may forage over the salt ponds and mud flats present in the wider area, however none observed at the Study Area (0.1% Flyway population is 325). The Study Area does not support a significant proportion of the national population. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) Species occurs within the wider Dampier Region, so not at the limit of its range. d) The habitat to be removed is not the preferred foraging or roosting habitat and will therefore not increase the decline of this species.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project

Common Name / Scientific Name	Conservation Status	Likelihood of Occurrence	Habitat, distribution and behaviour	Significant Impact Criteria			Conclusion
				Substantially modify, destroy or isolate an area of important habitat?	Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat?	Seriously disrupt the lifecycle of an ecologically significant proportion of the population?	
Broad-billed Sandpiper (*Limicola falcinellus*)	M, IA	Moderate	Prefers sheltered coastal estuaries and soft inter-tidal mudflats, coastal creeks, swamps and sewage ponds and only occasionally reefs. Often seen with Red- necked Stints or Curlew Sandpipers. A migrant to Australia, during non-breeding season. They mostly occur on the Pilbara and Kimberley coasts between Onslow and Broome (DoEE, 2018). The largest population of these birds is seen at the Port Hedland Saltworks (around 6000 birds).	a) Suitable habitat for this species does occur adjacent the Project Area and they may use those sites sparingly. None observed at the Study Area (0.1% Flyway population is 30). The Study Area does not support a significant proportion of the national population. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) Species occurs within the wider Dampier Region, so not at the limit of its range. d) The habitat to be removed is not the preferred foraging or roosting habitat and will therefore not increase the decline of this species.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project
Crested Tern (*Thalasseus bergii)*	M, IA	Moderate	This species is a common tern, especially of bays, harbours, boats and jetties. Inhabits beaches, offshore islands, deeper pelagic seas, inshore estuaries and only occasionally on salt ponds and saline lakes near the coast. This species has been recorded on the Dampier Archipelago and Hearson's Cove (DBCA, 2018).	a) This species may utilise the Project Area for foraging over the salt clay pans during the wet season, however none observed at the Study Area. The Study Area does not support a significant proportion of the national population. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) Species occurs within the wider Dampier Region, so not at the limit of its range. d) The habitat to be removed is not the preferred foraging or roosting habitat and will therefore not increase the decline of this species.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project
Curlew Sandpiper (*Calidris ferruginea*)	CR, M, IA	Moderate	Known to occupy drying near-coastal freshwater lakes and swamps. It feeds in shallow water and wet mud, pecking prey from the surface or probing in mud with the bill. It feeds both by day and by night. It is attracted to near-coastal water bodies, such as salt ponds, salt lakes, sewage ponds, beaches and freshwater swamps and lakes. This species has been recorded in the Dampier region (DBCA, 2018) and historically on the Burrup (Worley Astron, 2006).	a) This species may use the Project Area during the wet season for a short amount of time where the mud is wet or inundated by water for most of the day, though records suggest that the species prefers undisturbed islands and islets. The habitat within the Study Area is close to a busy road and the mud flats usually dry out quicker. The habitat within the Study Area is sub-optimal for the species. None observed at the Study Area (0.1% Flyway population is 90). The Study Area does not support a significant proportion of the national population. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) Species occurs within the wider Dampier Region, so not at the limit of its range. d) The habitat to be removed is not the preferred foraging or roosting habitat and will therefore not increase the decline of this species.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project

Common Name / Scientific Name	Conservation Status	Likelihood of Occurrence	Habitat, distribution and behaviour	Significant Impact Criteria			Conclusion
				Substantially modify, destroy or isolate an area of important habitat?	Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat?	Seriously disrupt the lifecycle of an ecologically significant proportion of the population?	
Eastern Curlew (*Numenius madagascariensis)*	CR, M, IA	Moderate	Predominately found in estuarine systems, saltmarshes, tidal mudflats and mangroves. Can be found in brackish or freshwater lakes. This species has been recorded at Nickol Bay (east coast of Burrup) (DBCA, 2018). The Eastern Curlew mainly eats mainly small crustaceans, small molluscs and insects in Australia. The Eastern Curlew is the largest curlew, with a much longer bill and legs than the similar Whimbrel. It forages by day and night, walking slowly on sandy and muddy flats, picking from the surface or probing deep with its long bill.	a) This species is a common migrant to the north and northeast and southeast of Australia. They mainly forage on soft sheltered intertidal sandflats or mudflats. They may use the Project Area during the wet season for a short amount of time where the mud is wet or inundated by water for most of the day. They are extremely shy species that will take flight at the first sign of danger, long before other shorebirds become nervous. The habitat within the Study Area is close to a busy road and the mud flats usually dry out quicker. There are no preferable roosting sites within the Project Area. The habitat within the Study Area is sub-optimal for the species. None were observed at the Study Area and the Study Area does not support a significant proportion of the national population. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) Species occurs within the wider Dampier Region, so not at the limit of its range. d) The habitat to be removed is not the preferred foraging or roosting habitat and will therefore not increase the decline of this species.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project
Greater Sand Plover (*Charadrius leschenaultii)*	VU, M, IA	Moderate	Resides in large mixed-species flocks on coastal, intertidal mudflats and sandbanks of sheltered bays. Less common on coastal salt marshes and brackish or freshwater wetlands. This species has been recorded northeast of Rosemary Island on an islet called Lady Nora within the Dampier archipelago and Hearson's Cove. This species is a regular migrant between August and May and is most common in northern Australia.	a) The species is not expected to be reliant on the Project Area habitats given it prefers sheltered bays and intertidal mudflats. None were observed at the Study Area (0.1% Flyway population is 200). The Study Area does not support a significant proportion of the national population. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) May use the area sparingly. Not regularly supports the population. This species never been recorded within the Study Area. Local regional areas such as Hearsons Cove and Dolphin Island has much suitable habitat for the species. d) The habitat to be removed is not the preferred foraging or roosting habitat and will therefore not increase the decline of this species.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project
Red Knot (*Calidris canutus)*	EN, M, IA	Moderate	In close proximity to coastal waters such as mudflats and sandflats in estuaries. Also known to occur in salt ponds and salt lakes near the coast. This species has been recorded in the Dampier region (DBCA, 2018) and less recently on the Burrup Peninsula (Worley Astron, 2006). The species is known to follow tide edges when foraging, and can be seen with many other shore	a) Given the proximity to Hearson's Cove, where the optimal habitat for this species occurs, the presence of open flats within the Project Area, this species may use the area for both foraging and roosting during wet season. However, this species was not recorded on either of APM's surveys at the Study Area (0.1% Flyway population is 110).	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion	No significant impact is expected from the Project

Common Name / Scientific Name	Conservation Status	Likelihood of Occurrence	Habitat, distribution and behaviour	Significant Impact Criteria			Conclusion
				Substantially modify, destroy or isolate an area of important habitat?	Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat?	Seriously disrupt the lifecycle of an ecologically significant proportion of the population?	
			birds, such as the Red-necked Stint, which was recorded on site, within the samphire habitat.	The Study Area does not support a significant proportion of the national population. b) Though suitable habitat present within Study Area, the habitat is not critical importance to the species at their life-cycle stages, so habitat not important for a significant proportion of the national population. c) Species occurs within the wider Dampier Region, so not at the limit of its range. d) The habitat to be removed is not the preferred foraging or roosting habitat and will therefore not increase the decline of this species.		of a population of any migratory species under consideration.	
Ruddy Turnstone (*Arenaria interpres)*	M, IA	Moderate	Resides on ocean coasts with exposed rock, stony or shell beaches, but also mudflats and sometimes inland on shallow pools. This species has been recorded on Roly Rock, a small, distant island off the coast of Dampier, King Bay and Cowrie Cove on the Burrup Peninsula (DBCA, 2018).	a) Only small, widely dispersed numbers potentially in the Study Area, though none were observed at the Study Area (0.1% Flyway population is 30). The Study Area does not support a significant proportion of the national population. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) Widely distributed species, not at the limits of their ranges. d) Species are not listed as threatened and therefore are not considered to be in decline.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project
White-winged Black Tern (*Chlidonias leucopterus)*	M, IA	Moderate	Inhabits marine and freshwater coastal wetlands, including inundated floodplains and estuaries. A regular migrant to Australia, common in the Top End. They congregate in large flocks in preferred sites and at staging sites before northern migration (Alva Beach Queensland and Perron Island Northern Territory). Elsewhere they roost and forage in small flocks or can be seen in twos, threes or singularly (DoEE, 2018).	a) Only small, widely dispersed numbers potentially in the Study Area, though none were observed at the Study Area. The Study Area does not support a significant proportion of the national population. b) No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population. c) Widely distributed species, not at the limits of their ranges. d) Species are not listed as threatened and therefore are not considered to be in decline.	The Project would not result in any invasive species becoming established in the area. No 'important habitat' for the listed migratory species under consideration exists in the locality.	The study area does not support important breeding foraging or roosting habitat, and will not disrupt the migration or resting behaviour of any migratory species. Therefore, the Project will not disrupt the lifecycle of an ecologically significant proportion of a population of any migratory species under consideration.	No significant impact is expected from the Project

3 Policy Documents for European Red Fox

3.1 Main issues raised by DAWE

Not satisfied

- The proponent has only partially addressed the objectives in the Threat abatement plan for predation by the European red fox.
- Proponent states that it will implement a fox control - trapping and euthanisation program.

Note

The Department advises that a separate Pest management plan be submitted.

3.2 Perdaman Response

Predation by the European red fox

Given the extent of their impact on biodiversity, predation by the European red fox (*Vulpes vulpes***)** is listed as a key threatening process under the EPBC Act 1999. Of the threatened species listed under the EPBC Act, foxes are considered a threat to 14 species of birds,48 mammals, 12 reptiles and 2 amphibians (DEWHA, 2008a).

There are a few threatened species known or predicted to occur within the Project area and surrounds that are threatened by fox predation. These include, but are not restricted to the:

- All turtle species
- Northern Quoll
- Olive Python
- Ghost bat

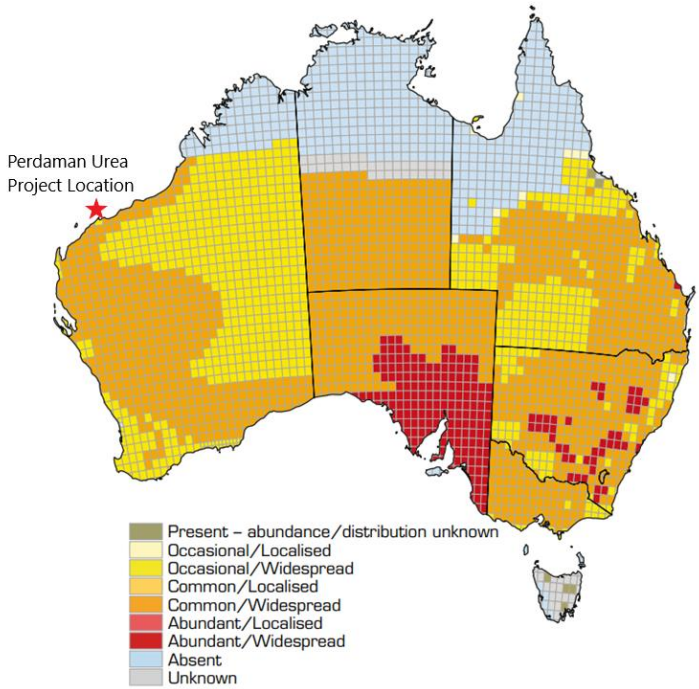

Figure 3-1 Distribution of the European Red Fox within Australia (*Vulpes Vulpes*) (Invasive Animals Cooperative Research Centre, 2008)

Distribution of the European Red Fox within Australia is shown in Figure 3-1.

Though not observed during the Biological Surveys conducted within the Study Area (APM, 2019), Worley Astron (2006) recorded Red Foxes within the broader Pilbara Region. The fox has been recorded closer to the Pilbara coast and is known to prey on turtle eggs along the beaches and coastal dunes near Onslow and Wheatstone. Turtles are at most risk from impacts during nesting, hatchling emergence and at-sea dispersal. Very low-level turtle nesting is expected at proximity of the Proposal Development Envelope.

Foxes prey on various local native fauna. If foxes find an easy to access food supply, they will regularly return and may establish a local population. This species could become a problem species if not effectively managed.

As mentioned in the ERD Threatened Species Management Plan in Appendix K, predator control (including European Red Foxes) has been identified as an absolute priority to minimise the impact of the Project.

A Pest Management Plan will be implemented by the Project which focuses on the control of European foxes and other pest and feral species. The Pest Management Plan developed for the Project shares the same goals as per the' Threat abatement plan (**TAP**) for predation by the European red fox (DEWHA, 2008b)', which is to minimise the impact of foxes on biodiversity in Australia and its territories by:

- protecting affected native species and ecological communities, and
- preventing further species and ecological communities from becoming threatened.

To achieve this goal, the TAP for European Red Fox has five main objectives. These objectives are to:

1. prevent foxes occupying new areas in Australia and eradicate foxes from high-conservation-value 'islands'. Islands' are defined as both offshore islands and as mainland islands that are isolated and/or do not currently have invasive species.
2. promote the maintenance and recovery of native species and ecological communities that are affected by fox predation
3. improve knowledge and understanding of fox impacts and interactions with other species and other ecological processes
4. improve the effectiveness, target specificity, integration and humaneness of control options for foxes, and
5. increase awareness of all stakeholders of the objectives and actions of the TAP, and of the need to control and manage foxes.

Objective 1: prevent foxes occupying new areas in Australia and eradicate foxes from high-conservation-value 'islands'

The following management and control measures will be applied as per the Project Pest Management Plan to prevent Foxes occupying new areas in the Project area and eradicate Foxes if present within the Project facility area:

- All personnel going to the Project site will undergo induction training in which the identification and management of pest animals will be discussed;
- The perimeter fence line must be constructed by cyclone mesh. It should be constructed according to the specification in Pest Management Plan: Feral cat, fox and rabbit proof fence design;
- Secure waste organic material (such as food scraps) in covered bins to deter scavenging by pest animals;
- Preferred habitat and nesting locations for pest species should be identified at each Project facility so that mitigation measures can be implemented to remove/minimise the favourable nesting locations;
- Avoid creating artificial water sources (e.g. depressions on ground) that provide a source of drinking water to vertebrate pests;
- Where pest fauna are encountered within the land clearing activities, a relevant authorised person/ the nearest veterinary clinic will euthanise the animal;

- When the “triggers” identified in the Pest Management Plan is triggered for each species, appropriate management and control measures will be deployed;
- In areas where pest numbers are a concern to human safety (e.g. high numbers of feral dogs / feral pigs), a suitably qualified contractor is to be contacted to implement a mitigation strategy (i.e. culling activities); and
- Liaise with PPA, YACMAC Rangers, Western Shield and Pilbara Regional Biosecurity Group (PRBG) and participate in existing and/or planned catchment wide pest animal management programs (i.e. Western Shield's fox and feral cat baiting program).

The above management and control measures are discussed in detailed in the Pest Management Plan.

Objective 2: promote the maintenance and recovery of native species and ecological communities that are affected by fox predation

Perdaman will ensure all feral animal management measures on site are integrated and coordinated with existing regional/local control programs (i.e. Pilbara Ports Authority, Pilbara Regional Biosecurity Group, Western Shield program run by the Western Australian Department of Parks and Wildlife, etc.). This will ensure the maintenance and recovery of native species and ecological communities that are affected by fox predation, such as the Flatback Turtle nests at Port Hedland.

Objective 3: improve knowledge and understanding of fox impacts and interactions with other species and other ecological processes

As per the Pest Management Plan developed for the Project, Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority) and participate in existing regional management and/or research programs where applicable.

Any data from these programs will be included in the annual report to relevant regulators.

Objective 4: improve the effectiveness, target specificity, integration and humaneness of control options for foxes

As per the Pest Management Plan developed for the Project, Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority) and participate in existing regional management and/or research programs where applicable.

Any data from these programs will be included in the annual report to relevant regulators.

Objective 5: increase awareness of all stakeholders of the objectives and actions of the TAP, and of the need to control and manage foxes

All personnel going to the Project site will receive a detailed induction program about the native and threatened species as well as the pest species that may occur within the site.

Detailed information about the pest specific training program can be found in the Pest Management Plan.

4 Policy Documents for Feral Pigs

4.1 Main issues raised by DAWE

Not Satisfied

> The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation to the impact on the species.

Note

The proponent lists the objectives in the TSMP but does not provide a discussion.

4.2 Perdaman Response

Policy documents - Threat abatement plan for predation - feral pigs

Feral Pigs (*Sus scrofa*) are not currently ranked as a high threat to the biodiversity in the Burrup Peninsula. According to the Western Australian Feral Pig Strategy 2020-2025 report (Department of Primary Industries and Regional Development 2019), feral pig populations in the Pilbara are restricted to localized densities closely associated with major river systems or large year-round water bodies. According to current distribution maps feral pig populations in the Pilbara region are restricted to Port Hedland region. They are absent in the Karratha/Dampier region (Figure 4-1).

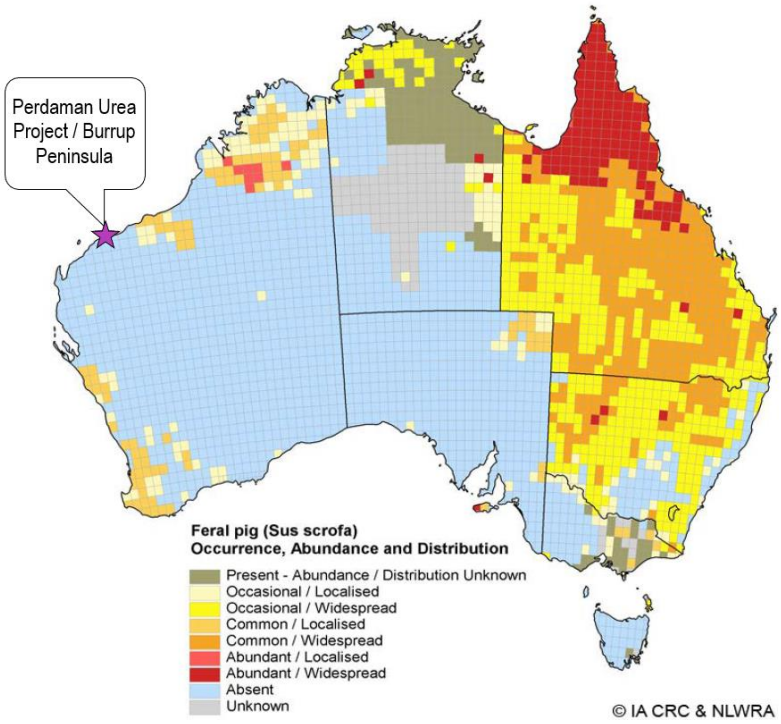

Figure 4-1 Occurrence, abundance and distribution of feral pigs (*Sus scrofa*) in Australia in 2006/2007 (DoEE, 2017c).

All turtle species (eggs and hatchlings) present within the wider Project area are threatened by predation by feral pigs if present. Feral pigs are responsible for reduced native plant biomass, changes to native vegetation structure and habitat/food sources for native animals, and as a result of loss of vegetation cover can expose small native animals such as Northern Quoll to an increased risk of predation.

A Pest Management Plan will be implemented by the Project. That shares the same goals as per the' *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs* (DoEE, 2017b)', which is to prevent further species and ecological communities from becoming threatened

or extinct due to predation, habitat degradation, competition and disease transmission by feral pigs, and to improve protection for EPBC-listed species and ecological communities currently threatened by feral pigs.

To achieve these goals, the threat abatement plan (DoEE, 2017b) has six objectives. These objectives are to:

1. Prioritise key species, ecological communities, ecosystems and locations across Australia for strategic feral pig management
2. Encourage the integration of feral pig management into land management activities at regional, state and territory, and national levels
3. Encourage further scientific research into feral pig impacts on nationally threatened species and ecological communities, and feral pig ecology and control
4. Record and monitor feral pig control programs, so their effectiveness can be evaluated
5. Build capacity for feral pig management and raise feral pig awareness amongst landholders and land managers, and
6. Improve public awareness about feral pigs and the environmental damage and problems they cause, and the need for the feral pig control.

Objective 1: 1. Prioritise key species, ecological communities, ecosystems and locations across Australia for strategic feral pig management

There are no the important ecosystems, habitats and species that may need protecting within the Burrup Peninsula from feral Pigs since they are not currently ranked as a high threat to the biodiversity in the Peninsula as they don't currently occur in the area.

Objective 2: Encourage the integration of feral pig management into land management activities at regional, state and territory, and national levels

Perdaman will integrate feral pig management into ongoing pest management and control processes via the implementation of the Pest Management Plan.

When the "triggers" identified in the Pest Management Plan is activated for feral Pigs, appropriate management and control measures will be applied. These management controls identified will reduce the ability of feral pig populations to reach high densities during favourable conditions.

Feral pigs are highly mobile across the landscape in response to changing conditions, so Perdaman will monitor the feral Pig announcements from the Department of Primary Industries and Regional Development for Pilbara Region.

As per the Pest Management Plan developed for the Project, Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority) and participate in existing regional management and/or research programs where applicable. Perdaman have consulted PPA, and they have advised there are no current feral pig control programs being implemented on the Burrup Penisula, as there are no Feral pigs present.

Any data from these programs will be included in the annual report to relevant regulators.

Objective 3: Encourage further scientific research into feral pig impacts on nationally threatened species and ecological communities, and feral pig ecology and control

As per the Pest Management Plan developed for the Project, Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority) and participate in existing regional management and/or research programs where applicable. Perdaman have consulted PPA, and they have advised there are no current feral pig control programs being implemented on the Burrup Penisula, as there are no Feral pigs present.

Any data from these programs will be included in the annual report to relevant regulators.

Objective 4: Record and monitor feral pig control programs, so their effectiveness can be evaluated

As per the Pest Management Plan developed for the Project, Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority) and participate in existing regional management and/or research

programs where applicable. Perdaman have consulted PPA, and they have advised there are no current feral pig control programs being implemented on the Burrup Penisula, as there are no Feral pigs present.

Any data from these programs will be included in the annual report to relevant regulators.

Objective 5: Build capacity for feral pig management and raise feral pig awareness amongst landholders and land managers

The Environmental Coordinator will undergo pest management training. There are several suitable training courses available including PetSmart website content (https://pestsmart.org.au/).

Perdaman will consult Indigenous land managers in regards to pest management when required.

All personnel going to the Project site will receive training on pest species.

Objective 6: Improve public awareness about feral pigs and the environmental damage and problems they cause, and the need for the feral pig control

All personnel going to the Project site will receive training on pest species including feral Pigs. They will receive training on the environmental damage and problems they cause, and the need for effective and coordinated feral pig control programs.

Feral Pigs are usually aggressive towards humans and any interaction with wildlife is banned within the Project premises including feeding any wildlife.

5 Policy Documents for Feral Cats

5.1 Main issues raised by DAWE

Not Satisfied

> The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation to the impact on the species.

Note

Proponent states that they will initiate a feral cat management plan. The feral fauna trapping and euthanisation program should be discussed in the Pest Management plan.

5.2 Perdaman Response

Predation by feral cats
Feral cats (*Felis catus*) have been recorded within multiple habitats in the Project area during the Biological Surveys (APM, 2019). Nationally, feral cats are recognised as a potential threat to 74 mammal species and sub-species, 40 birds, 21 reptiles and four amphibians (DoE, 2015a). Distribution of Feral Cats are shown in Figure 5-1.

There are a few threatened mammal species such as Northern Quoll and bird species known or predicted to occur within the Project area and surrounds that are threatened by cat predation.

As mentioned in the ERD Threatened Species Management Plan in Appendix K, predator control (including feral cats) has been identified as an absolute priority to minimise the impact of the Project.

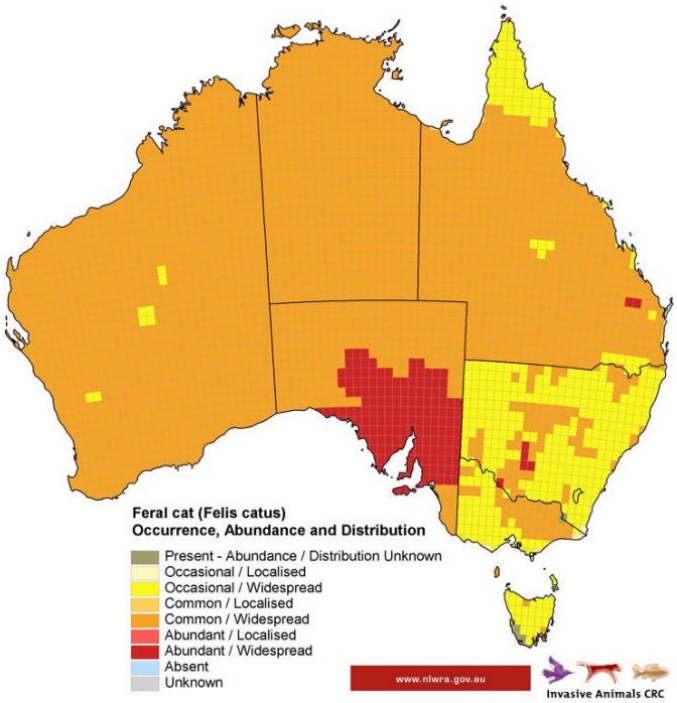

Figure 5-1 Occurrence, abundance and distribution of feral cats (*Felis catus*) in Australia in 2008 (Invasive Animals Cooperative Research Centre, 2008)

A Pest Management Plan will be implemented by the Project which focuses on the control of feral Cats and other pest and feral species. A Pest Management Plan shares the same goals as per the '*Threat abatement plan for predation by feral cats'* (DoEE, 2015d), which is to minimise the impact of feral cats on biodiversity in

Australia and its territories by: protecting affected threatened species; and preventing further species and ecological communities from becoming threatened.

To achieve this goal, the plan has four objectives. These objectives are to:

1. Effectively control feral cats in different landscapes;
2. Improve effectiveness of existing control options for feral cats;
3. Develop or maintain alternative strategies for threatened species recovery;
4. Increase public support for feral cat management and promote responsible cat ownership.

Objective 1: Effectively control feral cats in different landscapes

As per the Pest Management Plan developed for the Project, Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority) and participate in existing regional management and/or research programs where applicable.

Any data from these programs will be included in the annual report to relevant regulators.

As per the TAP for feral cats (DoEE, 2015d), investigations into the use of the toxic Eradicat® cat bait to control the feral cat is being undertaken at several locations in Western Australia.

The Project will coordinate with the existing feral cat trapping program coordinated by PPA (including MAC).

It has been noted that Eradicat® baits have additional advantage in Western Australia as it presents only a minimal risk to native animals that may consume the baits because native species in this area have a degree of tolerance to the toxin. This is because some plants in Western Australia naturally contain the toxin allowing tolerance to develop in the native species.

The efficiency of the feral Cat management controls will be presented in the annual report to relevant regulators.

Objective 2: Improve effectiveness of existing control options for feral cats

To improve the effectiveness of feral Cat control measures, the Environmental Coordinator will undergo pest management training. There are several suitable training courses available including PetSmart website content (https://pestsmart.org.au/). It has information on feral cats, monitoring methods, and standard operating procedures on the PestSmart Connect website (Invasive Animals CRC).

Further, all personnel going to the Project site will receive training on pest species as per Pest Management Plan.

Objective 4: Increase public support for feral cat management and promote responsible cat ownership

Through the induction program the Project staff will be given information on the impacts of feral cats, stray cats and freely roaming domestic cats on native wildlife. They will be educated on responsible cat ownership and ways to protect native wildlife.

More information can be found in the Pest Management Plan.

6 Policy Documents for Cane Toads

6.1 Main issues raised by DAWE

Partially Satisfied

> The Department notes the proponent's response to cane toad management. The Cane Toad MP and Cane Toad Control Program should be included in the Pest Management Plan.

Note

The Department suggests including a monitoring program for the species in the pest management strategy.

6.2 Perdaman response

The cane toad (*Bufo marinus*) is a highly invasive species that is believed to have entered Western Australia in 2009, occupying the habitats of many native species. Since then, they have spread west across the Kimberley at a rate of about 50km a year, reaching Halls Creek and Wyndham by 2014 (Western Australian Agriculture Authority, 2016). While the population is continuing to spread, to date Cane Toads are yet to be recorded on the Burrup Peninsula (Figure 6-1).

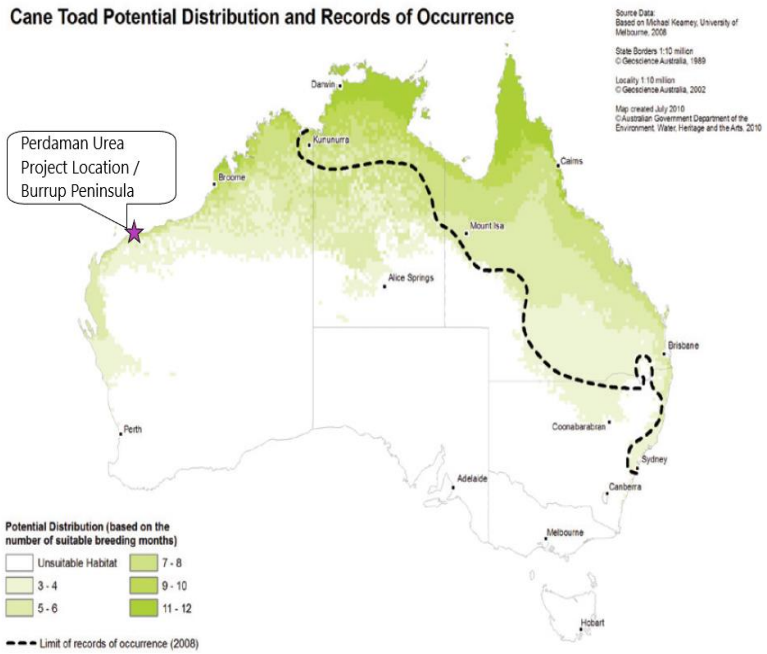

Figure 6-1 Map showing potential distribution (shaded areas) and limit of records of occurrence (black line) of cane toads in Australia (DSEWPC, 2011)

A Pest Management Plan will be implemented by the Project which focuses on the control of European foxes, feral cats, feral pigs and cane toads. The Pest Management Plan developed for the Project shares the same goals as per the *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads* (DSEWPC, 2011), which is to minimise the impact of Cane Toads on biodiversity in Australia and its territories by: protecting affected threatened species; and preventing further species and ecological communities from becoming threatened.

The Threat Abatement Plan for Cane Toads (DSEWPC), 2011) has three objectives:

> identify priority native species and ecological communities at risk from the impact of cane toads.

> reduce the impacts of cane toads on populations of priority native species and ecological communities.

> communicate information about cane toads, their impacts and this TAP.

As per the Pest Management Plan developed for the Project, Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority) and participate in existing and/or future regional management and/or research programs where applicable.

Any data from these programs will be included in the annual report to relevant regulators.

The following methods applied by the Project will aim to achieve the above objectives within the Project context:

- As part of the induction program Project Staff will be trained to identify Cane Toads and if found within the Project premises they will be instructed to notify the Environmental Coordinator.
- They will be given information on the invasiveness of the Cane Toad species and importance of protecting native fauna.
- All vehicles coming into the Project site will be inspected for presence of pests and their eggs.

More information can be found in Pest Management Plan and Threatened Species Management Plan.

7 Threat Abatement Plan for Marine Debris

7.1 Main issues raised by DAWE

Not Satisfied

The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation to the impact on migratory species.

7.2 Perdaman Response

The Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (DOEE, 2018) provides national guidance on action to prevent and mitigate the impacts of harmful marine debris on vertebrate marine life through five major objectives:

1. Contribute to long-term prevention of the incidence of marine debris
2. Understand the scale of impacts from marine plastic and microplastic on key species, ecological communities and locations
3. Remove existing marine debris
4. Monitor the quantities, origins, types and hazardous chemical contaminants of marine debris, and assess the effectiveness of management arrangements for reducing marine debris
5. Increase public understanding of the causes and impacts of harmful marine debris, including microplastic and hazardous chemical contaminants, to bring about behaviour change.

The Project plans to achieve the objectives by:

- The Waste Management Protocol (WaMP) included in Appendix 14 addresses the Project's key responsibilities including the stockpiling and storage of wastes, reuse and recycling, management of controlled wastes, and wastewater."
- Promote good hygiene within the Project premise, e.g. cigarette buds will be properly disposed off
- Solid waste storage areas will be provided on site. All waste shall be segregated to maximise reuse and recycling.
- Minimise generation of solid and liquid wastes and maximise opportunities to reuse or recycle material in preference to disposal
- All reasonable and practicable measures will be undertaken during the construction and operation phases of the Project to minimise the generation of waste
- To minimise and manage the creation of solid and liquid wastes, a waste management plan shall be prepared for the Project.
- Bins and skips (with lids) will be labelled and maintained so as to hold the intended waste stream securely.
- Ensure that facilities used for the receiving of waste from the site are appropriately licensed to accept the classified waste type.
- Solid wastes shall be removed off site by an appropriately licensed contractor.
- The project site will be kept clean and tidy at all times and litter and waste will be deposited into appropriate litter or recycling bins and the Project's nominated waste collection areas. Daily audits will be undertaken.

8 Red Knot (*Calidris canutus*)

8.1 Main issues raised by DAWE

Not satisfied

- The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation to the impact on migratory species.
- The Department notes that *The Wildlife Conservation Plan for Migratory Shorebirds* was referenced in the policy document list, however it was not considered. (e.g. shorebirds are most at risk from bioaccumulation of human-made chemicals such as organochlorines from herbicides and pesticides and industrial waste. How will the project manage this and mitigation measures?)
- ….migratory shorebirds are not directly affected by oil spills, but important habitat may be affected for many years through catastrophic loss of marine benthic food sources…How will the project protect habitat and what mitigation measures will be undertaken to address chemical spills?

Note

- A map to show the potential feeding grounds for migratory birds (e.g. Red knot) in relation to the DE would give a better insight into the potential impact to species.
- Is there scientific evidence to support the assumption that fauna will move safely and freely under the causeway structure and that there will not be a reduction to the Red Knots' feeding ground?

8.2 Perdaman Response

In Australasia the Red Knot usually forage in soft substrate near the edge of water on intertidal mudflats or sandflats exposed by low tide. At high tide the may feed at nearby lakes, sewage ponds and floodwaters. They mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps (DAWE, 2020a).

The Red Knot roosts on sandy beaches, spits and islets, and mudflats; also, in shallow saline ponds of saltworks. They like to roost in open areas far away from potential cover for predators, but close to feeding grounds.

The Red Knot is omnivorous. In Australia the species eats mostly worms, bivalves, gastropods, crustaceans and echinoderms. In Roebuck Bay, Western Australia, they feed predominantly on buried bivalves which are located by touch, as they do internationally. However, in some circumstances they also visually located and took prey from the surface (DAWE, 2020a).

Suitable habitat distribution for Red Knot around the Project area is shown in the Figure 8-1 and the recent records for Red Knot around the Project is shown in Figure 8-2.

Red Knot has been recorded near Dampier Salt Ponds in 2018 and less recently on the Burrup Peninsula (Worley Astron, 2006). Given the proximity to Hearson's Cove, and the presence of open flats within the Project Area, this species may use the area for both foraging and roosting. This species was not recorded on either of APM's biological surveys (APM, 2019), however, they have a moderate likelihood of occurrence (as per the Table 2-1 above) within the Project area.

The Figure 8-3 shows the supra tidal habitat present within the Project Development Area. This habitat type is subject to inundation, due to tidal surges, and also drainage from rainfall events. The mitigation measures to manage potential impacts to this species are summarised in the ERD Section 6.7.8 Table 6-4 and Appendix K (Threatened Species Management Plan).

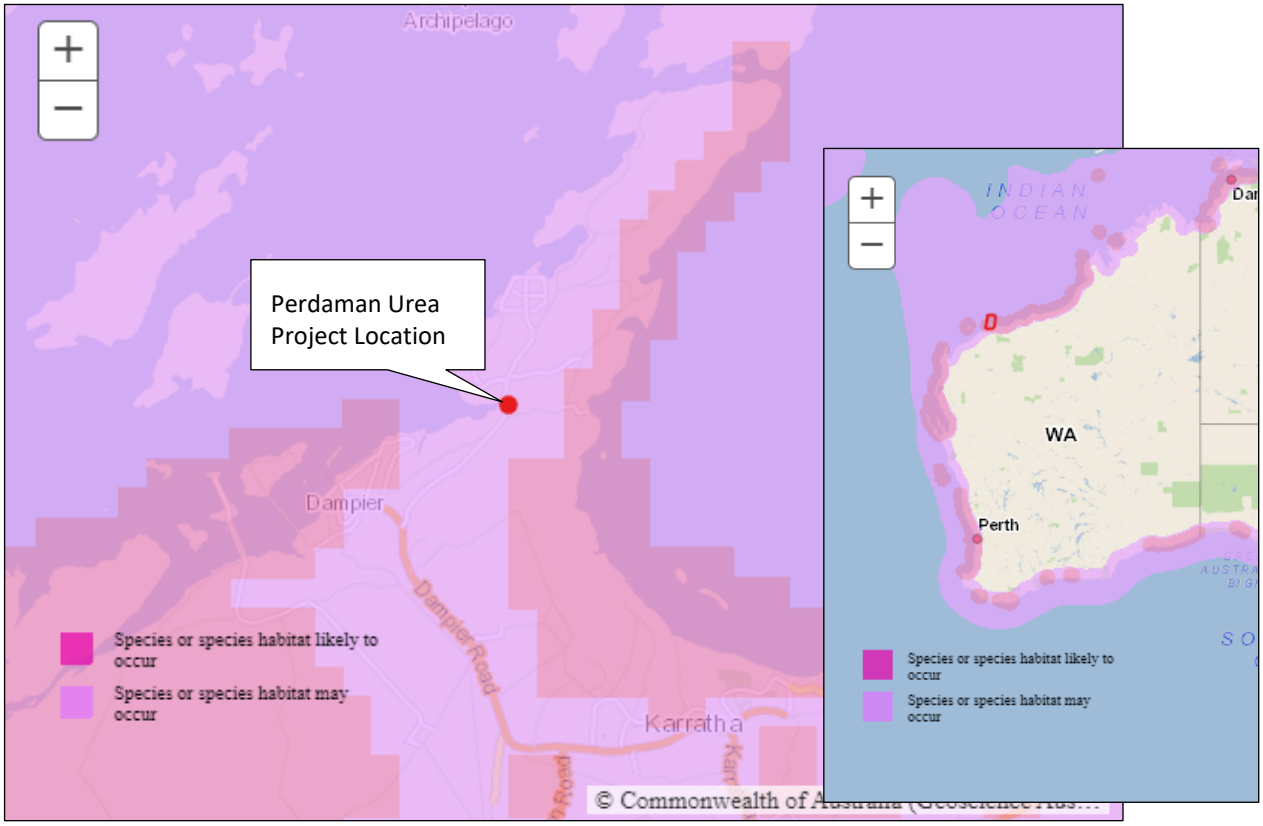

Figure 8-1 Red Knot species likely habitat distribution near Project area (DAWE, 2020a)

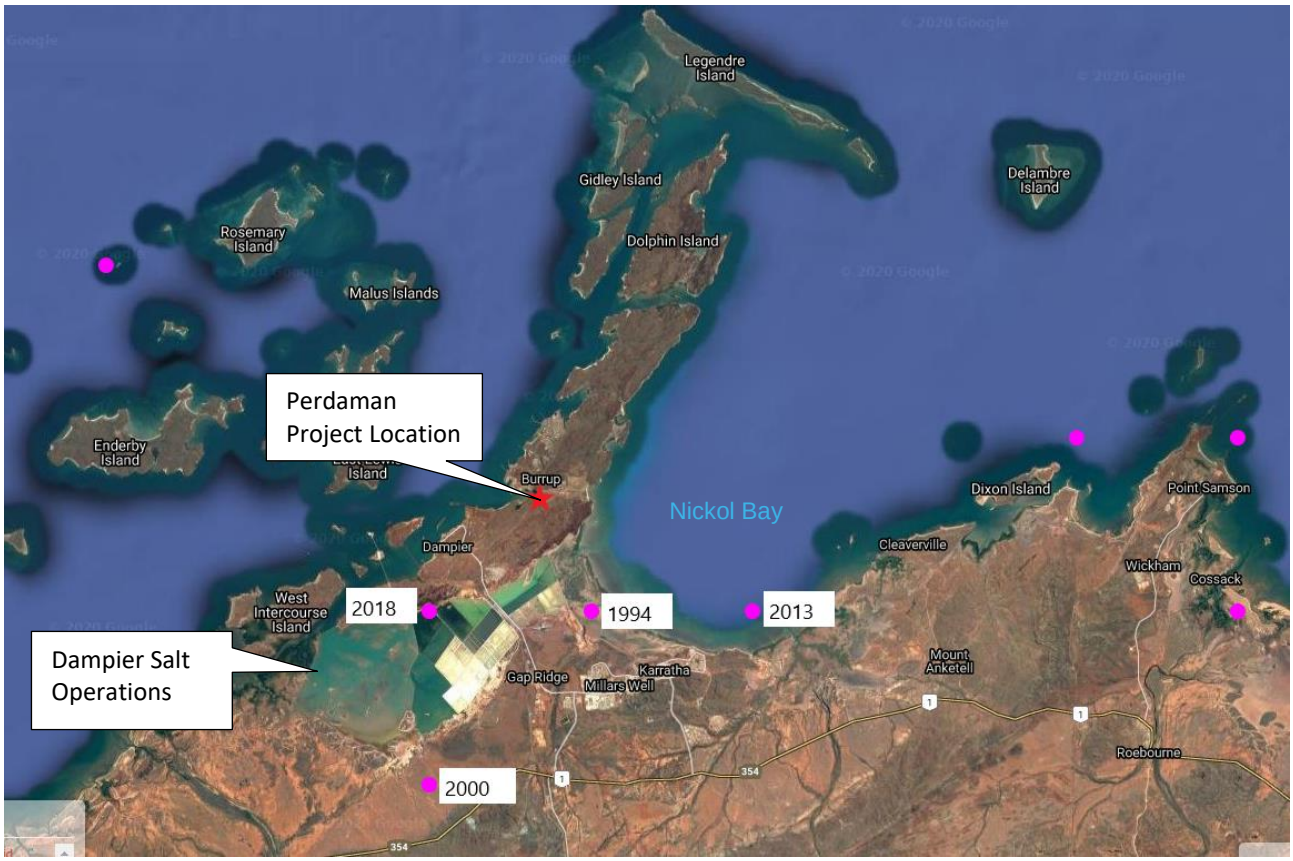

Figure 8-2 Red Knot species records near the Project area (Atlas of Living Australia, 2020a)

Figure 8-3 Supra-tidal Habitat Present within the Project area (APM, 2019)

As per the conservation advice for Red Knot (Threatened Species Scientific Committee (2016a), DoE (2015c) and DoEE (2017a), threats to the global population of the red knot across its range include habitat loss and habitat degradation (e.g. through land reclamation, industrial use and urban expansion, changes to the water regime, invasive plants and environmental pollution), over-exploitation of shellfish, pollution/contamination impacts, anthropogenic disturbance, direct mortality, diseases, extreme weather events, and climate change impacts. Therefore, the following management and mitigation measures have been applied by the Project to reduce impacts:

8.2.2 Habitat loss and habitat degradation

As per the Conservation Advice, the loss of important habitat reduces the availability of foraging and roosting sites for Red Knot. The original processing facility layout was forecast to impact 21.3 ha of the tidal flats and Samphire Shrubland/Saltplains habitat. Following Project design optimization, proposed clearing of this habitat type has been significantly reduced to 12.8 ha. The entire Project layout has been redesigned to minimise habitat fragmentation and minimise impacts to potential Red Knot feeding grounds. Potential impacts to mudflats have been minimised as much as practicable during the design phase and the causeway design will contain large diameter, short culverts with significantly larger flow capacity to maintain hydrological and tidal flows and also allow fauna to freely and safely move through the structure. The causeway has been designed considerably higher, further reducing the disturbance to Red Knots during feeding.

8.2.3 Chronic pollution

As per the Wildlife Conservation Plan for Migratory Shorebirds (DoE, 2015c),"*In their feeding areas, shorebirds are most at risk from bioaccumulation of human-made chemicals such as organochlorines from herbicides and pesticides and industrial waste"*.

The main output of the Project is Urea. Urea itself is nonvolatile in solid form and highly water soluble (U.S. Environmental Protection Agency, 2011).

As per the studies conducted by Franke et. al. (1994) using Golden Ide Fish (*Leuciscus idus melanotus*), the bioconcentration factor (BCF) of urea was <10. These BCF values suggest at that Urea has a low[1] potential for bioconcentration in aquatic organisms.

[1] United States: a substance is considered to be not bioaccumulative if it has a BCF less than 1000, bioaccumulative if it has a BCF from 1000–5000 and very bioaccumulative if it has a BCF greater than 5,000. In European Union: a substance with a BCF>2000 will be regarded as bio-accumulative (B). A substance with a BCF>5000 will be regarded as very bio-accumulative (vB).

8.2.4 Acute pollution

"*Wetlands and intertidal habitats are threatened by acute pollution caused by, for example, oil or chemical spillage. Acute pollution generally arises from accidents, such as chemical spills from shipping, road or industrial accidents. Generally, migratory shorebirds are not directly affected by oil spills, but important habitat may be affected for many years through catastrophic loss of marine benthic food sources*" (DoE, 2015c).

Urea spillages during emergency situations and oil spillage from the ships would indirectly affect migratory birds. Urea is readily hydrolysed to ammonia with exposure to water and/or heat this process can be accelerated by bacterial ureases in the environment and gut. Both urea and ammonia are rapidly absorbed intact from the avian gastrointestinal tract. Therefore, urea spillage onto a small body of water would be detrimental to birds. The rapid uptake of ammonia expected with this gastrointestinal loading would cause death in birds (Raidal & Jaensch, 2006).

Apart from the above stated impacts from oil spills, migratory birds may experience long term flight impairment and delayed arrival to breeding, wintering, or crucial stopover sites and subsequently suffered reductions in survival and reproductive success (Perez, et. al., 2007). Further, ingestion of oil can be sub-lethal or acute for migratory birds and will depend to a large extent on the type of oil. The birds may pass the oil to chicks, decreased shell thickness, fertility of eggs will decrease.

Therefore, the following avoidance and mitigation measures will be employed by the Project to avoid any spillage of urea and oil:

- The design scope for the fully enclosed conveying and ship loading system eliminates of the risk of loss of urea product as fugitive dust emissions or spills with the consequential loss of valuable product and potential environment impacts of degradation of water quality in the terrestrial and marine environments.
- Product discharge to the marine environment during ship loading is unlikely to occur as the ship loader will be equipped with a telescopic chute and shroud. Only personnel properly trained and qualified will be able to operate the ship loader and PPA procedural requirements will be adhered to.
- Strict management policies, plans and procedures by PPA to manage contamination risks associated with all current and future Port related business and operational activities within the port are precinct currently in place. An Operational Environmental Management Plant (OEMP) is required to be prepared and submitted to PPA for review prior to any operational activities taking place on PPA's lands. It is a standard requirement of PPA's Commercial Agreements with tenants.
- Spill contingency and emergency response plans and procedures that align with the appropriate PPA plans and procedures, will be developed and implemented to address environmental risks and potential impacts specifically related to the operational phase
- The proponent is committed to conduct all its activities within the port precinct during both the construction and operational phases wholly in compliance with the applicable approved PPA management policies, plans and procedures. Therefore, it is expected that these risks can be managed effectively during construction and operational activities.

8.2.5 Invasive species

"*Invasive weed species have adversely affected the ecological character and biodiversity of wetlands across Australia. Introduced animals such as pigs (Sus sp.), cane toads (Rhinella marina) and European carp (Cyprinus carpio) are also well known for their destructive impacts on wetland areas. Predation by invasive animals, such as cats (Felix catus) and foxes (Vulpes vulpes) in Australia has not been quantified, but anecdotal evidence suggests some individuals are taken as prey*" (DoE, 2015c).

Perdaman is committed to apply weed and pest management controls within the Project Development Area. They will be executed via detailed Weed Management Plan and Pest management Plan.

8.2.6 Altered hydrological regimes

"*Altered hydrological regimes can directly and indirectly threaten migratory shorebird habitats. Water regulation, including extraction of surface and ground water (for example, diversions upstream for consumptive or agricultural use), can lead to significant changes to flow regime, water depth and water temperature. Changes to flows can lead to permanent inundation or drying down of connected wetlands, and changes to the timing, frequency and duration of floods. These changes affect both habitat availability and*

type (for example, loss of access to mudflats through permanent higher water levels, or a shift from freshwater to salt-tolerant vegetation communities), and the disruption of lifecycles of plants and animals in the food chain for migratory shorebirds" (DoE, 2015c).

The Project would not alter the site hydrological regimes nor it would cause drying down of mudflats. The causeway which will be built up above the supra-tidal flat area to a road height of approximately 6m AHD with regular culverts to ensure the structure does not impede natural surface water or tidal flows ().

The Burrup Road already has installed culverts to regulate tidal movements inland (Figure 8-4)

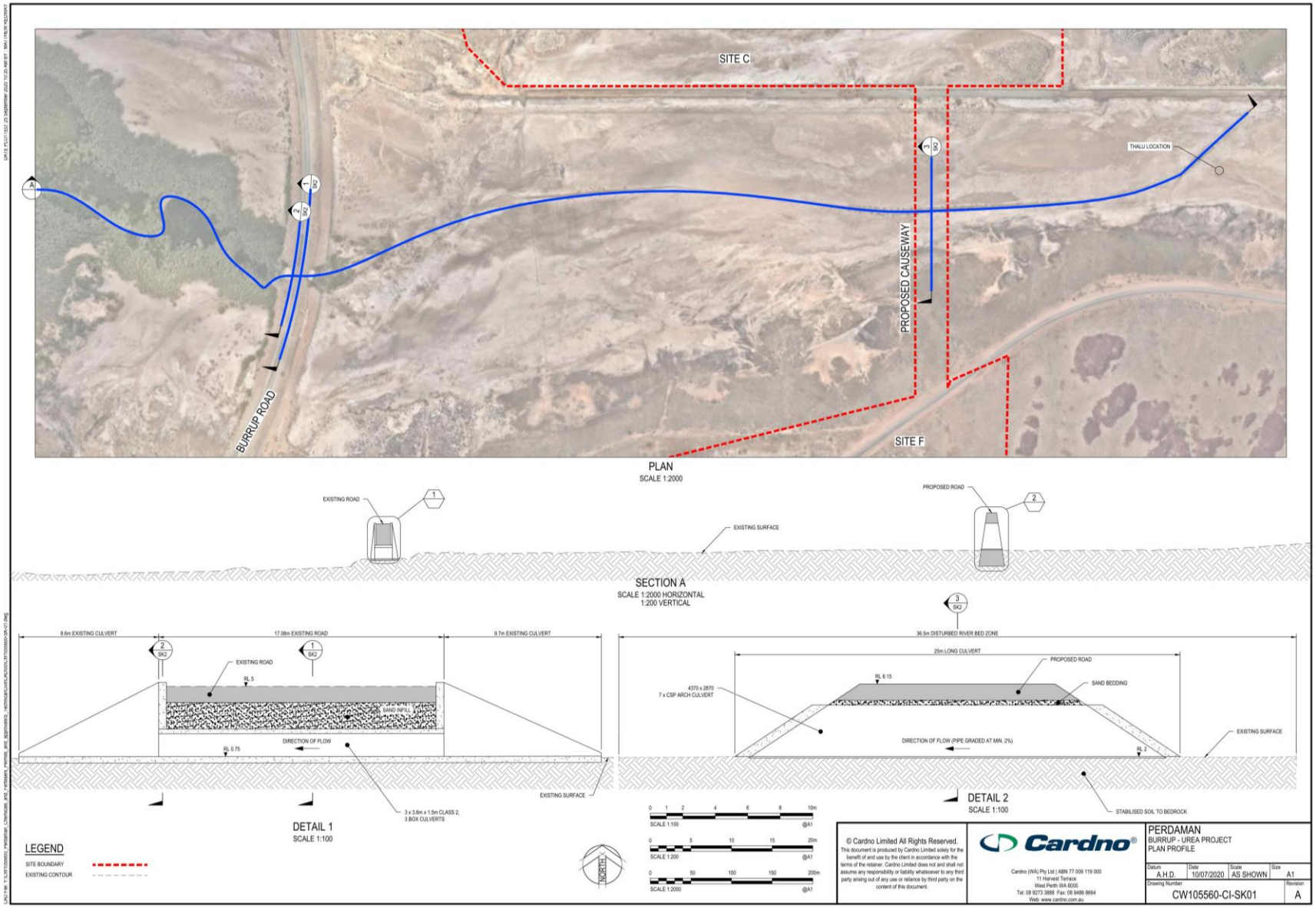

Figure 8-4 Culverts in Burrup Road

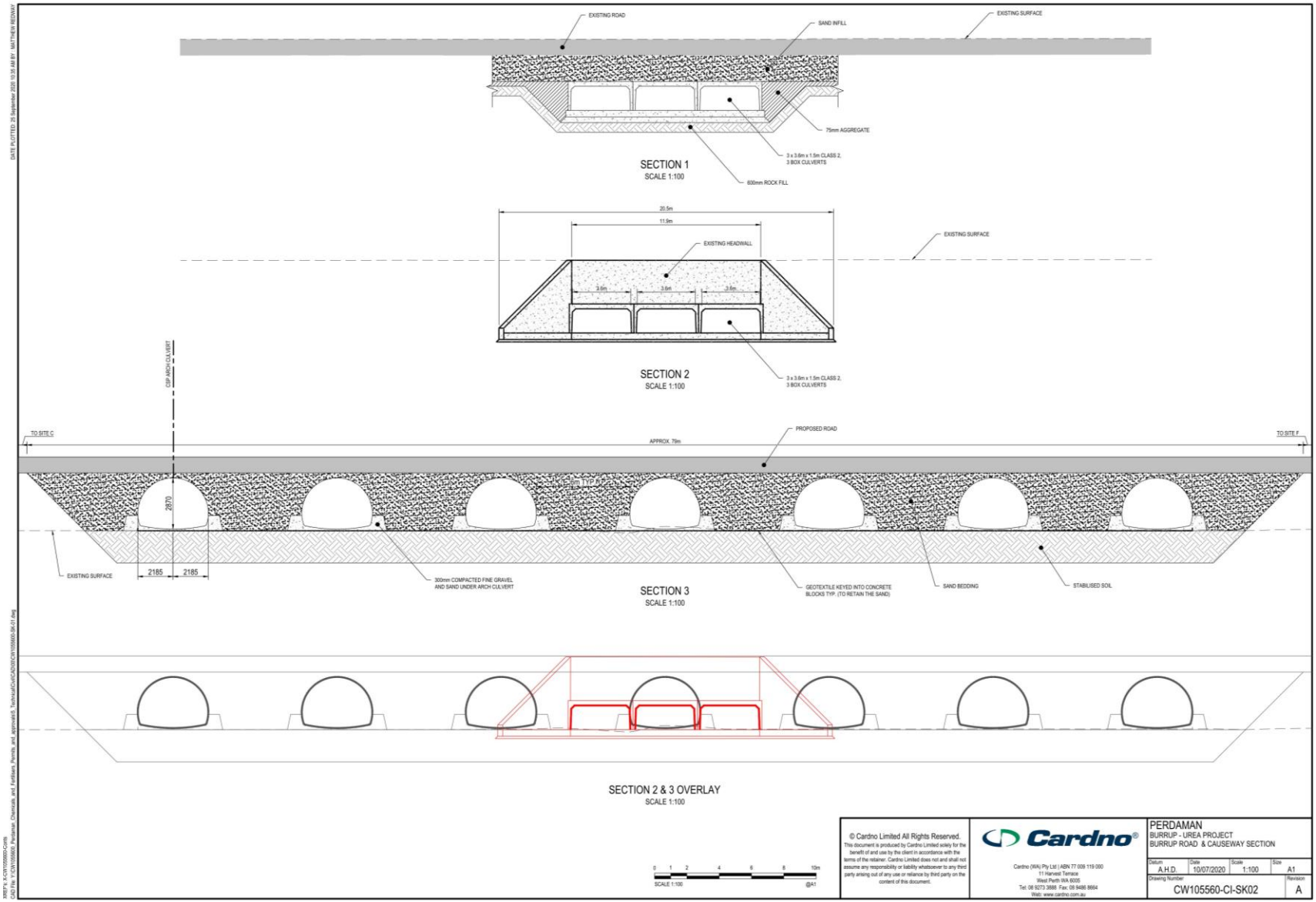

Figure 8-5 Culverts in Burrup Road compared with culverts designed for the Project

The Project causeway design incorporated seven culverts with a significantly greater flow capacity (Figure 8-5), both east to west and west to east than the existing Burrup Road installed culverts. Given the significantly larger flow capacity incorporated in the Project causeway design the Burrup Road transfer capacity under any weather/tide scenario dictated the flowrates on the tidal flats and this would not materially change from the current situation with the Causeway installation.

A hydrological investigation was undertaken of the impact of the PUP footprint upon the Saline (supra/intertidal) Coastal Flat which forms the natural discharge zone of Ste C & F, see Figure 8-6 for the extent of the catchment boundary.is zone is made up of clayey gravel which act as a aquitard separating the regular tidal movements and the less frequent surface runoff from the underlying brecciated granophyre groundwater, some seepage of groundwater may appear as minor lateral seeps along the interface with intertidal flats and the colluvium on the outwashes and scree flanks of the hillsides.

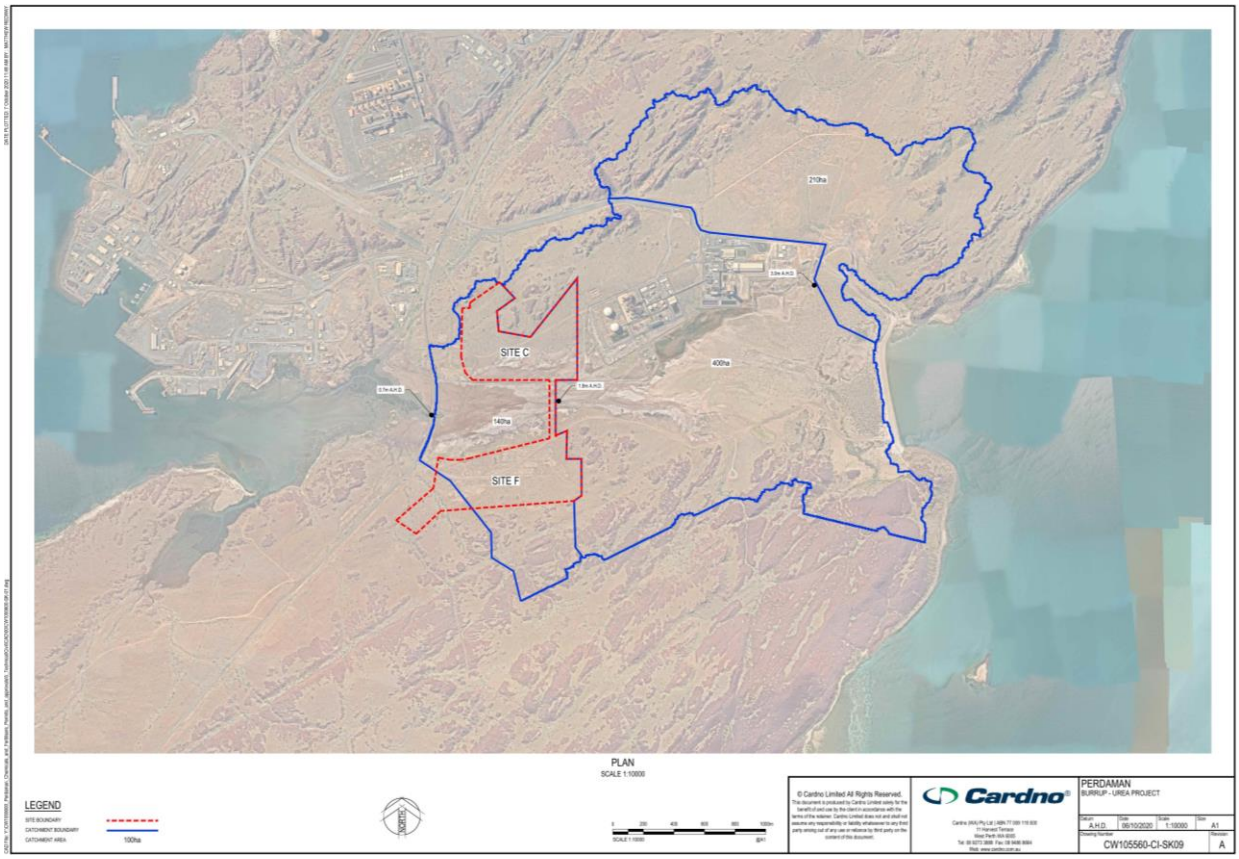

Figure 8-6 Project catchment area

Field investigations have confirmed that the groundwater in the clayey gravel tidal flat is approximately 1.0m below the surface and is disconnected from the average daily tidal inundation in the vicinity of the proposed causeway. The proposed causeway works will not act as a barrier to the groundwater movement within the clayey gravel layer.

As a consequence of the geology described above, the only hydrological elements which need to be assessed for the project are the tidal exchange and surface runoff in intertidal flats. As demonstrated in Figure 8-4, the hydrological regime is impacted by the existing Burrup Road and culverts SECTION A/DETAIL 1 and the proposed Causeway and culverts between Site C & F, SECTION A/DETAIL 3. The Burrup Road and associated culverts have been in place for approximately 40 years and are the principal impact upon the hydrology of the intertidal flats by acting as a dam/levee separating the marine environment from the hinterland.

Figure 8-7 illustrates the natural tidal levels (pre-industrial) should the Burrup Road culverts not exist and excluding the proposed causeway. Three tides and their respective levels are listed below:

- Average Tide – 2.30 m AHD
- Average Maximum Tide – 4.56 m AHD
- Highest Astronomical Tide – 5.10 m AHD

Modelling was undertaken to see the impact of the Burrup Road excluding the Causeway between C & F on the natural tidal levels pre-development (base case), see Figure 8-7, in this instance Burrup Road does act as an attenuator of flows for higher tide events resulting in a lessor tide range being experienced within the inter-tidal flats then during pre-industry.

Similarly, modelling was undertaken to see whether the inclusion of the Causeway between C & F (post-development) had a material difference to the tide levels within the inter-tidal flats, see Figure 8-8, which illustrates a marginal increase in range.

These results are not surprising when the existing Burrup Road culverts are compared to the proposed Causeway, the waterway capacity of the Causeway is at least 4x to 5x greater than the Burrup Road culvert, as illustrated in Figure 8-5, when the Burrup Road culvert is overlaid over the Causeway culvert, SECTION 2 & 3 OVERLAY.

Hydrological modelling has confirmed that the intertidal flats are a tidal driven system with precipitation events having little to no affect inundation in this zone.

This is demonstrated by undertake a series of simulations for frequent storms 1 in 5-year ARI storm (20% AEP rainfall event), uncommon storms 1 in 20-year ARI storm (5% AEP rainfall event) and a rare 1 in 100-year ARI storm (1% AEP rainfall event) during average, maximum average and highest astronomical tides. The water profile from these simulations shows that the tide would easily drown the inundation from rain events. confirming that the natural ecosystem is tide dependent and controlled by the Burrup Road which acts as a dam/levee and the relatively restrictive culverts.

The proposed 7 culverts within the Causeway joining sites C and F are significantly bigger than the 3 box culverts under the Burrup Road crossings. There, the tidal movement is controlled by the Burrup culverts. The proposed causeway will not alter any geomorphic processes on the coastal dynamics, ecosystem and environment.

Causeway construction works will be completed over the shortest time practicable to minimise the period of environmental disturbance in the saline coastal flat.

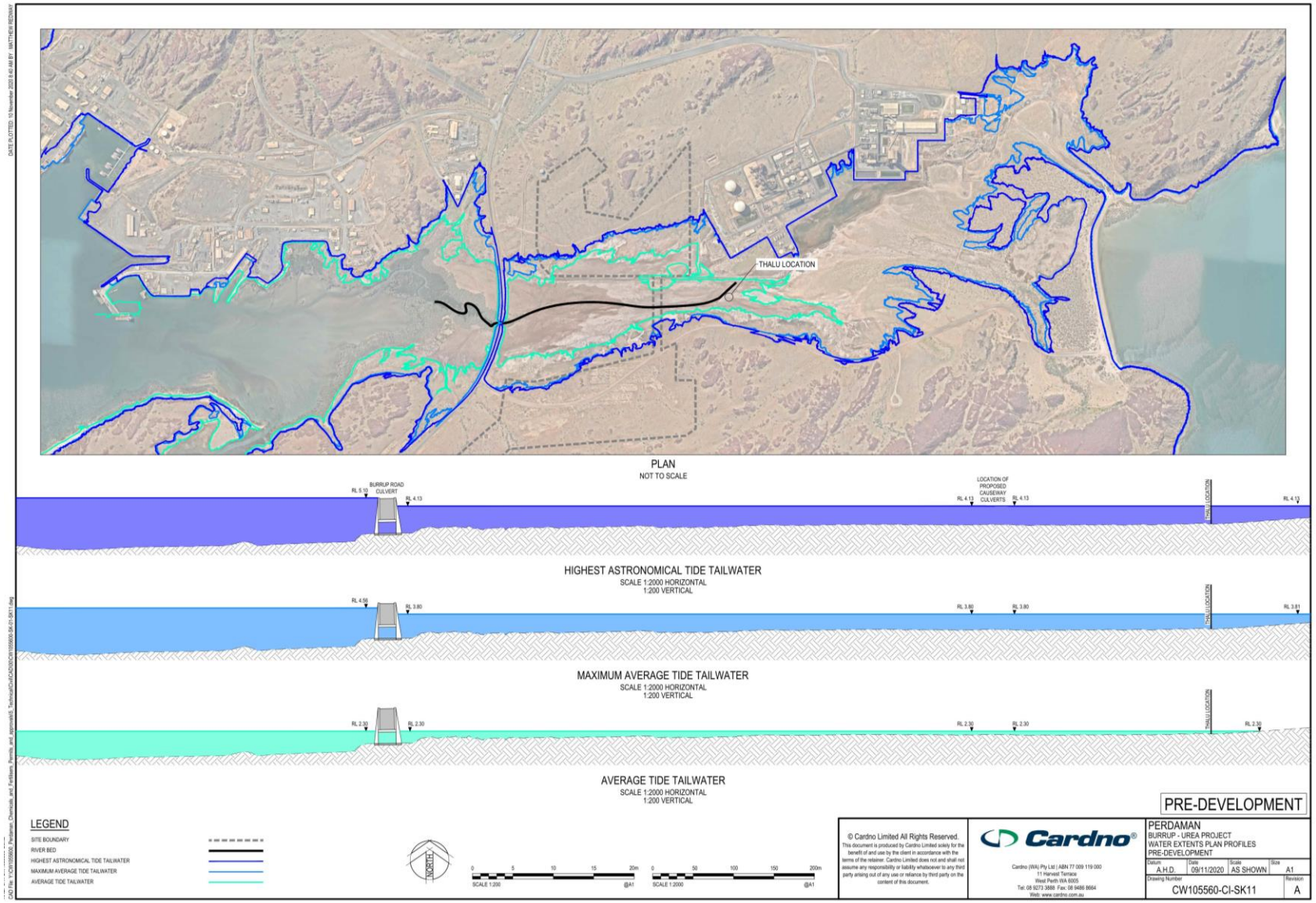

Figure 8-7 Pre-development water profile in mud-flats

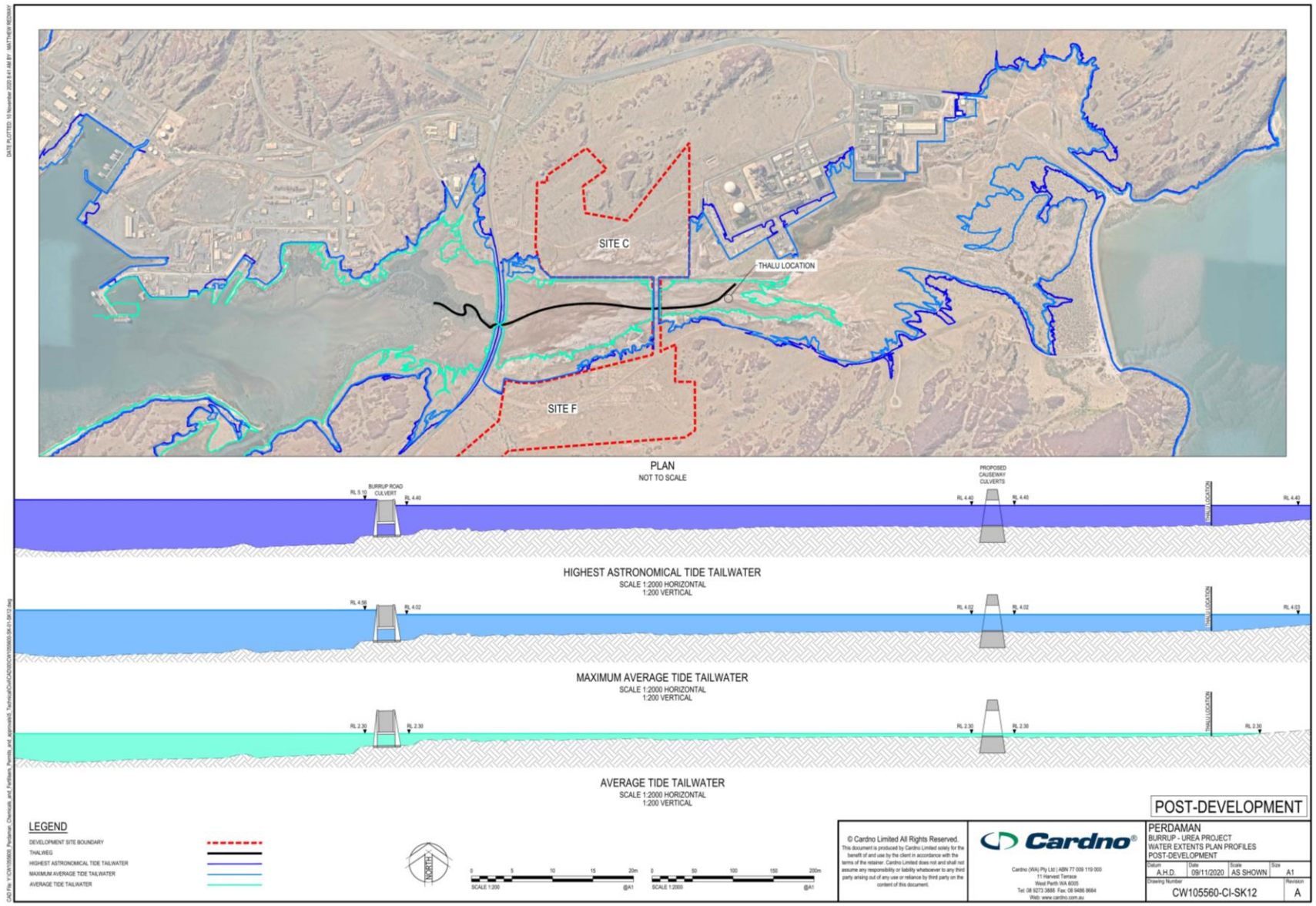

Figure 8-8 Post-development water profile in mud-flats

8.2.7 Anthropogenic disturbance

Research suggests that disturbance from human activities has a high energetic cost to shorebirds and may compromise their capacity to build sufficient energy reserves to undertake migration. Migratory shorebirds are most susceptible to disturbance during daytime roosting and foraging periods. Human disturbance can cause shorebirds to interrupt their feeding or roosting and may influence the area of otherwise suitable feeding or roosting habitat that is actually used. Disturbance from human activities may force migratory shorebirds to increase the time devoted to vigilance and anti-predator behaviour and/or may compel the birds to move to alternative, less favourable feeding areas (Threatened Species Scientific Committee, 2016).

Disturbance can result from recreational activities including fishing, boating, four wheel driving, walking dogs, noise and night lighting. While some disturbances may have a low impact, it is important to consider the combined effect of disturbances with other threats (Threatened Species Scientific Committee, 2016).

To reduce the disturbance from Project vehicles, the causeway will be built on top of the supratidal mudflats (about 6m height). The causeway will be the main mode of transportation between Site F and C. There will be considerable amount of traffic in the causeway during construction and it may cause distress to birds. At the same time, Burrup Road already has heavy traffic and if the shorebirds are visiting the Project area mudflats, it is assumed the vehicle noise and vibration may not present an additional distress to the birds.

In addition, the causeway is designed with large culverts to limit the impacts to mudflats (as per Section 8.2.6). Terrestrial fauna should be able to pass through without any barriers as - "*Culverts are the most suitable for fauna passage and allow the free movement of a wide range of native species. Culverts are suitable for terrestrial fauna should they provide dry passage conditions for the majority of the time. Culverts may be either singular or multiple, round or box sections and of various radii or rectangular box dimensions*" (Rowe, 2010). However, birds are more likely fly over the culverts than walk/fly through.

The Project staff are to refrain from approaching wildlife and accessing areas other than the Project grounds.

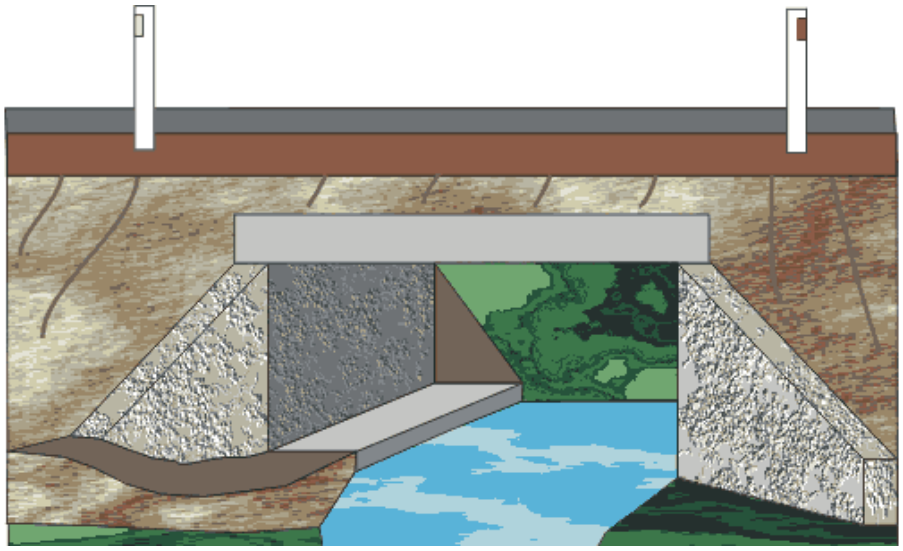

Figure 8-9 Example Culvert as Underpass (extracted from Rowe, 2010).

8.2.8 Direct mortality

Direct mortality may result from bird strike with vehicles or chemical spills and oil spills (Threatened Species Scientific Committee, 2016).

The Project will avoid direct mortality rates by adopting the following avoidance and mitigation measures:

- Project vehicle speeds will be managed on site (including entry and exit points) by enforcing speed limits in construction areas to reduce the potential for vehicle strikes.
- All employees will be required to record and report any native fauna strikes.

- Roadkill will be removed at least 10 m into surrounding vegetation, when safe to do so, by designated personnel to avoid further strikes of fauna feeding on carcasses.
- Site induction to emphasise that all native fauna has right-of-way, where possible and safe to do so.
- Personnel will be inducted regarding the key risk times for vehicle strike to fauna (e.g. dusk and dawn).
- Where possible, all non-essential movement will be scheduled to take place during the day.
- Site inductions to introduce personnel to local conservation significant fauna, and signage displayed in crib rooms and notice boards, to ensure all personnel can identify all larger conservation significant species.
- Chemical and oil spills will be managed as above stated.

9 Curlew Sandpiper (*Calidris ferruginea*)

9.1 Main issues raised by DAWE

Partially satisfied

> The Department notes that this has been partially addressed with Objectives 2 and 3

9.2 Perdaman Response

Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. Curlew Sandpipers forage on mudflats and nearby shallow water. In non-tidal wetlands, they usually wade, mostly in water 15–30 mm, but up to 60 mm, deep. In Roebuck Bay, northern Western Australia, they are also said to feed on part of the mudflats that have been exposed for a longer period, foraging in small groups (DAWE, 2020b).

Curlew Sandpipers generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh (DAWE, 2020b). Since the Project habitat is sub-optimal for roosting, it is not expected these species to roost near the Project area mud-flats.

Suitable habitat distribution for Curlew Sandpipers around the Project area is shown in the Figure 9-1 and the recent records for Curlew Sandpipers around the Project is shown in Figure 9-2. As shown more birds are observed towards the south of the project where the Dampier Salt Operations are. If any present within the Project area, they may be simply be passing through and opportunistic feeding. They have a moderate likelihood of occurrence within the Project area.

In Western Australia, they are widespread around coastal and subcoastal plains from Cape Arid to south-west Kimberley Division, but are more sparsely distributed between Carnarvon and Dampier Archipelago. They occur in large numbers, in thousands to tens of thousands, at Port Hedland Saltworks, 80 Mile Beach, Roebuck Bay and Lake Macleod. They are rarely recorded in the north-west Kimberley, around Wyndham and Lake Argyle, and occasionally they occur inland, in areas south of 26° S (DAWE, 2020b).

Curlew Sandpipers usually forage in water, near the shore or on bare wet mud at the edge of wetlands. On wet mud they forage by pecking and probing. They probe in shallow water, and jab at the edge of the water where a film of water remains on the sand. They glean from mud, from the surface of water, or in drier areas above the edge of the water. For a 'jab' less than half the length of the bill is inserted into the substrate; a probe is performed with a slightly open bill inserted to its full length. Curlew Sandpipers may wade up to the belly, often with their heads submerged while probing (DAWE, 2020b). Given their foraging method (i.e. pecking and probing), with the high evaporation rates in the Project area and depends on the tide, if these species present, they may able to forage for a limited time in the Project area mud-flats due to the sub-optimal habitat present. As shown in the Figure 9-2 there are more suitable and attractive foraging habitat towards the north and south of the Burrup Peninsula.

The Project area does not support important breeding, foraging or roosting habitat and the Project area does not support a significant proportion of the national population. The habitat to be removed is not the preferred foraging or roosting habitat and will therefore not increase the decline of this species. Therefore, no significant impact is expected from the Project

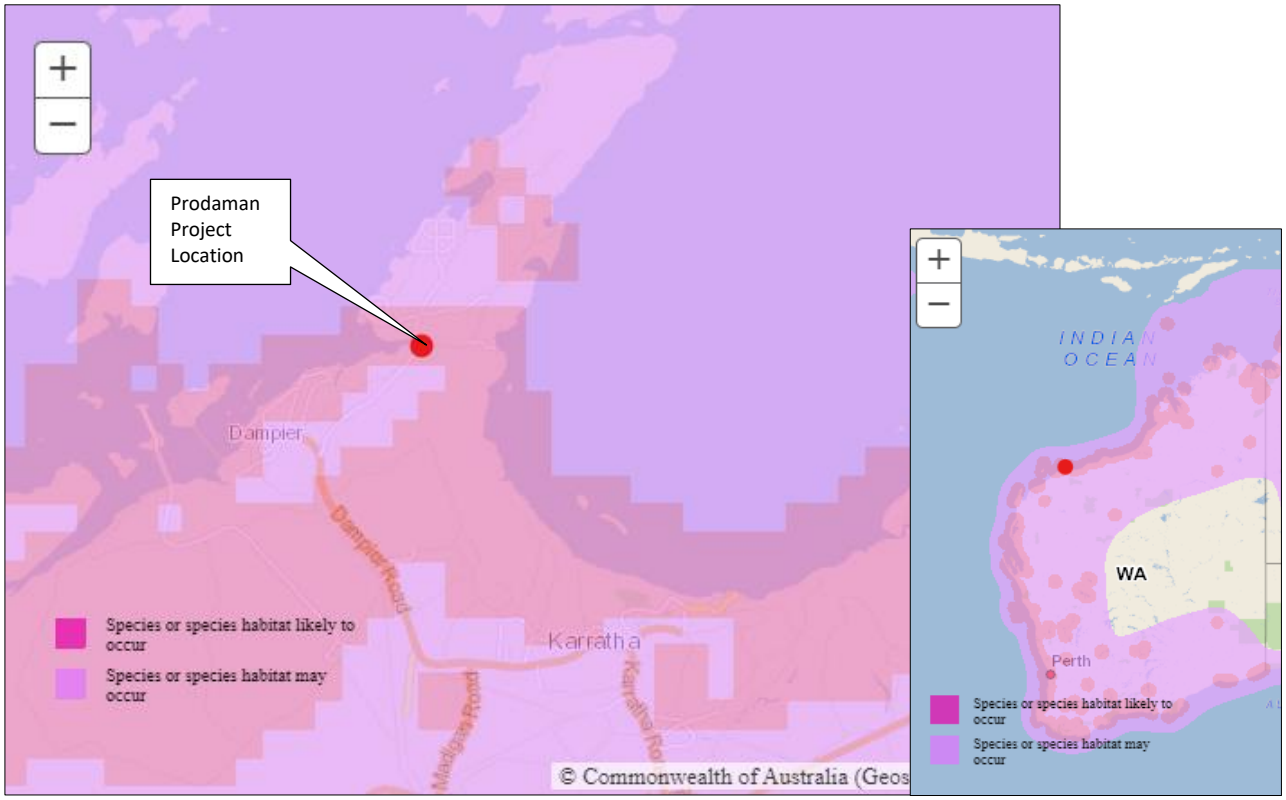

Figure 9-1 Curlew Sandpiper species likely habitat distribution near Project area (DAWE, 2020b)

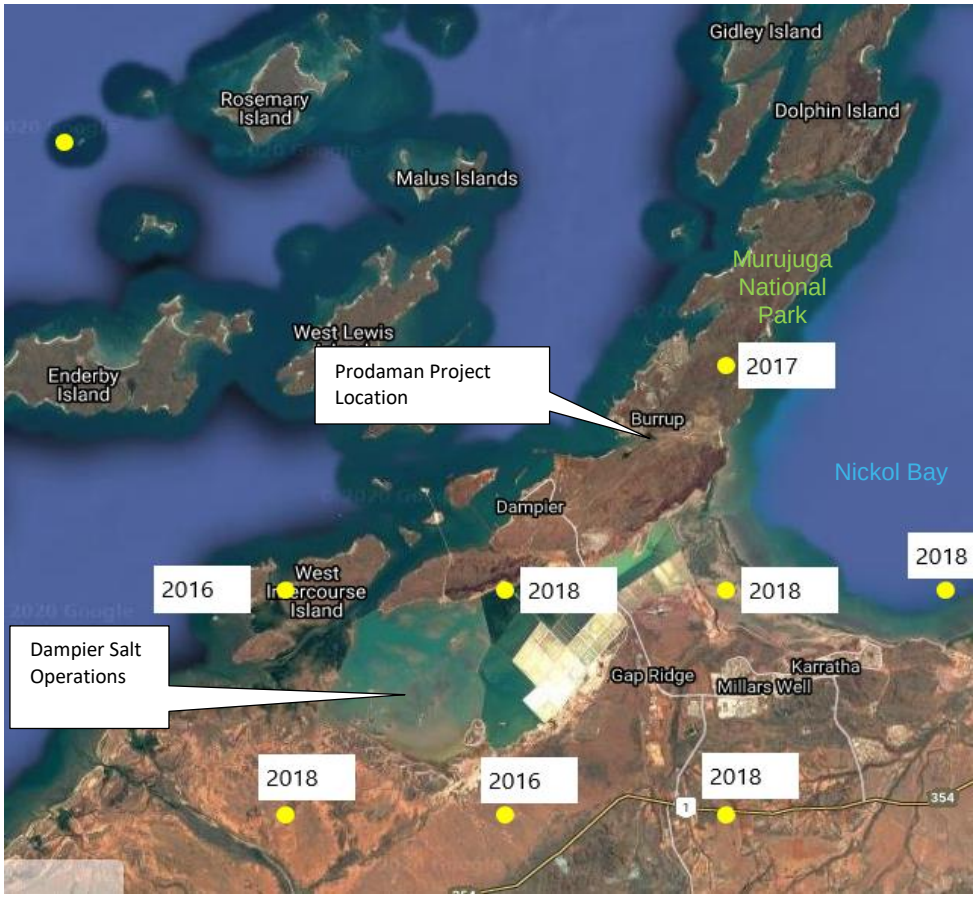

Figure 9-2 Curlew Sandpiper species records near the Project area (Atlas of Living Australia, 2020b)

9.2.2 Threats to Curlew Sandpiper

Curlew Sandpiper have a moderate likelihood of occurrence within the Project area (Table 2-1 above). As per the conservation advice for Curlew Sandpiper (Threatened Species Scientific Committee (2015a), DoE (2015c) and DoEE (2017a), threats to the global population of the Curlew Sandpiper across its range include ongoing human disturbance, habitat loss and degradation from pollution, changes to the water regime and invasive plants, direct mortality, diseases, extreme weather events, and climate change impacts. Therefore, the following management and mitigation measures have been applied by the Project to reduce impacts:

Therefore, the following management and mitigation measures have been applied by the Project to reduce impacts:

9.2.2.1 Habitat loss and habitat degradation

As mentioned above, the original processing facility layout was forecast to impact 21.3 ha of the tidal mudflats and samphire shrubland/ saltplains habitat. Following design optimization, proposed clearing of this habitat type has been significantly reduced (12.8 ha). The entire project layout has been redesigned to minimise habitat fragmentation and minimise impacts to potential Curlew Sandpiper feeding ground. Potential impacts to mudflats have been minimised as much as practicable during the design phase and the causeway design will contain large diameter culverts with significantly larger flow capacity to maintain hydrological and tidal flows and also allow fauna to freely and safely move through the structure. The elevated causeway design will reduce the disturbance to Curlew Sandpiper during feeding (Appendix K: Threatened Species Management Plan, Page 22 and Page 41).

The habitat loss, disturbance and modification to Curlew Sandpiper habitat are minimised by the more condensed project design, limit clearing to that which is absolutely necessary and land clearing will be undertaken progressively and incrementally during construction, in order to minimise the pressure on the carrying capacity of native vegetation surrounding the site.

Chronic pollution to migratory shorebirds habitat and mitigation measures applied by the Project is described in **Section 8.2.3.**

Acute pollution to migratory shorebird habitat and mitigation measures applied by the Project is described in **Section 8.2.4**.

Threats from invasive species and mitigation measures applied by the Project is described in **Section 8.2.5.**

Altered hydrological regimes to migratory shorebird habitat and mitigation measures applied by the Project is described in **Section 8.2.6**.

Anthropogenic disturbance to migratory shorebirds and mitigation measures applied by the Project is described in **Section 8.2.7**.

Direct mortality migratory shorebirds and mitigation measures applied by the Project is described in **Section 8.2.8**.

9.2.3 Conservation Actions

As per Conservation Advice: *Calidris ferruginea*, curlew sandpiper (Threatened Species Scientific Committee, 2015a), the primary conservation objectives for this species in Australia are:

1. Achieve a stable or increasing population.
2. Maintain and enhance important habitat.
3. Disturbance at key roosting and feeding sites reduced.
4. Raise awareness of curlew sandpiper within the local community

Objective 1: Achieve a stable or increasing population

Section 6.7.7.4 of the ERD and Figure 9-2 shows that Curlew Sandpipers are sparely distributed in the Dampier Archipelago region. Additionally, Sandpipers prefer intertidal mudflats in sheltered coastal areas and would only occur within the study area during the wet season.

Surveys conducted by AMP suggest that no Curlew Sandpiper individual was detected within the project vicinity.

Considering the above, the habitat within the survey area would unlikely support a stable population of curlew sandpiper and therefore any attempt to increase the population would be unsuccessful.

Notwithstanding these results, mitigation and management measures have been detailed in Section 8 of the Threatened Species Impact Management Plan to ensure that any potential threats to the Curlew Sandpiper have been avoided or minimised.

Mitigation responses include, no longer reclaiming tidal flat areas and instead constructing a causeway that connects the processing plant and administration building which will contain large culverts to maintain hydrological and tidal flows and also allow fauna to freely move through the structure.

Objective 2: Maintain and enhance important habitat

Under the 'significant impact criteria' (DEWHA, 2013) guidelines, the Project area mud-flats are not considered an "important habitat" for migratory Curlew Sandpiper:

This species may use the Project Area during the wet season for a short amount of time where the mud is wet or inundated by water for most of the day, though records suggest that the species prefers undisturbed islands and islets. The habitat within the Project area is close to a busy road and the mud flats usually dry out quicker. The habitat within the Project area is sub-optimal for the species. None observed at the Project area (0.1% Flyway population is 90). The Project area does not support a significant proportion of the national population. No breeding or roosting occurs in the Project area, so habitat not important for a significant proportion of the national population. Species occurs within the wider Dampier Region, so not at the limit of its range. The habitat to be removed is not the preferred foraging or roosting habitat and will therefore not increase the decline of this species.

Nonetheless, the Project has taken measures to minimise impacts to the mud-flats. The original processing facility layout was forecast to impact 21.3 ha of the tidal mudflats and samphire shrubland / saltplains habitat. Following design optimization, proposed clearing of this habitat type has been significantly reduced (12.8 ha). The entire project layout has been redesigned to minimise potential impacts to mudflats during the design phase and the causeway design will contain large diameter culverts with significantly larger flow capacity to maintain hydrological and tidal flows and also allow fauna to freely and safely move through the structure.

Since the mud-flats are now under the Project permit area, unauthorised access to this area will be limited, thus stopping further degradation from outside forces such as illegal waste dumping, hunting, etc.

Objective 3: Disturbance at key roosting and feeding sites reduced

As mentioned before in Objective 2, the Project area mud flats are not Curlew Sandpiper key roosting or feeding sites.

Nonetheless, the Project has taken measures during the design phase to reduce disturbance to mud-flats habitat. The Project no longer reclaiming tidal flat areas and instead constructing a causeway that connects the processing plant and administration building which will contain large culverts to maintain hydrological and tidal flows and also allow fauna to freely move through the structure.

Objective 4: Raise awareness of curlew sandpiper within the local community

As per the Threatened Species Management Plan, as part of site induction package anyone accessing the Project facility will be made aware of the threatened species that may found near the Project area. There will also be ongoing staff training and awareness including tool box meetings prior and during construction. Project staff are prohibited to make any contact with the wildlife. The Project welcomes any opportunity to work with local communities to raise awareness and wild life protection programs as part of the community outreach plans.

10 Great Knot (*Calidris tenuirostriss*)

10.1 Main issues raised by DAWE

The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation to the impact on migratory species.

10.2 Perdaman Response

In Australia, Great Knot prefer sheltered coastal habitats with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. Along sheltered coasts with areas of intertidal mudflats, they often congregate with other small species of shorebirds and can form large flocks comprising hundreds or thousands of birds (DAWE, 2020c).

This species has been historically recorded on the Burrup Peninsula (Worley Astron, 2006). It was not recorded during either of APM's surveys. The samphire/mudflat habitat is likely too open for this species (Figure 10-1), and it does not that contain the mangrove swamps it prefers (Figure 10-2). Great Knot has a low likelihood of occurrence within the Project area as per the Appendix H of Pre and Post-Wet Season Biological Survey Perdaman Urea Plant (APM, 2019).

Suitable habitat distribution for Great Knot around the Project area is shown in the Figure 10-3 and the recent records for Great Knot around the Project is shown in Figure 10-4. As shown more birds are observed towards the south of the project where the Dampier Salt Operations are. If any present within the Project area, they may be simply be passing through and opportunistic feeding. They have a low likelihood of occurrence within the Project area.

Typically, the Great Knot roosts in large groups in open areas, often at the water's edge or in shallow water close to feeding grounds. It is known that in hot conditions, waders prefer to roost where a damp substrate lowers the local temperature. A group of approximately 8610 birds have been recorded roosting at an inland claypan near Roebuck Bay in north-west Western Australia (DAWE, 2020c). Since the Project habitat is sub-optimal for roosting, it is not expected these species to roost near the Project area mud-flats.

Figure 10-1 Supra-tidal Habitat Present within the Project area (APM, 2019)

Figure 10-2 Mangrove vegetation is present in association with King Bay (APM, 2019)

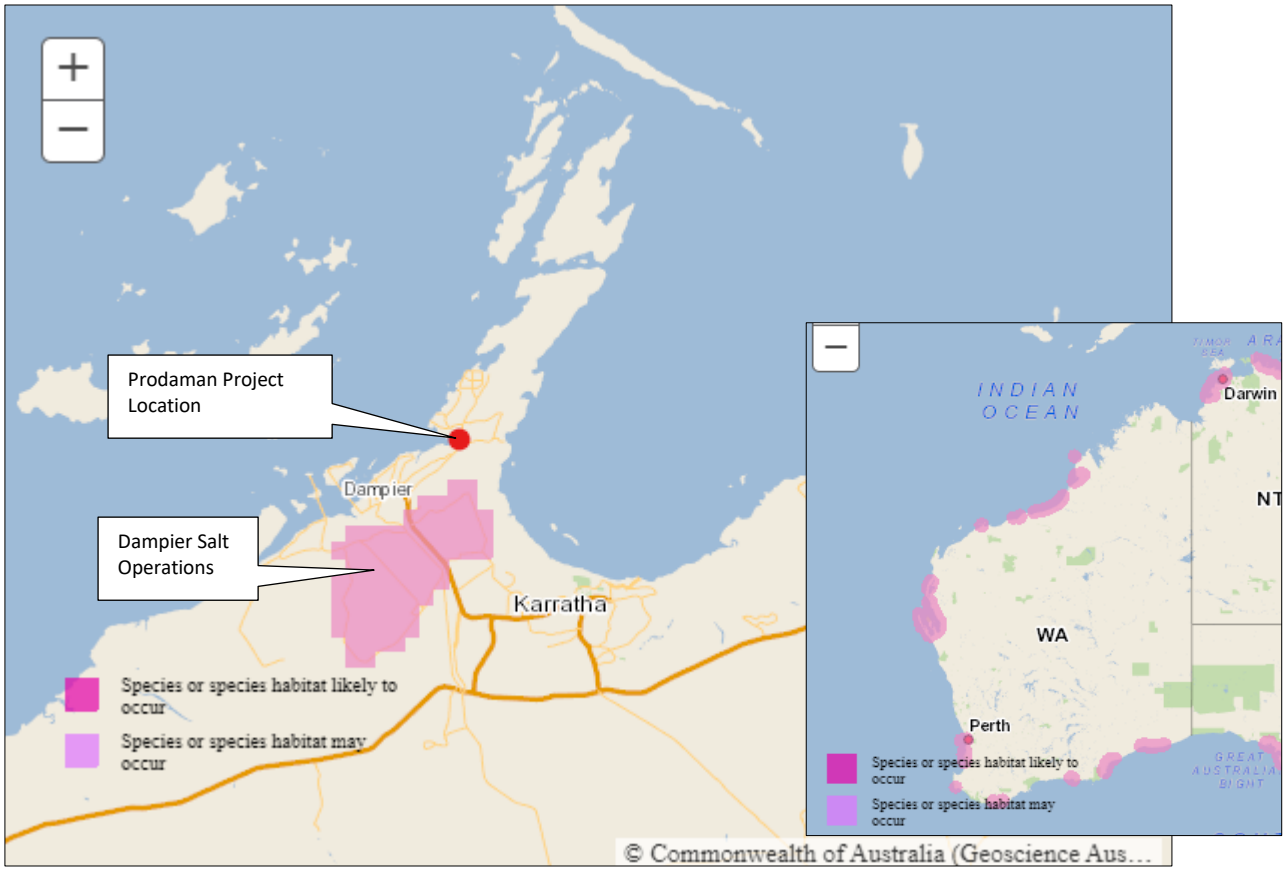

Figure 10-3 Great Knot species likely habitat distribution near Project area (DAWE, 2020c)

Figure 10-4 Great Knot species records near the Project area (Atlas of Living Australia, 2020c)

10.2.2 Threats to Great Knot

Great Knot have a low likelihood of occurrence within the Project area (APM, 2019). As per the conservation advice for Great Knot (Threatened Species Scientific Committee, 2016b), DoE (2015c) and DoEE (2017a), threats to the global population of the Great Knots across its range include: habitat loss and habitat degradation (e.g. through land reclamation, industrial use and urban expansion; changes to the water regime; invasive plants; water quality deterioration; environmental pollution); pollution/contaminants; disturbance; diseases; direct mortality e.g. hunting; and climate change impacts. Therefore, the following management and mitigation measures have been applied by the Project to reduce impacts:

Therefore, the following management and mitigation measures have been applied by the Project to reduce impacts:

Threats from habitat loss and habitat degradation and mitigation measures applied by the Project is described in **Section 8.2.2**.

Chronic pollution to migratory shorebirds habitat and mitigation measures applied by the Project is described in **Section 8.2.3**.

Acute pollution to migratory shorebird habitat and mitigation measures applied by the Project is described in **Section 8.2.4**.

Threats from invasive species and mitigation measures applied by the Project is described in **Section 8.2.5.**

Altered hydrological regimes to migratory shorebird habitat and mitigation measures applied by the Project is described in **Section 8.2.6**.

Anthropogenic disturbance to migratory shorebirds and mitigation measures applied by the Project is described in **Section 8.2.7**.

Direct mortality migratory shorebirds and mitigation measures applied by the Project is described in **Section 8.2.8**.

10.2.3 Conservation Actions

As per Conservation Advice: *Calidris tenuirostriss* Great knot (Threatened Species Scientific Committee, 2016b), the conservation and management actions are:

1. Work with governments along the East Asian – Australasian Flyway to prevent destruction of key breeding and migratory staging sites.
2. Protect important habitat in Australia.
3. Support initiatives to improve habitat management at key sites.
4. Maintain and improve protection of roosting and feeding sites in Australia.
5. Advocate for the creation and restoration of foraging and roosting sites.
6. Incorporate requirements for great knot into coastal planning and management.
7. Manage important sites to identify, control and reduce the spread of invasive species.
8. Manage disturbance at important sites which are subject to anthropogenic disturbance when great knots are present – e.g. discourage or prohibit vehicle access, horse riding and dogs on beaches, implement temporary site closures.

Objective 1: Work with governments along the East Asian – Australasian Flyway to prevent destruction of key breeding and migratory staging sites

The Project area is not a key breeding and migratory breeding and migratory staging area.

Objective 2: Protect important habitat in Australia

As defined by DEWHA (2013) guidelines, an area of '**important habitat'** for a migratory species is:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

This species may forage over the salt ponds and mud flats present in the wider area, however none observed at the Study Area (0.1% Flyway population is 425). The Project area does not support a significant proportion of the national population.

No breeding or roosting occurs in the study area, so habitat not important for a significant proportion of the national population.

Species occurs within the wider Dampier Region, so not at the limit of its range.

The habitat to be removed is not the preferred foraging or roosting habitat and will therefore not increase the decline of this species.

Therefore, the Project area is not an important habitat in Australia. However, the Project has taken initiatives to minimise potential impacts to mudflats as much as practicable during the design phase and the causeway design will contain large diameter culverts with significantly larger flow capacity to maintain hydrological and tidal flows and also allow fauna to freely and safely move through the structure.

Management and mitigation measures have been detailed in Section 8 of the Threatened Species Impact Management Plan to ensure that any unforeseen threats to the Great knot have been avoided or minimised.

Habitat loss, disturbance and modification to Great Knot habitat are minimised by the more condensed project design, limit clearing to that which is absolutely necessary and land clearing will be undertaken progressively and incrementally during construction, in order to minimise the pressure on the carrying capacity of native vegetation surrounding the site. Implementation of strict traffic speed limits to avoid collision with fauna

Objectives 3 to 7: Support initiatives to improve habitat management at key sites

This species does not occur in the project area, however, the Project welcomes opportunities to work with local communities to improve important local habitats and work with other industry stakeholders on catchment wide programs.

Objective 8: Manage disturbance at important sites which are subject to anthropogenic disturbance when great knots are present – e.g. discourage or prohibit vehicle access, horse riding and dogs on beaches, implement temporary site closures.

As above, Great Knot are not expected to forage or roost near Project area. However, as per the Threatened Species Management Plan, as part of site induction package anyone accessing the Project facility will be made aware of the threatened species that may found near the Project area. Apart from that, there will be ongoing staff training and awareness including tool box meetings prior and during construction. Project staff is prohibited to make any contact with the wildlife. The Project staff will be required to minimise the disturbance cause to wildlife by driving according to the Project speed limit. Afterhours lighting will be reduced to only security lighting and night time lighting needed in key operational areas.

11 Eastern Curlew (*Numenius madagascariensis*)

11.1 Main issues raised by DAWE

> The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation to the impact on migratory species.

Note

The Department requests that scientific evidence is required to support the statement "…*Rehabilitating any degraded mudflat habitats within the PDE once the causeway is constructed*."

11.2 Perdaman Response

The eastern curlew is the largest migratory shorebird in the world, with a long neck, long legs, and a very long downcurved bill. Within Australia, the eastern curlew has a primarily coastal distribution and found all states in Australia. They have a continuous distribution from Barrow Island and Dampier Archipelago, Western Australia, through the Kimberley and along the Northern Territory, Queensland, and NSW coasts and the islands of Torres Strait (DAWE, 2020d).

During the non-breeding season in Australia, the eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats. Occasionally, the species found on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes within the mangroves. The birds are also found in coastal saltworks and sewage farms (DAWE, 2020d).

Eastern Curlew distribution within Australia is shown in the Figure 11-1Figure 9-1 and the recent records for Eastern Curlew around the Project is shown in Figure 11-2. As shown, more birds are observed towards the south of the project where the Dampier Salt Operations are and Nickol Bay (east coast of Burrup). If any present within the Project area, they may be simply be passing through and opportunistic feeding. They have a moderate likelihood of occurrence within the Project area.

The eastern curlew mainly forages on soft sheltered intertidal sandflats or mudflats, open and without vegetation or covered with seagrass, often near mangroves, on saltflats and in saltmarsh, rockpools and among rubble on coral reefs, and on ocean beaches near the tideline (DAWE, 2020d).

The eastern curlew roosts during high tide periods on sandy spits, sandbars and islets, especially on beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. They occasionally roost on reef-flats, in the shallow water of lagoons and other near-coastal wetlands. At Roebuck Bay, Western Australia, birds have been recorded flying from their feeding areas on the tidal flats to roost 5 km inland on a flooded supratidal claypan. Eastern curlews typically roost in large flocks, separate from other shorebirds (DAWE, 2020d).

Eastern Curlews require deep deposits of soft, penetrable sediment to realize their greatest foraging potential. With the high evaporation rates in the Project area and depends on the tide, if these species present, they may only be able to forage for a limited time in the Project area mud-flats due to the sub-optimal habitat present. As shown in the Figure 11-2Figure 9-2 there are more suitable and attractive foraging habitat towards the north and south of the Burrup Peninsula and in Nickol Bay.

The Project area does not support important breeding, foraging or roosting habitat and the Project area does not support a significant proportion of the national population. The habitat to be removed is not the preferred foraging or roosting habitat and will therefore not increase the decline of this species. Therefore, no significant impact is expected from the Project

Figure 11-1 Eastern Curlew species distribution in Australia (Atlas of Living Australia, 2020c)

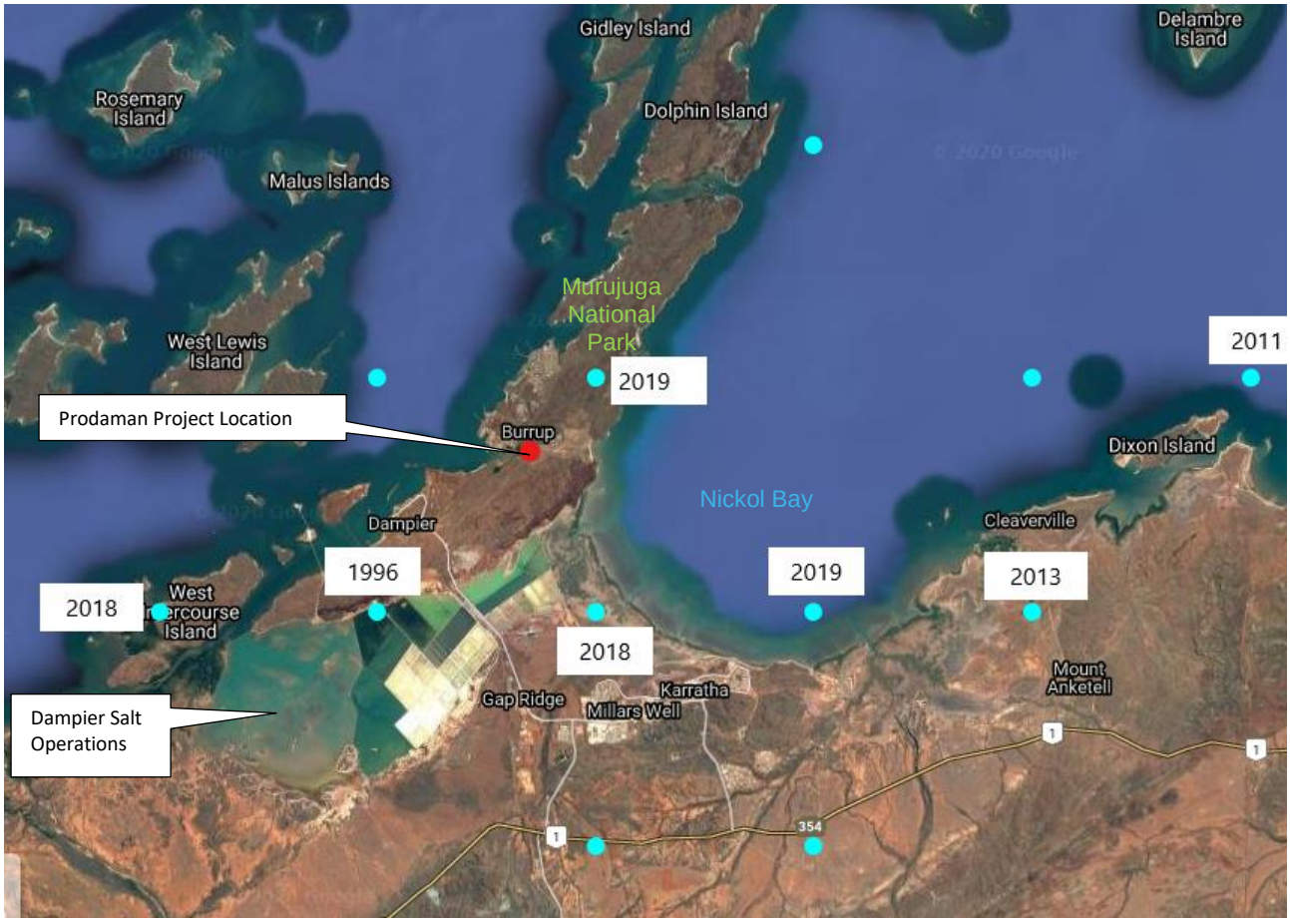

Figure 11-2 Eastern Curlew species records near the Project area (Atlas of Living Australia, 2020d)

11.2.2 Threats to Eastern Curlew

Eastern Curlew have a moderate likelihood of occurrence within the Project area (Table 2-1 above). As per the conservation advice for Eastern Curlew (Threatened Species Scientific Committee (2015b), DoE (2015c) and DoEE (2017a), threats in Australia include: ongoing human disturbance, habitat loss and degradation from pollution, changes to the water regime and invasive plants.

11.2.2.1 Human disturbance

Human disturbance can cause shorebirds to interrupt their feeding or roosting and may influence the area of otherwise suitable feeding habitat that is actually used. Eastern curlews take flight when humans approach to within 30–100 metres or even up to 250 metres away (Threatened Species Scientific Committee, 2015b).

Therefore, the following management and mitigation measures have been applied by the Project to reduce impacts from human disturbance:

The Project staff are to refrain from approaching wildlife and accessing areas other than the Project grounds.

To reduce the disturbance from Project vehicles, the causeway will be built on top of the supratidal mudflats (about 6m height). Other human disturbance to migratory shorebirds and mitigation measures applied by the Project is described in **Section 8.2.7**.

Threats from habitat loss and habitat degradation and mitigation measures applied by the Project is described in **Section 8.2.2**.

Chronic pollution to migratory shorebirds habitat and mitigation measures applied by the Project is described in **Section 8.2.3**.

Acute pollution to migratory shorebird habitat and mitigation measures applied by the Project is described in **Section 8.2.4**.

Altered hydrological regimes to migratory shorebird habitat and mitigation measures applied by the Project is described in **Section 8.2.6**.

Threats from invasive species and mitigation measures applied by the Project is described in **Section 8.2.5.**

Direct mortality migratory shorebirds and mitigation measures applied by the Project is described in **Section 8.2.8**.

The Department requests that scientific evidence is required to support the statement "…Rehabilitating any degraded mudflat habitats within the PDE once the causeway is constructed."

Only the area required to construct causeway will be disturbed. To construct the causeway the top soil needs to stabilised. Due to the Project area geology the proposed causeway works will not act as a barrier to the groundwater movement within the clayey gravel layer (Figure 11-3). No rehabilitation activity will be undertaken within the PDE until the end of the Project life.

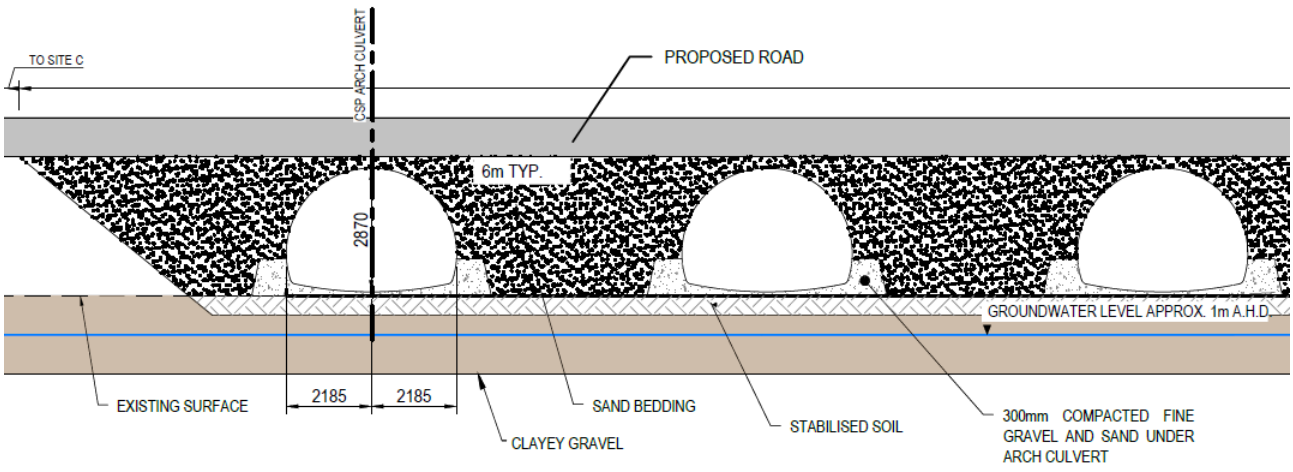

Figure 11-3 Project causeway design

11.2.3 Conservation Actions

As per Conservation Advice: *Numenius madagascariensis* Eastern Curlew (Threatened Species Scientific Committee, 2015b), the primary conservation objectives for this species in Australia are:

1. Achieve a stable or increasing population.
2. Maintain and enhance important habitat.
3. Disturbance at key roosting and feeding sites reduced.
4. Raise awareness of curlew sandpiper within the local community

Objective 1: Achieve a stable or increasing population

This species is a common migrant to the north and northeast and southeast of Australia. They mainly forage on soft sheltered intertidal sandflats or mudflats. They may use the Project area during a short amount of time where the mud is wet or inundated by water for most of the day. They are extremely shy species that will take flight at the first sign of danger, long before other shorebirds become nervous.

The habitat within the Project area is close to a busy road and the mud flats usually dry out quicker. There are no preferable roosting sites within the Project area. The habitat within the Project area is sub-optimal for the species. None were observed at the Project area and it does not support a significant proportion of the national population.

Objective 2: Maintain and enhance important habitat

As discussed in the ERD Section 4.6.6, the entire Project has been redesigned to significantly reduce the impacts to tidal mudflats and samphire shrubland/ saltplains habitat. These are potential Eastern Curlew feeding grounds.

The habitat loss, disturbance and modification to Eastern Curlew habitat are minimised by the more condensed project design, limit clearing to that which is absolutely necessary and land clearing will be undertaken progressively and incrementally during construction, in order to minimise the pressure on the carrying capacity of native vegetation surrounding the site.

Objective 3: Disturbance at key roosting and feeding sites reduced.

The habitat within the Project area is close to a busy road and the mud flats usually dry out quicker. There are no preferable roosting sites within the Project area. The habitat within the Project area is sub-optimal for the species. None were observed at the Project area and it does not support a significant proportion of the national population.

The entire Project layout to minimise habitat fragmentation and minimise /avoid impacts to potential Eastern Curlew feeding ground.

Rehabilitation of degraded mudflat habitats within the PDE will commence once the causeway is constructed.

The project will identify, control and reduce the spread of invasive species – by implementing Weed Management Plan and measures to control pest flora and fauna species within the PDE.

Objective 4: Raise awareness of curlew sandpiper within the local community

As per the Threatened Species Management Plan, as part of site induction package anyone accessing the Project facility will be made aware of the threatened species that may found near the Project area. There will also be ongoing staff training and awareness including tool box meetings prior and during construction. Project staff are prohibited to make any contact with the wildlife. The Project welcomes any opportunity to work with local communities to raise awareness and wild life protection programs as part of the community outreach plans.

12 Ghost Bat CA

12.1 Main issues raised by DAWE

Not satisfied

> The Department notes the information provided does not provide a discussion on how the Policy and Guidance documents have been considered in relation.

Note

> The map supplied shows the excluded drainage lines (identified as important foraging habitat for the GB) from the project development envelope.

> The map supplied in the document is insufficient in size. Proponent needs to provide a detailed A4 size map with scale and legend.

Satisfied

> The Department notes the Table 1-1 shows a breakdown of Ghost Bat habitat to be impacted.

12.2 Perdaman Response

This species has been recorded on the Burrup Peninsula about 4 km northeast of the Project Area (DBCA, 2018) and more recently by APM during the post-wet season survey.

This species was once distributed over the entire north of Australia but the current range is discontinuous (Figure 12-1), with geographically disjunct colonies occurring in the Pilbara, Kimberley (including several islands), northern part of Northern Territory (including Groote Eylandt), the Gulf of Carpentaria, coastal and near coastal eastern Queensland from Cape York to near Rockhampton, and western Queensland (including Riversleigh and Cammoweal districts. Only 14 breeding sites are currently known (Threatened Species Scientific Committee, 2016c).

Decline of Ghost Bat distribution is partly due to the introduction of the Cane Toad, but also loss and disturbance of roost sites and loss of foraging habitat through inappropriate management and dramatic land-use change (DENR, 2016).

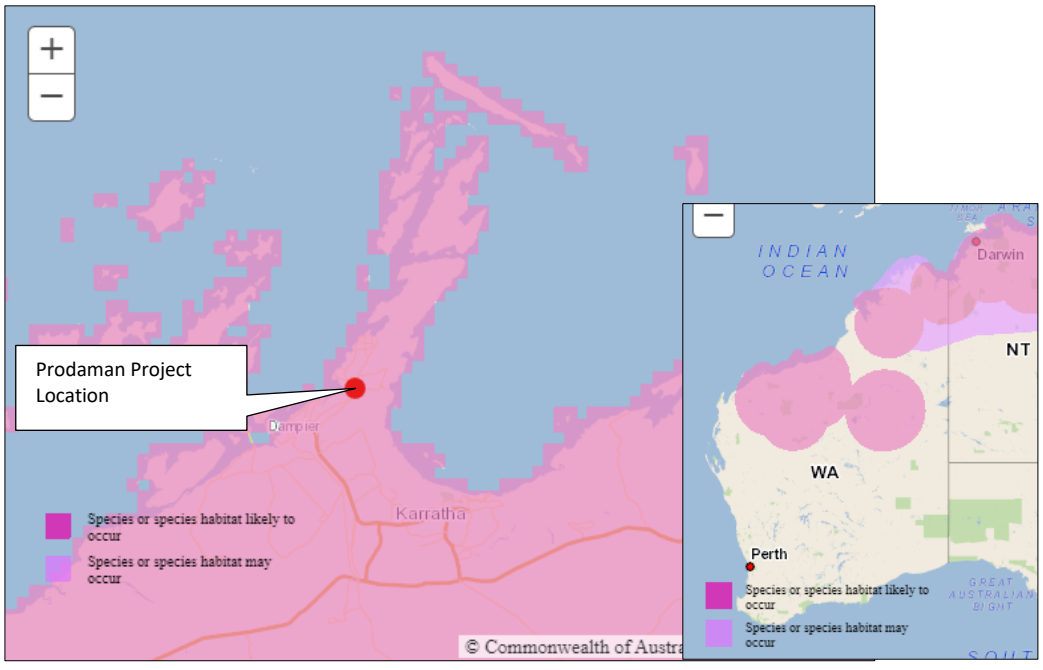

Figure 12-1 Ghost Bat species likely habitat distribution near Project area (DAWE, 2020e)

Ghost Bats (*Macroderma gigas*) were detected on two nights in rocky outcrop and mid-slope habitats within the Project area. However, no roost sites were identified during the surveys, indicating that the bats roost nearby (possibly at Murujuga National Park to the south), and forage over the Project area. The drainage line in the south-west of the Project area provides suitable foraging habitat for this species. Given the provision of tall trees as vantage points and the proximity to potential roosting habitat, this creekline is considered important Ghost Bat habitat (Figure 12-2).

Figure 12-2 Drainage Line Habitat in the Southwest Corner of the PDE (APM, 2019)

Weathering of the geology of the area has formed deeply incised narrow valleys amongst the exposed bedrock. These channels trend southwest to northeast and east to west throughout the Burrup Peninsula. The drainage channel present in the Study Area in the southwest corner is quite significant as this habitat type occurs infrequently on the Burrup Peninsula.

Trees containing hollows are likely to provide roosting habitat for the Northern Free-tailed Bat (*Chaerephon jobensis*), the Little Broad-nosed Bat (*S. greyii*), as well as foraging habitat for the Ghost bat (*M. gigas*). Drainage line habitat is relatively limited within the Study Area, and is likely to be of high importance due to the associated tall trees and ephemeral freshwater. Particularly, the creekline in the south-west of the Study Area is unique within the Study Area. This creek line drains from the Murujuga National Park, an area likely to contain suitable roost sites for the Ghost Bat (*M. gigas*), which forages along drainage lines.

12.2.2 Threats to Ghost Bats

As outlined in the *Macroderma gigas* (ghost bat) Conservation Advice (Threatened Species Scientific Committee, 2016c), threats to the ghost bat are listed below:

- Habitat loss (destruction of, or disturbance to, roost sites and nearby areas) due to mining
- Disturbance of (human visitation at) breeding sites
- Modification to foraging habitat
- Collision with fences, especially those with barbed wire
- Collapse or reworking of old mine adits
- Contamination by mining residue at roost sites
- Poisoning by cane toads
- Competition for prey with foxes and feral cats

12.2.2.1 Habitat loss (destruction of, or disturbance to, roost sites and nearby areas) due to mining

The key threat to the ghost bat is habitat loss (roost sites) and degradation due to mining activities. The species' slow reproductive rate, and the lack of suitable habitat which restricts its movement, renders it vulnerable to threats and localised extinctions (Threatened Species Scientific Committee, 2016c)

Many Pilbara roosts are vulnerable to iron ore mining and the deterioration and disturbance of old underground gold and copper mines.

Even though Ghost Bats were detected, no roost sites were identified during the surveys, indicating that the Ghost Bats roost nearby (possibly at Murujuga National Park to the south).

12.2.2.2 Disturbance of (human visitation at) breeding sites

No Ghost Bat breeding sites were found within the Project area or nearby.

12.2.2.3 Modification to foraging habitat

Vegetation simplification can impact on foraging strategies and productive riparian sites. Foraging bats search for prey from vantage points in trees before making short flights to capture prey. To persist in an area, small colonies require a group of caves/shelters that provide alternative day and night roost sites, and a gully or gorge system that opens onto a plain or riparian line that provides good foraging opportunities, typically less than 5 km from the diurnal roost site. Livestock grazing, fire and weed encroachment can degrade habitat; some population declines could be attributable to prey lost through habitat modification by fire and livestock (Threatened Species Scientific Committee, 2016c).

Therefore, the following management and mitigation measures have been applied by the Project to reduce impacts:

Drainage line habitat possibly used by Ghost Bat is found at the Southwest Corner of the PDE. Modification to foraging habitat is identified as a major threat to Ghost Bats in the Conservation Advice (Threatened Species Scientific Committee, 2016c). After recommendations from the Ecologists who conducted the Ghost Bat survey (APM, 2019), Perdaman has revised the design and excised the drainage line habitat important to Ghost Bat from the Project Development Envelope avoiding any modification to the Ghost Bat foraging habitat (see below Figure 12-2).

12.2.2.4 Collision with fences, especially those with barbed wire

Ghost bats have low fecundity and survival. They often fly at about fence height and substantial numbers are known to be killed when colliding with fencing wire. A single fence near a colony can effectively remove all of these individuals given enough time, and has been observed in the Pilbara. Therefore, the following management and mitigation measures have been applied by the Project to reduce impacts:

The Project will not be using barbed/razor fences during the construction and/or operation phases of the Project to minimise and mitigate potential impacts (ERD Section 6.7, Table 6-4). Instead the Project will use cyclone mesh for fencing and efforts should be made to increase the visibility to Ghost Bats. Perdaman will add visible (and often audible) objects to the fence, such as tape, plastic flags, metal tags, and empty aluminium cans.

12.2.2.5 Poisoning by cane toads and competition for prey with foxes and feral cats

The Project has developed a Pest Management Plan and if any triggers identified is activated, the Project will apply necessary management and control methods. As per the Pest Management Plan developed for the Project, Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority) and participate in existing regional pest animal management and/or research programs where applicable.

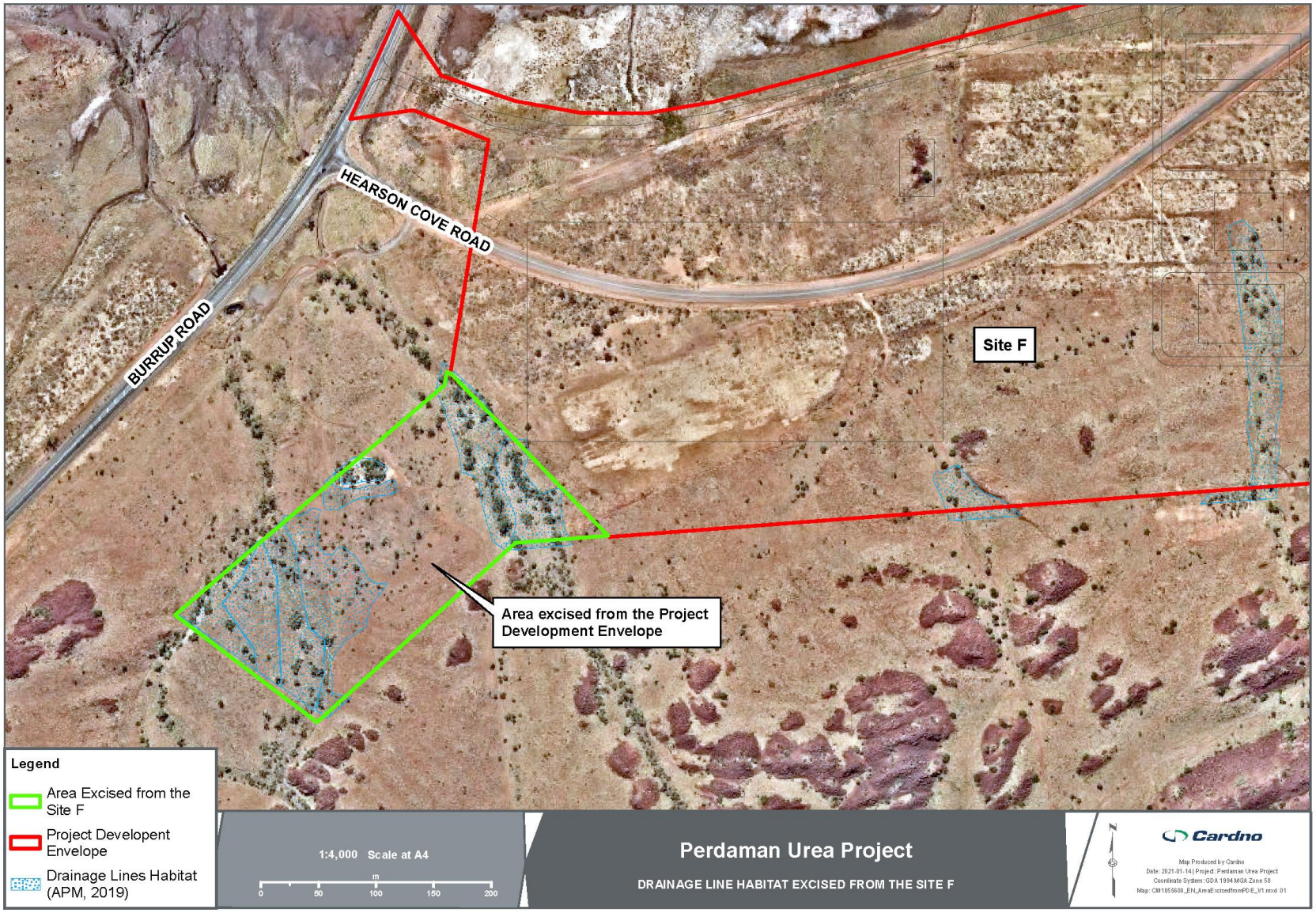

Figure 12-3 Drainage Line Habitat in the Southwest Corner of the PDE (APM, 2019)

13 Olive Python (*Liasis olivaceus barroni*)

13.1 Main issues raised by DAWE

Not satisfied

> The Department notes the information provided does not provide a discussion on how these documents have been considered.

Note

> The Department notes the Table 1-1 shows a breakdown of Olive Python habitat to be impacted.

13.2 Perdaman Response

The Olive Python (Pilbara sub species) is endemic to Australia and largely restricted to the Hamersley Range and Dampier Archipelago of the Pilbara region (DEWHA, 2008c).

This species has been historically recorded on Dolphin Island in the Dampier region and in King Bay, Hearson's Cove and in many locations around the Karratha Gas Plant and Pluto LNG facility, particularly where artificial water sources occur (open water pit). It is often recorded around the built environment and highly disturbed areas.

During the cooler months Pilbara Olive Python will typically hide in caves, crevices and fissures away from water sources. However, in the warmer months they become active and tend to stay near rocky outcrops and water. On the Burrup Peninsula, Olive Pythons have been found to prefer granophyre rock piles and occasionally are found in neighbouring spinifex grasslands.

Targeted Survey was conducted for Pilbara Olive Python in rocky outcrop habitats and due to their cryptic nature, no species was recorded. This species has a high likelihood of occurrence within the Project area.

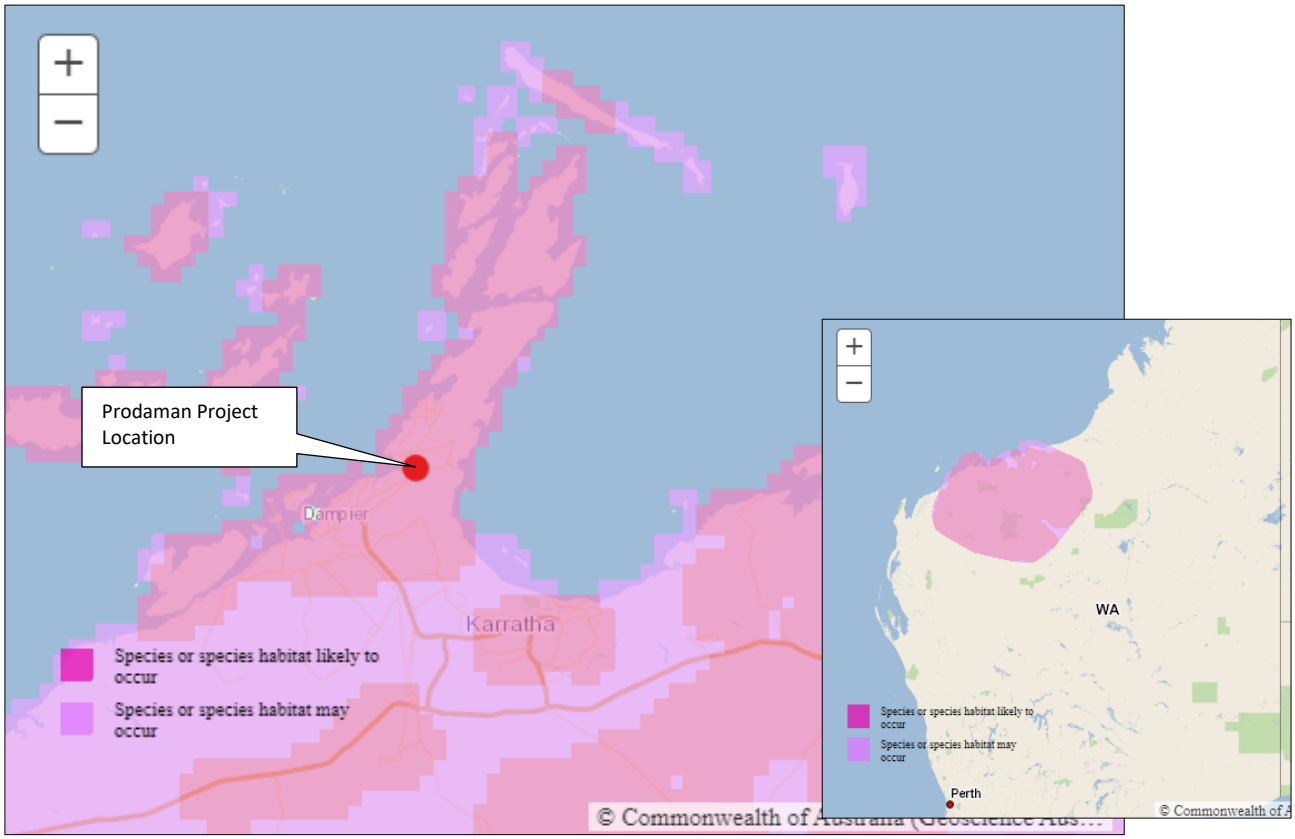

Figure 13-1 Olive Python (Pilbara subspecies) likely habitat distribution near the Project area (DAWE, 2020f)

13.2.2 Threats to Olive Python

The main identified threats to the Olive Python (Pilbara subspecies) include predation by feral cats (*Felis catus*) and foxes (*Vulpes vulpes*), particularly of juveniles; the predation of food sources (quolls and rock-wallabies) by foxes; and destruction of habitat due to gas and mining development (especially on Burrup Peninsula) (DEWHA, 2008c).

Other threats include the loss of suitable prey species, particularly in coastal locations where foxes are more prevalent; deliberate road kills, associated with increased road traffic from tourism and industry; and death resulting from mistaken identification as a poisonous brown snake (DEWHA, 2008c).

Therefore, the following management and mitigation measures have been applied by the Project to reduce impacts:

13.2.2.1 Predation by feral cats and foxes and competition for food sources

The Project has developed a Pest Management Plan and when the established “triggers” have been activated relevant management and control measures will be applied.

All Project staff will be trained in the Pest Management Plan.

As per the Pest Management Plan developed for the Project, Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority) and participate in existing regional pest animal management and/or research programs where applicable.

13.2.2.2 Destruction of habitat

During the design phases the Project largely reduced impacts to rocky out crop areas and excluded the southern rocky outcrop areas from the Project footprint. The original Site F permit included 0.3 ha of rocky outcrop areas. The January 2021 Project clearance footprint include only 0.05 ha of rocky outcrop habitats.

Land clearing will be undertaken progressively and incrementally during construction, in order to minimise the pressure on the carrying capacity of native vegetation surrounding the site. Native vegetation is retained where possible, such as around carparks and infrastructure, and landscaped areas.

Experienced fauna handlers (with necessary permits) will be onsite when the pre-clearance surveys and the construction clearing will take place to reduce any impacts to native fauna.

13.2.2.3 Deliberate road kills and death resulting from mistaken identification

The Project has developed Threatened Species Management Plan and all Project staff will be trained as part of the Site Induction plan. Project staff is prohibited to interact with any wildlife including deliberate killing of any native fauna.

All Project staff will have to adhere to specified sped limits within the Project facility.

13.2.3 Regional and Local Priority Actions

The Conservation Advice (DEWHA, 2008c) identify the following regional and local priority recovery and threat abatement actions to support the recovery of the Olive Python (Pilbara subspecies).

13.2.3.1 Habitat Loss, Disturbance and Modification

- Identify populations of high conservation priority.
- Ensure road widening, maintenance activities, and gas infrastructure development (or development activities) in areas where the Olive Python (Pilbara subspecies) occurs do not adversely impact on known populations.
- Manage any changes to hydrology which may result in changes to the water table levels, increased run-off, sedimentation or pollution.
- Investigate further formal conservation arrangements such as the use of covenants, conservation agreements or inclusion in reserve tenure.

There are no high conservation priority Olive Python population within the Project area.

Even though Olive Python were not observed during the surveys, the Threatened Management Plan will be implemented so the Project development would not adversely impact any population of Olive Pythons.

The Project would not result in changes to the natural hydrology of the site and no pollution material will be discharged to the waterways.

13.2.3.2 Animal Predation or Competition

> Implement Threat Abatement Plan for the control and eradication of foxes and cats in the local region (EA, 1999a & 1999b).

The Pest Management Plan developed for the Project is in accordance to the Threat Abatement Plan for the control and eradication of foxes and cats. The Pest Management Plan will be implemented during the Project lifetime.

As per the Pest Management Plan developed for the Project, Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority) and participate in existing regional pest animal management and/or research programs where applicable.

13.2.3.3 Conservation Information

> Raise awareness of the Olive Python (Pilbara subspecies) within the local community.

> Use road signage to raise awareness of the Olive Python (Pilbara subspecies) with road users on or near roads.

As per the Threatened Species Management Plan, Site inductions to introduce personnel to local conservation significant fauna, and signage displayed in crib rooms and notice boards, to ensure all personnel can identify all larger conservation significant species.

As per the Pest Management Plan developed for the Project, Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority) and participate in existing regional pest animal management and/or research programs where applicable.

14 Northern Quoll

14.1 Main issues raised by DAWE

Partially satisfied

> The Department notes the information provides some discussion on how the documents have been considered e.g. Objective 3 and 7 of the NQ NRP.

Note

The Department notes the Table 1-1 shows a breakdown of Northern Quoll habitat to be impacted.

14.2 Perdaman Response

The Northern Quoll occurs in five regional populations in Australia: across Queensland, the Northern Territory and Western Australia both on the mainland and on offshore islands (DAWE, 2020g).

Northern Quoll distribution within Australia and the likely habitats occur within the Project area is shown in the Figure 11-1Figure 9-1. Northern Quoll likely habitat distribution in Pilbara Region is shown in (Figure 14-2).

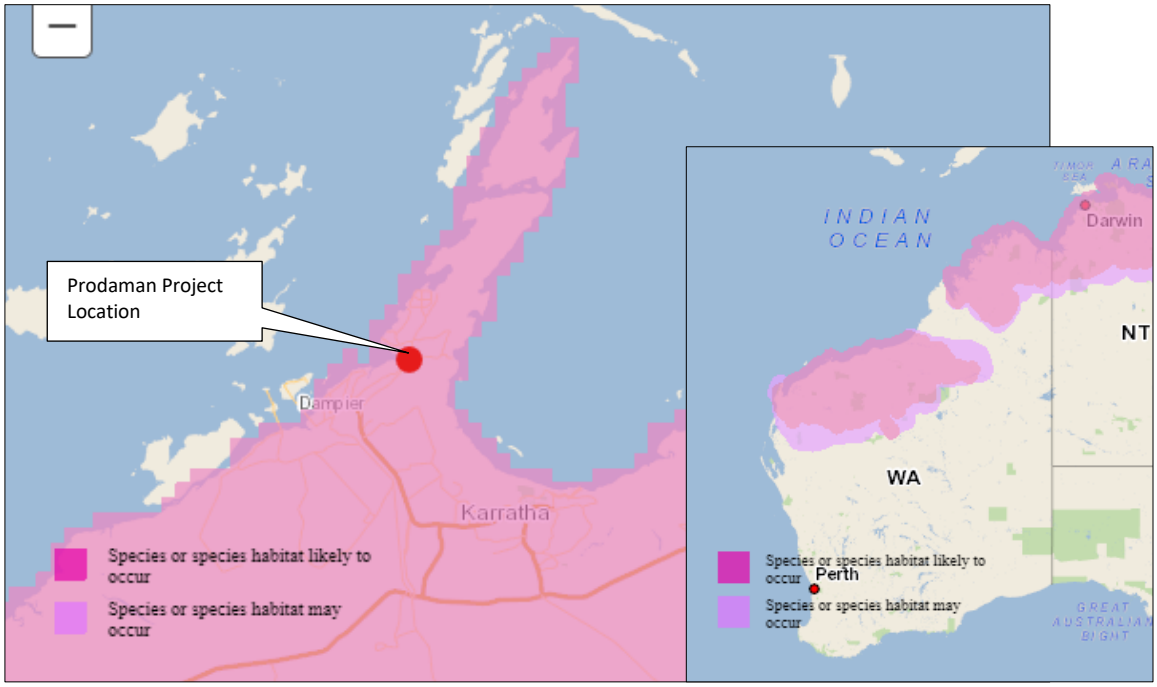

Figure 14-1 Northern Quoll likely habitat distribution near the Project area (DAWE, 2020g)

Northern Quoll habitat generally encompasses some form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal. Rocky habitats support higher densities of Quolls and/or longer lived individuals within the species range, due to more protection from predators, better nutrition and less exposure to agricultural practices (DAWE, 2020g).

Northern Quoll have been recorded in close proximity to the Project area. One record in 1990 is less than 1 km from the proposed site, and another at a similar time is approximately 2.2km away. The most recent record is from the northern point of King Bay which is approximately 2.7 km from the proposed site. Despite a concerted survey effort by APM during the 2018 and 2019 surveys, including cage and Elliot trapping, camera trapping, spotlight searches, and scat searches, Northern Quolls were not recorded. Given the low density of mainland populations of this species, and its cryptic nature, the lack of detections during APM surveys may not indicate the absence of this species from the area. However, the lack of detections does indicate that this species is rare in habitats at the Project area.

Northern Quolls on the Burrup Peninsula are likely to inhabit complex landforms of rocky outcrops, which can afford greater cover from predators that more open areas. The current survey area does not include the well-

developed and extensive rocky outcrops which present immediately north and south of the site. There is a moderate likelihood of occurrence for Northern Quolls within the Project area.

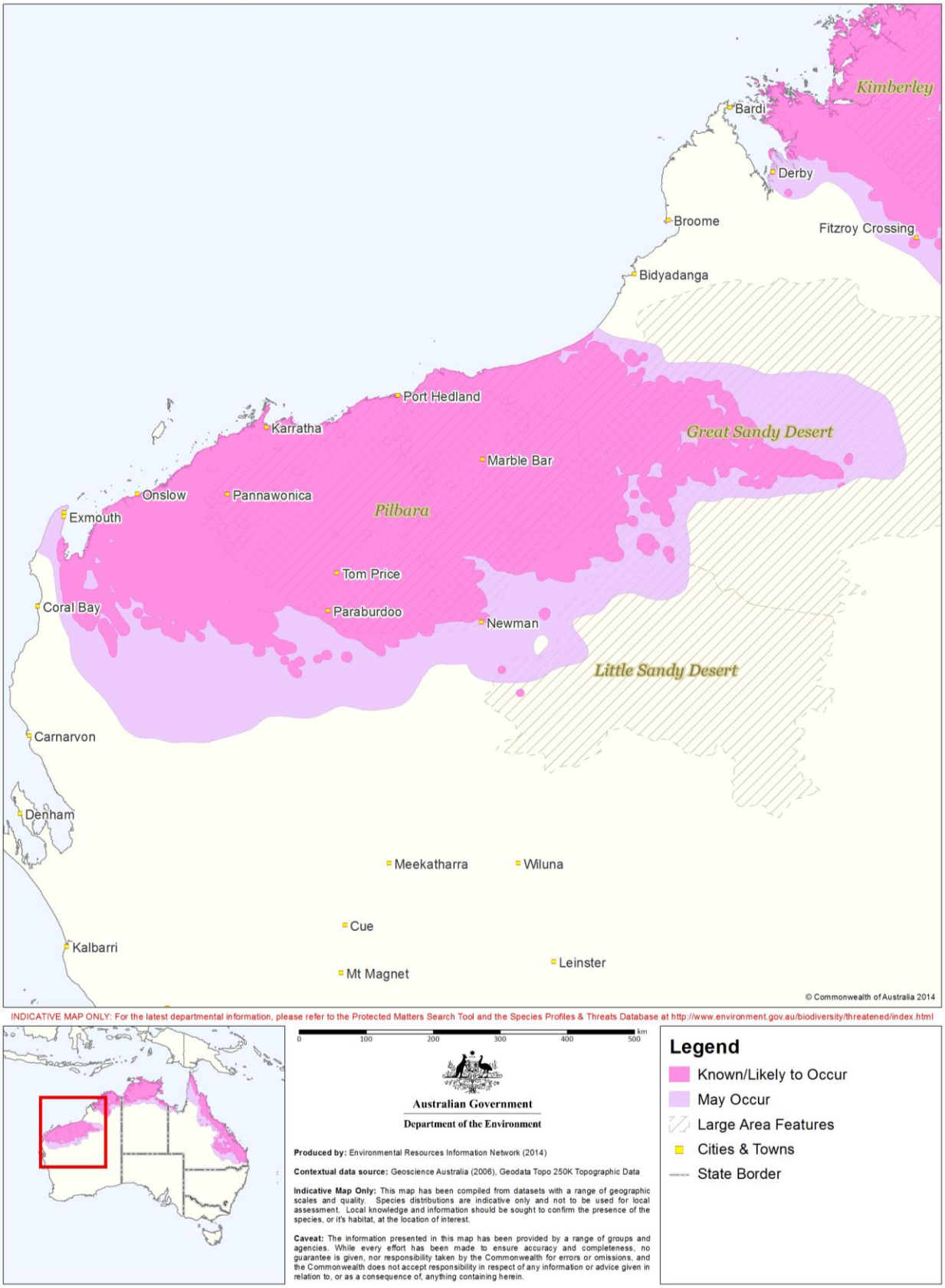

Figure 14-2 Northern Quoll likely habitat distribution in Pilbara Region (DoE, 2016).

14.2.2 Threats to Northern Quoll

As outlined in the *Dasyurus hallucatus (Northern Quoll)* Conservation Advice (Threatened Species Scientific Committee, 2005) and National Recovery Plan for the Northern Quoll (Hill & Ward, 2010), threats to Northern Quoll are listed below:

14.2.2.1 Lethal toxic ingestion of Cane Toad toxin

Poisoning as a result of the ingestion of Cane Toad toxin is considered to have had a catastrophic impact on a number of Northern Quoll populations (Threatened Species Scientific Committee, 2005).

The Project has developed a Pest Management Plan and it will be adopted until the Project closure. Cane Toads are not yet present within the Burrup Peninsula however, the Project has already defined management and control measures if the Cane Toad "triggers" were activated.

As per the Pest Management Plan developed for the Project, Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority) and participate in existing regional pest animal management and/or research programs where applicable.

14.2.2.2 Feral Predators

Feral predators may have impacts on quoll populations through competition for food or direct predation, and these impacts may be exacerbated after fire inappropriate fire regimes (Hill & Ward, 2010). The Project will adopt its Pest Management Plan for the management and control of feral predators such as foxes and cats.

As per the Pest Management Plan developed for the Project, Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority) and participate in existing regional pest animal management and/or research programs where applicable.

14.2.2.3 Inappropriate fire regimes

The detrimental impact of fire on quolls is likely to be through consequential changes in habitat structure and floristics (Hill & Ward, 2010). The greatest threat posed by fire may be increased predation of quolls after removal of cover.

- The Proponent will avoid igniting bushfires (thereby avoiding altering the current fire regime to the best of their ability).
- Staff will be trained in the use of fire extinguishers.
- Spot fire control measures will be devised.
- All vehicles will be fitted with fire extinguishers.
- A Hot Work Permit system will be devised and implemented.

14.2.2.4 Habitat degradation and habitat destruction

In the Pilbara, the distribution of quolls is fragmented and the species is mostly confined to ironstone formations and some river systems and the Burrup Peninsula and adjacent offshore islands. Loss of cover may increase the vulnerability of quolls to predation but also increases exposure of vertebrate prey for quolls (Hill & Ward, 2010).

The Project area does not include the well-developed and extensive rocky outcrops suitable for Northern Quolls. There is a moderate likelihood of occurrence for Northern Quolls within the Project area.

During the design phases the Project largely reduced impacts to rocky out crop areas and excluded the southern rocky outcrop areas from the Project footprint. The original Site F permit included 0.3 ha of rocky outcrop areas. The January 2021 Project clearance footprint include only 0.05 ha of rocky outcrop habitats.

The Causeway in between Site C and F will act as a fauna underpass so that fauna can freely move in between Kings Bay towards Hearsons Cove.

Site inductions to introduce personnel to local conservation significant fauna, and signage displayed in crib rooms and notice boards, to ensure all personnel can identify all larger conservation significant species.

14.2.2.5 Weeds

Weed and Pest Management Plans will be adopted to ensure there will be no weed invasion after land clearing for the Project or pest species will attract to the Site.

Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority & MAC) and participate in existing regional weed management and/or research programs where applicable.

14.2.2.6 Direct Mortality

The Project will avoid direct mortality rates by adopting the following avoidance and mitigation measures:

- Project vehicle speeds will be managed on site (including entry and exit points) by enforcing speed limits in construction areas to reduce the potential for vehicle strikes.
- All employees will be required to record and report any native fauna strikes.
- Roadkill will be removed at least 10 m into surrounding vegetation, when safe to do so, by designated personnel to avoid further strikes of fauna feeding on carcasses.
- Site induction to emphasise that all native fauna has right-of-way, where possible and safe to do so.
- Personnel will be inducted regarding the key risk times for vehicle strike to fauna (e.g. dusk and dawn).
- Where possible, all non-essential movement will be scheduled to take place during the day.
- Site inductions to introduce personnel to local conservation significant fauna, and signage displayed in crib rooms and notice boards, to ensure all personnel can identify all larger conservation significant species.
- Chemical and oil spills will be managed as above stated.

14.2.3 Recovery Objectives

The Project will support Northern Quoll recovery objectives via adopting the Pest Management Plan thereby preventing/reducing the pests such as Cane Toads, Feral Cats and Foxes.

All Project staff will be educated about Northern Quolls and ways to support native fauna.

15 TAP – 5 listed grasses

15.1 Main issues raised by DAWE

Not satisfied

The Department notes that the *Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses* has not been discussed as required.

15.2 Perdaman Response

DSEWPC), 2012

In 2009 the Australian Government listed 'Ecosystem degradation, habitat loss and species decline due to invasion of northern Australia by the following introduced species as a key threatening process (KTP) under the EPBC Act:

- gamba grass (*Andropogon gayanus*) - Figure 15-1
- para grass (*Urochloa mutica*) - Figure 15-2
- mission grass (*Pennisetum polystachion*) - Figure 15-3
- annual mission grass (*Pennisetum pedicellatum*) - Figure 15-4
- olive hymenachne (*Hymenachne amplexicaulis*) - Figure 15-5

As shown in the distribution maps for the five listed grasses within Australia, Burrup peninsula is not yet showing any major invasions. These species were not recorded in the Project area during the Biological Surveys conducted for the Project (APM, 2019:). However, the Projects Weed Management Plan will be implemented to prevent invasive and non-endemic plant species establishing themselves and displacing native species.

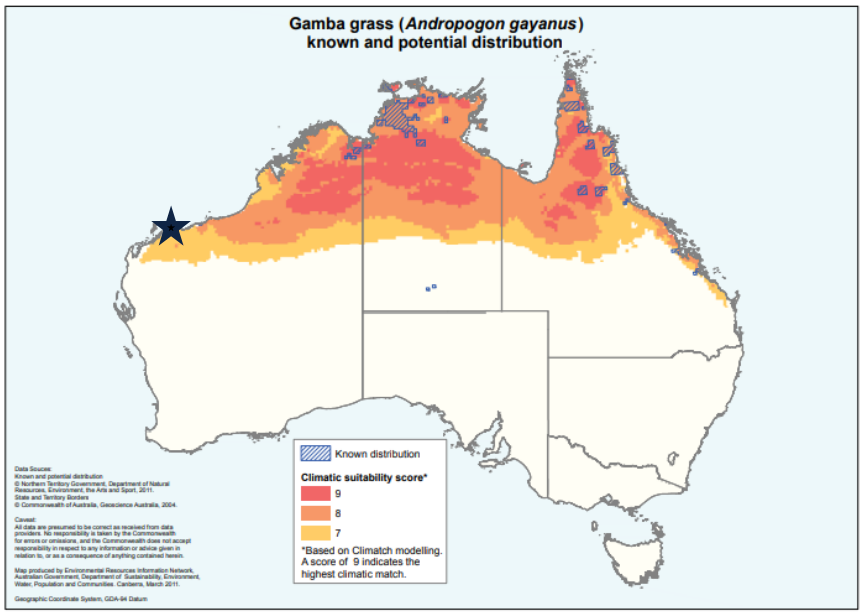

Figure 15-1 Map indicating known and potential distribution of gamba grass in Australia

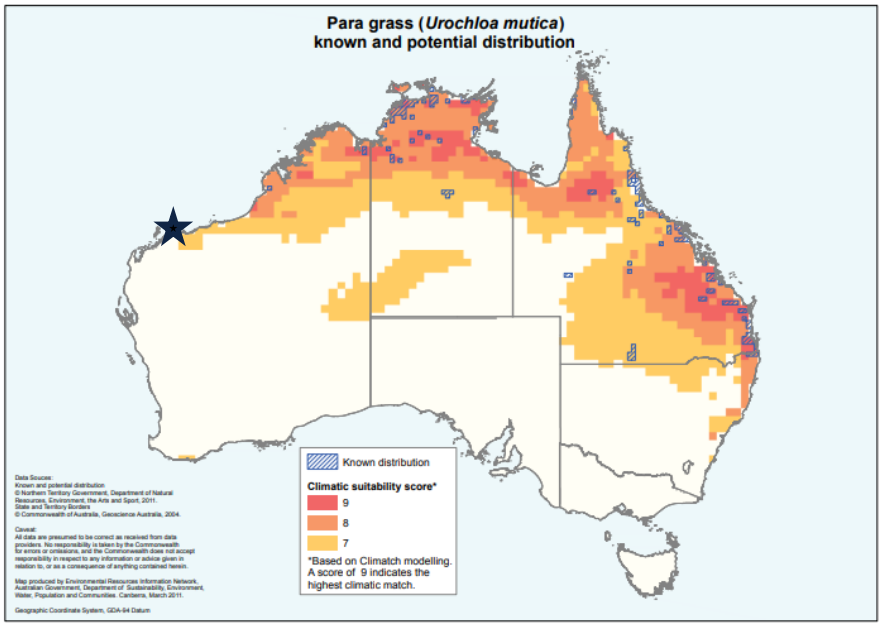

Figure 15-2 Map indicating known and potential distribution of para grass in Australia

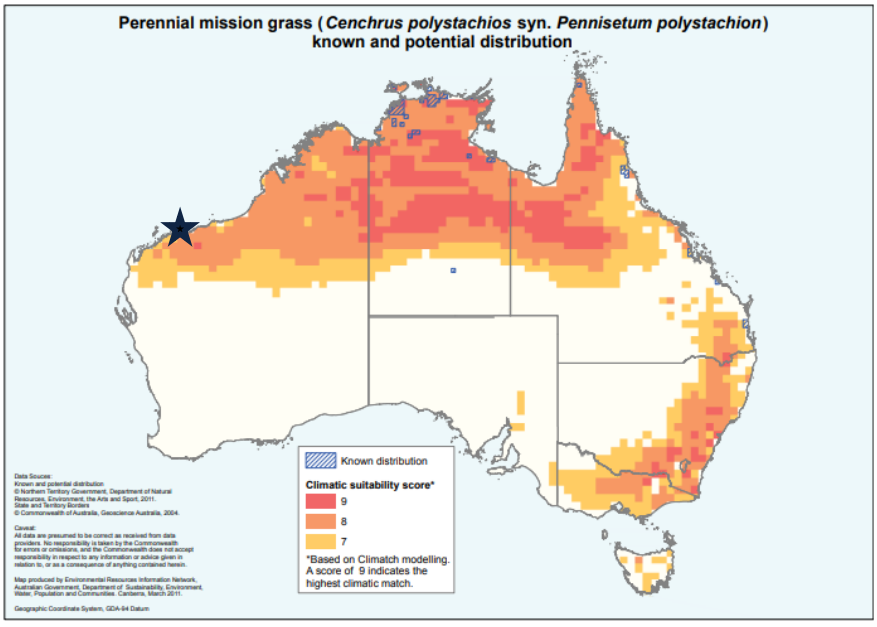

Figure 15-3 Map indicating known and potential distribution of perennial mission grass in Australia

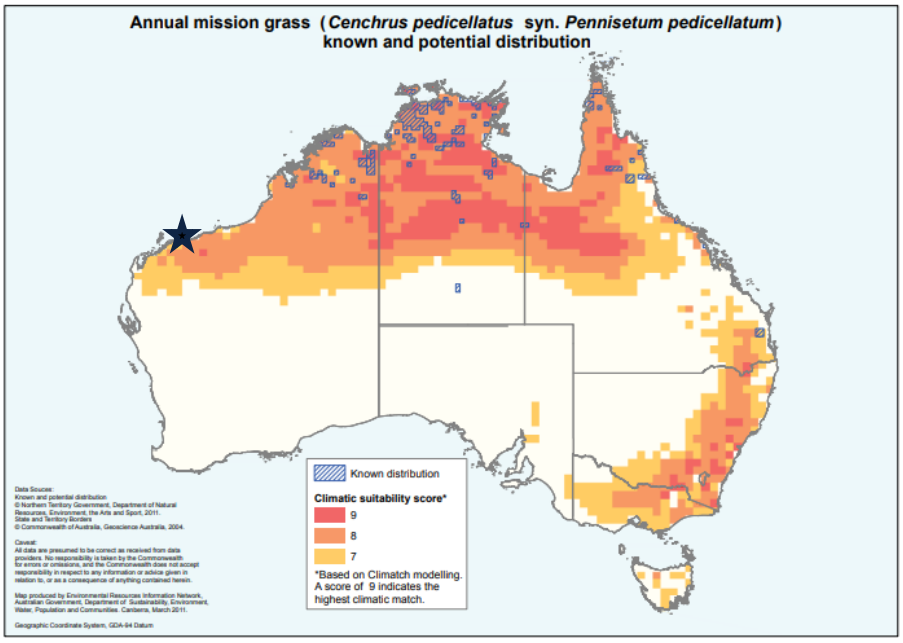

Figure 15-4 Map indicating known and potential distribution of annual mission grass in Australia

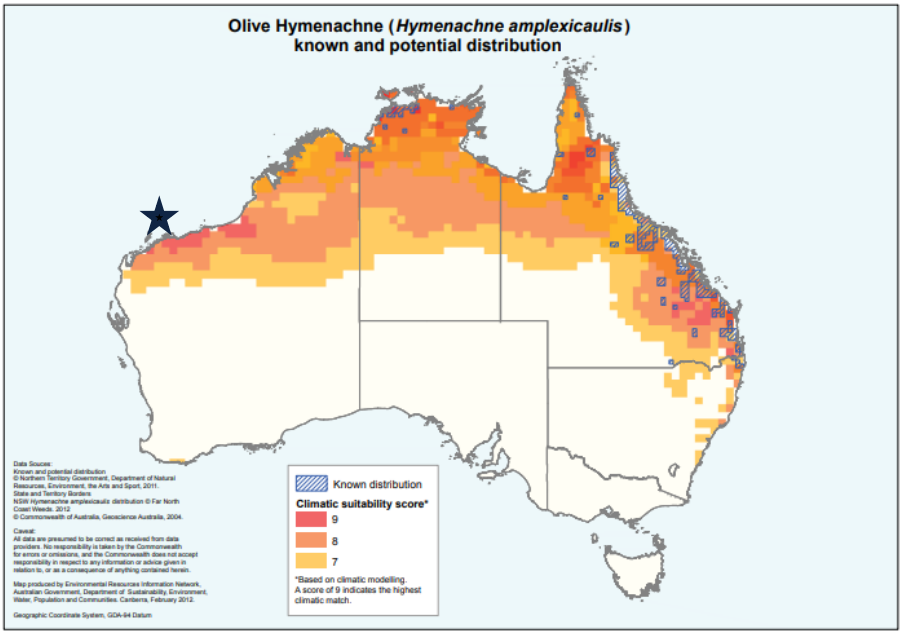

Figure 15-5 Map indicating known and potential distribution of olive hymenachne in Australia

15.2.2 Objectives and actions

The overarching goal of this TAP is to minimise the adverse impacts of the five listed grasses on affected native species and ecological communities. To achieve this goal, the TAP has six main objectives:

1. develop an understanding of the extent and spread pathways of infestation by the five listed grasses
2. support and facilitate coordinated management strategies through the design of tools, systems and guidelines
3. identify and prioritise key assets and areas for strategic management
4. build capacity and raise awareness among stakeholders
5. implement coordinated, cost-effective on-ground management strategies in high-priority areas

6. monitor, evaluate and report on the effectiveness of management programs.

The following weed management controls will be applied by the Project to manage the listed grass species:

- Identification of weeds via regular site inspections and communication with regulatory authorities.
- Particular focus on areas of potential new outbreak (e.g. soil stockpiles, disturbed areas).
- Mechanical removal of identified weeds and and/or the application of approved herbicides
- Follow-up site inspections to determine the effectiveness of eradication programmes.
- Minimisation of seed transport from the site during construction and operation through the use of the wash bay for footwear and vehicles.
- Specific control of noxious weeds, including these which have been recorded in the area.

Appropriately qualified persons would be engaged to undertake weed control. Follow-up site inspections would occur to determine the effectiveness of weed control. The monitoring results would be reported in the Annual Review Report.

Perdaman will liaise with other industry stakeholders (I.e. Pilbara Port Authority & MAC) and participate in existing regional weed management and/or research programs where applicable.

16 ERD Appendix K – Biological survey

16.1 Main issues raised by DAWE

Not satisfied

> The Department notes that there are no surveys for the entire footprint included in the Biological Survey. Only Sites C and F have been surveyed.

The Department does not have evidence that there was a mutual decision that the conveyor corridor and Pilbara port storage shed area was to be excluded from biological surveys.

16.2 Perdaman Response

Please see the email trail below - Perdaman - ERD [SEC=OFFICIAL]

17 Fauna Habitat across the DE

17.1 Main issues raised by DAWE

Not satisfied

> The table includes Site C, F and other (causeway, access roads and clearing for conveyor).

> The table does not include the port area (storage shed and ship loader - feed conveyor).

Total area to be disturbed = 70.5 ha.
Site C = 34 ha;
Site F = 30 ha;

Other (causeway, access roads and clearing for conveyor) = 6.48 ha.

17.2 Perdaman Response

Please see the Section 1.2.3 for the updated fauna habitat clearing.

The Conveyor will predominately transect the existing Burrup Service Corridor, which is bituminous and already cleared (Figure below).

The Storage Shed area within the Pilbara Port is already cleared and heavily disturbed as well.

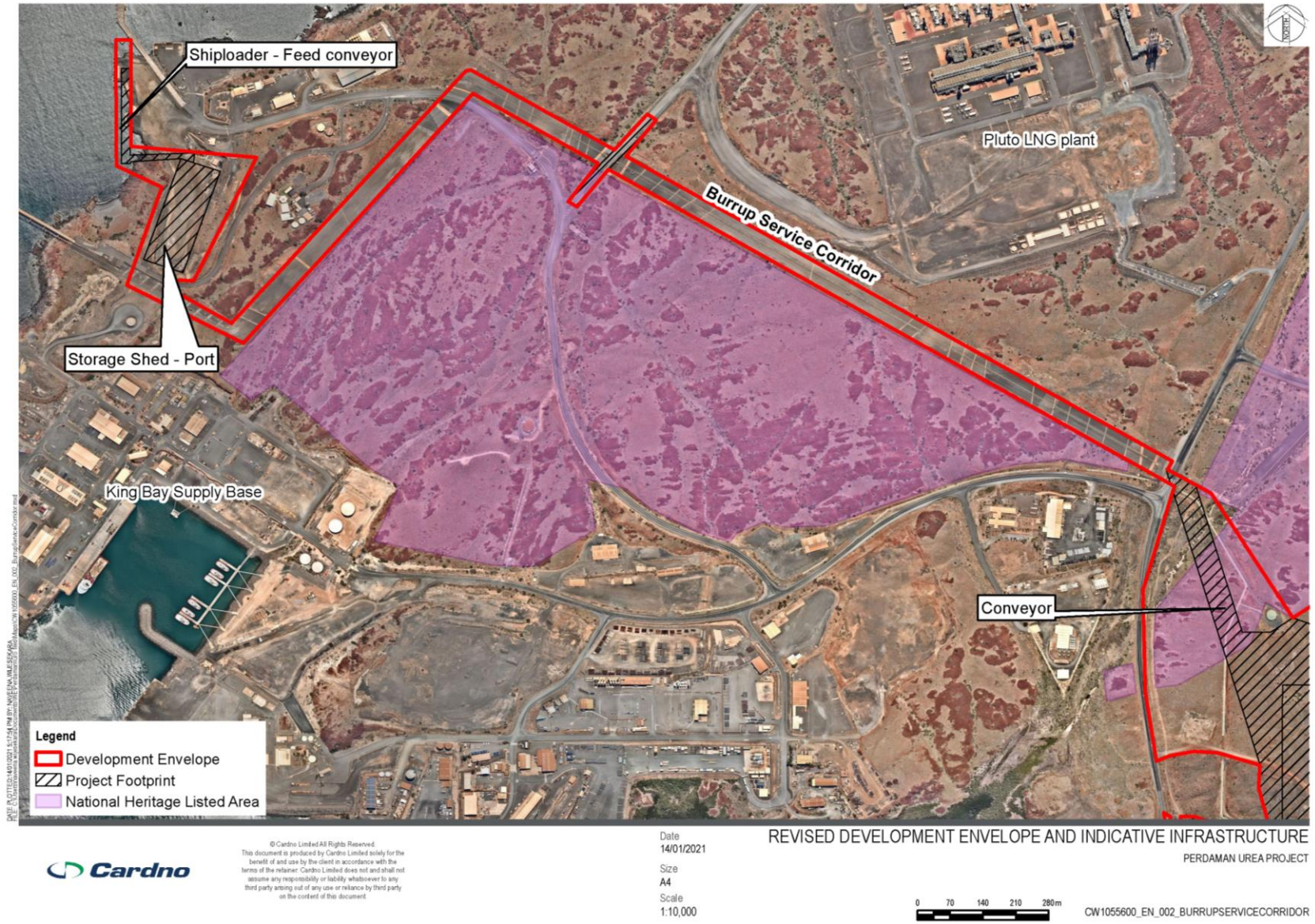

Figure 17-1 Development Envelope, Conveyor Route and Storage Shed

18 Biological Survey techniques

18.1 Main issues raised by DAWE

Not satisfied

The Department notes that this has not been addressed in Appendix B – Biological Survey. The survey methods are discussed, but do not reference DAWE policy documentation nor WA EPA documentation.

18.2 Perdaman Response

Please see the section 2.2.2

19 Impacts Associated with Habitat Fragmentation and Possible Isolation for EPBC Act Listed TS.

19.1 Main issues raised by DAWE

Not satisfied

> The Department notes that there is insufficient detail in the supplied map and does not include the surrounding fauna habitat.

The map should show the available fauna habitat in and outside the project area, including areas and number of hectares to be cleared and connectivity to the project area.

19.2 Perdaman Response

Please see the attached map.

20 References

1. Animal Plant Mineral, 2019, Perdaman Urea Project – Pre and Post-wet Season Biological Survey
2. Atlas of Living Australia, 2020a. Species records for Red Knot (*Calidris canutus*). Available at: https://spatial.ala.org.au/?q=lsid:urn:lsid:biodiversity.org.au:afd.taxon:c995232e-f721-48de-8e2b-fc8ce2a2efa7 [accessed January 2021]
3. Atlas of Living Australia, 2020b. Species records for Curlew Sandpiper (*Calidris ferruginea*). Available at: https://spatial.ala.org.au/?q=lsid:urn:lsid:biodiversity.org.au:afd.taxon:fa188c0e-68ba-4b3f-8e8f-48734608c7d1 [accessed January 2021]
4. Atlas of Living Australia, 2020c. Species records for Great Knot (*Calidris tenuirostris*). Available at: https://spatial.ala.org.au/?q=lsid:urn:lsid:biodiversity.org.au:afd.taxon:fa188c0e-68ba-4b3f-8e8f-48734608c7d1 [accessed January 2021]
5. Atlas of Living Australia, 2020d. Species records for Eastern Curlew (*Numenius madagascariensis*). Available at: https://spatial.ala.org.au/?q=lsid:urn:lsid:biodiversity.org.au:afd.taxon:21ab21e4-5cd7-4e68-9268-1b6db1a9c3aa [accessed January 2021]
6. Atlas of Living Australia, 2020e. Species records for Ghost Bat (*Macroderma gigas*). Available at: https://spatial.ala.org.au/?q=lsid:urn:lsid:biodiversity.org.au:afd.taxon:63bc796a-5a85-45bc-b4bc-edecc931cc50 [accessed January 2021]
7. Department of Agriculture, Water and Environment (DAWE), 2020a. Species Profile and Threats Database: *Calidris canutus* — Red Knot. Available at: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=855 [accessed January 2021]
8. Department of Agriculture, Water and Environment (DAWE), 2020b. Species Profile and Threats Database: *Calidris ferruginea* — Curlew Sandpiper. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=856 [accessed January 2021]
9. Department of Agriculture, Water and Environment (DAWE), 2020c. Species Profile and Threats Database: *Calidris tenuirostris* — Great Knot. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=862 [accessed January 2021]
10. Department of Agriculture, Water and Environment (DAWE), 2020d. Species Profile and Threats Database: *Numenius madagascariensis*— Eastern Curlew, Far Eastern Curlew. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=847 [accessed January 2021]
11. Department of Agriculture, Water and Environment (DAWE), 2020e. Species Profile and Threats Database: *Macroderma gigas* — Ghost Bat. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=174 [accessed January 2021]
12. Department of Agriculture, Water and Environment (DAWE), 2020f. Species Profile and Threats Database: *Liasis olivaceus barroni — Olive Python (Pilbara subspecies)*. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=66699 [accessed January 2021]
13. Department of Agriculture, Water and Environment (DAWE), 2020g. Species Profile and Threats Database: *Dasyurus hallucatus* — Northern Quoll. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=331 [accessed January 2021]
14. Department of the Environment, Water, Heritage and the Arts (DEWHA), 2010. Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act, Commonwealth of Australia 2010.
15. Department of the Environment, Water, Heritage and the Arts (DEWHA), 2008a. Background document for the threat abatement plan for predation by the European red fox, DEWHA, Canberra.
16. Department of the Environment, Water, Heritage and the Arts (DEWHA), 2008b. Threat abatement plan for predation by the European red fox, DEWHA, Canberra
17. Department of the Environment, Water, Heritage and the Arts (DEWHA), 2008c. Approved Conservation Advice for *Liasis olivaceus barroni* (Olive Python - Pilbara subspecies). Canberra: Department of the Environment, Water, Heritage and the Arts. Available from:

http://www.environment.gov.au/biodiversity/threatened/species/pubs/66699-conservation-advice.pdf [accessed January 2021]

18. Department of the Environment, Water, Heritage and the Arts (DEWHA), 2013. Significant Impact Guidelines 1.1 - Matters of National Environmental Significance, Commonwealth of Australia 2013. Available from: https://www.environment.gov.au/epbc/publications/significant-impact- guidelines-11-matters-national-environmental-significance

19. Department of the Environment (DoE), 2015a. Background document for the Threat abatement plan for predation by feral cats, Commonwealth of Australia 2015

20. Department of the Environment (DoE), 2015b. Draft referral guideline for 14 birds listed as migratory species under the EPBC Act, Commonwealth of Australia 2015.

21. Department of the Environment (DoE), 2015c. Wildlife Conservation Plan for Migratory Shorebirds, Commonwealth of Australia 2015.

22. Department of the Environment (DoE), 2015d. Threat abatement plan for predation by feral cats, Commonwealth of Australia, 2015

23. Department of the Environment (DoE), 2016. EPBC Act referral guideline for the endangered northern quoll *Dasyurus hallucatus*, EPBC Act Policy Statement. Commonwealth of Australia 2016.

24. Department of the Environment and Energy (DoEE), 2017a. EPBC Act Policy Statement 3.21— Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species, Commonwealth of Australia 2017.

25. Department of the Environment and Energy (DoEE), 2017b. Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) (2017)', Commonwealth of Australia, 2017.

26. Department of the Environment and Energy (DoEE), 2017c. Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) (2017) — Background Document', Commonwealth of Australia, 2017.

27. Department of Sustainability, Environment, Water, Populations and Communities (DSEWPC), 2011. Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads, Commonwealth of Australia 2011. Available at: https://www.environment.gov.au/system/files/resources/2dab3eb9-8b44-45e5-b249-651096ce31f4/files/tap-cane-toads.pdf

28. Department of Sustainability, Environment, Water, Populations and Communities (DSEWPC), 2012. Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses. Commonwealth of Australia 2012. Available at: https://www.environment.gov.au/system/files/resources/ff24e078-fbb9-4ebd-855d-db09cb4db1f8/files/five-listed-grasses-tap.pdf [accessed January 2021].

29. Department of Primary Industries and Regional Development 2019. Western Australian Feral Pig Strategy 2020-2025. Available at https://www.agric.wa.gov.au/sites/gateway/files/WA%20Feral%20Pig%20Strategy%202020-2025_1.pdf

30. Franke, C, Studinger, G., Berger, G., Böhling, S., Bruckmann, U., Cohors-Fresenborg, D., Jöhncke, U., 1994. The assessment of bioaccumulation, *Chemosphere*, Volume 29, Issue 7.

31. Hansen, B.D., Fuller, R.A., Watkins, D., Rogers, D.I., Clemens, R.S., Newman, M., Woehler, E.J. and Weller, D.R. (2016) Revision of the East Asian-Australasian Flyway Population Estimates for 37 listed Migratory Shorebird Species. Unpublished report for the Department of the Environment. BirdLife Australia, Melbourne.

32. Heydenrych, B, and Parsons, B., 2018. Pilbara Bioregion Conservation Action Planning Process. Update: Refined Strategies and Actions – September 2017, Prepared for Pilbara Corridors by Greening Australia, Perth.

33. Hill B.M. and Ward S.J. (2010). National Recovery Plan for the Northern Quoll *Dasyurus hallucatus*. Department of Natural Resources, Environment, The Arts and Sport, Darwin.

34. Invasive Animals Cooperative Research Centre (2008). Assessing Invasive Animals in Australia 2008, National Land & Water Resources Audit and Invasive Animals Cooperative Research Centre, Canberra.

35. Perez CR, Moye JK, Cacela D, Dean KM, Pritsos CA., 2007. Low level exposure to crude oil impacts avian flight performance: The Deepwater Horizon oil spill effect on migratory birds. *Ecotoxicol Environ Saf.* 2017 Dec; 146:98-103.

36. Raidal, S.R. & Jaensch, S. M., 2006. Acute poisoning of silver gulls (*Larus novaehollandiae*) following urea fertilizer spillage, *Avian Pathology*, 35:1, 38-41

37. Rowe, N., 2010. Design of Fauna Underpasses. Main Roads Western Australia. Available at: https://www.mainroads.wa.gov.au/technical-commercial/technical-library/road-traffic-engineering/roadside-items/design-of-fauna-underpasses/ [accessed January, 2020]

38. NSW Scientific Committee, 1998. Predation by the European Red Fox Vulpes Vulpes (Linnaeus, 1758) - profile. Available at: https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20015

39. Sharp, T., 2012a. Model code of practice for the humane control of feral cats. Code of Practice. PestSmart website. https://pestsmart.org.au/toolkit-resource/code-of-practice-feral-cats

40. Sharp, T., 2012b. Standard Operating Procedure for the ground shooting of feral cats, Invasive Animals Cooperative Research Centre: Canberra. PestSmart. PestSmart website. https://pestsmart.org.au/toolkit-resource/ground-shooting-of-feral-cats

41. Sharp, T., 2012c. Standard Operating Procedure: Trapping of feral cats using cage traps, Invasive Animals Cooperative Research Centre: Canberra. PestSmart website. https://pestsmart.org.au/toolkit-resource/trapping-of-feral-cats-using-cage-traps

42. Sharp, T., 2012d. Standard Operating Procedure: Trapping of feral cats using padded-jaw traps, Invasive Animals Cooperative Research Centre: Canberra. PestSmart website. https://pestsmart.org.au/toolkit-resource/trapping-of-feral-cats-using-padded-jaw-traps

43. Threatened Species Scientific Committee, 2005. Commonwealth Listing Advice on Northern Quoll (*Dasyurus hallucatus*).

44. Threatened Species Scientific Committee, 2016a. Conservation Advice *Calidris canutus* Red Knot. Canberra: Department of the Environment.

45. Threatened Species Scientific Committee, 2015a. Conservation Advice: *Calidris ferruginea*, Curlew Sandpiper. Canberra: Department of the Environment.

46. Threatened Species Scientific Committee, 2016b. Conservation Advice *Calidris tenuirostriss* Great Knot. Canberra: Department of the Environment.

47. Threatened Species Scientific Committee, 2015b. Conservation Advice *Numenius madagascariensis* Eastern Curlew. Canberra: Department of the Environment.

48. Threatened Species Scientific Committee, 2016c. Conservation Advice *Macroderma gigas* ghost bat. Canberra: Department of the Environment.

49. U.S. Environmental Protection Agency, 2011. Toxicological Review of Urea. Available at: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/toxreviews/1022tr.pdf

50. Webber, B.L., 2020. Increasing knowledge to mitigate cat impacts on biodiversity. The Western Australian Biodiversity Science Institute, Perth, Western Australia.

51. Western Australia Parks Foundation, 2020. Feral cat working group formed. Available at: https://www.ourwaparks.org.au/feral-cat-working-group-formed/

52. Western Australian Agriculture Authority, 2016. Western Australian Biosecurity Strategy 2016-2025. Available at: https://www.agric.wa.gov.au/sites/gateway/files/WA%20Biosecurity%20Strategy%20%28A1756933%29.pdf

53. Worley Astron, 2006. Pluto LNG Development Desktop Fauna Report 2006. Unpublished report for Sinclair Knight Merz.

Attachment 4: Revised Social Impact Assessment.

Perdaman Urea Project

Response to Submissions Appendix Q - Response to Heritage Branch Issue #8 and General Comment

Purpose

The purpose of this Response is to identify and assess the socioeconomic impact of the proposal and recommend management and mitigation measures to address the identified impacts. This is a response to comments from the Department of Agriculture, Water and the Environment (DAWE) on the Perdaman Urea Project Environmental Review Document (ERD) and feedback in relation to the Perdaman's draft Response to Submissions.

The information as follows, augments the material in Section 2.2.1 of the ERD and information considered by the Commonwealth Minister to support the grant for Major Project Status. Perdaman also recognises and commits to expanding this assessment as part of the requirements, as highlighted by the City of Karratha in its submission of the ERD to meet the requirement of the City's adopted Local Planning Policy DP20 which requires preparation of a Social Impact Assessment (SIA) and Social Impact Management Plan (SIMP) for major projects.

Data sources

The following data sources were used to define the socio-economic baseline:

- Data on population and demography, income and employment, and business and industry were sourced from the ABS Census 2016, and Commonwealth, State and local government agencies
- Existing socio-economic policies and strategies in the City of Karratha, including local government policies and strategies:
  - City of Karratha, Local Planning Strategy 02 February 2021. Endorsed by the Western Australian Planning Commission (City of Karratha, 2020)[12]
  - Structure plans:
    - Baynton West Development Plan WAPC ref 808 08 05 004
    - Gap Ridge Industrial Estate Structure Plan SPN 0402M-1
    - Lot 522 & Lot 521 Madigan Road Gap Ridge WAPC ref SPN 0712
    - Lot 4615 Turner Way Structure Plan WAPC ref SPN 2158
    - Mulataga Structure Plan WAPC Ref SPN-2265
    - North West Coastal Highway and Roebourne-Point Samson Road, Roebourne Structure Plan WAPC ref SPN 0175
    - Regals Valley Precinct Development Plan WAPC Ref_ SPN 0403
    - Tambrey Neighbourhood Centre Structure Plan WAPC ref SPN 2039
    - Wickham South Development Plan WAPC ref SPN 0230
    - Baynton West Structure Plan Amendment ref SPN 0865
- Analysis of social infrastructure based on a review of publicly available information, including Council's webpage
- Available mapping and imagery from Google maps and from government agencies.

[12] Note this Local Planning Strategy post-dates the Project ERD and is being used to proactively inform the Project design and management relating to social and economic aspects.

Stakeholder and Community Engagement

Detailed Information regarding Project Stakeholder and Community Engagement is outlined in Section 3 and Appendix I of the ERD. Stakeholder Engagement is ongoing and is expected to continue throughout the Detailed Design, Construction and Operational phases.

In an effort to capture and understand local community interest and relevant concerns for the Project, consultation with key stakeholders has been ongoing since the early stages of the Project. This comprised a combination of targeted presentation and workshops with identified stakeholders, internet and media releases, as well as broader public consultation, including open days and online capacity to lodge queries for consideration in this ERD.

A key focus of the stakeholder consultation program was how best to design, construct and operate the Project so that the project benefits could be realised and residual environmental, heritage and social impacts would be acceptable. The consultation program was designed to obtain input at key decision making stages of the ERD process.

Perdaman will continue to consult with relevant stakeholders to enable all stakeholders consulted to make informed decisions and views about the Project and provide ongoing support through the environmental approval process and implementation of this Proposal.

Existing Socio-Economic Environment

This section provides an overview of the socio-economic characteristics of the Perdaman Project Study Area. The following information was informed by the Australian Census of Housing and Population (ABS) Census 2016 and the City of Karratha: Local Planning Strategy 2020.

Population and demography

The Project is located in the Karratha LGA. It is an area of 15,239.5 km2 within the West Pilbara – Level 3 (SA3). The Karratha LGA consists of six major towns: Dampier, Karratha, Roebourne, Wickham, Point Samson and the historic village of Cossack. There are 27 localities in the Study Area: Mardie, Gnoorea, Maitland, Cooya Pooya, Sherlock, Whim Creek, Balla Balla (0 people), Roebourne, Cossack, Wickham, Point Samson, Mount Anketell, Antonymyre, Cleaverville, Karratha Industrial Estate, Mulataga, Stove Hill, Gap Ridge, Baynton, Nickol, Millars Well, Pegs Creek, Karratha City Centre, Bulgarra, Burrup, Dampier and Dampier Archipelago. Burrup and Dampier Archipelago has no people living there at the timing of the 2016 census. Refer to the Table 1-1 below.

Karratha's housing development continues, with new suburbs being built. Baynton West is currently being developed. A new suburb east of Bulgarra called, Mulataga has received council approval. There is also a current development of a second industrial estate: Gap Ridge which is west of the city.

Table 1-1 Demographic and social characteristics of the Karratha LGA (ABS 2016 Census)

Sub-category	Indicator	Karratha LGA	Western Australia
Population size	Population Total	21,473	2,474,413
	Male	11,943 (55.6 %)	1,238,419 (50%)
	Female	9,533 (44.4 %)	1,235,994 (50%)
Age	Babies and pre-schoolers (0-4)	9.5	6.3
	Primary and secondary schoolers (5-19)	20%	19%
	Tertiary education and independence (20 to 24)	6%	7%
	Young workforce (25 to 34)	21%	15%
	Parents and homebuilders (35 to 54)	33%	28%
	Older workers and pre-retirees (55 to 64)	8%	11%
	Empty nesters and retirees (65 to 74)	2%	8%
	Seniors (75 to 84)	0.4%	4%
	Elderly aged (85 and over)	0.1%	2%

Sub-category	Indicator	Karratha LGA	Western Australia
	Median age of persons	31	36
Average household size		2.8	2.6
Cultural Diversity	Aboriginal and Torres Strait Islander population	13%	3.1%
	Proportion of people who speak a language other than English at home	25.5%	24.8%
	Top three languages other than English spoken in the home	Yindjibarndi, Tagalog, Filipino	-
Dwelling Structures	Separate house	83%	79%
	Semi-detached, row or terrace house, townhouse etc	11%	14%
	Flat or apartment	3.4%	6%
	Other dwelling	2%	1%
Tenure Type	Median mortgage repayment (per monthly)	$2,600	$1,993
	Median rent (per weekly)	$220	$347
	Home owners (outright)	6%	28%
	Home owners (with a mortgage)	14%	40%
	Renters	76%	28%

The median age of people in the Karratha LGA was 31 years. Children aged 0 - 14 years made up 24.7 per cent of the population and people aged 65 years and over made up 2.5 per cent of the population (ABS. 2016). About 34.9% of people were attending an educational institution. Of these, 29.7% were in primary school, 16.0% in secondary school and 8.5% in a tertiary or technical institution.

The most common ancestries in Karratha (C) (Local Government Areas) were Australian 30.5%, English 23.1%, Scottish 5.7%, Irish 5.7% and Australian Aboriginal 2.7%. In Karratha (C) (Local Government Areas), 66.6% of people were born in Australia.

In 2016, the majority of residents of the Study Area lived in separate houses (83 per cent) and 11 per cent lived in semi-detached, terrace house or townhouses. Of the occupied private dwellings, the majority of them consists of four bedrooms or more (42 per cent). The average number of bedrooms per occupied private dwelling was 3.3. The average household size was 2.8 people.

About 6.2 per cent of dwellings in the Study Area were owned outright, 14.5 per cent were owned with a mortgage and 76.3 per cent were rented. In 2016, the Study Area had a much higher rate of rented homes when compared to the State of Western Australia (28 per cent), and this reflects in the low number of house owners in the Study Area. When compared to Western Australia (at 73 per cent), the Study Area had a high percentage of family households (at 77 per cent).

Population growth

The Study Area experienced a negative 1.3 per cent population growth between 2011 and 2016. The 2019 Estimated Residential Population (ERP) is 22,716. This represents an increase from the 2016 ERP of 22,211, or 505 persons.

In 2021, Karratha LGA ERP is 23,535 (City of Karratha, 2020). By 2031, the population of Karratha LGA is forecast to grow by 11 per cent, which is 26,045 people (City of Karratha, 2020). Refer to Table 1-2.

Table 1-2 Population change in Karratha LGA

	2001 (ABS Census, 2001)	2006 (ABS Census, 2006)	2011 (ABS Census, 2011)	2016 (ABS Census, 2016)	2021 (City of Karratha, 2020)	2026 (City of Karratha, 2020)	2031 (City of Karratha, 2020)
People	15,883	16,423	22,900	21,473	23,535	25,000	26,045

Male	55%	54%	60%	56%			
Female	45%	46%	40%	44%			

In addition to the City's population in 2031 an estimate for long term (FIFO) workers also needs to be considered, which is estimated as follows (City of Karratha, 2020):

- Woodside (300)
- Rio Tinto (600 – 650)
- Others (1,000 – 1,500)

Economic profile

Table 1-3 below summarises the economic profile of the Study Area.

Table 1-3 Economic profile of the Karratha LGA (ABS 2016 Census)

Sub-category	Indicator	Karratha LGA	Western Australia
Income	Median total household income ($/weekly)	2,626	1,595
	Median total personal income ($/weekly)	1,350	724
Employment	Worked full-time	69%	57%
	Worked part-time	18%	30%
	Employed, away from work	7%	5%
	Unemployed	6%	8%
	Top three professions	Technicians and Trades Workers - 24% Professionals - 14% Machinery Operators and Drivers - 13%	
	Top three industries of employment	Iron Ore Mining - 40% Oil and Gas Extraction – 4% Other Non-Metallic Mineral Mining and Quarrying – 4%	

In 2016 the median weekly household income in the Study Area was $2,626. This was higher than that of the Western Australia average ($1,595).

About 69 per cent of the Study Area's labour force was employed full time and about 18 per cent were employed part time. The most common occupations in the Study Area include technicians and trades workers (24 per cent), professionals (14 per cent) and machinery operators and drivers (13 per cent). People in the Study Area mainly worked for the iron ore mining, oil and gas extraction and other non-metallic mineral mining and quarrying industry sectors within the LGA.

Aboriginal and/or Torres Strait Islander peoples Profile

Table 1-1 indicates that a core element of the contemporary social setting for the Project is the significant indigenous demographic and its contribution to the current social fabric in the region. In this regard, as indicated in Section 3, Table 3-1 and Appendix I of the ERD, Perdaman has actively engaged with indigenous stakeholders both individually and collectively through a range of representative bodies.

The Murujuga Aboriginal Corporation (MAC) is the principal body representing Traditional Custodians for the Project sites at Murujuga. In keeping with the principles of Free, Prior and Informed Consent, Perdaman has diligently engaged in good faith with meaningful discussion as acknowledged by the MAC CEO in his letter to the Chairman of the EPA included in ERD Appendix J. The Commercial Agreement also noted in the ERD, including also in Appendix J, reflects outcomes of this dialogue and commitment to a mutually successful outcome into the future for both Perdaman, MAC and its stakeholders.

The CEO of MAC has subsequently provided an update letter in January 2020 reaffirming the continuation of this meaningful dialogue.

Through its liaison with MAC, Perdaman developed a sense that in the 15+years since the BMIEA was executed, the aspirations and potential enhanced position for current and future Custodians had not been realized which was manifesting as “sadness” to the MAC constituents.

Perdaman referred back to the liaison discussions where MAC highlighted the recurrence of unfulfilled promises and questioned what made Perdaman different.

Perdaman has reaffirmed to MAC that it was against this existing social setting that Perdaman was hoping to be benchmarked to go forward for a blended “fabric” (using the EPBC guidance terminology) together for a mutually positive future as “good neighbours”.

As an example of Perdaman’s efforts in this regard, it has successfully advocated for remediation of some existing detriment that will occur as part of the implementation of the Approved project. As part of the land assembly process for implementation of the Approved project, to redress the lack of long term secure status for MAC and the Traditional Custodians to the Yatha, NHP surrounded by Site F covering site #9349 and the Fish Thalu (and as noted in recommendations of the IIHS Heritage Survey Report), Perdaman has secured agreement from the State Government for the secure long-term security to these sites sought by the Traditional Custodians and MAC.

More generally, aspects of the Project relating to culture and heritage are described and discussed in ERD Sections 4.9 and 6.6 as well as in the Aboriginal Heritage Management Plan which is now reviewed and revised in the Response to Submissions Appendix U.

As noted previously in Perdaman’s response to submissions, through ongoing meaningful consultation and dialogue, Perdaman has addressed the range of issues identified through MAC’s review of the ERD. Correspondence from MAC’s CEO acknowledging this, is included in the RtS Appendix J.

Potential Social Impacts

The proposal has the potential for both wider regional and local benefits in the medium to longer term throughout the Project life.

Local consultations have revealed a strong desire for long-term sustained population growth in Karratha’s LGA. While currently influenced by the impacts of the resource development industry, it was identified that the fluctuating population at Karratha requires greater management of related impacts. Stakeholders had a general consensus to grow towards a majority residential based workforce, in contrast to the predominantly FIFO labour force.

The demand generated for housing as a response to FIFO requirements has resulted in the vulnerability of housing availability and affordability to sectors of the Karratha community. In order to support regional accommodation planning needs and reduce the impact on the Karratha LGA, greater transparency in regards to communication and housing planning must to be undertaken for the predicated residential footprint of Perdaman developments. In consultation with the City of Karratha and community stakeholders, Perdaman will source fit for purpose facilities to meet its FIFO accommodation requirements.

The Karratha Regional Land Supply Assessment (KRLSA) notes that land identified for residential development within the Karratha urban area has the capacity to support a population of approximately 28,000 (City of Karratha, 2020). The Local Planning Strategy for the City of Karratha (2020) notes the Karratha urban area has approximately 840ha of land for 'residential' purposes with approximately '760ha' of land for 'future residential'. Within Roebourne approximately 180ha of 'residential' land exists, whilst Wickham contains approximately 155ha of 'residential' land with 10ha of 'future residential' land. A relatively smaller amount of land exists in Dampier with approximately 100ha of 'residential' land and 20ha of 'future residential'. Point Samson has the smallest supply, with approximately 23ha of 'residential' land and 27ha of 'future residential' (City of Karratha, 2020).

There will be a real opportunity for the Karratha community to continue to benefit from the project in the long-term, including participation by local businesses in the supply chain and continued opportunities for local training and employment. The Perdaman Urea Project will create in excess of 2,000 direct jobs during the 3-year construction phase. While the majority of the construction work force will be FIFO, opportunity for local hire personnel will be availed of as a priority and a core management team will join the local community as permanent residents. Perdaman is committed to employing and training local indigenous people, and the focus will be predominantly on local hires, with no FIFO during operations. It is anticipated that synergistic and coordinated construction with Woodside’s Scarborough Project will be a game changer for Karratha and the surrounding region. Perdaman estimates that direct payroll payments to employees during construction, commissioning and pre-commissioning will be in excess of AU$84 million. In addition to the permanent workforce, the Project will create indirect employment opportunities in third party services from industries including transport, mining, engineering and human services.

Stakeholders raised a concern that the gap between socioeconomic indicators of Indigenous and non-Indigenous communities within the Karratha LGA will continue to widen. Recognising and in response to this concern, as noted in Section 2.2.1.2 of the ERD, the agreement concluded between Perdaman and MAC, in addition to meeting the contractual obligations of the BMIEA, the Commercial Agreement will set up transformative commercial opportunities for the traditional owner groups with regards to the Project. It also collaboratively supports MAC in its pursuit of World Heritage Listing for Murujuga. The Confidential Commercial Agreement was signed by the MAC Board in November 2019.

The extended time frame and potential population increase as a result of the implementation of a predominantly residential workforce is expected to positively impact community amenity and lifestyle. This will occur as the long-term residential workforce continues to integrate and participate in local groups and organisations to improve community vibrancy and connectedness. However, consultations revealed that challenges exist due to construction workforce rosters, which can play a part in a person's ability to participate in community life.

Attachment 5: Additional Responses and Clarifications for 3rd March 2021 liaison with DAWE

DEPARTMENT OF AGRICULTURE, WATER AND THE ENVIRONMENT

EPBC 2018-8383 - Perdaman Urea Project
Outstanding issues – 3 March 2021

• The Department believes that the matters discussed below are not new issues, as the matters below have been requested on several occasions. • The provision of the information requested below need not extent the timeframe for approval decisions to be made.		**PERDAMAN RESPONSE**
Summary of outstanding issues	**Timeframe**	
Turtle Management plan	Prepared and approved by the Department prior to the commencement of the action.	• A Turtle Management Plan will be provided to the Department prior to the commencement of civil works.
Fire and Rehabilitation Management plan	Additional information must be prepared and approved by the Department prior to commencing the action, either as individual plans or included in the Threatened Species or Fauna management plans.	• Additional information has been provided in the Threatened Species Management Plan.
Marine Debris Management plan	To be included in the Marine Turtle Management Plan.	• A Turtle Management Plan will be provided to the Department prior to the commencement of civil works.
National Heritage Place	Updated AHMP to include detailed mitigation measures and proposed remediation activities prior to the commencement of the action.	• AHMP has been updated accordingly.
Pest Management plan	Reporting Threats to MNES Risk assessment Management activities – further discussion Monitoring activities Details discussed as below. PMP must be prepared and approved by the Department prior to the commencement of the action.	• PMP has been revised accordingly.
Threatened Species Management plan	Reporting Threats Risk assessment Performance targets Monitoring activities Details discussed as below. TSMP must be prepared and approved by the Department prior to the commencement of the action.	• TSMP has been revised accordingly.
Weed Management plan	Reporting Threats to Matters of National Environmental Significance (MNES) Potential impacts	• WMP has been revised accordingly.
	Risk assessment Environmental management activities, controls and performance targets Maps Details discussed as below. WMP must be prepared and approved by the Department prior to the commencement of the action.	• WMP has been revised accordingly.

AHMP	Threats to NHL Potential impacts Reporting Performance targets Environmental monitoring Listed values of the National Heritage placeRemediation Details as discussed below. The AHMP must be prepared and approved by the Department prior to the commencement of the action.	• AHMP has been revised accordingly.
Air Quality Management plan	Threats - The management plan should acknowledge the potential impacts to the NHP from changing air quality.	• AQMP has been revised to address this concern.
Offset Management plan	Details as discussed below. OMP must be prepared and approved by the Department priorto the commencement of the action.	• Offset Report has been revised accordingly.
Construction Environmental Management plan (CEMP)	The CEMP must be submitted for viewing to DAWE prior to the commencement of the action.	• Noted.
Operational Environmental Management Plant (OEMP)	The Department requires to review and approval of this plan prior to the commencementof the action.	• It is intended that the Project Environmental Management Plan(PEMP), as a living document will be reviewed and revised to reflect operational requirement. As mitigation and avoidance measures may evolve as a result of detailed design and then through construction and commissioning, these potential ramifications for the PEMP cannot be forecast and incorporated at this stage of the Project development cycle. • If review and revision is required, approval of the revised planwill be sought with the approved plans being applicable and implemented pending such approval.
Subject	**Outstanding issue**	
All MNES	As previously discussed, noting some design aspects for the project are yet to be finalised it is yet to be clarified the exact extent and location of all impacts e.g. clearing.In the absence of further detail being provided the Department will undertake it's assessment of the action in accordance with the precautionary principle i.e. it will take into account the highest possible impact to MNES likely to occur, based on the information which is currently available.	• All management plans have been revised according to the Departments review comments. Impacts to MNES are nowmore clearly defined. • As mitigation and avoidance measures may evolve as a result ofdetailed design and then through construction and commissioning, these potential ramifications (if they eventuate)for the EMPs cannot be forecast and incorporated at this stageof the Project development cycle. If review and revision is required, approval of the revised plan will be sought with the approved plans being applicable and implemented pending such approval.
Listed threatened species and communities (section 18 & 18A)and Listed migratory species and communities (section 20 & 20A)		
Management Plans – on going requests to prepare specific management plans, prior to the approval of the assessment.	**Turtle management plan** – A Turtle Management plan must be prepared and approvedby the Department prior to the commencement of the action. **Fire management** and **rehabilitation management** – specific plans have not been prepared. If it is not intended to prepare individual plans, consideration as to how landscape wildfire activity and proposed rehabilitation will be managed should be included in other relevant management plans (such as the threatened species or fauna management plans). This additional information must be prepared and approved by the Department prior to the commencement of the action.	• See comment above

Commonwealth marine area (sections 23 & section 24A)		
Marine Turtles	Turtle Management plan. The Department has requested that a specific Marine Turtle Management plan be prepared by a species expert in order to more effectively mitigatepotential impacts to marine turtles.	• See comment above
Marine Debris	Management of waste and the potential impact to marine turtles must be incorporatedinto the Marine Turtle Management Plan.	• See comment above
Social impact Assessment	A Social Impact Assessment has been submitted. A commercial agreement has been concluded between Perdaman and MAC. The Department is committed to ongoing engagement with the community, however, is currently satisfied with the information provided on the social impact of the action.	• Noted.
	MAC will be able to maintain access to the Aboriginal Heritage sites within NHP. A written agreement between MAC and Perdaman must be sited before the commencement of theaction.	• Noted.
National Heritage Place (section 15B & section 15C)		
Considerations	The Department will undertake its assessment with the following understandings:	
	1. The proposed conveyor corridor will traverse the NHP area in this vicinity for approximately 300m but will not directly impact any known rock art or artefactscatters.	• Noted and agreed. • The AHMP has been reviewed and revised to further demonstrate this lack of impact and to embed additional mitigation and protective measures to ensure this is the case.
	2. A site-specific management plan will be developed for the NHL sites (as per discussion on 6/2/2020 via teleconference). This plan should clearly demonstratehow impacts to the listed values will be avoided. This plan must be approved by the Department prior to the commencement of the action.	• The NHL site ID 9439 is now to be excluded from the Project lease tobe granted by Development WA. • The NHP area and the site ID 9439 will be physically separated fromproject activities by the lease boundary fence. ○ This fence will provide a primary protective measure for thesite • This area is surrounded by Site F which has been historically disturbedfor industrial activity similar to that proposed by the Project. • The recognition and determination in 2007 that NHP listing values areintact notwithstanding this past proximal industrial activity is testament that industrial activity on Site F has and can occur concurrently with maintaining NHP listing values. • This is similar to the nearby Yatha, which while not part of the NHP, has acknowledged continuing cultural heritage relevant notwithstanding its proximity to past industrial use and disturbance ofSite F.
Additional requirements	More detailed mitigation measures should be included in the Aboriginal Heritage Management Plan (AHMP). Relevant measures would include Aboriginal monitors beingonsite during the drill and blast stages of the project and having the authority to stop work if they consider environmental or heritage sites are at risk (see Table 1 with suggestions at the end of this document).	• AHMP has been revised accordingly.

	The AHMP notes that incidents are required to be reported, however, there are no remediation activities proposed. Further details should be provided on how Perdamanintends to “make good” on any accidental damage which occurs.	• AHMP has always recognised and committed to compliance with the WA Aboriginal Heritage Act (AHA). Provisions of thatAct require notification of the Registrar under that Act who isthe statutory authority to determine what “make good” measures must be implemented. • Further, Perdaman considers the protective measure incorporated in the AHMP and its commitment to work closelywith MAC mean that the likely hood of impacts to heritage sites, including accidental damage, is low. • Pursuant to the requirements of the AHA, it would be presumptuous to commit in the AHMP to specific “make good” measures that may not reflect those determined by the Registrar in consultation with the Traditional Custodians, on a case by case basis if such requirement arises.

APPENDIX

R

DEPARTMENT OF BIODIVERSITY, CONSERVATION AND ATTRACTIONS SUBMISSION

Comment	Response
Dr Tom Hatton Chairman Environmental Protection Authority Locked Bag 10 JOONDALUP WA 6919 Dear Dr Hatton PERDAMAN UREA PROJECT - ENVIRONMENTAL REVIEW DOCUMENT - ASSESSMENT NO. 2184 I refer to Mr Troy Sinclair's letter dated 25 March 2020 inviting comment on the Perdaman Urea Project proposal as documented in the Environmental Review Document (ERD). The Department of Biodiversity, Conservation and Attractions (DBCA) provides the following advice on matters relevant to the department's Conservation and Land Management Act 1984 related responsibilities.	Email: murray.baker@dbca.wa.gov.au
The primary matter of interest to DBCA in relation to this proposal is the potential for environmental impact(s) (e.g. air quality, noise and visual impact) on the values of Murujuga National Park (Murujuga). Murujuga is owned in freehold by the Murujuga Aboriginal Corporation (MAC), leased to the State Government, and jointly managed by representatives	The Proponent notes, acknowledges and respects this factual status of ownership and management of Murujuga. It also recognises and respects that through this ownership and management status, continuing interaction between MAC, DBCA and the Proponent is essential as part of a “good neighbour” approach

Comment	Response
of MAC and DBCA for the purpose of conserving the very high natural, cultural and heritage values of this important area.	
Murujuga is an area of national and international cultural significance, containing one of the world's largest and most dense and diverse collections of petroglyphs (rock art) and forms part of the Dampier Archipelago National Heritage listed area. MAC is currently working in collaboration with the State Government to nominate the Murujuga Cultural Landscape (including Murujuga National Park) for World Heritage Listing, with the objective of ensuring that its unique cultural, spiritual and archaeological values are internationally recognised at the highest level. Robust measures to ensure the management of activities within the adjacent Burrup Strategic Industrial Area is carried out in a manner that suitably avoids or limits impacts on the values of Murujuga will be important to the success of the World Heritage nomination and the long-term conservation of the national park and its values. On this basis, the following advice is framed within an objective of ensuring that the assessment of this proposal results in best practice avoidance and minimisation of impacts on Murujuga and ensures that key values and attractions are suitably protected to allow their ongoing beneficial use/s.	The Proponent recognises and respects the aspiration to achieve World Heritage Listing for Murujuga. The Proponent suggests that this can be viewed as the application of a contemporary societal process to implement the Traditional lore responsibilities for custodianship and care for country. While the BMIEA provides that the State provide support to MAC in relation to World Heritage Listing, there is no obligation for Future Proponents to contribute to this aspiration. Through its arrangements with MAC it has committed to supporting MAC in the pursuit of this aspiration and will support MAC technically to respond and address issues raised in relation to potential detrimental impacts of its proposal as well as any other matters raised that may adversely impact the application.
The ERD does not appear to fully consider or address potential impact(s) of the proposed development on Murujuga and its unique values. A number of sites within Murujuga that are either under development or proposed for development as recreational / tourism sites may be affected by potential impacts of the proposal such as noise, vibration, dust, odour and / or other emissions and visual amenity may also be impacted. As an example, Ngajarli (formerly known	The Proponent notes the comments relating to sites within Murujuga that are either under or proposed for development as recreational/tourist sites. In relation to the potential impact aspects raised, the Proponent notes • Noise – see appendix F and recognises the DWER Noise Branch positive review of the robustness of the evidence included in Appendix F • Vibration – vibration is likely to be related to construction and will be addressed in detail in the Part V works approval application. Also see

Comment	Response
as 'Deep Gorge') is currently under redevelopment, planned for opening to tourism in August 2020, and is located approximately one kilometre from the development footprint / envelope. The ERD does not fully address all potential impacts of the proposed development on visitor use of this site, including any odour impacts on nearby recreation and tourism sites or the implications of vibration associated with proposed drilling, blasting and civil works during construction for visitor safety.	the Drill and Blast Near Rock Art Management Protocol in Appendix 9 of the Project Environmental Management Plan in Appendix K. • Dust – see Appendix D on Air Quality assessment and also see the Drill and Air Quality Management Protocol in Appendix 11 of the Project Environmental Management Plan in Appendix K. • Odour - see Appendix D on Air Quality assessment and discussion on ERD P151. Also see specific discussion below. • Other emissions – the air quality modelling in Appendix D has included assessment of potential impacts at a range of potential sensitive receptor within and proximal to Murujuga. Discussion in relation to these sensitive receptors is included in ERD Section 4.8, specifically Section 4.8.3.4. • Visual amenity - as acknowledged in DBCA comments below, the proposed development is located within a well-established strategic industrial estate. Therefore, it is appropriate that potential visual amenity impact be viewed in that existing context. The Proponent also notes and considers a relevant visual amenity assessment benchmark is the Australian Government's policy position on achieving concurrent industrial prosperity in the BSIA alongside the enhanced conservation afforded through the NHL, as expressed on the Government's NHP website for Murujuga – see quote below and link http://www.environment.gov.au/heritage/places/national/dampier-archipelago In relation to the issue of odour being raised, the Proponent notes that an odour detection threshold for ammonia has been documented in different studies as low as 0.04 ppm and as high as 57 ppm. The American Association of Railroads says most people can smell ammonia between 0.04 to 20 ppm. OSHA indicates the odour detection threshold is between 5 and 50 ppm. (see https://www.osha.gov/sites/default/files/2019-03/fs5-howsmelly.pdf) Against that frame of reference, all The Proponent ground level ammonia concentrations (GLC) are expressed in ppb than ppm. The latter is three orders of magnitude higher than the ppb.

Comment	Response
	The predicted regional GLCs for ammonia are 3 orders of magnitude below these generally recognised thresholds for odour sensitivity. Even at the highest GLC is an order of magnitude higher that the threshold. See Table 4-35 of the ERD.
DBCA does not have access to suitable expertise to directly review or provide expert advice on modelling and impact assessment of emissions from the proposed facility. Noting the capacity of the Department of Water and Environmental Regulation (DWER) to review, assess and recommend appropriate environmental conditions in relation to emissions in consultation with representatives of MAC and DBCA, it is respectfully requested that impacts associated with the construction and operation stages of the proposal, particularly noise, vibration, odour and visual amenity, are carefully and comprehensively considered. It is recommended that where possible, approval conditions establish clear impact limits to ensure impacts of the development on the amenity and safety of visitors to sites such as Ngajarli within Murujuga and on cultural activities within the park are acceptably avoided or minimised. There should also be a requirement for early notification of key stakeholders in advance of planned activities that may impact on access, visitation and use of important sites and attractions within Murujuga, and consultation with these stakeholders during contingency planning for potential incident responses.	Comments noted. Future liaison with DBCA and MAC in relation to interests and concerns at Murujuga is envisaged as part of a “good neighbour” approach to the future implementation of the approved project. Prior to construction, the Proponent will seek construction related approvals including a works approval pursuant to Part V of the EP Act. The DBCA and MAC are key stakeholders that will be consulted as part of seeking these constructions related approvals.
DBCA notes from the ERD that air pollutants associated with the proposal have the potential to impact on the heritage values of Murujuga (i.e. the integrity of the petroglyphs), and recognises that the Environmental Protection Authority and DWER have the role and capacity to review, assess and recommend and apply appropriate	Comment noted and the Proponent reaffirms its commitment to be a contributing participant to the WA Government’s MRAS.

Comment	Response
condition(s) in relation to air quality to avoid or otherwise address these potential impacts.	
In relation to the potential impact of the proposed development on visual amenity at Murujuga, DBCA notes that the ERD includes a landscape and visual impact assessment which incorporates the possible use of several proposed design controls to mitigate potential impacts. While acknowledging that the proposed development is located within a well-established strategic industrial estate, DBCA is supportive of the proponent implementing appropriate and feasible impact avoidance and mitigation measures to minimise the potential impacts on visual amenity for the owners and visitors to Murujuga.	The Proponent notes the supportive approach expressed by DBCA. Future liaison with DBCA and MAC in relation to interests and concerns at Murujuga is envisaged as part of a “good neighbour” approach to the future implementation of the approved project.
Should you wish to discuss any aspect of this advice, please contact Mr Murray Baker, DBCA's Environmental Officer on phone 9219 9504 or email at murray.baker@dbca.wa.gov.au. Yours sincerely DIRECTOR GENERAL 22 June 2020	

APPENDIX

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DEPARTMENT OF WATER AND ENVIRONMENTAL REGULATION – ADDITIONAL AIR QUALITY SERVICE BRANCH SUBMISSION

Additional DWER (AQSB) comments on the ERD (Air Quality) 17/07/2020	Proponent Response
1) Meteorological performance - Wind speed and wind direction are critical parameters for the transport of air pollutants in the atmosphere. Jacobs (2020) utilised the latest version of TAPM (Version 4) which includes a substantial number of new improvements to the modelled physics and incorporated available literature in model configuration. Despite these upgrades, the performance of wind speed estimates in latest version of TAPM in the Murujuga region is poorer than the older version of TAPM used in 1999 (See Table 3-2 (Jacobs, 2020) below; note that the ideal IOA value is 1 = perfect	The Proponent considers that the meteorological performance is appropriately considered and relevantly discussed in Section 5 and relevant comparisons included as Appendix B & C of the Air Quality Report forming ERD Appendix D. The Proponent re-affirms that as stated in ERD Appendix D Section 1.1, Jacobs was not engaged by either Woodside or the Proponent for the relevant modelling until 2019, not in 2018. Initial modelling was conducted for the Proponent in Q3 2019, which was included in the Draft ERD, then reviewed by AQSB that then provided comments on 13 January 2020. The Proponent commissioned updated modelling to reflect the relevant AQSB comments and to reflect updated design with the application of further BAT technologies. The Proponent reaffirms that as shown in the ERD Appendix D, the selection and use of 2014 as the comparison year is based on the reported correlation of model predictions compared to actual observed ambient data being mindful of the sources contributing to the monitored ambient airshed. The difference in the model performance tests statistics (Table 3-2) is acknowledged. The limitations of any model to predict absolute values is well documented. Taking this into account, the fundamental consideration is whether the model is capable of demonstrating the relative change in modelled ground level concentrations attributable to the Project. The comparisons of modelling with monitoring demonstrated the effect of low modelled wind speeds is very small (probably undetectable) for the photochemical modelling with TAPM-GRS, but still may be slightly conservative (possibly detectable) for the simpler mass dispersion modelling with TAPM. The validation shows that irrespective of the AQSB concerns about windspeed, the model does reliably predict likely GLCs, and is demonstrating the relative changes in predicted ground level concentrations attributable to the inclusion of emissions from the Project.

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match; 0 = no match). The model performance for temperature and relative humidity are normally good in the various TAPM versions. **Table 3-2 TAPM results for Karratha; model performance tests - wind speed** *Correlation is poor between wind speed data for 2012;	

Dataset	PCC	MSE	A	kill V	kill R
CSIRO, 1999 met.	0.65	.79	79	79	77
Jacobs, 2012 met.	0.01*	.44	41	54	47
Jacobs, 2014 met.	0.65	.71	61	64	16
Jacobs, 2018 met.	0.69	.89	61	54	17

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however, the basic statistics are similar to 2014. It is common practice to adopt the latest version of a particular model; however, it is critical to check the model performance before running any scenarios, especially given there are number of key industrial stakeholders using the same model on the Murujuga. As mentioned in the previous AQB technical advice on the draft ERD, underestimating wind speed would be expected to produce higher ground level concentrations of pollutants (GLCs). However, the model validation shows that the modelled GLCs are	

Additional DWER (AQSB) comments on the ERD (Air Quality) 17/07/2020	Proponent Response
comparable to the observation which suggests that the emissions may be underestimated, leading to uncertainty in modelled results. As mentioned by Jacobs (2020), there are ways to improve the model performance, (i.e. use an alternative initial guess field and sensitivity of surface roughness), which, ideally, should have been carried out much earlier in the project timeline. During the early consultations with Jacobs in 2018 and 2019, the AQB was informed that the model had already been run. The same concern was raised by the AQB in previous technical advice for	

Additional DWER (AQSB) comments on the ERD (Air Quality) 17/07/2020	Proponent Response
Woodside and Perdaman however, the same model configuration was still used. The good model performance in Perth and Kwinana does not justify its application for Murujuga as the model performance is context / location specific.	
2) Ammonia deposition and particulate formation - Ammonia (NH_3) plays an important role in many aspects of our environment including participation in the nutrient and nitrogen cycles, and the formation of particulate matter with an aerodynamic diameter less than or equal to 2.5 or 10 µm ($PM_{2.5}$ or PM_{10}). Also, the deposition of nitrogen and ammonia is important to the marine environment.	Secondary atmospheric production of NH_3 is expected to be a small effect relative to the assessed emissions. In support of this risk weighted evaluation, if the hypothesised effect is material, as is being implied, current measured background ambient NH_3 levels would be materially higher than the relatively low, measured regional background levels. The same argument applies for deposited ammonia. More broadly, the Proponent reaffirms that a number of technical, and practical, aspects were considered when selecting the modelling software and configuration for use in this assessment. This included ensuring that the model was suitable for representing the parameters identified as being relevant to the Project's current air quality assessment. The proponent reaffirms that the modelling was undertaken using the CSIRO meteorological, air dispersion and photochemical model, 'TAPM-GRS', (The Air Pollution Model–Generic Reaction Set). As indicated in ERD Appendix D, this model was selected for reasons of reliability and efficiency. As a model, TAPM is designed to solve the fundamental fluid dynamics and scalar transport equations to predict meteorology and concentrations for a range of reactive and non-reactive pollutants. The model predicts the flows important to local-scale air pollution, such as sea breezes and terrain-induced flows, against a background of synoptic-scale meteorological analyses. It includes a plume-rise module, wet and dry deposition effects, and gas- and aqueous-phase chemical reactions based on an extended version of the Generic Reaction Set (GRS) of equations for smog formation (Azzi et al. 1992). A risk-based approach was applied to identify the key substances associated with the Project. Emissions estimates were compared to a consistent set of air quality standards in the context of regional air quality. As indicated in ERD Appendix D, the risk assessment determined that the key substances related to emissions from the Project were: PM_{10}, $PM_{2.5}$, NH_3 and

Additional DWER (AQSB) comments on the ERD (Air Quality) 17/07/2020	Proponent Response
Production and use of fertilizer and cattle feedlots (consultant's report) are the current major sources of NH3 emission on Murujuga. NH3 is also one of the major emissions from the proposed development. Due to the limitation of the oversimplified chemistry scheme within TAPM, the current configuration models NH3 as a tracer for gas and deposition. The modelled results for NH3 alone can be considered plausible. However, the lack of information on fine particulate formation and photochemical reactions with other pollutants leads to	NO_2, (and O_3 by association with NO_2), with lower risks associated with emissions of SO_2, methanol, and the VOCs – formaldehyde was identified as being representative of the highest risk for VOCs. Notably, TAPM is one of the models that was used historically for air quality assessments in the region. TAPM was also the model in use for the Woodside North West Shelf Extension project that was proceeding through the impact assessment process concurrently, and had been acknowledge for this use by the EPA. Being consistent in model selection and aligning the Perdaman assessment to the same modelling software as used by the existing projects, facilitates the consideration of the potential cumulative impact – a critical and essential requirement for the assessment, as set out in the Environmental Scoping Document (ESD). The consistency in model selection also supports the assessment of the relative changes in emissions and therefore the potential change in impact across the Murujuga airshed. Due to the inherent differences across model software, the use of any model other than TAPM would have delivered a modelled baseline that is different to that already established by existing assessments. The introduction of this fundamental difference is not useful to the assessment. The selection of a model, other than TAPM, would therefore not deliver against the requirements set out in the ESD to assess the incremental cumulative impact "…considering other industry". A model, by nature is a simplified representation of a natural system. While there are inherent limitations in any model, retaining the consistency in model choice provides a consistent platform against which potential impact and risk can be comparably assessed, and importantly the relative change in air quality attributable to the project's emissions. Notably the EPA agreed to the choice of TAPM as an appropriate model for this assessment. The capability of the model was considered appropriate for the specific air quality considerations relevant for this assessment. While the limitations in TAPM-GRS are acknowledged, the emerging issue of interest associated with the potential formation of $PM_{2.5}$ due to the presence of ammonia, as noted in ERD Appendix D, was not identified in the air quality screening exercise as a potential risk. Similarly, the comparison of these parameters to the available assessment criteria (human health impacts selected as the most sensitive receptor) indicates that the modelled project impact (project only emissions) to be notably lower than the assessment criteria. Modelled values this low (relative to assessment criteria) do not indicate the need for a more sophisticated model to be adopted. A more sophisticated model in this case refers to a model that would incorporate less conservative emission assumptions than what has been adopted (i.e.the Perdaman emission estimates are conservative and are likely overestimates of what the actual emissions will be) – this would be justified in the event that the Perdaman only emissions were to approach or contribute to levels higher than the assessment criteria. It is understood that DWER is pursuing the development of a cumulative model for the Murujuga airshed with enhanced capability to simulate atmospheric chemical transformations. It is understood that DWER's model, once developed and

Additional DWER (AQSB) comments on the ERD (Air Quality) 17/07/2020	Proponent Response
significant uncertainty in the modelled results, especially for particulate formation and its deposition. In addition, the marine environment is sensitive to deposition of NH3 and particulate matter, including urea dust. There is a lack of sensitive receptor information available to determine the potential change in deposition for the marine environment.	released, will likely provide a defined baseline against which current and future projects will be consistently compared and assessed. It is also understood that this model will include a component designed to account for the potential for fine particulate formation (as a result of secondary and photochemical reactions with other pollutants emitted on the Burrup). It is reasonable to expect that the model developed by DWER will become the model of choice, and a requirement, for future project assessments. The availability of a single, agreed model for the Murujuga airshed is supported. The comment that "There is a lack of sensitive receptor information available to determine the potential change in deposition for the marine environment." is noted. It is acknowledged that no single specific marine location/s have been specified for comparison to assessment criteria. Instead as noted in the ERD, the presentation of the modelled results, for each modelled species, as contours / isopleths of concentrations facilitates the interpretation of results across the modelled domain (both land and marine based). As a gridded data set with multiple data points in the marine environment, the contour plots are a reliable means of conveying the potential GLC for each species (the controlling impact factors) based on the data over the entire aerial extent of the marine environment rather than selection of a single GLC at an arbitrary point sensitive receptor for comparative purposes. Contour plots for each species and averaging period (relevant) enable comparisons between the modelled results and assessment criteria, and as discussed in the ERD provide an indication of the dispersion pattern for each air pollutant over the course of a year. The effects of secondary dispersion of the material deposited from emissions in the airshed is further discussed below. As indicated in ERD Appendix D, as the TAPM model does not provide outputs for the deposition of NH_3, the estimate of (dry) deposition of NH_3 was calculated from the model results for annual average airborne concentrations of NH_3 combined with an estimate of the fall velocity for the molecule (0.60 cm/s); e.g., see Shen et al. (2016). The model results for deposition were illustrated as contour plots in a similar way to the standard presentation of results for (airborne) GLCs. Results are provided to enable comparisons with monitoring results such as those from Gillett (2008), Gillett et al. (2012), a CSIRO summary of results obtained by Gillett (2014); and the Woodside (2019) summary of results. **<u>Nutrient Increase | Marine Impact</u>** This comment and previous comments from DWER with respect to deposition from emissions in the airshed to the marine environment have been broad generalised statements about the sensitivity of the marine environment. The Proponent reaffirms that as indicated in ERD Section 4.3.5.2, there is little likelihood of any significant change to current marine water quality resulting from the Project emissions. In this regard as noted in the ERD, it should be noted that the main emissions where the project will be a principal contributor to the regional airshed are urea and ammonia.

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	In amplification of this ERD conclusion, the Proponent notes that both these chemicals are naturally occurring in the marine environment and are significantly contributed by marine mammal species such as cetaceans and turtles, which are both triggers for the Commonwealth Waters matter of national environmental significance for the Project, and fish. These existing contributions are recognised to be important components of the marine ecosystem and are contributed through excretion either as faeces, urine or through excretion through the skin or gills from fish. Thus the materiality or risk weighting assigned for consideration of the Precautionary Principle must be viewed against this natural context. It is important to note that the fugitive emission of urea dust to the environment is essentially a loss of commercial product/revenue, and as such a number of emission reduction and containment measures have been incorporated into the plant design. Principally, Perdaman will be producing the urea product in the form of a granule and not a prill. The urea granules are engineered to resist breakage and are sized (in the granulation plant) to eliminate fines (i.e dust). The material handling and transfer of prills, prior to shipping, is undertaken in enclosed structures, and all conveyors are covered to protect the product and avoid spillage. A conservative approach was adopted in the emissions estimation of urea dust from quantifiable point sources. A $PM_{2.5}/PM_{10}$ ratio of 30% for the urea dust particles was assumed. This is consistent with the GHD (2009) assessment for the proposed Collie Urea Project. As discussed in ERD Section 4.3.5.2, in relation to the potential for marine impacts, the potential impact will largely be influenced by the amount of urea released into the marine environment, as estimated by modelling as outlined in ERD Appendix D. The contour plots (ERD Appendix D, Figures 6-50 and 6-51) indicated that the median deposition of urea at PM_{10} across the entire grid (representing both terrestrial and marine areas) is comparatively low at 0.01kg/ha/year and, at $PM_{2.5}$ only 0.002kg/ha/year. Being more distant from source, the median that is representative of the marine subset (of the full gridded dataset represented by the above medians) is likely to be even lower. The urea granules and dust are expected to dilute and dissipate relatively quickly as a result of the soluble characteristics of the urea product and thus not result in a material nutrient effect. Dissipation will also be aided by the large tidal range experienced in the area leading to tidal flushing (see Attachment 3: Cardno, 2020). The analysis provided by the Coastal Engineer indicated that the high tidal range in King Bay combined with the strong tidal currents in Mermaid Sound are conducive of a high renewal of the water body in the bay. The high-level flushing analysis indicates “good” flushing characteristics with rapid renewal of the majority of the water body within 1.5 days, regardless of the tidal cycle. As a result, degradation of water quality within the bay is not expected to occur.

Additional DWER (AQSB) comments on the ERD (Air Quality) 17/07/2020	Proponent Response
	To put the marine deposition of urea in the marine environment into perspective to assign an appropriate risk weighting it is worth considering • ERD Appendix D Figure 6-51 shows that the maximum rate of urea deposition in the marine environment is approximately ≤0.5kg/ha/year ($1.4x10^{-3}$ kg/ha/day) urea and typically more likely to be closer to the grid median level of 0.01kg/ha/year as indicated above from the airshed (determined from contours shown in ERD Appendix D Figure 6-51) As noted above, urea is a natural component of urine that is released into the marine ecosystem on a daily basis by marine life including whales. The following provides broad contextual evidence to generally demonstrate the level of this natural contribution to the marine environment. • The Canadian Journal of Zoology[HH], notes a urine production rate from various species of whale of between 974 and 627 L/day, while these are Canadian species, they may be considered indicative for the purpose of general background. • Birukawa et all (2005)[II] notes in Zoological Science that studies show cetaceans urine contains 2-4 fold the level of urea compared to cattle; and • Bristow et all (1992)[JJ] reports that analysis of sample of urine from cattle ranged 6.8 to 21.6 g N $litre^{-1}$, of which an average of 69% was present as urea and 2.8% as ammonia, On the basis of the above, it can be shown that on a daily basis a single whale may be expected to deposit on average approximately 25kg of urea from urination (plus an unquantified additional quantity in faeces) into sensitive marine environments without detriment. Thus the risk weighting attributable to the deposition of ≤0.5kg/ha/year would not appear to

[HH] See: https://www.nrcresearchpress.com/doi/abs/10.1139/z03-041#.XzowgugzaUl

[II] See: https://www.researchgate.net/publication/7413674_Plasma_and_Urine_Levels_of_Electrolytes_Urea_and_Steroid_Hormones_Involved_in_Osmoregulation_of_Cetaceans

[JJ] See: https://onlinelibrary.wiley.com/doi/epdf/10.1002/jsfa.2740590316

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be material, especially given the demonstrated tidal dispersion (as discussed above and in ERD Section 4.3.5.2, p47) that would be at play.

In support of the above rudimentary analysis based on the common natural contributions of nitrogenous species in the marine environment, the Proponent also implemented an analysis by experienced coastal engineers of the probable expected project related concentrations in the marine environment based on the modelled deposition rates.

To conservatively assess the contribution of various species by deposition to the marine environment, Cardno has carried out the following high-level analysis:

- Taken the annual deposition rates over marine water from air emissions modelling and converted to an average deposition per metre, per day, for the water body segments assessed for flushing characteristics;
- Assumed that the constituent dissolves fully in the top 50cm layer of the water column only and remains stratified as such (conservative given mixing forces – waves, wind, tide); and
- Taken a conservative flushing time for each segment to convert daily deposition to average concentration per litre.

Concentrations were compared to ANZECC/ARMCANZ (2000) guideline values for marine water quality where available. The concentrations (conservatively) arrived at are generally at an order of magnitude that they would make a noticeable concentration to background levels (noting that background levels are unknown for the site). None are above guideline values. NH3, which would probably be the main contaminant of concern, would contribute to background concentrations several orders of magnitude below guideline values. Better understanding of background concentrations of the various constituents, offshore of the site, would be required to better understand if the contributions from air emissions could have any significance with respect to sensitive environmental receptors. This preliminary assessment suggests that the contributions are likely to be insignificant.

Flushing model area	Area (m2)	Flushing time (days)	Mean Concentrations

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			NO_2 Baseline (mg/l)	NO_2 FPNO (mg/l)	NO_2 BPNO (mg/l)	SO_2 Baseline (mg/l)	SO_2 FPNO (mg/l)	SO_2 BPNO (mg/l)	Urea $PM_{2.5}$ (ug/l)	Urea PM_{10} (ug/l)	NH_3 PNO (mg/l)
Segment 1	345500	1.5	0.003	0.003	0.003	0.002	0.002	0.002	0.018	1.430	0.005
Segment 2	692000	1.5	0.002	0.002	0.002	0.003	0.003	0.003	0.002	0.089	0.001
Segment 3	308000	1.5	0.002	0.003	0.002	0.002	0.002	0.002	0.010	0.989	0.003
Segment 4	803000	3.5	0.003	0.004	0.004	0.008	0.008	0.008	0.012	1.825	0.004
Segment 5 (Larger Coastal Area)	1.39E+10	10	0.002	0.003	0.002	0.019	0.019	0.019	0.004	0.189	0.002
ANZECC/ARMCANZ (2000) Marine Water (80%)(WA Southwest[KK])			0.005	0.005	0.005	-	-	-	-	-	-

[KK] Note, No applicable ANZECC/ARMCANZ(2000) Marine Water reference standard is available for WA Northwest/Pilbara, while not directly applicable the WA Southwest is used as an indicative proxy.

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ANZECC/ARMCANZ (2000) Marine Water (80%)	-	-	-	-	-	-	-	-	2.064
ANZECC/ARMCANZ (2000) Marine Water (90%)	-	-	-	-	-	-	-	-	1.457
ANZECC/ARMCANZ (2000) Marine Water (95%)	-	-	-	-	-	-	-	-	1.105

In terms of the monitoring, the Proponent proposes that as part of the emissions verification program described in the ERD AQMP (see ERD Appendix K) the veracity of the depositional modelling in terrestrial settings will be reviewed through targeted ambient monitoring. If this monitoring validates the robustness of the model as a reliable predictive mechanism, it will be reasonable to extrapolate that the predicted deposition in the marine environment is also a reliable predictive mechanism.

On the basis of the above comparison against the standards and the work included in Attachment 3 herewith, which reaffirms the significant and quick secondary dispersion, no monitoring is proposed or justified as necessary in the marine setting.

The Proponent has not considered the contribution to the marine environment due to deposition overland and rainfall runoff – this would be a relatively complex exercise and the risk is not considered on first principles to be material.

In summary of and reaffirming the above

Identified Issue: Potential Marine Environment impacts/changes from deposition of nitrogenous species, including the specific particulate species – urea, disperse in the regional airshed attributable to Perdaman's operation.

In order to address uncertainties related to the above, through the ERD and the above, Perdaman has provided a range of information and data to enhance the understanding and contribute to the risk weighted assessment of certainty/uncertainty as is a requirement for the application of the Precautionary Principle on the highlighted issue as follows:

1. High or enhanced degree of certainty identified/presented by Perdaman:
    - There is high certainty that the principal potential impact pathway being identified is through

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	○ primary dispersion of nitrogenous species as emissions contributing to the regional ambient airshed, which may then ○ deposit wholly or in part on the surface in the marine environment, where they may ○ dissolve and be subject to secondary dispersion by marine processes, and so ○ impact (change) the total nitrogen and specific species (principally urea) concentrations in the marine receiving environment. • Air Quality modelling enhances the degree of certainty to quantify the volume and concentration of nitrogenous species currently dispersed to the ambient airshed and thus currently available to contribute to the regional deposition of dispersed nitrogenous species to the regional marine environment ie the existing impacting pathway background for comparison purposes. • Air Quality modelling enhances the degree of certainty to quantify the volume and concentration of nitrogenous species dispersed to the ambient airshed by Perdaman and thus available to contribute to the regional deposition of dispersed nitrogenous species to the regional marine environment. • Air Quality modelling enhances the degree of certainty that identifies that the change, attributable to Perdaman's operation, to the regional ambient airshed concentrations and volumes of nitrogenous species compared to the existing regional ambient regional setting is low. • Air Quality modelling enhances the degree of certainty that identifies that the change to the regional ambient airshed concentrations and volumes of nitrogenous species anticipated as a component of the future regional ambient airshed is also low. • Air Quality modelling enhances the degree of certainty that identifies that future concentrations of nitrogenous species dispersed to, and available to potentially deposit from, the regional ambient airshed over the marine environment attributable to Perdaman are low and not materially different to the existing in the same setting. • Preliminary modelling enhances the degree of certainty that the potential Perdaman contribution to the regional marine water column, assuming ○ all material shown to be dispersed over the regional marine environment dissolves into the upper portion of the regional water column and ○ is then subject to secondary dispersion by usual marine dispersion processes,

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	is unlikely to materially impact (change) existing background water quality. • Existing water quality sampling in the region by Water Corporation provides data related to dispersion of species already in solution at comparatively high concentrations and with the primary dispersion in the marine environment from a point source rather that a regionally diffuse source at low concentrations. Recognition of these differences enhances the certainty that direct comparison is not wholly relevant. • There is a high degree of certainty that water quality reference standards directly applicable to diffuse airshed dispersion with resulting deposition into a marine environment in this region are not available for reference. 2. Specifically in relation to urea where Perdaman may potentially be the principal contributor to the regional ambient airshed, where deposition of this diffuse dispersed material occurs in a marine setting • Urea is contributed to the marine environment as a natural process through excretion from elements in the biosphere. • The decision that the Project triggers EPBC matters of national environmental significance for Commonwealth Marine Area is largely based on the accepted certainty that a number of marine species, including cetacean species are part of the marine biosphere in the region. • Quoted scientific research supports a high degree of certainty on the potential levels of urea contribution to the marine environment attributable to natural sources using whales derived data as a proxy contributor. • Using the Air Quality modelling potential concentrations data there is a high degree of certainty that the daily deposition of urea attributable to Perdaman's operations will not result in a material change when compared to natural contributions of urea in the marine environment. Perdaman therefore considers that the ERD and this RtS material demonstrates that: • The risk of changed impacts as a result of the changes to the regional ambient airshed total nitrogen loading attributable to Perdaman's operation, is unlikely to be material. • The risk of changed impacts in the marine environment as a consequence deposition of the changes to the regional ambient airshed total nitrogen loading, then secondary dispersion by marine processes potentially attributable to Perdaman's operation is therefore also unlikely to be material. • Specifically in relation to urea where Perdaman may potentially be the principal contributor to the regional ambient airshed, where deposition of this diffuse dispersed material occurs in a marine setting, there is a low risk of material

Additional DWER (AQSB) comments on the ERD (Air Quality) 17/07/2020	Proponent Response
	impacts as the change to the contribution from natural sources in the marine environment principally from excretion is also not likely to be material. • The lack of directly applicable water quality reference standards in the region does not change the materiality of the potential impact risks which, as the impact source pathway is shown by the air quality modelling not to change materially from the existing regional setting. **Project contribution to regional airshed ammonia levels.** The Proponent can confirm that while cattle feedlots can be a source of ambient NH_3, peer review has now identified that there are no cattle feedlots in the project's model domain. The modelling undertaken indicates that the Project will be a prominent source of ammonia and urea emissions (in terms of the tonnage emitted) in the Murujuga airshed. In terms of relativity, the Proponent reaffirms that the Project annual NH_3 emissions total 400tpa. By comparison, Yara's reported NPI emissions of NH_3 in 2018-2019 totalled 320tpa ie at a level broadly comparable to the Proponent's anticipated annual emission rate. The regional cumulative ammonia deposition from these two principal sources is shown in ERD Appendix D, Figure 6-20. The modelling also indicates that the Project's emissions are estimated, as ground level concentrations, to be below the relevant assessment criteria (human health impact). Review of Yara's 2018-2019 EPBC Approval 2008/4546 compliance monitoring for ammonia shows that measured changes compared to baseline vary depending on location: • The three monitoring locations were all found to be higher than the background levels however only one location was considered to have a change considered statistically significant (Burrup Road) • Burrup Road NH_3 higher than background and statistically significant. • Dry deposition increased at all three monitoring locations. • NH_3 considered to be the largest contributing source at two locations. It is also noted that the averaging period of the Yara monitoring regime (14 days) does not lend itself to be directly compared to DWERs draft ambient guideline value for NH_3 (1-hour) (adopted as the assessment criteria).

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	The Project's potential emission footprint has been notably reduced through an iterative process of engineering design and potential impact review. Subsequently the project design has incorporated a number of notable features indicating that appropriate leading practice has been pursued, including acid scrubbing designed to reduce NH_3 emitted. In addition, the modelling has taken a relatively conservative approach to the estimation of particulate deposition from emissions. This includes: • The particulate urea deposition due to emissions from the Project granulator vents was determined with the assumption that urea was the only particulate species from those vents (ie. estimating 100% of PM_{10} emissions). While emitted urea dust may be expected to decompose in the atmosphere when emitted, as a worst-case scenario, no degradation was assumed. • As indicated in Table 6-6 of ERD Appendix D, the background $PM_{2.5}$ was also calculated using a single estimate of the $PM_{2.5}/PM_{10}$ ratio, assumed to be 25% for all hours. This is considered to be a conservative estimate based on current knowledge). In relation to potential impacts of ammonia on aspects where there are not recognised assessment criteria, such as integrity of rock art, the proponent notes: • The often quoted 2005 report by MacLeod relied upon to support this supposition, including to the Senate inquiry, only discussed soluble nitrates found on the rock surfaces and made no comment on ammonia or ammonium ions; and • that measurements on the Yara monitoring sites have demonstrated the benign impact of ammonia on the monitored rock at Ngajarli (Deep Gorge). The Proponent also notes that recent research by Chinese scientists have confirmed the presence of the similar type of rock varnish in the Gobi Desert which has been produced abiotically i.e. through a suite of oxidation and reduction reactions catalysed by the presence of titanium dioxide. Thus, potential impacts of microbial activity as suggested, in submissions to the Senate Committee Murujuga Rock Art Enquiry, to be critical for rock varnish formation and preservation, may not be as significant as hitherto inferred.
3) The question of whether a model is fit for a specific purpose does not always reduce down to a simple	The Proponent reaffirms that a number of technical, and practical, aspects were considered when selecting the modelling software and configuration for use in this assessment. This included ensuring that the model was suitable for representing the parameters identified as being relevant to the Project's current air quality assessment.

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answer but a qualified discussion on the strengths and limitations of a model in a specific context. In this specific case there have been technical questions raised regarding some of the model results. It would be appropriate for the proponent to address specific concerns regarding the wind speeds and reflect on the possibility that there were compensating errors (e.g. apparent underestimation of emissions) in the validation case that may require further consideration. Nevertheless, TAPM is a commonly used PC based air dispersion model used for air quality assessment. It will be extremely difficult to improve the	The Proponent conducted re-modelling and revised the ERD air quality modelling report and ERD to address relevant matters raised by AQSB and reflect emissions reductions through additional BAT driven design adaptations incorporated as a result of MAC feedback. The Proponent re-affirms that, as indicated to the EPA in the discussions in February 2020, in the context of air quality impact assessment, TAPM-GRS cannot be described as a "very simplified" set of reactions, in fact it is more complex than most, if not all, other models used for regulatory purposes in Australia, such as AERMOD and CALPUFF. The gas-phase photochemistry is based on a semi-empirical mechanism, the Generic Reaction Set (GRS), originally developed by Azzi et al. (1992), with the hydrogen peroxide (H_2O_2) modification of Venkatram et al. (1997), and includes gas- and aqueous-phase reactions for SO_2 and particles. There are 10 chemical reactions for 13 species (Hurley, 2008); they are: (1) smog reactivity (Rsmog), representing hydrocarbons (2) radical pool (RP) (3) hydrogen peroxide (H_2O_2) (4) nitric oxide (NO) (5) nitrogen dioxide (NO_2) (6) ozone (O_3) (7) sulfur dioxide (SO_2) (8) stable non-gaseous organic carbon (SNGOC) (9) stable gaseous nitrogen products (SGN) (10) stable non-gaseous nitrogen products (SNGN) (11) stable non-gaseous sulfur products (SNGS) (12) Airborne Particulate Matter (APM)

Additional DWER (AQSB) comments on the ERD (Air Quality) 17/07/2020	Proponent Response
most recent version TAPM model performance for the Murujuga without consulting with the CSIRO and potentially requiring novel configurations or maybe modifying the source code. It is understood that these changes are difficult to make at this point of the project timeline and may require significant assistance from the CSIRO. This illustrates one of the major limitations of the current model used in most applications on the Murujuga that is, since the current model is not open source, the options for input are very limited and require a specialist modeller to optimise the model. In	(13) Fine Particulate Matter (FPM) including secondary particulate concentrations consisting of (SNGOC), (SNGN), and (SNGS). Descriptions of TAPM and TAPM-GRS including extensive quality testing by CSIRO atmospheric scientists are provided in Section 5 of Jacobs (2020), and will not be discussed further here. A well-qualified, academic research group in the UK tested a more basic (7-reaction) version of the GRS by comparing it with a comprehensive photochemical model, the Master Chemical Mechanism (MCM), for London. MCM was used as a benchmark to test GRS and another model, Common Representative Intermediates (CRI v2R5). The MCM (version 3.2) model treats the degradation of methane and 142 non-methane Volatile Organic Compounds (VOCs) including effects of photolysis and oxidation, containing 5,734 chemical species and 16,940 gas-phase reactions, so is a very comprehensive ('near explicit') photochemical model (Malkin et al., 2016). Malkin et al. (2016) found that when using equivalent constraints placed on the models, GRS predicted lower O_3 concentrations than MCM, but only on the days when the observed O_3 was most elevated, typified by warm, stagnant conditions. In London, these high O_3 concentrations are a lot higher than observed on Burrup Peninsula. If only O_3 less than 150 ppb was considered, (a typical high O_3 concentration for Burrup Peninsula would be 50 ppb) , the ratio GRS[O_3] : MCM[O_3] was calculated to be 0.96 (R2 = 0.7); i.e., this is a very good result for the GRS, demonstrating that under conditions of low O_3, GRS has the ability to reproduce the O_3 predicted by the more explicit MCM scheme (Malkin et al., 2016). It is emphasised, Malkin et al. (2016) tested a 7-reaction version of GRS, whereas TAPM-GRS v.4 uses 10 reactions. TAPM-GRS therefore includes more complex chemistry than the version tested by Malkin et al. (2016). Also, Malkin et al. (2016) were very clear about the computational advantages of using GRS. Computer run times were reduced by factors of 1,000–60,000 over MCM. While MCM is highly complex model with long run times, this performance comparison has obvious implications for modelling to support impact assessment for industrial proposals, which are required by regulators to simulate at least 8,760 hourly, 3-dimensional, meteorological datasets. Malkin et al. (2016) found GRS to be very efficient delivering good results when O_3 concentrations were low. This is supported by our experience with TAPM-GRS for Burrup Peninsula, which compared well with measurements of O_3 and NO_2. On the basis of the information presented above, which focusses on model performance, TAPM-GRS was determined to be 'fit for purpose' for the Burrup Peninsula. It is understood that DWER is pursuing the development of a cumulative model for the Murujuga airshed. It is reasonable to expect that the model developed by DWER will become the model of choice, and a requirement, for future project

Additional DWER (AQSB) comments on the ERD (Air Quality) 17/07/2020	Proponent Response
addition, TAPM is no longer being actively maintained. All these factors have added to the overall uncertainty in the modelling. It is recommended that the modelled results should be considered as broadly indicative only. When considering the model results, careful interpretation should be made and should focus on relative changes between model scenarios rather than the absolute concentration. This aspect is important to determine appropriate best practice measures for addressing all the pollutants emitted rather than disregarding pollutants for which there are no impact criteria.	assessments. The availability of a single, agreed model for the Murujuga airshed is supported for demonstrating the relative change in predicted ground level concentrations and potential change in impact. References: M. Azzi, G.M. Johnson, and M. Cope, An introduction to the generic reaction set photochemical smog mechanism, Proceedings of the 11th International Clean Air and Environment Conference, Brisbane, Clean Air Society of Australia & New Zealand, 1992. P. Hurley, 2008a, TAPM V4. Part 1: Technical Description, CSIRO Marine and Atmospheric Research, Paper No.25. Available from: https://publications.csiro.au/rpr/pub?pid=procite:0cff4149-4feb-4b86-abcb-c707168ecb0b. Jacobs, Perdaman Urea Project, Cardno (WA) Pty Ltd., Air Quality Impact Assessment, Final | Revision 7, 16 March 2020. **ERD Appendix D** T. L. Malkin, D. E. Heard, C. Hood, J. Stocker, D. Carruthers, I. MacKenzie, R. Doherty, M. Vieno, J. Lee, J. Kleffmann, S. Laufs and L. K. Whalley, 2016, Assessing chemistry schemes and constraints in air quality models used to predict ozone in London against the detailed Master Chemical Mechanism, Royal Society of Chemistry, Faraday Discussions, https://doi.org/10.1039/C5FD00218D. A. Venkatram, P. Karamchandani, P. Prasad, C. Sloane, P. Saxena, R. Goldstein. The development of a model to examine source-receptor relationships for visibility on the Colorado Plateau, Journal of the Air and Waste Management Association, 47, 286-301, 1997.

Additional DWER (AQSB) comments on the ERD (Air Quality) 17/07/2020	Proponent Response
Relative changes in emissions, such as reactive nitrogen species, are often taken into consideration during decision-making and approvals processes when comparing scenarios such as choice of emissions controls, configuration of expansion infrastructure or operational conditions. These are fundamental aspects of determining best practice implementation for proposals. It must be emphasised that a more robust modelling approach is preferred to assess the potential impacts posed to Murujuga, not only with respect to health impacts, but also other key	

Additional DWER (AQSB) comments on the ERD (Air Quality) 17/07/2020	Proponent Response
pathways for environmental harm, (i.e. reactive nitrogen deposition). It is recommended the proponent should review their modelling once the more robust EPA Murujuga airshed modelling project is completed and data are made available in September 2020	

Attachment 3: Cardno - PERDAMAN UREA PROJECT - KING BAY WATER QUALITY

Our Ref: CW1055600:CS
Contact: Cory Smith

17 July 2020

Cardno
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West Perth WA 6005

Attention: Marino Evangelisti

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Dear Marino ,

PERDAMAN UREA PROJECT - KING BAY WATER QUALITY

This letter provides a high level review of coastal processes affecting the flushing characteristics and associated water quality at King Bay, located in Dampier Western Australia. It was found that the large tidal range can be relied upon to efficiently flush the upstream areas of the bay. In addition to tidal flushing, the presence of strong currents within Mermaid Sound hinder the accumulation of pollutants and the deterioration of water quality at the entrance to the bay.

Coastal processes

Circulation of water within semi enclosed water bodies such as basins and harbours is generally the result of natural coastal processes such as the local tidal range, wave climate, meteorological conditions, and water density differences. Tides in the Dampier region are typically semi-diurnal with a large tidal range of approximately 5.1m (City of Karratha, 2016) .The King Bay bed level generally lies between -1m CD to +3m CD and is subsequently dry for a large portion of the tidal cycle (refer Figure 1).

The site is afforded protection from offshore swell to the west by the Islands of Dampier Archipelago and to the south by mainland Australia. The ambient wave climate at King Bay is predominantly comprised of local wind generated seas arriving from the south-west to north-west, with significant wave heights in the order of 0 to 0.5m (Port and Harbour Consultants, 1999). As a result of the generally calm ambient sea-state, it is unlikely that waves act as a dominant mechanism in the flushing characteristics of King Bay. Furthermore, due to the basin being dry for a large portion of the tidal cycle, the effects of wind on the flushing characteristics at King Bay are limited. This is primarily due to both, a reduction in the surface area of the water body, in which drag forces from the wind is exerted, as well as a reduction in wind levels at the surface ground surface due to retardation from bottom friction.

Tidal currents within the waters of the Burrup Peninsula are locally influenced by surrounding islands and channels that form the Dampier Archipelago. Currents within the Mermaid Sound can be in the order of 0.5m/s during spring tides (Pilbara Ports Authority, 2020). Currents of this magnitude are likely to renew the water body within the proximity of the King Bay entrance on a regular basis. It is also worth noting that the entrance to King Bay is a major thoroughfare for deep-draught vessels, which is likely to assist in the vertical mixing of the water column.

As such, it can be assumed that the dominant flushing mechanism at King Bay is the tide, with wind, waves and density effects considered a second order. During periods where the basin is not dry, the depth modulation and flooding process would generate significant levels of vertical turbulent mixing, suggesting that the water column is generally homogenous. As such, stratification is not likely to be an important aspect for water quality within the basin and simple empirical methods such as the tidal prism ratio are likely to provide an indication of the general flushing efficiency of the bay (Honghai Li, 2010).

Flushing analysis

High level empirical analysis of the flushing efficiency of King Bay was undertaken for the two typical tidal regimes (neap and spring tide). The analysis is based on a simple tidal prism method, calculated as the ratio of tidal volume to the total volume of the basin. For a semidiurnal tide, guidance from ASCE, 2012 suggests a tidal prism ratio less than 0.25 indicates poor flushing and a tidal prism ratio above 0.35 indicates good flushing. This is consistent with recommendations from USEPA, 1985, which suggests that a complete water exchange of a basin in 4 days is "good" an exchange of water in 10 days is "fair," and an exchange is "poor" if a longer time is required.

Calculated tidal prism ratios and flushing times for King Bay are provided in **Table 1**. The calculations consider the variation in ratio of water depth to tidal range along the length of the bay. Subsequently, potential reductions in the influence of the tide on the flushing characteristics of the bay are observed. To investigate the influence of the size of the control volume (CV) on the flushing efficiency, the bay was broken down into 4 segments (Refer **Figure 2**).

The results suggest that the natural flushing behaviour within the majority of the King Bay Basin is generally very efficient, with a cumulative flushing time of 3.4 days during the neap cycle and 1.5 days during the spring cycle. This indicates that the water body within the basin is expected to turn over at a sufficient rate to prevent significant loss in water quality.

Table 1-1 Flushing efficiency analysis, where CV1 is the most upstream and shallow control volume and CV4 encompasses the entire bay which extends into deeper water at the entrance of the basin.

Control Volume	Local Volumes (Neap Cycle)		Local Volumes (Spring Cycle)		Tidal Prism Ratio (Neap Cycle / Spring Cycle)	Tidal Prism Ratio Flushing Class	Flushing Time (Neap Cycle/ Spring Cycle) (Days)	Flushing Time Class
	Intertidal (m^3)	High Tide (m^3)	Intertidal (m^3)	High Tide (m^3)				
CV1	39,125	42,128	245,090	245,090	0.93 / 1.00	Good	1.1 / 1.0	Good
CV2	406,601	443,716	1,341,480	1,341,480	0.92 / 1.00	Good	1.1 / 1.0	Good
CV3	669,587	861,694	2,085,185	2,134,294	0.78 / 0.98	Good	1.3 / 1.0	Good
CV4	1,389,127	4,702,647	4,719,365	6,942,632	0.30 / 0.68	Fair	3.4 / 1.5	Good

In summary, the high tidal range in King Bay combined with the strong tidal currents in the Mermaid Sound are conducive of a high renewal of the water body in the bay. The high-level flushing analysis indicates "good" flushing characteristics with rapid renewal of the majority of water body within less than 1.5 days, regardless of the tidal cycle. As a result, degradation of water quality within the bay is not expected to occur.

Yours sincerely,

Cory Smith
Coastal Engineer
for Cardno
Direct Line: +61 8 9273 3806
Email: cory.smith@cardno.com.au

cc: Frederic Saint-Cast; Daniel Strickland; Peter Snepp, Daniel Hunter

K:\Projects\CW1055600_Perdaman_Chemicals_and_Fertilisers_Permits_and_approvals\5_Technical\Water and Environment\Reports\Internal Letter - King Bay Flushing\CW1055600_KingBayFlushing_RevB.docx

References

City of Karratha (2016), Hearson Cove – Foreshore Management Plan.

Port and Harbour Consultants, Marmaid Marine Australia Limited (1999), (Honghai Li, 2010). Dampier Marine Service Facility Environmental Assessment. Volume 2 - Hydrodynamic and Sediment Transport Analysis

American Society of Civil Engineers (ASCE) (2012), Planning and Design Guidelines for Small Craft Harbors.

U.S. Environmental Protection Agency (USEPA) (1985), Coastal Marinas Assessment Handbook.

Pilbara Ports Authority (2020), Port of Dampier Handbook.

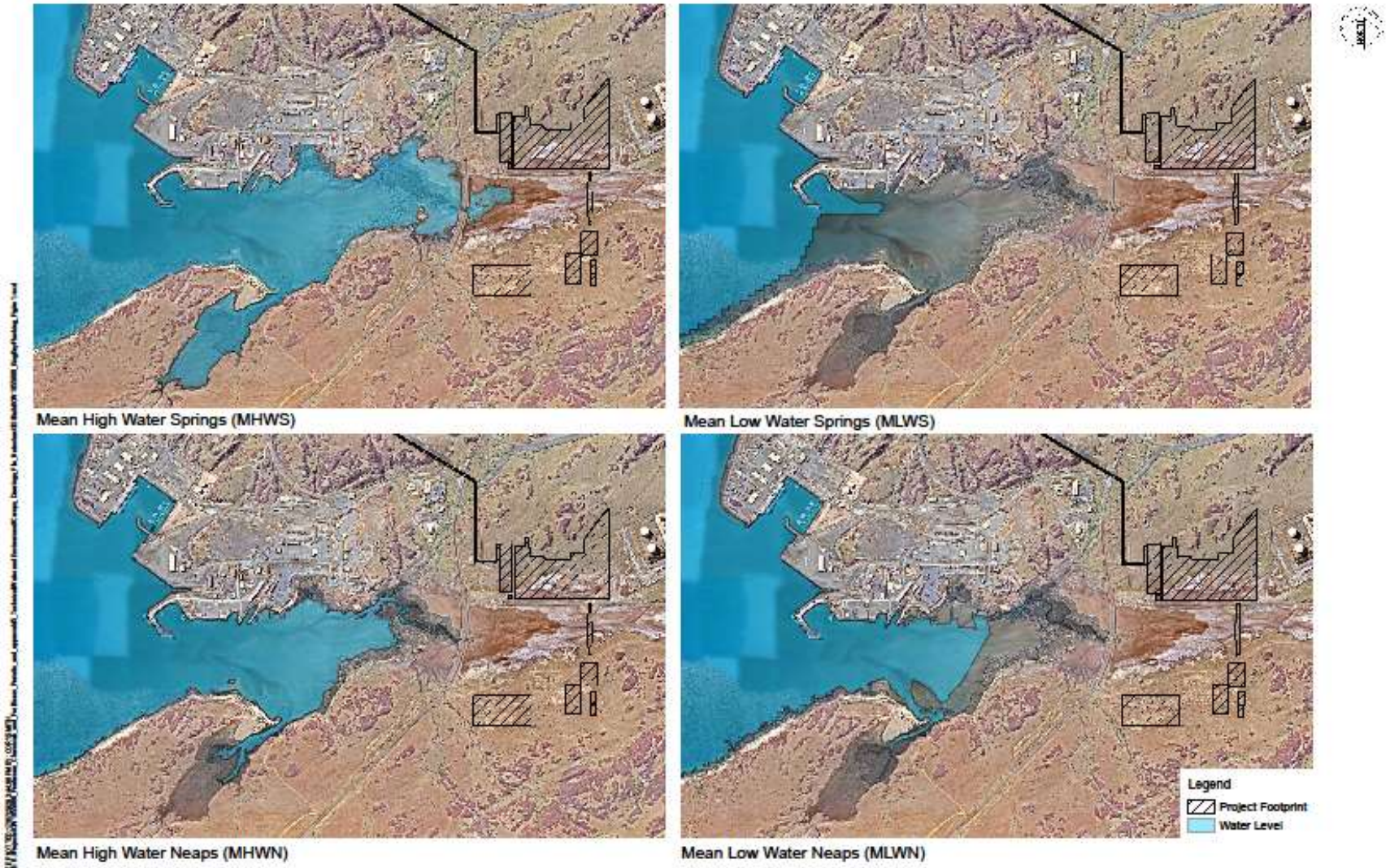

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FIGURE 1 - WATER LEVEL EXTENT AT VARYING TIDAL REGIMES

PERDAMAN UREA PROJECT
SECTION 43A
FIGURE 1
CW1055600_KINGBAYFLUSHING_FIGIRE 1

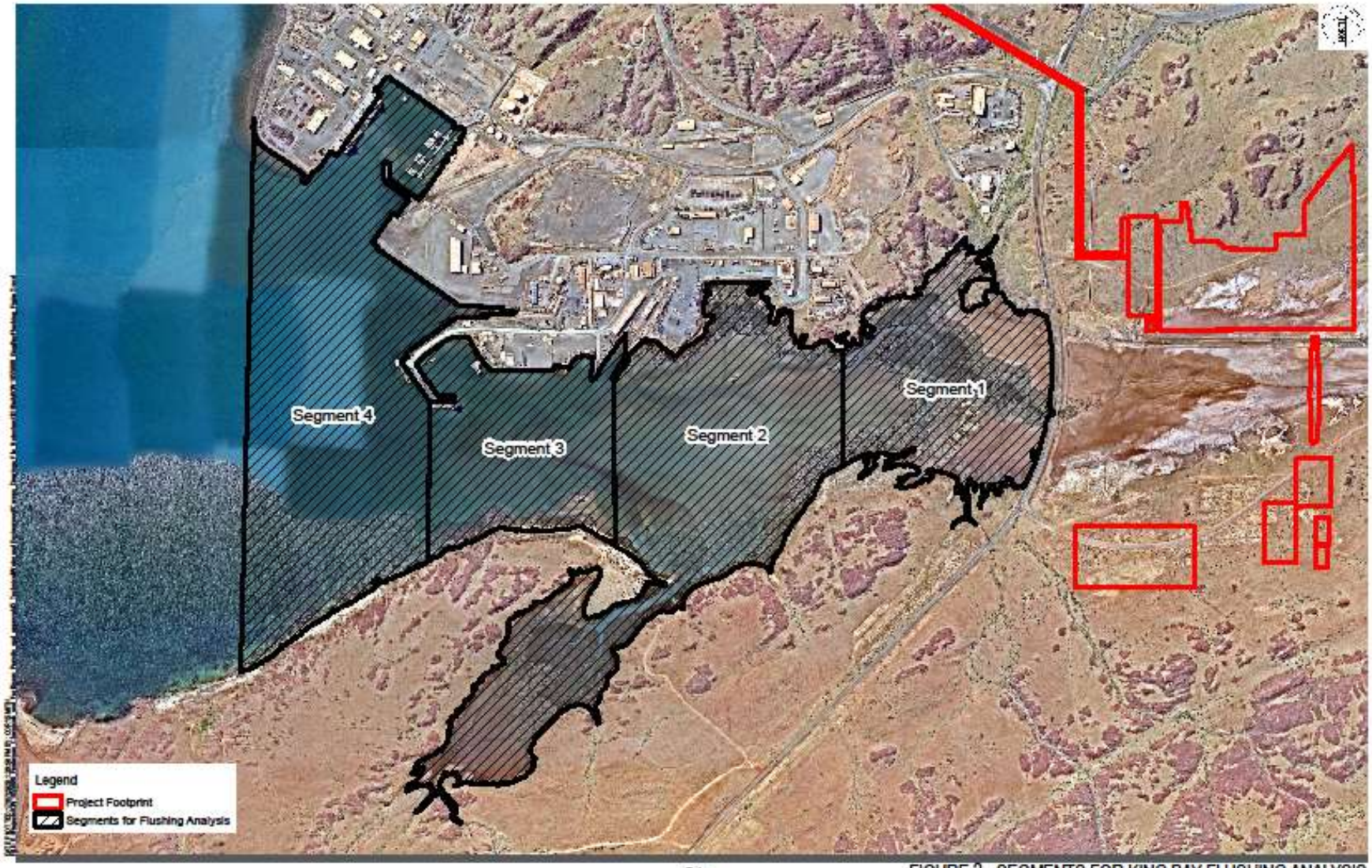

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FIGURE 2 - SEGMENTS FOR KING BAY FLUSHING ANALYSIS

PERDAMAN UREA PROJECT
SECTION 43A
FIGURE 2
CW1055600_KINGBAYFLUSHING_FIGIRE 2

APPENDIX

T

ERD ADDENDUM
TABLES 4-35, 4-36, 4-37, Appendix J, Figure 2 & Table ES2

Addendum to tables

Addendum to: ERD Table 4-35 Modelled concentrations of NO2, SO2, NH3 and O3 (1-hour averages) showing incremental increase from the project and cumulative (Sourced from ERD Appendix D Table E-1, E-2, E-3, E-4, E-5, E-6 and E-7)

Pollutant	Average Period	Scenario	Grid Maximum	AQMS Dampier	AQMS Karratha	Ngajarli	Hearson Cove	MNP-CN	MNP-SE	King Bay	Standing Stones	MLKC
NO_2 (ppb)	1-hour	Baseline	42.6	24.8	24.9	36.6	33.4	24.4	30.0	33.6	30.5	19.0
		% of criteria	*36%*	*21%*	*21%*	*31%*	*28%*	*20%*	*25%*	*28%*	*25%*	*16%*
		BPNO	43.1	24.8	25.6	37.0	33.7	25.7	31.6	34.1	31.5	20.6
		% of criteria	*36%*	*21%*	*21%*	*31%*	*28%*	*21%*	*26%*	*28%*	*26%*	*17%*
		BPUC	42.9	24.8	25.4	36.9	33.7	25.4	31.2	34.2	31.1	19.8
		% of criteria	*36%*	*21%*	*21%*	*31%*	*28%*	*21%*	*26%*	*29%*	*26%*	*17%*
		FPNO	43.9	25.8	28.4	37.7	35.4	30.2	32.9	36.0	33.9	25.5
		% of criteria	*37%*	*22%*	*24%*	*31%*	*30%*	*25%*	*27%*	*30%*	*28%*	*21%*
O_3 (ppb)		Baseline	61.8	55.4	58.2	55.0	56.1	59.0	57.4	59.2	60.3	59
		% of criteria	*62%*	*55%*	*58%*	*55%*	*56%*	*59%*	*57%*	*59%*	*60%*	*59%*
		BPNO	62.0	55.4	58.6	55.3	56.3	59.1	57.3	58.0	60.4	59.2
		% of criteria	*62%*	*55%*	*59%*	*55%*	*56%*	*59%*	*57%*	*58%*	*60%*	*59%*
		BPUC	61.9	55.4	58.4	55.1	56.1	59.2	57.3	58.1	60.3	59.2
		% of criteria	*62%*	*55%*	*58%*	*55%*	*56%*	*59%*	*57%*	*58%*	*60%*	*59%*
		FPNO	63	56.5	61.2	56.1	57.7	59.3	57.8	58.1	61.3	58.7
		% of criteria	*63%*	*57%*	*61%*	*56%*	*58%*	*59%*	*58%*	*58%*	*61%*	*59%*
SO_2 (ppb)		Baseline	18.2	13.2	3.6	9.2	9.5	7.3	8.7	9.3	10.9	9.0
		% of criteria	*9%*	*7%*	*2%*	*5%*	*5%*	*4%*	*4%*	*5%*	*5%*	*5%*

Pollutant	Average Period	Scenario	Grid Maximum	AQMS Dampier	AQMS Karratha	Ngajarli	Hearson Cove	MNP-CN	MNP-SE	King Bay	Standing Stones	MLKC
		BPNO	18.2	12.9	3.6	9.2	9.6	7.4	8.4	10.5	10.9	10.0
		% of criteria	*9%*	*6%*	*2%*	*5%*	*5%*	*4%*	*4%*	*5%*	*5%*	*5%*
		BPUC	18.2	12.9	3.6	9.2	9.6	7.4	8.4	10.5	10.9	10.0
		% of criteria	*9%*	*6%*	*2%*	*5%*	*5%*	*4%*	*4%*	*5%*	*5%*	*5%*
		FPNO	18.1	12.9	3.6	9.2	9.6	7.4	8.4	10.6	10.9	10.0
		% of criteria	*9%*	*6%*	*2%*	*5%*	*5%*	*4%*	*4%*	*5%*	*5%*	*5%*
NH_3 [LL] (µg/m³)		**Baseline[MM]**	0.4	0.4	0.4	0.7	0.2	0.8	0.3	2.0	0.9	1.1
		% of criteria[NN]	*0.1%*	*0.2%*	*0.3%*	*0.3%*	*0.3%*	*0.3%*	*0.3%*	*0.0%*	*0.4%*	*0.3%*
		BPNO	77.3	17.4	9.1	34.2	35.2	10.7	31.8	36.2	37.4	25.7
		% of criteria	*23%*	*5%*	*3%*	*10%*	*11%*	*3%*	*10%*	*11%*	*11%*	*8%*
		BPUC	76.2	16.6	9.1	28.9	28.0	12.3	22.9	34.5	35.3	27.1
		% of criteria	*23%*	*5%*	*3%*	*9%*	*8%*	*4%*	*7%*	*10%*	*11%*	*8%[OO]*
		FPNO	77.3	17.4	9.1	34.2	35.2	10.7	31.8	36.2	37.4	25.7
		% of criteria	*23%*	*5%*	*3%*	*10%*	*11%*	*3%*	*10%*	*11%*	*11%*	*8%*

[LL] Reported units in ERD Table 4-35 as ppb. Correct units are µg/m³

[MM] Note Baseline NH_3 levels across the grid are all small and unlikely to be detectable in usual ambient monitoring.

[NN] Percentage of criteria calculation corrected from 5% to 8%. Note that corrected units are µg/m³ and not ppb. Corrected percentages are lower than those reported originally in ERD Table 4-35

[OO] Percentage of criteria calculation corrected (note percentages are lower than originally reported in ERD). Note that corrected units are µg/m³ and not ppb

Addendum to: ERD Table 4-36 Modelled concentrations of SO2, PM10 and PM2.5 (24-hour averages) showing incremental increase from the project and cumulative (Sourced from ERD Appendix D Table E1, E2, E3, E4, E5, E6 and E7)

Pollutant	Average Period	Scenario	Grid Maximum	AQMS Dampier	AQMS Karratha	Ngajarli	Hearson Cove	MNP-CN	MNP-SE	King Bay	Standing Stones	MLKC
SO_2 (ppb)	24-hour	**Baseline**	7.0	4.5	1.7	4.0	3.5	2.3	3.0	4.2	5.0	3.0
		% of criteria	*9%*	*6%*	*2%*	*5%*	*4%*	*3%*	*4%*	*5%*	*6%*	*4%*
		BPNO	7.0	4.6	1.7	4.0	3.5	2.3	3.0	4.1	5.0	2.9
		% of criteria	*9%*[PP]	*6%*	*2%*	*5%*	*4%*	*3%*	*4%*	*5%*	*6%*	*4%*
		BPUC	7.0	4.6	1.4[QQ]	4.0	3.5	2.3	3.0	4.1	5.0	2.9
		% of criteria	*9%*	*6%*	*2%*	*5%*	*4%*	*3%*	*4%*	*5%*	*6%*	*4%*
		FPNO	7.0	4.6	1.7	4.0	3.5	2.3	3.0	4.1	5.0	2.9
		% of criteria	*9%*	*6%*	*2%*	*5%*	*4%*	*3%*	*4%*	*5%*	*6%*	*4%*
PM_{10} ($\mu g/m^3$)		**Baseline**	35.5	34.5	34.1	34.4	34.3	33.9	34.2	34.5	34.4	34
		% of criteria[RR]	*71%*	*69%*	*68%*	*69%*	*69%*	*68%*	*68%*	*69%*	*69%*	*68%*
		BPNO	44.7	34.6	34.4	39.2	39.6	34.2	35.4	37.6	35.5	34.6
		% of criteria	*89%*	*69%*	*69%*	*78%*	*79%*	*68%*	*71%*	*75%*	*71%*	*68%*

[PP] Reported in ERD Table 4-36 as 4% - corrected to 9%
[QQ] Reported in ERD Table 4-36 as 1.7 - corrected to 1.4 as per ERD Appendix D Table 6-11 and Table E-4
[RR] Percentage of criteria calculation corrected. Corrected percentages are lower than those originally reported in ERD Table 4-36.

Pollutant	Average Period	Scenario	Grid Maximum	AQMS Dampier	AQMS Karratha	Ngajarli	Hearson Cove	MNP-CN	MNP-SE	King Bay	Standing Stones	MLKC
		BPUC	53.0	34.7	34.5	41.7	42.4	34.5	36.3	39.6	36.1	35.2
		% of criteria	*106%*	*69%*	*69%*	*83%*	*85%*	*69%*	*73%*	*79%*	*72%*	*68%*
		FPNO	44.6[SS]	34.7	34.4	39.3	39.6	34.2	35.5	37.6	35.6	34.6
		% of criteria	*89%*	*69%*	*69%*	*79%*	*79%*	*68%*	*71%*	*75%*	*71%*	*68%*
$PM_{2.5}$ ($\mu g/m^3$)		**Baseline**	15.5	15.3	14.5	14.9	15.0	14.5	14.6	15.0	14.9	14.7
		% of criteria[TT]	*62%*	*61%*	*58%*	*60%*	*60%*	*58%*	*58%*	*60%*	*60%*	*59%*
		BPNO	17.4	15.5	14.7	16.0	15.9	14.7	14.9	15.6	15.4	14.7
		% of criteria	*70%*	*62%*	*59%*	*64%*	*64%*	*59%*	*60%*	*62%*	*62%*	*59%*
		BPUC	18.9	15.5	14.8	16.6	16.5	14.7	15.0	15.9	15.5	14.7
		% of criteria	*76%*	*62%*	*59%*	*66%*	*66%*	*59%*	*60%*	*64%*	*62%*	*59%*
		FPNO	17.4	15.5	14.8	16.1	16.0	14.7	15.0	15.8	15.5	14.7
		% of criteria	*70%*	*62%*	*59%*	*64%*	*64%*	*59%*	*60%*	*63%*	*62%*	*59%*

[SS] Value corrected from 34.7µg/m^3 to 44.6µg/m^3 (taken from ERD Appendix D Table 6-6, Table 6-13, Table E-6)
[TT] Percentage of criteria calculation corrected. Corrected percentages are lower than those reported originally in ERD Table 4-36.

Addendum to: ERD Table 4-37 Modelled concentrations of NO2, SO2, PM10 and PM2.5 (annual averages) showing incremental increase from the project and cumulative (Sourced from ERD Appendix D Table E1, E2, E3, E4, E5, E6 and E7)

Pollutant	Average Period	Scenario	Grid Maximum	AQMS Dampier	AQMS Karratha	MLKC
NO_2 (ppb)	Annual Average	**Baseline**	5.0	1.7	0.9	1.7
		% of criteria	*17%*	*6%*	*3%*	*6%*
		BPNO	5.6	1.7	0.9	1.7
		% of criteria	*19%*	*6%*	*3%*	*6%*
		FPNO	5.9	1.8	1.0	1.9
		% of criteria	*20%*	*6%*	*3%*	*6%*
SO_2 (ppb)		**Baseline**	4.5	1.6	0.9	1.0
		% of criteria	*23%*	*8%*	*5%*	*5%*
		BPNO	4.5	1.6	0.9	1.1
		% of criteria	*23%*	*8%*	*5%*	*6%*
		FPNO	4.5	1.6	0.9	1.1
		% of criteria	*23%*	*8%*	*5%*	*6%*
PM_{10} ($\mu g/m^3$)		**Baseline**	24.8	23.7	23.8	23.5
		% of criteria	*99%*	*95%*	*95%*	*95%*
		BPNO	30.9	23.8	23.9	23.8
		% of criteria	*124%*	*95%*	*96%*	*95%*
		FPNO	30.8	23.8	23.9	23.8
		% of criteria	*123%*	*95%*	*96%*	*95%*
$PM_{2.5}$ ($\mu g/m^3$)		**Baseline**	8.4	7.9	7.9	7.9
		% of criteria	*105%*	*99%*	*99%*	*99%*
		BPNO	10.3	8.0	7.9	8.0
		% of criteria	*129%*	*100%*	*99%*	*100%*
		FPNO	10.3	8.0	7.9	8.0
		% of criteria	*129%*	*100%*	*99%*	*100%*

Erratum ERD Section re cruise ship berthing opportunities.

ERD Section 2.27

During stakeholder consultation, the City of Karratha indicated its preference for the expansion and use of the Dampier Cargo Wharf rather than using the existing Dampier Bulk Liquids Berth. This would allow Dampier Port to increase its capacity to receive cruise ships. As this option is the chosen option for the Project, the proposed storage shed will be built on already disturbed Port land adjacent to the wharf and will not impact other Port users.

Government of Western Australia
Department of Jobs, Tourism, Science and Innovation

Your ref:
Our ref: J1030/201703
Enquiries: Steve.Dawson@jtsi.wa.gov.au

Mr Vikas Rambal
Chairman
Perdaman Chemicals and Fertilisers
Level 17
58 Mounts Bay Road
PERTH WA 6000

Dear Mr Rambal

Perdaman Urea Project - Responsibility for Relocation of Hearson Cove Road

I refer to the letter from Robert Harvey, Deputy Chair of the Environmental Protection Authority (EPA) to Perdaman Chemicals and Fertilisers Pty Ltd (Perdaman) on 17 November 2020 regarding the Response to Submissions Document for the Perdaman Urea Project (the Project).

In the EPA's comments on Perdaman's Response to Submissions document, the EPA requests at [24] that Perdaman "*include a copy of the relevant correspondence from the State Government to the proponent that unequivocally confirms that the State Government will be responsible for the re-alignment of Hearson Cove Road given that it does form part of the Perdaman Urea Project*".

In order to help satisfy this request, I can confirm that the State Government has committed to take responsibility for the re-alignment of Hearson Cove Road, subject to a number conditions precedent, including the Project reaching financial close, all statutory and regulatory approvals being met, and the Project securing offtake agreements.

Yours sincerely

Kristian Dawson
A/EXECUTIVE DIRECTOR
DEPARTMENT OF JOBS, TOURISM, SCIENCE AND INNOVATION

11 January 2021

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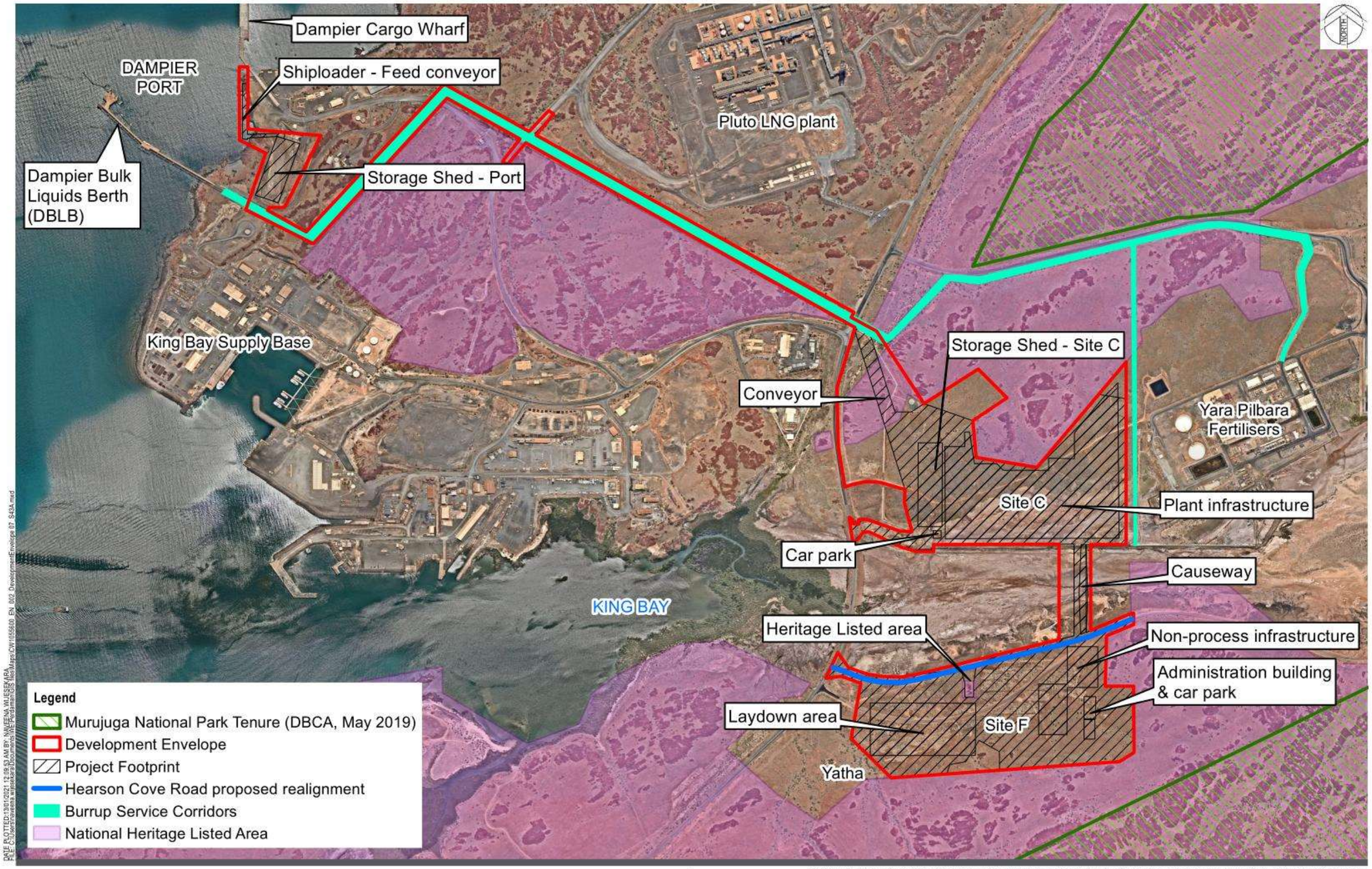
Revised ERD Figure 2 Development Envelope and Indicative infrastructure



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REVISED DEVELOPMENT ENVELOPE AND INDICATIVE INFRASTRUCTURE

PERDAMAN UREA PROJECT
FIGURE 2

0 125 250 375 500m

CW1055600_EN_002_DEVELOPMENTENVELOPE 07_S43A

Revised Table ES2 – Location and proposed extent of physical and operational elements

Element	Location	Proposed extent
Physical elements		
Overall extent of the Perdaman Urea Project	Figure 1	Clearing of no more than 73.05 ha within a Development Envelope of 106.7 ha.
Site**s** C & F	Figure 1 & 2	Site C: Approximately 34.4 ha with clearing of up to 31.10 ha. Site F: Approximately 34.0 ha with clearing of up to 32.54 ha. Causeway: Approximately 3.6 ha with clearing of up to 1.36 ha. Access Burrup Road - Site C: Approximately 1.5 ha with clearing of up to 1.45 ha.
Ammonia Plant	Figure 2 & 3	3,500 tpd nominal capacity - no 3rd party sales.
Urea Production Plant (Including Sites C and F, Causeway and access road (excluding conveyor and port facilities).	Figure 2 & 3	Footprint approximately 70.5 ha with clearing of up to 66.5 ha. 6,200 tpd nominal capacity, granulated product nominal 2.05 Mtpa.
Infrastructure and Logistics Buildings	Figure 2 & 3	including: ▪ Administration buildings; ▪ Operation control room; ▪ Maintenance workshop; ▪ Parts and materials warehousing; and ▪ Plant security.
Utility Block	Figure 3	▪ Air separation (~2,200 tpd); ▪ Power generation (Installed Combined Cycle Gas Turbine ~ 100 MW capacity and installed solar ~ 3.5MW capacity); ▪ Water treatment; ▪ Cooling water; ▪ Flare; ▪ Firefighting facilities; and ▪ Other utilities.
Hearson Cove Road realignment to the northern boundary of Site F	Figure 3	Approximately 4.4 ha with clearing of up to 4 ha including construction laydown.
Laydown associated with Construction	Figure 2	Clearing/fill of approximately 50 ha comprising of up to 28.5 ha in Site F and with the balance of laydown clearing as part of temporary construction activities across other construction elements within the DE.
Product Conveyor to Port	Figure 2	Site C boundary to the Development WA East West Service Corridor approximately 12.3 ha with clearing of approximately 2.60 ha. Closed conveyor along the existing East West Service Corridor to port approximately 11.3 ha (pre-disturbed).
Port Infrastructure / Product Storage Areas	Figure 2	Port Infrastructure (including Storage Shed, Ship-loader) approximately 5.2 ha (pre-disturbed). <u>Ammonia:</u> Storage of a maximum of 10,000 tonnes capacity on plant site in refrigerated tank. <u>Urea (plant site):</u> minimum 75,000 tonnes capacity, fully enclosed shed. <u>Urea (port site):</u> 75,000 tonnes capacity, fully enclosed shed.

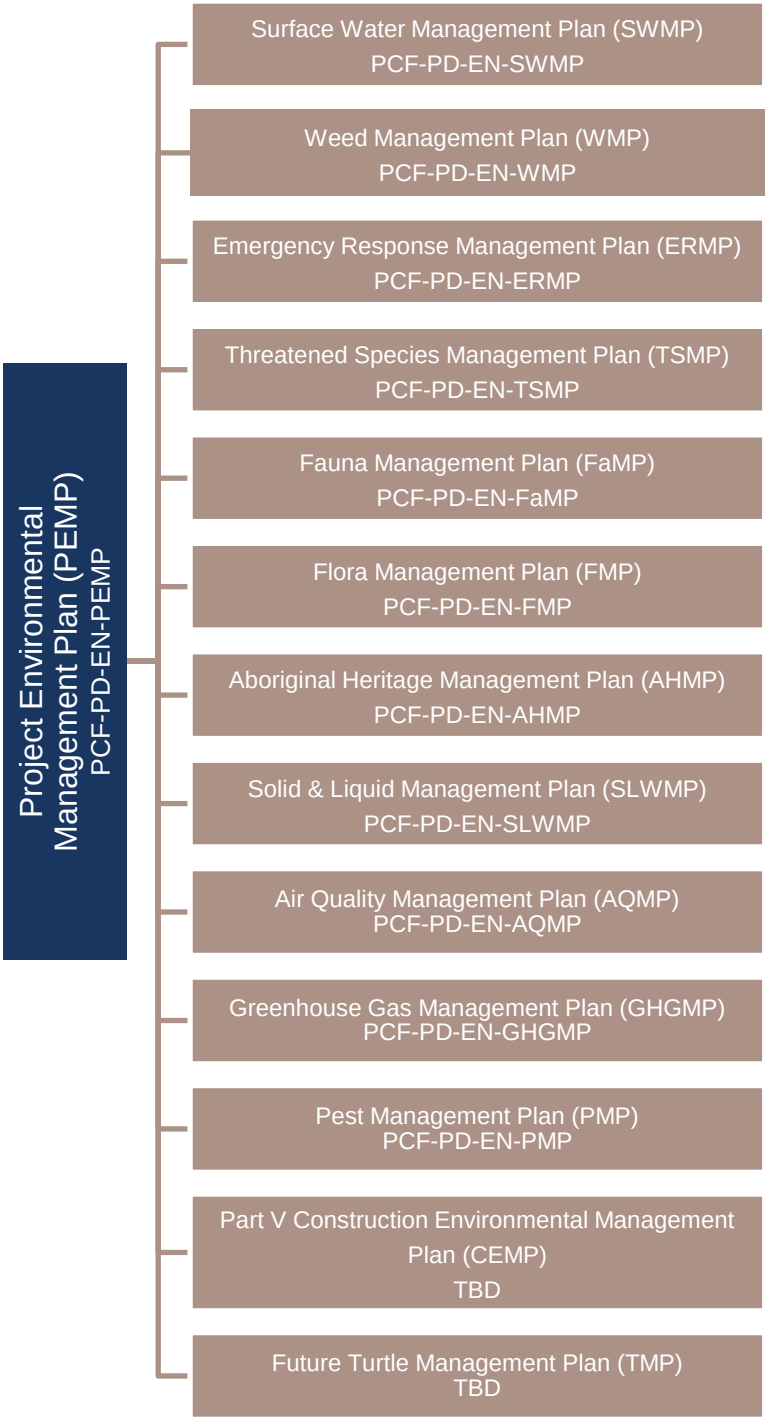
Element	Location	Proposed extent
Operational elements		
Gas Supply (Natural Gas)		130 terajoules per day supplied via a gas pipeline.
Urea Formaldehyde Input		11 ktpa approximately.
Power Supply		Internal generation.
Water Supply		25.2 GLpa from existing sea water supply by Water Corporation.
Stormwater		Stormwater will be treated and re-used on site to the fullest extent practicable.
Wastewater		Domestic wastewater will be treated and re-used on site. Any excess will be combined with saline water prior to being discharged into the existing Multi-User Brine Return Line (MUBRL), subject to agreement with the Water Corporation.
Saline Water Discharge		Up to approximately 20 GL/yr (including excess treated wastewater) will be discharged into the existing MUBRL, subject to agreement with the Water Corporation.
Solid Waste		Some solid waste from site water treatment residue to appropriate disposal site. Spent catalyst/resins to appropriate disposal sites. Construction waste streams to be recycled where such services are available from waste management contractors. Residual wastes to local landfill in accordance with landfill classification.
Energy Efficiency		Approximately 21 GJ/t urea (LHV). Approximately 5.1 Gcal/t urea (LHV).
Material Transport	Figure 1 & 2	Transport of urea (granules) through conveyor to Dampier Port along existing service corridor.
Urea Shiploading System	Figure 2	Travelling (closed) conveyor-fed, cantilever arm loader with direct discharge to ship hold via chute. Nominal loading capacity of 2,200 tonnes per hour.
Shipping	Figure 2	Urea 50-100 times per year, depending on destination port limits on vessel capacity.
Noise		< 35 dB(A) at nearest noise sensitive premises. < 65 dB(A) at plant boundary.
Air Emissions		
Oxides of Nitrogen (NO_x) (as NO_2)		319 tpa approximately from power generation and fired heater.
Carbon Dioxide (CO_2)		0.7 Mtpa approximately. Includes 0.07 Mtpa of CO_2 supplied in natural gas.
Sulphur Dioxide (SO_2)		5 tpa approximately.
Methane (CH_4)		Traces, < 1 tpa.
Ammonia (NH_3)		400 tpa maximum, to be minimised as practicable during detailed engineering design.
Urea Particulates		353 tpa maximum, to be minimised as practicable during detailed engineering design.
Methanol		< 1 tpa.
Dust		Construction and fugitive operational emissions.

APPENDIX

U

REVIEWED AND REVISED ENVIRONMENTAL MANAGEMENT PLANS

Project Environmental Management Plan and associated Sub-plans



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APPENDIX

V

ENVIRONMENTAL OFFSET REPORT/STRATEGY

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