Prepared for
Santos Limited
ABN: 80 007 550 923

AECOM

Appendix K - Santos Fairview Water Release Scheme

Preliminary Document Public Comment Responses

18-Jul-2023
EPBC 2021/8914 - Fairview Water Release Scheme

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Prepared by

AECOM Australia Pty Ltd
Turrbal and Jagera Country, Level 8, 540 Wickham Street, PO Box 1307, Fortitude Valley QLD 4006, Australia
T +61 7 3056 4800 www.aecom.com
ABN 20 093 846 925

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1.0 Introduction

1.1 Overview

AECOM Australia Pty Ltd (ABN 20 093 846 925 - AECOM) has been commissioned by Santos TOGA Pty Ltd (Santos), on behalf of the Santos GLNG joint venture participants (Santos TPY CSG, LLC; Santos TPY LLC; Santos Queensland LLC; Bronco Energy Pty Limited; Santos Toga Pty Ltd; PAPL (Upstream) Pty Limited, Total E&P Australia, Total E&P Australia II & KGLNG E&P Pty Ltd) (ABN 36 158 698 027 - Santos) to provide *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approvals support for the Fairview Water Release Scheme (WRS) desalinated water releases from the Santos Gas Field Development Project (GFD) Project (the proposed action).

This Public Comment Response document provides the public comment submissions in full as Appendices, summarises comments from each of the comment submissions and provides a response to the respective comment. Responses are either provided as a cross reference to where the applicable information may be found in the Fairview WRS Preliminary Documentation (PD), as a response providing additional information or a combination of both.

Section 1.1 of the Fairview WRS PD provides background information regarding the overall Gladstone Liquified Natural Gas (GLNG) and GFD Project. The proposed action application EPBC 2021/8914 is for the **continuation of the existing intermittent release** of up to 18 ML/day of desalinated produced water to the Dawson River via a drainage feature, waterhole and outlet watercourse to the Dawson River approved for the GLNG Project (2012/6615) with water from the GFD Project.

There will be no increase in the existing approved maximum daily release rate (18 ML/day) or total annual volume of 6,570 ML/year as required under the Queensland Environmental Authority (EA) EPPG00928713.

GFD Project water will gradually substitute GLNG Project water, and other water management and beneficial use options such as irrigation will remain in place. Water management and treatment prior to the proposed action will use existing water management and water treatment infrastructure at HCS04, including the reverse osmosis plant (ROP), water storage ponds and desalinated water release pipe from HCS04 to the drainage feature. No new water infrastructure will be developed as part of the proposed action.

Section 2.0 of the Fairview WRS PD provides a detailed description of the current water management strategy and the proposed action.

1.2 Project approval background

The following timeline summarises the project approvals for the GLNG and GFD projects:

- 2010 – EPBC 2008/4059 – approval to develop the GLNG Project including water management via beneficial re-use via irrigation and desalinated water releases to the Dawson River
- 2013 – State Environmental Authority (EA) No. EPPG00928713 for the Fairview Arcadia Project Area (FAPA) authorises desalinated water releases including conditions requiring baseline biological assessments and biological monitoring to be completed prior to the start of desalinated water releases
- 2016 – EPBC 2012/6615 – approval to develop the GFD project as an overlapping project with the GLNG project
- 2018 - State EA revision – removal of baseline biological monitoring (prior to start of desalinated water releases)
- 2021, March – EPBC 2021/8914 – referral to the Minister for the Environment for a decision on whether assessment and approval of the original proposed action (desalinated and event-based

releases[1] for the GFD Project) was required under the Commonwealth *Environment Protection and Biodiversity Conservation Act (1999)* (EPBC Act).

- 2021, July - EPBC 2021/8914 - the delegate of the Minister for the Environment determined the proposed action was likely to have a significant impact on the following matters protected under Part 3 of the EPBC Act:
  - listed threatened species and communities (sections 18 and 18A), and
  - a water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E).

  With this determination, the Department of Climate Change, Energy, Environment and Water (DCCEEW), then the Department of Agriculture, Water and the Environment (DAWE), issued a request for additional information for assessment by Preliminary Documentation, including the provision of information for assessment by the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC).
- 2022, June - EPBC 2021/8914 – a draft Preliminary Document was submitted to DCCEEW for adequacy review
- 2022, August - EPBC 2021/8914 – adequacy responses from DCCEEW and IESC were received
- 2022, December – EPBC 2021/8914 - a revised PD was submitted to DCCEEW for review for on-going desalinated water releases only
- 2023, February - EPBC 2021/8914 – the revised PD was released for public comment.

1.3 Public Comments

Public comments received for the Fairview WRS PD are summarised in Table 1-1. Received comments are addressed in the subsequent Sections referenced in Table 1-1. Two submissions from Lock the Gate Alliance and J. Baird *et al* reference a duplicate annexure under both their submissions. Where a comment is common across both these submission a cross reference will be provided to the primary response.

Table 1-1 List of Public Comments received

No.	Date	Entity Name	Addressed in
1	29/03/2023	Richard Moffat	Section 2.0
2	29/03/2023	Wildlife Preservation Society of Queensland – Upper Dawson Branch	Section 3.0
3	30/03/2023	Lock the Gate Alliance	Section 5.0
3a/4a	30/03/2023	Annexure to Lock the Gate Alliance and J. Baird *et. al.*	Section 4.0
4	31/03/2023	J. Baird *et. al.* (34 signatures)	Section 6.0
5	31/03/2023	Wardingarri formerly Iman People #2, (QUD6162/1998), and registered claimant Iman#4 (QUD413/2017)	Section 7.0

1.4 Comment Format

Comments received and their responses are provided in the respective Section referenced in Table 1-1 in date order. Within each Section the comment is provided in a comment box and grouped by theme. Responses to each received comment or group of comments are provided under each comment box as a “Response”. Each response is provided either:

[1] No longer part of the proposed action.

- as a cross reference to the PD document section where information that answers the comment may be found,
- as a specific response that provides a technical response to the comment based on existing data in the PD or additional presentation of underlying data or
- as a combination of both a cross reference and supplementary information.

Where a comment has been addressed previously in a comment response a cross reference to that response is provided.

Some comments have included references to the respective section of the Fairview WRS PD as a numbered suffix reference. Numbered suffix references have been removed from comment sections. Reference should be made to respective Appendices for complete cross references in submitted comments.

2.0 Richard Moffat

The submission from Richard Moffat is presented in Appendix A. The following sections respond to respective comments presented by Richard Moffat.

Comment 2.1 – Water Monitoring

As a riparian land holder living upstream from the town of Taroom, we are very concerned about the release of 'treated' water from the Santos CSG at Fairview into the Dawson River. Is this waste water being monitored and if so, who is and where is it being monitored.

Response 2.1

The proposed DRR monitoring program completed under the Receiving Environmental Monitoring Program (REMP) that has operated since 2013 is comprehensive and fit for purpose.

Released water is treated via reverse osmosis to achieve the required drinking water environmental value (EV) protection required under the State Environmental Authority (State EA) and is released after other beneficial uses are utilised.

The REMP for the Proposed Action is required and defined by the State EA EPPG00928713 presented in Appendix D of the Fairview WRS PD. The State EA specifies monitoring locations and compliance limits for desalinated water before release and at the downstream compliance point in the Dawson River at Yebna Crossing.

The REMP was initiated under the State EA prior to the start of desalinated water releases in 2015 to establish baseline information, and monitoring after desalinated water releases commenced for the GLNG project in 2015 to track any changes from those baseline conditions and assess the chemical and biological characteristics against trigger values and compliance limits specified in the State EA.

The REMP monitoring includes both upstream baseline monitoring locations and downstream impact monitoring locations. The State EA also requires monitoring of desalinated water prior to release. Appendix E of the Fairview WRS PD summarises REMP monitoring data including the number of samples collected at each monitoring location indicated in Figure 5-1 of the WRS PD. A detailed description of each location's habitat characteristics provided in Appendix J, Table 4.1 and in Appendix F (for each annual REMP report) of the Fairview WRS PD.

A summary of the REMP monitoring locations, number of monitoring events completed before and after desalinated water releases started in 2015 is provided in Table 2-1.

Table 2-1 Summary of REMP monitoring locations, sampling events completed and samples collected for baseline 2012 to 2015 REMP monitoring and post desalinated water release REMP monitoring to May 2022

Name	Location[a]	WQ pre-2015	Biological pre-2015[b]	WQ post-2015	Biological post-2015
DRR2	Upstream – Hutton Creek	32	7	20	12
DRR1	Upstream – Dawson River	41	6	28	12
WLMP1	Waterhole – confluence with drainage feature	31	5	71	13
WLMP2	Waterhole – central western limb	39	5	44	13
WLMP3	Waterhole – central eastern limb	41	5	44	13
WLMP4	Waterhole – far Western limb	22	5	31	13
WLMP5	Waterhole – far eastern limb and outlet	39	7	41	13
DRMP1	Dawson River – Downstream	41	4	61	12
S4	Dawson River – Downstream, Yebna Crossing	56	4	59	12
DWB01	Desalinated Water Dam – pre-release	ND	NA	166	NA

Name	Location[a]	WQ pre-2015	Biological pre-2015[b]	WQ post-2015	Biological post-2015
	Totals	342	48	565	113

Notes
a = refer to Appendix J and Appendix F of the Fairview WRS PD for detailed descriptions and images of monitoring site locations
b = 2 x events per year as winter and spring - refer to Appendix J of the Fairview WRS PD for details of sampling times. Number of sampling events conducted depended on water being present.
Summary is based on sample events completed – not all parameters presented in Appendix E-2 of the Fairview WRS PD have been analysed during all events.
Pre-2015 baseline monitoring period = June 2013 to May 2015 (for S4 August 2009 to August 2014
Post 2015 monitoring period = May 2015 to May 2022 (excluding December 2022 REMP sampling events)
ND = No Data available
NA = biological monitoring not applicable for the desalinated water pond

Individual Annual REMP reports are provided in Appendix F of the Fairview WRS PD. These reports provide details of the annual REMP monitoring events including chemical and physical observations at each location.

The REMP design report that outlines what is monitored, why it is monitored and where it is monitored is presented in Appendix J of the Fairview WRS PD.

Monitoring is completed by suitably qualified personnel from various sub-contractors and consultants including frc environmental and AECOM.

Comment 2.2 – Water Quality and Boron

Any undetected minerals and salts that are released could have long and harmful results to the flora and fauna particularly the critically endangered White-throated Snapping Turtle which nests in the area where water is to be released. Until it is known what the impact of the concentration of boron and its cumulative impact over time is on the insect and other food sources of this endangered turtle and other turtles, fish, platypus and aquatic life, the case for the environmental safety of this proposal should not be allowed until all avenues have been scientifically approved.

We have been involved with both Gas and Coal Mining companies and we are aware that their interests are NOT for the environment. A short term gain for a long term Pain.

Our river, the Dawson, eventually flows into the Great Barrier Reef which we do not want to endanger. The farmer is the custodian of the land the mining companies have little or no concern for the environment.

The proposal to release any extracted water from the mining companies should not be given permission till all scientific avenues have been carried out.

Response 2.2

The risk of negative effects on water quality in the environment due to the proposed action have been adequately assessed.

Up to 84 parameters are analysed under the REMP including organic and inorganic chemicals including the 58 chemical parameters required under the State EA (Table 3-4 in the PD). Biological sampling and assessment required under the REMP includes assessment of macrobenthic/insect species, fish and turtle populations and have not identified impacts to these populations.

Table 2-1 in Response 2.1 and Appendix E of the Fairview WRS PD, together with Table 5-14 and Table 5-19 of the Fairview WRS PD provide a summary of the collected sampling data completed for

both chemical and biological water quality from 2009 to 2015 for baseline REMP monitoring and 2015 to 2022 for REMP monitoring during GLNG desalinated water releases.

Toxic effects of undetected minerals and salts on the receiving environment would be expected to be detected in the 'Ecological Indicators' assessments (Sections 5.3.4 and 5.3.5.3 of the Fairview WRS PD) which investigated whether the desalinated water releases cause any impacts to:

- aquatic invertebrate communities
- fish communities and exotic fish
- invertebrate (crustacean exoskeleton) condition.

These analyses found either an improvement in the waterhole, or no significant negative impact from baseline or upstream conditions for the Dawson River. This program was designed to detect potential **cumulative** effects over a long timeframe from boron and other salts released to the Dawson River during intermittent discharges of desalinated water under the GLNG Project. As noted in ANZG (2019):

> *Indicators of biota condition are also a key component of water quality guideline values. They provide an assessment of stream condition that integrates the effects of water chemistry, habitat and stream flows and thus indicate whether the overall stream management regime has successfully protected the biota.*

3.0 Upper Dawson Wildlife Preservation Society Queensland

A copy of the complete submission from the Upper Dawson Wildlife Preservation Society Queensland is presented in Appendix B. The following sections respond to respective comments presented by the Upper Dawson Wildlife Preservation Society Queensland.

Comment 3.1 – River Flow

Without more detailed water sampling during different levels of flow, the proponent hasn't demonstrated possible impacts of the release under a variety of conditions. As water chemistry can vary widely under different flow regimes and weather conditions, this comprehensive sampling must be carried out.

Response 3.1

Historic water quality sampling of the Dawson River under the REMP is sufficiently representative of varying flow levels with samples collected over more than 85% of the flow regime.

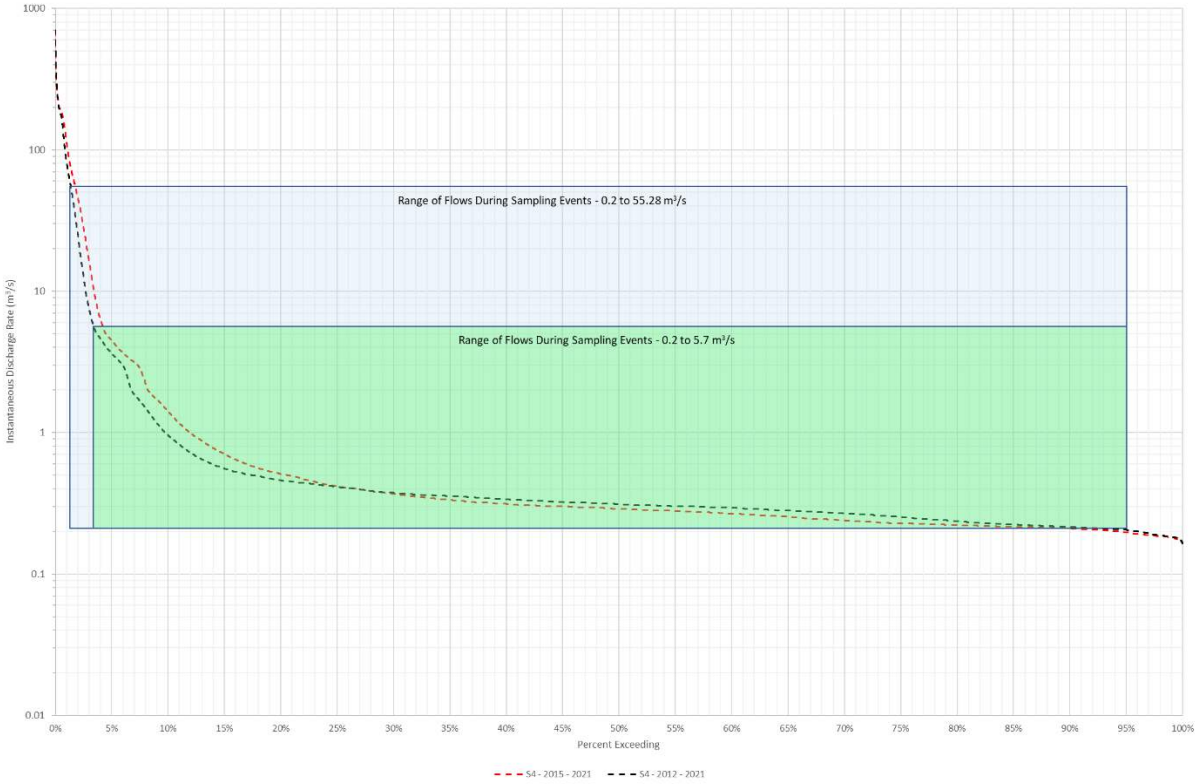
Water quality sampling at S4 has occurred over 115 sampling events between October 2009 and October 2022 as indicated Response 2.1, Table 2-1. 67 of the sampling events had concurrent flow data from S4 with the remainder missing due to either flood damage or prior to installation in October 2012.

The minimum recorded flow rate observed in the S4 gauging data between 2012 and 2021 is approx. 0.18 m^3/s (180 L/s), compared to a minimum flow rate of 0.21 m^3/s (210 L/s) during a water quality sampling event. Accordingly, the lowest flow periods observed at the S4 gauge are reasonably represented in the REMP and water quality sampling record.

The maximum flow rate during a water quality sampling event was 55.28 m^3/s (2.9m flow depth). Conducting sampling under higher or flood flows is considered to represent a significant safety risk to sampling personnel and or equipment due to higher flow velocity and risks from debris within flood waters. Desalinated water releases during flood conditions would increase water levels by 0.01 m in Dawson River flows as discussed in Section 5.2.2.3.3 and Table 5-7 of the Fairview WRS PD and compared to the natural increase is considered deminimus and further empirical data would not change the outcome of the assessment undertaken.

Additional discussion of Dawson River flow is provided in the response to Comment 4.1.1 and Response 4.3.1 to Response 4.3.3 from the Appendix to Lock the Gate Alliance and J. Baird *et. al.*.

Figure 3-1 S4 flow duration curve with water quality sampling event range



Comment 3.2 – Boron

Given that 'treated' water is not pure H2O or entirely chemical-free and that higher than usually permitted levels of boron are currently allowed in existing water releases, there has been very limited scientific assessment of the impact of these concentrations of boron or their downstream accumulation under repeated evaporation events on the flora and fauna of the Dawson and its surrounds. This rigorous assessment must be a pre-condition of any approval.

The use of boron to kill ants and cockroaches is well-known. The critically endangered White-throated Snapping Turtle nests in the area where water is to be released. Until it is known what the impact of this concentration of boron and its cumulative impact over time is on the insect and other food sources of this endangered turtle and other turtles, fish, platypus and aquatic life, the case for the environmental safety of this proposal has not been made.

Response 3.2

Desalinated water is treated via reverse osmosis to protect the drinking water ecological values of the Dawson River.

Biological sampling under the REMP has occurred from 2013 to 2023 and has not identified unacceptable changes to ecosystem indicators from baseline conditions outside natural variability. Concentrations of dissolved boron in the Dawson River below the desalinated water release are below the ANZG 99% species protection level (SPL) that are considered protective of high ecological value (HEV) systems (the Dawson River being designated moderately disturbed by Queensland Department of Environment and Science) including aquatic species such as the MNES turtles.

Refer to Response 2.1 for details of the number of water quality and biological sampling events and data for Dawson River water at DRMP1 and S4 downstream of the outlet watercourse.

Refer to Response 2.2 and Response 4.2.1 for comprehensive evaluation of potential boron effects.

Refer to Response 3.1 for consideration of repeat evaporation events. Water quality sampling has been conducted over 85% of the currently recorded flow range at S4.

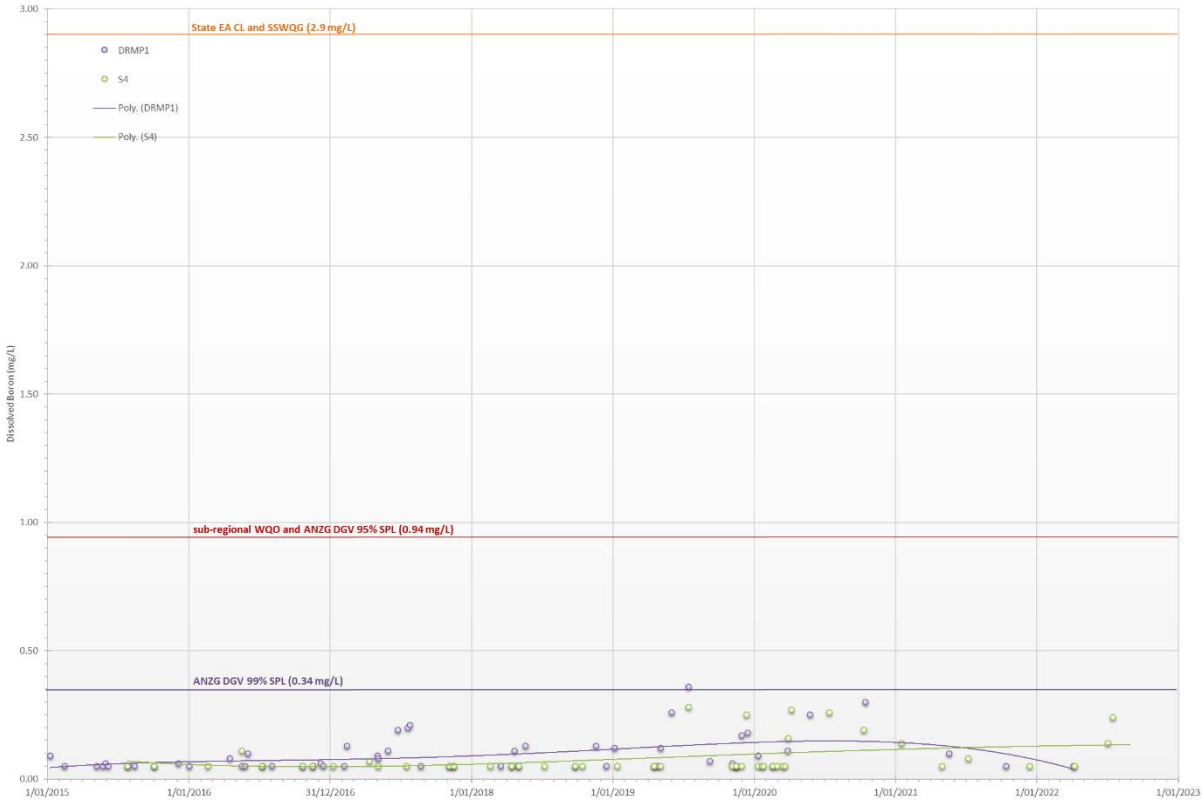
REMP water and sediment quality data are presented in Section 5.3 – 5.4, with summary statistics in Appendix E of the Fairview WRS PD. REMP water and sediment quality data indicates that surface water 95 percentile for dissolved boron in both the waterhole and Dawson Rivers are below the State EA contaminant limits. Boron in fact most often went undetected in water monitoring, for example being detected in only 4 of 46 samples from WLMP5, 26 out of 60 samples for DRMP1 and two out of 17 samples at S4. The maximum concentrations in the Dawson River at DRMP1 and S4 (bar one sample) were below the revised 99% Australasian species protection level (ANZG, 2021). See Figure 3-2 below for a visual summary of boron levels in DRMP1 and S4 against ecological levels of concern.

Similar results were reflected in the sediment program. The sediment 95 percentile for boron in the waterhole at WLMP5 and Dawson River at S4, and maximum for Dawson River at DRMP1 are all below the local trigger levels which were based on pre-release data. Detection frequency was also low: two detections of boron in sediments at S4 out of eight sampling events (refer to REMP reports in Appendix F). Noting also that sampling between 2019 and 2022 has not detected boron in sediments above the LoR. This indicates that boron is not significantly accumulating in the environment across repeat evaporation events or river flows.

Regarding the use of boron as an insecticide, US EPA guidance notes that boron's *"...low toxicity, and natural presence in terrestrial and aquatic environments are mitigating factors for any potential risk to non-target organisms*" (USEPA, 1993). While boron-based pesticides induce toxicity in terrestrial insects through direct exposures to high concentrations (Gentz and Grace, 2006), boron levels measured in the waterhole and Dawson River under the REMP and water quality monitoring program are demonstrably non-harmful (with most detections occurring beneath State EA and ANZG levels of concern).

Finally, the input of boron into the Dawson River system from surrounding agricultural land uses cannot be discounted. Cropping occurs on the floodplain adjacent to the waterhole, and in proximity to the downstream reaches of the Dawson River. Grazing and irrigation cropping occurs in the Dawson Valley, with irrigation occurring at Eurombah and Taroom. Boron is a known constituent of some agricultural fertilisers (Incitec Pivot Fertilisers, 2022) that may be used in the downstream region.

Figure 3-2 Boron concentrations in downstream assessment locations DRMP1 and S4



Comment 3.3 – Evergreen Formation

While the base of the Evergreen aquifer is thought to have low permeability, its upper levels are permeable, providing good quality water in local bores. It is likely that releasing water directly above the upper Evergreen will result in leakage into the aquifer. Further investigation is needed to demonstrate that this contamination cannot occur.

Response 3.3

There is no impact pathway by which the Upper Evergreen Formation can be affected by the proposed action.

The Upper Evergreen Formation has limited presence as a thin weathered layer within the proposed action area and is not utilised by local groundwater users. Desalinated water is released into the Waterhole that sits over the lower Evergreen Formation. Water quality downstream of the desalinated water release point to the Dawson River meets the required water quality and does not compromise potential downstream aquifers such as the Hutton Sandstone.

Desalinated water for the proposed release is treated to a standard that is protective drinking water quality criteria as required under the State EA to protect the aquatic ecosystem and drinking water EV of the Dawson River and is therefore not a source of contamination, as inferred by the submission.

An assessment of the geology and groundwater resources indicates that the proposed action will occur in an area underlain by the lower Evergreen Formation, an aquitard that separates the Precipice Sandstone and surface water in the waterhole and Dawson River within the proposed action area. Due to the low permeability of the underlying Evergreen Formation, there is no hydraulic connection between the underlying Precipice Sandstone and surface water in the proposed action area.

The Evergreen Formation is informally divided into an upper and lower units, which include the Boxvale Sandstone and the Westgrove Ironstone member in places (OGIA, 2019). Figure 4-1 in the Fairview WRS PD provides the detailed lithological sequence as defined by OGIA (2021) and Figure 4-2 in the Fairview WRS PD provides the detailed surface geology of the proposed action area.

The lower Evergreen Formation within the proposed action area is a low permeability (“tight”) aquitard, that confines the underlying Precipice Sandstone. The Boxvale Sandstone Member is identified by The Queensland Government’s Office of Groundwater Impact Assessment (OGIA) as a partial aquifer and the upper Evergreen Formation is identified as a tight aquitard. The presence of the lower Evergreen Formation above the Precipice Sandstone allows for the artesian conditions within this aquifer. Where the lower Evergreen Formation is absent, groundwater discharges from the Precipice Sandstone into the Dawson River within the proposed action area.

Desalinated water releases to the waterhole located on the lower Evergreen Formation will not influence the groundwater resources associated with the overlying (younger) Boxvale Sandstone Member or any possible upper Evergreen Formation at the waterhole because these units are located at a higher elevation and consequently water does cannot drain into these units from the waterhole. The Boxvale Sandstone within the proposed action area forms a hill adjacent to the waterhole (Figure 4-2 in the PD) and is a remnant outlier in outcrop located at a higher elevation.

The Boxvale Sandstone Member forms the dominant plateaux (flat-topped hills) present north of the proposed action area and is mapped to be capped by the Westgrove Ironstone Member and weathered upper Evergreen Formation cover. The upper Evergreen Formation occurs as a thin (< 10 m) weathered siltstone and mudstone with limited transmissivity and storage above the Westgrove Ironstone Member but combined and mapped as Westgrove Ironstone Member in regional geological mapping.

Mapped geology downstream of the proposed action area at S4 through to the Utopia Downs gauging station, consists of the lower Hutton Sandstone, upper Hutton Sandstone (aquifers) and then the Eurombah Formation (tight aquitard) and the Walloon Coal Measures (interbedded aquitard) of the lower elevation plains to Taroom.

Section 4.1.2 of the Fairview WRS PD references the median horizontal hydraulic conductivity of the lower Evergreen Formation ranging from 10^{-5} to 10^{-8} m/day. A search of registered bores adjacent the

proposed action area and downstream identifies one abandoned water supply bore on the Yebna property (RN 58362) as intersecting the Evergreen Formation. The bore appears to be incorrectly logged as intersecting the Evergreen Formation by the driller, which is not uncommon. The bore card for RN 58362 indicates that the bore was artesian drawing water from 97 meters below ground level (m bgl) to 122 m bgl with a yield between 380 to 1,226 m^3/day (4.4 to 14 L/s). This is strong evidence that the bore is completed, in part, in the Precipice Sandstone. The OGIA have independently assessed the bore and determined that it intersects both the Precipice Sandstone and the lower Evergreen Formation as the units intersected within RN58362.

Comment 3.4 - Stygofauna

Organisms that live in underground water (stygofauna) have not been adequately studied to know how such infiltration will impact the biodiversity of the Dawson Valley and its streams. We submit that this project must not proceed without the rigorous research outlined above.

Response 3.4

There is no direct pathway for stygofauna to be affected within the lower or upper Evergreen Formation or within sediments within the vicinity of the waterhole.

Desalinated water is treated to protect the drinking water EV of the Dawson River. As indicated in Section 6.4.3.2 of the PD stygofauna are more tolerant to acute and chronic exposure and therefore guidelines used for surface dwelling species are likely to be conservative and protective of stygofauna as stated in the ANZG (2018). The State EA requires desalinated water releases to be protective of the Drinking Water EV of the Dawson River. The State EA also requires water in the Dawson River at the S4 compliance point to achieve the sub-regional WQO for physicochemical parameters and for toxicants the ANZG (2018) DGV for 95% SPL as a MD water. REMP monitoring data in the Dawson River indicates both the drinking water EV and ANZG (2018) 95% SPL and do not unacceptably impact stygofauna.

4.0 Annexure to Lock the Gate Alliance and J. Baird *et. al*.

A copy of the Annexure to Lock the Gate Alliance and J. Baird *et. al.* (hereafter referred to as the Supporting Annexure) is presented in Appendix C. The Supporting Annexure lists a number of comments/issues regarding the proposed action as:

- *Water quality / flow regime relationships*
  - *The relationships between water chemistry and flow conditions in the Dawson River – which is a highly variable river system both spatially and temporally – remains poorly characterised. Water quality baselines and water quality objectives for rivers with highly variable flow conditions (such as the Dawson) must consider the dynamics of water quality at different flow stages and wetting/drying cycles. Sampling of baseline and ongoing water quality should occur during minimum, low, moderate, medium and high flows, each on multiple occasions to give statistical robustness to the data. These data should be presented and analysed in a way that allows the baseline water quality at different flow stages, and the likely impact of the additional treated water discharges at these different flows, to be analysed. Sample site coverage for water quality sampling, including control sites, is also limited in the current proposal, both spatially (i.e., for characterisation of a heterogeneous river system) and temporally (i.e., to adequately capture ecohydrologically important processes and change over time at each site).*
- *Limited knowledge base to support ecotoxicology assessment for boron*
  - *Boron concentrations in the desalinated water and oxbow lake wetland where releases currently take place, are generally above the ANZECC default guideline values for 95 and 99% species protection for aquatic ecosystems (0.94 and 0.34 mg/L). While Santos have negotiated a much less strict water quality objective for boron with the Queensland government (2.9 mg/L), this is based on limited ecotoxicology testing (utilising only five indicator species, while the most recent ANZECC guidelines prefer at least 15 species), and a poorly fitted relationship for Boron concentration and species protection percentiles. There remains limited information as to the likely effects of elevated boron concentrations on the threatened species living along the Dawson, such as the Fitzroy River and White-Throated Snapping Turtle, and the biota upon which they feed.*
- *Limited analysis of potential ecological impacts of change to low-flow regime*
  - *Analysis of the effects of the proposed releases on river flow regime, particularly at the low-flows end of the range of flows in the Dawson River, and associated risks to environmental values, remains limited. The increase in water discharge to the wetland and spill-over into the river will result in a decrease in the frequency, duration and magnitude of low flow spells in the river system, making pools and riffle areas more connected than would otherwise be the case under natural conditions. The effect of this on the ecosystem (e.g., through favouring species that are better adapted to a more permanent, higher level of baseflow, and greater connectivity between river sections) has not been thoroughly documented or analysed. The assumption of limited/no impact of the changed flow regime, rests on observations about the level of increase in water levels and flow velocities being small relative to natural variability. However, flow impacts will be cumulative on top of existing natural variability and affect river flows only in one direction – i.e., releases will always add additional flow to whatever natural flow variability is being experienced; as such, there will be a distinct change in flow regime towards higher rates of flow, most noticeable during lowest rainfall periods. Ecological consequences of such change must be carefully analysed and considered.*
- *Hydrogeological conceptual model and ground-surface water interaction*
  - *There are issues with the hydrogeological conceptual model. This model assumes that the Evergreen Formation – which underlies the oxbow wetland into which increased treated water releases are proposed – is an aquitard (with limited permeability). In fact, most field data indicate that the shallow Evergreen Formation in this region contains high-quality groundwater, and its upper layer(s) has substantial permeability. The uppermost part of the Evergreen Formation is the most likely hydrogeological layer to be in contact with, and exchange water with, surface water bodies in the region, including the oxbow lake, and*

Dawson River downstream of the proposed releases. Leakage of the treated CSG water from the wetland into the upper Evergreen Formation, and subsequent ground-surface water exchanges, have not been considered in the proposal due to conceptualisation of the whole unit as an aquitard. Impacts on groundwater levels and groundwater quality within the Evergreen Formation itself (in which there are landholder bores and likely GDEs) have been overlooked as an impact pathway.

- *Lack of field data on ecohydrology and groundwater dependent ecosystems*
  - *Stygofauna have still not been appropriately sampled and documented in the shallow groundwater in the vicinity of the release point, and Dawson River downstream of the oxbow lake wetland. While the revised proposal acknowledges that stygofauna will be present at the site, it is not possible to properly assess risk and/or impacts on such fauna without a proper baseline dataset on the type, abundance, and diversity of these. Stygofauna should be sampled in the alluvial groundwater, as well as the Evergreen Formation, where high quality groundwater occurs in close proximity to the release point and oxbow wetland. Leakage of water from the wetland into these shallow aquifers may occur, affecting groundwater quality utilised by GDEs.*
- *Broader context of produced water management (i.e., impact of other CSG water management strategies apart from treated releases)*
  - *The updated proposal documentation indicates that only approximately 20% of the CSG produced water generated from Santos's gas fields in the region will be managed through releases of RO treated water under the proposed FWRS. The predominant water management strategy (encompassing 60% of produced water) is re-use through irrigation. This includes unspecified mixtures of RO treated and un-treated CSG produced water. Evidence from the Supporting Annexure research showed that surface water near existing irrigation schemes (along Hutton Creek) is suffering poor water quality – with high turbidity, total iron and aluminium levels. If such irrigation schemes are expanded, there is a critical need to fully assess the impacts of runoff on surface water, groundwater and soil quality. It is unclear whether this is adequately documented and analysed in existing water management plans for the GLNG and GFD projects, and whether there may be increased risk of impacts on matters of national environmental significance arising from the increased management of produced CSG water through such irrigation schemes. Brine management strategies for the considerable quantities that would be generated through the life of the scheme are also not discussed, beyond storage within above-ground dams on-site.*

The Duplicate Appendix goes on to provide greater detail of comments/issues in sections subsequent to the above summary. The following response are based on the detailed comments provided in the Supporting Annexure. Some comments have been separated into subsections for clarity of responses to respective comments/issues raised. The Supporting Annexure has been referenced by both Lock the Gate Alliance and the submission by J. Baird *et. al.* Responses to comments in the Supporting Annexure in this Section are subsequently cross referenced as required for both Lock the Gate Alliance and J. Baird *et. al*.

Comment 4.1.1 – Flow regime and associated water quality characterisation

Flow regime and associated water quality characterisation – Pt 1

The receiving environment for the FWRS treated releases, in particular the Dawson River (Wardingarri) downstream of the overflow point(s) from the oxbow lake, is characterised by a highly variable flow regime, being a weakly perennial semi-arid river, with substantial differences between flow rates and stage heights at different percentiles. The FWRS proposal lacks careful consideration of the relationship(s) between water quality and flow rates, or potential flow-on effects to ecosystems of water quality changes occurring during specific flow conditions (particularly low-flows).

Water quality data in the FWRS documentation are only presented as summary statistics, and data are not separated according to different flow periods and/or phases of wetting-drying cycles. The derivation of Water Quality Objectives (WQOs) also appears not to have considered the likely importance of flow regime-water quality relationships. The use of generic (ANZG) WQOs may be

inappropriate for systems characterised by highly variable flow regimes that host sensitive and high-value ecosystems (Smith, Jeffree & John 2004; Smith et al. 2020).

Standardised water quality guidelines are typically devised for perennial flow systems which generally exhibit relatively stable water quality parameters (Smith, Jeffree & John 2004).

Conversely, during low or no flow periods, systems with variable flow regime become fragmented into ecohydrologically distinct waterbodies which exhibit highly variable water quality (Smith et al. 2020). Between flows, these isolated waterbodies behave as separate 'mesocosms' and physico-chemical parameters are essentially 'reset' following each large flow event (Sheldon 2005; Smith et al. 2020). Consequently, traditional seasonal monitoring methods and reference site approaches may not be suitable for the characterisation of temporary waters and may lead to undervaluation of stream quality (Walker, Sheldon & Puckridge 1995). In a guidance document produced following publication of the updated ANZECC Guidelines, Smith et al. (2020) emphasise use of conceptual models to develop an informed understanding of how the complex interrelating abiotic and biotic factors characterise different flow phases, and development of appropriate water quality monitoring strategies to account for these dynamics. This is a gap in the proposal.

Response 4.1.1

The flow regime and water quality values of the Dawson River have been adequately characterised.

The Dawson River within the proposed action area is a spring fed perennial system with stable flows that do not fall below 0.13 m^3/s (130 L/s) between 2012 to 2022. The minimum recorded flow at Utopia Downs over the same period is 0.07 m^3s (70 L/s). Fragmentation of the Dawson River within the proposed action area and immediately downstream is not typical. No periods of "no flow" (0.0 m^3s) have been recorded at Utopia Downs over the 2012 to 2022 period, indicating records of no flow are a rare and uncommon occurrence (less than 0.1%) in the longer Utopia Downs Record (1966 to 2023).

Figure 5-10 of the Fairview WRS PD provides the Dawson River hydrograph based on recorded data at S4 (Yebna Crossing). The data indicates that whilst the Dawson River flow is highly variable in flood conditions, in normal conditions flow rates are extremely stable.

Figure 4-1 below presents the flow duration curve for Utopia Downs (1966 – 2023), Utopia Downs (2012 to 2021) and S4 (2012 to 2021). The data comprise 30-minute flow data at the S4 gauge at Yebna Crossing and 60-minute flow data for the Utopia Downs gauge. The following conclusions are drawn from a comparison of the two sets of data over the 2012 to 2021 period (prior to the S4 gauge being destroyed in floods):

- There are no periods of nil flow (0 m^3/s) recorded at S4 or Utopia Downs
- The minimum observed flow rate at S4 was approximately 0.18 m^3/s (180 L/s)
- The minimum observed flow rate at Utopia Downs was approximately 0.07 m^3/s (70 L/s).

Jacobs (2019) estimated a baseflow rate of approx. 0.25 m^3/s (250 L/s) upstream of the proposed action area. This baseflow was attributed to spring inflows from the Precipice Sandstone unit. This has been recorded at S4 (Yebna Crossing) over the 2012 to 2021 and compared to Utopia Downs over the same period in Figure 4-1. The Dawson River flow at both S4 and Utopia Downs is best characterised as perennial.

The longer 56-year Dawson River flow data at Utopia Downs has 12 days (0.06%) of 0 m^3/s. As such, periods of nil flow are not considered a dominant or significant characteristic of the Dawson River. Given the extremely high hydraulic gradients that support the groundwater discharge rates from the Precipice Sandstone aquifer, it is unlikely that baseflow in the Dawson River adjacent to the Fairview WRS will ever cease to flow throughout the life of the proposed action.

The difference in apparent flow rate between S4 and Utopia Downs located approximately 32 km downstream is likely due to transmission losses (*i.e.,* a combination of evaporation, evapotranspiration and baseflow losses to the Hutton Sandstone). Notwithstanding, the magnitude of difference is minor, and likely within the margin of error of the flow duration curves derived for each gauge station location.

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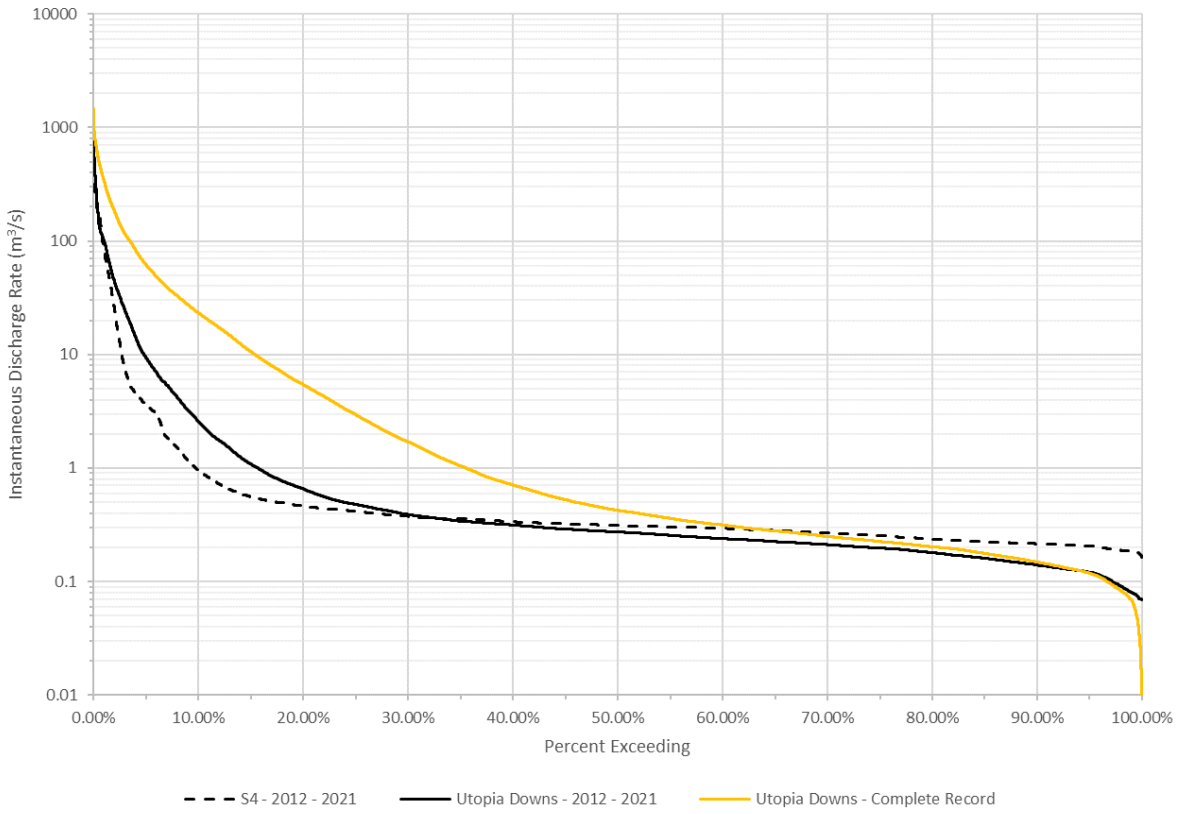
Figure 4-1 Flow duration curve for Utopia Downs and S4 (Yebna Crossing)



The following conclusions can be drawn:

- No flow periods do not generally occur at the site location, due to the persistent baseflow of groundwater from the Precipice Sandstone aquifer underlying the Dawson River
- The flow duration curve data suggests the Dawson River is a losing reach between S4 and Utopia Downs (*i.e.,* approx. 0.1 m^3/s water is lost over this portion of the river).

In conclusion, 56 years of gauging data from Utopia downs show that there are less than 0.1% of periods of no river flow. From 10 years of gauging data at S4 (Yebna Crossing), incorporating some low rainfall periods, no nil flow periods were observed.

Therefore, fragmentation of pools into "*temporary waters*" within the proposed action area is extremely unlikely. Fragmentation of pools into "temporary waters" further downstream (but prior to cattle access and irrigation areas downstream of Utopia Downs) during low flow conditions will be an extremely rare occurrence. Thus, nil flow periods resulting in fragmentation of the Dawson River are not expected to be critical to the functioning of the habitats at those locations in the context of the Significant Impact Guidelines (SIG) 1.1 assessment requirements.

Water quality sampling and flow rates

Historic water quality sampling of the Dawson River is sufficiently representative of the flow regime.

Figure 3-1 in Response 3.1 shows that water quality sampling at S4 has occurred over 85% of the recorded variation in flow. Existing water quality sampling has been completed over various flow rates within the Dawson River at upstream reference locations and downstream assessment locations.

Water quality samples collected from upstream control sites (DRR2 and DRR1) and downstream assessment sites (DRMP1 and S4) were at times of moderate (5.7 m^3/s) to low flow (0.2 m^3/s) that represents 87% of the flow record between 2013 and 2022 at the S4 gauging station. Above 5.7 m^3/s

sampling becomes increasingly hazardous to personnel safety and equipment stability; the S4 gauging station was destroyed during flood flows in 2022. The lowest flow at S4 was 0.18 m^3/s (180 L/s) with the lowest flow during a sampling event being 0.2 m^3/s (200 L/s) a difference of 20 L/s. The range of water quality sampling across the flow regime measured at S4 is considered adequate to represent water quality across the dominant flow encountered within the proposed action area.

Water quality guidelines have been developed appropriately in accordance with ANZG (2018).

Section 3.4 of the Fairview WRS PD provides the hierarchy for applying water quality guidelines and water quality objectives under Queensland State policy and the ANZG (2018) as discussed in Response 2.2 and Section 3.4.1 of the Fairview WRS PD. The derivation of sub-regional WQO specified in the Environmental Protection (Water and Wetland Biodiversity) Policy, 2019 Schedule 1 document for the Upper Dawson River are catchment specific and derived from "*site-specific scientific studies; the Queensland Water Quality Guidelines; Water Quality Guidelines for the Great Barrier Reef Marine Park 2010; ANZG; and other documents published by a recognised entity*" (DES, 2019) in accordance with the Queensland Monitoring and Sampling Manual (DES, 2018).

Development of sub-regional WQO is based on sampling conducted by Queensland DES or a "recognised entity".

Development of local trigger values referenced in the REMP are based on the 80th percentile of reference data and consistent with the ANZG (2018) and the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) Deriving site-specific guideline values for physicochemical parameters and toxicants (2019).

ANZG (2018) DGV are not flow or load based thresholds and are based on direct toxicity of a range or representative organisms. Concentrations of a parameter below the applied DGV is represents "…*the current best estimates of the concentrations of toxicants that should have no significant adverse effects on the aquatic ecosystem* (ANZG, 2018).

State and Commonwealth water quality management approaches, including IESC guidance, are consistent with the current water quality monitoring and assessment program conducted under the State EA REMP.

Appendix E-2 in the Fairview WRS PD includes the total number of samples collected, the number of samples above the respective LoR and the median and 95 percentile. Appendix E-2 provides the number of detections for each parameter at each monitoring location. Section 5.3.5 of the Fairview WRS discusses baseline water quality monitoring. Table 5-16 of the Fairview WRS PD identifies that within the Dawson River electrical conductivity (EC), aluminium, ammonia as N, nitrate+nitrite as N, and total nitrogen as N are the only monitored parameters exceeding their respective WQO or DGV. As presented in Table 5-16 the downstream concentrations for these parameters are similar or below the upstream reference concentration based on the flow range presented in Figure 3-1.

Summary statistics presented in Appendix E of the Fairview WRS PD also review the 50th percentile value of downstream assessment locations (DRMP1 and S4) against the 80th percentile of the upstream reference location values for aluminium, ammonia, nitrate+nitrite and total nitrogen values, as per ANZG (2018) guidance. None of the assessment locations 50th percentile are above the upstream reference value.

Comment 4.1.2 – Water Quality Characterisation

Flow Regime and associated water quality characterisation – Pt 2

Section 5.3 of main report (AECOM, 2023) and Appendix E.1, E.2 include water quality data from desalinated water pond monitoring, the oxbow lake wetland into which releases flow, and the Dawson River, at one upstream and two downstream sites. These data are presented only as summary statistics for samples collected prior to the commencement of approved desalinated water releases (pre-2015) and after releases (at the current approved rate) commenced in 2015. The data provide no indication of temporal dynamics in water quality parameters – including contaminants that exceed water quality objectives (e.g., ammonia, other nutrients, and aluminium). It is vitally important to understand whether these contaminants, and others which are elevated in the treated water relative to baseline data (e.g., Boron), are more elevated in the receiving environment when flows in the Dawson are low, as distinct from median and high flow conditions.

In order to understand how water quality in the Dawson will be affected by the releases through different periods of time, sampling of baseline water quality data and reporting of ongoing water quality results should occur during minimum (baseflow), low flow, moderate, medium, and high flow conditions, each at multiple upstream and downstream sites where sensitive species such as the threatened turtles may inhabit, and each on multiple occasions to give statistical robustness to the results. An example of how water quality data can be reported together with information on flow conditions is presented below [Figure 1 in Supporting Annexure]. *Such analysis is vital for a thorough assessment of the likely impact of the additional treated water discharges into a highly variable river environment.*

Response 4.1.2

Receiving water quality characterisation and risk of impact has been appropriately assessed in accordance with ANZG (2018)

The ANZG (2018) provides guidance on monitoring data presentation and exploratory analysis in the Data Analysis section of the guidelines for evaluating effects under multiple lines of evidence and weight of evidence process. The ANZG (2018) states that "…*a variety of numerical and graphical statistical tools to summarise data, including:*

- *graphs (e.g. histograms, box plots, dot plots, scatterplots)*
- *tables (e.g. frequency distributions, cross-tabulations)*
- *numerical measures (e.g. means, medians, SDs, percentiles).*

The objective of calculating or plotting summary statistics is to convey the essential information contained in a dataset as concisely and clearly as possible, to estimate a parameter of some population of values…" The data assessment presented in the Fairview WRS PD has used all of the above analysis methods in reviewing the data for the Fairview WRS PD as per the ANZG (2018) data analysis and data visualisation guidance. It is noted that ANZG (2018) do not state that every analysis tool is required during the data analysis process. Map visualisations are appropriate for data comprising of a single event to a limited number of events. Map data visualisations become less suitable and uneconomic for large time series data sets (refer to Table 2-1).

The ANZG (2018) state that "*water quality guideline values for aquatic ecosystem protection are clearly aimed at protecting the biota resident in, and directly associated with, waterways*." The ANZG (2018) also state that "*indicators of biota condition are also a key component of water quality guideline values. They provide an assessment of stream condition that integrates the effects of water chemistry, habitat* ***and stream flows*** *and thus indicate whether the overall stream management regime has successfully protected the biota*."

The comment is understood as seeking a greater understanding as to the correlation between flow rate and salt (e.g. boron) concentrations. It is appreciated that river chemistry can differ depending on

whether the river is in high, medium, or low flow. For the purpose of environmental monitoring, this understanding is implicitly accounted for through the design of a long-term, data-rich sampling program across a representative range of flows. The reported REMP sampling program has collected data between 2013 to 2022, incorporating 85% of the expected Dawson River flow regime (see Response 3.1), and adequately characterises boron levels across the breadth of environmental conditions for the Dawson River catchment. The reported monitoring program better-than satisfies the intent of the ANZG (2018) framework, which indicates a 12 - 24 month sampling program across seasons is satisfactory for characterising a waterbody's variability, and the application of the 95 percentile (as applied for boron and other toxicants) as the summary statistic for toxicant concentrations ensures conservatism for the monitoring program (see ANZG guideline derivation information).

Comment 4.1.3 – Control Site Monitoring

Control site monitoring

The high degree of complexity and natural variation of weakly perennial streams such as the Dawson/Wardingarri is well known (e.g., Sheldon 2005; Walker, Sheldon & Puckridge 1995). Such conditions require the use of multiple control sites to understand natural and anthropogenic drivers of water quality change (Smith et al. 2020). Currently, there appears to be one control site for surface water monitoring in the Dawson River (DRR1, 550 m upstream of the confluence of the oxbow lake and river), and one control site for assessing water quality of the Oxbow Lake wetland (DRR2), which is a pool on Hutton Creek upstream of its confluence with the Dawson. This is a limited spatial coverage with which to assess change relative to upstream/un-impacted conditions in the river and wetland, given there are multiple different hydrogeomorphic settings along the Dawson (deep pools, rocky riffles, narrow channels).

It is also questionable whether the use of DRR2 as a control site is appropriate, as it appears to be influenced by disturbance from nearby irrigation schemes (Figure 2). The RMIT team visited the DRR2 site during fieldwork in 2022, and found elevated levels of turbidity, total iron and aluminium in the water, along with an algal sheen on the surface of the water body (Figure 2 and Table 1). The environment was very different – both qualitatively and quantitatively – to the oxbow lake wetland for which it is serving as a control site, meaning it may not be an adequate indicator of the effects of the releases on this environment.

Water quality impacts observed at Hutton Creek were considered likely to be a result of runoff from the surrounding Santos irrigation schemes (shown in shaded green on Figure 3 below), which utilise treated and un-treated CSG wastewater (the site is labelled CR2 in Figure 3 below).The water quality impacts observed at this site raise further questions about the water quality impacts of this aspect of produced water management from the Fairview gas field (i.e., the use of CSG wastewater in irrigation schemes), a topic further discussed in section 6 of this report.

Response 4.1.3

The proposed monitoring sites are adequately located for the purpose of assessing potential changes in chemical water quality and ecological quality of the receiving environment.

Refer to Response 4.1.1 in relation to evidence supporting the perennial nature of the Dawson River in the proposed action area.

The upstream reference site DRR2 in Hutton Creek is not a reference location or control site for the waterhole.

REMP monitoring data from receiving environment sites is compared to project-specific water quality, sediment quality and biological guidelines that were developed from baseline (pre-release) data collected between 2013 and 2015 (refer to Table 2-1) before desalinated water releases occurred. Baseline reference data collected between 2013 and 2015 is considered representative of pre-activity conditions and suitable for the development of the local trigger values used in the REMP.

These local trigger values were developed from baseline data separately for the waterhole (Waterbody in REMP reports), Dawson River and Hutton Creek, because these were considered different water types based on their different hydrogeomorphic settings. Thus, differences in the hydrogeomorphic settings of the water types relevant to the Dawson River releases underpins the assessment framework of the REMP.

The two upstream reference sites (DRR2 in Hutton Creek and DRR1 in the Dawson River) are used to assess if there are background influences on aquatic ecology (e.g., rainfall variability, climate change, or catchment land use changes) that would be independent of the proposed desalinated water release scheme. Detailed assessment of potential changes relating to the desalinated water release relies on baseline data collected from the receiving water body itself, State EA CL, ANZG (2018) DGV and SSWQG.

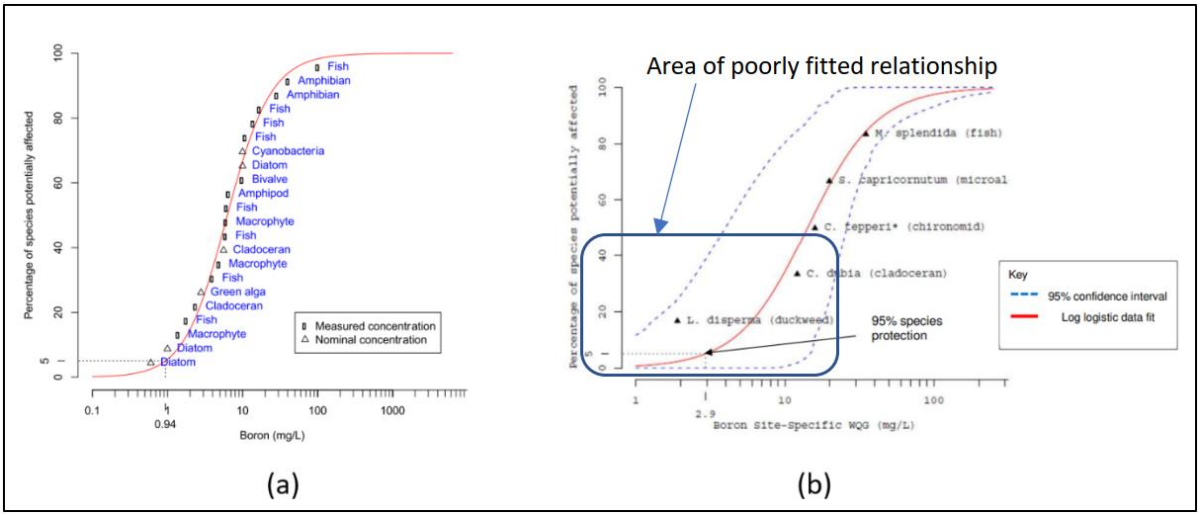
Santos' irrigation water management activities are not a component of the EPBC 2021/8914 referral and were previously assessed and approved under EPBC 2008/4059 and EPBC 2012/6615.

Comment 4.2.1 – Limited knowledge base to support ecotoxicology assessment for boron

Water quality: insufficient understanding of boron ecotoxicity

Water quality data for the oxbow lake wetland, reported in Appendix E1 and E2, shows that there has been a significant increase in boron concentrations (median value increasing from 0.07 to 0.60 mg/L and maximum value increasing from 0.13 to 1.23 mg/L) relative to pre-impact baseline data. Sampling by RMIT conducted in 2022 found a concentration of 1.04 mg/L within the oxbow lake wetland, and values of 0.06 mg/L in the Dawson River, downstream of the wetland, when the system was sampled during medium flows (Figure 1).

The impact of boron concentration increases on threatened species inhabiting the receiving environment – including considering water quality/flow relationships (section 1) remains poorly understood. Concentrations of Boron in the desalinated water and oxbow lake wetland frequently exceed ANZECC default guidelines for protection of 95% and 99% aquatic species (0.94 and 0.34 mg/L, respectively). Santos have negotiated with the Queensland regulator to amend the water quality objective for Boron in the receiving environment for the current approved treated releases, to 2.9 mg/L (as of 2022). This value was derived by plotting ecotoxicology test results estimating IC/EC10 (an indicator of chronic and acute effect concentrations), from five species to a log-logistic fit of concentration vs. %species protection level. The line of best fit achieved from the data is poor (see figure 4b) and there is particularly high uncertainty in the shape of fit at the low end of the response curve, which is critical for derivation of the 95 or 99% species protection value:



(Figure 4 – (a) Species-Specific Distribution utilised to derive the ANZECC default 95% guideline value of 0.94mg/L. (b) Species-Specific Distribution utilised to derive the site-specific guideline value of 2.9 mg/L for the Fairview release scheme (Adapted from: AECOM 2019, and ANZG 2021))

Warne et al. (2018, p. 19) note that the use of such a low number of species to derive a WQO is at the bare minimum of what is considered 'adequate'; datasets with 8–14 species belonging to at least four taxonomic groups are considered 'good', and those that contain data for at least 15 species are 'preferred'.

Since this ecotoxicology testing was conducted, newer, more robust default guideline values for Boron have been developed and established (ANZG 2021). In the updated ANZECC guidelines, 22 species were used to derive the current 95% and 99% protection guideline values for boron of 0.94 mg/L and 0.34 mg/L respectively. These guideline values fit Warne et al.'s (2018) definition of 'preferred' and provide a much better fitting relationship than used to develop the 2.9 mg/L value. In order to afford maximum protection of sensitive species in the receiving environment, either the new default guideline value should be adopted, or anew site-specific WQO should be determined based on ecotoxicology testing for a significantly larger number of species that are relevant in the receiving environment (at least eight, and ideally >15, depending on the level of fit that can be achieved in the resulting loglog relationship). It has been noted by the IESC that threatened species that inhabit the receiving environment (White Throated Snapping and Fitzroy River turtle) are sensitive to aqueous contaminant exposure, due to their cloacal respiration mechanism, and the turtles may also be exposed through accumulation of contaminants within algae and invertebrates upon which they feed. The assessment of a low risk to these turtles from water quality impacts in the proposal should be seen as uncertain in this context, and a more conservative approach taken.

Response 4.2.1

Boron ecotoxicology has been adequately assessed. Boron does not bioaccumulate or biomagnify in the receiving environment.

The increase in dissolved boron in the waterhole compared to baseline is acknowledged and noted in Section 53.3 of the Fairview WRS PD and is tracked under the REMP monitoring program required for the State EA. The 95th percentile value for dissolved boron in the waterhole (1.23 mg/L) did not exceed the SSWQG (2.9 mg/L) for 95% SPL.

The waterhole is contained within the mixing zone for desalinated water releases with S4 being the compliance point under the agreed State EA mixing zone. As discussed in Response 2.2 the maximum dissolved boron concentrations at both S4 (0.24 mg/L) and DRMP1 (0.28 mg/L) are below the SSWQG, the revised ANZG (2018) DGV for 95% SPL and 99% SPL (bar one value) as indicated in Figure 3-2 under Response 3.2.

The data collected as detailed in the Supporting Annexure in the waterhole and Dawson River in August 2022 is within the range of values reported within Appendix E of the Fairview WRS for WLMP5 (CW1), DRR1 (CR3), DRMP1 (CR4) and S4 (CR5). All locations reported in the Supporting Annexure are below the boron SSWQG (2.9 mg/L). All Dawson River locations reported in the Supporting Annexure are below the ANZG (2018) DGV for 95% SPL (0.94 mg/L) and 99% SPL (0.34 mg/L) by an order of magnitude. As indicated in Response 4.1.2 long term water quality monitoring presented in Appendix E of the Fairview WRS PD indicates maximum boron concentrations in the Dawson River are below the referenced 95% SPL and 99% SPL which are considered protective of biota in HEV systems; recognising the proposed action area is designated an Moderately Disturbed (MD) system.

It is noted that, as described in Section 5.1 of the Fairview WRS PD, the SSD-based DTA-derived guideline values for boron were updated according to the ANZG (Warne et al, 2018) framework in AECOM (2019), which included a good model fit for the data. Furthermore, the AECOM (2019) review rigorously assessed the underpinning the data from five species used in the Halcrow (2013) DTA, applying the revised ANZG (2018) criteria. These findings further underscore the DTA SSD outputs as 'high quality data', suitable for guideline derivation (AECOM, 2019). It is also noted usage of a site-specific DTA approach (involving Dawson River water as the test matrix) ensures a site-appropriate toxicity value, which are preferred to generic DGVs under ANZG (2019) and the Queensland Environmental Protection (Water and Wetland Biodiversity) Policy, 2019. This approach is particularly

preferred as pH, dissolved organic carbon levels, chloride, hardness can unpredictably alter the toxicity of aqueous boron (ANZG, 2021), meaning generic DGVs (involving various test matrices) may be less applicable to the site-specific conditions of the Dawson River.

It is important to note that some chemicals can induce long-term cumulative effects through bioaccumulation (*i.e.* uptake into living organism's tissues to high concentrations). However, it is noted that boron is water-soluble and does not behave in this way: "*…boron has no potential to bioaccumulate*" (RIVM, 2010). While boron can sometimes be detected in living tissues, there is also no evidence to support boron as biomagnifying (ANZG, 2021).

There is a general expectation that the listed 95% SPLs would be suitably protective of aquatic ecosystems, ANZG (2019) notes *water quality guideline values for aquatic ecosystem protection are clearly aimed at protecting the biota resident in, and directly associated with, waterways.* The WQOs for boron in discharges would therefore be protective of turtle populations, particularly cloacal breathing species as water-breathing species are the focus animal taxa for DGVs. Importantly, the WQOs and observed values are well below guideline boron values for vertebrate wildlife protection. Boron levels of up to 200 mg/L are considered protective of amphibian populations (US EPA, 1998).

Additionally, the rigorous Chemical Risk Assessment (undertaken in Section 8.0 of the Fairview WRS PD) holistically analyses boron (as boric acid, sodium tetraborate, and borax) risk in the context of a mixed discharge matrix, applying Commonwealth assessment approaches (Environment Protection and Heritage Council, 2009).Environment Protection and Heritage Council, 2009). The CRA analyses finds that boron results in a negligible cumulative risk associated with desalinated water.

Comment 4.3.1 – Modification of low flows hydrology

Modification of low flows hydrology – Part 1

Low flow periods play key role in maintaining natural diversity of stream ecosystems in many rivers (McGregor et al., 2011; Poff & Zimmerman, 2010). Low flows hydrology modification can result in significant changes to ecosystem structure and function. The Dawson River/Wardingarri is 'a series of interconnected pools…separated by sandy gravel & rocky riffles' (Miles, 2021), and these features play a significant ecohydrological role for macroinvertebrates, turtles, and fish communities. Flows in the Dawson are highly variable, quickly shifting between low-flow to flood conditions and then receding relatively rapidly to baseflow (e.g., Fig. 5-10 of the proposal documentation).

Daily discharge of 18 ML/day will significantly reduce the magnitude and duration of low-flow spells in the Dawson River – Figure 5 shows a comparison of this discharge rate with the flow duration curve for Utopia Downs, approximately 60 km downstream of the releases.

(Figure 5 – Flow duration curve for Dawson River (Wardingarri) at Utopia Downs, with daily treated water release rate indicated (orange line). The release rate exceeds natural river discharge monitored at this point approximately 40% of the time.)

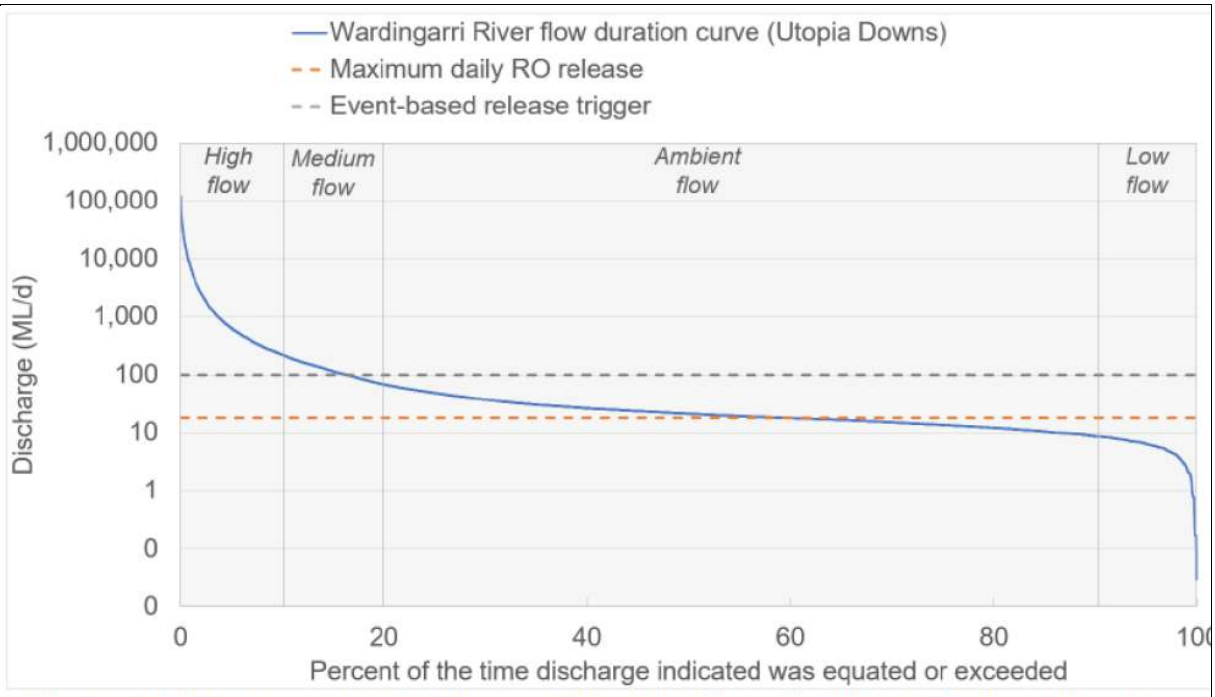


Figure 5 – Flow duration curve for Dawson River (Wardingarri) at Utopia Downs, with daily treated water release rate indicated (orange line). The release rate exceeds natural river discharge monitored at this point approximately 40% of the time.

Response 4.3.1

There is a low risk of impact to low flow hydrology.

Fragmentation of the Dawson River within the proposed action area and immediately downstream is not typical. No periods of "no flow" (0.0 m^3s) has been recorded at Utopia Downs over the 2012 to 2022 period indicating records of no flow are a rare and uncommon occurrence (less than 0.1%) in the longer Utopia Downs Record (1966 to 2023).

The potential for nil flows and fragmented pools is detailed in response 4.1.1. The Dawson River is a spring fed, perennial system with stable flows and fragmentation of the river is not typical.

The comment refers to the Utopia Downs Gauge flow exceedance curve, however it must be noted:

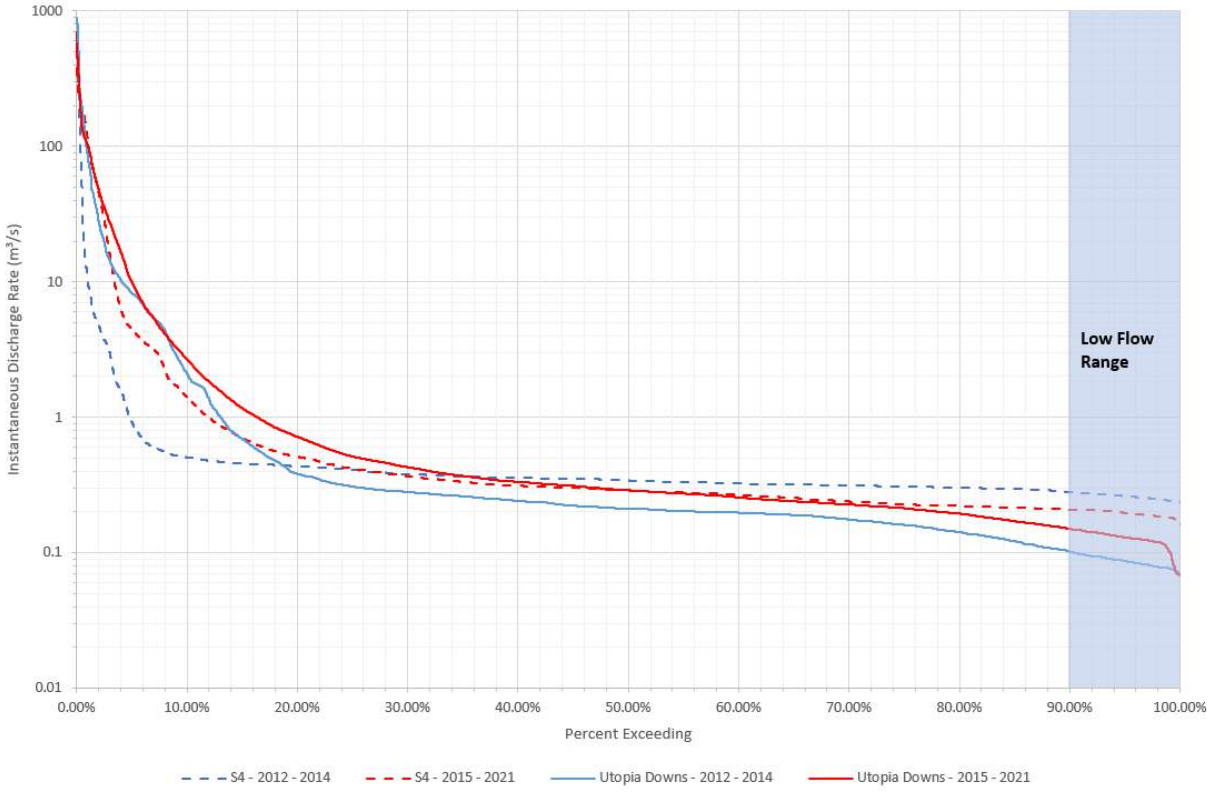
- The S4 Gauge flow exceedance curve is more relevant, due to proximity to the proposed action.
- A comparison at S4 suggests that the proposed release rate:
  - Exceeds the Dawson River flow rate approximately 10% of the time for the period 2012 – 2014
  - Does not exceed the minimum flow rate observed 2015 to 2021
- The waterhole has a buffering effect on the releases, with available storage attenuating the magnitude of release to the Dawson River
- The proposed release rate is expected to be lost to transmission losses (seepage, evaporation, evapotranspiration) progressively along the discharge path, at the drainage path, waterhole and within the Dawson River.

Comparison of the gauge data at S4 and Utopia Downs (refer Figure 4-1) suggests:

- For 2012 to 2014 (inclusive), the average daily rate of flow at Utopia Downs was 0.13 m^3/s less than at S4

- For 2015 to 2021, the average daily rate of flow at Utopia Downs was 0.02 m^3/s less than at S4
- The low flow portion of the flow exceedance curve is trending in opposite directions for each location. Between the 2012 to 2014 period and 2015 – 2021 period, low flows at S4 decreased in overall magnitude, whereas flows at Utopia Downs increased.

Figure 4-2 Flow duration curve for Utopia Downs for the total record, 2012 to 2021 and 2015 to 2021 with S4 2015 – 2021 for comparison



Due to the small degree of change in flow rate, it is not clear if this difference is due to existing desalinated water releases, or caused by other effects, such as gauge rating curve errors, rainfall spatial effects, inherent variability in flow data or other land use changes within the broader catchment. As such there is no conclusive data to conclude or exclude a significant change to low flow hydrology.

Desalinated water releases occurring such that periods of low flow/baseflow at S4 remain present in the observable data-set as indicated in Figure 5-11 of the Fairview WRS PD.

Accordingly, the proposed action is not likely to materially or significantly impact the number of no flow days, and the potential impact to low flow rates is not considered significant.

Comment 4.3.2 – Modification of Low Flow Hydrology

Modification of low flows hydrology – Part 2

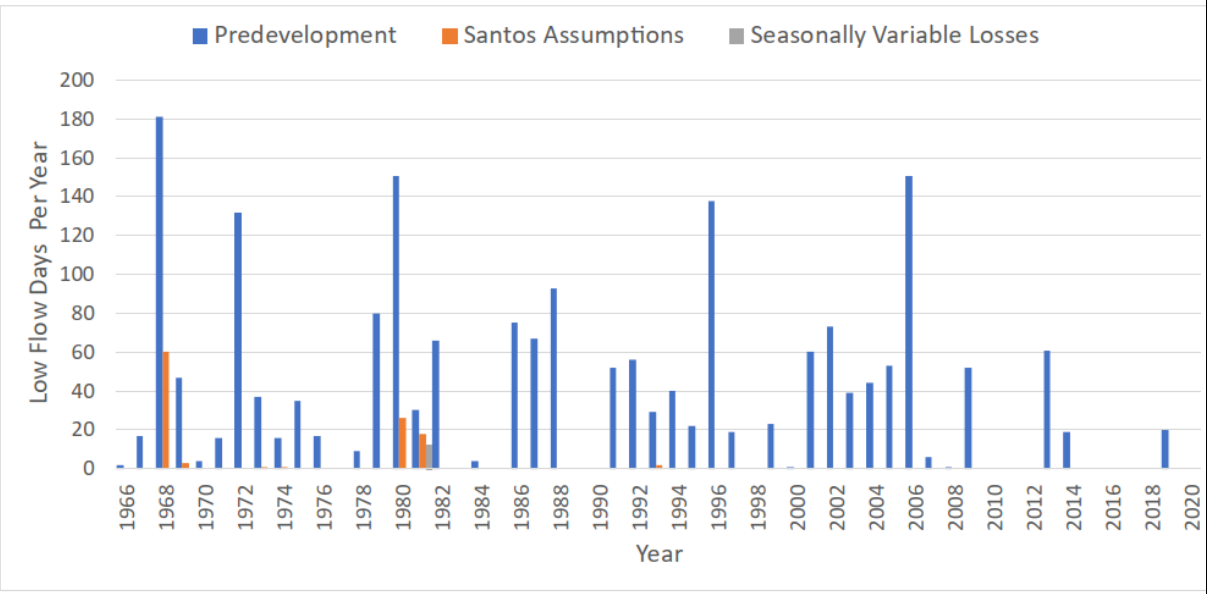
While not all discharged water will directly enter the Dawson (some will undergo evapotranspiration in the oxbow lake, some may leak into the underlying Evergreen Formation - see section 4 below), the increase in flows to the Dawson will be considerable relative to typical pre-development low-flows. Figure 6 reports results of an analysis of historic flows data (from Utopia Downs) with the impact of the additional flows from the releases on hydrological response variables (HRVs). The results encompass three scenarios:

• Pre-development: Flow regime (based on historic data) without any additional discharge (blue bars)

• Santos assumption (based on AECOM, 2021): Impact of additional discharge assuming initial 50% loss through evapotranspiration (ET) between discharge point and oxbow wetland, and subsequent 1.7ML/day from the wetland. This corresponds to an additional 7.3ML/day in the river (orange bars)

• Seasonally Variable: This accounts for seasonal variation in ET, with 50% ET losses Nov-Feb, 33% losses in Mar-Apr, 22% losses in May-Sep and 33% losses in October. This attempts to better capture seasonal losses in the wetland and adjusts flows from the wetland to the Dawson accordingly (grey bars).

The river flow data across back to 1966 were analysed under these three scenarios, with additional flows from the treated releases added to historically recorded flows. The most notable change in any HRV under the proposed discharge scenarios is the significant decline in number of low flow days (LFDs). While some low flow days still occur under the two discharge scenarios, these were largely during historic droughts (1968 and 1979-1982) with minimal occurrence throughout the rest of the record. (Figure 6 – Number of low flow days per year in Dawson River (at Utopia Downs) with and without daily treated releases, based on historical flows data (Nicholson et al., 2022).



Response 4.3.2

There is a low risk of impact to low flow hydrology.

Refer to Response 4.3.1.

Comment 4.3.3 – Modification of low flows hydrology

Modification of low flows hydrology – Part 3

While the daily releases of 18 ML/day may only result in limited rises in water levels (e.g. ~5 cm at Yebna Crossing), the potential ecological impacts of reducing the frequency and magnitude of low-flow periods in the river do not appear to have been studied in detail – with consideration of factors such as the connectivity of pools and impacts on water depth at shallow riffle environments. The IESC pointed out that increasing the frequency of spill-over from the oxbow lake wetland into the Dawson River may favour colonisation of the river channel by invasive species:

"For example, increased spilling may allow invasive fish species such as goldfish (Carassius auratus) and mosquitofish (Gambusia holbrooki) that are already in the waterhole to disperse repeatedly into the Dawson River. The proponent should assess the risk of the predicted changes to the waterhole's

water regime in facilitating the spread of invasive species in the Dawson River and propose suitable mitigation or remediation strategies if undesired changes occur."

The response to this advice (Appendix C) notes that these two invasive species already inhabit the Dawson, arguing that this is a pre-existing issue rather than an impact that needs consideration for the FWRS. However, it is critical that baseline and ongoing data collection monitor any additional effects caused by the treated water releases, both for the two species highlighted, and other potential invasive species. A protocol for collecting data to indicate the extent of transmission of non-native species from the waterhole to the river, and the possible effect on the EPBC listed threatened species should be developed as part of the REMP.

Response 4.3.3

The Dawson River is a spring fed perennial system with stable flows and fragmentation of the river is not typical. There is a low risk of impact to low flow hydrology.

Refer to Response 4.1.1 and 4.3.1

Monitoring for non-native fish is regularly undertaken in the waterhole and Dawson River under the REMP for the proposed action.

Fish, including pest fish, are monitored for as part of the REMP as discussed in Section 5.3.4.2 of the Fairview WRS PD. Both native and pest fish have a project-specific local biological guideline against which the monitoring data is assessed. Details of the fish monitoring program are provided in the REMP design report in Appendix J of the Fairview WRS PD.

Goldfish and eastern Gambusia are both known from the Dawson River and connected habitats as indicated in the Queensland Government WetlandInfo data and Section 5.3.4 of the Fairview WRS PD.

Whilst a single observation of goldfish occurred in the early 2017 REMP report, subsequent REMP monitoring data for late 2017, all of 2018, 2019, 2020, 2021 and 2022, and early 2023 did not find a single pest fish at any site (*i.e.,* zero pest fish recorded across the 12 most recent surveys). The absence of goldfish records in the past six years indicates very low abundance within the proposed action area, and that existing desalinated water releases has not caused proliferation of pest fish either in the waterhole or the Dawson River.

The REMP for the proposed action will continue to monitor pest fish' The timing of the REMP monitoring is post-wet season (when water levels are likely higher) and pre-wet season (when water levels are likely lower).

Comment 4.4.1 – Hydrogeological CSM and ground-surface water interaction

Hydrogeological conceptual model and ground-surface water interaction and implications for ground and surface water impacts – Part 1

The proposal documentation concludes that there is no significant risk of impacts to groundwater quality, quantity, or groundwater dependent ecosystems. This is based on baseline groundwater and GDE monitoring, and a conceptual hydrogeological model developed for the site, which encompasses ground-surface water interaction and eco-hydrological relationships (e.g., figure 3-3, reproduced from AECOM 2023, below).

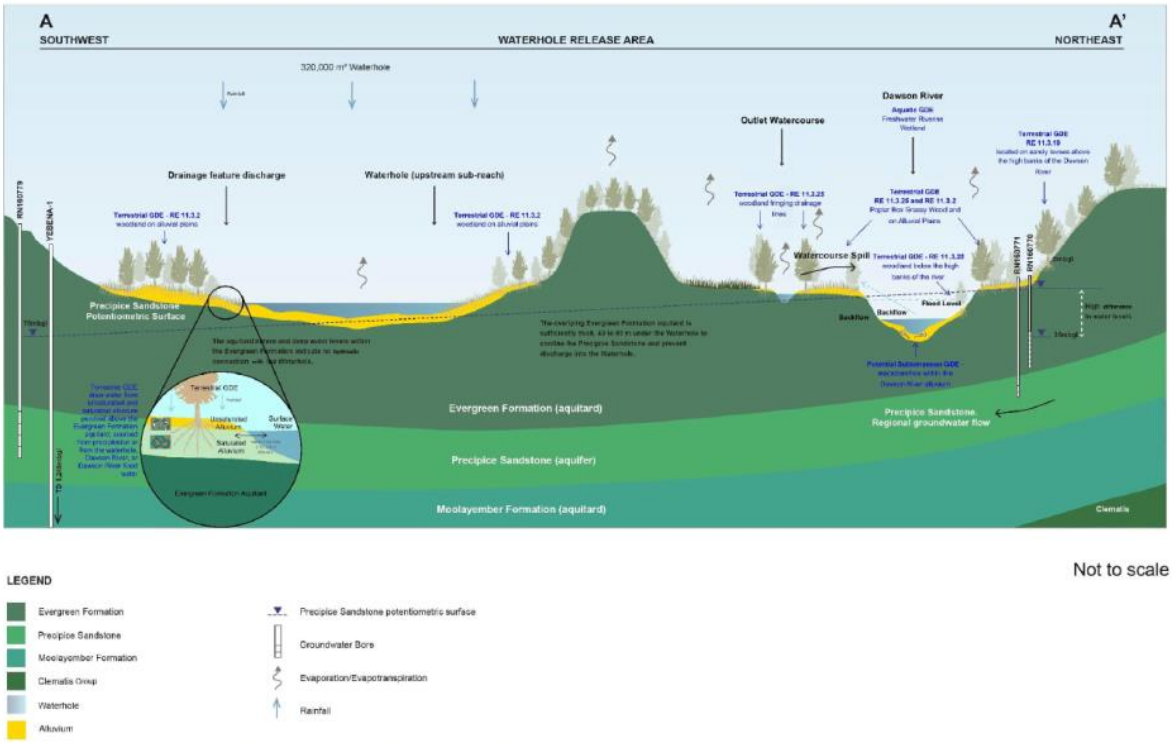


Figure 3-3 Ecohydrological model for groundwater resources and GDE associated with the waterhole and Dawson River (Panel A)

There is an important aspect of this conceptual model which appears to be inconsistent with the data collected from the site – namely the conceptualisation of the Evergreen Formation as an (essentially uniform) aquitard. This assumption is significant, as it limits the scope of the analysis of potential groundwater impacts and ground-surface water interaction to the Precipice Sandstone aquifer and shallow alluvium in the channel of the Dawson.

The Precipice Sandstone occurs at significant depth below the oxbow lake wetland and is therefore unlikely to interact directly with the treated water releases in the vicinity of the release point. However, the Evergreen Formation directly underlies the oxbow lake wetland and Dawson River channel downstream of the release point. Groundwater chemistry and hydraulic testing data (compiled by OGIA) for the upper Evergreen Formation (section 4.1.2.1) show that this unit is a potentially significant aquifer, which hosts high-quality groundwater. Hydraulic conductivity field data in Table 4-4 show values in the range of a moderate to high-yielding aquifer in the upper part of the formation (Kh values from 0.0014 to 8090 m/day); these are not consistent with uniform conceptualisation of the unit as an aquitard. Hydrochemical data presented in table 4.7 from registered bores in this formation, also indicate a high-quality groundwater resource, e.g., TDS values are all < 400 mg/L (or < 820 mg/L encompassing the Boxvale Sandstone member), and in one bore TDS is < 100 mg/L (or three bores if the Boxvale Sandstone is included). This puts the groundwater within the range of salinities considered viable for potable water supplies and is inconsistent with the quality of water expected for an aquitard. The low TDS values also indicate a potential for ground-surface water interaction occurring (e.g. leakage/recharge of the upper formation from surface water during high flow events), which has not been considered in the conceptual hydrogeological model.

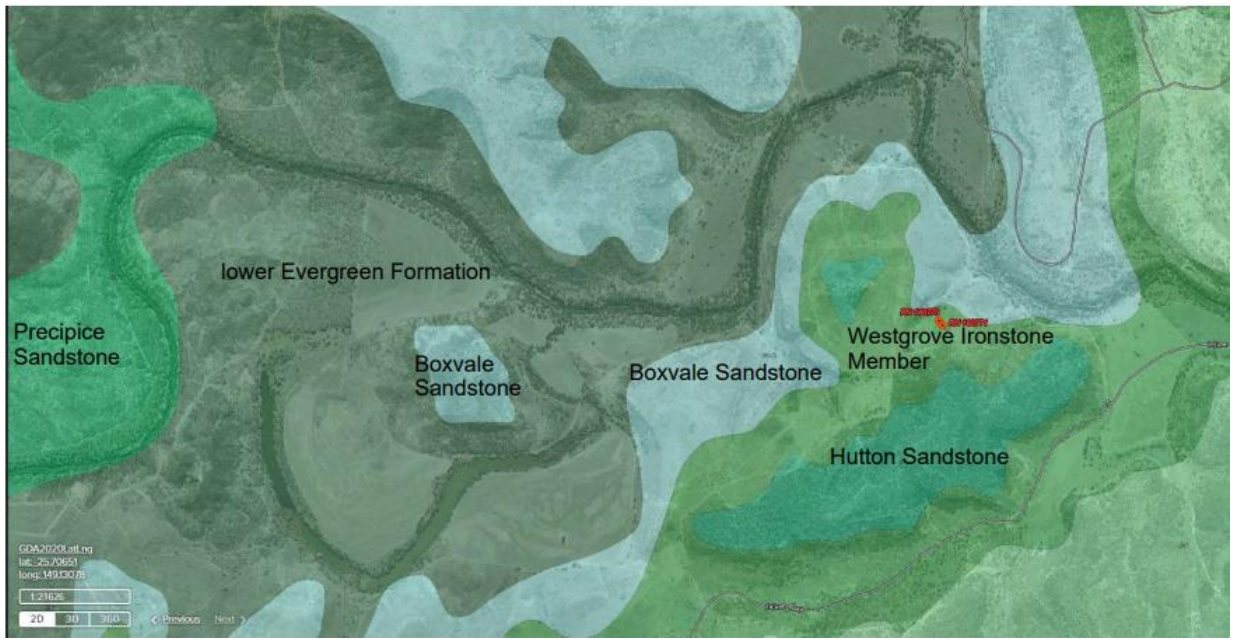
Response 4.4.1

The Lower Evergreen Formation underlying the waterhole is a competent aquitard with transmissivity of 10^{-5} to 10^{-8} m/day.

Based on the geological map, presented in Figure 4-2 of the Fairview WRS PD and reference to the OGIA (2021) lithostratigraphy (Figure 4-1), the lower Evergreen Formation underlies the waterhole.

The more permeable (sandstone rich) Boxvale Sandstone (the unit which allows for enhanced groundwater resources within the Evergreen Formation) is located above the waterhole level in the adjacent hill and plateaux as included in Figure 4-3 below.

Figure 4-3 Mapped Geology (source: Queensland Globe)



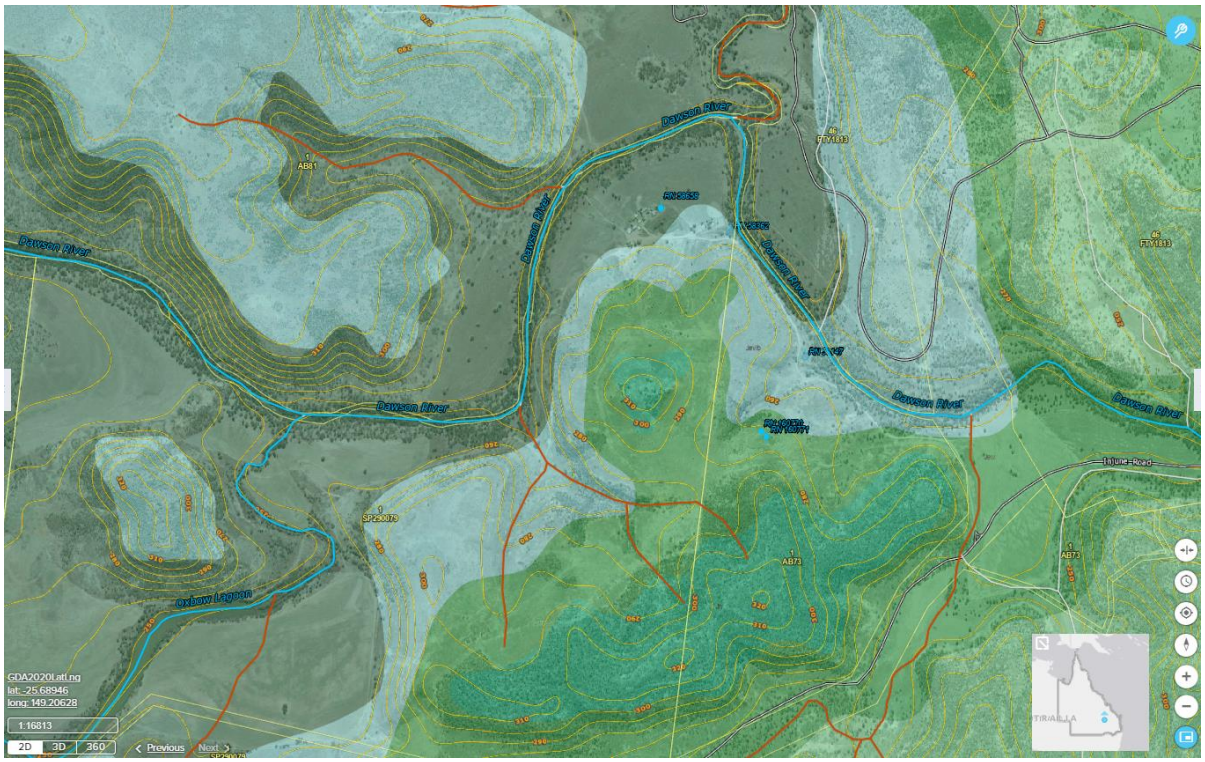
It is noted that upper Evergreen Formation occurs as thin (< 10 m) weathered siltstone and mudstone above the Westgrove Ironstone (as logged in registered bore 160770 which is located on the mapped Westgrove Ironstone Member (Figure 4-3). It is considered that there is a thin cover of upper Evergreen Formation above the Westgrove Ironstone Member but combined and mapped as Westgrove Ironstone Member.

As detailed in Response 3.3, the Dawson River flows over the lower Evergreen Formation, Boxvale Sandstone, and the mapped Westgrove Ironstone Member/upper Evergreen Formation then the younger Hutton Sandstone (as indicated in Figure 4-3 above).

Hydraulic parameter information summarised in Section 4.1.2.1 of the Fairview WRS PD for the Evergreen Formation is based on regional scale (Cumulative Management Area (CMA)) OGIA information. The following review of local registered bore information provides locally based information regarding the hydraulic nature of the lower Evergreen Formation.

Registered bores located on the Yebna property, RN58362 (Figure 4-4), are all reported to be artesian (i.e., unit intersected within these bores is confined above and below by aquitards). These bores must then intersect confined Precipice Sandstone, where the Precipice Sandstone is confined above (by lower Evergreen Formation) and below (by the Moolayember Formation aquitard). Bore logs for RN58147, RN58658, and RN58362, located at similar elevation to waterhole, indicate they were drilled through siltstone and muddy sandstone of the lower Evergreen Formation to access the Precipice Sandstone for water supply.

Figure 4-4 Geology, elevation, and registered bores for the Yebna property (source: Queensland Globe)



Review of the bore reports and aquifer attribution reports for the three registered bores indicates the primary water resource is the Precipice Sandstone and not the lower Evergreen Formation or upper Evergreen Formation. Table 4-1 summarises the primary water bearing sequences in the three registered bores with their respective depths and source formation. Bore report lithology information (drillers logs) from the Evergreen Formation within the three bores do not report significant water resources. Reported water test information completed within the Evergreen Formation of RN58362 within a discrete hard shaley sandstone layer between 73 to 76 meters below ground level (m bgl) reported a yield of 0.31 litres per second (l/s), which is lower than reported yields in the Precipice Sandstone of the three wells that ranged between 6.4 to 16 l/s.

The bore construction data from the registered bore cards, that are within and adjacent to the proposed action area, do not support the comment that the lower Evergreen Formation is:

- 1) not consistent with an aquitard, and
- 2) that the lower Evergreen Formation is a high yielding aquifer.

Reported quality information from the three bores screened or formerly screened in the Precipice Sandstone do indicate high quality water with electrical conductivity (EC) ranging between 120 to 170 µS/cm).

Table 4-1 Summary of Yebna Water Bores, yields and aquifer attribution

	RN 58658	RN 58362	RN 58147
Bore Type	Artesian – Controlled Flow	Artesian – Controlled Flow	Artesian – Controlled Flow
Bore Status	Active - Supply	Abandoned & destroyed	Abandoned & destroyed Replaced by RN 58362
Elevation (estimated, Qld Globe)	255 mAHD	255 mAHD	255 mAHD
Bore Depth (m bgl)	120	122	130

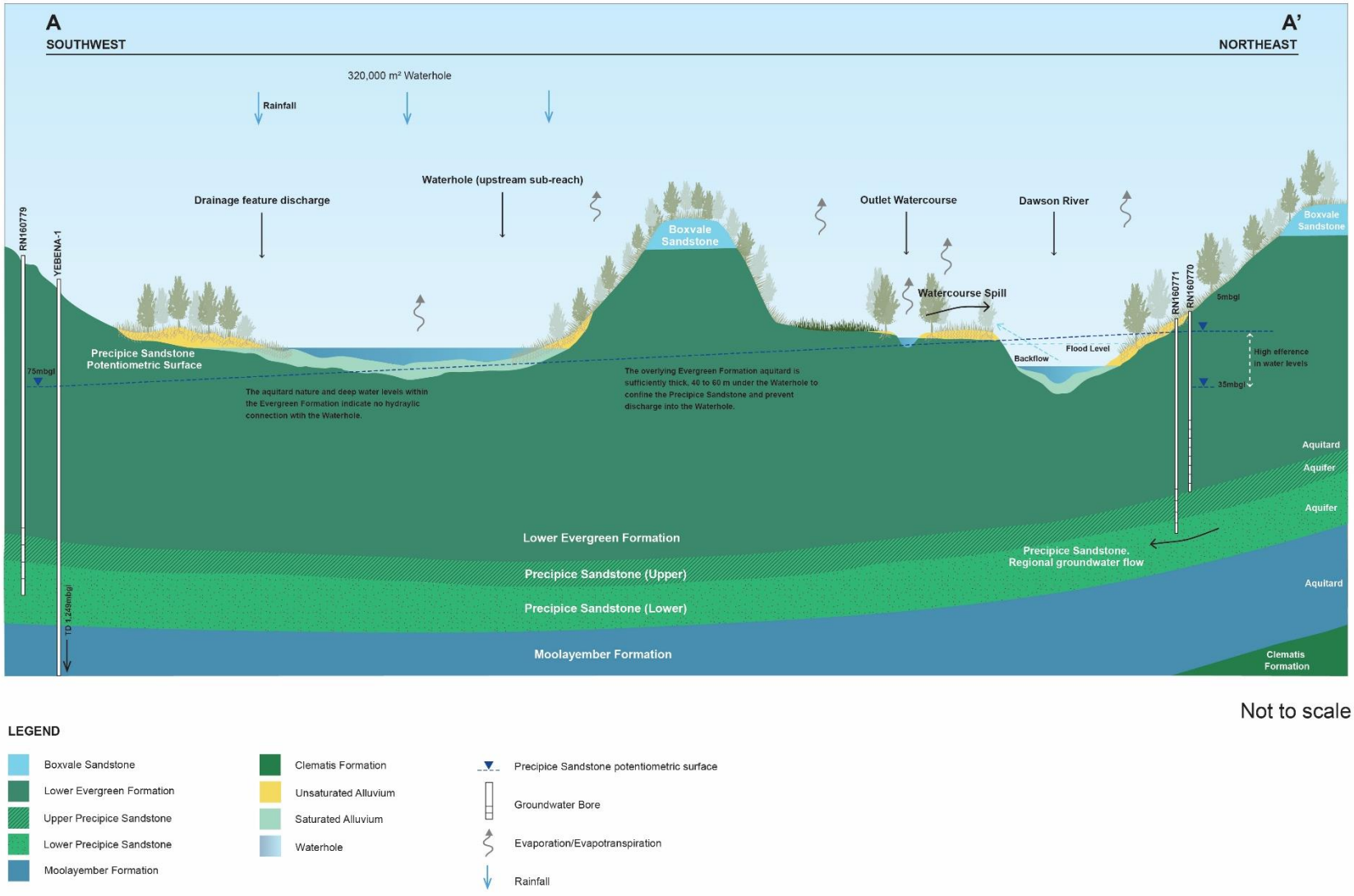
	RN 58658	RN 58362	RN 58147
Bore Casing (m bgl)	0 – 96	0 – 64.5	0 - 70
Slotted Casing (m bgl)	96 – 120	64.5 – 122.53 (open hole)	No reported
Geology summary	0-10 – topsoil 10-24 – sandy clay 24-26 – sandstone (Boxvale?) 26-98 – siltstone & coal (lower Evergreen) 98-100 – grey sandstone 100-120 – 2 mm white sandstone (Precipice)	0 – 11 – not recorded 11 – 18 – sandy shale with ironstone 18-71 – hard sand shale (lower Evergreen) 71-73 – hard shaley sandstone 73-76 – hard shaley sandstone (water – 0.31 l/s) 76-91 – hard grey shaley sandstone 91-97 – hard grey & brown sandy shale 97—103 – white sandstone (Precipice) (water – 4.4 l/s) 103–106 – coarse to fine sandstone 106-122 – sandstone (water – 14.6 l/s)	Not reported
Reported Supply formation	Precipice Sandstone	Precipice Sandstone	Not reported
OGIA Aquifer Attribution	Precipice Sandstone	Lower Evergreen Precipice Sandstone	Lower Evergreen Precipice Sandstone
Test depth and Reported Yield	103-120 – Sandstone – 16 l/s (1,382 m^3/day)	106-122 – Sandstone 14.6 l/s (1,226 m^3/day)	Depth not reported - 6.4 l/s (552 m^3/day)
Electrical Conductivity (EC, µS/cm)	140	120 - 170	165

It is further assessed, based on artesian conditions, and measured baseflow within the Dawson River, that the lower Evergreen Formation is an extensive, continuous, and competent confining aquitard. Field measurements indicate that groundwater from the Precipice Sandstone discharges into the Dawson River at a continuous ~250 L/s only where the lower Evergreen Formation has been eroded away.

This high potentiometric pressure associated with the Precipice Sandstone indicates that if the lower Evergreen Formation were “leaky” or more permeable then there would be springs/groundwater discharge where the Evergreen Formation is mapped. The groundwater piezometric surface map associated with the Precipice Sandstone is included in Figure 4-11 of the Fairview WRS PD and indicates the Precipice Sandstone is highly artesian under the waterhole, but no Precipice Sandstone discharge occurs within the waterhole or Dawson River within proposed action area.

Based on the reported geology in Figure 4-3, the waterhole conceptual groundwater model was updated in Figure 4-5 below to indicate the location of the overlying Boxvale Sandstone more clearly in the vicinity of the waterhole. The Boxvale Sandstone is a member of the Evergreen Formation, which is younger than the underlying lower Evergreen Formation aquitard.

Figure 4-5 Revised conceptual groundwater model for the waterhole and Dawson River



Comment 4.4.2 - Hydrogeological CSM and ground-surface water interaction

Hydrogeological conceptual model and ground-surface water interaction and implications for ground and surface water impacts – Part 2

Data from bore RN160770, screened in the upper Evergreen Formation near the Dawson River, shows rapid, periodic increases in level that decline gradually between rainfall events. (Figure 6 – Hydrograph of Evergreen Formation; a) bore location with respect to oxbow lake and Dawson River, b) groundwater level (m AHD) over time. Data from Queensland Globe)

The bore is screened from 16 to 79 m below ground surface across the Evergreen Formation. Water level is approximately 35 to 40 m below ground surface level; noting that the bore is located at the top of a steep cliff adjacent to the Dawson River channel – elevation at the river channel is approximately 250 m AHD (i.e., similar to the groundwater levels recorded in the bore). The periodic rises and subsequent fall in groundwater level imply that the aquifer has substantial permeability and is recharged rapidly, potentially through pulses of flow from the nearby alluvial channel of the Dawson River when it floods. The groundwater in the bore has a field EC value (last measured in 2014) of 200 µS/cm, consistent with this interpretation and indicating fresh groundwater with minimal solute concentration during recharge (as would be expected for groundwater in an aquitard). As such, a connection between the Dawson and/or its nearby alluvial sediments, and groundwater in the upper Evergreen Formation should be considered a potential key aspect of the conceptual hydrogeological model.

The low TDS groundwater in the upper Evergreen Formation make it a potential high-quality water source for beneficial uses, e.g., landholder water supplies and the maintenance of groundwater dependent ecosystems. This has not been considered or surveyed in the vicinity of the proposed releases – e.g., through landholder bore surveys, and ecohydrological investigations, including sampling for stygofauna in Evergreen Formation bores. Increases in certain contaminants that are elevated in RO treated water (e.g. aluminium, boron and nutrients) in Evergreen Formation groundwater, e.g., via leakage from the oxbow lake wetland, should be considered a possible impact pathway for the groundwater, and this should be assessed based on more comprehensive water quality sampling (and site-specific hydraulic testing) from upper Evergreen Formation bores.

Response 4.4.2

Rainfall recharge within the monitored formation in RN160770 is not relevant to the assessment of potential groundwater-surface water connectivity at the location of the proposed desalinated water release to the waterhole or Dawson River

As indicated in Response 3.3 and 4.4.1 the upper Evergreen Formation and Boxvale Sandstone Member are not in hydraulic connection with the waterhole.

A summary of the findings included in Fairview WRS PD includes:

- The upper Evergreen Formation in the proposed action area occurs as a thin weathered layer consisting of low transmissivity mudstone and siltstone mapped with the Westgrove Ironstone Member and has limited permeability.
- The proposed action discharges into the waterhole located on the lower Evergreen Formation, which is not in hydraulic connection with the younger members of the Evergreen Formation including the Boxvale Sandstone or the Westgrove Ironstone Member and overlying upper Evergreen Formation.
- There is no potential artificial recharge from the waterhole alluvium into the Boxvale Sandstone due to no hydraulic connection, refer to the revised hydrogeological conceptual cross section shown in Figure 4-5.
- No change in water quality, due to blending / mixing, down gradient of the waterhole outlet watercourse and Dawson River confluence is evident (refer to Section 5.5.2 in the Fairview WRS PD). As such any potential recharge from the Dawson River to the Boxvale Sandstone and upper

Evergreen Formation (assuming losing river conditions) would not be different to recharge from the Dawson River without the proposed action.

This indicates that if RN160770 is monitoring the Boxvale Sandstone or possibly other permeable sandstone layers within the upper Evergreen Formation the following conclusions are made:

- This bore and intersected hydrostratigraphic unit will not be impacted as the waterhole is located on top of the lower Evergreen Formation, which is an aquitard and is located at a lower elevation
- Desalinated water is treated to protect the Drinking Water EV of the Dawson River with water quality data from the Dawson River indicating no impact to surface water and therefore no potential pathway for impact to any downstream receptors.

Bore RN160770

Based on the OGIA (2021) generalised stratigraphic units reported in Figure 4-1 of the Fairview WRS PD and Figure 4-3 above, RN 160770 and 160771 are located on the Westgrove Ironstone Member, representing the lower limit of the Evergreen Formation, which overlies the Boxvale Sandstone. The bore logs indicate a thin (< 10 m) layer of weathered siltstone and mudstone of the upper Evergreen Formation in this area.

Klohn Crippen Berger Ltd (KCB) was commissioned by Origin Energy Resources Ltd (Origin) to install monitoring bores RN160770 and RN160771. These bores provide groundwater monitoring data in the Precipice Sandstone (RN160771) and the Evergreen Formation aquitard (RN160770).

RN160770 is screened from 16.6 mbGL to 79.5 mbGL. The placement of the screens was designed to monitor the entire Evergreen Formation from the first water strike to the total depth (79.6 mbGL). A minor seep was struck at 21 mbGL and the next noticeable water strike was located at 45 mbGL.

Airlift development of the bore indicated that a discharge rate could not be measured as a sustained yield could not be maintained. After 30 minutes of airlifting the bore, a volume of 60 L of water was purged before running dry. This indicates a very low permeability. The lithology of the Evergreen Formation was observed to be siltstone, mudstone, with occasional thin fine-grained sandstone layers intersected.

The RN160770 water level hydrograph indicates a response to high intensity rainfall events, which indicates limited recharge into the upper Evergreen Formation and Westgrove Ironstone Member subcrop. The groundwater level response to wet and dry periods indicates:

- The recharge is temporary or sporadic and as such does not indicate hydraulic connection with alluvium, which would (based on the perennial nature of the Dawson River) be regular and continuous
- The decline of the water level indicates limited effective storage.

This water level response to recharge and the airlift development response do not indicate "substantial permeability".

Comment 4.4.3 - Hydrogeological CSM and ground-surface water interaction

Hydrogeological conceptual model and ground-surface water interaction – Part 3

Leakage of discharged water into the underlying Evergreen Formation may in turn affect ground-surface water interaction downstream of the site – e.g., in areas where the Evergreen underlies the Dawson River, water from the formation may discharge into the river during low-flows. Increased rates of baseflow and changes in the chemical composition of groundwater and surface water receiving discharge from the formation is thus a further potential impact pathway that has been given limited consideration.

The IESC highlighted the need for careful characterisation of potential shallow surface groundwater interactions through additional mapping of hydraulic gradients and water quality at different surface water flow stages:

> *"For example, treated water releases, especially at low flows, are very likely to alter hyporheic water chemistry (assuming hyporheic water is chemically different from the released water)*

because of advective exchange in the riverbed in places where groundwater inputs are weak or absent, and this will potentially occur for a considerable distance downstream if the releases continue for years to decades.

Assessing the scale and extent of these potential impacts depends on mapping these areas and their vertical hydraulic gradients at various flows and then inferring the likelihood that impacts to groundwater resources may arise from contamination and, to a lesser degree and in much more localised areas, changes and even reversals in surface water-groundwater exchange."

The response to the IESC's advice argues that the area in question is underlain by the Evergreen Formation 'aquitard' and that the alluvium has limited extent and storage capacity. As such further shallow groundwater quality sampling, mapping of groundwater surface water gradients, and characterisation of potential exchanges (as recommended by the IESC) has not been undertaken. This is a significant potential oversight in the context of the above information.

Response 4.4.3

The conceptualisation that the lower Evergreen Formation, which underlies the waterhole and Dawson River, is a competent aquitard is supported by multiple lines of evidence.

As discussed in Response 4.3.1 and 4.3.2 and Section 4.1.2 of the Fairview WRS PD, the Lower Evergreen Formation is an aquitard.

The Dawson River is incised into the underlying bedrock units adjacent to and downstream of the proposed action area (refer to Response 3.3). As stated in Section 7.13 of the Fairview WRS PD, alluvium within the incised Dawson River sections is limited and consists of transient sediments that are re-distributed during flood flows. Transient sediments within the Dawson River are a discontinuous aquifer with little or no effective storage that is in equilibrium with the overlying Dawson River water. These sediments are washed further downstream and replaced by new sediment during higher flows and flood events.

Macrobenthic monitoring conducted under the REMP is reported in Section 5.3.5.3 of the Fairview WRS PD, including Signal 2 scores and Plecopteran, Ephemeroptera, Trichoptera (PET) scores. The data do not indicate there has been a decline in biological conditions for macrobenthic organisms (including sediment/hyporheic living organisms) over the 2015 to 2022 REMP monitoring period during which desalinated water was released to the waterhole.

Comment 4.5.1 – Groundwater Dependent Ecosystem Sampling (including Stygofauna)

Groundwater dependent ecosystem sampling (including Stygofauna) – Part 1

Sampling for GDEs (including Stygofauna) to characterise baseline ecological values associated with groundwater, remains highly limited. The assessment documentation has 'conservatively' assumed that alluvial sediments will contain stygofauna but these have still not been directly surveyed. It is argued that because hydrochemical and flow regime changes will be small as a result of the releases, there is limited risk to GDEs and they do not require baseline characterisation. This is despite the IESC advice on the earlier version of the proposal stating that:

"Mapping and impact assessment, together with collection of field data at a local scale (i.e., along the Dawson River and its riparian zone within and downstream of the project area) for aquatic, terrestrial and subterranean GDEs (e.g., stygofauna and hyporheos) is required, especially in alluvial sediments of the 12-km reach downstream of the proposed release point for untreated produced CSG water. Particular attention should also be paid to sampling the downstream section of the Dawson River where river water infiltrates into the banks and riverbed, providing potential flow paths into shallow alluvial aquifers. These data are needed to document the post-2015 baseline condition, to enable detection of potential impacts during operation, and to assess the effectiveness of proposed management and mitigation measures."

Response 4.5.1

The release of untreated Produced CSG water under high flow events is no longer a component of the proposed action. The water treated by desalination to protect the Drinking Water EV of the Dawson River and water quality data in the Dawson River indicates water quality achieves the respective 95% SPL or is equivalent to pre-existing upstream water quality and is protective of stygofauna.

The IESC comment specifically references and the untreated produced CSG water within the 12 km of the Dawson River between Dawson Bend and the confluence of the waterhole watercourse and Dawson River. The current application does not propose to release untreated CSG water and therefore this IESC comment is no longer applicable. The IESC statement quoted also indicates that the data is needed to "…*document the post 2015 baseline condition*" (after desalinated water started to be released to the waterhole) in that section of the river and "…*to assess the effectiveness of proposed management and mitigation measures"* for the formerly proposed untreated release.

Comment 4.5.2 – Groundwater Dependent Ecosystem Sampling (including Stygofauna)

Groundwater dependent ecosystem sampling (including Stygofauna) – Part 2

The lack of field sampling and characterisation of GDEs is, notwithstanding the removal of un-treated CSG releases from the proposal, an important knowledge gap. It is certain that the releases of treated water will change both the flow regime and the chemistry of both surface water and groundwater of the area to some degree. While it may be likely that the releases do not result in significant and frequent exceedances of current water quality objectives (noting issues with the current objectives discussed in previous sections of this report), it is unclear whether changes due to treated water releases (such as an increase in boron and aluminium concentrations, or changes in the balance of nutrients and organic matter in the water) may negatively impact on GDEs. In its response to the IESC advice on the matter, the proponent argues a) that there is a low level of risk to GDEs and b) that this is grounds for not needing to conduct baseline sampling of GDEs:

> *'..the desalinated water releases present a low risk to such fauna as the releases are unlikely to contribute to these habitats. If there is any contribution, the desalinated water quality is treated to a high quality and will be highly attenuated by background flows of the Dawson River'*

The Department of Agriculture, Water and Environment's advice on this issue is however important:

> *"Desalinated water releases, especially at low flows, are very likely to alter hyporheic water chemistry (assuming hyporheic water is chemically different from the released water) because of advective exchange in the riverbed in places where groundwater inputs are weak or absent, and this will potentially occur for a considerable distance downstream if the releases continue for years to decades."*

Without baseline sampling of GDEs or studies into their specific ecohydrological characteristics and requirements, along with robust analysis of ground-surface water interactions (encompassing the Evergreen Formation – see section 4 above) it will not be possible to assess changes to the health or condition of GDEs as a result of the releases in the ongoing monitoring program.

Response 4.5.2

Stygofauna in the Dawson River are generally present in low diversity and abundances and commonly consist of nematodes and copepods from a variety of families. Desalinated water is treated to protect the Drinking Water EV of the Dawson River and water quality data in the Dawson River indicates water quality achieves the respective 95% SPL or is equivalent to pre-existing upstream water quality and is protective of stygofauna.

Section 6.3 of the Fairview WRS PD provides revised mapping of aquatic and terrestrial GDE based on survey data.

Groundwater-surface water interactions are addressed in Response 4.4.1 to 4.4.3.

The proposed desalinated water releases are consistent with the current desalinated water release scenario that has occurred since 2021 as indicated in Figure 2-3 of the Fairview WRS PD.

No aquifer drawdown or reduction of groundwater or subsurface flow can occur due to the lower Evergreen Formation aquitard and thus local alluvial habitat for stygofauna will not change from the existing scenario.

The impact assessment was undertaken based on the assumption that stygofauna occur in the proposed action area and receiving environment as provided in comment responses to the IESC and Section 6.3.3 of the Fairview WRS PD. The impact assessment also identifies that stygofauna are generally present in low diversity and abundances and commonly consist of nematodes and copepods from a variety of families. Current information investigating the toxicity of contaminants to stygofauna (Canivet et al., 2001; Hose et al., 2016, 2019; Reboleira et al. 2013) have shown that stygofauna are more tolerant to acute and chronic exposure and therefore water quality guidelines used for surface dwelling species as defined in ANZG (2018) also protect stygofauna.

When conservatively compared to sub-reginal WQO and/or ANZG (2018) the 95% percentile or maximum (where insufficient detection above LoR are present) only boron, zinc and ammonia are exceeded. Each of these parameters is discussed in detail in Section 5.3.1 of the Fairview WRS PD.

Based on the assessment presented above the proposed releases are expected to have negligible impact to GDEs including stygofauna, terrestrial and aquatic GDE.

Comment 4.6.1 – Overall context of produced water and brine management

Overall context of produced water and brine management – Part 1

The treatment of CSG water by reverse osmosis, for release into the receiving environment and other uses, will result in large quantities of brine from the reverse osmosis process - approximately 10% of the volume of water treated. It is unclear from the FWRS proposal how such brine is to be managed, other than its diversion to storage ponds. A long-term management strategy as these ponds fill with increasing volumes of brine is not outlined.

Leakage and/or overflow from brine ponds may present a risk to nearby ground and surface water resources, and under conditions of extreme weather (e.g., flooding) there may be a considerable risk of uncontrolled releases.

Response 4.6.1

The production, management and disposal of water treatment products does not form part of the proposed action.

The proposed action EPBC 2021-8914 is an application for the release of desalinated water generated by the GFD Project via existing infrastructure to the ephemeral drainage line, waterhole, watercourse, and Dawson River.

Brine dam infrastructure are not a component of EPBC 2021-8914 referral.

Comment 4.6.2 – Overall context of produced water and brine management

Overall context of produced water and brine management – Part 2

The updated proposal documentation indicates that only approximately 20% of the CSG produced water generated from Santos' gas fields in the region will be managed through releases of RO treated water into the oxbow lake wetland under the FWRS. The predominant water management strategy (encompassing at least 60% of the water) is re-use through forestry and crop irrigation (e.g., Figure 2-1 reproduced from the report, below). The re-use for irrigation appears to include unspecified mixtures of RO treated and untreated CSG produced water. Characterisation of the mixtures, and associated water qualities, along with anticipated volumes used in irrigation are needed to fully understand potential environmental impacts of this management strategy.

Evidence from the RMIT capstone research showed that surface water near existing Santos irrigation schemes (site DRR2 along Hutton Creek, also labelled CR2 – see Figure 2 of section 1) is suffering from poor water quality – with high turbidity, total iron, aluminium and nitrogen concentrations compared to other surface water sites in the region, and a visible algal coating on the water body (see Figure 1).

(Table 1 – Water quality data from site CR2 along Hutton Creek within an area draining Santos' irrigation schemes, sampled on 25/7 to 26/7, 2022. Site localities indicated in Figure 1.)

If such irrigation schemes are to be significantly expanded, there is a critical need to fully assess the impacts of their runoff on local surface water, groundwater, sediment and soil quality. It is unclear whether this is adequately documented and analysed in existing water management plans for the GLNG and GFD projects (as opposed to the FWRS proposal), and whether there could be impacts on matters of national environmental significance arising from these irrigation schemes.

Response 4.6.5

The irrigation of coal seam water does not form part of the proposed action.

The proposed action EP 2021-8914 is an application for the release of desalinated water generated by the GFD Project via existing infrastructure to the ephemeral drainage line, waterhole, watercourse, and Dawson River.

The irrigation component of the Fairview Water Release Scheme for the GFD project has been assessed and approved under EPBC 2012/6615.

5.0 Lock the Gate Alliance

A copy of the complete submission from the Lock the gate is presented in Appendix D.

The following comments are sourced from the Lock the Gate submission that contained the Supporting Annexure as supporting material. Where a comment response has addressed or provided information within the Supporting Annexure a cross reference to that response will be made.

Submission 1 to 7 from Lock the Gate provide general background and introduction to the submission and no responses are required.

Comment 5.1 – Grounds for Submission

Grounds for Submission

8 The Minister should decide that the Proposed Action be refused.

9 In support of this contention, we note the following mandatory considerations:

(a) the Proposed Action will have a significant impact on listed threatened species and communities, including the White-throated Snapping turtle (Elseya albagula) and the Fitzroy River turtle (Rheodytes leukops); and

(i) is inconsistent with international obligations; and

(ii) is inconsistent with relevant national recovery plans.

(b) the Proposed Action may have a significant impact on water resources and is inconsistent with the Water Plan (Fitzroy Basin) 2011;

(c) economic and social impacts including that approval would:

(i) cause cultural and spiritual harm to Traditional Owners through impacts to flora, fauna, waterways, and Country more broadly; and

(ii) provide no specific social or economic benefits to local communities in relation to the Proposed Action;

(d) principles of ecologically sustainable development;

(e) Santos' history in relation to environmental matters, including the history of its executive officers and parent bodies.

10 Further detail on each of the above grounds is set out below.

Response 5.1

8 Comment is noted.

9 (a) – Section 7.2 of the Fairview WRS PD assesses the impact of the proposed action on MNES turtles including a significant impact assessment against the requirements of the Significant Impact Guideline 1.1 considering associated guidance documents.

The Significant Impact Assessments are presented in Table 7-2 for *E. albagula* (Critically Endangered) and Table 7-3 for *R. Leukops* (Vulnerable).

The supporting data demonstrate that no significant impact to MNES turtles within and downstream of the proposed action area is expected.

9 (b) – The comment is noted.

The proposed action is for the release of desalinated water under a release regime that has occurred since 2015 for the GLNG Project and monitored under the REMP required by the State EA.

Potential impacts of the continued release of desalinated water have been assessed against the requirements of the Significant Impact Guideline 1.3. The assessment has not identified significant impact to water resources that ***are of sufficient scale or intensity as to significantly reduce the current or future utility of the water resource for third party users, including environmental and other public benefit outcomes.***

The Water Plan (Fitzroy Basin) 2011 is a catchment wide plan for balancing the water resource needs for human use and ecological use across both undeveloped and developed (including agriculture) areas.

Section 13 of the Water Plan (Fitzroy Basin) 2011 (current as of 12 September 2022) provides the specific surface water and groundwater outcomes applicable to the Upper Dawson. Section 14 of the Water Plan (Fitzroy Basin) 2011 provides the specific General ecological outcomes.

The assessment presented demonstrates that these outcomes will be maintained by the proposed action.

9 (c) The economic and social impacts of the GLNG and GFD projects are summarised in Section 1.6 of the Fairview WRS PD. The proposed action is covered within the current Social Impact Management Plan for the GLNG and GFD projects.

Local communities are regularly engaged at a number of levels as detailed in Section 1.6.2 of the Fairview WRS PD.

Indigenous engagement is detailed in Section 1.6.3 of the Fairview WRS PD and Santos operate under Cultural Heritage Agreements; a cultural heritage management plan (CHMP) and cultural heritage management agreement (CHMA) with the Iman #4 and Wardingarri people. Economic matters are summarised Section 1.6.4 of the Fairview WRS PD, with current GLNG and GFD projects generating 1,000 direct and indirect roles.

9 (d) Ecologically sustainable development principles are incorporated into the proposed action under both the Commonwealth and State regulatory requirements.

9 (e) The environmental record of Santos is provided in Section 1.7 of the Fairview WRS PD.

Comment 5.2 – Significant Impact on listed threatened species and communities

A. Significant impact on listed threatened species and communities

Impacts apparent based on information available

11 The Proposed Action will have significant impacts on listed threatened species and communities, specifically the White-throated Snapping turtle (Elseya albagula) and the Fitzroy River turtle (Rheodytes leukops), due to negative effects of the Proposed Action on critical habitat and breeding areas.

12 The Significant Impact Guidelines 1.1 Matters of National Environmental Significance (Significant Impact Guidelines 1.1) set out relevant criteria for determining what constitutes a 'significant impact' to critically endangered species. Relevantly, those guidelines provide that an action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

(a) lead to a long-term decrease in the size of a population;

(b) reduce the area of occupancy of the species;

(c) adversely affect habitat critical to the survival of a species;

(d) disrupt the breeding cycle of a population; and

(e) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

13 The Significant Impact Guidelines 1.1 define habitat critical to the survival of a species or ecological community as (amongst others) areas that are necessary for activities such as foraging, breeding, roosting, or dispersal.

14 Habitat critical to the survival of the White-throated Snapping turtle is defined in the National Recovery Plan for the White-throated Snapping Turtle (Elseya albagula) (December 2020) (National Recovery Plan) as:

(a) parts of riverine systems with permanent water, including pools, within the species' distribution that contain shelter and refuges (e.g. bank overhangs, overhanging riparian vegetation, macrophyte beds, moderate to high densities of submerged boulders and/or log jams); and

(b) all currently known and new aggregated nesting sites (all nesting sites should be considered to be part of an aggregation unless it can be demonstrated otherwise).

Response 5.2

The comment is acknowledged as the introduction to the subsequent sections and comments addressed in those sections accordingly.

Comment 5.3 – Waterhole as Habitat

15 It is submitted that the Waterhole constitutes habitat critical to the survival of the White-throated Snapping Turtle for the following reasons:

(a) the Waterhole comprises foraging habitat because it has:

(i) extensive macrophyte beds in the shallow upstream (western) end of the Waterhole, 30 of which were described as "macrophytes dense on both left and right banks (moderate beds of Vallisneria sp., Ludwigia peploides, Myriophyllum sp. and Azolla sp);

(ii) microcrustacean presence in the Waterhole including Daphnia sp1, Daphnia sp 2, Chydoridae (Cladoceran 1), Cladoceran 2, Bosminidae (Cladoceran 3), Copepod 2 (Cyclopoida), Copepod 1 (Calanoida), Ostracod 2, Ostracod 1, Ostracod 3;

(iii) leaves and stems of terrestrial plants and tree roots from riparian vegetation, which were described as follows:

Dead shrubs and trees in water along edge suggest previous lower water levels…Little bare ground in riparian zone. Right bank riparian vegetation is dominated by grasses with some scattered Eucalypts. Left bank riparian vegetation is dominated by large Eucalypts, with grass understory.

(b) The National Recovery Plan defines 'habitat critical to the survival' of the White-throated Snapping Turtle as including pools that contain shelters and refuges such as macrophyte beds. This description fits the Waterhole.

16 The Waterhole may also be considered breeding habitat for the White-throated Snapping Turtle because:

(a) the presence of the White-throated Snapping Turtle was confirmed at the Waterhole and the species does not have separate breeding and non-breeding zones; and

(b) the unconsolidated silt banks of the Waterhole could provide nesting habitat for threatened turtles.

Response 5.3

The Waterhole is not habitat critical to the survival of the White-throated Snapping Turtle.

Section 1.2 of the National Recovery Plan for the White-throated Snapping Turtle (*Elseya albgula)* states *habitat critical to the survival of this taxon is defined as:*

- *Parts of riverine systems with permanent water, including pools, within the species' distribution that contain shelter and refuges (e.g. bank overhangs, overhanging riparian vegetation, macrophyte beds, moderate to high densities of submerged boulders and/or log jams).*
- *All currently known and new aggregated nesting sites (all nesting sites should be considered to be part of an aggregation unless it can be demonstrated otherwise).*

Section 4.2.3.4 and Section 7.1.3.2 of the Fairview WRS PD discusses the ephemeral nature of the waterhole prior to desalinated water releases in 2015. The baseline ephemeral nature was supported by observations and measurements made during the baseline monitoring program (2012-2015). Furthermore, historical records indicate that the waterhole can dry completely prior to desalinated water releases commencing in 2015.

The waterhole is perennial only under the modified condition of desalinated water releases since 2015 and ephemeral under pre-2015 conditions as discussed in Section 4.2.3.4 of the Fairview WRS PD. The waterhole does not achieve the definition of habitat critical to the survival of the species as defined in the National Recovery Plan.

It was noted in Section 7.1.2 of the Fairview WRS PD that the waterhole comprises potentially suitable habitat for MNES turtle species, including macrophyte beds, abundance macroinvertebrate and fish communities, and other food resources such as fallen terrestrial vegetation matter. Turtle monitoring data presented in Section 7.1.3.2 of the Fairview WRS PD demonstrates that a single white-throated snapping turtle (and zero Fitzroy River turtles) have been caught from the waterhole between 2015 and 2023. Conversely large numbers of Kreft's river turtles have been caught and modest numbers of broad-shelled river turtle and eastern long-neck turtle have also been caught.

In contrast, the MNES turtle species are regularly caught at multiple sites on the Dawson River and Hutton Creek. The REMP monitoring data thus indicates that white-throated snapping turtle uses the waterhole as habitat periodically or occasionally, but both MNES turtle species utilise aquatic habitat of the Dawson River more regularly and in larger numbers as empirical REMP data indicates and therefore the Dawson River habitat is more important.

Nonetheless, for the purposes of assessment and management, the waterhole is conservatively considered important habitat for MNES turtles, and turtles are regularly monitored in the waterhole under the REMP. Desalinated water releases completed from 2015 to 2022 has caused no adverse impact to habitat characteristics of the waterhole. Macroinvertebrate data from the REMP indicates that indices of sensitive macroinvertebrate communities (e.g. SIGNAL-2 Score) have improved since 2015 based on higher quality littoral habitat at the margins of the waterhole under the perennial water regime as indicated in Figure 5-2 of the Fairview WRS PD.

Potential nesting banks for MNES turtle species above full supply level in the waterhole are not inundated by the release due to the spill point via the downstream outlet to the Dawson River when full supply level is reached. However the waterhole is accessible along its entirety to cattle for drinking. As specified in Section 7.2.4 of the Fairview WRS PD, and the National Recovery Plan for the White-throated Snapping Turtle (Elseya Albagula) the primary threat to MNES turtles is the low recruitment due to nest predation and nest bank trampling.

While the waterhole comprises likely suitable refuge habitat for MNES turtle populations, as noted in the PD, known habitat critical to the survival of these species occur extensively along the Dawson River and other sub catchments of the Fitzroy River Basin.

Comment 5.4 – Dawson River habitat impact

17 The low sandbanks of the Dawson River constitute habitat critical to the survival of the White-throated Snapping Turtle because:

(a) The Recovery Plan states that all currently known and new aggregated nesting sites (all nesting sites to be considered part of an aggregation unless otherwise demonstrated) are considered habitat critical to the survival of the species. Notably, the Recovery Plan does not discriminate between nesting sites that are more vulnerable to inundation (i.e. low-level nesting sites) and high-level nesting sites;

(b) The Boobok Report states that "published data for nesting sites of the White-throated Snapping Turtle in the Mary, Burnett, and Fitzroy Rivers indicate that a variety of nesting locations may be used by the Turtles. (Hamann et al. 2004, Limpus et al. 2011). These include in-stream and on-bank flood-deposited sandbanks as well as sandy to loamy soils on riverbanks." This indicates that the in-stream and low sandbanks of the Dawson River also constitute potential nesting locations; and

(c) given that the survival rate of hatchlings and juveniles is extremely low, a precautionary approach should be taken to protect all nesting sites of the White-throated Snapping Turtle.

Response 5.4

The proposed action will not impact habitat critical to the survival of the White-throated Snapping Turtle. Surveys and REMP monitoring observations have not identified nesting on low sandbanks within 0.05 m vertical distance of existing water levels.

Section 7.1.2 of the Fairview WRS PD describes the aquatic habitats of the action area with respect to MNES turtle habitat preferences and Section 7.1.3 describes field habitat observations within the Dawson River. Lotic (flowing water) habitat features, such as riffles, runs and glides with connected with pool habitats, such as those of the Dawson River, were identified as preferred habitat features for white-throated snapping turtle and Fitzroy River turtle.

Section 7.1.3.3.2 of the Fairview WRS PD describes the observed presence of nesting habitat along the Dawson River during the 2021 habitat survey between 0.6 m and 5 m above the water level observed at

the time. The nests identified in the survey were located on the slopes and crests of the inner high bank. Three of the four nests were considered to belong to *E. Albagula*. Three of the four nests were observed to be predated and disturbed. As noted in the National Recovery Plan, these nests are assumed to comprise part of a nesting aggregation along the Dawson River.

REMP data presented in Appendix F of the Fairview WRS PD indicates that both threatened turtle species have been caught in low abundance on a regular basis at multiple sites on the Dawson River and Hutton Creek. The ecohydrological model shown in Figure 3.4 of the Fairview WRS PD demonstrates that the measured 0.05 m (5 cm) water level rises in the Dawson River due to the desalinated releases do not inundate observed MNES turtle nesting banks.

The Dawson River at Fairview is acknowledged to consist of habitat critical for the survival for white-throated snapping turtle and Fitzroy River turtle, noting that habitat critical for the survival of these species also occurs extensively along other reaches Dawson River and other sub catchments of the Fitzroy River Basin.

Comment 5.5 – Water flow changes and turtle breeding

18 The Proposed Action poses risks to critical habitat and breeding areas for the White-throated Snapping turtle as the introduction of 18ML per day will change surface water flows and landscape features that are integral to that habitat. For example, it is predicted that the proposed water release will result in an increase in water depth of 0.05m. This increase in water level threatens the existence of riffles (being shallower, faster moving sections of a stream) which are important to maintaining critical habitat, and poses inundation risks to low lying nesting areas.

19 Increased water flow further disrupts the breeding cycle of the White-throated Snapping Turtle, which breeds during the dry season as this is when nesting habitats are least likely to be scoured out or flooded. Disruption of breeding cycles is particularly problematic as the species have relatively small home ranges, they commonly utilise stream lengths of less than 1 km and do not have separate breeding and non-breeding zones. This makes the White-throated Snapping turtle particularly sensitive and vulnerable to changes in habitat.

Response 5.5

The proposed action will not impact habitat critical to the survival of the White-throated Snapping Turtle. **Proposed desalinated water releases are intermittent and at the lower range of natural rainfall flow depth variability for the Dawson River.**

18 - Sediments within the Dawson River are noted in Section 4.4.3 of the Fairview WRS PD to be transient and highly dynamic due to the high flow variability. Riffles and run habitat are constantly shifting and are present throughout the proposed action area, and up-stream, at various flow depths based on the last depositional cycle. New sediment is always being washed into and out of the proposed action area. The 0.05 m intermittent increase in flow depth during a typical five to 14 day release cycle is 1) temporary in nature and 2) within the range of existing runs and riffles present within the proposed action area.

REMP survey data between 2015 and 2022 includes survey of river habitat including riffles and runs as part of the macrobenthic survey. Riffles were located at all Dawson River sites under baseflow conditions. Water chemistry data presented in Appendix E-2 of the Fairview WRS PD does not display any decrease in dissolved oxygen downstream of the waterhole outlet watercourse and Dawson River that may be associated with a decrease in flow depth of riffles and runs.

19 - Figure 3.4 of the Fairview WRS PD indicates that observed 0.05 m increases in water level will not inundate observed MNES turtle nesting banks during the dry season. Empirical data from the REMP indicates there is no observed risk to bed or bank geomorphology (or subsequent risks to turtle nesting banks) due to the release. Figure 5-10 and Figure 5-11 in the Fairview WRS PD indicates water level increases associated with local or upstream rainfall events during the dry season and MNES turtle nesting season are equal to or much greater than the observed 0.05 m increase during desalinated water release events.

As indicated in Response 5.4, MNES turtle nests were observed above 0.6 m from the water level at the time of the 2021 survey.

Comment 5.6 – Inconsistency with International Obligations

Inconsistency with international obligations

20 The Proposed Action should not be approved by the Minister as approval would be inconsistent with Australia's obligations under the Biodiversity Convention 1992, specifically:

(d) Article 8(i) which provides that each party shall, as far as possible and appropriate '[e]ndeavour to provide the conditions needed for compatibility between present uses and the conservation of biological diversity and the sustainable use of its components';

(e) Article 10(d) which provides that each party shall, as far as possible and appropriate '[s]upport local populations to develop and implement remedial action in degraded areas where biological diversity has been reduced'.

21 Approval of the Proposed Action would be inconsistent with these obligations due to biodiversity considerations relating to the significant impacts to listed threatened species described above.

Response 5.6

The Comment is noted and is a matter for Government. The outcomes of this assessment however show that there is a low risk of significant impact to MNES from the proposed action and therefore considered that environmental outcomes under such obligations would be achieved.

Comment 5.7 – Inconsistency with National Recovery Plan

Inconsistency with National Recovery Plan

22 Approval of the Proposed Action is inconsistent with the National Recovery Plan for the White-throated Snapping Turtle (Elseya albagula) (December 2020) (Recovery Plan) including:

(f) the objective to enhance the condition of habitat across the White-throated Snapping Turtle's range to maximise survival and reproductive success;

(g) the recovery strategy to improve stream flow and habitat quality throughout the species' distribution.

23 Approval of the Proposed Action does not contribute to any of the noted criteria for success, and instead are likely to result in events noted under criteria for failure, due to impacts described above.

24 There is no National Recovery Plan for the Fitzroy River turtle.

Response 5.7

Refer to Response 5.6.

Comment 5.8 – Need for Further Information

Need for further information

8 The Preliminary Documentation primarily relies upon the following documents to reach the conclusion that the White-throated Snapping Turtle is unlikely to occur in the Waterhole:

(a) a report by Boobook Ecological Consulting Dawson River Proposed Action Area Habitat Survey and Impact Assessment for White-throated Snapping Turtle and Fitzroy River Turtle (BooBook Report);

(b) annual receiving environment monitoring program (REMP) reports by frc environmental; and

(c) a report by frc environmental Dawson River Scheme Turtle Assessment June 2019 (frc Turtle Assessment).

9 The Boobook Report is problematic for the following reasons:

(a) The Boobook Report was conducted with the aim of identifying the potential of the proposed action area to provide shelter, foraging and breeding (nesting) habitat of the White-throated Snapping Turtle and Fitzroy River Turtle.

(b) Boobook did not conduct any observational or trapping surveys for the White-throated Snapping Turtle and Fitzroy River Turtle. Boobook states that it did not have enough time to do so and there was no need for such surveys as (1) the species were already known to occur in the area and (2) the project time frame did not enable it to conduct species-specific surveys.

(c) The Boobook Report and the Preliminary Documentation rely on frc Turtle Assessment, which states that the White-Throated Snapping Turtle was only captured at a single location from 2013-2019. As a key survey report, the frc Turtle Assessment should be provided as part of the Preliminary Documentation. However, it was not included.

(d) It is unclear whether Boobook was able to access the entire frc Turtle Assessment as Boobook states that: While it is unclear what habitat types was present at sites where frc environmental (2019a) trapped this species and R. leukops in the river, their methods – cathedral traps and fyke nets – suggest pools and/or deeper runs or glides…

(e) It is unclear why passive surveys such as cathedral traps and fyke nets were used by frc. The Survey Guidelines for Australia's Threatened Reptiles state that:

(i) snorkelling, is the preferred and generally most successful method of surveying for threatened turtle species; and

(ii) seining, which involves actively dragging a net, has been used effectively in capturing chelid turtles in lagoons, streams and lakes.

(f) Boobook's assessment of nesting sites was only conducted on 14 June 2021.37 Given that the White-throated Snapping Turtle has an extended nesting season of around 7 months, with breeding from May-December, there arguably should have been replicate surveys during the breeding season during various flow conditions.

10 In light of these methodological issues, further assessment should be undertaken to understand the extent of the White-throated Snapping Turtle population in the area prior to any approval being made in relation to the Proposed Action.

Response 5.8

Ecological monitoring of the Waterhole by Santos has been effective at determining the presence or absence of MNES turtles.

Monitoring of MNES turtles has occurred since 2012 and will continue under the REMP. Turtle monitoring historically used fyke nets and baited cathedral traps, both of which successfully capture MNES and other turtles.

The REMP has been updated to include snorkelling as a potential additional method of MNES turtle survey, however limitations have to be considered based on conditions experienced during each survey period as indicated in *The Survey Guidelines for Australia's Threatened Reptiles*. It is noted that the waterhole is up to 100 m in width with large amounts of submerged and emergent woody debris present. The effectiveness of sein netting in the waterhole would be limited where there is woody debris present.

A recent REMP survey in April 2023 used cathedral traps, fyke nets and snorkelling to assess threatened turtles. High turbidity limited the effectiveness of snorkelling, and turtles were only detected using cathedral traps and fyke nets. While the guideline indicates snorkelling is a suitable methods for threatened turtles, this is only true for waters with low turbidity (high visibility).

Comment 5.9 – Need for further information

Need for further information

11 Santos has failed to demonstrate that the Proposed Action will not significantly impact the groundwater and surface water resources. Rather the Proposed Action will result in changes to the hydrology and water quality of the Waterhole and the Dawson River and further, poses risks to the future environmental utility of those water resources.

12 Applying the precautionary principal, and in light of the requirement for the Minister to be satisfied that there is enough information in the Preliminary Documentation for assessment by way of that documentation, the Proposed Action should not be approved.

13 In particular, there are significant data and knowledge gaps relevant to the assessment of water and environmental impacts of the Proposed Action gaps in baseline characterisation of the region's water quality, hydrology, hydrogeology and eco-hydrological relationships.

14 Annexure A to these submissions is a report 'Analysis of Fairview Water Release Scheme: Impact and risk assessment for water and connected environmental values' prepared by Professor Matthew Currell et al in response to the Proposed Action and Preliminary Documentation. That report sets out in further detail the knowledge and data gaps.

Response 5.9

The potential effect of the proposed action on the environment is extremely well studied and has been monitored over many years of operation.

11 and 13) – The comments are noted. Please refer to Responses 2.2, 3.1, 3.2, 4.1.1 to 4.3.3.

The Fairview WRS PD assessment has utilised multiple lines of evidence, site specific data that has been collected in accordance with the hierarchy of data required by ANZG (2018) and the Queensland Environmental Protection (Water and Wetland Biodiversity) Policy 2019 drawing on 10 years of site-specific monitoring data completed under the REMP, together with additional information from baseline studies completed prior to 2013. Water quality results and biological monitoring have not detected significant changes to the downstream ecosystem or environmental utility of water (Response 2.2, Response 3.2, Response 4.1.2).

River flow data has been monitored at S4 since 2012 on a 30-minute period and provides a high-resolution data set representative of flow conditions within the proposed action area as identified in Response 3.1.

The data set drawn on for assessing impacts from the proposed action is considered sufficient for the purpose of the assessment of potential impact.

12) Section 13 of the Significant Impact Guidelines 1.3, stating the Minister must take consideration of the precautionary principle when deciding an action is a controlled action. The SIG 1.3 defines the precautionary principle in the context of the Guideline as *if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation*.

As indicated above the information referenced in the Fairview WRS PD has drawn on more than 10 years of site monitoring data and relevant data from additional sources to assess the impact of the proposed action on MNES and water resources.

14) Please refer to Section 4.0 of this document for Responses to comments detailed within the Supporting Annexure.

Comment 5.10 – Detrimental economic and social impact

Detrimental economic and social impacts

16 The economic and social impacts identified by Santos are not sufficiently tailored to the Proposed Action, and address Santos' activities in the region more broadly rather than the social and economic impacts to the community who will be impacted by the Proposed Action.

17 Part 1.6 of Santos' Preliminary Documentation addresses economic and social impacts and indicates that a Social Impact Assessment (SIA) was undertaken prior to commencement of the Gladstone Liquified Natural Gas Project (of which the Santos GFD Project and the Proposed Action are smaller components).

18 The SIA relied on by Santos addresses coal seam gas fields over an area of over 1,660,000 hectares as well as the required gas transmission pipeline and liquefied natural gas (LNG) facility. Conversely, the Proposed Action is a smaller component of the larger project and will impact the local community in a specific and distinct manner.

19 In the Preliminary Documentation, the Waterhole and Dawson River are assessed by Santos as being of moderate and high cultural and spiritual value, respectively.

However, the social impacts resulting from cultural and spiritual harms to First Nations People caused by the Proposed Action are not addressed in the Preliminary Documentation. Nor is there any indication of whether Traditional Owners or the local community will receive any economic benefits relating to the Proposed Action, or compensation relating to loss, harm or damage resulting from it.

Response 5.10

The Social Impact Assessment (SIA) provides strategic direction for all activities including proposed action which falls in the Fairview project area.

16-18. The SIA is the systematic appraisal in advance of impacts on the day-to-day quality of life of persons and communities whose environment is affected by a proposed project or plan. The SIA found that Santos' activities will be minimal and manageable given the remote location of the Proposed Action Area, the nature of the proposed water releases and that no additional employees are required for the operational phase of the project. Please find further information in the Preliminary Document (Section 1.6.1 Economic and social impacts).

19. Santos recognises and appreciates the cultural significance of the land on which our business operates. We have been working in partnership with the Iman people since 2008 and continue to engage with Traditional Owners throughout the lifecycle of the project. Our Cultural Heritage Management Plans and Cultural Heritage Management Agreements for both GLNG and GFD projects were developed in partnership with Wardingarri-Iman people, and we continue to work together on land management plans. Additionally, Santos provides cultural awareness training to contractors and Santos staff who undertake any activity of creating ground disturbance as well as providing training to the wider workforce to increase our cultural competency.

Santos is committed to sharing the positive economic and social benefits of natural gas to ensure a sustainable future for both Santos and the community. Please find further information in the Preliminary Document (Section 1.6.3 Indigenous Engagement).

Comment 5.11 – Principles of ecologically sustainable development

Principles of ecologically sustainable development

20 The Proposed Action does not conform to principals of ecologically sustainable development (ESG).

21 The principles of ESD are described in section 3A of the EPBC Act. Relevant to the Proposed Action, they are as follows:45

(a) decision-making processes that effectively integrate long-term and short-term economic, environmental, social and equitable considerations;

(b) not using lack of scientific uncertainty to postpone measures that prevent environmental degradation where there are threats of serious or irreversible damage;

(c) the principle of intergenerational equity – that the health, diversity and productivity of the environment should be safeguarded by the present generation for the benefit of future generations; and

(d) the conservation of biological diversity and ecological integrity as a fundamental consideration in decision-making.

22 Table 10-1 in Santos' Preliminary Documentation addresses the implementation of principles of ESD.46 The following outlines Santos' failure to implement principals of ESD, in relation to each of the principle outlined above respectfully:

(a) Santos fails to demonstrate for its policy to 'avoid', 'minimise', 'mitigate', 'remediate and rehabilitate' and 'offset' have been applied in relation to the impacts from the Proposed Action. Further, it focused primarily on the economic benefits of its proposed decision-making processes without sufficient regard to the social and equitable considerations.

(b) Santos has committed to considering the precautionary principle throughout all phases of the project development without defining it or adequately outlining how the principle would be considered, nor has it provided a proposed management plan outlining its preventative measures where threats of serious or irreversible environmental damage arise.

(c) Beyond general statements relating to minimising harm from its activities, Santos has failed to demonstrate how the Proposed Action would ensure the maintenance of the health, diversity and

productivity of the environment for the benefit of future generations. There is for example no consideration of any rehabilitation plans in relation to the Proposed Action.

(d) Approval of the Proposed Action would undermine the biological diversity and ecological integrity of the Waterhole and Dawson River. Santos has not provided any plan or strategy to ameliorate negative impacts and accordingly has not demonstrate implementation of this principle.

Response 5.11

Santos is committed to creating a sustainable future for the communities in which it operates.

As detailed in Section 10.0, 10.1 and Table 101 in the Fairview WRS PD, Santos has undertaken a comprehensive assessment on the Proposed Action to understand and mitigate potential impacts and environmental risks. We are committed to creating a sustainable future and providing long-term value to our communities and we achieve this by applying the below approach to our local projects:

- Maintaining an advanced environmental, health and safety management system that meets Australian standards AS/NZS4801:2001, ISO14001:2015
- Creating a comprehensive management and assessment framework to minimise impacts on biological diversity and ecological integrity
- Applying the protocol: Avoid, Minimise, Remediate and Offset to determine the appropriate course of action when assessing potential impacts and environmental risks
- Considering the precautionary principle in all phases of the project development allowing multiple opportunities for refinement of scope and execution to reduce impacts and scientific uncertainty
- Providing local employment, training, education, and enterprise opportunities
- Playing a key role in driving decarbonisation and aiding the energy transition into the future, and
- Supplying critically needed energy to grow and sustain our communities.

Comment 5.12 – Santos Environmental Record

Santos' history in relation to environmental matters

23 Santos has a history involving poor environmental management of CSG, petroleum and oil projects across Australia. This poor management has resulted in infringement notices, enforcement actions, prosecutions and fines in relation to Santos' failure to comply with conditions of approvals or authorities. There have also been a number of environmental incidents resulting from infrastructure safety and integrity issues. These incidents are detailed below.

(a) In November 2022, there was an unmeasured gas leak from the Santos' John Brookes platform in Karratha, WA resulting from a pipeline integrity issue.

(b) On March 2022, around 25,000 litres of oil were leaked from a Santos facility on Varanus Island in WA.

(c) In August 2019, Santos was issued a Penalty Infringement Notice by the Queensland Department of Agriculture and Fisheries for causing an environmental nuisance through emitting black smoke from the Santos Gladstone LNG process flare on Curtis Island.

(d) In July 2018, Santos received a $68,000 fine from the Queensland Department of Environment and Science for the unauthorised release of hydrocarbons to land.

(e) On 13 August 2021, Santos was issued with an Environmental Protection Order by the Queensland Department of Environment and Science in relation a failure to comply with a condition relating to stimulation risk assessment for the Scotia CSG Project.

(f) In March 2014, Santos was fined $1,500 by the NSW Environment Protection Authority for contamination of an aquifer in Narrabri, NSW.

(g) In January 2014, Santos was fined $52,500 for failing to report the spill of untreated water at a water treatment plant in Narrabri, NSW.

(h) In May 2013, Santos' Zeus oil field spilled 240,000 litres of oil into the Cooper Basin, making it Queensland's third largest oil spill.

(i) In October 2012, Santos was issued fines totalling $19,800 relating to the company's late reporting of five minor oil spills between March and September 2011 in the Great Barrier Reef, Queensland.

(j) In July 2012, Santos was issued with two fines by the NSW Environment Protection Authority for pollution of waters.

(k) In July 2007, Santos' Jackson-Moomba pipeline spilled 100,000 litres of oil, causing the evacuation of around 400 homes in southern Brisbane, QLD.

(l) In March 2003, Santos was fined $300,000 for an oil pipeline and oil spill in Brisbane, QLD.

Response 5.12

Santos is committed to being the safest gas company wherever we have a presence and preventing harm to the environment.

Comment 23 (a)-(j) is acknowledged. At Santos, we seek to be an industry leader in health and safety performance. Ensuring the health of our workforce, communities and environment is critically important and fundamental to our success. We achieve this by:

- Ensuring the environment is at the forefront of all our activities each and every day, the Santos Management System (SMS) describes how we manage, monitor and evaluate environmental compliance
- Reducing environmental impacts of activities to as low as reasonably practicable and acceptable by applying a whole-of-life cycle decision making framework to effectively manage environmental risks throughout all stages of our activities, including:
    - Identifying potential environmental risks early in the planning phase and working to avoid and mitigate them through planning and design.
    - Providing a comprehensive environmental management program to manage risk and reduce impacts during the operational phase.
- Working proactively and collaboratively with our stakeholders and local communities to maintain our licence to operate and deliver positive environmental outcomes such as the beneficial reuse of produced water for environmental and agricultural applications
- Ensuring that activities comply with all legal obligations by understanding and managing our environmental compliance obligations. For more information on Santos environmental record please refer to Section 1.7 of the Fairview WRS PD.

Comment 5.13 – Conditional Approval

Conditional Approval

24 Alternatively, if the Minister decides the Proposed Action is to be approved, it should be approved subject to conditions.

25 With regard to threatened species, these conditions should require Santos to:

(a) conduct additional surveys for threatened species and implement measures to mitigate impacts such as translocating animals or managing feral species;

(b) fund and conduct research on threatened species; and

(c) purchase offsets for any additional residual impacts to threatened species.

26 With regard to water resources, these conditions should require Santos to:

(a) publish a chemical risk assessment framework;

(b) engage a chemical risk assessment expert to peer review risk assessments;

(c) submit a statement to the Department stating how all concerns raised in the peer review have been addressed; and

(d) manage risks to groundwater through a risk assessment framework.

Conclusion

27 For the reasons stated above, we strongly recommend that the Proposed Action be refused.

Response 5.13

24) The comment is acknowledged.

The State EA contains management and actions/responses to triggers in Schedule K as summarised in Section 9.0 of the Fairview WRS PD.

25) (a) The REMP currently includes MNES turtle monitoring

25) (b) The most significant threat to MNES turtles in the proposed action area, upstream and downstream is nest predation by feral species and nest disturbance by cattle and horses (Section 7.0 of the Fairview WRS PD).

25 The State EA requires an Offset Plan to be developed (under Schedule D) to manage residual impacts associated with the overall project including endangered and vulnerable remnant regional ecosystems, essential habitat and wetlands of general ecological significance.

26 (a to d) The chemical risk assessment framework (CRAF) is presented in Appendix I of the Fairview WRS PD together with Chemical Risk Assessments and a register of assessed chemicals. The CRAF is developed and revised independently by EHS Support and will be publicly available on the Santos website.

6.0 J. Baird *et. al.* (34 signatures)

A copy of the complete submission from the J. Baird *et al* is presented in Appendix E.

The following comments are sourced from the J. Baird submission that refers to the same Supporting Annexure as the Lock the Gate submission. Where a comment response has addressed or provided information within the Supporting Annexure or Lock the Gate submission a cross reference to that response will be made.

The J. Baird *et. al*. submission is provided around the following headline comments:

1. Regulatory Framework
2. Critical Habitat
3. Project Impacts
4. Precautionary Principle.

Comments 1 to 9 of the J. Baird *et. al*. submission provides general background and reasons for the submission and are not considered to require a comment.

Comment 6.1 – Regulatory framework and interpretation

1. Regulatory Framework

1.1 Section 139(1)(a)

9. In deciding whether or not to approve the taking of an action, for the purposes of subsection 18 or 18A of the Act, the Minister must not act inconsistently with a recovery plan. Section 139(1)(a) provides:

"139 Requirements for decisions about threatened species and endangered communities

(1) In deciding whether or not to approve for the purposes of a subsection of section 18 or section 18A the taking of an action, and what conditions to attach to such an approval, the Minister must not act inconsistently with:

(a) Australia's obligations under:

(i) the Biodiversity Convention; or

(ii) the Apia Convention; or

(iii) CITES; or

(b) a recovery plan or threat abatement plan."

10. The effect of s 139 (1) is to render a Minister's approval decision ultra vires, or in other words, beyond her power or authority. A question of interpretation arises as to the nature and degree of inconsistency required to trigger the operation of s 139(1)(b). This is because s 139(1)(b) may be interpreted in the following ways:

a. No inconsistency is permitted, meaning that any degree of inconsistency with a recovery plan is prohibited.

b. A low degree of inconsistency is permitted, meaning only a minimum degree of inconsistency with a recovery plan is permitted.

c. A medium degree of inconsistency is permitted, meaning some inconsistency with a recovery plan is permitted.

d. A high degree of inconsistency is permitted, meaning substantial inconsistency with a recovery plan is permitted.

11. We consider that meaning of words "must not act inconsistently with a recovery plan" is a matter of statutory construction. This requires a literal consideration of the words "act inconsistently with a recovery plan", the Act as a whole, and legislative intent.

Response 6.1

The comment is acknowledged as an opinion of the submission.

The subject of interpretation of the intent of s 139 (1) of the EPBC Act is for DCCEEW to provide as administrator of the EPBC Act.

Comment 6.2 – Regulatory framework and interpretation

1.2 Literal meaning
12. There are two considerations drawn from the text "must not act inconsistently with a recovery plan" that support a broad construction of the words.
13. First, prima facie, the word "inconsistently" must be given meaning and effect. The Cambridge Dictionary defines "inconsistent" as meaning "if a reason, idea, opinion, etc. is inconsistent, different parts of it do not agree, or it does not agree with something else."12 This definition is broad in scope and envisages a situation where an approval decision that, in any part, does not agree with a recovery plan is "inconsistent".
14. Second, s 139(1)(b) uses the words "must not act inconsistently", not "must not act in a manner that is substantially inconsistent" with a recovery plan. The High Court does not favour statutory interpretation that introduces words that are not found in the express statutory text.13 Any construction that arbitrarily alters the meaning of s 139(1) from "inconsistently" to the lesser standard of "substantially inconsistent" is not suggested by the express words of the statutory text.
1.3 Statutory context and legislative intent
15. The general context of the phrase "must not act inconsistently with a recovery plan" is that it forms part of the Act, the objects of which are set out in s 3 as follows:
"3. Objects of Act
(1) The objects of this Act are:
(a) to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance; and
(b) to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources; and
(c) to promote the conservation of biodiversity…"
16. It has been held that the Act is to be interpreted in a way that is "consistent with the high public policy apparent in the objects of the Act" and that "no narrow approach should be taken to the interpretation of legislation having objects of this kind."14
17. The specific context of the phrase "must not act inconsistently with a recovery plan" is used in respect of recovery plans that are made or adopted under s 269A. The purpose of such recovery plans is the protection, conservation and management of listed threatened species and listed threatened ecological communities (s 269A(2)).
18. Recovery plans are a critical part of the legislative framework because they specify what actions should be taken to protect species that are on the brink of extinction. Section 179 defines eligibility for listing in the "vulnerable", "endangered" or "critically endangered" categories as:
a. Vulnerable –a high risk of extinction in the wild (s 179(5));
b. Endangered –a very high risk of extinction in the wild (s 179(4)); and
c. Critically endangered – an extremely high risk of extinction in the wild (s 179(3)).
19. The evident object of the statutory scheme is to ensure strict compliance with recovery plans. Section 268 expressly prohibits a Commonwealth agency, including the Minister, from taking any action that contravenes a recovery plan or threat abatement plan. Section 139(1)(b) clarifies that the general prohibition in s 268 applies to Minister's exercise of power to approve or not approve an action.
20. Given the imminent and irreversible nature of extinction, an interpretation of the phrase "act inconsistently with a recovery plan" that permits a medium or high degree of inconsistency with recovery plans would arguably undermine the high public policy and practical operation of the Act. Such an interpretation would permit the Minister to approve actions that increase the chances of threatened species becoming extinct, for example actions that contribute to key threatening process and destroy habitat critical to the survival of a species.

21. For the above reasons, it is submitted that the modern approach to statutory construction leads to a broad interpretation of the words ""must not act inconsistently with a recovery plan", such that only a minimum degree of inconsistency with a recovery plan is permitted under s 139(1)(b) of the Act.

Response 6.2

The comment is acknowledged as an opinion of the submission.

The subject of interpretation of the intent of s 139 (1) of the EPBC Act is for DCCEEW to provide as administrator of the EPBC Act.

Comment 6.3 – Critical habitat

2. Critical Habitat
2.1 Definition
22. The Significant Impact Guidelines 1.1 Matters of National Environmental Significance (Significant Impact Guidelines 1.1) and the National Recovery Plan for the White-throated Snapping Turtle (Elseya albagula) (Recovery Plan) define habitat critical for the survival of the White-throated Snapping Turtle as follows:
a. areas that are necessary for activities such as foraging, breeding, roosting or dispersal;
b. "permanent water, including pools, within the species distribution that contain shelter and refuges (e.g. bank overhangs, overhanging riparian vegetation, macrophyte beds, moderate to high densities of submerged boulders and/or log jams)"; and
c. "all currently known and new aggregated nesting sites (all nesting sites should be considered to be part of an aggregation unless it can be demonstrated otherwise)."
23. It is submitted that the Waterhole and the Dawson River downstream of the release location fit the above definitions and are therefore critical habitat for the White-throated Snapping Turtle. This is discussed in further detail below.

Response 6.3

Refer to Response 5.3 and Response 5.4.

The natural ephemeral state of the waterhole (in the absence of desalinated water releases) is not considered to meet the criteria for habitat critical for the survival of the species.

The Dawson River is acknowledged as meeting the criteria for habitat critical to the survival of the species.

Comment 6.4 – Critical habitat – waterhole

2.2 Waterhole
24. The PD makes the following observations about the suitability of the Waterhole as habitat for the White-throated Snapping Turtle:
a. The Waterhole and the watercourse connecting it to the Dawson River are not critical habitat for the White-throated Snapping Turtle due to the lack of riffles (ie shallower and faster moving sections of a stream) and nesting banks;
b. It is unlikely that the White-throated Snapping Turtle is abundant in the Waterhole because of the lower range of habitats and the absence of observation of the White-throated Snapping Turtle from 2015-2022 data from the receiving environment monitoring program (REMP);21 and
c. There was only one observation of the White-throated Snapping Turtle in the Waterhole. It is not possible to say whether the observation represented a movement into the waterhole facilitated by the water release or a movement during a flood event. It cannot be said with certainty when the turtle entered the Waterhole.
25. In response, we note that habitat assessments of listed threatened species must consider and apply the criteria for critical habitat as set out in the Significant Impact Guidelines 1.1 and the

Recovery Plan. Applying these criteria, we consider that the Waterhole constitutes habitat critical for the survival of the White-throated Snapping Turtle because:
a. The White-throated Snapping Turtle is known to inhabit large slow-flowing reaches and large non-flowing pools in the Fitzroy Catchment. This description fits the Waterhole, which is an oxbow lake wetland (Figure 1 below).

b. The Waterhole contains permanent water within the species distribution and contains shelter and refuges in the form of extensive macrophyte beds the shallow upstream western end of the Waterhole (Figure 2 below).

c. The Waterhole constitutes foraging habitat for the White-throated Snapping Turtle because of the presence of macrophytes25 and the presence of leaves and stems from riparian vegetation.

26. In response to the statement in the PD asserting that the White-throated Snapping Turtle was only sighted once in the Waterhole based on REMP data from 2015-2022, we note that:
a. The annual REMP surveys only included monitoring for aquatic habitat (including geomorphology), sediment quality, macroinvertebrates and fish. These surveys did not search for the White-throated Snapping Turtle, which may not have been visible from the banks and edges of the Waterhole where the bed and bank assessments were conducted and macroinvertebrate samples were collected.

b. The REMP fish surveys were conducted using fyke nets, which are long bag-shaped nets suitable for passively catching fish (see Figure 3 below). It is doubtful that these nets would have been suitable for the White-throated Snapping Turtle, which is one of the largest short-necked freshwater turtle in Australia. Adult female turtles have carapace lengths of up to 42 cm and males have carapace lengths of up to 30 cm. It is for this reason that the Survey Guidelines for Australia's Threatened Reptiles (Survey Guidelines) recommends snorkeling or using seine nets for surveying threatened species of turtles (see Figure 4 below).

c. The presence of the White-throated Snapping Turtle should be assumed at the Waterhole due to a failure by the proponent to conduct appropriate surveys in accordance with the Survey Guidelines, which provide: "Failing to survey appropriately for threatened species that may be present at a site could result in the department applying the precautionary principle with regard to significant impact determinations. That is, if no supporting evidence (such as survey results) is presented to support the claim of species absence, then the department may assume that the species is in fact present. The department will not accept claimed species absence without effective validation such as through these survey guidelines, other survey techniques (for example, a state guideline or an accepted industry guideline), or relevant expertise. Where a claim of absence is made, proposals should provide a robust evaluation of species absence."30

d. The PD is, in effect, claiming species absence at the Waterhole. It should therefore provide a robust evaluation of species absence. This requirement has not been met the REMP surveys and the report by Boobook Environmental Consultants (Boobook) did not specifically survey for the White-throated Snapping Turtle.

Response 6.4

The Waterhole is not habitat critical to the survival of the White-throated Snapping Turtle.

25. a) - Refer to Response 5.3 and Response 5.4.

The natural non-permanent state of the waterhole prior to the start of desalinated water releases in 2015 (and to which the waterhole will revert in the absence of releases) is not considered to meet the criteria for habitat critical for the survival of the species as indicated in Section 7.1.3.2 and Section 6.4.4.1 of the Fairview WRS PD.

25. b) – refer to Response 5.8 in relation to the limitations of snorkelling and sein netting in the waterhole. The REMP Design Report in Appendix J of the Fairview WRS PD includes snorkelling as a referenced survey method.

25. c) Refer to Response 5.3.

25. d) Refer Response 5.3 in relation to limitations of survey methods within the waterhole. REMP survey includes methods for all turtle species with *E. albagula* observed in low abundance.

Comment 6.5 – Critical Habitat – Dawson River

2.3 Dawson River

27. The PD states that the Proposed Action is expected to impact the low sandbanks of the Dawson River. These are located within the main channel at levels that are lower than the first bench. The PD states that the low sandbanks are unlikely to be used as nest sites because:

a. They "would be vulnerable to small rises in water level associated to local rainfall event run-off where rapid water level rises to small rain events inundate the sand banks;" and

b. The four nests detected by Boobook during a field survey were positioned at heights ranging from 0.6 m to 6 m above water level observed at the time. These locations were on the slopes and crests of the inner high bank or on the banks below the slope of the high bank.

28. Our response is as follows:

a. Published data for nesting sites of the White-throated Snapping Turtle in the Mary, Burnet and Fitzroy rivers includes in-stream and on-bank flood-deposited sandbanks as well as sandy to loamy soil on riverbanks. Accordingly, the low sandbanks and riverbanks of the Dawson River constitute potential nesting areas within the definition of "habitat critical for survival" of the species as defined by the Recovery Plan.

b. The Recovery Plan does not discriminate between low-level nesting sites, which may be prone to inundation, and high-level nesting sites as it states that "all currently known and new aggregated nesting sites" are "habitat critical for survival" of the species.

c. The Boobook survey should not be relied upon as evidence that the White-throated Snapping Turtle only nests in heights ranging from 0.6 - 6 m because it was only conducted on one day. Surveys should have been carried out in both dry and wet seasons at various river flow conditions.

Response 6.5

The proposed action will not impact habitat critical to the survival of the White-throated Snapping Turtle. **Proposed desalinated water releases are intermittent and at the lower range of natural rainfall flow depth variability for the Dawson River.**

27. Comment is noted.

28. a) The published literature, including the white-throated snapping turtle recovery plan and the SPRAT database for Fitzroy River turtle, indicate that nesting occurs on sandy or loamy soils and deposits on riverbanks. Neither document indicates that MNES turtles nest on instream sand bars or low banks, but instead indicate nest sites are meters (often tens of meters) from water level, and are above water level. This is consistent with observations during the 2021 survey and REMP.

28. b) See comment 5.4 otherwise acknowledging the Dawson River as critical habitat.

28. c) The comment is noted as an opinion.

Comment 6.6 – Significant Impact Guidelines 1.3

3. Project Impacts

3.1 Significant Impact Guidelines 1.3

29. The Significant Impact Guidelines 1.3 Coal Seam Gas and Large Coal Mining Developments – Impacts on Water Resources (Significant Impact Guidelines 1.3) 35 set out criteria for determining whether an action is likely to have a significant impact on the hydrology or water quality of a water resource.

30. The significance of an impact to a water resource requires an objective consideration of the value of a water resource and the whether the scale and intensity of change significantly reduces the future utility of the water resource to third party users including the environment and other public benefit outcomes.36 This policy intent is reflected in the wording of ss 5.3 and 5.4 of the Significant Impact Guidelines 1.3.

31. Section 5.3 defines a significant impact to hydrological characteristics of a water resource as:

"5.3. ***Guidance on changes to hydrological characteristics***

A significant impact on the hydrological characteristics of a water resource may occur where there are, as a result of the action:

a) changes in the water quantity, including the timing of variations in water quantity

b) changes in the integrity of hydrological or hydrogeological connections, including substantial structural damage (e.g. large scale subsidence)

c) changes in the area or extent of a water resource ***where these changes are of sufficient scale or intensity as to significantly reduce the current or future utility of the water resource for third party users, including environmental and other public benefit outcomes****.*

The following aspects may need to be considered when assessing changes in hydrological characteristics:

• flow regimes (volume, timing, duration and frequency of surface water flows)

• recharge rates to groundwater

• aquifer pressure or pressure relationships between aquifers

• groundwater table and potentiometric surface levels

• groundwater-surface water interactions …"

32. Section 5.4 defines a significant impact to water quality as:

*"****5.4 Guidance on changes to water quality***

A significant impact on a water resource may occur where, as a result of the action:

• there is a risk that the ability to achieve relevant local or regional water quality objectives would be materially compromised, and as a result the action:

− creates risks to human or animal health or to the condition of the natural environment as a result of the change in water quality

− substantially reduces the amount of water available for human consumptive uses or for other uses, including environmental uses, which are dependent on water of the appropriate quality

− causes persistent organic chemicals, heavy metals, salt or other potentially harmful substances to accumulate in the environment

− seriously affects the habitat or lifecycle of a native species dependent on a water resource*, or*

− causes the establishment of an invasive species (or the spread of an existing invasive species) that is harmful to the ecosystem function of the water resource*, or*

• there is a significant worsening of local water quality (where current local water quality is superior to local or regional water quality objectives), or

• high quality water is released into an ecosystem which is adapted to a lower quality of water."

33. The following sections discuss the application of sections 5.3 and 5.4 to the assessment of impacts to hydrology and water quality from the Proposed Action.

Response 6.6

The comment is acknowledged as an introduction to the subsequent comments on the items indicated in bold.

Comment 6.7 - Significant Impact Guidelines 1.3 - Hydrology

34. RO-treated water has been released from the GLNG project at a maximum release rate of 13.5ML per day in 2015 and from 2018-2021. From 2016-2017, the release rate was 13.5 to 18 ML per day.37 These releases have raised the depth of the Waterhole, which is now permanently inundated to a depth of approximately 1m.

35. The Treated Releases are expected to result in the depth of the Waterhole remaining higher for longer, which is expected to reduce the ephemeral nature of the waterhole. The PD states it is unlikely that the Treated Releases will have a significant impact on the hydrology of the Waterhole because monitoring of the Waterhole bed and bank stability did not identify any issues.

36. Changes to stream levels in the Dawson River are also expected to occur. The PD states that water level monitoring at the Waterhole (WLMP1) and the Dawson River (S4) during the 13.5 ML/day and 18 ML/day scenarios have indicated an observable increase in water depth of no more than 0.5 m during both scenarios. The PD states that it is unlikely that the Treated Releases will have a significant impact of the hydrology of the Dawson River because the REMP indicates stable geomorphological conditions.

37.In response, we consider that the PD incorrectly applied the Significant Impact Guidelines 1.3 because it failed to consider whether the changes to hydrology in the Waterhole and the Dawson River are of sufficient scale or intensity as to significantly reduce the current or future utility of the Waterhole and the Dawson River, with such utility including supporting services such as the maintenance of ecosystem function.

38. The term “ecosystem function” is defined in s 4.2.1 of the Significant Impact Guidelines 1.3 as including “the ecosystem components, processes and benefits or services that characterise the water resource, including support for the biological diversity or species composition of the water resource.” Applying this definition to the Proposed Action, it is submitted that the Waterhole and the Dawson River are high-value water resources because of their function as critical habitat for the White-throated Snapping Turtle.

39. Low flow periods are critical to the ecosystem functions of the Waterhole and the Dawson River. A recent analysis of the PD by a team at RMIT University (FWRS Water Impact Analysis), which is annexed to this submission, states: “Low flow periods play key role in maintaining natural diversity of stream ecosystems in many rivers (McGregor et al., 2011; Poff & Zimmerman, 2010). Low flows hydrology modification can result in significant changes to ecosystem structure and function. The Dawson River/Wardingarri is ‘a series of interconnected pools…separated by sandy gravel & rocky riffles’ (Miles, 2021), and these features play a significant ecohydrological role for macroinvertebrates, turtles, and fish communities. Flows in the Dawson are highly variable, quickly shifting between low-flow to flood conditions and then receding relatively rapidly to baseflow (e.g., Fig. 5-10 of the proposal documentation).”

40. The current ecosystem functions of the Waterhole and Dawson River are already severely stressed by the releases of RO-treated water from the GLNG Project. This is because the 13.5 and 18ML releases of produced water have (1) altered the Waterhole into being permanently inundated and (2) significantly reduced the number of low-flow days in the Waterhole and Dawson River (see Figure 5 below).

41. The increased depth of the Waterhole and more frequent inundation of the Dawson River is a significant change that is likely to impact the White-throated Snapping Turtle as the species is considered habitat specialist. Such species are affiliated with specific habitats and dependent on specific resources, as opposed to generalists that can survive in a wider array of habitats and resources.

42. For this reason, we consider that a precautionary approach is necessary to maintain the ecosystem functions of both the Waterhole and the Dawson River as close as possible to historic

levels to minimise disturbance to the habitat of the White-throated Snapping Turtle as the species is already severely stressed as turtle recruitment in the project area is almost zero. We note that the Independent Scientific Committee's Advice on the Fairview Water Release Scheme (IESC Advice) stated that "additional stresses, even minor to these two species from the project should be avoided and a precautionary approach is essential."

Response 6.7

34 to 36. Comments are noted as introductory observations.

37 and 38. Refer to Response 4.3.1 to 4.3.3 relating to changes in low flow hydrology. Section 4.2.1 of the Significant Impact Guidelines 1.3 states **"***The key factor that will be relevant in determining the value of a water resource will be its utility for all third party uses, including environmental and other public benefit outcomes***."** This includes both ecosystem function and "provisioning services" including availability of water for all third party users. Dawson River environmental values include ecological/aquatic ecosystems and human uses (stockwater, farm supply, irrigation, drinking water etc) as specified in Section 3.3 of the Fairview WRS.

Reference to REMP biological and chemical monitoring data in Section 5.5 of the Fairview WRS PD has considered requirements of the Significant Impact Guidelines 1.3 does not indicate a significant decrease in biological function via microbenthic indicators, bed and bank habitat, fish diversity or chemical indicators. It is noted that the waterhole is not habitat critical for the survival of the he White-throated Snapping Turtle as indicated in Section 7.2.1 of the Fairview WRS PD.

39. Refer to Response 3.1, Responses 4.3.1 to 4.3.3 and Response 5.5. The Dawson River is perennial within and downstream of the proposed action area.

40. Refer to Response 2.2, Response 3.2, and Responses 4.1.1 to 4.1.3. REMP water quality and biological data collected between 2015 and 2022 during and between existing desalinated water releases are within or above baseline water quality and are not indicative of a severely stressed system within an agricultural environment.

41. Refer to Response 5.3. The waterhole is not considered habitat critical to the survival *E. albagula*, however it is acknowledged that it may be used intermittently by both MNES turtle species.

42. The opinion is acknowledged. As indicated in Response 5.6, the largest threat to the MNES turtle species is nest disturbance and predation.

Comment 6.8 - Significant Impact Guidelines 1.3 – Water Quality

3.3 Water quality

43. The Treated Water will contain chemicals used in the CSG operations. These will include chemicals used in hydraulic fracturing, drilling and water treatment and geogenics. The presence of such chemicals has a real and not remote chance of affecting the White-Throated Snapping Turtle because to its cloacal respiration mechanism and through bioaccumulation of contaminants within the food chain.

44. Applying s 5.4 of the Significant Impact Guidelines 1.3, it is submitted that the Proposed Action is likely to change the water quality of the receiving environment and that these changes will:

a. create risks to human or animal health or to the condition of the natural environment as a result of the change in water quality; and

b. seriously affect the habitat or lifecycle of a native species dependent on a water resource.

45. These risks invoke the application of the precautionary principle because the sensitivity of the receiving environment and the high degree of scientific uncertainty regarding:

a. the relationship(s) between water quality and flow rates, or potential flow-on effects, to ecosystems due to water quality changes occurring during specific flow conditions (particularly low-flows);

b. the potential impacts of existing exceedances of Water Quality Objectives (WQOs) for several analytes, in particular, exceedances of boron, on threatened species;

c. the potential impacts of further increasing the concentration and loads for several analytes including suspended solids, aluminum, boron, copper, nitrogen;

d. the potential impacts of Tier 2 and Tier 3 chemicals on hatchlings of the White-throated Snapping Turtle, particularly because of their heavy reliance on cloacal respiration and greater potential susceptibility to contaminated water;

e. the potential impacts of the Proposed Action on groundwater-dependent ecosystems (GDEs);52 and

f. surface-groundwater interactions due to the assumption in the PD that the Evergreen Formation is an aquitard when groundwater chemistry and hydraulic testing data for the upper Evergreen Foundation show that this unit is a potentially significant aquifer.

46. In particular, we are concerned that there is a high level of risk to human and animal health because of potential impacts from the Proposed Action on high-quality groundwater resources. The FWRS Water Impact Analysis states:

"The Precipice Sandstone occurs at significant depth below the oxbow lake wetland and is therefore unlikely to interact directly with the treated water releases in the vicinity of the release point. However, the Evergreen Formation directly underlies the oxbow lake wetland and Dawson River channel downstream of the release point. Groundwater chemistry and hydraulic testing data (compiled by OGIA) for the upper Evergreen Formation (section 4.1.2.1) show that this unit is a potentially significant aquifer, which hosts high-quality groundwater. Hydraulic conductivity field data in Table 4-4 show values in the range of a moderate to high-yielding aquifer in the upper part of the formation (Kh values from 0.0014 to 8090 m/day); these are not consistent with uniform conceptualisation of the unit as an aquitard. Hydrochemical data presented in table 4.7 from registered bores in this formation, also indicate a high-quality groundwater resource, e.g., TDS values are all < 400 mg/L (or < 820 mg/L encompassing the Boxvale Sandstone member), and in one bore TDS is < 100 mg/L (or three bores if the Boxvale Sandstone is included). This puts the groundwater within the range of salinities considered viable for potable water supplies and is inconsistent with the quality of water expected for an aquitard. The low TDS values also indicate a potential for ground-surface water interaction occurring (e.g. leakage/recharge of the upper formation from surface water during high flow events), which has not been considered in the conceptual hydrogeological model."

47. The application of the precautionary principle is discussed in further detail in the next section.

Response 6.8

43. Refer to Comment 5.1.3. The CRAF presented in Appendix I of the Fairview WRS PD is a detailed and staged process for evaluating actual and proposed chemicals used in the GLNG and GFD project. The CRAF is based on Australian and International classification and assessment processes. Chemicals are restricted in their use based on the outcome of the CRAF classification and assessment process. Bioaccumulative chemicals are identified assessed in the CRAF and their use restricted in accordance with CRAF criteria.

44. Refer to Response 2.2, Response 3.2, and Response 4.1.1 to 4.2.1 for information on water quality. Section 4.4 of the Significant Impact Guidelines 1.3 requires a material change in local or regional water quality that creates a risk to human health or animal health or to the condition of the natural environment, substantially reduces the amount of water available to human consumptive uses or causes chemicals and salt to accumulate in the environment.

REMP water quality and biological data collected between 2015 and 2022 during or between existing desalinated water releases are within or above LBO derived from baseline data in accordance with ANZG (2018) or are below local WQO or applied guidelines for scheduled EVs that include human and ecological uses within a MD water, or are below the reference upstream data as a pre-existing condition and do not materially compromise human or animal health or the condition of the natural environment.

45. a) Refer to Response 2.2, Response 3.1, Response 4.1.1, and Response 4.3.1 to Response 4.3.3 regarding low flow changes and water quality.

45. b) Section 8.2 of the Fairview WRS PD discusses the applicability of the ANZG (2018) WQG in relation to freshwater turtles. As stated in Response 2.2 and Response 3.2 dissolved boron concentrations in the Dawson River are below the ANZG (2021) revised dissolved boron level of 0.94 mg/L for 95% SPL and bar one sample the 99% SPL. The 99% SPL is considered protective of MNES turtles. Figure 3-2

45. c and d) Refer to Response 2.2, Response 3.2, Response 4.1.1 to Response 4.1.3.

46. e) Refer to Response 4.5.1 and 4.5.245. f) Refer to Response 3.3, and Response 4.4.1 to Response 4.4.3.

46) Refer to Response 3.3, and Response 4.4.1 to Response 4.4.3.

The upper Evergreen Formation occurs only as a thin (< 10 m) weathered cover consisting of low permeability mudstone and siltstone over the Westgrove Ironstone Member aquitard within or downstream of the proposed action area. The Boxvale Sandstone is located above the elevation of the waterhole and is not hydraulically connected. The Boxvale Sandstone and Hutton Sandstone are located under the Dawson River at the lower end of the proposed action area. All local water bores draw water from the Precipice Sandstone that is not hydraulically connected to the waterhole or Dawson River (which receives baseflow from the Precipice Sandstone) within the proposed action area.

Comment 6.9 Significant Impact Guidelines 1.3 – Precautionary Principle

4. Precautionary Principle

4.1 Regulatory requirements

48. The Minister is required to apply the precautionary principle when making decisions pursuant to section 391 of the Act when there is a lack of full scientific certainty regarding the potential for serious or irreversible environmental damage. In particular, s 391(2) of the EPBC Act states:

"(2) The precautionary principle is that lack of full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there are threats of serious or irreversible environmental damage."

49. In Telstra Corporation Limited v Hornsby Shire Council [2006] NSWLEC 133 (24 March 2006) (Telstra v Hornsby) Chief Justice Preston of the NSW Land and Environment Court explained the conditions precedent for the application for the precautionary principle. His Honour stated:

"The application of the precautionary principle and the concomitant need to take precautionary measures is triggered by the satisfaction of two conditions precedent or thresholds: a threat of serious or irreversible environmental damage and scientific uncertainty as to the environmental damage. These conditions or thresholds are cumulative. Once both of these conditions or thresholds are satisfied, a precautionary measure may be taken to avert the anticipated threat of environmental damage, but it should be proportionate: N de Sadeleer, Environmental Principles: From Political Slogans to Legal Rules, Oxford University Press, 2005 at p. 155." (Telstra v Hornsby at [128])

50. His Honour stated that the assessing the seriousness or irreversibility of environmental damage involves a consideration of many factors. These may include:

"(a) the spatial scale of the threat (eg local, regional, statewide, national, international);

(b) the magnitude of possible impacts, on both natural and human systems;

(c) the perceived value of the threatened environment;

(d) the temporal scale of possible impacts, in terms of both the timing and the longevity (or persistence) of the impacts;

(e) the complexity and connectivity of the possible impacts;

(f) the manageability of possible impacts, having regard to the availability of means and the acceptability of means;

(g) the level of public concern, and the rationality of and scientific or other evidentiary basis for the public concern; and

(h) the reversibility of the possible impacts and, if reversible, the time frame for reversing the impacts, and the difficulty and expense of reversing the impacts." (Telstra v Hornsby at [131])

51. The degree of uncertainty has been described as "highly certain of threat" or "considerable scientific uncertainty" regarding the impacts of a project (Telstra v Hornsby at [146]-[147]). Factors that may be taken into account in determining the degree of uncertainty include:

"(a) the sufficiency of the evidence that there might be serious or irreversible environmental harm caused by the development plan, programme or project;

(b) the level of uncertainty, including the kind of uncertainty (such as technical, methodological or epistemological uncertainty); and

(c) the potential to reduce uncertainty having regard to what is possible in principle, economically and within a reasonable time frame." (Telstra v Hornsby at [141])

52. This formulation of the precautionary principle was recently applied by the Federal Court in Bob Brown Foundation Inc v Minister for the Environment (No 2) [2022] FCA 873.4.2 Application

53. We consider that the Proposed Action fulfills both conditions precedent to the application of the Precautionary Principle. First, it gives rise to a threat of serious or irreversible damage because of the following factors:

a. The value of the receiving environment, which comprises habitat critical to the survival of the White-throated Snapping Turtle because it has both foraging, breeding and nesting areas.

b. The temporal scale of impacts, which includes:

i. long-term increase in depth of the Waterhole;

ii. long-term inundation of low sandbanks of the Dawson River;

iii. long-term potential bioaccumulation of chemicals in the food chain and/or sediments; and

iv. long-term potential impacts to groundwater from ground-surface water interaction.

c. The complexity and connectivity of the impacts because of the combination of chemicals present in produced water as well as the cumulative impacts of chemicals that may be persistent, bioaccumulative and toxic.

d. The high degree of public concern regarding the impacts of the project from local and national community groups including the Wildlife Preservation Society of Queensland, BirdLife Capricornia, Lock the Gate Alliance and local landholders. These concerns are based on the scientific views of the IESC and research such as the FWRS Water Impact Analysis.

54. Second, the Proposed Action arguably gives rise to "considerable scientific uncertainty" as stated in paras 45-46 above.

55. For these reasons, we consider that the Proposed Action invokes the application of the Precautionary Principle.

Response 6.9

We acknowledge that Comments 58 to 52 present introductory information for Comments 53, 54 and 55.

53. a) Refer to Response 6.3 to Response 6.4. The waterhole is not habitat critical to the survival of the MNES turtle species. The Dawson River upstream, within the proposed action area, downstream and within the broader Fitzroy catchment is acknowledged as containing habitat critical to the survival of the species.

The Fairview WRS PD has not identified significant impacts to the MNES turtles associated with the proposed action. The National Recover Plan for the White Throated Snapping Turtle (*Elsaya Albagula*)

states that the species *has experienced a severe loss of eggs due to predation and nest bank trampling, resulting in a recruitment rate to the breeding population of only 1% each year*. The primary threat to the species is nest predation by feral animals and disturbance of nests by livestock accessing the Dawson River upstream, within the proposed action area and downstream through the agricultural areas of the Dawson Valley.

53. b) Desalinated water releases are intermittent as indicated in Figure 5-11 of the Fairview WRS PD. Desalinated water releases are completed after prioritising other beneficial uses for desalinated water as identified in Section 2.2 of the Fairview WRS. The waterhole is an ephemeral system with a high degree of variability under its natural condition ranging from dry to full depending seasonal rainfall and is accessed by livestock for drinking water. Furthermore, as noted in Response 5.3, the release has had a positive influence on littoral habitat quality and aquatic ecology of the waterhole and acts as a buffer/mixing zone to ameliorate impacts to the Dawson River.

As noted in Response 6.5 low sandbanks are not known nesting sites for MNES turtles, as noted in Response 2.2 bioaccumulation of toxicants in food chains has low potential of occurrence, and as noted in Response 4.4.1 there are negligible effects on ground-surface water interactions.

The chemical risk assessment has been completed to international standards, identifies chemicals that are persistent, bioaccumulative or toxic (PBT) and restricts their use. No PBT chemicals associated with the proposed action have been identified in desalinated water that is treated to achieve the drinking water environmental value of the receiving environment as regulated under the State EA.

Refer to Response 3.3 and Response 4.4.1 to 4.4.3 the major groundwater aquifer used in the vicinity for water resources (Precipice Sandstone) will not be impacted by the proposed action due to the overlying lower Evergreen Formation aquitard.

For alluvial sediments sediment quality, water quality and biological monitoring over the 2015 to 2022 period under the REMP program has indicated that chemical parameters are within required referenced limits or upstream background levels, biological indicators have not detected a significant change from baseline or reference locations during the existing desalinated water releases.

Six public submissions have been received for the project as listed in Table 1-1.

54. Considerable scientific studies have supported the initial application, as presented through the Fairview WRS PD. Additional studies have since been commissioned, such as boron toxicity studies (AECOM 2019), and ongoing monitoring of stream flow, water quality, sediment quality and river biology (turtles, fish, macroinvertebrates and aquatic plants) have been implemented to provide ongoing scientific data concerning potential effects of the release on the receiving environmental and to inform environmental management decision making.

55. The opinion stated in the comment is acknowledged.

Comment 6.10 - Precautionary Principle – Adaptive Management

4.3 Adaptive management

56. The type and level of precautionary measures that are appropriate depends on the degree of seriousness of and irreversibility of the threat and the degree of uncertainty. The more significant the seriousness and the more uncertain the threat, the greater the level of precaution required. (Telstra v Hornsby [161])

57. Adaptive management is not an appropriate precautionary measure because of the serious and irreversible nature of impacts to the White-throated Snapping Turtle.

a. the critically endangered status of the White-throated Snapping Turtle means that it is at an extremely high level of extinction in the wild; and

b. the local population of the White-throated Snapping Turtle is already at a severely stressed level, as evidenced by recruitment being almost zero.

58. Further, we consider that adaptive management is not possible due to the high degree of uncertainty regarding the susceptibility of hatchlings to chemicals in the Treated Releases,

Response 6.10

See Response 5.3, 5.4, 5.5 and 6.5 indicating that the proposed action does not introduce further stressors on MNES turtles over and above the known threatening processes (i.e., nest predation and nest trampling)..

Comment 6.11 – Precautionary Principle – Recovery Plan

59. Two key questions arise regarding the application of s 139(1)(b) to the Proposed Action:

a. Is the approval of the Proposed Action inconsistent with the Recovery Plan?

b. Is the approval of the Proposed Action inconsistent with the Recovery Plan, if adaptive management conditions are attached to the approval?

60. We consider that the answer to both questions is "no". Our analysis is set out in Table 1 below: 6. Conclusion

61. For the reasons stated in this submission, we ask the Minister to exercise her power under s 133 of the Act refuse to approve the Proposed Action.

Table 1: Analysis of whether the approval is inconsistent with the Recovery Plan

Response 6.11

See Response 5.6 and 5.7 that discuss consistency with the Recovery Plan.

7.0 Wardingarri People and Iman #4

A copy of the complete submission from Clint Hansen is presented in Appendix F.

The following sections respond to respective comments presented by the Clint Hansen.

Submission 1 to 3 in the attached document from Clint Hansen provide general background to the submission and no responses are required. Comment 7.1 – Free Prior Informed Consent to all Indigenous Traditional Owners within the Fitzroy Basin

4. *We are concerned that Santos has not provided Free Prior Informed Consent to all Indigenous Traditional Owners within the Fitzroy Basin that these releases will likely have an impact on the water bodies both at the release point and downstream past the current monitoring site.*
5. *We are aware that Santos met with Native Title groups both Wardingarri and Iman#4 on the 21st of October 2022 in Brisbane with plans for continued engagement in 2023. Yet these meetings are often one sided and rarely allow for Free Prior and Informed Consent to take place.*
6. *We believe that if Santos truly aspires to meet the Indigenous Engagement targets as outlined below, then further meaningful engagement and education is required. • Industry best-practice recruitment and development programs for meaningful career opportunities • Leader in community engagement and cultural heritage management, and • Support Indigenous businesses through our supply chain."*

Response 7.1

Santos is committed to meaningful engagement with Indigenous Traditional Owners.

4. It is Santos' priority that Indigenous Traditional Owners are meaningfully engaged and informed throughout the lifecycle of the project. We have undertaken targeted consultation around the proposed action to ensure all stakeholders are engaged and informed. We are partnering with Wardingarri and Iman #4 to execute Cultural Heritage Management Plans and Native Title Agreements as well as holding regular field visits, detailed briefings and meetings which are attended by Elders.

5. Santos is committed to ensuring the Wardingarri board and Iman #4 applicants are engaged and informed for each stage of the process. We have held multiple consultation sessions including regular detailed briefings where the supply of information was communicated and shared, and we coordinated a site visit to the Dawson River on 9 May 2023 and presented a specific briefing on the Proposed Action on 10 May 2023, which were attended by the Wardingarri Board.

We also presented a specific briefing on the Proposed Action to the Iman #4 representatives in Rockhampton on 17 May 2023.

6. It is Santos' objective to proactively partner with Indigenous groups and communities to build respectful and mutually beneficial relationships and deliver positive outcomes for Indigenous people. As outlined above, Santos is committed to providing ongoing consultation, identifying opportunities for collaboration (e.g., the implementation of a committee to identify economic opportunities), partnerships, opportunities for work (through direct employment, training, and supply chain opportunities) and economic growth and land management (currently conducting land management activities in collaboration with Iman #4).

For further information please refer to Section 1.6.3 Indigenous engagement in the Fairview WRS PD.

Comment 7.2 – Lack of appropriate consultation and uncertainty of impacts to groundwater

> *7. We oppose the approval of this project because of the lack of appropriate consultation and uncertainty of impacts to groundwater dependent ecosystems and surface waters. We also say that approval of this project has the potential to irreversibly affect not only our cultural heritage and identity, but all First Nations People who have connections, responsibilities and kinship with the Waters above and below ground both at the release point and downstream of this.*

Response 7.2 –

Santos' partnership with the Iman and Wardingarri people is critical to the success of the project and prosperity of the region.

7. Santos has worked in partnership with the Iman and Wardingarri people since 2008. We will continue to engage Iman and Wardingarri people to ensure we achieve our joint objective to deliver greater outcomes and opportunities for Indigenous people. For further information please refer to Section 1.6.3 Indigenous engagement in the Fairview WRS PD.

Comment 7.3 – The Referral has not adequately addressed indigenous cultural and heritage values

> 8. *Section 5.2.1 of the Significant Impact Guidelines 1.3 provides that the value of a water resource is important in determining whether there is likely to be a significant impact. The key factor in determining the value of a water resource is "its utility for all third party uses, including environmental and other public benefit outcomes". These public benefit outcomes include cultural and heritage.*
>
> 9. *a. No substantive assessment of the culture and heritage value of the Dawson River, known as the Wardingarri River, to the Iman People has been made, in particular with regard to the significance of the Wardingarri River to the Iman people and how this affects water quality objectives.*
>
> *b. No studies of the Cultural value of springs, spring groups and Ground Water Dependent Ecosystems to Indigenous Culture and Heritage have been undertaken by the Proponent.*
>
> *c. The Cultural Heritage act is outdated and is currently going through a public comment period on how it may be improved. Santos to our knowledge has not contributed in any way to improving the act as it stands. Working alongside various Traditional Owner groups of which Santos has so much Cultural Heritage Data and stories and lessons from the development that may be used as case studies to address the issues within the act.*
>
> *d. While Santos appears to have executed Cultural Heritage Management Plan (CHMP) for the GFD Project, the GFD Project approval conditions specifically excluded the approval of release or discharge of co-produced water into the Dawson River under Condition 2A unless the Minister has approved the release or discharge of co-produced water or such release or discharge is not considered a "controlled action" under the EPBC Act.*

Response 7.3

Santos achieves its cultural duty of care in partnership with the Wardingarri and Iman #4 people.

8-9. Santos has executed Cultural Heritage Management Plans and Native Title Agreements in compliance with the *Queensland Aboriginal Cultural Heritage Act (2003)* and in partnership with the Wardingarri and Iman #4 people. The management plans ensure the Wardingarri and Iman are engaged to assess and manage cultural heritage for all project activities. Since 2008, Santos and Wardingarri-Iman have undertaken multiple assessments and compliance actions all under the cultural

authority of the Iman people. For further information please visit Section 1.6.3 Indigenous engagement in the Fairview WRS PD.

Comment 7.4 – Section 2. Statutory Context -Section 88 of the Aboriginal Cultural Heritage Act 2003 (Qld)

Section 2 - Statutory Context

9. e. Section 88 of the Aboriginal Cultural Heritage Act 2003 (Qld) provides that: "88 Cultural heritage management plan may be needed if other environmental authority needed (1) This section applies to a project if— (a) under an Act other than this Act— (i) a lease, licence, permit, approval or other authority is required for the project; and (ii) under the operation of the Act under which the authority is required, or under the operation of another Act, an environmental assessment is required for the project; and (b) the project is a project, or a project of a type, prescribed under a regulation for this section. (2) The entity authorised to give the authority must not give the authority unless— (a) a cultural heritage management plan for the project has been developed and approved under this Act; or (b) the authority is given subject to conditions to ensure that no excavation or construction takes place for the project without the development and approval of a cultural heritage management plan for the project. (3) The entity authorised to give the authority has power to impose conditions mentioned in subsection (2)(b). (4) The plan area for a cultural heritage management plan approved for subsection (2) may be limited to the part of the project area that is the subject of the environmental assessment. (5) The Minister may recommend the making of a regulation under subsection (1)(b) only if the Minister is satisfied the project or type of project will have a significant impact on Aboriginal cultural heritage. (6) In this section— environmental assessment means a form of environmental assessment or planning, not including an EIS."

Given that cultural heritage plans are project-specific and that the conditions of approval of the GFD project specifically provide that further approvals may be needed for the release of co-produced water, it is possible that the current CHMP does not cover the Proposed Action.

f. If the current CHMP does not relate to the cultural and heritage values affected by the Proposed Action, Santos cannot rely upon the CHMP to establish that it has engaged in appropriate consultation to determine the cultural and heritage values of the Dawson River to the Iman people for the purposes of the EPBC Act.

Response 7.4

Santos achieves its cultural duty of care in partnership with the Wardingarri and Iman #4 people.

As previously mentioned in Response 7.3, Santos executes Cultural Heritage Management Plans in compliance with the *Queensland Aboriginal Cultural Heritage Act (2003)* and in partnership with the Wardingarri and Iman #4. The management plans have review clauses and are implemented with the Wardingarri and Iman #4. For further information please refer to Section 1.6.3 Indigenous engagement in the Fairview WRS PD.

Comment 7.5 – Section 3-7 Indigenous engagement, social emotional and cultural wellbeing, Free Prior Informed Consent, Reverse Osmosis Water and Cultural Water, Conclusion

Section 3. Indigenous Engagement.

Engagement with Traditional Owner groups is required to be ongoing, further than the current engagement priories by Santos. Quantity and quality of engagements where meaningful intentional relationships are build is required for broader awareness of extractive industry ongoing and planned works. This may allow for a richer and more diverse group of engagement and understanding.

Section 4.Social Emotional and cultural wellbeing.

Santos must realise and recognise the ongoing emotional and cultural wellbeing of Traditional owner groups where business and projects are conducted. This would involve understanding the historical and cultural context of various project areas and the cultural obligations various clan groups have to specific areas.

Section 5. Free prior Informed Consent

For Santos to meet their aspirations of an Industry leader for best practice cultural heritage management then best practice appropriately technology and dissemination of project impacts and works is greatly required for Traditional owner groups to make informed decisions. Conceptual models of the release area and impact pathways should be explained and shown to Traditional owner boards and Cultural Heritage officers

Section 6. Reverse Osmosis Water and Cultural Water

The water that flows through the Dawson River is natural and of country it is not that of a synthetic made Reverse osmosis component water that is difference in composition than that of the natural environmental and cultural flows of the area.

Section 7.Conclusion

For the reasons stated in this submission, we ask the Minister to exercise her power under s133 of the Act refuse to approve the Proposed Action.

Response 7.5

Section 3. As mentioned in Response 7.1, Santos is committed to meaningful engagement with Indigenous Traditional Owners. Santos has and continues to conduct ongoing consultation with Traditional Owners to ensure the community is engaged and informed at each stage of the project's lifecycle.

Section 4. Santos recognises and appreciates the cultural significance of the land on which our businesses operate. We are committed to informing our workforce on the cultural context and obligations of where we operate both locally and around the world. For further information please refer to Section 1.6.3 Indigenous engagement in the Fairview WRS PD.

Section 5. Please see Response 7.1 (4)

Section 6. Please see Response 7.3 (8-9)

Appendix A

Submission by R Moffat

Appendix A Submission by R Moffat

The Santos Fairview Water Release Scheme Project (EPBC 2021/8914)

Attention: Team Leader Environment

Dear Sir/Madam,
As a riparian land holder living upstream from the town of Taroom, we are very concerned about the release of 'treated' water from the Santos CSG at Fairview into the Dawson River. Is this waste water being monitored and if so, who is and where is it being monitored?

Any undetected minerals and salts that are released could have long and harmful results to the flora and fauna particularly the critically endangered White-throated Snapping Turtle which nests in the area where water is to be released. Until it is known what the impact of this concentration of boron and its cumulative impact over time is on the insect and other food sources of this endangered turtle and other turtles, fish, platypus and aquatic life, the case for the environmental safety of this proposal should not be allowed until all avenues have been scientifically approved.

We have been involved with both Gas and Coal Mining companies and we are aware that their interests are NOT for the environment. A short term gain for a long term Pain.

Our river, the Dawson, eventually flows into the Great Barrier Reef which we do not want to endanger. The farmer is the custodian of the land the mining companies have little or no concern for the environment.

The proposal to release any extracted water from the mining companies should not be given permission till all scientific avenues have been carried out.

Yours Faithfully,
R. S. Moffat.

Richard Moffat, Riparian Landholder, President Upper Dawson Wildlife Preservation Society Queensland (WPSQ)
Eurombah
Taroom 4420 0746283228

Appendix B

Submission by the Upper Dawson Wildlife Preservation Society of Queensland

Appendix B Submission by the Upper Dawson Wildlife Preservation Society of Queensland

Wildlife Preservation SOCIETY OF QUEENSLAND Upper Dawson Branch

PO Box 262
Taroom Q 4420
E: upperdawson@wildlife.org.au

24-03-2023

community@santos.com
Attention: Team Leader Environment
PO Box 1010, BRISBANE 4001

re:The Santos Fairview Water Release Scheme Project (EPBC 2021/8914)

Dear Sir/Madam,

The Upper Dawson Branch of Wildlife Qld submits that:

Without more detailed water sampling during different levels of flow, the proponent hasn't demonstrated possible impacts of the release under a variety of conditions. As water chemistry can vary widely under different flow regimes and weather conditions, this comprehensive sampling must be carried out.

Given that 'treated' water is not pure H_2O or entirely chemical-free and that higher than usually permitted levels of boron are currently allowed in existing water releases, there has been very limited scientific assessment of the impact of these concentrations of boron or their downstream accumulation under repeated evaporation events on the flora and fauna of the Dawson and its surrounds. This rigorous assessment must be a pre-condition of any approval.

The use of boron to kill ants and cockroaches is well-known. The critically endangered White-throated Snapping Turtle nests in the area where water is to be released. Until it is known what the impact of this concentration of boron and its cumulative impact over time is on the insect and other food sources of this endangered turtle and other turtles, fish, platypus and aquatic life, the case for the environmental safety of this proposal has not been made.

While the base of the Evergreen aquifer is thought to have low permeability, its upper levels are permeable, providing good quality water in local bores. It is likely that releasing water directly above the upper Evergreen will result in leakage into the aquifer. Further investigation is needed to demonstrate that this contamination cannot occur.

Organisms that live in underground water (stygofauna) have not been adequately studied to know how such infiltration will impact the biodiversity of the Dawson Valley and its streams.

We submit that this project must not proceed without the rigorous research outlined above.

Thank you for the opportunity to comment on this proposal,

Kind Regards,
Ann Hobson
Secretary,
Upper Dawson Branch
0427 504 560

Wildlife Preservation Society of Qld wildlife.org.au | 60 YEARS CELEBRATING

Appendix C

Annexure to Lock the Gate Alliance and J. Baird et. al.

Appendix C Annexure to Lock the Gate Alliance and J. Baird et. al.

Analysis of Fairview Water Release Scheme: Impact and risk assessment for water and connected environmental values

Professor Matthew Currell

Ms Monica Esmond (PhD candidate)

Mr Riley Nicholson (BEng Hons graduate)

Ms Katelyn Dooley (BEng Hons graduate)

Mr Clint Hansen (Indigenous Research Fellow/PhD candidate)

School of Engineering, RMIT University

24th March 2023

Through RMIT University's *Engineering Capstone* project course and related research programs, a body of work examining the hydrology, hydrogeology, water quality and ecology of the Upper Dawson River (known as the *Wardingarri* in Iman language), in the vicinity of the proposed Fairview Water Release Scheme (FWRS) was conducted in 2022 (Nicholson et al., 2022) and remains ongoing. The research has identified a number of data and knowledge gaps relevant to the assessment of water and environmental impacts of the FWRS scheme, as originally outlined in documents submitted for EPBC review in 2021-22.

Some of the issues identified in the 2022 research have been resolved, or are no longer relevant, due to the amendment of the FRWS proposal to exclude un-treated, event-based coal seam gas water releases into the Dawson River. However, there are still knowledge gaps and unresolved issues in the assessment of water and related environmental matters, associated with the proposed daily treated water releases. These include gaps in baseline characterisation of the region's water quality, hydrology, hydrogeology and eco-hydrological relationships. The issues identified and discussed below relate only to the revised proposal made available in February 2023, involving the application to increase the rate of discharge of treated CSG co-produced water to 18 ML/day at the current release point, upstream of the oxbow wetland that flows to the Dawson River/Wardingarri.

The main issues identified in this review, which are gaps in the FWRS impact analysis, are:

1. **Water quality** / **flow regime relationships:** The relationships between water chemistry and flow conditions in the Dawson River – which is a highly variable river system both spatially and temporally – remains poorly characterised. Water quality baselines and water quality objectives for rivers with highly variable flow conditions (such as the Dawson) must consider the dynamics of water quality at different flow stages and wetting/drying cycles. Sampling of baseline and ongoing water quality should occur during minimum, low, moderate, medium and high flows, each on multiple occasions to give statistical robustness to the data. These data should be presented and anlaysed in a way that allows the baseline water quality at different flow stages, and the likely impact of the additional treated water discharges at these different flows, to be analysed. Sample site coverage for water quality sampling, including control sites, is also limited in the current proposal, both spatially (i.e., for characterisation of a heterogeneous river system) and temporally (i.e., to adequately capture ecohydrologically important processes and change over time at each site).

2. **Limited knowledge base to support ecotoxicology assessment for boron:** Boron concentrations in the desalinated water and oxbow lake wetland where releases currently take place, are generally above the ANZECC default guideline values for 95 and 99% species protection for aquatic ecosystems (0.94 and 0.34

mg/L). While Santos have negotiated a much less strict water quality objective for boron with the Queensland government (2.9 mg/L), this is based on limited ecotoxicology testing (utilising only five indicator species, while the most recent ANZECC guidelines prefer at least 15 species), and a poorly fitted relationship for Boron concentration and species protection percentiles. There remains limited information as to the likely effects of elevated boron concentrations on the threatened species living along the Dawson, such as the Fitzroy River and White-Throated Snapping Turtle, and the biota upon which they feed.

3. **Limited analysis of potential ecological impacts of change to low-flow regime:** Analysis of the effects of the proposed releases on river flow regime, particularly at the low-flows end of the range of flows in the Dawson River, and associated risks to environmental values, remains limited. The increase in water discharge to the wetland and spill-over into the river will result in a decrease in the frequency, duration and magnitude of low flow spells in the river system, making pools and riffle areas more connected than would otherwise be the case under natural conditions. The effect of this on the ecosystem (e.g., through favouring species that are better adapted to a more permanent, higher level of baseflow, and greater connectivity between river sections) has not been thoroughly documented or analysed. The assumption of limited/no impact of the changed flow regime, rests on observations about the level of increase in water levels and flow velocities being small relative to natural variability. However, flow impacts will be cumulative on top of existing natural variability and affect river flows only in one direction – i.e., releases will always add additional flow to whatever natural flow variability is being experienced; as such, there will be a distinct change in flow regime towards higher rates of flow, most noticeable during lowest rainfall periods. Ecological consequences of such change must be carefully analysed and considered.

4. **Hydrogeological conceptual model and ground-surface water interaction:** There are issues with the hydrogeological conceptual model. This model assumes that the Evergreen Formation – which underlies the oxbow wetland into which increased treated water releases are proposed – is an aquitard (with limited permeability). In fact, most field data indicate that the shallow Evergreen Formation in this region contains high-quality groundwater, and its upper layer(s) has substantial permeability. The uppermost part of the Evergreen Formation is the most likely hydrogeological layer to be in contact with, and exchange water with, surface water bodies in the region, including the oxbow lake, and Dawson River downstream of the proposed releases. Leakage of the treated CSG water from the wetland into the upper Evergreen Formation, and subsequent ground-surface water exchanges, have not been considered in the proposal due to conceptualisation of the whole unit as an aquitard. Impacts on groundwater levels and groundwater quality within the Evergreen Formation itself (in which there are landholder bores and likely GDEs) have been overlooked as an impact pathway.

5. **Lack of field data on ecohydrology and groundwater dependent ecosystems:** Stygofauna have still not been appropriately sampled and documented in the shallow groundwater in the vicinity of the release point, and Dawson River downstream of the oxbow lake wetland. While the revised proposal acknowledges that stygofauna will be present at the site, it is not possible to properly assess risk and/or impacts on such fauna without a proper baseline dataset on the type, abundance, and diversity of these. Stygofauna should be sampled in the alluvial groundwater, as well as the Evergreen Formation, where high quality groundwater occurs in close proximity to the release point and oxbow wetland. Leakage of water from the wetland into these shallow aquifers may occur, affecting groundwater quality utilised by GDEs.

6. **Broader context of produced water management (i.e., impact of other CSG water management strategies apart from treated releases):** The updated proposal documentation indicates that only approximately 20% of the CSG produced water generated from Santos's gas fields in the region will be managed through releases of RO treated water under the proposed FWRS. The predominant water management strategy (encompassing 60% of produced water) is re-use through irrigation. This includes unspecified mixtures of RO treated and un-treated CSG produced water. Evidence from the RMIT capstone research showed that surface water near existing irrigation schemes (along Hutton Creek) is suffering poor water quality – with high turbidity, total iron and aluminium levels. If such irrigation schemes are expanded, there is a critical need to fully assess the impacts of runoff on surface water, groundwater and soil quality. It is unclear whether this is adequately documented and analysed in existing water management plans for the GLNG and GFD projects, and whether there may be increased risk of impacts on matters of national environmental significance arising from the increased management of produced CSG water through such irrigation schemes. Brine management strategies for the considerable quantities that would be generated through the life of the scheme are also not discussed, beyond storage within above-ground dams on-site.

1. Flow regime and associated water quality characterisation

The receiving environment for the FWRS treated releases, in particular the Dawson River (Wardingarri) downstream of the overflow point(s) from the oxbow lake, is characterised by a highly variable flow regime, being a weakly perennial semi-arid river, with substantial differences between flow rates and stage heights at different percentiles. The FWRS proposal lacks careful consideration of the relationship(s) between water quality and flow rates, or potential flow-on effects to ecosystems of water quality changes occurring during specific flow conditions (particularly low-flows).

Water quality data in the FWRS documentation are only presented as summary statistics, and data are not separated according to different flow periods and/or phases of wetting-drying cycles. The derivation of Water Quality Objectives (WQOs) also appears not to have considered the likely importance of flow regime-water quality relationships. The use of generic (ANZG) WQOs may be inappropriate for systems characterised by highly variable flow regimes that host sensitive and high-value ecosystems (Smith, Jeffree & John 2004; Smith et al. 2020).

Standardised water quality guidelines are typically devised for perennial flow systems which generally exhibit relatively stable water quality parameters (Smith, Jeffree & John 2004). Conversely, during low or no flow periods, systems with variable flow regime become fragmented into ecohydrologically distinct waterbodies which exhibit highly variable water quality (Smith et al. 2020). Between flows, these isolated waterbodies behave as separate 'mesocosms' and physico-chemical parameters are essentially 'reset' following each large flow event (Sheldon 2005; Smith et al. 2020). Consequently, traditional seasonal monitoring methods and reference site approaches may not be suitable for the characterisation of temporary waters and may lead to undervaluation of stream quality (Walker, Sheldon & Puckridge 1995). In a guidance document produced following publication of the updated ANZECC Guidelines, Smith et al. (2020) emphasise use of conceptual models to develop an informed understanding of how the complex interrelating abiotic and biotic factors characterise different flow phases, and development of appropriate water quality monitoring strategies to account for these dynamics. This is a gap in the proposal.

Section 5.3 of main report (AECOM, 2023) and Appendix E.1, E.2 include water quality data from desalinated water pond monitoring, the oxbow lake wetland into which releases flow, and the Dawson River, at one upstream and two downstream sites. These data are presented only as summary statistics for samples collected prior to the commencement of approved desalinated water releases (pre-2015) and after releases (at the current approved rate) commenced in 2015. The data provide no indication of temporal dynamics in water quality parameters – including contaminants that exceed water quality objectives (e.g., ammonia, other nutrients, and aluminium). It is vitally important to understand whether these contaminants, and others which are elevated in the treated water relative to baseline data (e.g., Boron), are more elevated in the receiving environment when flows in the Dawson are low, as distinct from median and high flow conditions.

In order to understand how water quality in the Dawson will be affected by the releases through different periods of time, sampling of baseline water quality data and reporting of ongoing water quality results should occur during minimum (baseflow), low flow, moderate, medium, and high flow conditions, each at multiple upstream and downstream sites where sensitive species such as the threatened turtles may inhabit, and each on multiple occasions to give statistical robustness to the results. An example of how water quality data can be reported together with information on flow conditions is presented below:

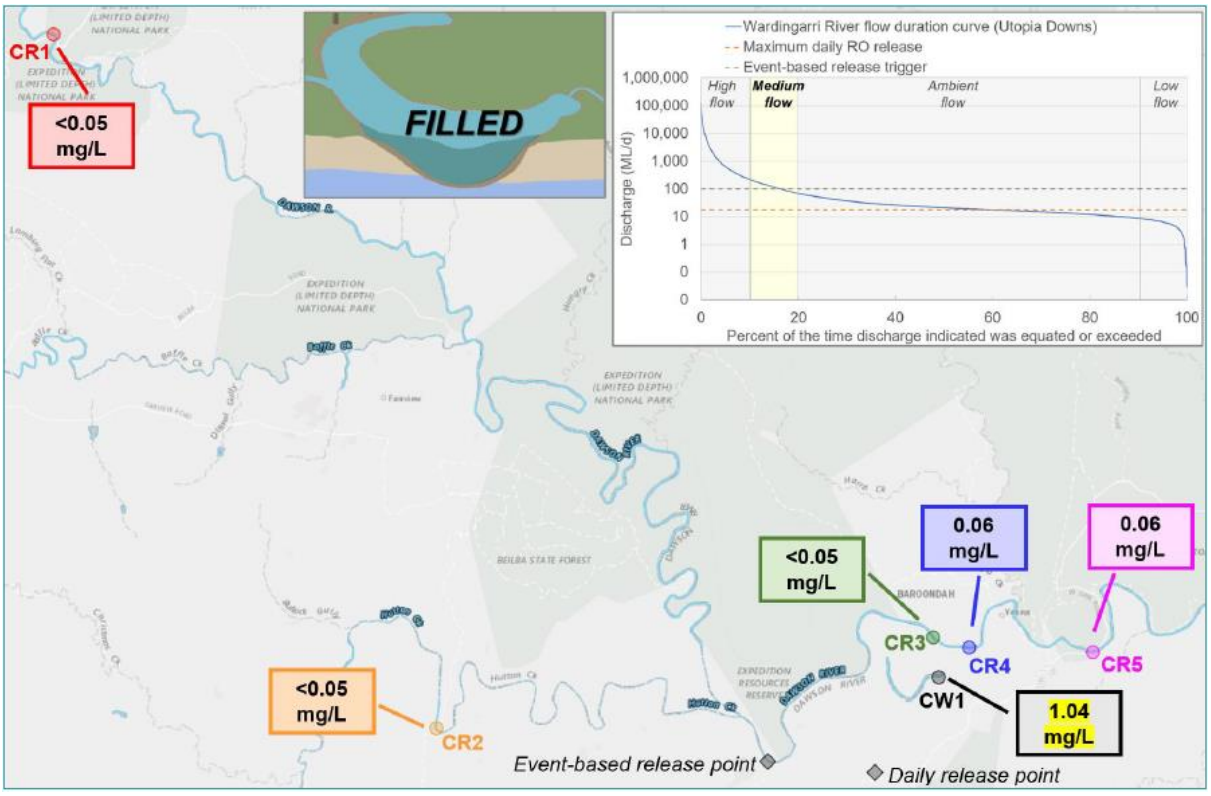


Figure 1: Example of format for presenting water quality data along with flow conditions (indicated in yellow on flow duration curve) to characterise flow/quality relationships (Nicholson et al., 2022).

Such analysis is vital for a thorough assessment of the likely impact of the additional treated water discharges into a highly variable river environment.

Control site monitoring

The high degree of complexity and natural variation of weakly perennial streams such as the Dawson/Wardingarri is well known (e.g., Sheldon 2005; Walker, Sheldon & Puckridge 1995). Such conditions require the use of multiple control sites to understand natural and anthropogenic drivers of water quality change (Smith et al. 2020). Currently, there appears

to be one control site for surface water monitoring in the Dawson River (DRR1, 550 m upstream of the confluence of the oxbow lake and river), and one control site for assessing water quality of the Oxbow Lake wetland (DRR2), which is a pool on Hutton Creek upstream of its confluence with the Dawson.This is a limited spatial coverage with which to assess change relative to upstream/un-impacted conditions in the river and wetland, given there are multiple different hydrogeomorphic settings along the Dawson (deep pools, rocky riffles, narrow channels).

It is also questionable whether the use of DRR2 as a control site is appropriate, as it appears to be influenced by disturbance from nearby irrigation schemes (Figure 2). The RMIT team visited the DRR2 site during fieldwork in 2022, and found elevated levels of turbidity, total iron and aluminium in the water, along with an algal sheen on the surface of the water body (Figure 2 and Table 1). The environment was very different – both qualitatively and quantitatively – to the oxbow lake wetland for which it is serving as a control site, meaning it may not be an adequate indicator of the effects of the releases on this environment.

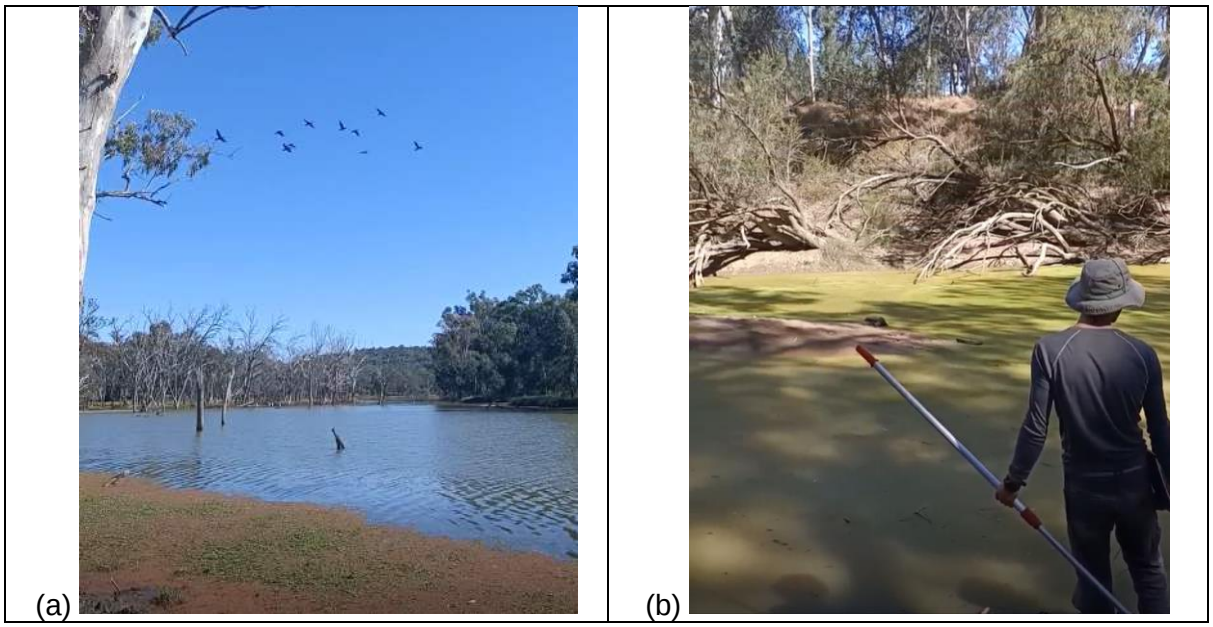


Figure 2: Comparison of (a) Oxbow Lake Wetland and (b) Hutton Creek site (DRR2) during 2022

Water quality impacts observed at Hutton Creek were considered likely to be a result of runoff from the surrounding Santos irrigation schemes (shown in shaded green on Figure 3 below), which utilise treated and un-treated CSG wastewater (the site is labelled CR2 in Figure 3 below).

The water quality impacts observed at this site raise further questions about the water quality impacts of this aspect of produced water management from the Fairview gas field (i.e., the use of CSG wastewater in irrigation schemes), a topic further discussed in section 6 of this report.

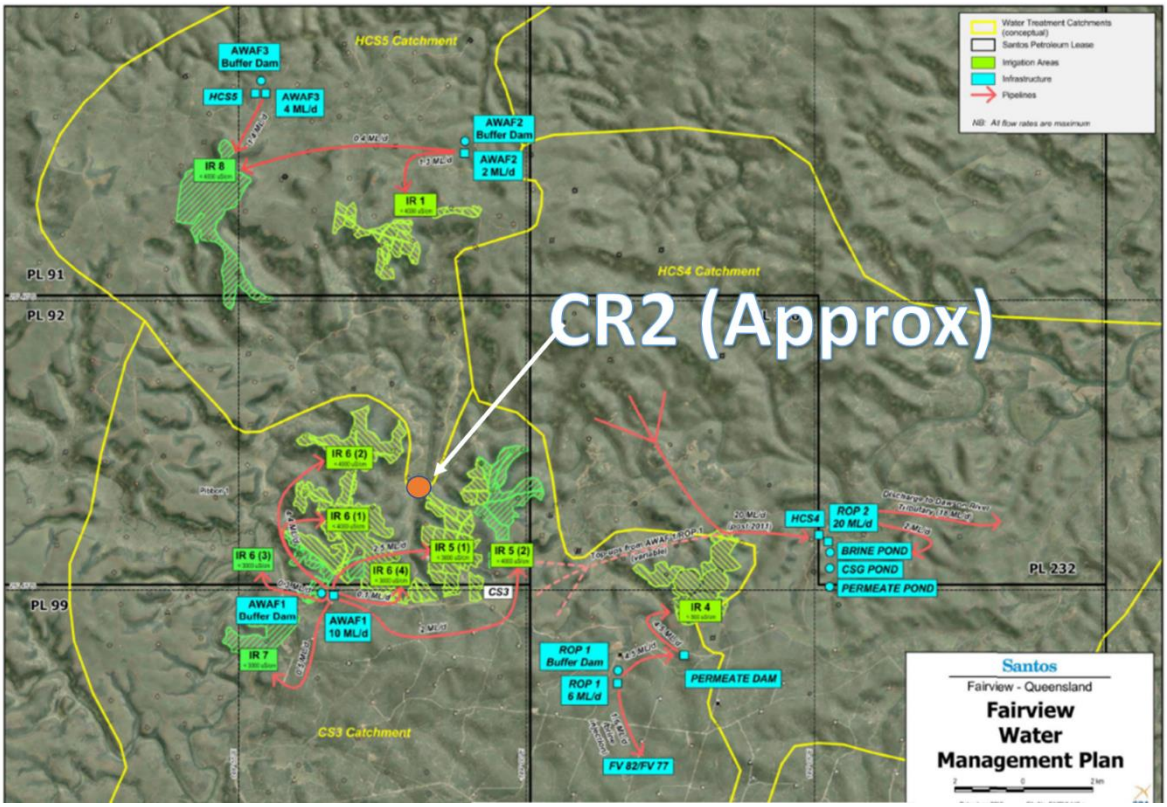


Figure 3: Location of control site for oxbow wetland (Hutton Creeek), showing locations irrigation schemes utilising co-produced CSG water (Nicholson et al., 2022). Site is labelled CR2 as per the nomenclature selected in the RMIT capstone research, but is the same site as DRR2

2. Water quality: insufficient understanding of boron ecotoxicity

Water quality data for the oxbow lake wetland, reported in Appendix E1 and E2, shows that there has been a significant increase in boron concentrations (median value increasing from 0.07 to 0.60 mg/L and maximum value increasing from 0.13 to 1.23 mg/L) relative to pre-impact baseline data. Sampling by RMIT conducted in 2022 found a concentration of 1.04 mg/L within the oxbow lake wetland, and values of 0.06 mg/L in the Dawson River, downstream of the wetland, when the system was sampled during medium flows (Figure 1).

The impact of boron concentration increases on threatened species inhabiting the receiving environment – including considering water quality/flow relationships (section 1) remains poorly understood. Concentrations of Boron in the desalinated water and oxbow lake wetland frequently exceed ANZECC default guidelines for protection of 95% and 99% aquatic species (0.94 and 0.34 mg/L, respectively). Santos have negotiated with the Queensland regulator to amend the water quality objective for Boron in the receiving environment for the current approved treated releases, to 2.9 mg/L (as of 2022). This value was derived by plotting ecotoxicology test results estimating IC/EC10 (an indicator of chronic and acute effect concentrations), from five species to a log-logistic fit of concentration vs. %species protection level. The line of best fit achieved from the data is poor (see figure 4b) and there is particularly high uncertainty in the shape of fit at the low end of the response curve, which is critical for derivation of the 95 or 99% species protection value:

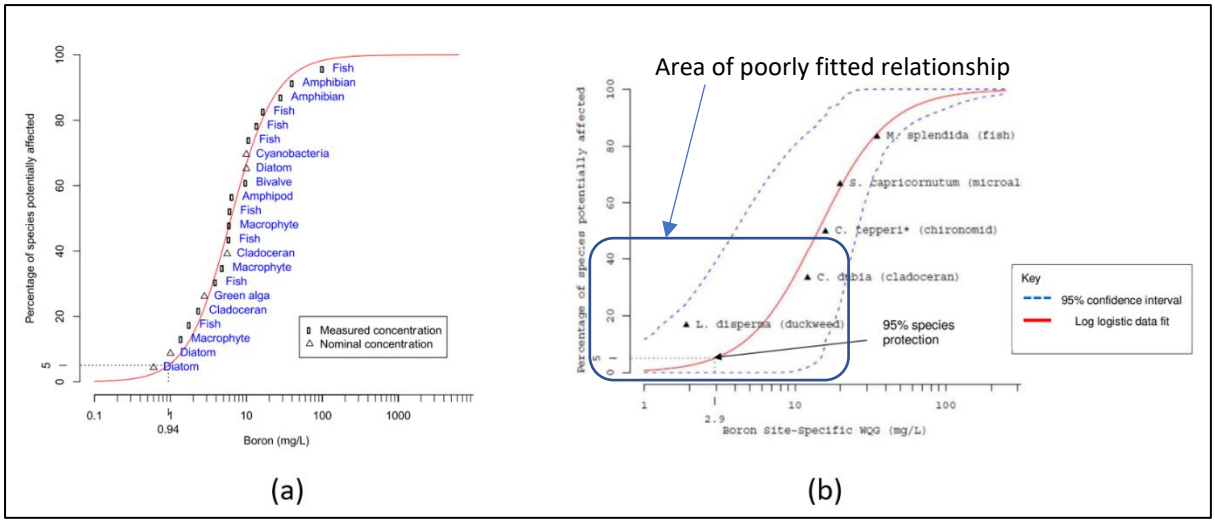


Figure 4 – (a) Species-Specific Distribution utilised to derive the ANZECC default 95% guideline value of 0.94mg/L. (b) Species-Specific Distribution utilised to derive the site-specific guideline value of 2.9 mg/L for the Fairview release scheme (Adapted from: AECOM 2019, and ANZG 2021)

Warne et al. (2018, p. 19) note that the use of such a low number of species to derive a WQO is at the bare minimum of what is considered 'adequate'; datasets with 8–14 species belonging to at least four taxonomic groups are considered 'good', and those that contain data for at least 15 species are 'preferred'.

Since this ecotoxicology testing was conducted, newer, more robust default guideline values for Boron have been developed and established (ANZG 2021). In the updated ANZECC guidelines, 22 species were used to derive the current 95% and 99% protection guideline values for boron of 0.94 mg/L and 0.34 mg/L respectively. These guideline values fit Warne et al.'s (2018) definition of 'preferred' and provide a much better fitting relationship than used to develop the 2.9 mg/L value. In order to afford maximum protection of sensitive species in the receiving environment, either the new default guideline value should be adopted, or a new site-specific WQO should be determined based on ecotoxicology testing for a significantly larger number of species that are relevant in the receiving environment (at least eight, and ideally >15, depending on the level of fit that can be achieved in the resulting log-log relationship). It has been noted by the IESC that threatened species that inhabit the receiving environment (White Throated Snapping and Fitzroy River turtle) are sensitive to aqueous contaminant exposure, due to their cloacal respiration mechanism, and the turtles may also be exposed through accumulation of contaminants within algae and invertebrates upon which they feed. The assessment of a low risk to these turtles from water quality impacts in the proposal should be seen as uncertain in this context, and a more conservative approach taken.

3. Modification of low flows hydrology

Low flow periods play key role in maintaining natural diversity of stream ecosystems in many rivers (McGregor et al., 2011; Poff & Zimmerman, 2010). Low flows hydrology modification can result in significant changes to ecosystem structure and function. The Dawson River/Wardingarri is 'a series of interconnected pools…separated by sandy gravel & rocky riffles' (Miles, 2021), and these features play a significant ecohydrological role for macroinvertebrates, turtles, and fish communities. Flows in the Dawson are highly variable, quickly shifting between low-flow to flood conditions and then receding relatively rapidly to baseflow (e.g., Fig. 5-10 of the proposal documentation).

Daily discharge of 18 ML/day will significantly reduce the magnitude and duration of low-flow spells in the Dawson River – Figure 5 shows a comparison of this discharge rate with the flow duration curve for Utopia Downs, approximately 60 km downstream of the releases.

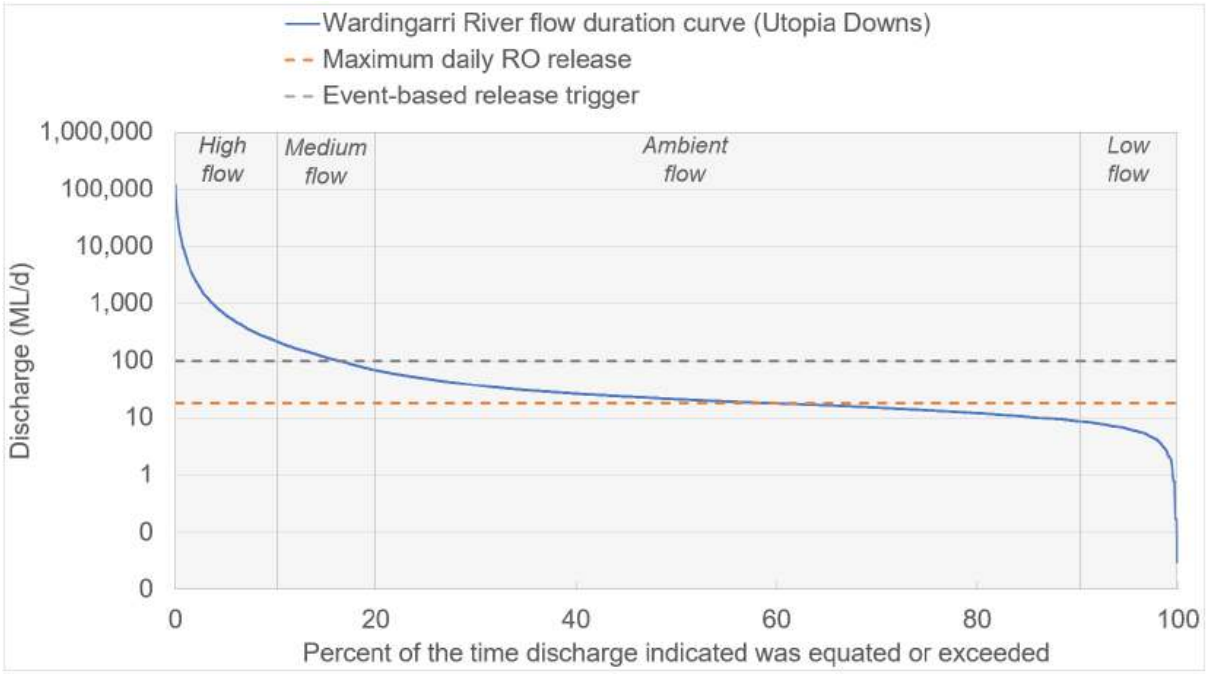


Figure 5 – Flow duration curve for Dawson River (Wardingarri) at Utopia Downs, with daily treated water release rate indicated (orange line). The release rate exceeds natural river discharge monitored at this point approximately 40% of the time.

While not all discharged water will directly enter the Dawson (some will undergo evapotranspiration in the oxbow lake, some may leak into the underlying Evergreen Formation - see section 4 below), the increase in flows to the Dawson will be considerable relative to typical pre-development low-flows. Figure 6 reports results of an analysis of historic flows data (from Utopia Downs) with the impact of the additional flows from the releases on hydrological response variables (HRVs). The results encompass three scenarios:

- Pre-development: Flow regime (based on historic data) without any additional discharge (blue bars)
- Santos assumption (based on AECOM, 2021): Impact of additional discharge assuming initial 50% loss through evapotranspiration (ET) between discharge point and oxbow wetland, and subsequent 1.7ML/day from the wetland. This corresponds to an additional 7.3ML/day in the river (orange bars)
- Seasonally Variable: This accounts for seasonal variation in ET, with 50% ET losses Nov-Feb, 33% losses in Mar-Apr, 22% losses in May-Sep and 33% losses in October. This attempts to better capture seasonal losses in the wetland and adjusts flows from the wetland to the Dawson accordingly (grey bars).

The river flow data across back to 1966 were analysed under these three scenarios, with additional flows from the treated releases added to historically recorded flows. The most notable change in any HRV under the proposed discharge scenarios is the significant decline in number of low flow days (LFDs). While some low flow days still occur under the two discharge scenarios, these were largely during historic droughts (1968 and 1979-1982) with minimal occurrence throughout the rest of the record.

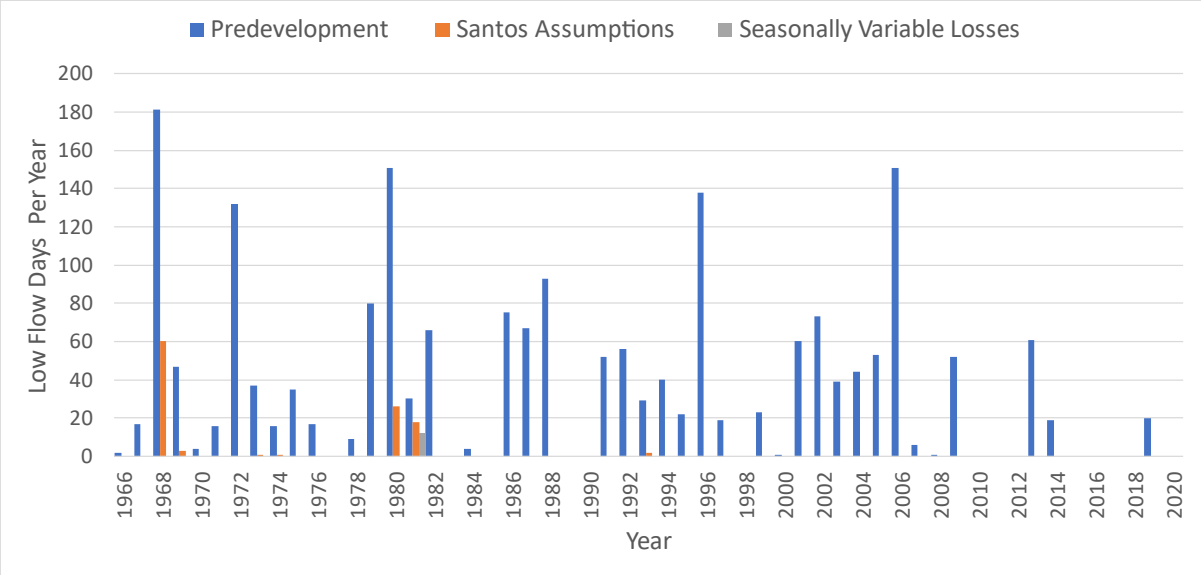


Figure 6 – **Number of low flow days per year in Dawson River (at Utopia Downs) with and without daily treated releases, based on historical flows data (Nicholson et al., 2022).**

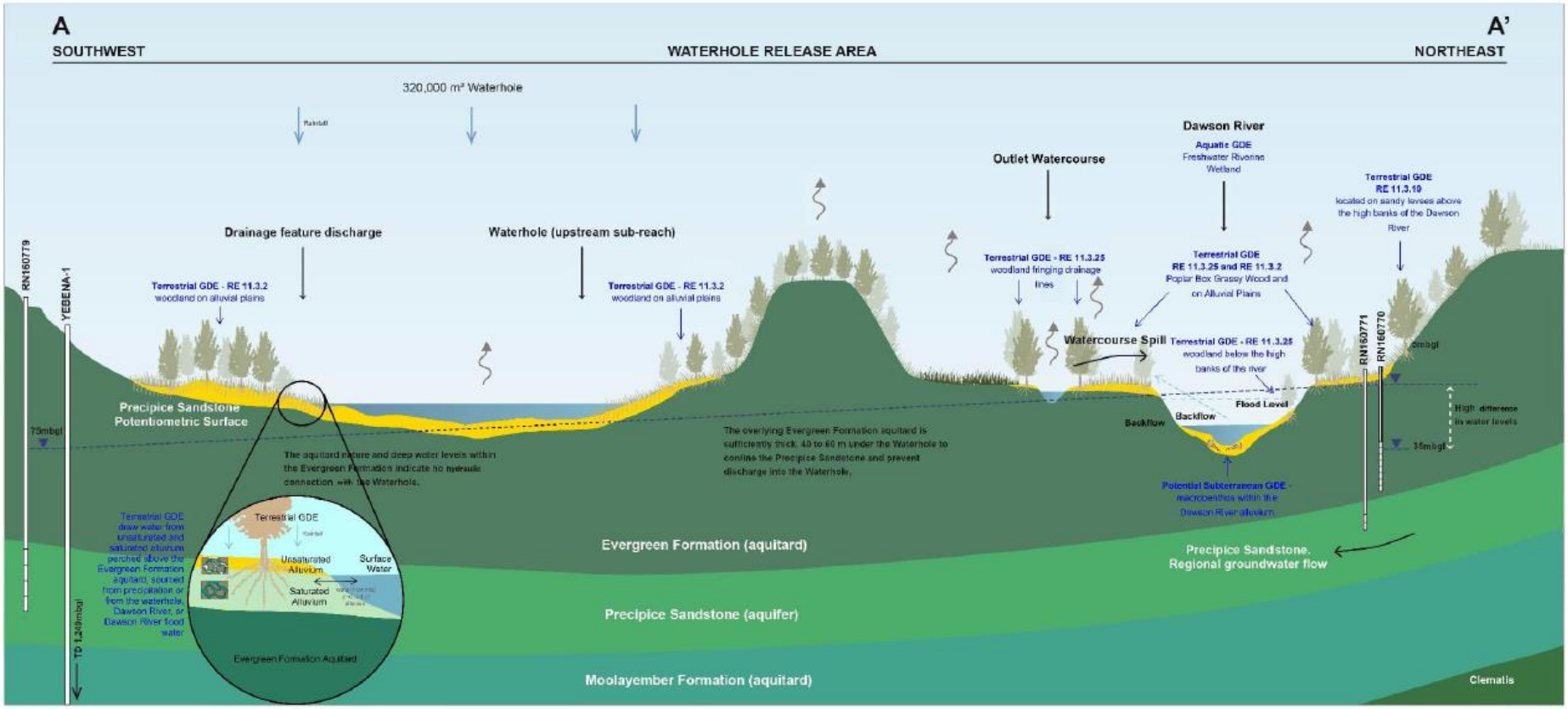
While the daily releases of 18 ML/day may only result in limited rises in water levels (e.g. ~5 cm at Yebna Crossing), the potential ecological impacts of reducing the frequency and magnitude of low-flow periods in the river do not appear to have been studied in detail – with consideration of factors such as the connectivity of pools and impacts on water depth at shallow riffle environments. The IESC pointed out that increasing the frequency of spill-over from the oxbow lake wetland into the Dawson River may favour colonisation of the river channel by invasive species:

> "For example, increased spilling may allow invasive fish species such as goldfish (*Carassius auratus*) and mosquitofish (*Gambusia holbrooki*) that are already in the Waterhole to disperse repeatedly into the Dawson River. The proponent should assess the risk of the predicted changes to the Waterhole's water regime in facilitating the spread of invasive species in the Dawson River and propose suitable mitigation or remediation strategies if undesired changes occur."

The response to this advice (Appendix C) notes that these two invasive species already inhabit the Dawson, arguing that this is a pre-existing issue rather than an impact that needs consideration for the FWRS. However, it is critical that baseline and ongoing data collection monitor any additional effects caused by the treated water releases, both for the two species highlighted, and other potential invasive species. A protocol for collecting data to indicate the extent of transmission of non-native species from the waterhole to the river, and the possible effect on the EPBC listed threatened species should be developed as part of the REMP.

4. Hydrogeological conceptual model, ground-surface water interaction and implications for ground and surface water impacts

The proposal documentation concludes that there is no significant risk of impacts to groundwater quality, quantity, or groundwater dependent ecosystems. This is based on baseline groundwater and GDE monitoring, and a conceptual hydrogeological model developed for the site, which encompasses ground-surface water interaction and eco-hydrological relationships (e.g., figure 3-3, reproduced from AECOM 2023, below):



Not to scale

LEGEND

- Evergreen Formation
- Precipice Sandstone
- Moolayember Formation
- Clematis Group
- Waterhole
- Alluvium
- Precipice Sandstone potentiometric surface
- Groundwater Bore
- Evaporation/Evapotranspiration
- Rainfall

Figure 3-3 Ecohydrological model for groundwater resources and GDE associated with the waterhole and Dawson River (Panel A)

There is an important aspect of this conceptual model which appears to be inconsistent with the data collected from the site – namely the conceptualisation of the Evergreen Formation as an (essentially uniform) aquitard. This assumption is significant, as it limits the scope of the analysis of potential groundwater impacts and ground-surface water interaction to the Precipice Sandstone aquifer and shallow alluvium in the channel of the Dawson.

The Precipice Sandstone occurs at significant depth below the oxbow lake wetland and is therefore unlikely to interact directly with the treated water releases in the vicinity of the release point. However, the Evergreen Formation directly underlies the oxbow lake wetland and Dawson River channel downstream of the release point. Groundwater chemistry and hydraulic testing data (compiled by OGIA) for the upper Evergreen Formation (section 4.1.2.1) show that this unit is a potentially significant aquifer, which hosts high-quality groundwater. Hydraulic conductivity field data in Table 4-4 show values in the range of a moderate to high-yielding aquifer in the upper part of the formation (Kh values from 0.0014 to 8090 m/day); these are not consistent with uniform conceptualisation of the unit as an aquitard. Hydrochemical data presented in table 4.7 from registered bores in this formation, also indicate a high-quality groundwater resource, e.g., TDS values are all < 400 mg/L (or < 820 mg/L encompassing the Boxvale Sandstone member), and in one bore TDS is < 100 mg/L (or three bores if the Boxvale Sandstone is included). This puts the groundwater within the range of salinities considered viable for potable water supplies and is inconsistent with the quality of water expected for an aquitard. The low TDS values also indicate a potential for ground-surface water interaction occurring (e.g. leakage/recharge of the upper formation from surface water during high flow events), which has not been considered in the conceptual hydrogeological model.

Data from bore RN160770, screened in the upper Evergreen Formation near the Dawson River, shows rapid, periodic increases in level that decline gradually between rainfall events.

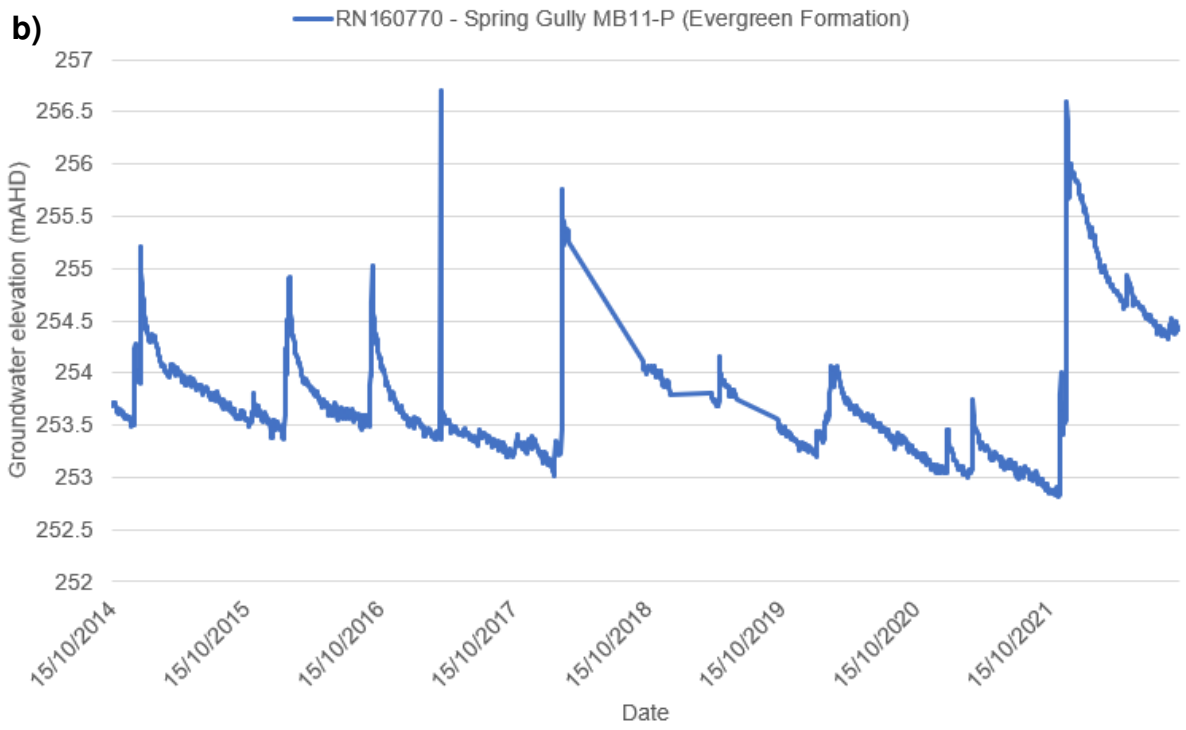


Figure 6 – Hydrograph of Evergreen Formation; a) bore location with respect to oxbow lake and Dawson River, b) groundwater level (m AHD) over time. Data from Queensland Globe

The bore is screened from 16 to 79 m below ground surface across the Evergreen Formation. Water level is approximately 35 to 40 m below ground surface level; noting that the bore is located at the top of a steep cliff adjacent to the Dawson River channel – elevation at the river channel is approximately 250 m AHD (i.e., similar to the groundwater levels recorded in the bore). The periodic rises and subsequent fall in groundwater level imply that the aquifer has substantial permeability and is recharged rapidly, potentially through pulses of flow from the nearby alluvial channel of the Dawson River when it floods. The groundwater in the bore has a field EC value (last measured in 2014) of 200 µS/cm, consistent with this interpretation and indicating fresh groundwater with minimal solute concentration during recharge (as would be expected for groundwater in an aquitard). As such, a connection between the Dawson and/or its nearby alluvial sediments, and groundwater in the upper Evergreen Formation should be considered a potential key aspect of the conceptual hydrogeological model.

The low TDS groundwater in the upper Evergreen Formation make it a potential high-quality water source for beneficial uses, e.g., landholder water supplies and the maintenance of groundwater dependent ecosystems. This has not been considered or surveyed in the vicinity of the proposed releases – e.g., through landholder bore surveys, and ecohydrological investigations, including sampling for stygofauna in Evergreen Formation bores. Increases in certain contaminants that are elevated in RO treated water (e.g. aluminium, boron and nutrients) in Evergreen Formation groundwater, e.g., via leakage from the oxbow lake wetland, should be considered a possible impact pathway for the groundwater, and this should be assessed based on more comprehensive water quality sampling (and site-specific hydraulic testing) from upper Evergreen Formation bores.

Leakage of discharged water into the underlying Evergreen Formation may in turn affect ground-surface water interaction downstream of the site – e.g., in areas where the Evergreen underlies the Dawson River, water from the formation may discharge into the

river during low-flows. Increased rates of baseflow and changes in the chemical composition of groundwater and surface water receiving discharge from the formation is thus a further potential impact pathway that has been given limited consideration.

The IESC highlighted the need for careful characterisation of potential shallow surface-groundwater interactions through additional mapping of hydraulic gradients and water quality at different surface water flow stages:

> "For example, treated water releases, especially at low flows, are very likely to alter hyporheic water chemistry (assuming hyporheic water is chemically different from the released water) because of advective exchange in the river bed in places where groundwater inputs are weak or absent, and this will potentially occur for a considerable distance downstream if the releases continue for years to decades. Assessing the scale and extent of these potential impacts depends on mapping these areas and their vertical hydraulic gradients at various flows and then inferring the likelihood that impacts to groundwater resources may arise from contamination and, to a lesser degree and in much more localised areas, changes and even reversals in surface water-groundwater exchange."

The response to the IESC's advice argues that the area in question is underlain by the Evergreen Formation 'aquitard' and that the alluvium has limited extent and storage capacity. As such further shallow groundwater quality sampling, mapping of groundwater-surface water gradients, and characterisation of potential exchanges (as recommended by the IESC) has not been undertaken. This is a significant potential oversight in the context of the above information.

5. Groundwater dependent ecosystem sampling (including Stygofauna)

Sampling for GDEs (including Stygofauna) to characterise baseline ecological values associated with groundwater, remains highly limited. The assessment documentation has 'conservatively' assumed that alluvial sediments will contain stygofauna but these have still not been directly surveyed. It is argued that because hydrochemical and flow regime changes will be small as a result of the releases, there is limited risk to GDEs and they do not require baseline characterisation. This is despite the IESC advice on the earlier version of the proposal stating that:

> "Mapping and impact assessment, together with collection of field data at a local scale (i.e., along the Dawson River and its riparian zone within and downstream of the project area) for aquatic, terrestrial and subterranean GDEs (e.g., stygofauna and hyporheos) is required, especially in alluvial sediments of the 12-km reach downstream of the proposed release point for untreated produced CSG water. Particular attention should also be paid to sampling the downstream section of the Dawson River where river water infiltrates into the banks and riverbed, providing potential flow paths into shallow alluvial aquifers. These data are needed to document the post-2015 baseline condition, to enable detection of potential impacts during operation, and to assess the effectiveness of proposed management and mitigation measures."

The lack of field sampling and characterisation of GDEs is, notwithstanding the removal of un-treated CSG releases from the proposal, an important knowledge gap. It is certain that the releases of treated water will change both the flow regime and the chemistry of both surface water and groundwater of the area to some degree. While it may be likely that the releases do not result in significant and frequent exceedances of current water quality objectives (noting issues with the current objectives discussed in previous sections of this report), it is unclear whether changes due to treated water releases (such as an increase in

boron and aluminium concentrations, or changes in the balance of nutrients and organic matter in the water) may negatively impact on GDEs. In its response to the IESC advice on the matter, the proponent argues a) that there is a low level of risk to GDEs and b) that this is grounds for not needing to conduct baseline sampling of GDEs:

> '..the desalinated water releases present a low risk to such fauna as the releases are unlikely to contribute to these habitats. If there is any contribution, the desalinated water quality is treated to a high quality and will be highly attenuated by background flows of the Dawson River'

The Department of Agriculture, Water and Environment's advice on this issue is however important:

> "Desalinated water releases, especially at low flows, are very likely to alter hyporheic water chemistry (assuming hyporheic water is chemically different from the released water) because of advective exchange in the riverbed in places where groundwater inputs are weak or absent, and this will potentially occur for a considerable distance downstream if the releases continue for years to decades."

Without baseline sampling of GDEs or studies into their specific ecohydrological characteristics and requirements, along with robust analysis of ground-surface water interactions (encompassing the Evergreen Formation – see section 4 above) it will not be possible to assess changes to the health or condition of GDEs as a result of the releases in the ongoing monitoring program.

6. Overall context of produced water and brine management

The treatment of CSG water by reverse osmosis, for release into the receiving environment and other uses, will result in large quantities of brine from the reverse osmosis process - approximately 10% of the volume of water treated. It is unclear from the FWRS proposal how such brine is to be managed, other than its diversion to storage ponds. A long-term management strategy as these ponds fill with increasing volumes of brine is not outlined. Leakage and/or overflow from brine ponds may present a risk to nearby ground and surface water resources, and under conditions of extreme weather (e.g., flooding) there may be a considerable risk of uncontrolled releases.

The updated proposal documentation indicates that only approximately 20% of the CSG produced water generated from Santos gas fields in the region will be managed through releases of RO treated water into the oxbow lake wetland under the FWRS. The predominant water management strategy (encompassing at least 60% of the water) is re-use through forestry and crop irrigation (e.g., Figure 2-1 reproduced from the report, below):

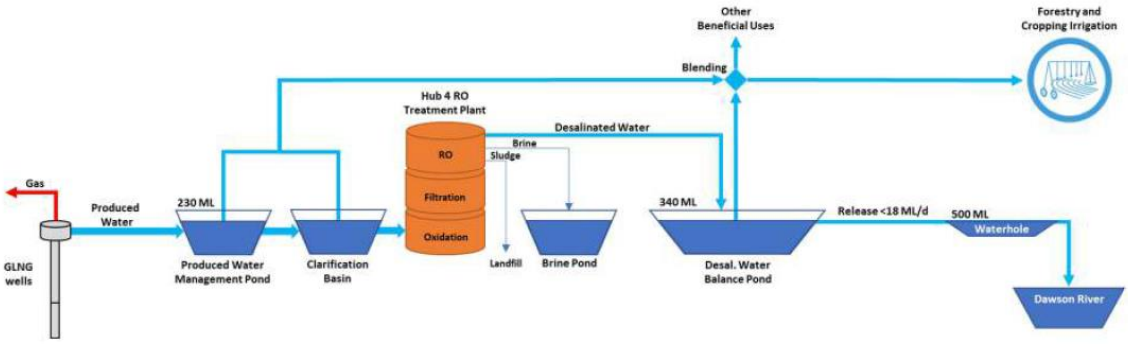


Figure 2-1 Conceptualisation of current water management

The re-use for irrigation appears to include unspecified mixtures of RO treated and un-treated CSG produced water. Characterisation of the mixtures, and associated water qualities, along with anticipated volumes used in irrigation are needed to fully understand potential environmental impacts of this management strategy.

Evidence from the RMIT capstone research showed that surface water near existing Santos irrigation schemes (site DRR2 along Hutton Creek, also labelled CR2 – see Figure 2 of section 1) is suffering from poor water quality – with high turbidity, total iron, aluminium and nitrogen concentrations compared to other surface water sites in the region, and a visible algal coating on the water body (see Figure 1).

Parameter	**Site CR2 (DRR2 control site, Hutton creek)**	**Dawson River (CR3 – upstream of oxbow lake overflow)**	**Oxbow lake wetland (CW1)**
Specific Conductance (field, µS/cm)	255	330	320
pH (field)	6.7	7.00	7.21
DO (field, mg/L)	11.5	9.0	9.9
Turbidity (field, TU)	144	28	8.4
Chloride (mg/L)	10	30	38
Metals & Metalloids (Total, mg/L)			
Aluminium	7.53	0.63	0.2
Barium	0.108	0.12	0.10
Manganese	0.77	0.14	0.43
Boron	< 0.05	<0.05	1.04
Iron	5.91	1.96	0.91
Nutrients (by discrete analyser, mg/L)			
Ammonia-N	0.13	0.13	0.02
Total N	1.3	1	0.4
Total P	0.19	0.05	0.03

Table 1 – Water quality data from site CR2 along Hutton Creek within an area draining Santos irrigation schemes, sampled on 25/7 to 26/7, 2022. Site localities indicated in Figure 1.

If such irrigation schemes are to be significantly expanded, there is a critical need to fully assess the impacts of their runoff on local surface water, groundwater, sediment and soil quality. It is unclear whether this is adequately documented and analysed in existing water management plans for the GLNG and GFD projects (as opposed to the FWRS proposal), and whether there could be impacts on matters of national environmental significance arising from these irrigation schemes.

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Appendix D

Submission by Lock the Gate Alliance

Appendix D Submission by Lock the Gate Alliance

LOCK THE GATE ALLIANCE
AUSTRALIANS WORKING TOGETHER TO PROTECT OUR LAND, WATER, AND FUTURE

Ellie Smith
Queensland Coordinator,
Lock the Gate Alliance
PO Box 55
Helensvale QLD 4212

30 March 2023

Santos TOGA Pty Ltd

Team Leader Environment
PO Box 1010, BRISBANE 4001

By email only: community@santos.com, CC EPBC.Referrals@environment.gov.au

Dear Minister,

RE: Comment on preliminary documentation - Fairview Water Release Scheme, QLD

EPBC No. 2021/8914

1 We welcome the opportunity to make comments on the preliminary documentation in response to the referral (EPBC No. 2021/8914) of the Fairview Water Release Scheme, (**the Proposed Action**) by Santos TOGA Pty Ltd, on behalf of the Santos GLNG joint venture participants (Santos TPY CSG Corp, Santos TPY Corp, Santos Queensland Corp, Bronco Energy Pty Ltd, PAPL (Upstream) Pty Limited, Total E&P Australia, Total E&P Australia II & KGLNG E&P Pty Ltd) (together **Santos**) under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (**EPBC Act**).

Overall – The Proposed Action should be refused

2 The Preliminary Documentation does not provide sufficient information in key areas relevant to assessing the impacts of the Proposed Action. Given the significant risks of the impacts associated with the proposed development as set out in further detail below, we strongly recommend the referral be refused.

About Lock the Gate

3 Lock the Gate is a national grassroots organisation who are concerned about the risks associated with coal mining, coal seam gas and fracking. We are made up of over 120,000 supporters and more than 260 local groups. These supporters and groups are located in all parts of Australia, and regions including Santos' gas fields of Arcadia, Scotia, Roma, and Fairview where the Proposed Action is to take place. Lock the Gate's supporters comprise of farmers, First Nations Peoples, conservationists and urban residents.

The Proposed Action

4 Santos is seeking approval to release up to 18 ML/day of desalinated produced water to the Dawson River via a waterhole (the **Waterhole**) and outlet watercourse which flows to the Dawson River.[1]

5 Water management and treatment prior to the proposed action will use existing water management and water treatment infrastructure, including the reverse osmosis plant, water storage ponds and desalinated water release pipe.[2]

6 The Proposed Action is intended to be carried out until 31 March 2066.[3]

Background to referral

7 The Fairview Water Release Scheme forms a part of the overall produced water management strategy of the Santos Gas Field Development (**GFD**) Project which is located within the Arcadia, Fairview, Scotia, and Roma Project Areas of southern central Queensland.

8 In 2010, Santos received approval under the EPBC Act (EPBC 2008/4059) for the development of 2,650 coal seam gas (CSG) wells and associated infrastructure for the Gladstone Liquefied Natural Gas (GLNG) Project.

9 In 2016, Santos received further approval under the EPBC Act (EPBC 2012/6615) in relation to the GDF Project. That Project involved the drilling of an additional 6,100 wells and installation of associated infrastructure over the same geographical area as the GLNG Project.

10 Santos is now seeking authorisation for the release of desalinated (treated) water from the Santos GFD Project into a waterhole (**the Waterhole**) that discharges into the Dawson River (Wardingarri) (the **Proposed Action**).[4] This activity was not addressed in early EPBC approvals.

11 On 7 July 2021, the Minister determined the relevant controlling provisions in relation to the Proposed Action were:

(a) listed threatened species and communities (ss 18 and 18A); and

(b) water resources in relation to coal seam gas development and large coal mining development (ss 24D and 24E).

9 On that date, the Minister also decided that the Proposed Action is to be assessed using preliminary documentation under Part 8, Division 4 of the EPBC Act, on the basis that the Minister was satisfied that she had enough information in relation to the action to allow assessment of the relevant impacts of the action.[5]13. In support of the referral, AECOM Australia Pty Ltd prepared the Santos Fairview Water Release Scheme Preliminary Documentation dated 10 February 2023 (**Preliminary Documentation**).

Grounds for Submission

8 The Minister should decide that the Proposed Action be refused.

9 In support of this contention, we note the following mandatory considerations:[6]

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[1] Preliminary Documentation, p. 3.
[2] Preliminary Documentation, p. 1.
[3] Preliminary Documentation, p. 18.
[4] Preliminary Documentation, p. vi.
[5] EPBC Act, s 87(5).
[6] EPBC Act, s 136(1).

(a) the Proposed Action will have a significant impact on listed threatened species and communities, including the White-throated Snapping turtle (*Elseya albagula*) and the Fitzroy River turtle (*Rheodytes leukops*); and

(i) is inconsistent with international obligations;[7] and

(ii) is inconsistent with relevant national recovery plans.[8]

(b) the Proposed Action may have a significant impact on water resources and is inconsistent with the Water Plan (Fitzroy Basin) 2011;[9]

(c) economic and social impacts including that approval would:[10]

(i) cause cultural and spiritual harm to Traditional Owners through impacts to flora, fauna, waterways, and Country more broadly; and

(ii) provide no specific social or economic benefits to local communities in relation to the Proposed Action;

(d) principles of ecologically sustainable development;[11]

(e) Santos' history in relation to environmental matters, including the history of its executive officers and parent bodies.[12]

10 Further detail on each of the above grounds is set out below.

A. Significant impact on listed threatened species and communities

Impacts apparent based on information available

11 The Proposed Action will have significant impacts on listed threatened species and communities, specifically the White-throated Snapping turtle (*Elseya albagula*) and the Fitzroy River turtle (*Rheodytes leukops*), due to negative effects of the Proposed Action on critical habitat and breeding areas.

12 The Significant Impact Guidelines 1.1 Matters of National Environmental Significance (**Significant Impact Guidelines 1.1**)[13] set out relevant criteria for determining what constitutes a 'significant impact' to critically endangered species. Relevantly, those guidelines provide that an action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

(a) lead to a long-term decrease in the size of a population;

(b) reduce the area of occupancy of the species;

(c) adversely affect habitat critical to the survival of a species;

(d) disrupt the breeding cycle of a population; and

(e) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

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[7] EPBC Act, s 139(1)(a).
[8] EPBC Act, s 139(1)(b).
[9] EPBC Act, s 136(1)(a).
[10] EPBC Act, a 136(1)(b).
[11] EPBC Act, s 139(a).
[12] EPBC Act, s 136(4).
[13] Commonwealth of Australia, *Significant Impact Guidelines 1.1 Matters of National Environmental Significance* (2013).

13 The Significant Impact Guidelines 1.1 define habitat critical to the survival of a species or ecological community as (amongst others) areas that are necessary for activities such as foraging, breeding, roosting, or dispersal.

14 Habitat critical to the survival of the White-throated Snapping turtle is defined in the National Recovery Plan for the White-throated Snapping Turtle (*Elseya albagula*) (December 2020) (**National Recovery Plan**) as:[14]

(a) parts of riverine systems with permanent water, including pools, within the species' distribution that contain shelter and refuges (e.g. bank overhangs, overhanging riparian vegetation, macrophyte beds, moderate to high densities of submerged boulders and/or log jams); and

(b) all currently known and new aggregated nesting sites (all nesting sites should be considered to be part of an aggregation unless it can be demonstrated otherwise).

15 It is submitted that the Waterhole constitutes habitat critical to the survival of the White-throated Snapping Turtle for the following reasons:

(a) the Waterhole comprises foraging habitat because it has:

(i) extensive macrophyte beds in the shallow upstream (western) end of the Waterhole, 30 of which were described as "*macrophytes dense on both left and right banks (moderate beds of Vallisneria sp., Ludwigia peploides, Myriophyllum sp. and Azolla sp*);[15]

(ii) microcrustacean presence in the Waterhole including Daphnia sp1, Daphnia sp 2, Chydoridae (Cladoceran 1), Cladoceran 2, Bosminidae (Cladoceran 3), Copepod 2 (Cyclopoida), Copepod 1 (Calanoida), Ostracod 2, Ostracod 1, Ostracod 3;[16]

(iii) leaves and stems of terrestrial plants and tree roots from riparian vegetation, which were described as follows:

> *Dead shrubs and trees in water along edge suggest previous lower water levels…Little bare ground in riparian zone. Right bank riparian vegetation is dominated by grasses with some scattered Eucalypts. Left bank riparian vegetation is dominated by large Eucalypts, with grass understory.*[17]

(b) The National Recovery Plan defines 'habitat critical to the survival' of the White-throated Snapping Turtle as including pools that contain shelters and refuges such as macrophyte beds.[18] This description fits the Waterhole.

16 The Waterhole may also be considered breeding habitat for the White-throated Snapping Turtle because:

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[14] National Recovery Plan, 1.2, p. 6.
[15] frc environmental, *Dawson River Release Scheme Receiving Environment Monitoring Program: Interim Ecology Study 2022* (2022) Appendix C2.
[16] frc environmental, *Dawson River Release Scheme Receiving Environment Monitoring Program: Interim Ecology Study 2022* (2022) Appendix D3.
[17] frc environmental, *Dawson River Release Scheme Receiving Environment Monitoring Program: Interim Ecology Study 2022* (2022) Appendix C2.
[18] National Recovery Plan, p. 17.

(a) the presence of the White-throated Snapping Turtle was confirmed at the Waterhole and the species does not have separate breeding and non-breeding zones;[19] and

(b) the unconsolidated silt banks of the Waterhole could provide nesting habitat for threatened turtles.[20]

17 The low sandbanks of the Dawson River constitute habitat critical to the survival of the White-throated Snapping Turtle because:

(a) The Recovery Plan states that all currently known and new aggregated nesting sites (all nesting sites to be considered part of an aggregation unless otherwise demonstrated) are considered habitat critical to the survival of the species. Notably, the Recovery Plan does not discriminate between nesting sites that are more vulnerable to inundation (i.e. low-level nesting sites) and high-level nesting sites;[21]

(b) The Boobok Report states that "*published data for nesting sites of the White-throated Snapping Turtle in the Mary, Burnett, and Fitzroy Rivers indicate that a variety of nesting locations may be used by the Turtles. (Hamann et al. 2004, Limpus et al. 2011). These include in-stream and on-bank flood-deposited sandbanks as well as sandy to loamy soils on riverbanks*."[22] This indicates that the in-stream and low sandbanks of the Dawson River also constitute potential nesting locations; and

(c) given that the survival rate of hatchlings and juveniles is extremely low, a precautionary approach should be taken to protect all nesting sites of the White-throated Snapping Turtle.

18 The Proposed Action poses risks to critical habitat and breeding areas for the White-throated Snapping turtle as the introduction of 18ML per day will change surface water flows and landscape features that are integral to that habitat. For example, it is predicted that the proposed water release will result in an increase in water depth of 0.05m.[23] This increase in water level threatens the existence of riffles (being shallower, faster moving sections of a stream) which are important to maintaining critical habitat, and poses inundation risks to low lying nesting areas.

19 Increased water flow further disrupts the breeding cycle of the White-throated Snapping Turtle, which breeds during the dry season as this is when nesting habitats are least likely to be scoured out or flooded.[24] Disruption of breeding cycles is particularly problematic as the species have relatively small home ranges, they commonly utilise stream lengths of less than 1 km and do not have separate breeding and non-breeding zones.[25] This makes the White-throated Snapping turtle particularly sensitive and vulnerable to changes in habitat.

Inconsistency with international obligations

[19] National Recovery Plan, p. 13.
[20] Preliminary Documentation, p. 183.
[21] National Recovery Plan, p. 6.
[22] Boobook Ecological Consulting, *Dawson River Proposed Action Area Habitat Survey and Impact Assessment for White-throated Snapping Turtle and Fitzroy River Turtle* (1 February 2023), p. 11.
[23] Preliminary Documentation, p. 171.
[24] National Recovery Plan. p. 13.
[25] National Recovery Plan. p. 13.

20 The Proposed Action should not be approved by the Minister as approval would be inconsistent with Australia's obligations under the *Biodiversity Convention* 1992, specifically:[26]

(d) Article 8(i) which provides that each party shall, as far as possible and appropriate '[e]ndeavour to provide the conditions needed for compatibility between present uses and the conservation of biological diversity and the sustainable use of its components';

(e) Article 10(d) which provides that each party shall, as far as possible and appropriate '[s]upport local populations to develop and implement remedial action in degraded areas where biological diversity has been reduced'.

21 Approval of the Proposed Action would be inconsistent with these obligations due to biodiversity considerations relating to the significant impacts to listed threatened species described above.

Inconsistency with National Recovery Plan

22 Approval of the Proposed Action is inconsistent with the National Recovery Plan for the White-throated Snapping Turtle (*Elseya albagula*) (December 2020) (**Recovery Plan**) including:

(f) the objective to enhance the condition of habitat across the White-throated Snapping Turtle's range to maximise survival and reproductive success;[27]

(g) the recovery strategy to improve stream flow and habitat quality throughout the species' distribution.[28]

23 Approval of the Proposed Action does not contribute to any of the noted criteria for success, and instead are likely to result in events noted under criteria for failure, due to impacts described above.

24 There is no National Recovery Plan for the Fitzroy River turtle.

Need for further information

8 The Preliminary Documentation primarily relies upon the following documents to reach the conclusion that the White-throated Snapping Turtle is unlikely to occur in the Waterhole:

(a) a report by Boobook Ecological Consulting *Dawson River Proposed Action Area Habitat Survey and Impact Assessment for White-throated Snapping Turtle and Fitzroy River Turtle* (**BooBook Report**);[29]

(b) annual receiving environment monitoring program (**REMP**) reports by frc environmental; and

(c) a report by frc environmental *Dawson River Scheme Turtle Assessment June 2019* (**frc Turtle Assessment**).

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[26] EPBC Act, s 139(1)(a).
[27] Recovery Plan, 1.3.
[28] Recovery Plan, 1.4.
[29] Boobook Ecological Consulting, *Dawson River Proposed Action Area Habitat Survey and Impact Assessment for White-throated Snapping Turtle and Fitzroy River Turtle* (1 February 2023).

9 The Boobook Report is problematic for the following reasons:

(a) The Boobook Report was conducted with the aim of identifying the potential of the proposed action area to provide shelter, foraging and breeding (nesting) habitat of the White-throated Snapping Turtle and Fitzroy River Turtle.[30]

(b) Boobook did not conduct any observational or trapping surveys for the White-throated Snapping Turtle and Fitzroy River Turtle.[31] Boobook states that it did not have enough time to do so and there was no need for such surveys as (1) the species were already known to occur in the area and (2) the project time frame did not enable it to conduct species-specific surveys.[32]

(c) The Boobook Report and the Preliminary Documentation rely on frc Turtle Assessment, which states that the White-Throated Snapping Turtle was only captured at a single location from 2013-2019. As a key survey report, the frc Turtle Assessment should be provided as part of the Preliminary Documentation. However, it was not included.

(d) It is unclear whether Boobook was able to access the entire frc Turtle Assessment as Boobook states that:

> *While it is unclear what habitat types was present at sites where frc environmental (2019a) trapped this species and R. leukops in the river, their methods – cathedral traps and fyke nets – suggest pools and/or deeper runs or glides…*[33]

(e) It is unclear why passive surveys such as cathedral traps and fyke nets were used by frc. The *Survey Guidelines for Australia's Threatened Reptiles*[34] state that:

(i) snorkelling, is the preferred and generally most successful method of surveying for threatened turtle species;[35] and

(ii) seining, which involves actively dragging a net, has been used effectively in capturing chelid turtles in lagoons, streams and lakes.[36]

(f) Boobook's assessment of nesting sites was only conducted on 14 June 2021.[37] Given that the White-throated Snapping Turtle has an extended nesting season of around 7 months, with breeding from May-December, there arguably should have been replicate surveys during the breeding season during various flow conditions.

10 In light of these methodological issues, further assessment should be undertaken to understand the extent of the White-throated Snapping Turtle population in the area prior to any approval being made in relation to the Proposed Action.

B. Matters relevant to the protection of water resources from coal seam gas development

[30] frc environmental, *Dawson River Receiving Scheme Turtle Assessment June 2019* (2019).
[31] Boobook Report, p. 8.
[32] Boobook Report, p. 8.
[33] Boobook Report, p. 15.
[34] Commonwealth of Australia, Survey Guidelines for Australia's Threatened Reptiles (2011) (**Survey Guidelines**).
[35] Survey Guidelines, p. 14.
[36] Survey Guidelines, p. 15.
[37] Boobook Report, p. 8.

Need for further information

11 Santos has failed to demonstrate that the Proposed Action will not significantly impact the groundwater and surface water resources. Rather the Proposed Action will result in changes to the hydrology and water quality of the Waterhole and the Dawson River and further, poses risks to the future environmental utility of those water resources.[38]

12 Applying the precautionary principal, and in light of the requirement for the Minister to be satisfied that there is enough information in the Preliminary Documentation for assessment by way of that documentation, the Proposed Action should not be approved.[39]

13 In particular, there are significant data and knowledge gaps relevant to the assessment of water and environmental impacts of the Proposed Action gaps in baseline characterisation of the region's water quality, hydrology, hydrogeology and eco-hydrological relationships.

14 **Annexure A** to these submissions is a report 'Analysis of Fairview Water Release Scheme: Impact and risk assessment for water and connected environmental values' prepared by Professor Matthew Currell et al in response to the Proposed Action and Preliminary Documentation. That report sets out in further detail the knowledge and data gaps.

Inconsistency with Water Plan (Fitzroy Basin) 2011

15 The Proposed Action is inconsistent with the purposes of the Water Plan (Fitzroy Basin) 2011, which include to reverse, where practicable, degradation in natural ecosystems and to sustainably manage water.[40] Specifically, the release of reverse osmosis-treated produced water into the Dawson River is inconsistent with:

(a) the Plan's general outcomes to support water-related cultural values including the values of Traditional Owners and to manage water flow that supports the quality of water for human and ecological use;[41] and

(b) the Plan's specific ecological outcomes to protect flows and water quality for flow-spawning fish endemic species.[42]

C. Detrimental economic and social impacts

16 The economic and social impacts identified by Santos are not sufficiently tailored to the Proposed Action, and address Santos' activities in the region more broadly rather than the social and economic impacts to the community who will be impacted by the Proposed Action.

17 Part 1.6 of Santos' Preliminary Documentation addresses economic and social impacts and indicates that a Social Impact Assessment (SIA) was undertaken prior to commencement of the Gladstone Liquified Natural Gas Project (of which the Santos GFD Project and the Proposed Action are smaller components).[43]

18 The SIA relied on by Santos addresses coal seam gas fields over an area of over 1,660,000 hectares as well as the required gas transmission pipeline and liquefied natural gas (LNG) facility. Conversely, the Proposed Action is a smaller component of

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[38] The Significant Impact Guidelines 1.3 Coal seam gas and large coal mining developments — impacts on water resources (**Significant Impact Guidelines 1.3**), p. 10.
[39] EPBC Act, s 87(5).
[40] *Water Plan (Fitzroy Basin) 2011* s 2 (**Water Plan**).
[41] Water Plan, s 12.
[42] Water Plan, s 15.
[43] Preliminary Documentation, pp. 8 – 10.

the larger project and will impact the local community in a specific and distinct manner.

19 In the Preliminary Documentation, the Waterhole and Dawson River are assessed by Santos as being of moderate and high cultural and spiritual value, respectively.[44] However, the social impacts resulting from cultural and spiritual harms to First Nations People caused by the Proposed Action are not addressed in the Preliminary Documentation. Nor is there any indication of whether Traditional Owners or the local community will receive any economic benefits relating to the Proposed Action, or compensation relating to loss, harm or damage resulting from it.

Principles of ecologically sustainable development

20 The Proposed Action does not conform to principals of ecologically sustainable development (**ESG**).

21 The principles of ESD are described in section 3A of the EPBC Act. Relevant to the Proposed Action, they are as follows:[45]

(a) decision-making processes that effectively integrate long-term and short-term economic, environmental, social and equitable considerations;

(b) not using lack of scientific uncertainty to postpone measures that prevent environmental degradation where there are threats of serious or irreversible damage;

(c) the principle of intergenerational equity – that the health, diversity and productivity of the environment should be safeguarded by the present generation for the benefit of future generations; and

(d) the conservation of biological diversity and ecological integrity as a fundamental consideration in decision-making.

22 Table 10-1 in Santos' Preliminary Documentation addresses the implementation of principles of ESD.[46] The following outlines Santos' failure to implement principals of ESD, in relation to each of the principle outlined above respectfully:

(a) Santos fails to demonstrate for its policy to 'avoid', 'minimise', 'mitigate', 'remediate and rehabilitate' and 'offset' have been applied in relation to the impacts from the Proposed Action. Further, it focused primarily on the economic benefits of its proposed decision-making processes without sufficient regard to the social and equitable considerations.[47]

(b) Santos has committed to considering the precautionary principle throughout all phases of the project development without defining it or adequately outlining how the principle would be considered, nor has it provided a proposed management plan outlining its preventative measures where threats of serious or irreversible environmental damage arise.[48]

(c) Beyond general statements relating to minimising harm from its activities, Santos has failed to demonstrate how the Proposed Action would ensure the maintenance of the health, diversity and productivity of the environment for the

[44] Preliminary Documentation, p. 28.
[45] EPBC Act s 3A.
[46] Preliminary Documentation, pp. 6 – 8.
[47] Preliminary Documentation Table 10-1.
[48] Preliminary Documentation Table 10-1.

benefit of future generations.[49] There is for example no consideration of any rehabilitation plans in relation to the Proposed Action.

(d) Approval of the Proposed Action would undermine the biological diversity and ecological integrity of the Waterhole and Dawson River. Santos has not provided any plan or strategy to ameliorate negative impacts and accordingly has not demonstrate implementation of this principle.

Santos' history in relation to environmental matters

23 Santos has a history involving poor environmental management of CSG, petroleum and oil projects across Australia. This poor management has resulted in infringement notices, enforcement actions, prosecutions and fines in relation to Santos' failure to comply with conditions of approvals or authorities. There have also been a number of environmental incidents resulting from infrastructure safety and integrity issues. These incidents are detailed below.

(a) In November 2022, there was an unmeasured gas leak from the Santos' John Brookes platform in Karratha, WA resulting from a pipeline integrity issue.[50]

(b) On March 2022, around 25,000 litres of oil were leaked from a Santos facility on Varanus Island in WA.[51]

(c) In August 2019, Santos was issued a Penalty Infringement Notice by the Queensland Department of Agriculture and Fisheries for causing an environmental nuisance through emitting black smoke from the Santos Gladstone LNG process flare on Curtis Island.[52]

(d) In July 2018, Sants received a $68,000 fine from the Queensland Department of Environment and Science for the unauthorised release of hydrocarbons to land.[53]

(e) On 13 August 2021, Santos was issued with an Environmental Protection Order by the Queensland Department of Environment and Science in relation a failure to comply with a condition relating to stimulation risk assessment for the Scotia CSG Project.[54]

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[49] Preliminary Documentation Table 10-1.
[50] P Milne, 'Safety fears shut down Santos platform, curtailing WA's gas supply', *Sydney Morning* Herald, Available at: https://www.smh.com.au/business/companies/safety-fears-shut-down-santos-platform-curtailing-wa-s-gas-supply-20221128-p5c1yr.html (Accessed 27 March 2023); S Rossi, 'Santos' John Brookes shuts due to methane leak' *Climate Change News*, Available at: https://www.climatecontrolnews.com.au/renewable-energy/santos-john-brookes-shuts-due-to-methane-leak (Accessed 27 March 2023).
[51] P Milne, 'Environmental group disputes 'negligible' impact of Santos' WA oil spill', *Sydney Morning Herald,* 4 April 2022, available at: https://www.smh.com.au/business/companies/environmental-group-disputes-negligible-impact-of-santos-wa-oil-spill-20220329-p5a8ym.html (accessed 24 March 2023).
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[53] Preliminary Documentation, p. 10.
[54] Queensland Department of Environment and Science, Environmental Protection Order (ref C-CPLPO-100072625), available at: https://storagesolutiondocsprod.blob.core.windows.net/register-documents-enforcements/state100110472_1_EPONotice.pdf (accessed 24 March 2023).

(f) In March 2014, Santos was fined $1,500 by the NSW Environment Protection Authority for contamination of an aquifer in Narrabri, NSW. [55]

(g) In January 2014, Santos was fined $52,500 for failing to report the spill of untreated water at a water treatment plant in Narrabri, NSW.[56]

(h) In May 2013, Santos' Zeus oil field spilled 240,000 litres of oil into the Cooper Basin, making it Queensland's third largest oil spill.[57]

(i) In October 2012, Santos was issued fines totalling $19,800 relating to the company's late reporting of five minor oil spills between March and September 2011 in the Great Barrier Reef, Queensland.[58]

(j) In July 2012, Santos was issued with two fines by the NSW Environment Protection Authority for pollution of waters.[59]

(k) In July 2007, Santos' Jackson-Moomba pipeline spilled 100,000 litres of oil, causing the evacuation of around 400 homes in southern Brisbane, QLD.[60]

(l) In March 2003, Santos was fined $300,000 for an oil pipeline and oil spill in Brisbane, QLD. [61]

Conditional Approval

24 Alternatively, if the Minister decides the Proposed Action is to be approved, it should be approved subject to conditions.

25 With regard to threatened species, these conditions should require Santos to:

(a) conduct additional surveys for threatened species and implement measures to mitigate impacts such as translocating animals or managing feral species;

(b) fund and conduct research on threatened species; and

(c) purchase offsets for any additional residual impacts to threatened species.

26 With regard to water resources, these conditions should require Santos to:

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[55] NSW Environment Protection Authority, Public Register (Web Page), available at: https://apps.epa.nsw.gov.au/prpoeoapp/Detail.aspx?instid=1520047&id=1520047&option=notice&searchrange=notice&range=Penalty%20Notice&prp=no&status=Issued (accessed 24 March 2023); NSW Environment Protection Authority, 'Santos fined $1,500 for water pollution' (Media Release, 18 February 2014), available at: https://www.epa.nsw.gov.au/news/media-releases/2014/epamedia14021802 (accessed 24 March 2023); Preliminary Documentation, p. 10.

[56] *Connell v Santos NSW Pty Limited* [2014] NSWLEC 1, available at: https://www.caselaw.nsw.gov.au/decision/54a63cd53004de94513db7d0 (accessed 24 March 2023).

[57] C Van Extel, 'Greens claim Santos oil spill reveals 'self-regulation gone mad', *ABC RN,* 12 June 2013, available at: https://www.abc.net.au/radionational/programs/breakfast/oil-spill/4747030 (accessed 24 March 2023).

[58] Dburdon, 'Santos Gladstone LNG fined for late reporting of oil spills', *The Courier Mail,* 11 December 2012, available at: https://www.couriermail.com.au/news/queensland/mackay/santos-gladstone-lng-fined-for-late-reporting-of-oil-spills/news-story/045299219b1415b3bf87ba58c83d0bdd (accessed at 27 March 2023).

[59] NSW Environment Protection Authority, Public Register (Web Page) < https://apps.epa.nsw.gov.au/prpoeoapp/SearchResult.aspx?SearchTag=notice&searchrange=notice&range=notice>.

[60] J Gould, 'Disused pipeline stops hundreds from building', *The Courier Mail*, Available at: https://www.couriermail.com.au/news/queensland/ipswich/inside-story-disused-pipeline-stops-hundreds-from-building/news-story/05b36301c17bb9098d51a55c0cab5cc0 (Accessed 27 March 2023).

[61] https://www.santos.com/news/lytton-oil-spill-court-decision/.

(a) publish a chemical risk assessment framework;

(b) engage a chemical risk assessment expert to peer review risk assessments;

(c) submit a statement to the Department stating how all concerns raised in the peer review have been addressed; and

(d) manage risks to groundwater through a risk assessment framework.

Conclusion

27 For the reasons stated above, we strongly recommend that the Proposed Action be refused.

28 We thank you for the opportunity to make submissions and look forward to receiving your response. If you have any further queries, please do not hesitate to contact myself, Ellie Smith on 0448335452 or ellie@lockthegate.org.au

Yours sincerely,

Ellie Smith,
Queensland Coordinator,
On behalf of Lock the Gate Alliance

Appendix E

Submission by J Baird et. al.

Appendix E Submission by J Baird *et. al.*

SUBMISSION ON THE FAIRVIEW WATER RELEASE SCHEME DRAFT PRELIMINARY DOCUMENTATION REPORT

EPBC 2021/8914

Executive Summary

1. We thank the Department of Climate Change, Energy, the Environment and Water for the opportunity to make a submission on the preliminary documentation (**PD**) for the Fairview Water Release Scheme (EPBC 2021/8914) (**Proposed Action**).

2. We support the Australian Government's role in ensuring the rigorous and transparent assessment of environmental risks arising from the release of produced water to ensure just implementation of the principles of environmentally sustainable development (**ESD**).[1]

3. International consensus is building in the recognition that the core of ESD sets an environmental bottom line that must be met regarding the conservation of biodiversity and water resources.[2] The outcome that ESD demands is the requirement that development must improve the total quality of life both now and in the future in a way that maintains ecological processes upon which life depends.[3]

4. Aligning decision-making under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (**Act**) with best-practice standards is critical for ensuring the viability of the proposed Nature Repair Market by providing investors with confidence in the regulatory framework governing biodiversity. A credible Nature Repair Market cannot exist alongside the continual approval of projects with serious and irreversible impacts to biodiversity.

5. We do not support the approval of a controlled action where the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (**IESC**) has been unable to fully assess the impacts of the action due to insufficient information and modelling and where there has been substantial noncompliance with the *IESC Information Guidelines Explanatory Note: Assessing Groundwater-Dependent Ecosystems.*

6. We note that the main purpose of the Act is the protection of the environment[4] and serious questions of impartial and ethical decision-making[5] arise when public officials:

    a. pre-determine what is in the public good without genuine consideration of community views of the rationale for such projects or feasible alternatives;

    b. presume that economic benefits are the most important indicators of the public good without impartial consideration of other factors that contribute to the community well-being, including human health, the conservation of biodiversity[6] and safeguarding the life-supporting capacity of water, soil and ecosystems;

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[1] *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 136(2)(a).
[2] *Environmental Defence Society Inc v The New Zealand King Salmon Company Ltd* [2014] NZSC 38; [2014] 1 NZLR 593.
[3] World Commission on Environment and Development, *Our Common Future* (OUP 1987) 44, ch 2 [1]; adopted by the United Nations General Assembly, *Report of the World Commission on Environment and Development* GA Res 42/187, UN GAOR, 2nd Comm, Agenda Item 82e (11 December 1987) A/Res/42/87; *National Strategy for Ecologically Sustainable Development* (Australian Government Publishing Service 1992) 8.
[4] *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 3(1).
[5] *Public Service Act 1999* (Cth) s 13.
[6] *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 3(1)(c).

c. make decisions prioritising short-term economic profit over intergenerational equity,[7] or in other words, ensuring that each generation maintains the quality of the natural and cultural environments such that they are passed on in no worse condition than they are received;[8] and/or

d. presume that all major projects will be approved, with the environmental assessment and approval process functioning primarily as an approval process.

7. We submit that the Minister should not approve the Proposed Action. Further, we consider that the Minister should seek the IESC's advice on the PD and invite public comments before making a decision (ss131A and 132(e) of the Act).

8. The key points made in this submission are as follows:

a. The appropriate statutory construction of the words ""must not act inconsistently with a recovery plan" in s 139(1)(a) of the Act is that only a minimum degree of inconsistency with a recovery plan is permitted.

b. Applying this statutory construction, approval of the Proposed Action is inconsistent with the Recovery Plan.

c. The Proposed Action is likely to significantly impact the hydrology and water quality of the Waterhole and Dawson River.

d. The scientific uncertainty and potential for serious and irreversible damage to the White-throated Snapping Turtle and water resources invoke the application of the precautionary principle.

e. Adaptive management is not a reasonable or appropriate precautionary measure because it cannot reduce the threat of serious or irreversible environmental harm to acceptable levels.

f. Approval of the Proposed Action with adaptive management conditions is inconsistent with the Recovery Plan.

[7] *Environment Protection and Biodiversity Conservation Act 1999* (Cth) s 3A(c).
[8] Edith Brown Weiss, 'Intergenerational Equity: A Legal Framework for Global Environmental Change' in Edith Brown Weiss (ed), *Environmental Change and International Law: New Challenges and Dimensions* (United Nations University Press 1992) 401, 404–405.

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1. Regulatory Framework

1.1 Section 139(1)(a)

9. In deciding whether or not to approve the taking of an action, for the purposes of subsection 18 or 18A of the Act, the Minister must not act inconsistently with a recovery plan. Section 139(1)(a) provides:

> **"139 Requirements for decisions about threatened species and endangered communities**
>
> (1) In deciding whether or not to approve for the purposes of a subsection of section 18 or section 18A the taking of an action, and what conditions to attach to such an approval, the Minister must not act inconsistently with:
>
> (a) Australia's obligations under:
>
> (i) the Biodiversity Convention; or
>
> (ii) the Apia Convention; or
>
> (iii) CITES; or
>
> (b) a recovery plan or threat abatement plan."

10. The effect of s 139 (1) is to render a Minister's approval decision ultra vires, or in other words, beyond her power or authority. A question of interpretation arises as to the nature and degree of inconsistency required to trigger the operation of s 139(1)(b). This is because s 139(1)(b) may be interpreted in the following ways:

    a. No inconsistency is permitted, meaning that any degree of inconsistency with a recovery plan is prohibited.

    b. A low degree of inconsistency is permitted, meaning only a minimum degree of inconsistency with a recovery plan is permitted.

    c. A medium degree of inconsistency is permitted, meaning some inconsistency with a recovery plan is permitted.

    d. A high degree of inconsistency is permitted, meaning substantial inconsistency with a recovery plan is permitted.

11. We consider that meaning of words "must not act inconsistently with a recovery plan" is a matter of statutory construction. This requires a literal consideration of the words "act inconsistently with a recovery plan",[9] the Act as a whole,[10] and legislative intent.[11]

[9] *Amalgamated Society of Engineers v Adelaide Steamship Co Ltd* (1920) 28 CLR 129.
[10] *Metropolitan Gas Co v Federated Gas Employees' Industrial Union* (1924) 35 CLR 449, 455.
[11] *Project Blue Sky Inc v Australian Broadcasting Authority* (1998) 194 CLR 355; *Acts Interpretation Act* 1901 (Cth), s 15AA.

1.2 Literal meaning

12. There are two considerations drawn from the text "must not act inconsistently with a recovery plan" that support a broad construction of the words.

13. First, *prima facie*, the word "inconsistently" must be given meaning and effect. The Cambridge Dictionary defines "inconsistent" as meaning "if a reason, idea, opinion, etc. is inconsistent, different parts of it do not agree, or it does not agree with something else."[12] This definition is broad in scope and envisages a situation where an approval decision that, in any part, does not agree with a recovery plan is "inconsistent".

14. Second, s 139(1)(b) uses the words "must not act inconsistently", not "must not act in a manner that is substantially inconsistent" with a recovery plan. The High Court does not favour statutory interpretation that introduces words that are not found in the express statutory text.[13] Any construction that arbitrarily alters the meaning of s 139(1) from "inconsistently" to the lesser standard of "substantially inconsistent" is not suggested by the express words of the statutory text.

1.3 Statutory context and legislative intent

15. The general context of the phrase "must not act inconsistently with a recovery plan" is that it forms part of the Act, the objects of which are set out in s 3 as follows:

> "**3. Objects of Act**
>
> (1) The objects of this Act are:
>
> (a) to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance; and
>
> (b) to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources; and
>
> (c) to promote the conservation of biodiversity…"

16. It has been held that the Act is to be interpreted in a way that is "consistent with the high public policy apparent in the objects of the Act" and that "no narrow approach should be taken to the interpretation of legislation having objects of this kind."[14]

17. The specific context of the phrase "must not act inconsistently with a recovery plan" is used in respect of recovery plans that are made or adopted under s 269A. The purpose of such recovery plans is the protection, conservation and management of listed threatened species and listed threatened ecological communities (s 269A(2)).

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[12] Cambridge University Press, *Cambridge Dictionary* https://dictionary.cambridge.org/dictionary/english/inconsistent.
[13] See for example *Weiss v R* (2005) 224 CLR 300, [9] and [10].
[14] *Marks v GIO Australia Holdings Ltd* [1998] HCA 69; (1998) 196 CLR 494 at 515, 528, 537; *Queensland Conservation Council Inc v Minister for Environment and Heritage* [2003] FCA 1463, [40] per Kiefel J.

18. Recovery plans are a critical part of the legislative framework because they specify what actions should be taken to protect species that are on the brink of extinction. Section 179 defines eligibility for listing in the "vulnerable", "endangered" or "critically endangered" categories as:

    a. Vulnerable –a high risk of extinction in the wild (s 179(5));

    b. Endangered –a very high risk of extinction in the wild (s 179(4)); and

    c. Critically endangered – an extremely high risk of extinction in the wild (s 179(3)).

19. The evident object of the statutory scheme is to ensure strict compliance with recovery plans. Section 268 expressly prohibits a Commonwealth agency, including the Minister, from taking any action that contravenes a recovery plan or threat abatement plan. Section 139(1)(b) clarifies that the general prohibition in s 268 applies to Minister's exercise of power to approve or not approve an action.

20. Given the imminent and irreversible nature of extinction, an interpretation of the phrase "act inconsistently with a recovery plan" that permits a medium or high degree of inconsistency with recovery plans would arguably undermine the high public policy and practical operation of the Act. Such an interpretation would permit the Minister to approve actions that increase the chances of threatened species becoming extinct, for example actions that contribute to key threatening process and destroy habitat critical to the survival of a species.

21. For the above reasons, it is submitted that the modern approach to statutory construction leads to a broad interpretation of the words ""must not act inconsistently with a recovery plan", such that only a minimum degree of inconsistency with a recovery plan is permitted under s 139(1)(b) of the Act.

2. Critical Habitat

2.1 Definition

22. The *Significant Impact Guidelines 1.1 Matters of National Environmental Significance* (**Significant Impact Guidelines 1.1**)[15] and the *National Recovery Plan for the White-throated Snapping Turtle (Elseya albagula)* (**Recovery Plan**)[16] define habitat critical for the survival of the White-throated Snapping Turtle as follows:

    a. areas that are necessary for activities such as foraging, breeding, roosting or dispersal;[17]

    b. "permanent water, including pools, within the species distribution that contain shelter and refuges (e.g. bank overhangs, overhanging riparian vegetation, macrophyte beds, moderate to high densities of submerged boulders and/or log jams)";[18] and

[15] Commonwealth of Australia, *Significant Impact Guidelines 1.1 Matters of National Environmental Significance* (2013)
[16] Commonwealth of Australia, *National Recovery Plan for the White-throated Snapping Turtle (Elseya Albagula*) (2020).
[17] Commonwealth of Australia, above n15,10.
[18] Commonwealth of Australia, above n16, 6.

c. "all currently known and new aggregated nesting sites (all nesting sites should be considered to be part of an aggregation unless it can be demonstrated otherwise)."[19]

23. It is submitted that the Waterhole and the Dawson River downstream of the release location fit the above definitions and are therefore critical habitat for the White-throated Snapping Turtle. This is discussed in further detail below.

2.2 Waterhole

24. The PD makes the following observations about the suitability of the Waterhole as habitat for the White-throated Snapping Turtle:

    a. The Waterhole and the watercourse connecting it to the Dawson River are not critical habitat for the White-throated Snapping Turtle due to the lack of riffles (ie shallower and faster moving sections of a stream) and nesting banks;[20]

    b. It is unlikely that the White-throated Snapping Turtle is abundant in the Waterhole because of the lower range of habitats and the absence of observation of the White-throated Snapping Turtle from 2015-2022 data from the receiving environment monitoring program (**REMP**);[21] and

    c. There was only one observation of the White-throated Snapping Turtle in the Waterhole. It is not possible to say whether the observation represented a movement into the waterhole facilitated by the water release or a movement during a flood event. It cannot be said with certainty when the turtle entered the Waterhole.[22]

25. In response, we note that habitat assessments of listed threatened species must consider and apply the criteria for critical habitat as set out in the Significant Impact Guidelines 1.1 and the Recovery Plan. Applying these criteria, we consider that the Waterhole constitutes habitat critical for the survival of the White-throated Snapping Turtle because:

    a. The White-throated Snapping Turtle is known to inhabit large slow-flowing reaches and large non-flowing pools in the Fitzroy Catchment.[23] This description fits the Waterhole, which is an oxbow lake wetland (Figure 1 below).

    b. The Waterhole contains permanent water within the species distribution and contains shelter and refuges in the form of extensive macrophyte beds the shallow upstream western end of the Waterhole (Figure 2 below).[24]

[19] Commonwealth of Australia, above n16, 6.
[20] Aecom, *Santos Fairview Water Release Scheme: Draft Preliminary Documentation* (10 February 2023) 183.
[21] Ibid.
[22] Ibid.
[23] Commonwealth of Australia, above n16, 15.
[24] frc environmental, *Dawson River Release Scheme Receiving Environment Monitoring Program: Interim Ecology Study 2022* (2022) Appendix C2.

Figure 1: Image of the Waterhole

Figure 2: Image of macrophyte beds at the Waterhole

c. The Waterhole constitutes foraging habitat for the White-throated Snapping Turtle because of the presence of macrophytes[25] and the presence of leaves and stems from riparian vegetation.[26]

26. In response to the statement in the PD asserting that the White-throated Snapping Turtle was only sighted once in the Waterhole based on REMP data from 2015-2022, we note that:

a. The annual REMP surveys only included monitoring for aquatic habitat (including geomorphology), sediment quality, macroinvertebrates and fish. These surveys did not search for the White-throated Snapping Turtle, which may not have been visible from the banks and edges of the Waterhole where the bed and bank assessments were conducted and macroinvertebrate samples were collected. [27]

b. The REMP fish surveys were conducted using fyke nets, which are long bag-shaped nets suitable for passively catching fish (see Figure 3 below). It is doubtful that these nets would have been suitable for the White-throated Snapping Turtle, which is one of the largest short-necked freshwater turtle in Australia. Adult female turtles have carapace lengths of up to 42 cm and males have carapace lengths of up to 30 cm.[28] It is for this reason that the *Survey Guidelines for Australia's Threatened Reptiles* (**Survey Guidelines**) recommends snorkeling or using seine nets for surveying threatened species of turtles[29] (see Figure 4 below).

c. The presence of the White-throated Snapping Turtle should be assumed at the Waterhole due to a failure by the proponent to conduct appropriate surveys in accordance with the *Survey Guidelines*, which provide:

"Failing to survey appropriately for threatened species that may be present at a site could result in the department applying the precautionary principle with regard to significant impact determinations. That is, if no supporting evidence (such as survey results) is presented to support the claim of species absence, then the department may assume that the species is in fact present. The department will not accept claimed species absence without effective validation such as through these survey guidelines, other survey techniques (for example, a state guideline or an accepted industry guideline), or relevant expertise. Where a claim of absence is made, proposals should provide a robust evaluation of species absence."[30]

d. The PD is, in effect, claiming species absence at the Waterhole. It should therefore provide a robust evaluation of species absence. This requirement has not been met the REMP surveys and the report by Boobook Environmental Consultants (**Boobook**) did not specifically survey for the White-throated Snapping Turtle.

[25] frc environmental, *Dawson River Release Scheme Receiving Environment Monitoring Program: Interim Ecology Study 2022* (2022) Appendix D3.
[26] frc environmental, *Dawson River Release Scheme Receiving Environment Monitoring Program: Interim Ecology Study 2022* (2022) Appendix C2.
[27] Aecom, *Santos Fairview Water Release Scheme: Draft Preliminary Documentation* (10 February 2023) 183 Appendix F.
[28] Commonwealth of Australia, above n16, 8.
[29] Commonwealth of Australia, *Survey Guidelines for Australia's Threatened Reptiles* (2011).
[30] Ibid 1.

Figure 3: Image of a fyke net

Figure 4: Image of a seine net

2.3 Dawson River

27. The PD states that the Proposed Action is expected to impact the low sandbanks of the Dawson River. These are located within the main channel at levels that are lower than the first bench. The PD states that the low sandbanks are unlikely to be used as nest sites because:

    a. They "would be vulnerable to small rises in water level associated to local rainfall event run-off where rapid water level rises to small rain events inundate the sand banks;"[31] and

    b. The four nests detected by Boobook during a field survey were positioned at heights ranging from 0.6 m to 6 m above water level observed at the time. These locations were on the slopes and crests of the inner high bank or on the banks below the slope of the high bank.[32]

28. Our response is as follows:

    a. Published data for nesting sites of the White-throated Snapping Turtle in the Mary, Burnet and Fitzroy rivers includes in-stream and on-bank flood-deposited sandbanks as well as sandy to loamy soil on riverbanks.[33] Accordingly, the low sandbanks and riverbanks of the Dawson River constitute potential nesting areas within the definition of "habitat critical for survival" of the species as defined by the Recovery Plan.

    b. The Recovery Plan does not discriminate between low-level nesting sites, which may be prone to inundation, and high-level nesting sites as it states that "all currently known and new aggregated nesting sites" are "habitat critical for survival" of the species.[34]

    c. The Boobook survey should not be relied upon as evidence that the White-throated Snapping Turtle only nests in heights ranging from 0.6 - 6 m because it was only conducted on one day. Surveys should have been carried out in both dry and wet seasons at various river flow conditions.

3. Project Impacts

3.1 Significant Impact Guidelines 1.3

29. The *Significant Impact Guidelines 1.3 Coal Seam Gas and Large Coal Mining Developments – Impacts on Water Resources* (**Significant Impact Guidelines 1.3**)[35] set out criteria for determining whether an action is likely to have a significant impact on the hydrology or water quality of a water resource.

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[31] Ibid 184.
[32] Ibid 184.
[33] Boobook Ecological Consulting, *Dawson River Proposed Action Area Habitat Survey and Impact Assessment for White-throated Snapping Turtle and Fitzroy River Turtle* (1 February 2023) 11.
[34] Commonwealth of Australia
[35] DCCEEW, *Significant Impact Guidelines 1.3 Coal Seam Gas and Large Coal Mining Developments – Impacts on Water Resources* (2022)

30. The significance of an impact to a water resource requires an objective consideration of the value of a water resource and the whether the scale and intensity of change significantly reduces the future utility of the water resource to third party users including the environment and other public benefit outcomes.[36] This policy intent is reflected in the wording of ss 5.3 and 5.4 of the *Significant Impact Guidelines 1.3.*

31. Section 5.3 defines a significant impact to hydrological characteristics of a water resource as:

> "**5.3. Guidance on changes to hydrological characteristics**
>
> A significant impact on the hydrological characteristics of a water resource may occur where there are, as a result of the action:
>
> a) changes in the water quantity, including the timing of variations in water quantity
>
> b) changes in the integrity of hydrological or hydrogeological connections, including substantial structural damage (e.g. large scale subsidence)
>
> c) changes in the area or extent of a water resource
>
> **where these changes are of sufficient scale or intensity as to significantly reduce the current or future utility of the water resource for third party users, including environmental and other public benefit outcomes.**
>
> The following aspects may need to be considered when assessing changes in hydrological characteristics:
>
> • **flow regimes (volume, timing, duration and frequency of surface water flows)**
>
> • recharge rates to groundwater
>
> • aquifer pressure or pressure relationships between aquifers
>
> • **groundwater table and potentiometric surface levels**
>
> • groundwater-surface water interactions …"

32. Section 5.4 defines a significant impact to water quality as:

> **"5.4 Guidance on changes to water quality**
>
> A significant impact on a water resource may occur where, as a result of the action:
>
> • there is a risk that the ability to achieve relevant local or regional water quality objectives would be materially compromised, and as a result the action:

[36] Ibid s 4.2.1.

− **creates risks to human or animal health or to the condition of the natural environment as a result of the change in water quality**

− substantially reduces the amount of water available for human consumptive uses or for other uses, including environmental uses, which are dependent on water of the appropriate quality

− causes persistent organic chemicals, heavy metals, salt or other potentially harmful substances to accumulate in the environment

− seriously affects the habitat or lifecycle of a native species dependent on a water resource, or

− causes the establishment of an invasive species (or the spread of an existing invasive species) that is harmful to the ecosystem function of the water resource, or

• there is a significant worsening of local water quality (where current local water quality is superior to local or regional water quality objectives), or

• high quality water is released into an ecosystem which is adapted to a lower quality of water."

33. The following sections discuss the application of sections 5.3 and 5.4 to the assessment of impacts to hydrology and water quality from the Proposed Action.

3.2 Hydrology

34. RO-treated water has been released from the GLNG project at a maximum release rate of 13.5ML per day in 2015 and from 2018-2021. From 2016-2017, the release rate was 13.5 to 18 ML per day.[37] These releases have raised the depth of the Waterhole, which is now permanently inundated to a depth of approximately 1m.[38]

35. The Treated Releases are expected to result in the depth of the Waterhole remaining higher for longer, which is expected to reduce the ephemeral nature of the waterhole.[39] The PD states it is unlikely that the Treated Releases will have a significant impact on the hydrology of the Waterhole because monitoring of the Waterhole bed and bank stability did not identify any issues.[40]

36. Changes to stream levels in the Dawson River are also expected to occur. The PD states that water level monitoring at the Waterhole (WLMP1) and the Dawson River (S4) during the 13.5 ML/day and 18ML/day scenarios have indicated an observable increase in water depth of no more than 0.5 m during both scenarios. The PD states that it is unlikely that the Treated Releases will have a significant impact of the hydrology of the Dawson River because the REMP indicates stable geomorphological conditions.[41]

[37] Aecom, above n20, 16.
[38] Aecom, above n20, 93.
[39] Aecom, above n20, 147.
[40] Aecom, above n20, 147.
[41] Aecom, above n20,

37. In response, we consider that the PD incorrectly applied the *Significant Impact Guidelines 1.3* because it failed to consider whether the changes to hydrology in the Waterhole and the Dawson River are of sufficient scale or intensity as to significantly reduce the current or future utility of the Waterhole and the Dawson River, with such utility including supporting services such as the maintenance of ecosystem function.

38. The term "ecosystem function" is defined in s 4.2.1 of the *Significant Impact Guidelines 1.3* as including "the ecosystem components, processes and benefits or services that characterise the water resource, including support for the biological diversity or species composition of the water resource." Applying this definition to the Proposed Action, it is submitted that the Waterhole and the Dawson River are high-value water resources because of their function as critical habitat for the White-throated Snapping Turtle.

39. Low flow periods are critical to the ecosystem functions of the Waterhole and the Dawson River. A recent analysis of the PD by a team at RMIT University (**FWRS Water Impact Analysis**), which is annexed to this submission, states:

    "Low flow periods play key role in maintaining natural diversity of stream ecosystems in many rivers (McGregor et al., 2011; Poff & Zimmerman, 2010). Low flows hydrology modification can result in significant changes to ecosystem structure and function. The Dawson River/Wardingarri is 'a series of interconnected pools…separated by sandy gravel & rocky riffles' (Miles, 2021), and these features play a significant ecohydrological role for macroinvertebrates, turtles, and fish communities. Flows in the Dawson are highly variable, quickly shifting between low-flow to flood conditions and then receding relatively rapidly to baseflow (e.g., Fig. 5-10 of the proposal documentation)."[42]

40. The current ecosystem functions of the Waterhole and Dawson River are already severely stressed by the releases of RO-treated water from the GLNG Project. This is because the 13.5 and 18ML releases of produced water have (1) altered the Waterhole into being permanently inundated and (2) significantly reduced the number of low-flow days in the Waterhole and Dawson River (see Figure 5 below).

[42] Matthew Currell, Monica Esmond, Riley Nicholson, Katelyn Dooley and Clint Hansen, *Analysis of Fairview Water Release Scheme: Impact and risk assessment for water and connected environmental values* (24 March 2023) 8.

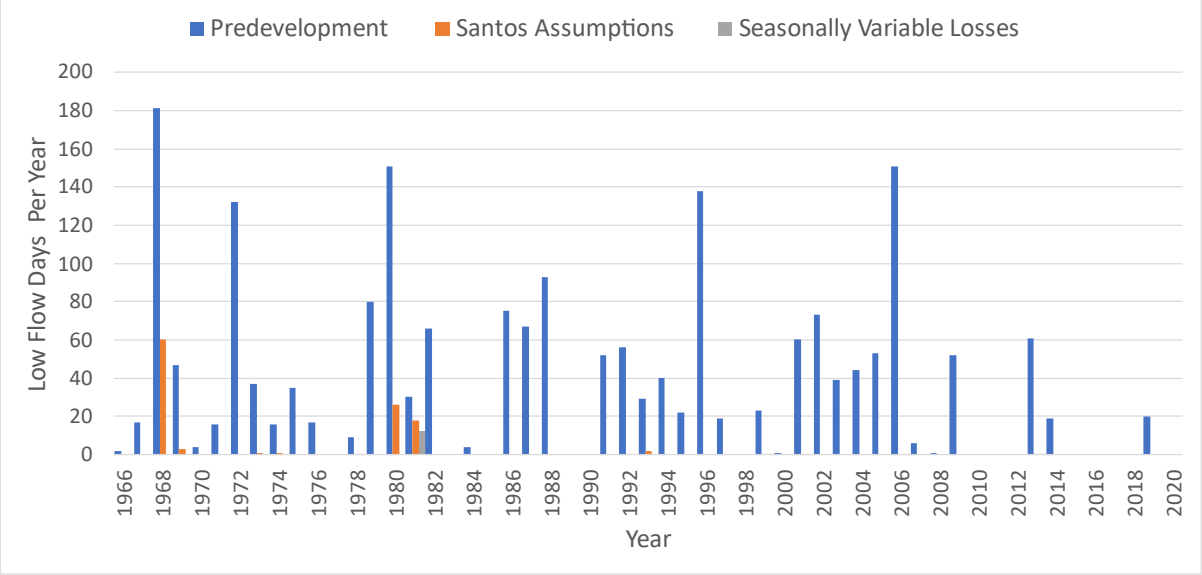


Figure 5: Number of low flow days per year in Dawson River (at Utopia Downs) with and without daily treated releases, based on historical flows data[43]

41. The increased depth of the Waterhole and more frequent inundation of the Dawson River is a significant change that is likely to impact the White-throated Snapping Turtle as the species is considered habitat specialist.[44] Such species are affiliated with specific habitats and dependent on specific resources, as opposed to generalists that can survive in a wider array of habitats and resources.

42. For this reason, we consider that a precautionary approach is necessary to maintain the ecosystem functions of both the Waterhole and the Dawson River as close as possible to historic levels to minimise disturbance to the habitat of the White-throated Snapping Turtle as the species is already severely stressed as turtle recruitment in the project area is almost zero. We note that the Independent Scientific Committee's Advice on the Fairview Water Release Scheme (**IESC Advice**)[45] stated that "additional stresses, even minor to these two species from the project should be avoided and a precautionary approach is essential."[46]

3.3 Water quality

43. The Treated Water will contain chemicals used in the CSG operations. These will include chemicals used in hydraulic fracturing, drilling and water treatment and geogenics. The presence of such chemicals has a real and not remote chance of affecting the White-Throated Snapping Turtle because to its cloacal respiration mechanism and through bioaccumulation of contaminants within the food chain.[47]

[43] Nicholson, R., Esmond, M., Mullins, R., Dooley, K., 2022. Protecting water from the impacts of coal seam gas development. RMIT University Engineering Capstone project report (326pp). [Available on request]
[44] Recovery Plan p 14.
[45] IESC, *Advice to decision maker on coal seam gas project IESC 2022-133: Fairview Water Release Scheme (EPBC 2021/8914)*
[46] Ibid 9.
[47] Ibid 10.

44. Applying s 5.4 of the *Significant Impact Guidelines 1.3*, it is submitted that the Proposed Action is likely to change the water quality of the receiving environment and that these changes will:

    a. create risks to human or animal health or to the condition of the natural environment as a result of the change in water quality; and

    b. seriously affect the habitat or lifecycle of a native species dependent on a water resource.[48]

45. These risks invoke the application of the precautionary principle because the sensitivity of the receiving environment and the high degree of scientific uncertainty regarding:

    a. the relationship(s) between water quality and flow rates, or potential flow-on effects, to ecosystems due to water quality changes occurring during specific flow conditions (particularly low-flows);[49]

    b. the potential impacts of existing exceedances of Water Quality Objectives (**WQOs**) for several analytes, in particular, exceedances of boron, on threatened species;[50]

    c. the potential impacts of further increasing the concentration and loads for several analytes including suspended solids, aluminum, boron, copper, nitrogen;

    d. the potential impacts of Tier 2 and Tier 3 chemicals on hatchlings of the White-throated Snapping Turtle, particularly because of their heavy reliance on cloacal respiration and greater potential susceptibility to contaminated water;[51]

    e. the potential impacts of the Proposed Action on groundwater-dependent ecosystems (**GDEs**);[52] and

    f. surface-groundwater interactions due to the assumption in the PD that the Evergreen Formation is an aquitard when groundwater chemistry and hydraulic testing data for the upper Evergreen Foundation show that this unit is a potentially significant aquifer.[53]

46. In particular, we are concerned that there is a high level of risk to human and animal health because of potential impacts from the Proposed Action on high-quality groundwater resources. The FWRS Water Impact Analysis states:

    "The Precipice Sandstone occurs at significant depth below the oxbow lake wetland and is therefore unlikely to interact directly with the treated water releases in the vicinity of the release point. However, the Evergreen Formation directly underlies the oxbow lake wetland and Dawson River channel downstream of the release point. Groundwater chemistry and hydraulic testing data (compiled by OGIA) for the upper Evergreen Formation (section 4.1.2.1) show that this unit is a potentially significant aquifer, which hosts high-quality groundwater. Hydraulic conductivity field data in Table 4-4 show values in the range of a moderate to high-

[48] DCCEEW, above n 35, s 5.4.
[49] Currell et al, above n42, 3-6.
[50] Currell et al, above n42, 6-7.
[51] IESC, above n45, 10.
[52] Currell et al, above n42, 13-14.
[53] Currell et al, above n42, 9-13.

yielding aquifer in the upper part of the formation (Kh values from 0.0014 to 8090 m/day); these are not consistent with uniform conceptualisation of the unit as an aquitard. Hydrochemical data presented in table 4.7 from registered bores in this formation, also indicate a high-quality groundwater resource, e.g., TDS values are all < 400 mg/L (or < 820 mg/L encompassing the Boxvale Sandstone member), and in one bore TDS is < 100 mg/L (or three bores if the Boxvale Sandstone is included). This puts the groundwater within the range of salinities considered viable for potable water supplies and is inconsistent with the quality of water expected for an aquitard. The low TDS values also indicate a potential for ground-surface water interaction occurring (e.g. leakage/recharge of the upper formation from surface water during high flow events), which has not been considered in the conceptual hydrogeological model."[54]

47. The application of the precautionary principle is discussed in further detail in the next section.

4. Precautionary Principle

4.1 Regulatory requirements

48. The Minister is required to apply the precautionary principle when making decisions pursuant to section 391 of the Act when there is a lack of full scientific certainty regarding the potential for serious or irreversible environmental damage. In particular, s 391(2) of the EPBC Act states:

    "(2) The precautionary principle is that lack of full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there are threats of serious or irreversible environmental damage."

49. In *Telstra Corporation Limited v Hornsby Shire Council [2006] NSWLEC 133 (*24 March 2006) (**Telstra v Hornsby**) Chief Justice Preston of the NSW Land and Environment Court explained the conditions precedent for the application for the precautionary principle. His Honour stated:

    "The application of the precautionary principle and the concomitant need to take precautionary measures is triggered by the satisfaction of two conditions precedent or thresholds: a threat of serious or irreversible environmental damage and scientific uncertainty as to the environmental damage. These conditions or thresholds are cumulative. Once both of these conditions or thresholds are satisfied, a precautionary measure may be taken to avert the anticipated threat of environmental damage, but it should be proportionate: N de Sadeleer, Environmental Principles: From Political Slogans to Legal Rules, Oxford University Press, 2005 at p. 155." (Telstra v Hornsby at [128])

50. His Honour stated that the assessing the seriousness or irreversibility of environmental damage involves a consideration of many factors. These may include:

    "(a) the spatial scale of the threat (eg local, regional, statewide, national, international);

[54] Currell et al, above n42, 11.

(b) the magnitude of possible impacts, on both natural and human systems;

(c) the perceived value of the threatened environment;

(d) the temporal scale of possible impacts, in terms of both the timing and the longevity (or persistence) of the impacts;

(e) the complexity and connectivity of the possible impacts;

(f) the manageability of possible impacts, having regard to the availability of means and the acceptability of means;

(g) the level of public concern, and the rationality of and scientific or other evidentiary basis for the public concern; and

(h) the reversibility of the possible impacts and, if reversible, the time frame for reversing the impacts, and the difficulty and expense of reversing the impacts." (Telstra v Hornsby at [131])

51. The degree of uncertainty has been described as "highly certain of threat" or "considerable scientific uncertainty" regarding the impacts of a project (Telstra v Hornsby at [146]-[147]). Factors that may be taken into account in determining the degree of uncertainty include:

"(a) the sufficiency of the evidence that there might be serious or irreversible environmental harm caused by the development plan, programme or project;

(b) the level of uncertainty, including the kind of uncertainty (such as technical, methodological or epistemological uncertainty); and

(c) the potential to reduce uncertainty having regard to what is possible in principle, economically and within a reasonable time frame." (Telstra v Hornsby at [141])

52. This formulation of the precautionary principle was recently applied by the *Federal Court in Bob Brown Foundation Inc v Minister for the Environment (No 2) [2022] FCA 873*.

4.2 Application

53. We consider that the Proposed Action fulfills both conditions precedent to the application of the Precautionary Principle. First, it gives rise to a threat of serious or irreversible damage because of the following factors:

    a. The value of the receiving environment, which comprises habitat critical to the survival of the White-throated Snapping Turtle because it has both foraging, breeding and nesting areas.

    b. The temporal scale of impacts, which includes:

        i. long-term increase in depth of the Waterhole;

ii. long-term inundation of low sandbanks of the Dawson River;

iii. long-term potential bioaccumulation of chemicals in the food chain and/or sediments; and

iv. long-term potential impacts to groundwater from ground-surface water interaction.

c. The complexity and connectivity of the impacts because of the combination of chemicals present in produced water as well as the cumulative impacts of chemicals that may be persistent, bioaccumulative and toxic.

d. The high degree of public concern regarding the impacts of the project from local and national community groups including the Wildlife Preservation Society of Queensland, BirdLife Capricornia, Lock the Gate Alliance and local landholders. These concerns are based on the scientific views of the IESC and research such as the FWRS Water Impact Analysis.

54. Second, the Proposed Action arguably gives rise to "considerable scientific uncertainty" as stated in paras 45-46 above.

55. For these reasons, we consider that the Proposed Action invokes the application of the Precautionary Principle.

4.3 Adaptive management

56. The type and level of precautionary measures that are appropriate depends on the degree of seriousness of and irreversibility of the threat and the degree of uncertainty. The more significant the seriousness and the more uncertain the threat, the greater the level of precaution required. (Telstra v Hornsby [161])

57. Adaptive management is not an appropriate precautionary measure because of the serious and irreversible nature of impacts to the White-throated Snapping Turtle.

a. the critically endangered status of the White-throated Snapping Turtle means that it is at an extremely high level of extinction in the wild; and

b. the local population of the White-throated Snapping Turtle is already at a severely stressed level, as evidenced by recruitment being almost zero.

58. Further, we consider that adaptive management is not possible due to the high degree of uncertainty regarding the susceptibility of hatchlings to chemicals in the Treated Releases,

5. Recovery Plan

59. Two key questions arise regarding the application of s 139(1)(b) to the Proposed Action:

a. Is the approval of the Proposed Action inconsistent with the Recovery Plan?

b. Is the approval of the Proposed Action inconsistent with the Recovery Plan, if adaptive management conditions are attached to the approval?

60. We consider that the answer to both questions is "no". Our analysis is set out in Table 1 below:

Table 1: Analysis of whether the approval is inconsistent with the Recovery Plan

	Recovery Plan	Is approval inconsistent with the Recovery Plan?	Is approval with adaptive management inconsistent with the Recovery Plan?
1	**Recovery objectives** -to ensure a self-sustaining healthy population structure in all catchments in which the white-throated snapping turtle occurs - to enhance the condition of habitat across the white-throated snapping turtle's range to maximise survival and reproductive success".	Yes. Approval of the decision would reduce the condition of habitat because of the release of harmful chemicals to the habitat of the white-throated snapping turtle. Further, approval will result in permanent inundation of nesting areas for the white-throated snapping turtle. This will decrease the likelihood of survival and reproductive success.	Yes. Approval of the decision would reduce the condition of habitat because of the release of harmful chemicals to the habitat of the white-throated snapping turtle. Further, approval will result in permanent inundation of nesting areas for the white-throated snapping turtle. This will decrease the likelihood of survival and reproductive success. Adaptive management will not prevent an overall reduction in the water quality of the Waterhole and Dawson River, which comprise habitat of the white-throated snapping turtle. Adaptive management will not prevent the loss of breeding habitat at the Dawson River due to permanent inundation from the Treated Releases.
2	**Recovery strategies** -to substantially improve the recruitment of hatchlings and juveniles into the population; - to decrease adult/subadult mortality rates; and - to improve stream flow and habitat quality throughout the species' distribution.	Yes. The reduction in water quality is likely to reduce the recruitment of hatchlings and juveniles into the population because of their potential susceptibility to contaminants in the water due to their cloacal respiration.	Yes. Adaptive management is unlikely to mitigate potential harm to the recruitment of hatchlings due to a lack of knowledge of their vulnerability to water contamination. Adaptive management is unlikely to mitigate potential harm to hatchlings juveniles because their habitat use and dispersal requirements are still poorly understood (Recovery Plan p 17).

	Recovery Plan	Is approval inconsistent with the Recovery Plan?	Is approval with adaptive management inconsistent with the Recovery Plan?
			Adaptive management of water quality will not prevent an overall reduction in water quality of the Waterhole and the Dawson River.

6. Conclusion

61. For the reasons stated in this submission, we ask the Minister to exercise her power under s 133 of the Act refuse to approve the Proposed Action.

Submission on the Preliminary Documentation for the Fairview Water Release Scheme

Submission made by:

1. Janice Baird
NSW 2074
janicebaird@protonmail.com

2. Celine Gunther
NSW 2448
celinetara@gmail.com

3. Adrian Gunther
NSW 2448
oselstrada@gmail.com

4. Annabelle Wilson
NSW 2021
annabellevwilson@gmail.com

5. Dolma Gunther
NSW 2008
dolmani@gmail.com

6. Jeannie Alamkara
QLD 4223
jeanniealamkara@gmail.com

7. Jemma Noble
NSW 2020
jemmanoble3@gmail.com

8. Brigette Fyfe
NSW 2256
pemamaya@yahoo.com

9. Rowan Hardinge
QLD 4223
Rowansnow@gmail.com

10. Donna Pillay
NSW 2134
donnapillay@gmail.com

11. Wenda Shurety
QLD 4152
Wenda.shurety@gmail.com

12. Ivan Georgiev
SA 5100
roadsoftime@gmail.com

13. Mel Bastian
WA 6163
Melaniebastian@gmail.com

14. Kate Robertson
NSW 2350
Krobertson2010@gmail.com

15. Anne Quinlivan
NSW 2518
Quinnyswan1@gmail.com

16.Ebony Quinn
NSW 2580
Qebony6@gmail.com

17. Monica Esmond
VIC 4221
esmondmonica@gmail.com

18. Clint Hansen
VIC 3060
Clint.hansen@rmit.edu.au

19. Lucinda Walker
VIC 3055
Lucindawalker11@gmail.com

20. Leandra Martiniello
NSW 2480
Leandra.m.ampetyane@protonmail.com

21. Pat Marks
VIC 3070
Pmarks@collarts.edu.au

22. Kym Fenton
WA 6006
fentonkym@gmail.com

23. Josh Catanzariti
NSW 2611
Josh Catanzariti@gmail.com

24. Tomasi Tikiger
VIC 3031
Masi.tikiger@gmail.com

25. Claire Farrugia
NSW 2550
Calire.a.farrugia@gmail.com

26. Bronwyn Lawson
Qld 4701
Lawsonbronwyn51@mail.com

27. Janet Lawson
Qld 4174
tenajlawson@gmail.com

28. Luke Lawson
Qld 4701
Ltlawson1@hotmail.com

30. Krystal Pollock
Qld 4780
Krystalhansen88@gmail.com

31. Leanne Ogilvie
Qld 4511
Leanne.ogilvie@bigpond.com

32. Jonathan Mason
Qld 4701
Jemason08@gmail.com

33. Sally Waller
Vic 3071
S_waller@hotmail.com

34. Jen McMaster
New Zealand
jenrmcmaster@gmail.com

We would like to maintain the confidentiality of the personal information of all the signatories to this submission. In accordance with correspondence with the Department, we have only included email addresses and, for some signatories, suburbs and postcodes. We ae happy to provide more personal information upon request.

If you would like to discuss this submission, please contact Janice Baird at 02 8007 4807 or janicebaird@earthevery.org.

Analysis of Fairview Water Release Scheme: Impact and risk assessment for water and connected environmental values

Professor Matthew Currell

Ms Monica Esmond (PhD candidate)

Mr Riley Nicholson (BEng Hons graduate)

Ms Katelyn Dooley (BEng Hons graduate)

Mr Clint Hansen (Indigenous Research Fellow/PhD candidate)

School of Engineering, RMIT University

24th March 2023

Through RMIT University's *Engineering Capstone* project course and related research programs, a body of work examining the hydrology, hydrogeology, water quality and ecology of the Upper Dawson River (known as the *Wardingarri* in Iman language), in the vicinity of the proposed Fairview Water Release Scheme (FWRS) was conducted in 2022 (Nicholson et al., 2022) and remains ongoing. The research has identified a number of data and knowledge gaps relevant to the assessment of water and environmental impacts of the FWRS scheme, as originally outlined in documents submitted for EPBC review in 2021-22.

Some of the issues identified in the 2022 research have been resolved, or are no longer relevant, due to the amendment of the FRWS proposal to exclude un-treated, event-based coal seam gas water releases into the Dawson River. However, there are still knowledge gaps and unresolved issues in the assessment of water and related environmental matters, associated with the proposed daily treated water releases. These include gaps in baseline characterisation of the region's water quality, hydrology, hydrogeology and eco-hydrological relationships. The issues identified and discussed below relate only to the revised proposal made available in February 2023, involving the application to increase the rate of discharge of treated CSG co-produced water to 18 ML/day at the current release point, upstream of the oxbow wetland that flows to the Dawson River/Wardingarri.

The main issues identified in this review, which are gaps in the FWRS impact analysis, are:

1. **Water quality / flow regime relationships:** The relationships between water chemistry and flow conditions in the Dawson River – which is a highly variable river system both spatially and temporally – remains poorly characterised. Water quality baselines and water quality objectives for rivers with highly variable flow conditions (such as the Dawson) must consider the dynamics of water quality at different flow stages and wetting/drying cycles. Sampling of baseline and ongoing water quality should occur during minimum, low, moderate, medium and high flows, each on multiple occasions to give statistical robustness to the data. These data should be presented and anlaysed in a way that allows the baseline water quality at different flow stages, and the likely impact of the additional treated water discharges at these different flows, to be analysed. Sample site coverage for water quality sampling, including control sites, is also limited in the current proposal, both spatially (i.e., for characterisation of a heterogeneous river system) and temporally (i.e., to adequately capture ecohydrologically important processes and change over time at each site).

2. **Limited knowledge base to support ecotoxicology assessment for boron:** Boron concentrations in the desalinated water and oxbow lake wetland where

releases currently take place, are generally above the ANZECC default guideline values for 95 and 99% species protection for aquatic ecosystems (0.94 and 0.34 mg/L). While Santos have negotiated a much less strict water quality objective for boron with the Queensland government (2.9 mg/L), this is based on limited ecotoxicology testing (utilising only five indicator species, while the most recent ANZECC guidelines prefer at least 15 species), and a poorly fitted relationship for Boron concentration and species protection percentiles. There remains limited information as to the likely effects of elevated boron concentrations on the threatened species living along the Dawson, such as the Fitzroy River and White-Throated Snapping Turtle, and the biota upon which they feed.

3. **Limited analysis of potential ecological impacts of change to low-flow regime:** Analysis of the effects of the proposed releases on river flow regime, particularly at the low-flows end of the range of flows in the Dawson River, and associated risks to environmental values, remains limited. The increase in water discharge to the wetland and spill-over into the river will result in a decrease in the frequency, duration and magnitude of low flow spells in the river system, making pools and riffle areas more connected than would otherwise be the case under natural conditions. The effect of this on the ecosystem (e.g., through favouring species that are better adapted to a more permanent, higher level of baseflow, and greater connectivity between river sections) has not been thoroughly documented or analysed. The assumption of limited/no impact of the changed flow regime, rests on observations about the level of increase in water levels and flow velocities being small relative to natural variability. However, flow impacts will be cumulative on top of existing natural variability and affect river flows only in one direction – i.e., releases will always add additional flow to whatever natural flow variability is being experienced; as such, there will be a distinct change in flow regime towards higher rates of flow, most noticeable during lowest rainfall periods. Ecological consequences of such change must be carefully analysed and considered.

4. **Hydrogeological conceptual model and ground-surface water interaction:** There are issues with the hydrogeological conceptual model. This model assumes that the Evergreen Formation – which underlies the oxbow wetland into which increased treated water releases are proposed – is an aquitard (with limited permeability). In fact, most field data indicate that the shallow Evergreen Formation in this region contains high-quality groundwater, and its upper layer(s) has substantial permeability. The uppermost part of the Evergreen Formation is the most likely hydrogeological layer to be in contact with, and exchange water with, surface water bodies in the region, including the oxbow lake, and Dawson River downstream of the proposed releases. Leakage of the treated CSG water from the wetland into the upper Evergreen Formation, and subsequent ground-surface water exchanges, have not been considered in the proposal due to conceptualisation of the whole unit as an aquitard. Impacts on groundwater levels and groundwater quality within the Evergreen Formation itself (in which there are landholder bores and likely GDEs) have been overlooked as an impact pathway.

5. **Lack of field data on ecohydrology and groundwater dependent ecosystems:** Stygofauna have still not been appropriately sampled and documented in the shallow groundwater in the vicinity of the release point, and Dawson River downstream of the oxbow lake wetland. While the revised proposal acknowledges that stygofauna will be present at the site, it is not possible to properly assess risk and/or impacts on such fauna without a proper baseline dataset on the type, abundance, and diversity

of these. Stygofauna should be sampled in the alluvial groundwater, as well as the Evergreen Formation, where high quality groundwater occurs in close proximity to the release point and oxbow wetland. Leakage of water from the wetland into these shallow aquifers may occur, affecting groundwater quality utilised by GDEs.

6. **Broader context of produced water management (i.e., impact of other CSG water management strategies apart from treated releases):** The updated proposal documentation indicates that only approximately 20% of the CSG produced water generated from Santos's gas fields in the region will be managed through releases of RO treated water under the proposed FWRS. The predominant water management strategy (encompassing 60% of produced water) is re-use through irrigation. This includes unspecified mixtures of RO treated and un-treated CSG produced water. Evidence from the RMIT capstone research showed that surface water near existing irrigation schemes (along Hutton Creek) is suffering poor water quality – with high turbidity, total iron and aluminium levels. If such irrigation schemes are expanded, there is a critical need to fully assess the impacts of runoff on surface water, groundwater and soil quality. It is unclear whether this is adequately documented and analysed in existing water management plans for the GLNG and GFD projects, and whether there may be increased risk of impacts on matters of national environmental significance arising from the increased management of produced CSG water through such irrigation schemes. Brine management strategies for the considerable quantities that would be generated through the life of the scheme are also not discussed, beyond storage within above-ground dams on-site.

1. Flow regime and associated water quality characterisation

The receiving environment for the FWRS treated releases, in particular the Dawson River (Wardingarri) downstream of the overflow point(s) from the oxbow lake, is characterised by a highly variable flow regime, being a weakly perennial semi-arid river, with substantial differences between flow rates and stage heights at different percentiles. The FWRS proposal lacks careful consideration of the relationship(s) between water quality and flow rates, or potential flow-on effects to ecosystems of water quality changes occurring during specific flow conditions (particularly low-flows).

Water quality data in the FWRS documentation are only presented as summary statistics, and data are not separated according to different flow periods and/or phases of wetting-drying cycles. The derivation of Water Quality Objectives (WQOs) also appears not to have considered the likely importance of flow regime-water quality relationships. The use of generic (ANZG) WQOs may be inappropriate for systems characterised by highly variable flow regimes that host sensitive and high-value ecosystems (Smith, Jeffree & John 2004; Smith et al. 2020).

Standardised water quality guidelines are typically devised for perennial flow systems which generally exhibit relatively stable water quality parameters (Smith, Jeffree & John 2004). Conversely, during low or no flow periods, systems with variable flow regime become fragmented into ecohydrologically distinct waterbodies which exhibit highly variable water quality (Smith et al. 2020). Between flows, these isolated waterbodies behave as separate 'mesocosms' and physico-chemical parameters are essentially 'reset' following each large flow event (Sheldon 2005; Smith et al. 2020). Consequently, traditional seasonal monitoring methods and reference site approaches may not be suitable for the characterisation of temporary waters and may lead to undervaluation of stream quality (Walker, Sheldon &

Puckridge 1995). In a guidance document produced following publication of the updated ANZECC Guidelines, Smith et al. (2020) emphasise use of conceptual models to develop an informed understanding of how the complex interrelating abiotic and biotic factors characterise different flow phases, and development of appropriate water quality monitoring strategies to account for these dynamics. This is a gap in the proposal.

Section 5.3 of main report (AECOM, 2023) and Appendix E.1, E.2 include water quality data from desalinated water pond monitoring, the oxbow lake wetland into which releases flow, and the Dawson River, at one upstream and two downstream sites. These data are presented only as summary statistics for samples collected prior to the commencement of approved desalinated water releases (pre-2015) and after releases (at the current approved rate) commenced in 2015. The data provide no indication of temporal dynamics in water quality parameters – including contaminants that exceed water quality objectives (e.g., ammonia, other nutrients, and aluminium). It is vitally important to understand whether these contaminants, and others which are elevated in the treated water relative to baseline data (e.g., Boron), are more elevated in the receiving environment when flows in the Dawson are low, as distinct from median and high flow conditions.

In order to understand how water quality in the Dawson will be affected by the releases through different periods of time, sampling of baseline water quality data and reporting of ongoing water quality results should occur during minimum (baseflow), low flow, moderate, medium, and high flow conditions, each at multiple upstream and downstream sites where sensitive species such as the threatened turtles may inhabit, and each on multiple occasions to give statistical robustness to the results. An example of how water quality data can be reported together with information on flow conditions is presented below:

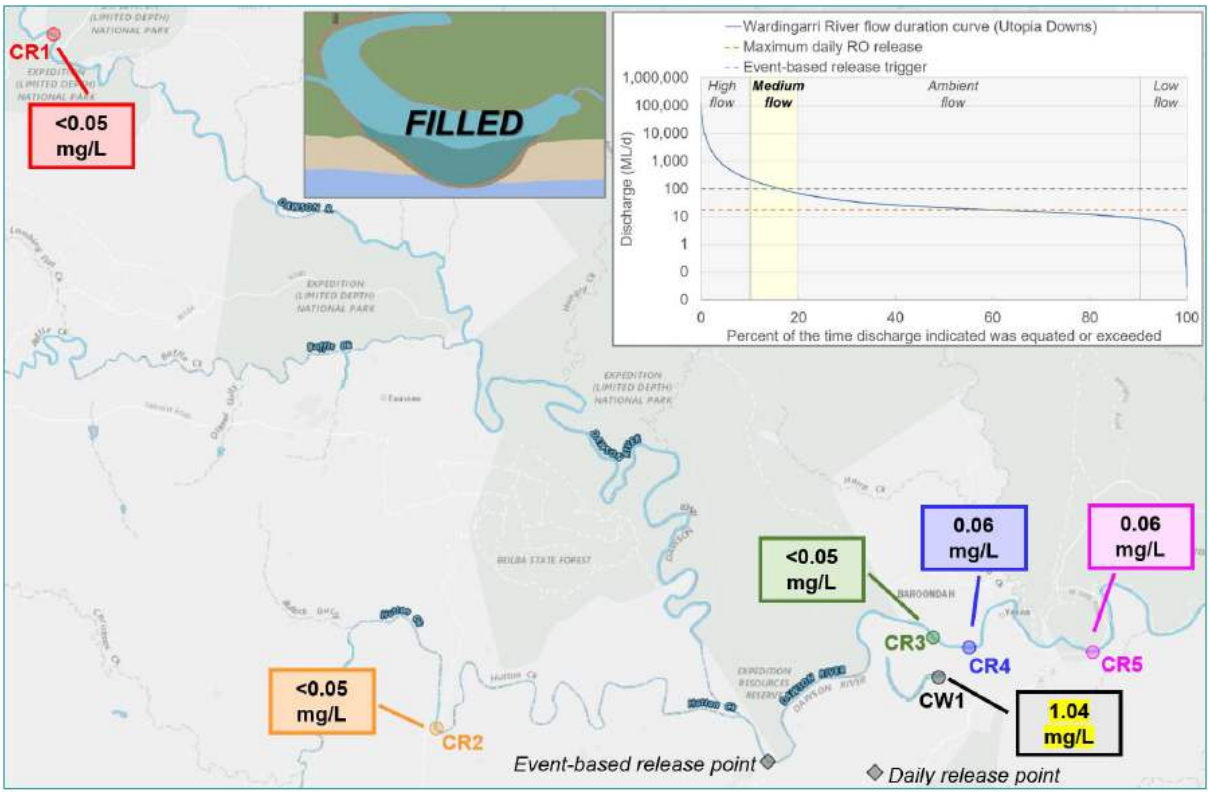


Figure 1: Example of format for presenting water quality data along with flow conditions (indicated in yellow on flow duration curve) to characterise flow/quality relationships (Nicholson et al., 2022).

Such analysis is vital for a thorough assessment of the likely impact of the additional treated water discharges into a highly variable river environment.

Control site monitoring

The high degree of complexity and natural variation of weakly perennial streams such as the Dawson/Wardingarri is well known (e.g., Sheldon 2005; Walker, Sheldon & Puckridge 1995). Such conditions require the use of multiple control sites to understand natural and anthropogenic drivers of water quality change (Smith et al. 2020). Currently, there appears to be one control site for surface water monitoring in the Dawson River (DRR1, 550 m upstream of the confluence of the oxbow lake and river), and one control site for assessing water quality of the Oxbow Lake wetland (DRR2), which is a pool on Hutton Creek upstream of its confluence with the Dawson.This is a limited spatial coverage with which to assess change relative to upstream/un-impacted conditions in the river and wetland, given there are multiple different hydrogeomorphic settings along the Dawson (deep pools, rocky riffles, narrow channels).

It is also questionable whether the use of DRR2 as a control site is appropriate, as it appears to be influenced by disturbance from nearby irrigation schemes (Figure 2). The RMIT team visited the DRR2 site during fieldwork in 2022, and found elevated levels of turbidity, total iron and aluminium in the water, along with an algal sheen on the surface of the water body (Figure 2 and Table 1). The environment was very different – both qualitatively and quantitatively – to the oxbow lake wetland for which it is serving as a control site, meaning it may not be an adequate indicator of the effects of the releases on this environment.

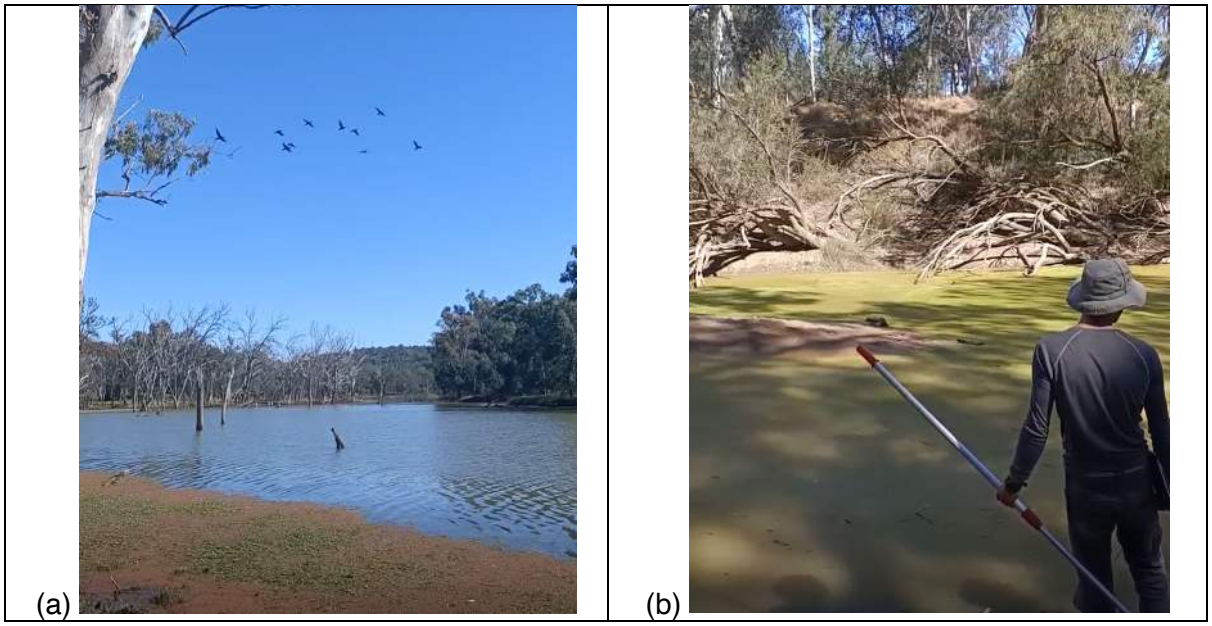


Figure 2: Comparison of (a) Oxbow Lake Wetland and (b) Hutton Creek site (DRR2) during 2022

Water quality impacts observed at Hutton Creek were considered likely to be a result of runoff from the surrounding Santos irrigation schemes (shown in shaded green on Figure 3 below), which utilise treated and un-treated CSG wastewater (the site is labelled CR2 in Figure 3 below).

The water quality impacts observed at this site raise further questions about the water quality impacts of this aspect of produced water management from the Fairview gas field (i.e., the use of CSG wastewater in irrigation schemes), a topic further discussed in section 6 of this report.

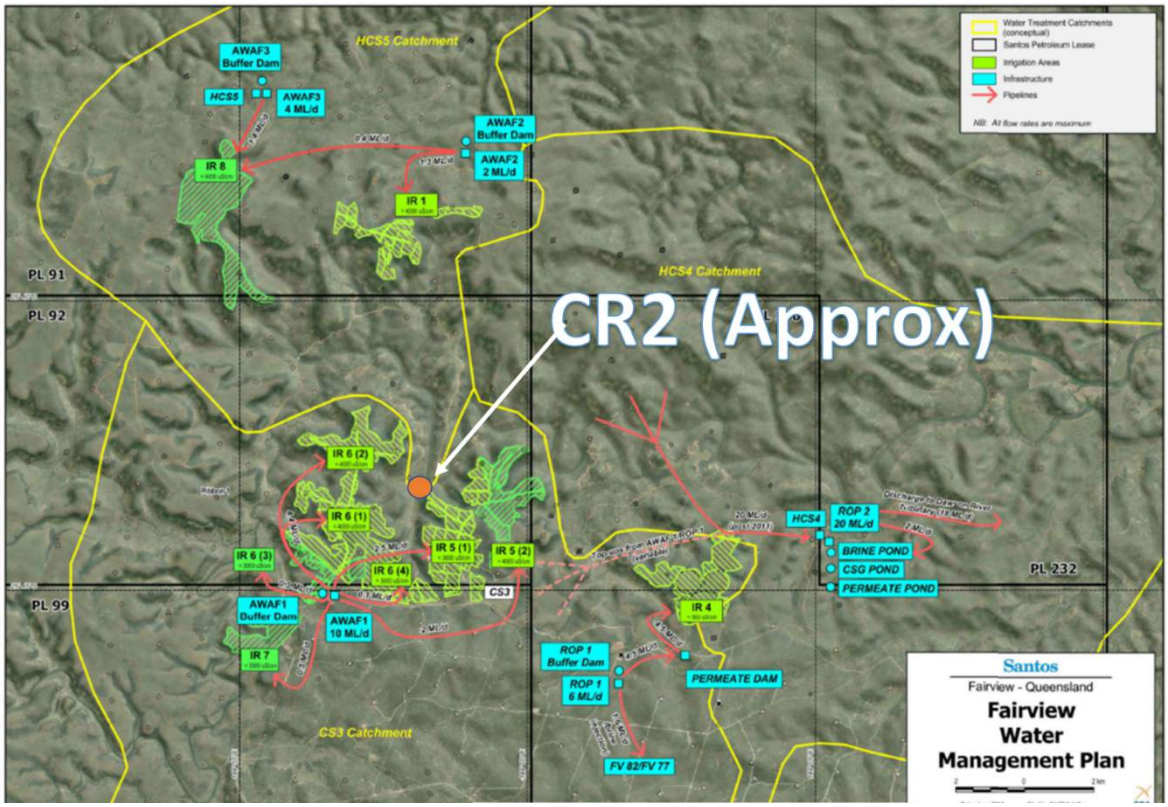


Figure 3: Location of control site for oxbow wetland (Hutton Creeek), showing locations irrigation schemes utilising co-produced CSG water (Nicholson et al., 2022). Site is labelled CR2 as per the nomenclature selected in the RMIT capstone research, but is the same site as DRR2

2. Water quality: insufficient understanding of boron ecotoxicity

Water quality data for the oxbow lake wetland, reported in Appendix E1 and E2, shows that there has been a significant increase in boron concentrations (median value increasing from 0.07 to 0.60 mg/L and maximum value increasing from 0.13 to 1.23 mg/L) relative to pre-impact baseline data. Sampling by RMIT conducted in 2022 found a concentration of 1.04 mg/L within the oxbow lake wetland, and values of 0.06 mg/L in the Dawson River, downstream of the wetland, when the system was sampled during medium flows (Figure 1).

The impact of boron concentration increases on threatened species inhabiting the receiving environment – including considering water quality/flow relationships (section 1) remains poorly understood. Concentrations of Boron in the desalinated water and oxbow lake wetland frequently exceed ANZECC default guidelines for protection of 95% and 99% aquatic species (0.94 and 0.34 mg/L, respectively). Santos have negotiated with the Queensland regulator to amend the water quality objective for Boron in the receiving environment for the current approved treated releases, to 2.9 mg/L (as of 2022). This value was derived by plotting ecotoxicology test results estimating IC/EC10 (an indicator of chronic and acute effect concentrations), from five species to a log-logistic fit of concentration vs. %species protection level. The line of best fit achieved from the data is poor (see figure 4b) and there is particularly high uncertainty in the shape of fit at the low end of the response curve, which is critical for derivation of the 95 or 99% species protection value:

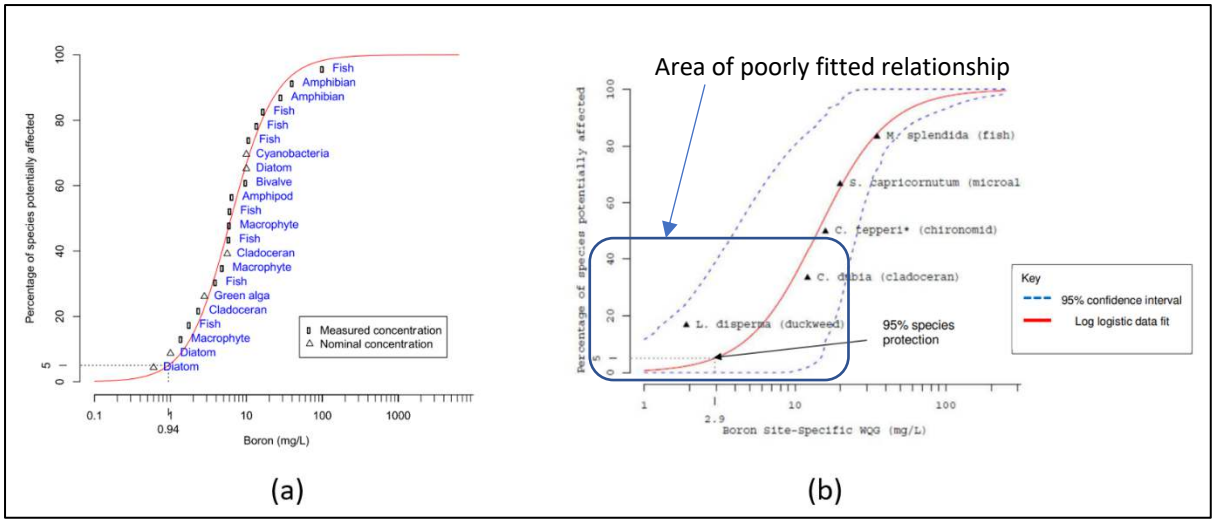


Figure 4 – (a) Species-Specific Distribution utilised to derive the ANZECC default 95% guideline value of 0.94mg/L. (b) Species-Specific Distribution utilised to derive the site-specific guideline value of 2.9 mg/L for the Fairview release scheme (Adapted from: AECOM 2019, and ANZG 2021)

Warne et al. (2018, p. 19) note that the use of such a low number of species to derive a WQO is at the bare minimum of what is considered 'adequate'; datasets with 8–14 species belonging to at least four taxonomic groups are considered 'good', and those that contain data for at least 15 species are 'preferred'.

Since this ecotoxicology testing was conducted, newer, more robust default guideline values for Boron have been developed and established (ANZG 2021). In the updated ANZECC guidelines, 22 species were used to derive the current 95% and 99% protection guideline values for boron of 0.94 mg/L and 0.34 mg/L respectively. These guideline values fit Warne et al.'s (2018) definition of 'preferred' and provide a much better fitting relationship than used to develop the 2.9 mg/L value. In order to afford maximum protection of sensitive species in the receiving environment, either the new default guideline value should be adopted, or a new site-specific WQO should be determined based on ecotoxicology testing for a significantly larger number of species that are relevant in the receiving environment (at least eight, and ideally >15, depending on the level of fit that can be achieved in the resulting log-log relationship). It has been noted by the IESC that threatened species that inhabit the receiving environment (White Throated Snapping and Fitzroy River turtle) are sensitive to aqueous contaminant exposure, due to their cloacal respiration mechanism, and the turtles may also be exposed through accumulation of contaminants within algae and invertebrates upon which they feed. The assessment of a low risk to these turtles from water quality impacts in the proposal should be seen as uncertain in this context, and a more conservative approach taken.

3. Modification of low flows hydrology

Low flow periods play key role in maintaining natural diversity of stream ecosystems in many rivers (McGregor et al., 2011; Poff & Zimmerman, 2010). Low flows hydrology modification can result in significant changes to ecosystem structure and function. The Dawson River/Wardingarri is 'a series of interconnected pools…separated by sandy gravel & rocky riffles' (Miles, 2021), and these features play a significant ecohydrological role for macroinvertebrates, turtles, and fish communities. Flows in the Dawson are highly variable, quickly shifting between low-flow to flood conditions and then receding relatively rapidly to baseflow (e.g., Fig. 5-10 of the proposal documentation).

Daily discharge of 18 ML/day will significantly reduce the magnitude and duration of low-flow spells in the Dawson River – Figure 5 shows a comparison of this discharge rate with the flow duration curve for Utopia Downs, approximately 60 km downstream of the releases.

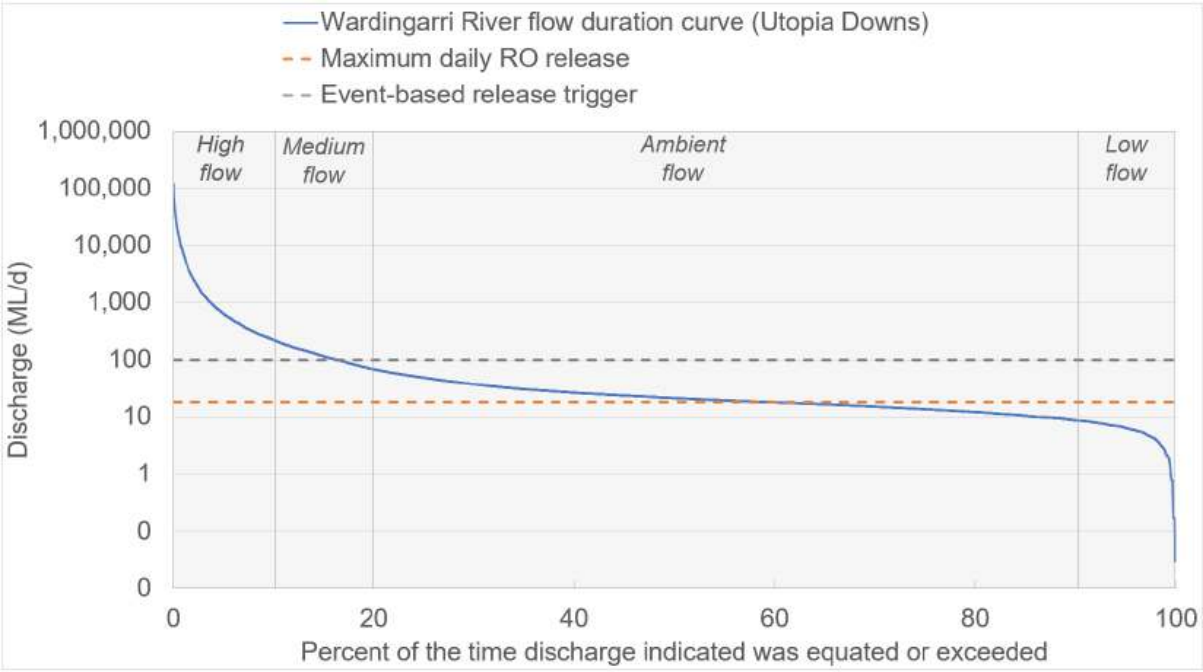


Figure 5 – Flow duration curve for Dawson River (Wardingarri) at Utopia Downs, with daily treated water release rate indicated (orange line). The release rate exceeds natural river discharge monitored at this point approximately 40% of the time.

While not all discharged water will directly enter the Dawson (some will undergo evapotranspiration in the oxbow lake, some may leak into the underlying Evergreen Formation - see section 4 below), the increase in flows to the Dawson will be considerable relative to typical pre-development low-flows. Figure 6 reports results of an analysis of historic flows data (from Utopia Downs) with the impact of the additional flows from the releases on hydrological response variables (HRVs). The results encompass three scenarios:

- Pre-development: Flow regime (based on historic data) without any additional discharge (blue bars)
- Santos assumption (based on AECOM, 2021): Impact of additional discharge assuming initial 50% loss through evapotranspiration (ET) between discharge point and oxbow wetland, and subsequent 1.7ML/day from the wetland. This corresponds to an additional 7.3ML/day in the river (orange bars)
- Seasonally Variable: This accounts for seasonal variation in ET, with 50% ET losses Nov-Feb, 33% losses in Mar-Apr, 22% losses in May-Sep and 33% losses in October. This attempts to better capture seasonal losses in the wetland and adjusts flows from the wetland to the Dawson accordingly (grey bars).

The river flow data across back to 1966 were analysed under these three scenarios, with additional flows from the treated releases added to historically recorded flows. The most notable change in any HRV under the proposed discharge scenarios is the significant decline in number of low flow days (LFDs). While some low flow days still occur under the

two discharge scenarios, these were largely during historic droughts (1968 and 1979-1982) with minimal occurrence throughout the rest of the record.

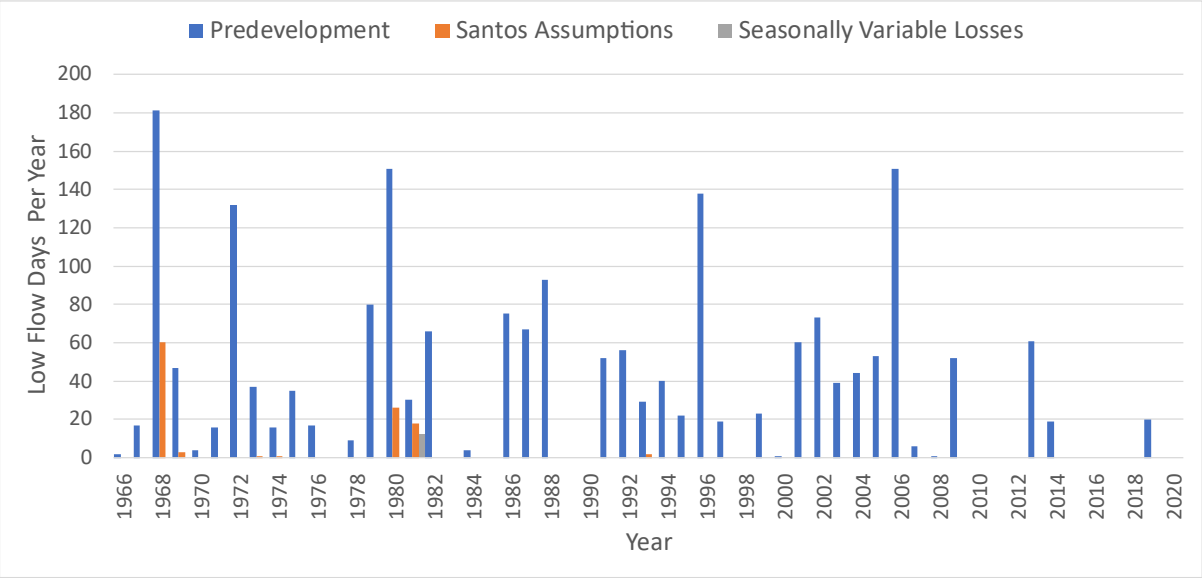


Figure 6 – Number of low flow days per year in Dawson River (at Utopia Downs) with and without daily treated releases, based on historical flows data (Nicholson et al., 2022).

While the daily releases of 18 ML/day may only result in limited rises in water levels (e.g. ~5 cm at Yebna Crossing), the potential ecological impacts of reducing the frequency and magnitude of low-flow periods in the river do not appear to have been studied in detail – with consideration of factors such as the connectivity of pools and impacts on water depth at shallow riffle environments. The IESC pointed out that increasing the frequency of spill-over from the oxbow lake wetland into the Dawson River may favour colonisation of the river channel by invasive species:

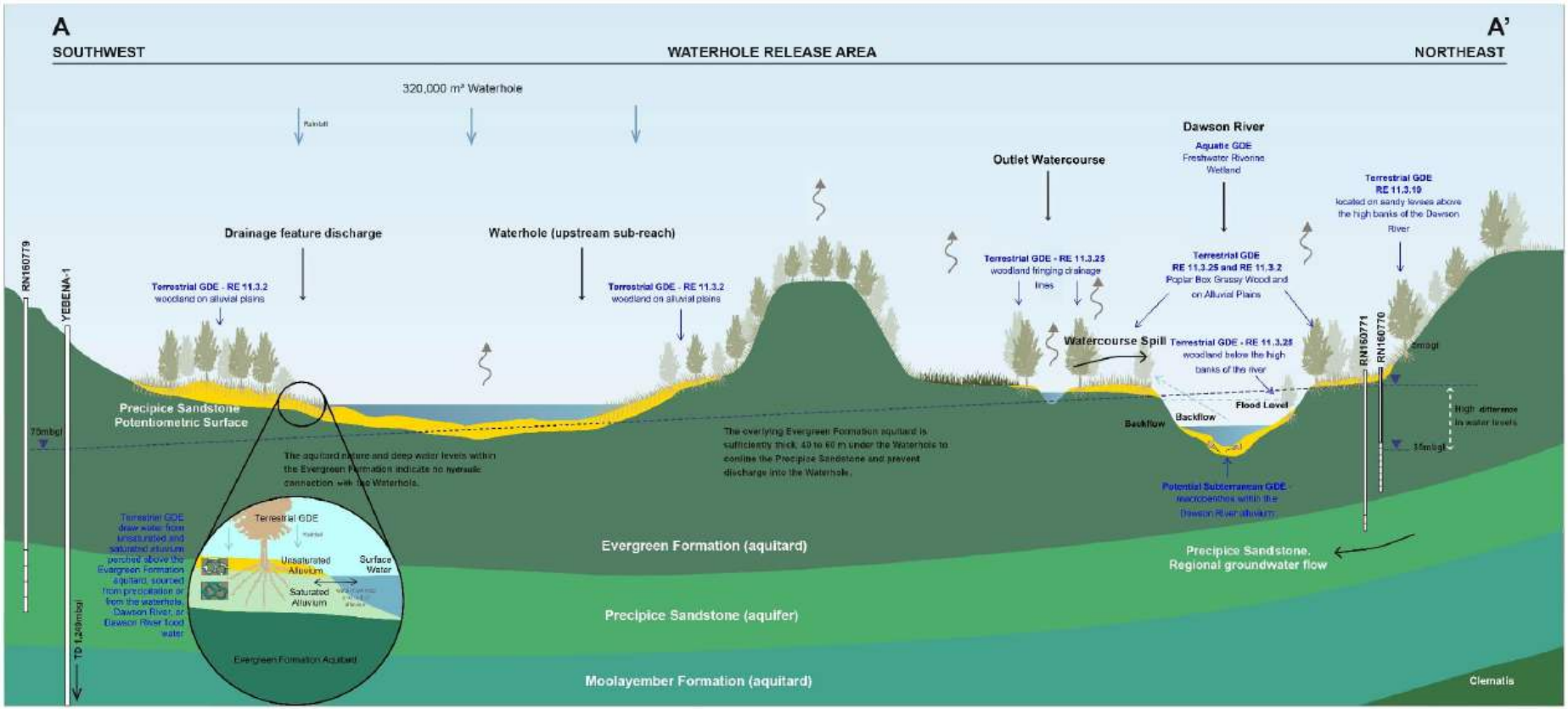
> "For example, increased spilling may allow invasive fish species such as goldfish (*Carassius auratus*) and mosquitofish (*Gambusia holbrooki*) that are already in the Waterhole to disperse repeatedly into the Dawson River. The proponent should assess the risk of the predicted changes to the Waterhole's water regime in facilitating the spread of invasive species in the Dawson River and propose suitable mitigation or remediation strategies if undesired changes occur."

The response to this advice (Appendix C) notes that these two invasive species already inhabit the Dawson, arguing that this is a pre-existing issue rather than an impact that needs consideration for the FWRS. However, it is critical that baseline and ongoing data collection monitor any additional effects caused by the treated water releases, both for the two species highlighted, and other potential invasive species. A protocol for collecting data to indicate the extent of transmission of non-native species from the waterhole to the river, and the possible effect on the EPBC listed threatened species should be developed as part of the REMP.

4. Hydrogeological conceptual model, ground-surface water interaction and implications for ground and surface water impacts

The proposal documentation concludes that there is no significant risk of impacts to groundwater quality, quantity, or groundwater dependent ecosystems. This is based on baseline groundwater and GDE monitoring, and a conceptual hydrogeological model

developed for the site, which encompasses ground-surface water interaction and eco-hydrological relationships (e.g., figure 3-3, reproduced from AECOM 2023, below):



Not to scale

LEGEND

- Evergreen Formation
- Precipice Sandstone
- Moolayember Formation
- Clematis Group
- Waterhole
- Alluvium
- Precipice Sandstone potentiometric surface
- Groundwater Bore
- Evaporation/Evapotranspiration
- Rainfall

Figure 3-3 Ecohydrological model for groundwater resources and GDE associated with the waterhole and Dawson River (Panel A)

There is an important aspect of this conceptual model which appears to be inconsistent with the data collected from the site – namely the conceptualisation of the Evergreen Formation as an (essentially uniform) aquitard. This assumption is significant, as it limits the scope of the analysis of potential groundwater impacts and ground-surface water interaction to the Precipice Sandstone aquifer and shallow alluvium in the channel of the Dawson.

The Precipice Sandstone occurs at significant depth below the oxbow lake wetland and is therefore unlikely to interact directly with the treated water releases in the vicinity of the release point. However, the Evergreen Formation directly underlies the oxbow lake wetland and Dawson River channel downstream of the release point. Groundwater chemistry and hydraulic testing data (compiled by OGIA) for the upper Evergreen Formation (section 4.1.2.1) show that this unit is a potentially significant aquifer, which hosts high-quality groundwater. Hydraulic conductivity field data in Table 4-4 show values in the range of a moderate to high-yielding aquifer in the upper part of the formation (Kh values from 0.0014 to 8090 m/day); these are not consistent with uniform conceptualisation of the unit as an aquitard. Hydrochemical data presented in table 4.7 from registered bores in this formation, also indicate a high-quality groundwater resource, e.g., TDS values are all < 400 mg/L (or < 820 mg/L encompassing the Boxvale Sandstone member), and in one bore TDS is < 100 mg/L (or three bores if the Boxvale Sandstone is included). This puts the groundwater within the range of salinities considered viable for potable water supplies and is inconsistent with the quality of water expected for an aquitard. The low TDS values also indicate a potential for ground-surface water interaction occurring (e.g. leakage/recharge of the upper formation from surface water during high flow events), which has not been considered in the conceptual hydrogeological model.

Data from bore RN160770, screened in the upper Evergreen Formation near the Dawson River, shows rapid, periodic increases in level that decline gradually between rainfall events.

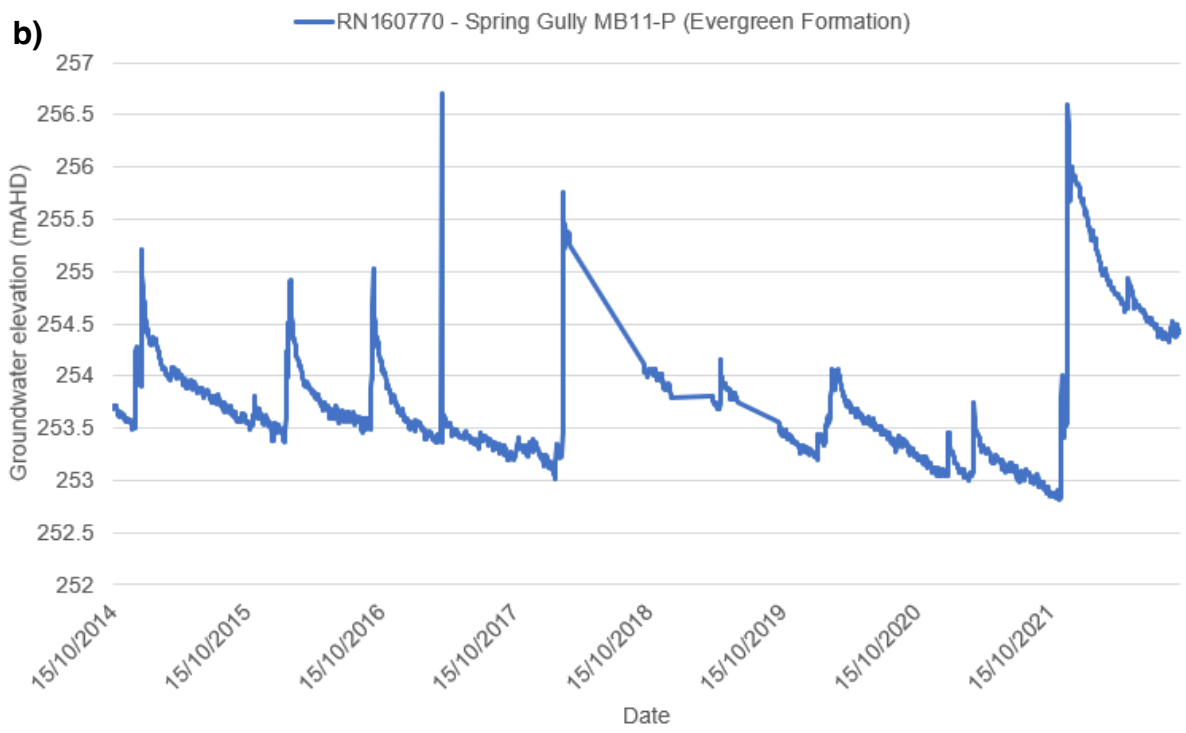


Figure 6 – Hydrograph of Evergreen Formation; a) bore location with respect to oxbow lake and Dawson River, b) groundwater level (m AHD) over time. Data from Queensland Globe

The bore is screened from 16 to 79 m below ground surface across the Evergreen Formation. Water level is approximately 35 to 40 m below ground surface level; noting that the bore is located at the top of a steep cliff adjacent to the Dawson River channel – elevation at the river channel is approximately 250 m AHD (i.e., similar to the groundwater levels recorded in the bore). The periodic rises and subsequent fall in groundwater level imply that the aquifer has substantial permeability and is recharged rapidly, potentially through pulses of flow from the nearby alluvial channel of the Dawson River when it floods. The groundwater in the bore has a field EC value (last measured in 2014) of 200 μS/cm, consistent with this interpretation and indicating fresh groundwater with minimal solute concentration during recharge (as would be expected for groundwater in an aquitard). As such, a connection between the Dawson and/or its nearby alluvial sediments, and groundwater in the upper Evergreen Formation should be considered a potential key aspect of the conceptual hydrogeological model.

The low TDS groundwater in the upper Evergreen Formation make it a potential high-quality water source for beneficial uses, e.g., landholder water supplies and the maintenance of groundwater dependent ecosystems. This has not been considered or surveyed in the vicinity of the proposed releases – e.g., through landholder bore surveys, and ecohydrological investigations, including sampling for stygofauna in Evergreen Formation bores. Increases in certain contaminants that are elevated in RO treated water (e.g. aluminium, boron and nutrients) in Evergreen Formation groundwater, e.g., via leakage from the oxbow lake wetland, should be considered a possible impact pathway for the groundwater, and this should be assessed based on more comprehensive water quality sampling (and site-specific hydraulic testing) from upper Evergreen Formation bores.

Leakage of discharged water into the underlying Evergreen Formation may in turn affect ground-surface water interaction downstream of the site – e.g., in areas where the

Evergreen underlies the Dawson River, water from the formation may discharge into the river during low-flows. Increased rates of baseflow and changes in the chemical composition of groundwater and surface water receiving discharge from the formation is thus a further potential impact pathway that has been given limited consideration.

The IESC highlighted the need for careful characterisation of potential shallow surface-groundwater interactions through additional mapping of hydraulic gradients and water quality at different surface water flow stages:

> "For example, treated water releases, especially at low flows, are very likely to alter hyporheic water chemistry (assuming hyporheic water is chemically different from the released water) because of advective exchange in the river bed in places where groundwater inputs are weak or absent, and this will potentially occur for a considerable distance downstream if the releases continue for years to decades. Assessing the scale and extent of these potential impacts depends on mapping these areas and their vertical hydraulic gradients at various flows and then inferring the likelihood that impacts to groundwater resources may arise from contamination and, to a lesser degree and in much more localised areas, changes and even reversals in surface water-groundwater exchange."

The response to the IESC's advice argues that the area in question is underlain by the Evergreen Formation 'aquitard' and that the alluvium has limited extent and storage capacity. As such further shallow groundwater quality sampling, mapping of groundwater-surface water gradients, and characterisation of potential exchanges (as recommended by the IESC) has not been undertaken. This is a significant potential oversight in the context of the above information.

5. Groundwater dependent ecosystem sampling (including Stygofauna)

Sampling for GDEs (including Stygofauna) to characterise baseline ecological values associated with groundwater, remains highly limited. The assessment documentation has 'conservatively' assumed that alluvial sediments will contain stygofauna but these have still not been directly surveyed. It is argued that because hydrochemical and flow regime changes will be small as a result of the releases, there is limited risk to GDEs and they do not require baseline characterisation. This is despite the IESC advice on the earlier version of the proposal stating that:

> "Mapping and impact assessment, together with collection of field data at a local scale (i.e., along the Dawson River and its riparian zone within and downstream of the project area) for aquatic, terrestrial and subterranean GDEs (e.g., stygofauna and hyporheos) is required, especially in alluvial sediments of the 12-km reach downstream of the proposed release point for untreated produced CSG water. Particular attention should also be paid to sampling the downstream section of the Dawson River where river water infiltrates into the banks and riverbed, providing potential flow paths into shallow alluvial aquifers. These data are needed to document the post-2015 baseline condition, to enable detection of potential impacts during operation, and to assess the effectiveness of proposed management and mitigation measures."

The lack of field sampling and characterisation of GDEs is, notwithstanding the removal of un-treated CSG releases from the proposal, an important knowledge gap. It is certain that the releases of treated water will change both the flow regime and the chemistry of both surface water and groundwater of the area to some degree. While it may be likely that the releases do not result in significant and frequent exceedances of current water quality

objectives (noting issues with the current objectives discussed in previous sections of this report), it is unclear whether changes due to treated water releases (such as an increase in boron and aluminium concentrations, or changes in the balance of nutrients and organic matter in the water) may negatively impact on GDEs. In its response to the IESC advice on the matter, the proponent argues a) that there is a low level of risk to GDEs and b) that this is grounds for not needing to conduct baseline sampling of GDEs:

> '..the desalinated water releases present a low risk to such fauna as the releases are unlikely to contribute to these habitats. If there is any contribution, the desalinated water quality is treated to a high quality and will be highly attenuated by background flows of the Dawson River'

The Department of Agriculture, Water and Environment's advice on this issue is however important:

> "Desalinated water releases, especially at low flows, are very likely to alter hyporheic water chemistry (assuming hyporheic water is chemically different from the released water) because of advective exchange in the riverbed in places where groundwater inputs are weak or absent, and this will potentially occur for a considerable distance downstream if the releases continue for years to decades."

Without baseline sampling of GDEs or studies into their specific ecohydrological characteristics and requirements, along with robust analysis of ground-surface water interactions (encompassing the Evergreen Formation – see section 4 above) it will not be possible to assess changes to the health or condition of GDEs as a result of the releases in the ongoing monitoring program.

6. Overall context of produced water and brine management

The treatment of CSG water by reverse osmosis, for release into the receiving environment and other uses, will result in large quantities of brine from the reverse osmosis process - approximately 10% of the volume of water treated. It is unclear from the FWRS proposal how such brine is to be managed, other than its diversion to storage ponds. A long-term management strategy as these ponds fill with increasing volumes of brine is not outlined. Leakage and/or overflow from brine ponds may present a risk to nearby ground and surface water resources, and under conditions of extreme weather (e.g., flooding) there may be a considerable risk of uncontrolled releases.

The updated proposal documentation indicates that only approximately 20% of the CSG produced water generated from Santos gas fields in the region will be managed through releases of RO treated water into the oxbow lake wetland under the FWRS. The

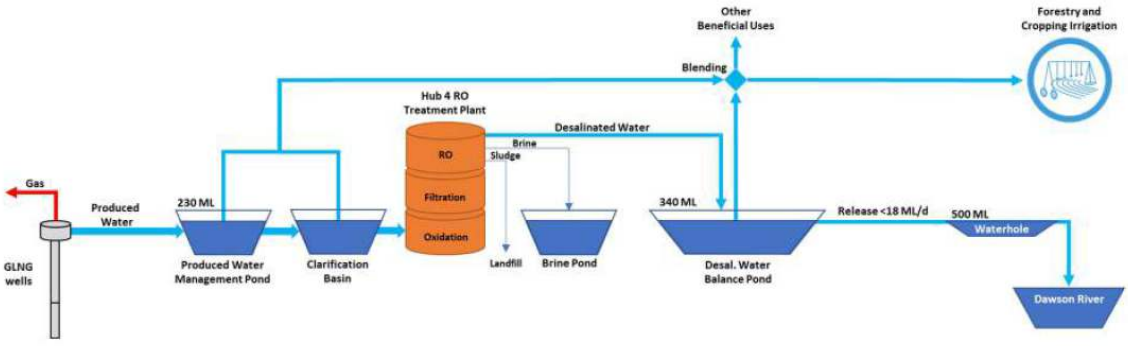


Figure 2-1 Conceptualisation of current water management

predominant water management strategy (encompassing at least 60% of the water) is re-use through forestry and crop irrigation (e.g., Figure 2-1 reproduced from the report, below):

The re-use for irrigation appears to include unspecified mixtures of RO treated and un-treated CSG produced water. Characterisation of the mixtures, and associated water qualities, along with anticipated volumes used in irrigation are needed to fully understand potential environmental impacts of this management strategy.

Evidence from the RMIT capstone research showed that surface water near existing Santos irrigation schemes (site DRR2 along Hutton Creek, also labelled CR2 – see Figure 2 of section 1) is suffering from poor water quality – with high turbidity, total iron, aluminium and nitrogen concentrations compared to other surface water sites in the region, and a visible algal coating on the water body (see Figure 1).

Parameter	**Site CR2 (DRR2 control site, Hutton creek)**	**Dawson River (CR3 – upstream of oxbow lake overflow)**	**Oxbow lake wetland (CW1)**
Specific Conductance (field, μS/cm)	255	330	320
pH (field)	6.7	7.00	7.21
DO (field, mg/L)	11.5	9.0	9.9
Turbidity (field, TU)	144	28	8.4
Chloride (mg/L)	10	30	38
Metals & Metalloids (Total, mg/L)			
Aluminium	7.53	0.63	0.2
Barium	0.108	0.12	0.10
Manganese	0.77	0.14	0.43
Boron	< 0.05	<0.05	1.04
Iron	5.91	1.96	0.91
Nutrients (by discrete analyser, mg/L)			
Ammonia-N	0.13	0.13	0.02
Total N	1.3	1	0.4
Total P	0.19	0.05	0.03

Table 1 – Water quality data from site CR2 along Hutton Creek within an area draining Santos irrigation schemes, sampled on 25/7 to 26/7, 2022. Site localities indicated in Figure 1.

If such irrigation schemes are to be significantly expanded, there is a critical need to fully assess the impacts of their runoff on local surface water, groundwater, sediment and soil quality. It is unclear whether this is adequately documented and analysed in existing water management plans for the GLNG and GFD projects (as opposed to the FWRS proposal), and whether there could be impacts on matters of national environmental significance arising from these irrigation schemes.

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Appendix F

Submission by the Wardingarri People

Appendix F Submission by the Wardingarri People

Department of Climate Change, Energy, the Environment and Water
GPO Box 787
Canberra ACT 2601

By Email: epbc.comments@awe.gov.au

Copy to: Team Leader Environment
Santos Limited
PO Box 1010
Brisbane 4001

By Email: community@santos.com

22 March 2023

Dear Sir/Madam

Re: EPBC Act Referral 2021/8914: Santos TOGA Pty Ltd/Energy Generation and Supply (non-renewable)/Injune Road, Baroondah/Queensland/Fairview Water Release Scheme, 50km east of Injune, QLD

1. We would like to comment on the Preliminary Documentation (**PD**) published by Santos CSG Limited (**Santos**) on the Fairview Water Release Scheme (EPBC 2021/8914).

2. I am a proud Iman man and a valued community member of Wardingarri Aboriginal Corporation who has knowledge and skillset that many of the board support and rely upon for my independent expertise and review of matters pertaining to our land, waters and cultural heritage of which I am a custodian of.

3. I thank the Department of Climate Change, Energy, the Environment and Water for the opportunity to make a submission on the preliminary documentation (PD) for the Fairview Water Release Scheme (EPBC 2021/8914) (Proposed Action).

4. We are concerned that Santos has not provided Free Prior Informed Consent to all Indigenous Traditional Owners within the Fitzroy Basin that these releases will likely have an impact on the water bodies both at the release point and downstream past the current monitoring site.

5. We are aware that Santos met with Native Title groups both Wardingarri and Iman#4 on the 21st of October 2022 in Brisbane with plans for continued engagement in 2023. Yet these meetings are often one sided and rarely allow for Free Prior and Informed Consent to take place.

6. We believe that if Santos truly aspires to meet the Indigenous Engagement targets as outlined below, then further meaningful engagement and education is required.

    - Industry best-practice recruitment and development programs for meaningful career opportunities
    - Leader in community engagement and cultural heritage management, and
    - Support Indigenous businesses through our supply chain."

7. We oppose the approval of this project because of the lack of appropriate consultation and uncertainty of impacts to groundwater dependent ecosystems and surface waters. We also say that approval of this project has the potential to irreversibly affect not only our cultural heritage and identity, but all First Nations People who have connections, responsibilities and kinship with the Waters above and below ground both at the release point and downstream of this.

Contents

1. Aboriginal Culture and Heritage

1. Background

The project area is within the Native Title determination of the Wardingarri, formerly Iman People #2, (QUD6162/1998), and registered claimant Iman#4 (QUD413/2017) who are mentioned in section 1.6.3 of the Referral.

8. Section 5.2.1 of the Significant Impact Guidelines 1.3 provides that the value of a water resource is important in determining whether there is likely to be a significant impact. The key factor in determining the value of a water resource is "its utility for all third party uses, including environmental and other public benefit outcomes". These public benefit outcomes include cultural and heritage.

9. It is submitted that that the Referral has not adequately addressed indigenous cultural and heritage values for the following reasons:

    a. No substantive assessment of the culture and heritage value of the Dawson River, known as the Wardingarri River, to the Iman People has been made, in particular with regard to the significance of the Wardingarri River to the Iman people and how this affects water quality objectives.

    b. No studies of the Cultural value of springs, spring groups and Ground Water Dependent Ecosystems to Indigenous Culture and Heritage have been undertaken by the Proponent.

    c. The Cultural Heritage act is outdated and is currently going through a public comment period on how it may be improved. Santos to our knowledge has not contributed in any way to improving the act as it stands. Working alongside various Traditional Owner groups of which Santos has so much Cultural Heritage Data and stories and lessons from the development that may be used as case studies to address the issues within the act.

    d. While Santos appears to have executed Cultural Heritage Management Plan (**CHMP**) for the GFD Project, the GFD Project approval conditions specifically excluded the approval of release or discharge of co-produced water into the Dawson River under Condition 2A unless the Minister has approved the release or discharge of co-produced water or such release or discharge is not considered a "controlled action" under the EPBC Act.

2. Statuary Context

    e. Section 88 of the *Aboriginal Cultural Heritage Act* 2003 (Qld) provides that:

    "***88 Cultural heritage management plan may be needed if other environmental authority needed***

    (1) This section applies to a project if—

(a) under an Act other than this Act—

(i) a lease, licence, permit, approval or other authority is required for the project; and

(ii) under the operation of the Act under which the authority is required, or under the operation of another Act, an environmental assessment is required for the project; and

(b) the project is a project, or a project of a type, prescribed under a regulation for this section.

(2) The entity authorised to give the authority must not give the authority unless—

(a) a cultural heritage management plan for the project has been developed and approved under this Act; or

(b) the authority is given subject to conditions to ensure that no excavation or construction takes place for the project without the development and approval of a cultural heritage management plan for the project.

(3) The entity authorised to give the authority has power to impose conditions mentioned in subsection (2)(b).

(4) The plan area for a cultural heritage management plan approved for subsection (2) may be limited to the part of the project area that is the subject of the environmental assessment.

(5) The Minister may recommend the making of a regulation under subsection (1)(b) only if the Minister is satisfied the project or type of project will have a significant impact on Aboriginal cultural heritage.

(6) In this section—

environmental assessment means a form of environmental assessment or planning, not including an EIS."

Given that cultural heritage plans are project-specific and that the conditions of approval of the GFD project specifically provide that further approvals may be needed for the release of co-produced water, it is possible that the current CHMP does not cover the Proposed Action.

f. If the current CHMP does not relate to the cultural and heritage values affected by the Proposed Action, Santos cannot rely upon the CHMP to establish that it has engaged in appropriate consultation to determine the cultural and heritage values of the Dawson River to the Iman people for the purposes of the EPBC Act.

3. Indigenous engagement

Engagement with Traditional Owner groups is required to be ongoing, further than the current engagement priorities by Santos. Quantity and quality of engagements where meaningful intentional

relationships are build is required for broader awareness of extractive industry ongoing and planned works. This may allow for a richer and more diverse group of engagement and understanding.

4. Social Emotional and cultural wellbeing

Santos must realise and recognise the ongoing emotional and cultural wellbeing of Traditional owner groups where business and projects are conducted. This would involve understanding the historical and cultural context of various project areas and the cultural obligations various clan groups have to specific areas.

5. Free prior Informed Consent

For Santos to meet their aspirations of an Industry leader for best practice cultural heritage management then best practice appropriately technology and dissemination of project impacts and works is greatly required for Traditional owner groups to make informed decisions. Conceptual models of the release area and impact pathways should be explained and shown to Traditional owner boards and Cultural Heritage officers.

6. Reverse Osmosis Water and Cultural Water

The water that flows through the Dawson River is natural and of country it is not that of a synthetic made Reverse osmosis component water that is difference in composition than that of the natural environmental and cultural flows of the area.

7. Conclusion

For the reasons stated in this submission, we ask the Minister to exercise her power under s133 of the Act refuse to approve the Proposed Action.