Atlas Stage 3 Gas Project

Draft Preliminary Documentation (EPBC 2022/09410)

22 March 2024

Project No.: 0639876

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22 March 2024

Atlas Stage 3 Gas Project

Draft Preliminary Documentation (EPBC 2022/09410)

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Acronyms and Abbreviations

Acronym	Description
ALARP	As low as reasonably practical
ATP	Authority to Prospect
CHMA	Cultural Heritage Management Agreement
CMA	Cumulative Management Area
CRAF	Chemical Risk Assessment Framework
CSG	Coal Seam Gas
DESI	Department of Environment, Science and Industry
DCCEEW	Department of Climate Change, Energy, the Environment and Water
EA	Environmental Authority
EP Act	*Environmental Protection Act 1994* (Qld)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
FDA	Field Development Area
GAB	Great Artesian Basin
ha	Hectares
HDD	Horizontal Directional Drill
IESC	Independent Expert Scientific Committee on Unconventional Gas Development and Large Coal Mining Development
JIF	Joint Industry Framework
km	Kilometres
kPag	Kilopascal gauge
m	Metres
ML	Megalitre
MNES	Matter of National Environmental Significance
MSES	Matter of State Environmental Significance
OECD	Organisation for Economic Co-operation and Development
OGIA	Office of Groundwater Impact Assessment
P&G Act	*Petroleum and Gas (Production and Safety Act) 2004* (Qld)
PD	Preliminary Documentation
PJ	Petajoules
PL	Petroleum Lease
PL(A)	Petroleum Lease Application
Qld	Queensland

Acronym	Description
RFI	Request for further information
RoW	Right of Way
Senex	Senex Energy Pty Ltd
SIG	Significant Impact Guidelines
TEC	Threatened Ecological Community
the Project	Atlas Stage 3 Gas Project
Water Act	*Water Act 2000* (Qld)
WCM	Walloon Coal Measures
WDRC	Western Downs Regional Council
WTF	Water treatment facility

EXECUTIVE SUMMARY

Senex Energy Pty Ltd (Senex), through its subsidiaries Senex Assets Pty Ltd and Senex Assets 2 Pty Ltd is proposing to develop a coal seam gas (CSG) project in the Surat Basin to supply natural gas to commercial markets.

The Project, referred to as the Atlas Stage 3 Gas Project (EPBC No. 2022/09410), is comprised of construction, operation, decommissioning and rehabilitation of up to 151 CSG wells and supporting infrastructure within Authority to Prospect (ATP) 2059 (Petroleum Lease Application 1127), Petroleum Lease (PL) 445, the northern portion of PL 209, and the eastern portion of PL 1037. The Project will be developed over a period of between approximately 5 to 10 years.

The Project is authorised by the Queensland government under the *Petroleum and Gas (Production and Safety) Act 2004* for petroleum authorities and holds an Environmental Authority (EA) under the *Environmental Protection Act 1994*.

The Project was referred to the Minister for Environment and Water (the Minister) on 17 November 2022. As part of the referral documentation (17 November 2022) Senex had committed to a maximum clearance amount of 1 ha of MNES threatened ecological communities (TECs) or areas confirmed as potential habitat for MNES threatened species, except for Koala dispersal habitat (530 ha of previously cleared land).

On 19 May 2023, in accordance with section 75 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the Project was declared a controlled action by the Minister, to be assessed by Preliminary Documentation (PD).

The controlling provisions (the Matters of National Environmental Significance (MNES)) under Part 3 of the EPBC Act are:

- Listed threatened species and communities (section 18 and 18A); and
- A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E).

On 6 June 2023, a request for information (RFI) detailing additional information requirements to be included in the PD was issued. Since the referral and as part of the development of the PD, Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land).

This revised PD summary report and its attachments respond to the DCCEEW RFI (refer to Attachment A) to allow the Minister to make an informed decision whether to approve, under Part 9 of the EPBC Act, the taking of the action for the purposes of each controlling provision. As required by the RFI, the PD consolidates and references:

- The information contained in the original referral;
- The further information requested on the impacts of the action and the strategies Senex propose to avoid, mitigate and offset those impacts; and
- Other relevant information on the matters protected by the EPBC Act.

Detailed assessments of these matters provided in the attached Ecology Assessment Report and the attached EPBC Water Resource Impact Assessment Report are complemented by supporting documentation that demonstrates Senex's commitment to ensuring potential impacts will be systematically planned, identified, assessed, and adequately managed. Senex's commitments are detailed in the management plans; these are provided as attachments to this PD. Based on extensive experience in gas field development in the Surat Basin, Senex has adapted existing approved management plans to address site-specific MNES.

These impact assessments and management plans are presented as final documents to be approved and conditioned for implementation when construction commences in 2024 following approval. Proposed management measures are assessed as being effective and appropriate. The impact and management plans include:

- Environmental Protocol for Constraints Planning and Field Development (Constraints Protocol) (Senex, 2023a) – Attachment B
- Ecology Assessment Report – Attachment C
- EPBC Water Resource Impact Assessment Report – Attachment D
- Environmental Management Plan – Attachment E
- Rehabilitation Plan – Attachment F
- Ecology Significant Impact Assessment Report – Attachment G
- Significant Species Management Plan – Attachment H
- Water Monitoring and Management Plan – Attachment I
- CSG Water Management Plan ATP 2059 – Attachment J
- CSG Water Management Plan PL 445 and PL 209 – Attachment K
- Chemical Risk Assessment – Attachment L
- IESC RFI and Response – Attachment M
- Contingency Procedure for Emergency Environmental Incidents – Attachment N
- Spill Response Plan – Attachment O.

Potential impacts to MNES are well-understood due to the detailed assessments undertaken to develop the Ecology Assessment Report, Ecology Significant Impact Assessment Report and EPBC Water Resource Impact Assessment. The reports found that the Project is unlikely to have a residual significant impact on any listed species or community, or water resources.

Through development of the Project in accordance with the management plans and existing approvals, the impact assessments determined that the Project is unlikely to result in significant impacts to known, likely or potential MNES within the Project Area. The Project is proposed to be developed in an area that has been subject to substantial historical clearing and disturbance associated with agricultural production, and Senex is committed to avoiding all remaining areas that have not been cleared of remnant vegetation and habitat for MNES species other than the temporary construction disturbance to previously cleared land, of which 530 ha and 2.1 ha is dispersal habitat for Koala and Southern Squatter Pigeon respectively. As such, offsets in accordance with the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012) are not required.

1 INTRODUCTION

1.1 Overview

Senex Energy Pty Ltd (Senex), through its subsidiaries Senex Assets Pty Ltd and Senex Assets 2 Pty Ltd, proposes to develop the Atlas Stage 3 Gas Project (the Project, or proposed action) within the Surat Basin, Queensland. The Project will be developed over a period of approximately 5 to 10 years.

The Project (EPBC 2022/09410), will involve the construction, operation, maintenance, decommissioning and rehabilitation of up to 151 coal seam gas (CSG) wells and supporting infrastructure within petroleum authorities granted under the Queensland *Petroleum and Gas (Production and Safety) Act 2004* (Qld) (P&G Act). The relevant petroleum authorities are:

- Petroleum Lease (PL) 445;
- The northern portion of PL 209;
- The eastern portion of PL 1037; and
- Authority to Prospect (ATP) 2059, in relation to the area of which Senex applied to the Queensland Department of Resources (DoR) on 18 September 2023 for a PL, assigned PL Application (PL(A)) 1127.

The Project was determined by the then Minister for the Environment and Water to be a controlled action requiring approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and to be assessed by Preliminary Documentation (PD).

The Project includes the following areas which are referred to throughout the PD summary report, both shown on Figure 1-1

- Project Area – The Project Area totals 12,304 hectares (ha) but the potential disturbance within the Project Area is limited to the Field Development Area (FDA), plus a required brine storage dam which will be sited in a previously cleared area devoid of Matters of National Environment Significance (MNES). The term Project Area is used to describe the Project and its location more broadly in this PD.
- Field Development Area (FDA) – The FDA is approximately 9,772 ha and is located within the Project Area. The FDA was used to conduct the various impact assessment studies associated with the Project. The FDA did not extend to the part of PL 1037 which is west of Woleebee Creek because:
    - This area has already been the subject of previous ecological assessments, including those completed in 2018 for Senex's existing Project Atlas CSG Project, and subsequent pre-disturbance surveys; and
    - The only proposed Project infrastructure on PL 1037 is a new brine storage dam (and connecting/gathering lines) which will be required to manage produced water from the Project. This dam will be sited on previously cleared areas of land and located close to the existing Project Atlas CSG Project water treatment facility (WTF). This new brine storage dam is a part of the Project as it is required to manage the additional water from the Project. It will be sited using Senex's Environmental Protocol for Constraints Planning and Field Development (Constraints Protocol) (Senex, 2023a) (Attachment B) to ensure that there will be no significant impact to any listed MNES threatened species or Threatened Ecological Communities (TECs).

The Project that is the subject of this PD is a separate action to the Atlas CSG Project (EPBC 2018/8329) and Atlas to Reedy Creek Pipeline (ARC Pipeline) (EPBC 2023/09585). While there is currently a level of shared corporate ownership, the construction and particularly the subsequent operation and maintenance of the Project are standalone ventures which can exist in their own right.

The ARC Pipeline (EPBC 2023/09585) is the subject of a separate referral that is currently being considered by the Commonwealth under the EPBC Act. As detailed in Section 7.2 in response to RFI 2.2.2 and Section 7.1.4 of the Ecology Assessment Report (Attachment C) and Section 5.6 of the Ecology Significant Impact Assessment Report (Attachment G), an assessment of cumulative impacts for the Project and the ARC Pipeline determined that these projects would not result in a significant cumulative impact on any MNES.

1.2 Project Approval Background

The EPBC Act establishes a process for environmental assessment and approval of proposed actions (projects) that have, will have, or are likely to have a significant impact on a MNES or on Commonwealth land. Under the EPBC Act, a referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) is required if the proponent of a project has determined their project may cause a 'significant impact on a MNES'. The purpose of the referral is for the Minister for the Environment and Water (or delegate) (Minister) to make a 'controlled action' decision. A controlled action is an action that the Minister has decided has, will have or is likely to have significant impacts on one or more MNES, and the referral will proceed to the environmental assessment and approval.

For MNES assessed in accordance with the Significant Impact Guideline 1.1 and 1.3 – Matters of National Environmental Significance (Commonwealth of Australia 2013; Commonwealth of Australia 2022), a 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment, which is impacted, and upon the intensity, duration, magnitude, and geographic extent of the impact.

The Project was referred to the DCCEEW on 17 November 2022. On 19 May 2023, in accordance with Section 75 of the EPBC Act, the Project was declared to be a controlled action by the Minister, to be assessed by PD.

The relevant controlling provisions under Part 3 of the EPBC Act for the Project are:

- Listed threatened species and communities (section 18 and 18A); and
- A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E).

On 6 June 2023, a request for information (RFI) detailing additional information requirements to be included in the PD was issued.

This PD summary report and all attachments respond to the RFI (refer to Attachment A) received from DCCEEW. Together, this PD summary report and all its attachments provide sufficient information to allow the Minister to make an informed decision whether to approve, under Part 9 of the EPBC Act, the taking of this action for the purposes of each controlling provision.

1.3 Document Structure

This PD summary report has been prepared to act as the central source of information for this Project and refers to attached technical reports and management plans for further detailed information. This PD summary report is intended as a summary of key findings, and proposed impact avoidance, management, and mitigations measures, which are detailed in the Attachments. The structure and content of the PD summary report and its attachments are provided in Table 1-1.

Table 1-1 Document Structure

Section	Description
Section 1: Introduction	Provides a brief introduction to the document, Project, approvals process and site.
Section 2: Description of the Project	Describes the action. Addresses Section 1 of the RFI.
Section 3: Habitat Assessments	Summarises the findings of the Ecology Assessment Report (Attachment C). Addresses Section 2.1 of the RFI.
Section 4: Constraints Protocol	Summarises the Environmental Constraints Protocol (Senex 2023a) (Attachment B). Addresses Section 2.4 of the RFI.
Section 5: Water Resources	Summarises the findings of the Water Impact Assessment (Attachment D) Addresses Section 3 of the RFI.
Section 6: Chemical Risk	Summarises the findings of the Chemical Risk Assessment which is found in the Water Impact Assessment Report (Attachment D).
Section 7: Impact Assessment	Summarises the findings of the impact assessments completed in the Ecology Assessment Report (Attachment C), Ecology Significant Impact Assessment Report (Attachment G) and EPBC Water Resource Impact Assessment (Attachment D). Addresses Section 2.2 of the RFI.
Section 8: Avoidance and Mitigation Measurements	Summarises the findings of the Water Monitoring and Management Plan (Attachment I), CSG Water Management Plan ATP 2059 (Attachment J), Water Management Plan PL 445 and PL 209 (Attachment K) Environmental Management Plan (Attachment E) and Significant Species Management Plan (Attachment H). Addresses Section 2.3 of the RFI.
Section 9: Rehabilitation Requirements	Summarises the findings of the Rehabilitation Plan (Attachment F). Addresses Section 4 of the RFI.
Section 10: Offsets	Summarises the findings of the significant residual impact assessments. No offsets required. Addresses Section 5 of the RFI.
Section 11: Ecologically Sustainable Development	Addresses Section 6 of the RFI.
Section 12: Economic and Social Matters	Addresses Section 7 of the RFI.
Section 13: Environmental Record	Addresses Section 8 of the RFI.

Section	Description
Section 14: Conclusion	Summarises the impact assessment outcomes for the Project and the documentation prepared.
Section 15: References	List of references used.
Attachment A: Additional Information Requirements	Copy of the RFI from DCCEEW issued on 6 June 2023.
Attachment B: Constraints Protocol	Environmental Constraints Protocol (Senex 2023a) – updated since submission of the referral.
Attachment C: Ecology Assessment Report	Ecology Assessment Report (ERM 2023a) – updated since submission of the referral.
Attachment D: EPBC Water Resource Impact Assessment	EPBC Water Resources Impact Assessment (KCB 2023a)– updated since submission of the referral.
Attachment E: Environmental Management Plan	Environmental Management Plan (Senex 2023b) – updated since submission of the referral.
Attachment F: Rehabilitation Plan	Rehabilitation Plan (Senex 2023c) – updated since submission of the referral.
Attachment G: Ecology Significant Impact Assessment Report	Ecology Significant Impact Assessment (ERM 2023c) – updated since submission of the referral.
Attachment H: Significant Species Management Plan	Significant Species Management Plan (ERM 2023d) – updated since submission of the referral.
Attachment I: Water Monitoring and Management Plan	Water Monitoring and Management Plan (Senex 2023d) – updated since submission of the referral.
Attachment J: CSG Water Management Plan ATP 2059	CSG Water Management Plan for ATP 2059 (Senex 2023e) – updated since submission of the referral.
Attachment K: CSG Water Management Plan PL 445 and PL 209	CSG Water Management Plan for PL 445 and PL 209 (Senex 2023f) – updated since submission of the referral.
Attachment L: Chemical Risk Assessment	Chemical Risk Assessment (KCB 2023b).
Attachment M: IESC RFI and Response	Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) adequacy review including Senex response.
Attachment N: Contingency Procedure for Emergency Environmental Incidents	Contingency Procedure for Emergency Environmental Incidents
Attachment O: Spill Response Plan	Spill Response Plan (Senex 2017)

1.4 Project Background and Site Description

RFI 1.1

The location, boundaries and size (in hectares) of the maximum disturbance footprint and of any adjoining areas which may be indirectly impacted by the proposal, including nearby vegetation. Include mapping and coordinates.

RFI 1.4

A description of the surrounding land uses.

RFI 1.1 and RFI 1.4 Response:

The Project Area is in the central part of Queensland's Surat Basin, and located in an established gas-producing region. Senex commits to a maximum disturbance footprint of 530 ha of previously cleared land within the Project Area.

The landscape within the Project Area is predominantly used by rural and agricultural industries with the Project Area overlapped by Coal exploration and development tenures and surrounded by existing CSG developments, most of which are owned and operated by third parties. There are also some renewable energy projects that are existing and proposed within and adjacent to the Project Area, including:

- Wandoan South Solar Project by Vena Energy is proposed adjacent to and overlapping with the Project Area; and
- The Gangarri Solar Farm by Shell Australia is also located adjacent and to the south-west of the Project Area.

The Project Area is in the Western Downs Regional Council (WDRC) local government area, 10 km southwest of the nearest town, Wandoan, 63 km northwest of Miles and 350 km northwest of Brisbane. The Project Area overlays 28 cadastral land parcels comprising of Freehold and Lands Lease land, road reserves and easements, and is approximately 12,304 ha (refer to Figure 1-1). The land parcels wholly or partially included with the Project Area are:

- Lot 1 RP123884
- Lot 2 RP123884
- Lot 17 FT163
- Lot 19 FT60
- Lot 20 FT672
- Lot 23 FT41
- Lot 24 FT41
- Lot 10 FT949
- Lot 54 FT788
- Lot 7 SP254407
- Lot 1 FT982
- Lot 6 FT788
- Lot 222 RP868424
- Lot 48 SP127252
- Lot 28 FT672
- Lot 57 FT901
- Lot 1 SP184589
- Lot 2 SP184589
- Lot 49 SP237297
- Lot 26 FT88
- Lot 29 FT169
- Lot 50 FT167
- Lot 45 FT167
- Lot 46 FT103
- Lot 51 FT429
- Lot 52 SP237297
- Lot 1 SP254444
- Lot 5 SP186409

The main land use within the Project Area is grazing of stock for beef production. Some parts of the Project Area have also been developed for centre-pivot irrigated cropping. Isolated residential areas (residences) are present through the area.

The ecological studies conducted to support the Referral at the time of submission assessed an area referenced as the FDA. The FDA is approximately 9,772 ha and is shown in Figure 1-1.

Most of the FDA has been subject to extensive disturbance with approximately 90.5% being cleared of remnant native vegetation and converted to non-remnant pasture dominated by native and introduced grasses, notably buffel grass (*Cenchrus ciliaris*) and sabi grass (*Urochloa mossambicus*). The habitats retained in the FDA are mostly in moderate to low condition, with signs of degradation and fragmentation due to cattle grazing, erosion, and the presence of introduced flora species.

The Project Area does not include any National Parks, Conservation Areas or State Forests. Several State Forests and Resources Reserves are near the Project Area, including:

- Juandah State Forest located approximately 7 km west of the Project Area;
- Hinchley State Forest located approximately 10 km west of the Project Area;
- Mount Organ State Forest located approximately 16 km northwest of the Project Area;
- Cherwondah State Forest located approximately 10 km east of the Project Area;
- Stones Country Resources Reserve located approximately 10 km south of the Project Area; and
- Gurulmundi State Forest located approximately 13 km south of the Project Area.

The Project Area overlaps with future planned coal mining shown in Table 1-2.

Table 1-2 Overlapping Tenure

Tenure Holder	Tenure	Location
Wandoan Holdings Pty Ltd	MDL 449	Partial overlap of ATP 2059, PLs 209 and 445
	MDL 221	Partial overlap of PL 445
	ML 50230	Partial overlap of PL 445

Information has been exchanged between Senex and Wandoan Holdings Pty Ltd and impacts are expected to be minimal. The effect on Mineral Development Licences (MDL) 221 and 449 while the remain MDLs will be limited and the effect on future higher forms of tenure will depend on the extent to which Wandoan Holdings intends to exploit the coal resource underlying the tenement. The effect on Mining Lease 50230 will be minimal given the small extent of the overlapping area.

The Project Area is also surrounded by other CSG production and exploration development areas (CSG Acreage). The CSG Acreage adjacent to the Project Area are shown in Table 1-3.

Table 1-3 Adjacent CSG Acreage

Tenure Holder	Tenure	Gas Field	Location
Senex	PL 1037	Atlas	Directly West
QGC	PL 277	Mamdal	Directly West
	PL 276	Cam, Kathleen, Mamdal, Ros and Woleebee Creek	Directly West
	PL 510	Paradise Downs	Directly East
	ATP 574	Pinelands 3	Directly East
APLNG	PL 444	Sandpit	Directly North
	PL 470	Ramyard	Directly West
	PL 469	Ramyard Central	Directly West
	ATP 973	Carinya	Directly South
	ATP 606 / PL(A) 444	Combabula/ Ramyard	Directly North

The Project Area is located within ATP 2059, PL 445, the northern portion of PL 209 and the eastern part of PL 1037.

An application to convert ATP 2059 to a PL under the Queensland P&G Act was lodged with the Queensland Government on 18 September 2023 and has been assigned PL(A) 1127. For the purposes of this PD, reference to ATP 2059 is taken to include PL(A) 1127 and includes any renewal, replacement, substitution, consolidation, subdivision, variation or extension of ATP 2059 and PL(A) 1127.

Senex acquired PL 445 and PL 209 from Australia Pacific LNG Pty Limited (APLNG) in late 2021. The Environmental Authorities for PL 445 and PL 209 were transferred to Senex in early 2022. The Project's activities previously formed part of APLNG's broader development project and were assessed and approved under the EPBC Act (approval EPBC 2009/4974). However, the EPBC Act does not allow the partial transfer or assignment of an existing approval. The nature of the Project is consistent with that previously approved with PL 445 and the northern portion of PL 209.

Senex's Project Atlas CSG Project (EPBC 2018/8329) is an existing action which received a not a controlled action decision on 18 January 2019 and has already commenced.

Natural gas from the Project will be processed through the Atlas East Gas Compression Facility (Atlas East CPF). The Atlas East CPF and associated power facilities will be developed under Petroleum Facility Licence (PFL) 31 and owned and operated by Senex Compression Facility Pty Ltd (a subsidiary of Senex).

Once processed, the natural gas will be transported from the Atlas East CPF by the ARC Pipeline, which is owned and operated by ARC Pipeline Pty Ltd, a subsidiary of Senex, under Petroleum Pipeline Licence (PPL) 2075.

At Reedy Creek the natural gas will enter the Reedy Creek to Wallumbilla Pipeline, owned and operated by APA Reedy Creek Wallumbilla Pty Limited, a third party, under PPL 2023. From there, it will be transported to the Wallumbilla Hub for delivery to market.

Senex's standard hub-and-spoke operating model is selling downstream gas processing and transportation infrastructure to third parties. For example, the Eos gas processing and transportation infrastructure at Senex's Western Surat Gas Project was sold to a third-party operator following construction, and the existing Atlas gas processing and transportation infrastructure are owned and operated by a third-party. Consistent with this operating model, it is likely that:

- ARC Pipeline Pty Ltd, and consequently the ARC Pipeline; and/ or
- Senex Compression Facility Pty Ltd, and consequently the Atlas East CPF,

may be sold to a third-party in the future. However, as the EPBC Act does not allow the partial transfer or assignment of an existing approval to a new proponent, the Atlas East CPF and the ARC Pipeline do not form part of this Project in the event of future divestment of this infrastructure. The ARC Pipeline (EPBC 2023/09585]) was referred as a separate proposed action on 21 June 2023 and is currently being assessed by DCCEEW. This Atlas Stage 3 Gas Project has been referred as a separate action to the ARC Pipeline project and the two projects can stand alone and exist independently of each other. However, due to the level of shared corporate ownership and partial geographic closeness of the Atlas Stage 3 Gas Project and the ARC Pipeline, all care has been taken to ensure that the impacts are not considered in isolation in terms of potential significance for each relevant MNES and having regard to Section 527E of the EPBC Act.

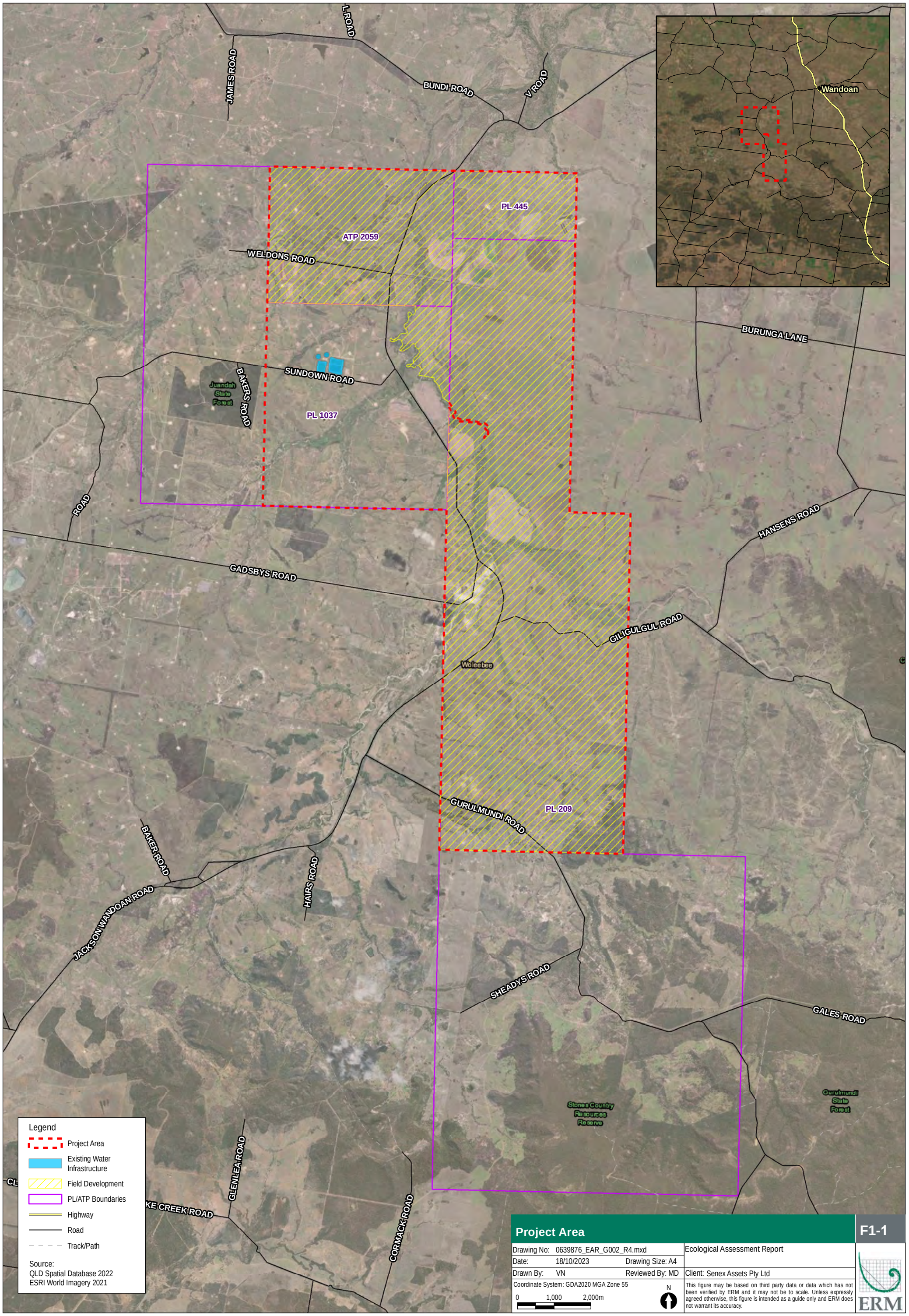
The Atlas East CPF is subject to a self-assessment under the EPBC Act.

Senex also intends to expand its other existing operations in the Surat Basin, including the Roma North Project. This Project is distinct from Senex's Roma North Project in that those operations are:

- Located near Roma, Queensland (approximately 110 km away from the Project);
- Owned and operated by Stuart Petroleum Cooper Basin Gas Pty Ltd (a subsidiary of Senex); and

- Subject to separate State and Federal approvals, including EPBC 2015/7469.

Senex's other assets in the Surat and Bowen Basin are still in the exploration stage and there are currently no development plans approved. There are no other gas extraction projects in the area of the Project reasonably foreseen by Senex.


L ROAD
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BUNDI ROAD
V ROAD
Wandoan
PL 445
ATP 2059
WELDONS ROAD
BURUNGA LANE
SUNDOWN ROAD
BAKERS ROAD
Juandah State Forest
PL 1037
ROAD
GADSBYS ROAD
HANSENS ROAD
GILIGULGUL ROAD
Woleebee
GURULMUNDI ROAD
PL 209
BAKER ROAD
HAIRS ROAD
JACKSON WANDOAN ROAD
SHEADYS ROAD
GALES ROAD
Stones Country Resources Reserve
Gurulmundi State Forest
GLENLEA ROAD
CORMACK ROAD
KE CREEK ROAD
Legend
Project Area
Existing Water Infrastructure
Field Development
PL/ATP Boundaries
Highway
Road
Track/Path
Source:
QLD Spatial Database 2022
ESRI World Imagery 2021
Project Area
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Ecological Assessment Report
Date: 18/10/2023
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Reviewed By: MD
Client: Senex Assets Pty Ltd
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1.5 Project Changes Since Referral

RFI 1.8

Include updated information if any changes have been made to the project since the referral documentation was submitted.

RFI 1.8 Response:

Senex are not proposing to change the scope of proposed infrastructure development across the Project Area, however two changes have been made since the referral was originally submitted to DCCEEW as detailed below:

- An application to convert ATP 2059 to a PL under the Queensland P&G Act was lodged with the Queensland Government on 18 September 2023 and has been assigned PL(A) 1127. For the purposes of this PD, reference to ATP 2059 is taken to include PL(A) 1127 and includes any renewal, replacement, substitution, consolidation, subdivision, variation or extension of ATP 2059 and PL(A) 1127.
- In the referral, Senex committed to limiting clearing to a maximum of 1 ha of MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala dispersal habitat (being, 530 ha of previously cleared land). Senex now commits, in this PD, to not clearing any areas confirmed as MNES TECs, or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). This represents a reduction in potential impact from what was proposed in the referral, by avoidance of MNES TECs and potential habitat for MNES threatened species.

1.6 Compliance with the Request for Information

Table 1-4 provides a cross-reference providing evidence of compliance with the DCCEEW RFI that has been included in this PD. Table 1-4 is a cross-reference which includes extracts from the RFI.

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Table 1-4 Cross Reference

RFI reference	Information required	Cross-reference
1	**DESCRIPTION OF THE ACTION**	
1.1.	The location, boundaries and size (in hectares) of the maximum disturbance footprint and of any adjoining areas which may be indirectly impacted by the proposal, including nearby vegetation. Include mapping and coordinates.	Section 2.1
1.2.	A description of all components of the action, including the anticipated timing and duration (including start and completion dates) of each component of the project. All construction, operational and (if relevant) decommissioning and rehabilitation components of the proposed action should be described in detail. Include details regarding the methods and processes to be used to access and extract the gas resource (including stimulation, dewatering, etc.). In addition, any components which were included in the referral material, but are no longer part of the proposed action, must be clarified.	Section 1.7
1.3.	A description of the operational requirements of the action, including any anticipated maintenance works.	Section 2.3
1.4.	A description of the surrounding land uses.	Section 1.3
1.5.	If available, an indicative layout plan for the proposed action area, including key infrastructure (the number and location of wells, gas/water transmission pipelines, gas facilities, water storage/management facilities, power generation facilities, etc.). If available, include mapping and coordinates for each of the above. Where existing approved infrastructure will be utilised, this should be clearly articulated.	Section 2.1 A complete layout plan will be developed in accordance with the Environmental Constraints Protocol (refer to Attachment B).
1.6.	To the extent reasonably practicable, provide any alternatives to the proposed action, including a comparative description of the impacts of each alternative on the matters protected by the controlling provisions for the action.	Section 2.5

RFI reference	Information required	Cross-reference
1.7.	Provide a description of any approval that has been obtained from a State or Commonwealth agency or authority, including any conditions that apply to the action. Include a statement identifying any additional approval that is required.	Section 2.6
1.8.	Include updated information if any changes have been made to the project since the referral documentation was submitted.	Section 1.5
2	**LISTED THREATENED SPECIES AND COMMUNITIES**	
2.1.	**Habitat Assessments**	
2.1.1.	Provide a habitat assessment for relevant listed threatened species and communities. Please note an assessment must be undertaken regardless of whether the species was recorded in the project area or not.	Section 3.3.1
2.1.2.	Identify and describe known historical records of the listed threatened species and ecological communities in the broader region. All known records must be supported by: ■ an appropriate source (i.e. Commonwealth and State databases, published research, publicly available survey reports, etc.); ■ the year of the record; and ■ a description of the habitat in which the record was identified.	Section 3.3.1
2.1.3.	Include an assessment of the adequacy of any surveys undertaken (including survey effort and timing). In particular, the extent to which these surveys were appropriate for the listed threatened species or community and undertaken in accordance with relevant departmental survey guidelines.	Section 3.3.1
2.1.4.	Attach all relevant ecological surveys referenced in the referral and preliminary documentation as supporting documents to the preliminary documentation.	Section 3.3.1

RFI reference	Information required	Cross-reference
2.1.5.	Provide detailed mapping of suitable habitat (within, adjacent to and downstream of the project site, where relevant) for all listed threatened species and communities, which: ■ is specific to the habitat assessment undertaken for each listed threatened species and ecological community (i.e. does not only illustrate relevant Queensland Regional Ecosystems); ■ includes an overlay of the project disturbance footprint; ■ includes known records of individuals derived from desktop analysis and field surveys; and ■ is provided separately as Attachments in JPEG format.	Section 3.3.1. An indicative layout plan is currently unavailable as per response to RFI item 1.5 (earlier in this table). As such an overlay of the Project disturbance footprint is unable to be included on habitat mapping figures. JPEGs of relevant habitat mapping have been provided separately.
2.2.	**Impact Assessment**	
2.2.1.	An assessment of the likely impacts associated with the proposed action, including the vegetation clearance, construction, operational, maintenance and decommissioning components of the project.	Section 7.2
2.2.2.	Include the direct, indirect and consequential/facilitated loss and/or disturbance of protected matters and their habitat as a result of the proposed action. This must include the area (in hectares) and quality of the habitat to be impacted and quantification of the individuals to be impacted (where applicable).	Section 7.2
2.2.3.	An assessment of the impacts of habitat fragmentation in the project area and surrounding areas, including consideration of species' movement patterns.	Section 7.2
2.2.4.	An assessment of the likely duration of impacts to protected matters as a result of the proposed action.	Section 7.2

RFI reference	Information required	Cross-reference
2.2.5.	A discussion of whether the impacts are likely to be repeated, for example as part of maintenance.	Section 7.2
2.2.6.	A discussion of whether any impacts are likely to be unknown, unpredictable or irreversible.	Section 7.2
2.2.7.	Justify, with supporting evidence, how the proposed action will not be inconsistent with: ■ Australia's obligations under the Biodiversity Convention, the Convention on Conservation of Nature in the South Pacific (Apia Convention), and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and ■ a recovery plan or threat abatement plan.	Section 7.2
2.3.	**Avoidance, Mitigation and Management Measures**	
2.3.1.	Include any relevant plans relied upon for the mitigation or management of impacts on MNES (in approved or draft format) as Attachments to the preliminary documentation.	Section 8.1
2.3.2.	A detailed summary of measures proposed to be undertaken by the proponent to avoid, mitigate and manage relevant impacts of the proposed action on relevant protected matters (including any measures required through other Commonwealth, State and/or local government approvals). Proposed measures must be based on best available practices, appropriate standards, evidence of success for other similar actions and supported by published scientific evidence. All commitments must be drafted using committal language (e.g. 'will' and 'must') when describing the proposed measures. All proposed measures must also be drafted to meet the 'S.M.A.R.T' principle: ■ S – Specific (what and how) ■ M – Measurable (baseline information, number/value, auditable) ■ A – Achievable (timeframe, money, personnel) ■ R – Relevant (conservation advices, recovery plans, threat abatement plans) ■ T – Time-bound (specific timeframe to complete)	Section 8.1

RFI reference	Information required	Cross-reference
2.3.3.	Information on the timing, frequency and duration of the proposed avoidance, mitigation and management measures to be implemented.	Section 8.1
2.3.4.	Details of specific and measurable environmental outcomes to be achieved for relevant protected matters, including an assessment of the expected or predicted effectiveness of the proposed measures.	Section 8.1
2.3.5.	Any statutory or policy basis for the proposed measures, including reference to the SPRAT Database and relevant approved conservation advice, recovery plan or threat abatement plan, and a discussion on how the proposed measures are consistent with relevant plans.	Section 8.1
2.3.6.	Details of ongoing management and monitoring programs, including timing, to validate the effectiveness of proposed measures and demonstrate that environmental outcomes will be, or have been, achieved.	Section 8.1
2.3.7.	Details of tangible, on-ground corrective actions that will be implemented, including timing, in the event that monitoring programs indicate that the environmental outcomes have not been, or will not be, achieved.	Section 8.1
2.4.	**Constraints Protocol**	
2.4.1.	Pre-disturbance surveys must be supervised by a suitably qualified person and undertaken in accordance with the department's survey guidelines in effect at the time of the survey or other equivalent survey methodology.	Section 4.3
2.4.2.	Include habitat mapping rules and specific survey requirements, informing the Constraints Protocol, to ensure that they contain complete habitat descriptions and survey requirements for each MNES, as outlined in relevant documents, including, but not limited to, SPRAT, conservation advice and recovery plans.	Section 4.3
2.4.3.	As vegetation communities/habitat are clarified and further defined within the project site, update the constraints protocol and any other relevant reports as appropriate.	Section 4.3
2.4.4.	Commitments must be made using unambiguous language, i.e. use 'will' and 'must' when committing to actions instead of 'where possible', 'where practicable', 'if there is flexibility', etc.	Section 4.3

RFI reference	Information required	Cross-reference
2.4.5.	Include constraints commitments for all threatened species habitat and threatened ecological communities which may occur at the site of the proposed action. Where different maximum areas of impact are proposed on different habitat quality categories for a species or community, provide clear totals for extent of all impact and on each category.	Section 4.3
2.4.6.	Include mapping of constraints categories for MNES, including identified no go zones.	Section 4.3
3.	**A WATER RESOURCE IN RELATION TO COAL SEAM GAS DEVELOPMENT AND LARGE COAL MINING DEVELOPMENT**	
3.1.	**Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development** Under section 131AB of the EPBC Act, the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC), which is a statutory body under the EPBC Act, will provide advice to the Minister on the proposed action. The *Information guidelines* for IESC advice on coal seam gas and large coal mining development proposals (IESC guidelines) provides guidance on the IESC's information needs and can be found at the following website: http://www.iesc.environment.gov.au/publications/information-guidelines-independent-expert-scientific-committee-advice-coal-seam-gas. The information provided in the draft PD will be reviewed by the IESC. The draft PD must cross-reference the IESC checklist, found in the IESC guidelines, to ensure that the IESC's information guidance has been considered and addressed. The IESC advice and the proponent's response to that advice, including any necessary additions and/or revisions to the draft PD, must be included in the PD package that will be published for public comment. The IESC provides a number of publications and resources, including the IESC explanatory notes, which can be used as guidance material in drafting the PD. These publications can be found at the following website: http://iesc.environment.gov.au/publications. Where the approach to assessment of impacts and management of water resources differs from that outlined in the IESC guidance documentation, provide detailed reasoning and justification.	Section 5.1

RFI reference	Information required	Cross-reference
3.2.	**Joint Industry Framework** Please note the joint industry framework (JIF) will likely apply to the proposed action. The JIF can be found here: https://www.environment.gov.au/epbc/publications/coal-seam-gas-joint-industry-framework. The JIF provides an outcomes and risk-based approach to groundwater impact management and outlines standard conditions for groundwater management of coal seam gas (CSG) developments in the Surat Basin. The JIF incorporates relevant management framework/s that must be followed by an approval holder if a risk threshold for a protected matter is predicted to be exceeded. The management of surface water and other impacts to a water resource unrelated to groundwater is outside the scope of the JIF.	Section 5.1
3.3.	**The hydrology relevant to the proposed action area, including surface water and groundwater** Provide a regional overview of the proposed action area, including a description of the geological basin, coal resource, surface water catchments, groundwater systems and water dependent assets. Describe any potential third-party users of water in areas potentially affected by the proposed action, including municipal, agricultural, industrial, recreational and environmental uses of water.	Section 5.1
3.4.	**Impact Assessment** The preliminary documentation must include an assessment of direct, indirect and consequential/facilitated impacts on water resources as a result of the proposed action and must be assessed in accordance with relevant departmental policies and guidelines. The department considers the proposed action may result in, but is not limited to, the following impacts: ■ chemical contamination; ■ changes to hydrological regimes; ■ changes to water quality; ■ groundwater drawdown and associated impacts on: ○ groundwater dependent ecosystems; and ○ third-party bores; ■ subsidence; and	Section 5.1

RFI reference	Information required	Cross-reference
	■ cumulative impacts with other CSG operations in the region. The PD must include a description and assessment of the potential impacts to water resources, giving consideration to relevant departmental policies and guidelines, including the JIF and Significant Impact Guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources (2013). These guidelines can be found at the following website: https://www.dcceew.gov.au/sites/default/files/documents/significant-impact-guidelines-1-3.pdf. The PD must provide robust scientific information and supporting evidence for every assertion, assumption and/or conclusion made in the assessment of potential impacts, or lack of impacts, on water resources.	
3.5.	**Avoiding, monitoring, mitigating and managing impacts** As discussed above (Section 2.3), the department expects avoidance and mitigation measures to be thoroughly investigated as a part of project design and planning, which must be supported by evidence to demonstrate likely success. The PD must outline methodologies and commitments for ongoing monitoring, identifying, assessing (including incorporation of a risk assessment) and managing impacts to water resources for the life of the project. Methodologies should be specific to the particular water resource component. The preliminary documentation must provide the general information requirements set out in section 2.3, as well as the following:	Section 8.2 and see below, in sections related to RFI items 3.5.7, 3.5.8, 3.5.9 and 3.5.10.
3.5.7	**Groundwater:** The department considers that the referral provided insufficient evidence to conclude that there is a lack of hydraulic connectivity between the Quaternary alluvium and underlying geology, provide: ■ additional evidence that conclusively demonstrates a lack of connectivity between the Quaternary alluvium and the underlying geology; or ■ monitoring, mitigation and management measures relating the impacts of groundwater drawdown that may propagate into the Quaternary alluvium.	Section 5.3.1.1
3.5.8	**Groundwater Dependent Ecosystems:** If conclusive evidence that demonstrates that there is a lack of connectivity between the Quaternary alluvium and underlying geology is not provided, provide: ■ an analysis using the methods in Information Guidelines Explanatory Note: Assessing groundwater-dependent ecosystems (2019); of whether potential terrestrial GDEs in the project area, including Brigalow (*Acacia harpophylla* dominant and co-dominant), are reliant (partially or fully) on groundwater using direct techniques (e.g. plant water stable isotopes, and pre-dawn water stable isotopes); and/or	Section 5.3.1.2

RFI reference	Information required	Cross-reference
	■ monitoring, mitigation and management measures relating the impacts of groundwater drawdown on GDEs. This should also include corrective actions and offsets if required.	
3.5.9	**Surface Water:** Details of the monitoring, mitigation and management measures relating to impacts to surface water (e.g. chemical spill, waste leaching, or seepage into surface water features).	Section 5.3.1.3
3.5.10	**Cumulative Impacts:** The proposed action is part of the broader development of CSG resources in the Surat Basin by the proponent and other developers. The PD must identify and assess the scale and extent of all the potential and likely cumulative impacts on water resources from the proposed action and other nearby resource projects. Where cumulative impacts are predicted, avoidance, mitigation and management measures must be proposed. This should also include corrective actions and offsets if required.	Section 5.3.1.4
3.6.	**Chemical Risk** The PD must provide detail regarding the chemicals to be used during drilling and/or extraction operations and must include a chemical risk assessment framework (CRAF) that details how the risk of adverse impacts on protected matters posed by chemicals will be assessed and managed for the duration of this approval. The CRAF must include, but is not limited to:	
3.6.1	Details of how the risks of adverse impacts on protected matters posed by chemicals will be assessed and managed consistent with best practice risk assessment methodology. These details must include: a) the process lifecycle for chemicals; b) how risk from geogenic chemicals in CSG produced water and recovered drilling fluids will be managed to prevent adverse impacts to protected matters; and c) minimum mitigation and management measures to be undertaken as part of CSG operations.	Section 6.1
3.6.2	Details of the criteria by which chemicals will be categorised, based on the properties of each chemical. Criteria must include, but not be limited to: a) combined persistence, bioaccumulative and toxicity assessment; b) chemical database of concern assessment; and c) specific persistence, bioaccumulative and toxicity assessment.	Section 6.1

RFI reference	Information required	Cross-reference
3.6.3	Detail a risk assessment process for each chemical to determine risk to protected matters from the chemical's use. This process must: a) identify the risk assessment requirements based on the chemical's category; b) consider the chemical's intended use and function, and an estimation of the quantity of the chemical likely to be used, and at what concentration, in a typical year; c) consider the likely environmental fate of the chemical; and d) consider what, if any, mitigation and management measures are needed to prevent adverse impacts to protected matters from that chemical for the duration of this approval.	Section 6.1
3.6.4	Details of the process by which risk assessments for low-risk chemicals will be peer reviewed by an independent chemical risk assessment expert. This process must: a) consider any checklists completed by the independent chemical risk assessment expert, to demonstrate that risks have been adequately assessed; and b) include provision of a signed and dated statement from the independent chemical risk assessment expert confirming that the chemical has been correctly categorised.	Section 6.1
3.6.5	Details of the process for recording each chemical's risk assessment in a register on the approval holder's website and for the provision of each chemical's risk assessment to the department.	Section 6.1
3.6.6	Details of a process to monitor and report on the implementation of any mitigation and management measures undertaken during use and handling of chemicals, to demonstrate no adverse impacts to protected matters.	Section 6.1
3.6.7	Details of the process by which information in the risk assessments will be adaptively used to address any accidental release of a chemical to prevent adverse impacts to protected matters.	Section 6.1
4.	**REHABILITATION REQUIREMENTS**	
4.1.	The details of any rehabilitation activities proposed to be undertaken, including any activities required through other Commonwealth, State and/or local government approvals.	Section 9.2.1

RFI reference	Information required	Cross-reference
	All commitments must be drafted using committal language (e.g. 'will' and 'must') when describing the proposed activities.	
4.2.	The proposed final landform, including rehabilitation completion criteria, and its relation to the pre-disturbance vegetation community. Include an assessment of the expected or predicted effectiveness of the proposed rehabilitation activities.	Section 9.2.2
4.3.	Information on the timing, frequency and duration of proposed rehabilitation activities to be implemented, including anticipated time to completion.	Section 9.2.3
4.4.	Details of ongoing management and monitoring programs, including timing, to validate the effectiveness of proposed rehabilitation activities and demonstrate that completion criteria will be, or have been, achieved.	Section 9.2.4
4.5.	Details of tangible, on-ground corrective actions that will be implemented, including timing, in the event that monitoring programs indicate that the completion criteria have not been, or will not be, achieved.	Section 9.2.4
5.	**OFFSETS**	
5.1.	An assessment of the likelihood of residual significant impacts occurring on relevant protected matters, after avoidance, mitigation and management measures have been applied.	Section 10
5.2.	A summary of the proposed environmental offset and key commitments to achieve a conservation gain for each protected matter.	Section 10
5.3.	If an offset area has not been nominated, include a draft OS as an Attachment to the preliminary documentation. The draft OS must meet the information requirements set out in Attachment B.1.	Section 10
5.4.	Where offset area/s have been nominated, include a draft OMP as an Attachment to the preliminary documentation. The draft OMP must meet the information requirements set out in Attachment B.2, and must be prepared by a suitably qualified ecologist and in accordance with the department's Environmental Management Plan Guidelines (2014), available at: www.environment.gov.au/epbc/publications/environmental-management-plan-guidelines.	Section 10

RFI reference	Information required	Cross-reference
6.	**ECOLOGICALLY SUSTAINABLE DEVELOPMENT (ESD)**	
6.1.	A description of how the proposed action meets the principles of ESD, as defined in section 3A of the EPBC Act. The following principles are principles of ecologically sustainable development: ■ decision making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations; ■ 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; ■ the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations; ■ the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making; ■ improved valuation, pricing and incentive mechanisms should be promoted.	Section 11
7.	**ECONOMIC AND SOCIAL MATTERS**	
7.1.	An analysis of the economic and social impacts of the action, both positive and negative.	Section 12.1
7.2.	Details of any public consultation activities undertaken and their outcomes.	Section 12.2
7.3.	Details of any consultation with Indigenous stakeholders. Indigenous engagement Identify existing or potential native title rights and interests, including any areas and objects that are of particular significance to Indigenous peoples and communities, possibly impacted by the proposed action and the potential for managing those impacts. Describe any Indigenous consultation that has been undertaken, or will be undertaken, in relation to the proposed action and their outcomes.	Section 12.3

RFI reference	Information required	Cross-reference
	The department considers that best practice consultation, in accordance with https://www.dcceew.gov.au/sites/default/files/documents/interim-engaging-with-first-nations-people-and-communities-assessments-and-approvals-under-epbc-act.pdf includes: ■ ensuring cultural safety; ■ building and maintaining trust; ■ engaging early and often; ■ negotiating suitable timeframes; and ■ negotiating suitable submission formats. Describe any state requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action with regards to Indigenous peoples and communities.	
7.4.	Projected economic costs and benefits of the project, including the basis for their estimate through cost/benefit analysis or similar studies.	Section 12.4
7.5.	Employment opportunities expected to be generated by the project (including construction and operational phases).	Section 12.5
8.	**ENVIRONMENTAL RECORD OF THE PERSON PROPOSING TO TAKE THE ACTION**	
8.1.	Include details of any past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against: ■ the person proposing to take the action; ■ for an action for which a person has applied for a permit, the person making the application; ■ if the person is a body corporate—the history of its executive officers in relation to environmental matters; and ■ if the person is a body corporate that is a subsidiary of another body or company (the parent body)—the history in relation to environmental matters of the parent body and its executive officers.	Section 13

1.7 Personnel Involved with Preparation of the Preliminary Documentation

The personnel and their role and qualification who were involved with preparing the PD and the supporting attachments are provided below:

- **Scott Mainey** – Environmental Planner at Environmental Resources Management Pty Ltd (ERM)
  - **Role**: Primary Author
  - **Qualification**: Bachelor of Urban and Environmental Planning
- **John Herron** – Partner at ERM
  - **Role**: Technical Review and Quality Assurance
  - **Qualification**:
    - Master of Environmental Management (Sustainable Development)
    - Bachelor of Applied Science (Biology)
- **Matt Davis** – Principal Ecologist at ERM
  - **Role**: Ecology Lead and Technical Review
  - **Qualification**:
    - Master of Environmental Management (Conservation Biology)
    - Bachelor of Science (Ecology)
- **Amy Blacker** – Senior Ecologist at ERM
  - **Role**: Ecology Support and Author
  - **Qualification**:
    - Doctor of Philosophy (Ecology)
    - Bachelor of Science (Ecology and Conservation Biology)
- **Carly Waterhouse** – Senior Hydrogeologist at Klohn Crippen Berger
  - **Role**: Water Lead and Author Support
  - **Qualification**:
    - Master of Hydrogeology
    - Bachelor of Environmental Science
- **Chris Strachotta** –Hydrogeologist at Klohn Crippen Berger
  - **Role**: Water Technical Review
  - **Qualification**: Bachelor of Applied Science (Geology)
- **Jacob Cumpstay** – Environment Manager at Senex Energy
  - **Role**: Senex environment reviews
  - **Qualification**: Bachelor of Environmental Engineering
- **Lidia Gossmann** – Hydrogeologist at Senex Energy
  - **Role**: Senex Water Component Reviews
  - **Qualifications**:
    - Bachelor of Science (Natural Environmental)
    - Master of Science (Modular Environmental Science)
    - Master of Science (Applied Environmental Geoscience)

- **Mark Stewart** – Technical Director – Groundwater at AECOM Australia Pty Ltd
  - **Role**: Third party independent reviewer
  - **Qualification**: Bachelor of Science (Geology)
- **Steve Fox** – Environmental Approvals Project Manager at Senex Energy
  - **Role**: Senex environment reviews
  - **Qualification:**
    - Graduate Certificate in Urban and Regional planning
    - Bachelor of Applied Science (Natural Systems and Wildlife Management)
- **Tania Kennedy** – Sustainability Manager at Senex Energy
  - **Role**: Primary author of Ecologically Sustainable Development Section
  - **Qualification**:
    - Bachelor of Applied Science (Honours)
    - Master of Groundwater and Water Management
    - Master of Strategic Foresight
    - Australian Institute of Company Directors Graduate
- **Larissa Dudley** – Environment and Approvals Manager at Senex Energy
  - **Role**: Senex environment, cultural heritage and native title reviews
  - **Qualification** – N/A
- **Justin Claridge** – Principal Environmental Scientist at Attexo
  - **Role**: Primary author of revisions to Environmental Management Plan, Rehabilitation Plan and Constraints Protocol
  - **Qualification**:
    - Bachelor of Land Resource Science
    - Masters of Land Resource Science

2 DESCRIPTION OF THE PROJECT

RFI 1.2

A description of all components of the action, including the anticipated timing and duration (including start and completion dates) of each component of the project. All construction, operational and (if relevant) decommissioning and rehabilitation components of the proposed action should be described in detail.

Include details regarding the methods and processes to be used to access and extract the gas resource (including stimulation, dewatering, etc.). In addition, any components which were included in the referral material, but are no longer part of the proposed action, must be clarified.

RFI 1.2 Response:

Information that responds to the RFI is provided in the following locations:

- Description of all components of the action – refer to Section 2.1;
- Anticipated timing and duration – refer to Section 2.1;
- Construction details – refer to Section 2.2;
- Operation details – refer to Section 2.3;
- Decommissioning and rehabilitation details – refer to Section 2.4;
- Methods to extract the gas resource – refer to Section 2.3.1 and 2.3.2; and
- Staged action discussion – refer to Section 2.6.

RFI 1.5

If available, an indicative layout plan for the proposed action area, including key infrastructure (the number and location of wells, gas/water transmission pipelines, gas facilities, water storage/management facilities, power generation facilities, etc.). If available, include mapping and coordinates for each of the above.

Where existing approved infrastructure will be utilised, this should be clearly articulated.

RFI 1.5 Response:

A response to the RFI 1.5 is provided in Section 2.1. The location of existing approved infrastructure planned to be used has been provided on Figure 1-1.

2.1 Proposed Infrastructure

The Project consists of:

- The progressive construction, operation, decommissioning and rehabilitation of up to 151 CSG wells (approximately 100 ha of disturbance of previously cleared areas), installed over the first 5 to 10 years of the Project, which will be connected to a gathering system for gas and water, and have associated access tracks (approximately 264 ha of disturbance of previously cleared areas);
- Up to 600 megalitre (ML) brine storage (up to 30 ha of previously cleared land);
- Produced water storage (approximately 30 ha of previously cleared land);
- Possible further brine treatment options including potential concentration via solar evaporation;
- Ancillary supporting infrastructure including:
  - Temporary accommodation facilities (approximately 20 ha of previously cleared land);
  - Laydown, stockpile and site office areas (approximately 45 ha of previously cleared land);
  - Borrow pits (approximately 11 ha of previously cleared land);
  - Other infrastructure (approximately 30 ha of previously cleared land), such as above and below ground power lines, fuel and chemical storage, washdown facilities and groundwater monitoring bores, and environmental monitoring equipment and management control.

The gas field will be progressively developed over a period of approximately 5 to 10 years. The average maximum production rate of the Project is expected to be approximately 60 terajoules per day, although variable potential production rates may be higher at times. Field development is planned to move generally from the north towards the south over the life of the Project.

Field development basis of design is dependent on technical aspects, such as well productivity, topographic features, and environmental constraints. Typically, this process will commence in the most productive area and span out to the full field development over time, based on field development resources, i.e. equipment and personnel to meet a production schedule. Landholder sentiment then informs the way in which a field development basis of design can be executed. Well development negotiations with landholders must therefore be sufficiently progressed to proceed with the design for downstream infrastructure.

Land access considerations are prioritised in the planning of Project infrastructure.

In all cases the Constraints Protocol (Attachment B) will be implemented and all areas of MNES habitat will be avoided with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). This is in keeping with Senex's commitment to not clear any areas confirmed as potential habitat for MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land).

The Constraints Protocol (Attachment B) is used in conjunction with the Manual for Assessing Consequence categories and Hydraulic Performance of Structures (Department of Environment and Science, 2016) and other dam design criteria to select the suitable location for produced water storage. Monitoring bores and equipment for monitoring and management controls will be installed where detailed design dictates them as a requirement.

The location of existing approved infrastructure planned to be used has been provided on Figure 1-1

Suitable borrow material (i.e. gravel) used primarily for well pad construction and access tracks is typically sourced from locations nearest to development. Where an insufficient quality and quantity of borrow material cannot be sourced in the area, locations may also be scouted in areas further afield. Suitability is assessed closer to the time of construction and therefore locations may vary over the course of Project development. Borrow material is expected to be sourced from new borrow pits

(approximately 11 ha of previously cleared land) and/or existing quarries inside the Project Area and/or from existing local government approved commercial quarries that may be located outside of the Project Area.

Above and below ground powerlines are typically (where possible) located adjacent to access tracks. Fuel and chemical storages are usually stored on laydowns located adjacent to temporary accommodation facilities. Washdown facilities are usually located with temporary accommodation facilities and, if assessed as necessary, in transition areas between properties with known presence of weeds (as declared under biosecurity laws and regulations, and where of concern to landholders).

2.2 Construction

2.2.1 Pre-construction/Pre-clearing Activities

Senex has developed the Constraints Protocol (Attachment B) to guide site selection throughout the planning and pre-construction/pre-clearing stage to ensure impacts upon MNES are avoided and minimised. The protocol includes the following steps:

- Desktop environmental constraints analysis;
- Site surveys including environmental and cultural heritage clearance surveys (where required, additional species-specific targeted field-based surveys are undertaken) – findings are documented within a standardised Biodiversity Values Report;
- Post-survey environmental constraints analysis (which includes location refinements to further avoid and minimise impacts to field validated values, identification of no-access areas, identify site specific mitigation measures and controls); and
- Environmental constraints reporting (confirming siting complies with relevant approvals including disturbance limits and secondary approvals, quantifying any unavoidable impacts and identifying required mitigation measures).

2.2.2 Clearing and Civil Works

Most of the Project Area has been subject to extensive disturbance by the agricultural industry with approximately 90.5% of the FDA being cleared of remnant native vegetation. A maximum ground disturbance area of up to 530 ha (4.3%) for the Project is expected. However, Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). The maximum MNES and Matters of State Environmental Significance (MSES) disturbance limits for the Project are provided in Section 7 of the Ecology Assessment Report (Attachment C).

Civil works will be required for other infrastructure such as brine storage, water storage, temporary accommodation facilities, laydown areas, stockpile and site office areas, and other infrastructure.

Before the drill rig is mobilised to site, the drill site, access tracks and infrastructure areas are prepared through:

- Avoidance of forested areas in all cases. Where individual trees/woody vegetation is present and unavoidable, it will be cleared within the well lease and access tracks and stored at the edge of disturbed areas for later use in rehabilitation. Recoverable timber hollows, larger rocks and other features will be stored for later microhabitat rehabilitation. Grasses and other groundcovers will then be graded from the well pad footprint; and
- Topsoil removal using earthmoving equipment. This is stockpiled to one side of the lease and/or access track for later use in rehabilitation. Final earthmoving equipment preparations, such as site levelling are then completed.

2.2.3 Wells

Up to 151 wells will generally be spaced 500–750 m apart. The wells will be designed and constructed in accordance with the Queensland Code of Practice for constructing and abandonment of petroleum wells and associated bores in Queensland (Department of Natural Resources, Mines and Energy (Version 2) 16 December 2019) (the code). This code outlines mandatory requirements and good practice to achieve long term well integrity and appropriately reduce the risk of environmental harm.

Well sites will generally be constructed in an area of approximately 80 m by 70 m allowing the initial drilling and completion of the well (installing surface facilities). The layout and size of well sites will vary depending on the size and type of drilling rig, program for completion of the well and the surrounding environment. Typically, 0.6 ha is required although smaller areas may be utilised where topography and vegetation cover allow. In some cases, up to approximately 1 ha is required to accommodate site constraints. Well pads are designed and located based on flood modelling to avoid areas of concentrated flow such as gullies and waterways. Some well pads may require cut and fill batters that will have a local and minor impact to runoff on sloping land.

Well construction will involve the use of a drill rig and other equipment such as drill fluid pumps, storage and processing and storage for water supply, fuel and chemicals. Options for the management of residual drilling material include on site and offsite options. Where on site management options are proposed, this will be undertaken in accordance with State approvals which require for the assessment of the quality and the potential impacts of the reuse of residual drilling materials, and implementation of any relevant management measures.

Following the well drilling phase, the wells will be completed, and a pump installed to dewater the production reservoir. Separate connections will be provided at the well head for the gas and water streams. It is expected that produced water will be pumped to the surface by a downhole progressive cavity pump and connected from the wellhead tubing. The standard well site facility will be fenced and generally consist of:

- A wellhead gas and water metering package;
- Gas and water separation equipment;
- Initially, natural gas power generation package to provide power for the electric motor driving the downhole pump (noting that it is possible that in future years wells may be powered by alternative sources including solar, hybrid and distributed power);
- Fuel and instrument gas scrubber to power the generator and supply gas to instruments;
- Sand/particulate filter separator for water and gas streams; and
- Surface pressure piping constructed of steel to the required specification and connection to the gathering system.

It will generally take up to six months to dewater each production well sufficiently for gas to flow, and approximately 18 months to reach peak production.

The total aggregate disturbance footprint for well pads required during construction will be approximately 100 ha, and during operation will occupy up to approximately 60 ha. In accordance with the Constraints Protocol (Attachment B), all the areas to be utilised for well pads will have been previously cleared. At the completion of the Project, all well pads will be rehabilitated to the condition of the adjoining land. An example of the Project infrastructure is provided in Photograph 2-1 to Photograph 2-3.

Photograph 2-1: Right of way at pipe installation stage showing temporary disturbance

Photograph 2-2: Intersection of two right of ways post construction showing no impedance to fauna dispersal

Photograph 2-3: Typical coal seam gas well infrastructure showing small footprint and no barrier to fauna dispersal

2.2.4 Water and Gas Gathering Lines and Pipelines

To install the gathering lines, 18 m wide right-of-way (RoW) will require some vegetation to be removed, a trench to be excavated, pipeline laid, the trench backfilled, and RoW reinstated (a 24 m wide RoW will be required during construction for approximately 15 km of major trunk lines). In accordance with the Environmental Authority (EA), the RoW will be reinstated and re-profiled to a level consistent with surrounding soils, original contours and established drainage lines so as not to impede surface water flows. Where possible, RoWs will be aligned with existing roads/tracks, fence or power lines or other linear infrastructure to minimize disturbance to native vegetation and overall impact on land users. In general, RoWs will be rehabilitated except for a 6 m wide earthen access track which will be maintained along the RoW for ongoing operations access.

The Project will avoid impacting riparian vegetation through the design of the Project and ongoing application of the Constraints Protocol (Attachment B). The Project includes the following construction methods for crossings of watercourses:

- Horizontal Directional Drill (HDD) gathering system crossings of Woleebee Creek on PL 1037 to avoid impacts to the watercourse;
- Several HDD are being considered for gathering system crossings of Woleebee Creek and other drainage features on PL 209; and
- Several HDD are being considered for gathering system crossings of Woleebee Creek, Wandoan Creek and other drainage features on ATP 2059.

HDD can potentially be used to avoid impacts to watercourses and adjacent MNES habitat. However, there are a range of issues that limit its use more widely, including the nature of the subsurface soil and bedrock materials at a proposed crossing and the ecological values potentially impacted adjacent to the riparian crossing. The potential issues will be assessed on a site by site basis during the Project operations. In all instances, the Project will avoid all areas of MNES habitat, with the exception of

Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land).

The buried gathering system will enable low pressure gas and water to flow through separate buried High-Density Polyethylene pipes, up to 800 mm diameter. The gas gathering system will typically operate at 70-400 kilopascal gauge (kPag) (with maximum operating pressure of 615 KPag). The water gathering system will typically operate at 140-700 kPag (with maximum operating pressure of approximately 1350 KPag). In total the disturbance footprint required during construction of the gas and water gathering system (including temporary additional construction areas for drainage feature crossings, road crossings, inter-property tie-ins, HDD crossings) will total approximately 264 ha.

2.2.5 Access Roads and Tracks

Construction of a typical access road and track (6 to 15 m wide) will accommodate heavy and light vehicles associated with Project activities. Wherever practicable, existing landholder access tracks will be upgraded for use and new access roads and tracks (typically 6 m wide) will be co-located with gas and water gathering networks to reduce the overall disturbance footprint. All access tracks and roads will be of earthen material and are designed to be low impact and will be constructed in accordance with the Queensland waterway barrier works requirements (*Fisheries Act 1994* (Qld)).

2.2.6 Supporting Infrastructure and Activities

It is expected that several temporary accommodation facilities will be required for construction and drilling activities. These facilities would be assembled on site using prefabricated modular units with basic amenities such as modular sewage treatment plants and water tanks. It is expected that these facilities will utilise approximately 20 ha of previously cleared land at any one time. Disturbances will be progressively rehabilitated as they are no longer required.

A number of other ancillary facilities and activities will be required to support construction, described in Section 2.3.5 due to continued use in the operations stage. These ancillary facilities and activities will utilise approximately 30 ha of previously cleared land.

2.2.7 Water Management Facilities

Groundwater will be extracted from CSG production wells to depressurise the production coal seams. It is expected that the action may generate up to approximately 6.5 ML of produced water per day. Produced water will initially be collected via the water gathering systems into aggregation dams. Water for beneficial use, where treatment is not required, will be drawn from the aggregation dams.

The water management process for produced water for the Project is expected to include:

- New pre-engineered above ground tanks and/or purpose-built earthen dams with impervious liners and leakage detection/collection systems, which may be established on PL 209. However, to minimise impacts and improve operational efficiency, some of the water will be transferred to centrally located aggregation and brine storages that are already established for the Project Atlas CSG Project (EPBC 2018/8329). These facilities are not part of the Project.
- The existing WTF on PL 1037 established for the Project Atlas CSG Project (EPBC 2018/8329) (the WTF is not part of the Project) will treat water from the Project. Subject to water production rates and other field development characteristics, an additional WTF may also be constructed on PL 209. This additional WTF is part of the Project. If required, the WTF will be sited using the Constraints Protocol (Attachment B) to ensure that there will be no significant impact to any listed MNES threatened species or TECs. Potential impacts to MNES surface water values will be evaluated as part of the WTF site selection risk assessment process .
- Brine from the water treatment process will be stored in a new brine storage dam (up to 300 ML) which will be developed on PL 1037 is part of the Project. Additional brine storage (up to 300 ML) may also be required on PL 209. Further brine treatment options including concentration via solar evaporation may be used and result in a concentrated slurry or solid salt product.

In total, approximately 30 ha of brine storage and approximately 30 ha of water storage will be established on previously cleared land for the Project.

The brine and water storage will be located in areas that avoid floodplains, shallow groundwater systems and other environmentally sensitive locations. Site preparation will involve removal of topsoil, excavation and compaction of subsoil and placement of impermeable/low permeability layers with leak detection/collection systems. All water storages that are considered regulated structures under the EA for the Project will be required to meet the Manual for assessing consequence categories and hydraulic performance of structures (DES 2016). An application for one or more regulated structures must, where the location of the regulated structure is known, include a copy of the most recent consequence assessment undertaken for that regulated structure as per the Guideline for Structures which are dams or levees constructed as part of environmentally relevant activities (DES 2022).

For a dam to be considered a regulated dam, it must be determined to be in the 'significant' or 'high' consequence category, and a detailed dam design report must be submitted to Queensland Department of Environment, Science and Industry (DESI) following granting of the EA or as part of an EA Application.

The following will apply with respect to any regulated dams required for the Project:

- Senex will design and construct dams in accordance with relevant legislation and Queensland standards and DES guidelines;
- An independent third-party will be engaged to certify dams to ensure design, construction and hydraulic performance meet the design plan;
- Dams will be constructed under the supervision of a suitably qualified and experienced person and in accordance with the relevant DES schedule of conditions relating to dam design, construction, inspection, and mandatory reporting requirements; and
- Senex will implement a seepage monitoring program for water storage dams, where required. The seepage monitoring program will identify infrastructure and procedures that are in place to detect loss of containment as early as possible.

Any low-hazard dams required for CSG water storage will be designed in accordance with accepted engineering standards. The dams will be designed with a floor and sides comprising material capable of containing the water for the life of the Project.

2.3 Operations and Transitional Rehabilitation

RFI 1.3

A description of the operational requirements of the action, including any anticipated maintenance works.

RFI 1.3 Response:

See information to respond below.

2.3.1 Wells

The Project will be progressively developed over a period of between approximately 5 to 10 years. Once all wells are producing, activities will transition to maintenance and operation of the existing infrastructure. This will include visual inspection and maintenance of well access tracks and RoW. All wells will also be monitored remotely with field staff responding through well visits as changes to normal operations are detected.

Following drilling of the well, sites will be partially rehabilitated, with a cleared area of approximately 60 m by 60 m (0.36 ha) left to allow access for workover rig operations. CSG production is a method of producing natural gas through the depressurisation of coal seam via the removal of in-situ water which results in the liberation of gas from the coal surfaces.

Once the wells are completed, a pump is installed to dewater the production reservoir. It is expected that produced water will be pumped to the surface by a downhole progressive cavity pump and connected from the wellhead tubing. It will generally take up to six months to dewater each production well sufficiently for gas to flow, and approximately 18 months to reach peak production.

Gas will be produced via wells, from the Walloon Coal measures at depths of 55 – 650 metres below ground level (mbgl). The wells will be operated in accordance with the code which aims to ensure:

- The environment and groundwater resources are protected;
- Risk to the public and workers is managed to a level as low as reasonably practical (ALARP);
- Regulatory and applicable Australian and international standards/requirements, as well as the operator's standards, are understood and implemented where appropriate; and
- The life of a petroleum well or associated bore is managed effectively through appropriate design and construction techniques and ongoing well integrity monitoring.

Water is produced through tubing via a progressing cavity pump (PCP) into a dedicated gathering system and gas flows up the well annulus into a gas gathering network and is transported to a central processing facility. A well site separation facility may be incorporated into the production system.

A typical gas production profile consists of an early de-watering period where primarily water is produced with very little gas. As the reservoir pressure depletes, gas is desorbed from the coal surface and is produced in increasing amounts. Gas production, typically, peaks around 12 to 18 months after the start of production at which point the well transitions into a gradual and extended decline. Water continues to be pumped to maintain low reservoir pressure throughout the life of the well.

The well bore itself will generally be serviced by a workover rig approximately every three years, although some wells are expected to require more frequent servicing depending on performance.

Hydraulic stimulation (fracking) of wells is not required and is not part of the Project.

2.3.2 Water and Gas Gathering Lines and Pipelines

Gas and water from the well facilities will be transported via the gas and water gathering system. Water will be transported to water processing facilities and gas to gas processing facilities through the gathering system. In the unlikely event maintenance of gathering systems (in the form of pipeline maintenance) is required, ground disturbance and partial trenching will be experienced.

After post-construction rehabilitation, the disturbance footprint for the gas and water gathering system will utilise up to approximately 80 ha. At the completion of the Project, any areas not required to remain as access tracks for the use of the landholder, will be rehabilitated to the condition of the adjoining land. Watercourse crossings will be rehabilitated by re-contouring disturbed areas to match the surrounding land.

2.3.3 Water Management Facilities

As part of the CSG production process, coal seams are depressured via the extraction of groundwater. This allows the flow of gas. It is expected that the action may generate up to approximately 6.5 ML of produced water per day.

For all regulated produced water storage dams Senex will:

- Conduct a seepage monitoring program for water storage dams, where required. The seepage monitoring program will identify infrastructure and procedures that are in place to detect loss of containment as early as possible;
- Routinely monitor water quality in dams, and in the respective dam’s shallow groundwater monitoring bores, installed as part of the seepage monitoring program;
- Monitor dam levels to provide early warning of overtopping and / or unidentified water losses; and

- Monitor the integrity and assess the available storage of dams annually.

After treatment the produced water will predominantly be used for irrigation, however other uses (such as, stock water, hydrogen fuel production or other beneficial uses) may also be pursued. Treated water for irrigation will be transferred via water transmission pipelines to third party irrigation dam(s) (approximately 50 to 200 ML each) on PL 1037 and/or PL 209, which do not form part of the Project. The produced water will be treated to comply with the standard water quality parameters as specified in State codes. Minor quantities of produced water may be beneficially reused in the Project Area for dust suppression and construction activities in accordance with the Environmental Management Plan (Attachment E).

Brine from the water treatment process will be stored in the brine storage dams. Further brine treatment options including concentration via solar evaporation may be used and result in a concentrated slurry or solid salt product. For any required brine storages Senex will:

- Conduct a seepage monitoring program. The seepage monitoring program will identify infrastructure and procedures that are in place to detect loss of containment as early as possible;
- Monitor storage levels to provide early warning of overtopping and / or unidentified water losses; and
- Monitor the integrity and assess the available storage of storages annually.

Where appropriate, salt or salt slurry will be trucked from site and disposed of at a Regulated Waste Facility.

Where practicable, produced water will be utilised for beneficial reuse in accordance with the relevant Environmental Authorities or Queensland End of Waste Code requirements. Produced water will also be used for drilling and other Project activities. Minor quantities of produced water may be beneficially reused in the Project Area for dust suppression and construction activities in accordance with the Environmental Management Plan (Attachment E).

2.3.4 Access Roads and Tracks

Access roads and tracks will be maintained to allow servicing of well leases and access to other infrastructure within the Project. Wherever practical, the Project will use existing landholder access tracks or already disturbed areas. Where upgrades to existing landholder access tracks are required, this will be undertaken in consultation with landholders. The access tracks will also be regularly monitored by field staff as they undertake well inspections and maintenance works (e.g. re-grading) will be completed where required.

2.3.5 Supporting Infrastructure and Activities

It is expected that the following additional facilities and activities will be required to support construction (constructed early in the Project) and operations (required to the end of the Project):

- Laydown, stockpile, and site office areas (up to approximately 45 ha of previously cleared land);
- Borrow pits (up to approximately 11 ha of previously cleared land);
- Power/communication lines (overhead or underground);
- Plant and equipment service and maintenance facilities and workshops;
- Construction support, warehousing and administration buildings;
- Fuel and chemical storage;
- Washdown facilities;
- Ancillary infrastructure such as communications infrastructure, water supply, holding tanks and dams, and energy supply;

- Groundwater monitoring bores installed to ensure the early detection of potential groundwater impacts in the alluvium and underlying geological formations resulting from CSG production (see Section 5.3.1.1);
- Environmental monitoring equipment and management controls; and
- Ecological, topographic, cadastral, geological, geophysical and geotechnical surveys.

Rehabilitated areas will also be regularly monitored and, where necessary maintained, in accordance with the Rehabilitation Plan (Attachment F), the requirements of the EA and any landholder requests.

2.4 Decommissioning and Final Rehabilitation

A maximum ground disturbance area of up to 530 ha (4.3%) of previously cleared land for the Project is expected. Rehabilitation of some initial construction disturbances will commence early in the action and continue progressively so that a much smaller proportion will be occupied at any point in time. In almost all cases, surface infrastructure and temporary construction footprints will be located in previously cleared and disturbed areas.

Once operations have ceased, infrastructure will be decommissioned unless retention and transfer of ownership of assets is agreed with the landholder. Disturbed areas will be rehabilitated in accordance with the Rehabilitation Plan (Attachment F) and the requirements of the EA. Rehabilitation will be undertaken progressively as disturbed land is no longer required for operational purposes in accordance with the relevant EA. This will include reprofiling disturbed land to original contours, re-establishment of surface drainage lines, re-establishment of groundcover vegetation and ensuring the rehabilitated land is safe and stable. Where the landholder and regulatory authority agree in writing, infrastructure such as access tracks and dams may be retained on site for landholder reuse.

2.4.1 Wells

Once depleted of gas, wells will be progressively decommissioned and rehabilitated throughout the Project life. Wells are decommissioned in accordance with the code which has the objectives to ensure:

- Isolation of aquifers from each other and from permeable hydrocarbon zones;
- Isolation of permeable hydrocarbon zones from each other unless commingling is permitted; and
- Permeable formations containing fluids at different pressure gradients and/or significantly different salinities are isolated from each other to prevent crossflow.

The life expectancy of a well is between approximately 15 to 50 years. Decommissioning of individual wells is not expected to occur until after the well has been producing for at least 15 years but could be much longer (anticipated to be decommissioned between 20 and 50 years).

Wells are abandoned by placing permanent cement barriers to flow which are demonstrable to have sufficient integrity to isolate and control wellbore fluids while also retaining wellbore integrity. This ensures that groundwater aquifers are isolated.

At this point, all surface infrastructure related to the well will have been removed and a process of rehabilitation in-line with surrounding surface conditions will begin.

The total disturbance footprint required during construction of all 151 wells will be approximately 100ha and after post-construction rehabilitation will occupy approximately 60 ha. All the areas to be utilised for wells have previously been cleared of original native vegetation. At completion of the Project all well pads will be rehabilitated to the condition of the adjoining land.

2.4.2 Water and Gas Gathering Lines and Pipelines

Where it is practical and safe to do so, gathering lines and pipelines will be abandoned and left in-situ in accordance with the relevant codes and Australian standards. This is to avoid disturbing the re-established vegetation, and habitat for threatened communities, through excavation and removal. The

overall objective is to leave the RoW in a condition that is as near as practical to pre-existing environmental conditions. where abandonment in-situ is not practicable, sections of buried infrastructure will be excavated, removed and disposed offsite.

If the gathering lines and pipelines are to be abandoned and left in-situ, an abandonment plan will be developed in accordance with relevant codes. When abandoning in-situ, the gathering lines and pipeline section will be abandoned in such a way to ensure that ground subsidence and the risk of contamination of the soil or groundwater is minimised. Gathering lines and pipelines will be disconnected from all sources of hydrocarbons that may be present in processing plant, meter stations, control lines and other appurtenances, and will be purged of all hydrocarbons and vapour with a non-flammable fluid and then capped.

2.4.3 Water Management Facilities

Produced water will be managed using aggregation dams. Prior to decommissioning dams, landholders will be given the option to retain the dams for their own water storage purposes. Any residue in the dam will be quantified and tested to demonstrate that it is safe and fit for the intended use of the dam.

When the brine storage dams are decommissioned, saline residue or salt resulting from reverse osmosis will be disposed to an appropriately licenced facility where required.

Aggregation dams will have all water removed (preferably through beneficial use options). Once any liquid is removed, and where dams are not being retained by the landholder for future beneficial use, dams will be rehabilitated to remove any source of potential contaminants and the land returned to a useable form.

The process for decommissioning and rehabilitation the produced water aggregation and brine storage dams will generally involve the following:

- Removing and recycling or disposing of synthetic liners;
- Assessing any land contamination that may have occurred. In the case where some leakage of the liner system has occurred a contaminated land assessment shall be undertaken as per the current National Environment Protection (Site Assessment) Measure (NEPM);
- Remediating soils by removal to a soil remediation area or in-situ treatment of contaminated soils where required or disposing the contaminated soils to an off-site licensed facility;
- Retaining clay materials for reuse where suitable clay has been used as part of the containment system;
- Rehabilitating the site by pushing in dam embankments and filling in depressions to recontour landforms to match surrounding topography. Any retained subsoil could be used to infill dams and topsoil can be respread; and
- Revegetating the area by direct seeding with appropriate species based on post-disturbance landform.

2.4.4 Access Roads and Tracks

Access tracks and tracks which are no longer required for ongoing operational activities or requested be retained by the landholder, will be closed and reinstated to a condition compatible with the surrounding land use. This will generally involve tilling to remove compaction, re-spreading stockpiled topsoil and revegetating. Landholder access tracks in existence prior to construction will be re-instated and will not be blocked in any way. Where access tracks are retained by landholders, any wheel ruts will be graded and erosion-control measures such as diversion drains installed to an agreed condition.

Watercourse crossings will be rehabilitated by re-contouring disturbed areas to match the surrounding land. Any temporary watercourse barriers, erected to prevent erosion will be removed.

2.5 Project Alternatives

RFI 1.6

To the extent reasonably practicable, provide any alternatives to the proposed action, including a comparative description of the impacts of each alternative on the matters protected by the controlling provisions for the action.

RFI 1.6 Response:

PL 1037 was granted by the Queensland Government in March 2018. ATP 2059 was awarded to Senex by the Queensland Government in 2021 based on the strength of its proposed development plans and will be subject to a PL application in the near future. PL 209 and PL 445 were acquired by Senex in January 2022.

Senex assessed alternatives within the Project Area (for example the number of wells, well layout and infrastructure location) to maximise commercial outcomes of the Project while avoiding and minimising environmental disturbance. These assessments have resulted in the Project avoiding disturbance of threatened species, ecological communities and their habitats.

Taking no action is not an option as it is not consistent with a petroleum tenement or Australia's energy demands. Australia has an identified shortfall in domestic gas supply on the east coast, and the Project assists in meeting the identified shortfall, thereby supporting Queensland's and Australia's standard of living and economic viability. No appropriate alternative is identified given the economic and social benefits that will be achieved through developing the natural gas resource in a manner that avoids significant impact upon any MNES or other significant environmental values.

Approximately 90.5% of the FDA has been cleared of its original native vegetation (most was cleared by the 1960's) and the Project is able to be developed whilst protecting the extant environmental values and coexisting with current and envisaged land uses. The Project is consistent with the WDRC's identification of the region as the "Energy Capital of Queensland" supplying a diversity of gas, solar and coal electricity to the national electricity grid (WDRC, Planning Scheme, Part 3 – Strategic Plan, p3-2).

The proposed impacts will be consistent with, or less than, those which have already been authorised in PL 445 and PL 209 under the existing APLNG approval (EPBC 2009/4974). The Project Area is highly suited to the Project, given the current modified condition of the landscape and limited extent of natural vegetation within the Project Area.

2.6 Project Approvals

RFI 1.7

Provide a description of any approval that has been obtained from a State or Commonwealth agency or authority, including any conditions that apply to the action. Include a statement identifying any additional approval that is required.

RFI 1.7 Response:

The Project holds current resource authorities granted under the P&G Act by the State of Queensland as detailed in Table 2-1.

Table 2-1 Granted Resource Authorities

Resource Authority	Date Commenced	Term
PL 209	16/12/2004	50 years
PL 1037	27/03/2018	30 years
PL 445	25/07/2021	30 years
ATP 2059 (PL(A) 1127)^	01/10/2020	6 years

^the term ATP 2059 includes any renewal, replacement, substitution, consolidation, subdivision, variation or temporal extension of the ATP 2059 tenement (including by way of a Potential Commercial Area).

An application to convert ATP 2059 (PL(A) 1127) area to a PL is being prepared for submission to the State. An application is only provided with a provisional number on submission to the DoR and that information is not available at this time.

The PL will be required prior to the commencement of production activities described and will be considered part of the action when it is granted.

Each of the granted resource authorities has an issued EA under the Queensland *Environmental Protection Act 1994* (EP Act) by the state of Queensland as detailed in Table 2-2 below.

Table 2-2 Resource Authorities and issued Environmental Authorities

Resource Authority	Environmental Authority Number	Authorised Wells	Intensity
PL 209	P-EA-100112777	270 wells	270 wells
PL 445			
PL 1037	EA0001207	113 wells 4 Temporary sewage treatment facility 6 Regulated/low consequence structures 1 Water Management Facility	113 hectares >21EP<100EP per facility 50 hectares 4 hectares
ATP 2059 (PL(A) 1127)^	EA0002524	Exploration activities that comply with the eligibility criteria	Not more than 1% of total land area

^the term ATP 2059 includes any renewal, replacement, substitution, consolidation, subdivision, variation or temporal extension of the ATP 2059 tenement (including by way of a Potential Commercial Area).

The EA conditions are issued over the following schedules to address the requirements of the EP Act and the protection of environmental values while undertaking the authorised activities. EA conditions follow the following structure and requirements:

- General;
- Waste;
- Noise;
- Environmental nuisance;
- Air;
- Land;

- Disturbance to land;
- Biodiversity;
- Water (including Groundwater, Sewage treatment);
- Well construction, maintenance and stimulation (hydraulic fracturing activities);
- Structures/Regulated structures;
- Rehabilitation;
- Community issues;
- Notification; and
- Definitions.

Copies of the EAs can be found on the public register (Search for environmental authorities | Queensland Government (des.qld.gov.au)) using the EA number in the search field.

Activities not currently authorised by the relevant EA but included in the Project (as described in Section 2.1) will require amendments to be lodged with the State of Queensland for approval prior to commencement.

The EA for ATP 2059 currently permits standard exploration activities When PL(A) 1127 is granted, thereby replacing ATP 2059, an EA will be issued for production activities (being, 31 wells and associated gathering). This EA will be required prior to the commencement of production activities in the area of PL(A) 1127.

Senex intends to amend conditions of all EAs for the Project to become largely consistent with the streamlined model conditions for petroleum activities (ESR/2016/1989, Version 2.02, Effective: 05 MAY 2016). The streamlined model conditions formed the basis for EA0001207 however P-EA-100112777 contains conditions that were derived prior to that State initiative and amended from time to time by the previous holder.

Permits such as those required under the *Nature Conservation Act 1994*, the *Fisheries Act 1994* or *Regional Planning Interests Act 2014* will be understood in advance of specific development areas, usually following pre-disturbance surveys undertaken as per the Constraints Protocol (Attachment B).

The legislative framework under which additional approvals may be required is set out in Table 2-3.

Table 2-3 Legislative Framework

Legislation, Codes and Policy	Relevance
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The EPBC Act administers the protection of the environment within Australia – protecting MNES, which include: ■ World heritage properties; ■ National heritage properties; ■ Wetlands of international importance; ■ Threatened species and ecological communities; ■ Migratory species; ■ Commonwealth marine areas; ■ The Great Barrier Reef Marine Park; ■ Nuclear Actions (include. uranium mines); and ■ A water resource, in relation to coal seam gas development and large coal mining development.

Legislation, Codes and Policy	Relevance
	The Significant Impact Guidelines (SIG) provide overarching guidance of the determination of whether an action is likely to have a significant impact on MNES. SIG 1.1– MNES (Commonwealth 2013) have been applied to the assessed impacts of the Project on Threatened Ecological Communities, Listed Flora and Fauna Species and Migratory Species within the Project Area. SIG 1.3: CSG and large coal mining developments - impacts on water resources (Commonwealth 2022b) has been applied to the assessment of water resource impacts identified and modelled for the Project and the Project cumulatively with surrounding CSG and large coal mining developments to determine its significance.
Petroleum and Gas (Production and Safety Act) 2004 (P&G Act)	The P&G Act regulates the exploration, production, and safety aspects of petroleum and gas activities in the state of Queensland, Australia. The P&G Act: ■ Provides a legal framework for the responsible development and operation of the petroleum and gas industry while ensuring the protection of public safety, the environment, and the rights of landholders; and ■ Facilitates and regulates the carrying out of responsible petroleum activities and the development of a safe, efficient and viable petroleum and fuel gas industry. Petroleum tenure granted by the Qld DoR that are relevant to the Project are ATP 2059, PL 209, PL 445 and PL 1037. Senex intends to apply for a PL over the area of ATP in the near future as a PL will be required prior to commercial production of gas.
Mineral and Energy Resources (Common Provisions) Act 2014	The *Mineral and Energy Resources (Common Provisions) Act 2014* stipulates the requirements for resource proponents accessing land for resource activities, including entry notice and other access requirements, the process for conduct and compensation agreements and make good impacts on landholder water bores. The *Mineral and Energy Resources (Common Provisions) Act 2014* also governs overlapping mineral and petroleum resource authorities.
Land Access Code (DNRM 2023)	The Land Access Code sets out the Queensland Government's expectations for the behaviours and best practice guidelines for communicating and negotiating with all resource authority holders and landholders. It also imposes mandatory conditions about conduct when entering and carrying out authorised activities on private land.
Code of Practice for constructing and abandonment of petroleum wells and associated bores in Queensland (Code of Practice Petroleum-Wells-Bores (DNRME, 2019))	The code ensures that all petroleum wells and associated bores are constructed, maintained and abandoned to a minimum acceptable standard resulting in long-term well integrity, containment of petroleum and the protection of groundwater resources. The code identifies industry standards and good oilfield practice for oil and gas well design and provides a way for operators to comply with their obligations under the P&G Act. The wells contemplated in this Project will all be designed, constructed, decommissioned and rehabilitated in accordance with the code.
Environmental Protection Act 1994 (EP Act)	The EP Act is the overarching environmental regulatory framework for governing the environmental management of resource activities in Queensland. Approvals under the EP Act take the form of an EA which authorises resource activities subject to conditions that protect environmental values, including acoustic, biodiversity, land, air, surface water, groundwater and wetlands.

Legislation, Codes and Policy	Relevance
	Environmentally Sensitive Areas (ESAs) are listed under the subordinate Environmental Protection Regulation 2008. ESAs include three categories i.e. A, B and C, reflecting the hierarchy of their importance to nature conservation. The EA Application Requirements for Petroleum Activities (Department of Environment and Heritage Protection [DEHP], 2013) provide for protection zones around these ESAs i.e.: ■ Primary Protection Zone – an area within 200 m of the boundary of a Category A, B or C ESA; and ■ Secondary Protection Zone – an area within 100 m of the boundary of a Category A or B ESA.
Waste Reduction and Recycling Act 2011	The *Waste Reduction and Recycling Act 2011* establishes the framework to modernise waste management and resource recovery practices in Queensland and to promote waste avoidance and reduction and encourage resource recovery and efficiency. The *Waste Reduction and Recycling Act 2011*provides the framework for End of Waste (EOW) Codes to be developed such that a waste can be deemed a resource. Produced water is contemplated under two EOW Codes – Associated water (including CSG water) and Associated water for irrigation (including CSG water) detailed in the items below.
ENEW07546918 End of Waste Code – Irrigation of Associated Water (including coal seam gas water) 2019	Produced water will be stored within existing aggregation dams on PL 1037 prior to being treated within an existing water treatment plant. New aggregation dams may also be established on PL 209 as part of the referred action. Treated water will be made available to landholders for irrigation purposes in accordance with EOW Code ENEW07546918.
ENEW07547018 End of Waste Code – Associated Water (including coal seam gas water) 2019	Produced water may be provided to a third party for use such as (but not limited to) stock water, dust suppression, construction and industrial operations. These activities will be undertaken in accordance with EOW Code ENEW07547018.
Coal Seam Gas Water Management Policy 2012 (State of Queensland 2012)	Relates to the management and use of CSG water under the EP Act.
Water Act 2000 (Water Act)	The Water Act provides for the sustainable management of water and the management of impacts on underground water, among other purposes. The Water Act provides for the management of the impacts on underground water caused by the exercise of underground water rights by resource tenure holders, which are regulated under the P&G Act. The Act also outlines the requirements for make good agreements, associated with the impacts to underground water. Under this regulatory framework, where there is an area of concentrated development, a cumulative management area (CMA) can be declared. The Project is located within the Surat CMA, which was declared in 2011.
Environmental Offsets Act 2014 (and Regulation)	Provides the framework for offsetting significant residual impacts to MSES. The *Environmental Offsets Act 2014* requires development proponents to provide offsets for significant residual impact to MSES, including endangered, of concern and watercourse regional ecosystems, connectivity areas and protected wildlife

Legislation, Codes and Policy	Relevance
Queensland Environmental Offsets Policy 2022 Version 1.12 (QEOP)	habitat. Potential impacts to each MSES have been assessed in accordance with the Queensland Environmental Offsets Policy Significant Residual Impact Guideline (DEHP 2014). A State Environmental Offset Strategy has been developed and will be implemented in accordance with the *Environmental Offsets Act 2014* and the requirements of the existing EA conditions. The policy includes a system for reporting to the Queensland Government on offset arrangements; their management; how offset values are met and maintained; and the offset reconciliation process. Senex will enter into an environmental offset agreement with the relevant Queensland Government Department. Senex will comply with any identified offset requirements under *Environmental Offsets Act 2014*.
Aboriginal Cultural Heritage Act 2003	The *Aboriginal Cultural Heritage Act 2003* provides recognition, protection and conservation of cultural heritage in Queensland and outlines duty of care obligations for issues compromising Indigenous heritage. Senex engages with the relevant Indigenous Stakeholders and will continue operate under the existing agreements with these Indigenous Stakeholders, in order to protect Aboriginal cultural heritage.
Biosecurity Act 2014	The primary pest, disease and contaminant management legislation that provides comprehensive biosecurity measures to safeguard Queensland's economy, agriculture and tourism industries. Under the *Biosecurity Act 2014*, the Project will be required to take all reasonable steps to prevent or minimise each biosecurity risk, minimise the likelihood of causing a biosecurity event and prevent or minimise the harmful effects a risk could have and not do anything that might make any harmful effects worse. The Project will apply corporate procedures and plans to minimise biosecurity risks.
Nature Conservation Act 1992	Regulates an activity which may interfere with protected wildlife (native plants and animals) including requiring permits and species management plans. The Project will apply for any permits and approvals that are necessary for the development as proposed and confirmed through survey.
Regional Planning Interests Act 2014	Provides for the effective management of the coexistence between CSG activities and agricultural interests. Applications for dealings under the *Regional Planning Interests Act 2014* will be undertaken as necessary.
Fisheries Act 1994	Provides for the use, conservation and enhancement of the community's fisheries resources and fish habitats. The Project may require permits where works are considered to be constructing or raising waterway barrier works. The Project will apply for permits that are necessary for the development when confirmed by survey.
Vegetation Management Act 1999	The *Vegetation Management Act 1999* is the regulatory framework for the management of vegetation using the Regional Ecosystem classification system. It regulates the broad scale clearing of vegetation, with the intent of conserving remnant vegetation, preventing the loss of biodiversity, maintaining ecological processes and allowing for sustainable use. There are clearing exemptions for some work activities.

3 HABITAT ASSESSMENTS

A detailed Ecological Assessment Report and Significant Impact Assessment was prepared by Environmental Resources Management Australia Pty Ltd (ERM) to support referral of the Project. Following the controlled action decision and RFI, the Ecological Assessment Report (Attachment C) and Ecology Significant Impact Assessment Report (Attachment G) were updated to address the additional information requirements. Section 3.3 below addresses each information requirement and identifies where these matters are addressed in the Ecological Assessment Report (Attachment C) and Ecology Significant Impact Assessment Report (Attachment G).

The reports were prepared with reference to the 'Significant impact guidelines 1.1 – Matters of National Environmental Significance' (DotE, 2013a), relevant Commonwealth Approved Conservation Advice and the Species Profile and Threat Database (SPRAT).

3.1 General Assessment Requirements

The RFI provided background information on requirements for habitat assessments. The Ecology Assessment Report (Attachment C) has been amended in consideration of these requirements, as outlined in the following sections.

Background
"Based on the information provided in your referral, and other available information, the department considers that the listed threatened species and communities identified below may be significantly impacted by the proposed action.
It is the proponent's responsibility to be aware of any changes to the distribution of listed threatened species and ecological communities, and information available in the Species Profile and Threats (SPRAT) Database. The proponent must ensure that a recent Protected Matters Search Tool (PMST) report has been generated and considered before finalising the draft preliminary documentation."

The Ecology Assessment Report (Attachment C) includes a current report from the EPBC PMST as Appendix A. The PMST dated 11 December 2023, identifies the listed threatened species and TECs considered in this PD.

The ecology assessment has been completed in accordance with current Commonwealth Approved Conservation Advice or SPRAT. References to the guidance considered in the species-specific assessment of likelihood and potential for significant impacts are included in Appendix B (Likelihood of Occurrence) of the Ecology Assessment Report (Attachment C) and Ecology Significant Impact Assessment Report (Attachment G).

"Habitat assessments must be informed by desktop and field surveys (in accordance with departmental guidelines or as defined by evidence-based best practice), and with reference to relevant departmental documents (e.g. approved Conservation Advices, Recovery Plans, draft referral guidelines and Listing Advices, and the SPRAT Database), including published research and other relevant sources.
The department does not accept the consideration of only Queensland Regional Ecosystem (RE) mapping to determine habitat for listed threatened species.
Listed threatened species includes, but is not limited to:

- Australian Painted Snipe (*Rostratula australis*) – Endangered;
- Belson's Panic (*Homopholis belsonii*) – Vulnerable;
- Bluegrass (*Dichanthium setosum*) – Vulnerable;
- Brigalow Woodland Snail (*Adclarkia cameroni*) – Endangered;
- *Calytrix gurulmundensis* – Vulnerable;
- Collared Delma (*Delma torquata*) – Vulnerable;
- Corben's Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable;
- Curly-bark Wattle (*Acacia curranii*) – Vulnerable;
- Diamond Firetail (*Stagonopleura guttata)* – Vulnerable;
- Dulacca Woodland Snail (*Adclarkia dulacca*) – Endangered;
- Dunmall's Snake (*Furina dunmalli*) – Vulnerable;
- Greater Glider (central and southern) (*Petauroides volans*) – Endangered;
- Grey Snake (*Hemiaspis damelii*) – Endangered;
- Koala (*Phascolarctos cinereus*) (combined populations of Qld, NSW, and the ACT) – Endangered;
- Northern Quoll (*Dasyurus hallucatus*) – Endangered;
- Ooline (*Cadellia pentastylis*) – Vulnerable;

- Painted Honeyeater (*Grantiella picta*) – Vulnerable;
- Slender Tylophora (*Vincetoxicum forsteri*) – Endangered;
- South-eastern Glossy Black-cockatoo (*Calyptorhynchus lathami lathami*) – Vulnerable;
- Squatter Pigeon (southern) (*Geophaps scripta scripta*) – Vulnerable;
- Yakka Skink (*Egernia rugosa*) – Vulnerable;
- Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*) – Vulnerable;
- Brigalow (*Acacia harpophylla* dominant and co-dominant) – Endangered; and
- Poplar Box Grassy Woodland on Alluvial Plains – Endangered.

For the listed threatened species and TECs, the Ecology Assessment Report (Attachment C) details the desktop and field survey methods used to assess habitats in accordance with departmental guidelines, and with reference to relevant departmental documents, including approved Conservation Advices, Recovery Plans, draft referral guidelines and Listing Advices, SPRAT Database, published research and other specialist opinion. Habitat was determined considering context including landscape features, condition, breeding and roosting habitat features, foraging sources, microhabitat presence, wetland presence and signs of threatened species. The assessment methodology is detailed in Section 3 of the Ecology Assessment Report (Attachment C).

The extent, classification and condition of ground-truthed vegetation communities within the FDA was validated in accordance with Methodology for Surveying and Mapping Regional Ecosystems and Vegetation Communities in Queensland (Nelder, et al., 2022).

3.2 Summary of Assessment Findings

The Ecology Assessment Report identified a total of 31 MNES threatened species or communities as known, likely or potentially occurring within the FDA based on desktop assessment and field validation surveys. This included two TECs, three threatened flora species, 20 threatened fauna species and seven migratory species.

The threatened species and TECs which are known to occur within the FDA include:

- Brigalow (*Acacia harpophylla* dominant and codominant);
- Poplar Box Grassy Woodland on Alluvial Plains;
- Ooline (*Cadellia pentastylis*);
- Greater Glider (*Petauroides volans*); and
- White-throated Needletail (*Hirundapus caudacutus*).

The threatened species and migratory species which are likely to occur within the FDA include:

- Koala (*Phascolarctos cinereus*);
- South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*);
- Dulacca Woodland Snail (*Adclarkia dulacca*); and
- Fork-tailed Swift (*Apus pacificus*).

The threatened species and migratory species which have the potential to occur within the FDA include:

- Belson's Panic (*Homopholis belsonii*);
- Slender Tylophora (*Vincetoxicum forsteri*);
- Australian Painted Snipe (*Rostratula australis*);
- Brown Treecreeper (*Climacteris picumnus victoriae*);
- Collared Delma (*Delma torquata*);
- Corben's Long-eared Bat (*Nyctophilus corbeni*);
- Diamond Firetail (*Stagonopleura guttata*);

- Dunmall's Snake (*Furina dunmalli*);
- Five-clawed Worm-skink (*Anomalopus mackayi*);
- Grey Snake (*Hemiaspis damelii*);
- Northern Quoll (*Dasyurus hallucatus*);
- Painted Honeyeater (*Grantiella picta*);
- Southern Whiteface (*Aphelocephala leucopsis*);
- Squatter Pigeon (southern) (*Geophaps scripta scripta*);
- Yakka Skink (*Egernia rugosa*);
- Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*);
- Satin Flycatcher (*Myiagra cyanoleuca*);
- Rufous Fantail (*Rhipidura rufifrons*);
- Common Sandpiper (*Actitis hypoleucos*);
- Sharp-tailed Sandpiper (*Calidris acuminata*);
- Latham's Snipe (*Gallinago hardwickii*); and
- Oriental Cuckoo (*Cuculus optatus*).

A significant impact assessment for these known, likely and potentially occurring MNES threatened species, migratory species and TECs was completed in the Ecology Significant Impact Assessment Report (Attachment G). The significance of impacts to MNES was determined against the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (SIG1.1) (DoE, 2013), assuming the controls and mitigation measures proposed in Section 6 of the Ecology Assessment Report (Attachment C), the Environmental Management Plan (Attachment E) and the Significant Species Management Plan (Attachment H) are implemented.

Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). The significant impact assessments concluded that, with the implementation of avoidance and mitigation measures, the Project is unlikely to result in a significant impact to any of the known, likely, or potentially occurring MNES threatened species or MNES TECs. Accordingly, offsets are not required in accordance with the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012).

3.3 Additional Information Requested

3.3.1 Species general Information

RFI 2.1.1

Provide a habitat assessment for relevant listed threatened species and communities.

Please note an assessment must be undertaken regardless of whether the species was recorded in the project area or not.

RFI 2.1.1 Response:

Section 4.2, 4.3 and 4.4 of the Ecology Assessment Report (Attachment C) includes additional information on the vegetation communities and habitat for relevant threatened species and communities. This also includes updated information on low ecological value land within the FDA which habitat for some listed MNES threatened species and TECs.

A summary of this information is provided below.

A habitat assessment has been undertaken with the methodology discussed in Section 3.5, 4.2 and 4.3 of the Ecology Assessment Report (Attachment C). A summary of habitats for the listed threatened and/or migratory species and TECs known or likely to occur is included in Section 4.4 of the Ecology Assessment Report (Attachment C). Section 4.4 of the Ecology Assessment Report (Attachment C) discusses potential habitat for listed species with the potential to occur. These sections and habitat mapping are based on ground-truthed vegetation communities and defined habitat preferences and ground conditions as observed from field surveys.

An assessment of the habitat values across the FDA was undertaken based on field observations and is provided below. The following twelve fauna habitat types were observed within the FDA, which are described in Section 4.2 and mapped in Figure 4-1 of the Ecological Assessment Report (Attachment C):

- **Acacia woodlands dominated by Brigalow (*Acacia harpophylla*)** – The Project Area contains 209.5 ha of this habitat type. This habitat type corresponds to areas with the floristic structural characteristics of the following REs:
  - RE 11.3.1 – *Acacia harpophylla* and/or *Casuarina cristata* open forest, with or without scattered emergent *Eucalyptus spp*;
  - RE 11.9.5 – *Acacia harpophylla* and/or *Casuarina cristata* open forest to woodland on fine-grained sedimentary rocks; and
  - RE 11.9.5a – *Acacia harpophylla* predominates and forms a continuous canopy (10-18 m high). Other tree species such as *Eucalyptus populnea*, *Casuarina cristata*, *Cadellia pentastyl*is and *Brachychiton spp*.
- **Callitris and Eucalypt dominated woodlands –** The Project Area contains 14.2 ha of this habitat type. This habitat type corresponds to areas with the floristic structural characteristics of RE 11.3.19 – *Callitris glaucophylla, Corymbia spp.* and/or *Eucalyptus melanophloia* woodland on Cainozoic alluvial plains;
- **Eucalypt dominated woodlands mainly of *Eucalyptus crebra*, *E. populnea* and *E. melanophloia*** – The Project Area contains 292.6 ha of this habitat type. This habitat typecorresponds to the floristic structural characteristics of numerous REs that are dominated by *Eucalyptus populnea*, *E. tereticornis* and/or *E. crebra* (and are often accompanied by *Callitris glaucophylla*), including RE 11.3.2, 11.3.4, 11.3.17, 11.3.39, 11.5.1, 11.5.5, 11.9.2, 11.9.7, 11.10.7 and 11.10.11;

- **Riparian and wetland Eucalypt woodlands dominated by *E. tereticornis*** - The Project Area contains 364.0 ha of this habitat type. This habitat type corresponds to areas with the floristic structural characteristics of the following REs:
  - RE 11.3.25 –- *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines; and
  - RE 11.3.27f – Freshwater wetlands with *Eucalyptus coolabah* and/or *E. tereticornis* open woodland to woodland fringing swamps.
- **Eucalypt open forest dominated by *E. populnea*** – The Project Area contains 29.5 ha of this habitat type. This habitat type corresponds to areas with the floristic structural characteristics of RE 11.9.10 – *Eucalyptus populnea* open forest with a secondary tree layer of *Acacia harpophylla* and sometimes Casuarina cristata on fine-grained sedimentary rocks.

There are other areas of low ecological value land which exists in the FDA. These include:

- **Cleared exotic pasture used for grazing** – Is the predominant low ecological value land found throughout the Project Area comprising 7,924.0 ha, with dominant exotic species including Buffel Grass (*Cenchrus ciliaris*) and Sabi Grass (*Urochloa mosambicensis*) and corresponds to all areas that have been cleared for agricultural grazing, throughout the Project Area;
- **Irrigated pastures and cropping** – The Project Area contains 554.4 ha. This low ecological value land type features all irrigated pastures and cropping that are primarily used for agricultural purposes. These pastures are predominantly located in the north-eastern portion of the Project Area, as well as one defined area in the centre of the Project Area;
- **Acacia regrowth** – The Project Area contains 14.5 ha of this low ecological value land. This low ecological value land corresponds to sapling or young juvenile Acacia regrowth vegetation. This area contain low habitat values, providing habitat to some of the MNES species that are considered known, likely or with the potential to occur in the Project Area. Due to the low ecological values in these area, only some MNES species are potentially present in these areas;
- **Eucalypt regrowth** – The Project Area contains 35.6 ha of this low ecological value land. This low ecological value land corresponds to sapling or young juvenile Eucalypt regrowth vegetation. This area contains low habitat values, providing habitat to some of the MNES species that are considered known, likely or with the potential to occur in the Project Area. Due to the low ecological values in these area, only some MNES species are potentially present in these areas;
- **Acacia and Eucalypt regrowth** – The Project Area contains 280.1 ha of this low ecological value land. This low ecological value land corresponds to a combination of immature Acacia regrowth and immature Eucalypt regrowth as described above;
- **Eucalypt and acacia paddock trees** – The Project Area contains 30.9 ha of this low ecological value land. These areas are defined by areas of isolated, scattered and small groups of paddock trees, with a combination of mature eucalypts and *Acacia harpophylla* (Brigalow) trees with separation between each tree (or small group of 2-3 trees) ranging from 40-90 m; and
- **Existing CSG and agricultural infrastructure –** The Project Area contains 22.8 ha of this low ecological value land.

The aquatic ecology and habitat values are described in Section 4.3 of the Ecological Assessment Report (Attachment C) and includes the following habitat types:

- Woleebee Creek Aquatic Habitat; and
- Wandoan Creek Aquatic Habitat.

RFI 2.1.2

Identify and describe known historical records of the listed threatened species and ecological communities in the broader region. All known records must be supported by:

- *An appropriate source (i.e. Commonwealth and State databases, published research, publicly available survey reports, etc.);*
- *The year of the record; and*
- *A description of the habitat in which the record was identified.*

RFI 2.1.2 Response:

The nearest historical records of listed threatened species and TECs that desktop searches indicated may be of relevance to the FDA are provided in Section 3.2 of the Ecology Assessment Report (Attachment C). Not all species had historical records within the broader reaches of the FDA (within 10 km buffer around the FDA). All flora and fauna species listed in the likelihood of occurrence table were included in this desktop review. The species were researched in the Atlas of Living Australia (ALA) database, with a 10 km buffer of the FDA. Any species occurring within the FDA, or the buffer area were listed, with spatial record identification provided in the respective figures. Where the species was not identified within the buffer area, this was noted and the nearest record to the FDA was listed, irrespective of the date of record. The information gathered from this desktop review for all species included:

- The occurrence ID number;
- The date of the record;
- Distance from the FDA, including direction; and
- A habitat description of where the record was found.

Of the 55 PMST listed species and TECs, the following 13 species had publicly listed records within 10 km of the Project Area:

- *Acacia harpophylla* (Brigalow, dominant and codominant);
- Poplar Box Grassy Woodland on Alluvial Plains;
- *Calidris ferruginea* (Curlew Sandpiper);
- *Calyptorhynchus lathami lathami* (South-eastern Glossy Black-cockatoo);
- *Hirundapus caudacutus* (White-throated Needletail);
- *Rhipidura rufifrons* (Rufous Fantail);
- *Acacia curranii* (Curly-bark Wattle);
- *Cadellia pentastylis* (Ooline);
- *Calytrix gurulmundensis*;
- *Dichanthium setosum* (Bluegrass);
- Homopholis belsonii (Belson's Panic);
- *Adclarkia dulacca* (Dulacca Woodland Snail); and
- *Petauroides volans* (Greater Glider (central and southern)).

RFI 2.1.3

Include an assessment of the adequacy of any surveys undertaken (including survey effort and timing). In particular, the extent to which these surveys were appropriate for the listed threatened species or community and undertaken in accordance with relevant departmental survey guidelines.

RFI 2.1.3 Response:

Detailed assessment methodology is presented in Section 3 of the Ecology Assessment Report (Attachment C). Section 3.3.2 and Section 3.3.3 of the Ecology Assessment Report (Attachment C) describe the survey events conducted in 2022 and 2023, being:

- BOOBOOK Ecological Consulting: Targeted vehicle based and foot traverses of the FDA, over the periods of:
  - 14 – 18 March 2022,
  - 22 – 25 March 2022;
  - 30 April – 5 May 2022,
  - 9 – 13 June 2022.
- Freshwater Ecology: Aquatic field ecological surveys undertaken over an eight-day period (14 – 21 March 2022; and
- Attexo Group: Targeted Ooline and threatened flora surveys over a four-day period (31 March – 3 February 2023).

Desktop searches and subsequent baseline ecology surveys were performed prior to listing events and distribution changes for some species.

An adequacy review of surveys has been prepared and provided in Section 3.3.4 of the Ecological Assessment Report (Attachment C). As per the adequacy review of surveys, the surveys were determined to be suitable for completing impact assessments and identifying the likelihood of occurrence of MNES species and communities. The surveys completed were adequate for the purposes of determining likely and possible presence of MNES species and TECs given that MNES species are considered to be present wherever suitable habitat is present. All areas of suitable MNES habitat have been considered MNES habitat and will be avoided (with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land)). The surveys were not intended to, and have not been used to confirm absence of any species. Additional ecological assessments will be completed during pre-clearance surveys in accordance with the Constraints Protocol (Attachment B) to ensure no significant impacts to MNES occur.

RFI 2.1.4

Attach all relevant ecological surveys referenced in the referral and preliminary documentation as supporting documents to the preliminary documentation.

RFI 2.1.4 Response:

All relevant ecological survey reports listed below have been attached to the Ecological Assessment Report (Attachment C):

- BOOBOOK Ecological Consulting Pty Ltd (BOOBOOK) completing the terrestrial component (BOOBOOK, 2022) (Appendix C of the Ecological Assessment Report (Attachment C)).
- Freshwater Ecology Consulting Pty Ltd (Freshwater Ecology) conducting the aquatic component (Freshwater Ecology, 2022) (Appendix D of the Ecological Assessment Report (Attachment C)).
- Attexo Group completing targeted Ooline and threatened flora surveys (Attexo Group 2023) (Appendix E of the Ecological Assessment Report (Attachment C).

RFI 2.1.5

Provide detailed mapping of suitable habitat (within, adjacent to and downstream of the project site, where relevant) for all listed threatened species and communities, which:

- *is specific to the habitat assessment undertaken for each listed threatened species and ecological community (i.e. does not only illustrate relevant Queensland Regional Ecosystems);*
- *includes an overlay of the project disturbance footprint;*
- *includes known records of individuals derived from desktop analysis and field surveys; and*
- *is provided separately as Attachments in JPEG format.*

RFI 2.1.5 Response:

A review of suitable habitat within the Project Area for listed MNES threatened species and TECs was undertaken. Figures 4-3 to Figure 4-14 of the Ecological Assessment Report (Attachment C) includes habitat mapping for listed MNES threatened species and TECs.

A summary of this habitat mapping information is provided and additional information on downstream habitat has also been provided in the following sections.

The Ecological Assessment Report (Attachment C) contains habitat mapping for 23 threatened flora and fauna species with a likelihood to occur (i.e., known, likely or potential). This mapping further includes the known locations for species recorded within FDA or within 10 km of the FDA, based on field sightings and publicly available data. Habitat mapping has been prepared for two TECs, one flora and four fauna which are known or likely to occur; and two flora and 14 fauna species with a potential to occur.

Habitat has not been mapped for the white-throated needletail (*Hirundapus caudacutus)* and fork-tailed swift (*Apus pacificus*) as both species are almost exclusively aerial.

The likelihood of occurrence assessment was based on a review of species' distributions and habitat requirements, literature review of recent papers, historical records for the region, and the results of habitat assessments and field surveys conducted within the FDA.

The Project disturbance footprint is not yet available and was therefore unable to be included on the habitat mapping.

The distribution of predicted habitat was mapped based on criteria detailed in Section 3.5 and Section 4 of the Ecological Assessment Report (Attachment C), differentiating areas of habitat into habitat critical to the survival of the species and potential breeding, foraging and dispersal habitat, where relevant.

The criteria used for each species are informed by the habitat requirements and definitions specified in the Commonwealth listing advice/conservation advice, SPRAT database, recovery plans or referral guidelines, where available, as well as Queensland DES Wildlife Online (WO) historical records. For most species, predicted habitat mapping was underpinned by REs considered ecologically equivalent to the Commonwealth habitat descriptions relevant to conservation significant species. REs represent a high-resolution spatial representation of ecosystem composition, structure and landscape position (e.g. landform, topography), that is conducive to aligning to species-specific habitat requirements. Where relevant, (field-verified) REs as the base unit for mapping were adapted to reflect variations in on site conditions identified via field surveys (for example, inclusion of non-REs (e.g. non-remnant) vegetation as a habitat criterion for Koala). The relationship between Commonwealth habitat criteria and the criteria used to map habitat for each species has been detailed in the relevant species sections in Section 3.5 and Section 4 of the Ecological Assessment Report (Attachment C).

Of the remaining MNES species identified in the desktop assessment, it was concluded that six EPBC Act migratory species have the 'potential to occur' in the FDA. Those species determined to have a 'potential to occur' include species where the distribution incorporates the FDA but no suitable habitat, or habitat lacking essential species' resources is present, or the species has not been recorded in the desktop search extent. This includes transient or vagrant species that have a reduced likelihood of occurrence but cannot be entirely discounted. Due to their reduced potential to occur, the impact to these 'potential to occur' migratory species arising from the Project is considered minimal or negligible and as such, habitat has not been mapped for these 'potential to occur' migratory species. Additionally, detailed assessments of impacts against the Commonwealth significant impact guidelines are not considered necessary for these 'potential to occur' migratory species, given impacts arising are unlikely to have any population/metapopulation-level implications, nor reduce access to resources. The migratory species with the 'potential to occur' are:

- Satin flycatcher (*Myiagra cyanoleuca*);
- Rufous fantail (*Rhipidura rufifrons*);
- Common sandpiper (Actitis hypoleucos);
- Sharp-tailed sandpiper (*Calidris acuminata*);
- Latham's snipe (*Gallinago hardwickii*); and
- Oriental cuckoo (*Cuculus optatus*).

Detailed habitat mapping for the following MNES threatened species and TECs which are known, likely or potential to occur has been included in Figures 4-2 to Figure 4-13 in the Ecological Assessment Report (Attachment C):

- Brigalow (*Acacia harpophylla* dominant and codominant);
- Poplar box grassy woodland on alluvial plains;
- Ooline (*Cadellia pentastylis*);
- Greater glider (southern and central) (*Petauroides Volans*);
- South-eastern glossy black-cockatoo (*Calyptorhynchus lathami lathami*);
- Koala (*Phascolarctos cinereus*);
- Dulacca woodland snail (*Adclarkia dulacca*);
- Slender tylophora (*Vincetoxicum forsteri*);
- Belson's panic (*Homopholis belsonii*);
- Southern whiteface (*Aphelocephala leucopsis*);
- Brown treecreeper (south-eastern) (*Climacteris picumnus victoriae*);
- Southern squatter pigeon (*Geophaps scripta scripta*);

- Painted honeyeater (*Grantiella picta*);
- Australian painted snipe (*Rostratula australis*);
- Diamond firetail (*Stagonopleura guttata*);
- Northern quoll (*Dasyurus hallucatus*);
- Corben's long-eared bat (*Nyctophilus corbeni*);
- Yellow-bellied glider (south-eastern) (*Petaurus australis australis*);
- Five-clawed worm-skink (*Anomalopus mackayi*);
- Yakka skink (*Egernia rugosa*);
- Dunmall's snake (*Furina dunmalli*);
- Collared delma (*Delma torquata*); and
- Grey snake (*Hemiaspis damelii*).

The broad habitat areas and low ecological value land have been assessed for their potential habitat suitability for MNES listed threatened species. By applying the habitat classification and mapping rules implemented in the Ecological Assessment Report (Attachment C) a summary of MNES habitat for listed TECs and threatened species within the FDA is provided in Table 3-1.

Table 3-1 MNES Listed Threatened Species Habitat in FDA

Broad Habitat Type or Low Ecological Value Land Type	MNES listed threatened species and communities
Acacia woodlands dominated by Brigalow (*Acacia harpophylla*) 209.5 ha	■ Belson's Panic ■ Collared Delma ■ Corben's Long-eared Bat ■ Diamond Firetail ■ Dulacca Woodland Snail ■ Dunmall's Snake ■ Fork-tailed Swift (aerial only) ■ Grey Snake ■ Koala ■ Northern Quoll ■ Ooline ■ Oriental Cuckoo ■ Painted Honeyeater ■ South-eastern Glossy-black Cockatoo ■ Southern Squatter Pigeon (dispersal habitat only when within 100 m of mapped breeding and foraging habitat) ■ Southern Whiteface ■ White-throated Needletail (aerial only) ■ Yakka Skink
Callitris and Eucalypt dominated woodlands 14.2 ha	■ Brown Treecreeper ■ Collared Delma ■ Corben's Long-eared Bat ■ Diamond Firetail ■ Dulacca Woodland Snail ■ Dunmall's Snake ■ Fork-tailed Swift (aerial only) ■ Greater Glider (southern and central) ■ Koala ■ Northern Quoll ■ Oriental Cuckoo ■ South-eastern Glossy-black Cockatoo ■ Southern Squatter Pigeon ■ Southern Whiteface ■ White-throated Needletail (aerial only) ■ Yakka Skink

Broad Habitat Type or Low Ecological Value Land Type	MNES listed threatened species and communities
Eucalypt dominated woodlands mainly of *Eucalyptus crebra, E. populnea and E. melanophloia* 292.6 ha	■ Belson's Panic ■ Brown Treecreeper ■ Collared Delma ■ Corben's Long-eared Bat ■ Diamond Firetail ■ Dulacca Woodland Snail ■ Dunmall's Snake ■ Fork-tailed Swift (aerial only) ■ Greater Glider (southern and central) ■ Grey Snake ■ Koala ■ Northern Quoll ■ Ooline ■ Oriental Cuckoo ■ Painted Honeyeater ■ Slender Tylophora ■ South-eastern Glossy-black Cockatoo ■ Southern Squatter Pigeon ■ Southern Whiteface ■ White-throated Needletail (aerial only) ■ Yakka Skink ■ Yellow-bellied Glider (south-eastern)
Riparian and wetland Eucalypt woodlands dominated by *E. tereticornis* – 364.0 ha	■ Australian Painted Snipe ■ Brown Treecreeper ■ Collared Delma ■ Common Sandpiper ■ Corben's Long-eared Bat ■ Diamond Firetail ■ Dunmall's Snake ■ Fork-tailed Swift (aerial only) ■ Greater Glider (southern and central) ■ Grey Snake ■ Five-clawed worm-skink ■ Koala ■ Latham's Snipe ■ Northern Quoll ■ Ooline ■ Oriental Cuckoo ■ South-eastern Glossy-black Cockatoo ■ Rufous Fantail ■ Satin Flycatcher ■ Sharp-tailed Sandpiper ■ Southern Squatter Pigeon ■ Southern Whiteface ■ White-throated Needletail (aerial only) ■ Yellow-bellied Glider (south-eastern)
Eucalypt open forest dominated by *E. populnea* 29.5 ha	■ Belson's Panic ■ Brown Treecreeper ■ Collared Delma ■ Corben's Long-eared Bat ■ Diamond Firetail ■ Dulacca Woodland Snail Koala ■ Dunmall's Snake ■ Fork-tailed Swift (aerial only) ■ Greater Glider (southern and central) ■ Grey Snake ■ Northern Quoll ■ Ooline

Broad Habitat Type or Low Ecological Value Land Type	MNES listed threatened species and communities
	■ Oriental Cuckoo ■ Painted Honeyeater ■ South-eastern Glossy-black Cockatoo ■ Southern Squatter Pigeon ■ Southern Whiteface ■ White-throated Needletail (aerial only) ■ Yakka Skink
Cleared exotic pasture used for grazing 7,924 ha	■ Fork-tailed Swift (aerial only) ■ Ooline ■ Koala (dispersal habitat only) ■ White-throated Needletail (aerial only)
Irrigated pastures and cropping 554.4 ha	■ Fork-tailed Swift (aerial only) ■ White-throated Needletail (aerial only) ■ Koala (dispersal habitat only)
Acacia regrowth 14.5 ha	■ Glossy Black-cockatoo (south-eastern) ■ Diamond Firetail ■ Dulcca Woodland Snail ■ Grey Snake ■ Fork-tailed Swift (aerial only) ■ White-throated Needletail (aerial only) ■ Koala (dispersal habitat) ■ Southern Squatter Pigeon (dispersal habitat only when within 100 m of mapped breeding and foraging habitat); however, none of the current areas of Acacia regrowth are currently within 100 m of the Southern Squatter Pigeon breeding and foraging habitat.
Eucalypt regrowth 35.6 ha	■ Fork-tailed Swift (aerial only) ■ White-throated Needletail (aerial only) ■ Koala (dispersal habitat) ■ Glossy black-cockatoo (foraging habitat) ■ Diamond Firetail (foraging habitat) ■ Dulacca Woodland Snail ■ Grey Snake ■ Southern Squatter Pigeon (dispersal habitat only when within 100 m of mapped breeding and foraging habitat)
Acacia and Eucalypt regrowth 280.1 ha	■ Fork-tailed Swift (aerial only) ■ White-throated Needletail (aerial only) ■ Koala (dispersal habitat) ■ Glossy black-cockatoo (foraging habitat) ■ Diamond Firetail (foraging habitat) ■ Dulacca Woodland Snail ■ Grey Snake ■ Southern Squatter Pigeon (dispersal habitat only when within 100 m of mapped breeding and foraging habitat)
Eucalypt and acacia paddock trees 30.9 ha	■ Fork-tailed Swift (aerial only) ■ White-throated Needletail (aerial only) ■ Koala (dispersal habitat) ■ Glossy black-cockatoo (foraging habitat) ■ Diamond Firetail (roosting habitat) (The presence of isolated paddock trees in areas of cleared, managed or low grass and shrub cover are unlikely to provide habitat for Diamond Firetail). ■ Dulacca Woodland Snail ■ Grey Snake ■ Southern Squatter Pigeon (dispersal habitat only when within 100 m of mapped breeding and foraging habitat)
Existing CSG and agricultural infrastructure 22.8 ha	■ Nil

Downstream Habitat Mapping

The Office of Groundwater Impact Assessment's (OGIAs) groundwater modelling of the Project has predicted that there is one location outside of the Project Area where > 0.2 m groundwater drawdown could possibly occur (at the 95th percentile) in an aquifer that may potentially be hydraulically connected with the alluvium and potential Groundwater Dependent Ecosystems (GDEs) as a result of the Project. This external 'Potential GDE impact area' is approximately 7.2 ha, is downstream from the Project Area on Wandoan Creek and is illustrated in Figure 3-1. If > 0.2 m groundwater drawdown did occur in this Upper Springbok Formation outcropping area, and if vegetation in this area was dependant on groundwater that was hydraulically connected with the Upper Springbok Formation, such drawdown would have the potential to impact any MNES in this area. Although the groundwater impact assessment provided in the EPBC Water Resource Impact Assessment (Attachment D), found that a significant impact on GDEs is unlikely as a result of the Project, vegetation community, TECs and MNES habitat mapping has been extended to this area in order to satisfy the RFI requirement. This habitat mapping has been prepared through extrapolation of field survey data within the Project Area coupled with desktop analysis including assessment of 2023 high resolution aerial imagery.

There are two broad vegetation communities mapped within this area of potential groundwater drawdown, including 2.2 ha of riparian eucalypt woodland/open forest and 0.4 ha of Poplar Box (*Eucalyptus populnea*) woodland. Both of these vegetation communities are located in riparian zones or the adjoining alluvial plain and have the potential to be alluvial GDE, reliant on seasonal surface water and groundwater sources of water. The riparian vegetation is associated with Wandoan Creek, while the Poplar Box woodland is located in a thin, linear strip within an otherwise generally cleared landscape.

The area mapped and classified as Poplar Box Woodland on Figure 3-1 forms a contiguous patch with other areas of the same vegetation community and together these areas meet the key diagnostic criteria and condition thresholds of the endangered Poplar Box Woodland on Alluvial Plains TEC.

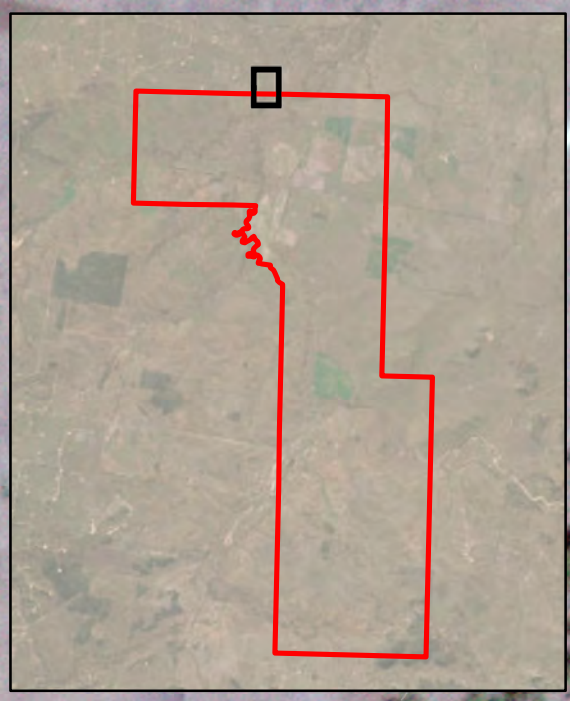
There is also low ecological value land mapped within this area, including 0.06 ha of Eucalypt Regrowth. This area provides habitat for the Glossy black-cockatoo and Diamond firetail.

These vegetation communities have been assessed for potential habitat suitability for MNES listed threatened species, applying the habitat classification and mapping rules implemented in the Ecological Assessment Report (Attachment C), with a summary of MNES habitat within this 'Potential GDE impact area' provided in Table 3-2.

Table 3-2 MNES Listed Threatened Species Habitat in Downstream 'Potential GDE Impact Area'

Broad Habitat Type or Low Ecological Value Land Type	MNES listed threatened species and communities
Riparian and wetland Eucalypt woodlands dominated by *E. tereticornis*. 2.2 ha	■ Koala ■ Greater Glider ■ Glossy Black-cockatoo ■ Southern Whiteface ■ Diamond Firetail
Poplar Box Grassy Woodland on Alluvial Plains 0.4 ha	■ Poplar Box Grassy Woodland on Alluvial Plains TEC ■ Koala ■ Greater Glider ■ Southern Whiteface ■ Diamond Firetail

Broad Habitat Type or Low Ecological Value Land Type	MNES listed threatened species and communities
	■ Brown Treecreeper ■ Belson's Panic
Eucalypt regrowth 0.06 ha	■ Glossy Black-cockatoo ■ Diamond Firetail



3, 5

1, 2, 3, 4, 5

1, 2, 4, 5, 6, 7

JACKSON WANDOAN ROAD

Legend

- Project Area ('Field Development Area' in the Preliminary Documentation)
- Potential GDE impact area
- Poplar Box grassy woodland on alluvial plains (TEC) - 0.35ha
- Riparian eucalypt woodland/open forest - 2.21ha
- Eucalypt regrowth
- Cleared exotic pasture used for grazing
- Highway
- Road
- Track/Path

Source:
QLD Spatial Database 2022
ESRI World Imagery 2021

ID	Habitat
1	Koala
2	Greater Glider
3	Glossy Black-cockatoo
4	Southern Whiteface
5	Diamond Firetail
6	Brown Treecreeper
7	Belson's Panic

Vegetation Community and Habitat Mapping of Downstream Areas

F3-1

Drawing No: 0639876_EAR_G026_R3.mxd
Date: 19/03/2024 Drawing Size: A4
Drawn By: VN Reviewed By: MD
Coordinate System: GDA2020 MGA Zone 55
0 50 100m
N

Ecological Assessment Report

Client: Senex Assets Pty Ltd

ERM

4 CONSTRAINTS PROTOCOL

4.1 Protocol Summary

An Environmental Constraints Protocol for Planning and Field Development (Constraints Protocol) was prepared to support the referral of the Project. Following the controlled action decision and RFI, the Constraints Protocol (Attachment B) was updated to address specific additional information requirements. Section 4.2 provides a summary of the Constraints Protocol and Section 4.3 addresses each information requirement and identified where in Attachment B these matters are addressed.

4.2 General Assessment Requirements

The RFI included general assessment requirements relating to preparation of an Environmental Constraints Planning and Field Development Protocol. The Environmental Constraints Planning and Field Development Protocol, referred to as the Constraints Protocol (Attachment B), has been prepared in accordance with these requirements, as outlined below.

Background

The PD must include a detailed Environmental constraints planning and field development protocol (constraints protocol) that outlines the process for ensuring the siting of gas field infrastructure involves: • consideration of matters of national environmental significance (MNES) present;

- *thorough investigation of avoidance and mitigation measures;*
- *where avoidance and mitigation are not possible, the consideration of necessary environmental offsets (refer to Section 5); and*
- *consideration of rehabilitation activities.*

The constraints protocol must include constraints categories for MNES with consideration of their values (e.g. listing status), including proposed constraints, permitted activities and management measures under each category.

The Constraints Protocol (Attachment B) outlines the processes to be implemented to ensure the Project systematically identifies, assesses, avoids, minimises and manages potential impacts on MNES associated with development of any new petroleum activity within the Project Area. The final location of infrastructure will be determined through the application of development constraints such as cultural heritage, landholder considerations and environmental constraints, particularly MNES.

Recognising the potential for uncertainty, Senex has outlined the field development process for the Project in the Constraints Protocol (Attachment B). The Constraints Protocol will be applied throughout the life of the Project for each phase of development most importantly the planning, design and construction phases but will also be implemented during the operational, decommissioning and rehabilitation phases.

Through the Constraints Protocol, Senex will implement a field development process to ensure potential impacts on MNES associated with development of any new petroleum activity within the Project Area will be systematically planned, identified, assessed and adequately managed. The field development process will apply a hierarchy of management principles to avoid, minimise and mitigate land disturbance and impacts on MNES when planning for and implementing new petroleum activities within the Project Area. These principles are:

- Avoid – preferentially avoiding direct and indirect adverse environmental impacts;
- Minimise – minimise direct and indirect adverse environmental impacts through a reduction in the duration, intensity and/or extent of adverse impacts, where these cannot be avoided;
- Mitigate – implement mitigation and management measures to minimise direct, indirect and cumulative adverse impacts; and

- Restore (remediate and rehabilitate) – actively remediate and rehabilitate impacted areas to promote and maintain long-term recovery.

The Constraints Protocol will ensure Senex plans and locates Project infrastructure with strict considerations of relevant MNES identified as having potential, likely or known to occur within the Project Area, preferentially locating infrastructure in low constraint areas. Through implementation of the Constraints Protocol, Senex makes a commitment to avoid clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land) (as identified in Table 3 of the Constraints Protocol (Attachment B)).

Based on the MNES values and threat status, three hierarchical constraint categories for the Project's field development planning are identified in Table 4-1. Permitted activities will avoid potential impacts and threats to the MNES habitat. Permitted activities for each constraint category along with the environmental constraint is identified in Table 4-2.

Table 4-1 Summary of Activities Permitted in Each Constraint Category

Constraint category	Low impact petroleum activities	Linear infrastructure	Well pads	All petroleum activities
No-go area	No	No	No	No
High constraint area	Yes	Yes	No	No
Low constraint area	Yes	Yes	Yes	Yes

Table 4-2 Constraint Categories

Constraint category	Activities permitted	Constraints[1]
No-go area	No petroleum activities	Threatened Ecological Communities listed in Section 2.5 of the Constraints Protocol (Attachment B). MNES species habitat listed in Section 2.5 of the Constraints Protocol (Attachment B) (apart from Koala dispersal habitat and Southern Squatter Pigeon dispersal habitat), including all areas of remnant vegetation and regrowth areas that meet species habitat definitions. Ooline plants (10 m buffer)[5] in addition to mapped Ooline habitat If any are found to be present in the Project Area: - Slender Tylophora plants and a 10 m buffer[5] and - Populations[2] of the Dulacca Woodland Snail
High constraint area	Low impact petroleum activities[3], and Linear infrastructure[3]	Buffer zone (10 m buffer around all 'No-go areas')
Low constraint area	All petroleum activities[4]	Koala dispersal habitat and Southern Squatter Pigeon dispersal habitat Previously cleared areas that have been assessed as not containing MNES or MNES habitat (other than Koala dispersal habitat and Southern Squater Pigeon dispersal habitat)

[1] Disturbance of MNES will not exceed upper disturbance limits identified in Table 3 of the Constraints Protocol (Attachment B).

[2]Avoids field verified populations of the threatened Dulacca Woodland snail (*Adclarkia dulacca*), if it is found to occur within proposed disturbance areas in the Atlas tenements.

[3]Definitions for these activities are provided in the definitions section.

[4]All petroleum activities will be permitted within the low constraints area, however Koala juvenile and non-juvenile trees and seedlings will be avoided unless unavoidable due to other constraints (e.g. environmental features and values, cultural heritage values, geological features, landholder / livestock / agricultural requirements and existing or planned landholder, utility or community infrastructure).

[5]Refer to Section 4.3 below (RFI 2.4.5) for justification of 10 m buffer.

Through implementation of the Constraints Protocol, Senex makes a commitment to avoid clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). Disturbance to remaining MNES habitat will be minimised, and cumulative disturbance will not occur except for a disturbance of up to 530 ha of Koala dispersal habitat and up to 2.1 ha of Southern Squatter Pigeon Habitat which will not inhibit these species' dispersal, other than a short period during construction, as identified in Table 3 of the Constraints Protocol (Attachment B). This is in keeping with Senex's commitment to not clear any areas confirmed as potential habitat for MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). Note, construction of infrastructure, will be developed progressively over time to reduce potential for direct impacts to MNES TECs and threatened species.

4.3 Additional Information Requested

RFI 2.4.1

Pre-disturbance surveys must be supervised by a suitably qualified person and undertaken in accordance with the department's survey guidelines in effect at the time of the survey or other equivalent survey methodology.

RFI 2.4.1 Response:

Section 3 of the Constraints Protocol (Attachment B) has been updated to include additional information on pre-clearance surveys including a commitment to completion prior to any disturbance.

A summary of this information is provided below.

The steps described in Section 3 of the Constraints Protocol (Attachment B) include field surveys. The field surveys include Senex representatives and the landholder conducting a review of the feasibility and constructability of the proposed infrastructure layout determined from desktop consideration of constraints, including MNES habitat mapping. The pre-clearance survey will be undertaken not more than one year prior to clearing activities commencing. The Constraints Protocol steps describe field surveys to be conducted to identify protected vegetation, fauna habitat, watercourses, prescribed environmental matters to trigger environmental offsets, invasive weeds and areas of regional interest and will extend a minimum of 30 m beyond the Project infrastructure footprint. Where required, additional species-specific active field-based surveys will be undertaken by suitably qualified and experienced ecologists within areas identified as potential habitat. It is identified in Section 3.3 of the Constraints Protocol (Attachment B) that on-ground environmental surveys, or pre-clearance surveys, are to be undertaken by a suitably qualified ecologist in accordance with relevant survey guidelines in effect at the time of the survey or other equivalent survey methodology. The pre-clearance surveys include ecological ground-truthing to confirm the likelihood of habitat for protected fauna, the likelihood of occurrence of protected flora and fauna, regional ecosystems and ecological communities, and validation of mapped watercourses.

RFI 2.4.2

Include habitat mapping rules and specific survey requirements, informing the Constraints Protocol, to ensure that they contain complete habitat descriptions and survey requirements for each MNES, as outlined in relevant documents, including, but not limited to, SPRAT, conservation advice and recovery plans.

RFI 2.4.2 Response:

As detailed in Appendix A of the Constraints Protocol (Attachment B), MNES habitat mapping rules for the Project describes all potential habitat for MNES identified as known, likely or potentially occurring within the Project Area. The habitat mapping was developed through applying the ecological field validation and aerial imagery to habitat definitions formulated for each of the listed MNES using relevant documents such as SPRAT, conservation advices and recovery plans (detailed in Section 3.5 of the Ecology Assessment Report (Attachment C)). For MNES known, likely or potentially occurring, a list of relevant departmental guidance and supporting evidence is presented in the Ecology Significant Impact Assessment Report (Attachment G).

Appendix B of the Constraints Protocol (Attachment B) identifies the detailed ecological assessment methodology for the pre-clearance field surveys. Senex will be following the precautionary principle and all potential listed MNES threatened species habitat and TEC habitat will be avoided, with the exception of Koala and Southern Squatter Pigeon dispersal habitat.

RFI 2.4.3

As vegetation communities/habitat are clarified and further defined within the project site, update the constraints protocol and any other relevant reports as appropriate.

RFI Response 2.4.3:

Section 3 of the Constraints Protocol (Attachment B) includes a process for systematic change management related to vegetation communities and habitat mapping and corresponding constraint categorisation, including integrating further definition within the Project Area. This process outlines a range of pre-development steps including preliminary infrastructure layout, desktop constraints analysis, field surveys and constraints analysis, resulting in the issuing of internal approvals.

Detailed ecological assessment will be required to ground truth proposed changes or unavoidable impacts in accordance with Section 3.3 of the Constraints Protocol (Attachment B) and habitat definitions in Appendix A of the Constraints Protocol (Attachment B) where changes in site conditions indicate a change to habitat mapping is required.

Following completion of the site surveys and detailed ecological assessment, the field validated values and any refinements made to the design/layout will be uploaded to Senex's GIS. Where the results of the detailed ecological assessments are significant, Senex may be required to repeat desktop assessment of infrastructure locations to refine and minimise proposed impacts to identified MNES values. Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land).

RFI 2.4.4

Commitments must be made using unambiguous language, i.e. use 'will' and 'must' when committing to actions instead of 'where possible', 'where practicable', 'if there is flexibility', etc.

RFI 2.4.4 Response:

Commitments made in the Constraints Protocol (Attachment B) have been updated to use unambiguous language when committing to disturbance limits.

All mapped habitats related to the Dulacca Woodland Snail will be avoided. One or more snails in any area would be considered a population and if a single snail is recorded outside of mapped potential habitat, additional surveys will be undertaken where habitat is consistent with the habitat in which the new record was found to occur. Section 2.3 of the Constraints Protocol (Attachment B) has been updated to reflect when habitat mapping will and will not be modified. In all cases, TEC and potential MNES habitat mapping will be revised wherever site surveys identify constraints or constraint boundaries different from the Project's current TEC and, in all cases, no clearing will occur in TECs or potential habitat for MNES, except for Koala and Southern Squatter Pigeon dispersal habitat.

Should an unexpected threatened species that was a listed MNES threatened species at the time of the decision on the referral (19 May 2023) be identified during the pre-clearance surveys, Senex's Constraints Protocol and its commitments will equally apply.

RFI 2.4.5

Include constraints commitments for all threatened species habitat and threatened ecological communities which may occur at the site of the proposed action. Where different maximum areas of impact are proposed on different habitat quality categories for a species or community, provide clear totals for extent of all impact and on each category.

RFI 2.4.5 Response:

Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). The identified total potential habitat for threatened species in the Project Area was based on ground truthed regional ecosystem mapping, targeted fauna surveys and fauna habitat assessments. Detailed pre-clearance surveys will be undertaken and include habitat assessments and active fauna surveys. Appendix B of the Constraints Protocol (Attachment B) outlines the detailed ecological assessment methodology. Should an unexpected threatened species that was a listed MNES threatened species at the time of the decision on the referral (19 May 2023) be identified during the pre-clearance surveys, Senex's Constraints Protocol (Attachment B) and its commitments equally apply. Constraints layers will be continually updated with findings from site ecological surveys and any other detailed ecological assessments to ensure compliance with constraint avoidance commitments.

The 10 m buffer stipulated in the Constraints Protocol (Attachment B) and produced in Table 4-2 is considered appropriate for the avoidance of Ooline, Slender Tylophora plants and populations of the Dulacca Woodland Snail for the following reasons:

- Ooline – a 10 m buffer will protect individual plants from potential Project impacts. Ooline rely on natural seed dispersal via dropping seeds or by birds, or suckering from rootstock. A 10 m buffer from disturbance will help protect against direct impacts to root systems and land immediately around trees where natural recruitment from dropped seeds can occur. A 10 m buffer will also limit indirect impacts from potential erosional processes, which is crucial in maintaining the health of the root systems of Ooline.

- Slender Tylophora plants – a 10 m buffer will also be implemented via marked exclusion zones to protect these species against physical disturbance. The buffer will be managed to prevent trampling and other disturbance activities from occurring, and indirect impacts from erosional processes.
- Dulacca Woodland snail–- a 10 m buffer is considered appropriate as this species has limited mobility as described in Section 4.4.7.4 of the Ecology Assessment Report (Attachment C). The 10 m buffer only applies to the Dulacca Woodland Snail where populations are field verified and in accordance with the Constraints Protocol (Attachment B). A 10 m buffer will help preserve the natural habitat including vegetation, soil, and microclimatic conditions. The buffer will limit threats from Project activities such as trampling, habitat destruction and pollution, and reduce the potential for indirect impacts from erosional processes.

RFI 2.4.6

Include mapping of constraints categories for MNES, including identified no go zones.

RFI 2.4.6 Response:

Constraints mapping is provided as Figure 1 of the Constraints Protocol (Attachment B) and was based off identified constraints in Section 2.2 of the Constraints Protocol (Attachment B). Constraints data was sourced from State and Federal governments, other open-source datasets and Senex datasets including ecological survey findings. The MNES mapping forms the basis of the individual constraint layer for the Project that is used to develop the constraint category mapping. MNES mapping rules and habitat descriptions are presented in Appendix A of the Constraints Protocol (Attachment B). Using the precautionary principle, the initial MNES habitat mapping has been developed using conservative habitat mapping rules that will be subject to further ground-truthing during the ecology surveys which will be completed prior to the commencement of any Project development work as discussed in Section 3.3 of the Constraints Protocol (Attachment B).

The Constraints Protocol (Attachment B) will be used to manage the impacts on MNES threatened species and communities including by implementing minimum 10 m buffers of high constraint category around all MNES areas but will not provide a standard buffer from watercourses and waterways.

The implementation of standard buffers at watercourses and waterways was contemplated but was not considered to be warranted because of the Constraints Protocol (Attachment B) and mitigation measures to ensure the protection and management of riverine areas from erosion and sedimentation have been proposed in a number of the management plans provided as part of the Preliminary Documentation. See specific references below.

- Within the Significant Species Management Plan (Attachment H), Section 5.2 and 6.2 consider impacts associated with the degradation of threatened species habitats or TECs as a result of erosion. Key management measures are included in Section 5.3 and 6.3 of the Significant Species Management Plan (Attachment H), and include measures such as:
  - Sediment and erosion control to be managed in accordance with the Rehabilitation Plan (Attachment F) and the Contractor's erosion and sediment control procedures.
  - Watercourse crossing points will be adequately stabilised to prevent erosion.
  - Works on site will not commence until any relevant Contractor erosion and sediment control procedures have been approved and installed. Erosion and sediment control structures will be inspected periodically and after rain events and maintenance carried out.
- Within the Environmental Management Plan (Attachment E), Section 7.13 considers management measures associated with watercourses and wetlands and Section 7.14 considers management measures associated with soil and erosion. Key management measures identified in these sections include the following:

- Sediment and erosion control must be managed in accordance with the Senex Queensland Erosion and Sediment Procedure [SENEX-QLDS-EN- PRC-003] and the Contractor's erosion and sediment control procedures.
- Sediment and erosion control measures to prevent soil loss and deposition beyond significantly disturbed land will be implemented and maintained.
- 'No-go' areas will be GPS located and clearly marked (for example, with bunting and/or flagging tape).
- For linear Infrastructure (for example, pipelines) – construction or maintenance activities in wetlands or a watercourse must only be carried out under the authorization of an ATW and under the supervision of a Senex environment representative to ensure conditions of the EA are achieved.

- Within the Rehabilitation Plan (Attachment F), erosion and sediment control measures are further outlined. Section 4.3 identifies the following:
  - Erosion and sediment control (ESC) will be implemented during the construction phase in accordance with the IECA Best Practice Erosion and Sediment Control Guidelines 2008.

5 WATER RESOURCES

A detailed EPBC Water Resource Impact Assessment was prepared by Klohn Crippen Berger (KCB) to support the referral of the Project to the Commonwealth. Following the Minister's decision on the referral, the following relevant reports have been updated and attached:

- EPBC Water Resources Impact Assessment Report (Attachment D);
- Chemical Risk Assessment (Attachment L), which includes a separate Chemical Risk Assessment Framework (CRAF);
- Water Monitoring and Management Plan (Attachment I);
- Coal Seam Gas Water Management Plan ATP 2059 (Attachment J); and
- Coal Seam Gas Water Management Plan PL 445 and PL 209 (Attachment K).

Section 5 below addresses each information requirement and identifies where in each Attachment these matters are addressed.

The reports were prepared with reference to the following guidelines:

- DCCEEW Significant Impact Criteria provided in 'Significant impact guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources' (Commonwealth of Australia 2022b);
- DCCEEW Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (Commonwealth of Australia 2013) (Section 2.1); and
- The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (the IESC) 'Information guidelines for proponents preparing coal seam gas and large coal mining development proposals' (IESC 2018b).

5.1 General Assessment Requirements

The EPBC Water Resource Impact Assessment (Attachment D) has been prepared with consideration of both the RFI requirements and the IESC comments.

5.1.1 IESC Checklist

The IESC functions are prescribed in Section 505D of the EPBC Act. The IESC's key function is to provide scientific advice to the Commonwealth Environment Minister and relevant State Ministers in relation to CSG or large coal mining development proposals that are likely to have a significant impact on water resources. The IESC provides advice on whether the Project will have, or is likely to have, a significant impact on a water resource, including any impacts of associated salt production and/or salinity (Section 131AB of the EPBC Act).

To allow the IESC to provide robust scientific advice to government regulators on water related impacts of CSG or large coal mining development proposals, an information guideline (IESC 2018) was developed outlining the information considered necessary for the IESC to undertake the relevant assessment, referred to as the 'IESC checklist'.

RFI 3.1

The draft PD must cross-reference the IESC checklist, found in the IESC guidelines, to ensure that the IESC's information guidance has been considered and addressed.

The IESC advice and the proponent's response to that advice, including any necessary additions and/or revisions to the draft PD, must be included in the PD package that will be published for public comment.

The IESC provides a number of publications and resources, including the IESC explanatory notes, which can be used as guidance material in drafting the PD. These publications can be found at the following website: http://iesc.environment.gov.au/publications. Where the approach to assessment of impacts and management of water resources differs from that outlined in the IESC guidance documentation, provide detailed reasoning and justification.

RFI 3.1 Response:

Table 1.1 of the EPBC Water Resource Impact Assessment Report (Attachment D) provides the checklist and cross-references to the relevant sections of the EPBC Water Resource Impact Assessment Report (Attachment D) that addresses each checklist item. Some items in the guideline are not required for this Project, including final landform and voids – coal mines, acid-forming materials and other contaminants of concern, coastal processes, and checklist items related to hydraulic stimulation for CSG.

Other IESC publications, including those in draft format for consultation, have been referred to in the assessment.

Senex has included a specific response to the IESC advice in the IESC RFI and Response (Attachment M).

5.1.2 Joint Industry Framework

The purpose of the Joint Industry Framework (JIF) is to establish a consistent post-approval framework for the management of impacts on groundwater caused by CSG developments, within the Surat CMA, which are subject to approvals under the EPBC Act. The JIF provides a risk management framework to achieve stated outcomes for relevant MNES and is intended to reduce duplication between the regulation of groundwater at a Commonwealth and State level.

RFI 3.2

The JIF provides an outcomes and risk-based approach to groundwater impact management and outlines standard conditions for groundwater management of coal seam gas (CSG) developments in the Surat Basin. The JIF incorporates relevant management framework/s that must be followed by an approval holder if a risk threshold for a protected matter is predicted to be exceeded. The management of surface water and other impacts to a water resource unrelated to groundwater is outside the scope of the JIF.

RFI 3.2 Response:

The JIF defines the process to be used by approval holders to determine the risk level of a particular impact on EPBC-listed springs and/or GDEs and understand their related obligations under approval conditions. The approval holder's management actions and the regulatory involvement in those management actions will be commensurate to the level of risk to the EPBC-listed spring or associated user, and the level of regulation at a State level.

Senex agrees to apply the JIF for this Project.

The management of surface water is not applied through the JIF, but through the application of Senex monitoring and management procedures. These are discussed in more detail in the sections below. Specific documentation related to the management of surface water includes the Water Monitoring and Management Plan (Attachment I).

5.1.3 Hydrological Regime

RFI 3.3

Provide a regional overview of the proposed action area, including a description of the geological basin, coal resource, surface water catchments, groundwater systems and water dependent assets.

Describe any potential third-party users of water in areas potentially affected by the proposed action, including municipal, agricultural, industrial, recreational and environmental uses of water.

RFI 3.3 Response:

The EPBC Water Resource Impact Assessment Report (Attachment D) describes the hydrological and hydrogeological regimes of the Project Area. The existing environment was considered via a desktop assessment to establish the baseline hydrogeological conditions, environmental values and potential receptors. This was further supported with the undertaking of a field program to collect site-specific information including:

- The installation of eight groundwater monitoring bores within the Project Area (Appendix X and XI of the EPBC Water Resource Impact Assessment Report (Attachment D)), collection and evaluation of baseline groundwater levels and quality data and isotope analysis;
- Terrestrial and aquatic ecology surveys and GDE mapping (Appendix VIII of the EPBC Water Resource Impact Assessment Report (Attachment D));
- Bore baseline assessments (KCB 2023b; Streamline Hydro 2022);
- Field verification mapping (Appendix IX of the EPBC Water Resource Impact Assessment Report (Attachment D)); and
- Stygofauna sampling (Appendix VII of the EPBC Water Resource Impact Assessment Report (Attachment D)).

The Water Resources Impact Assessment Report (Attachment D) incorporated a review of the data collected for the immediately adjacent Project Atlas CSG Project (EPBC 2018/8329) (PL 1037). Appendix I of the Water Resources Impact Assessment Report (Attachment D) includes all groundwater baseline data collected to date from the Senex groundwater monitoring network (both water level and water quality data).

5.1.3.1 Regional Overview

The FDA covers an area of approximately 9,772 ha and is located approximately 10 km southwest of the township of Wandoan. The Project is located within ATP 2059, PL 445, northern PL 209, and parts of PL 1037, as shown in Figure 5-1. Additionally, the location for a new brine storage dam is still to be confirmed; however, this facility is being planned within previously cleared land, proximate to the existing water management facilities.

A summary of the regional setting is provided below:

- The CSG target coal seam for the Project is the Walloon Coal Measure (WCM), of the Jurassic-Cretaceous Surat Basin, which is underlain by the Permo-Triassic Bowen Basin;
- The Project is located towards the headwaters of the Upper Dawson River Sub-Basin, which is part of the larger Fitzroy Basin;
- The Surat Basin forms part of the Great Artesian Basin (GAB), which comprises several aquifers and confining aquitards. Aquifers of the Surat Basin are a significant source of water used for stock, public water and domestic supply; and
- Water-dependent assets identified in the Project Area include third-party groundwater bores, potential terrestrial GDEs, subterranean and aquatic fauna.

The Project is located adjacent to Project Atlas CSG Project and other CSG tenure holders including QGC and APLNG (Origin). The Project is adjacent to the proposed Wandoan Coal Project (tenure holder: Glencore), which was granted Mining Leases 50229, 50230 and 50231 in 2017 (OGIA 2021a). Mining Lease 50230 partially overlies PL 445 (see Figure 2.1). The Wandoan Coal Project is a proposed open-cut thermal coal mine targeting the Juandah Coal Measures, with an anticipated start year of 2024 and peak development (all mining areas in operation) expected around 2056 (OGIA 2021a). Development of the mine is currently on hold subject to market conditions (OGIA 2021a).

Elevations across the Project Area range between 250 mAHD (metres above Australian Height Datum) and 420 mAHD. Topographic highs are present in the south of the Project Area. The Project is located within the Upper Dawson River sub-basin, which is part of the Fitzroy River Basin. There are five primary land use types within the Project Area. The dominant land use is 'production from relatively natural environments', specifically grazing native vegetation. Production forestry and cropping is also present in the Project Area.

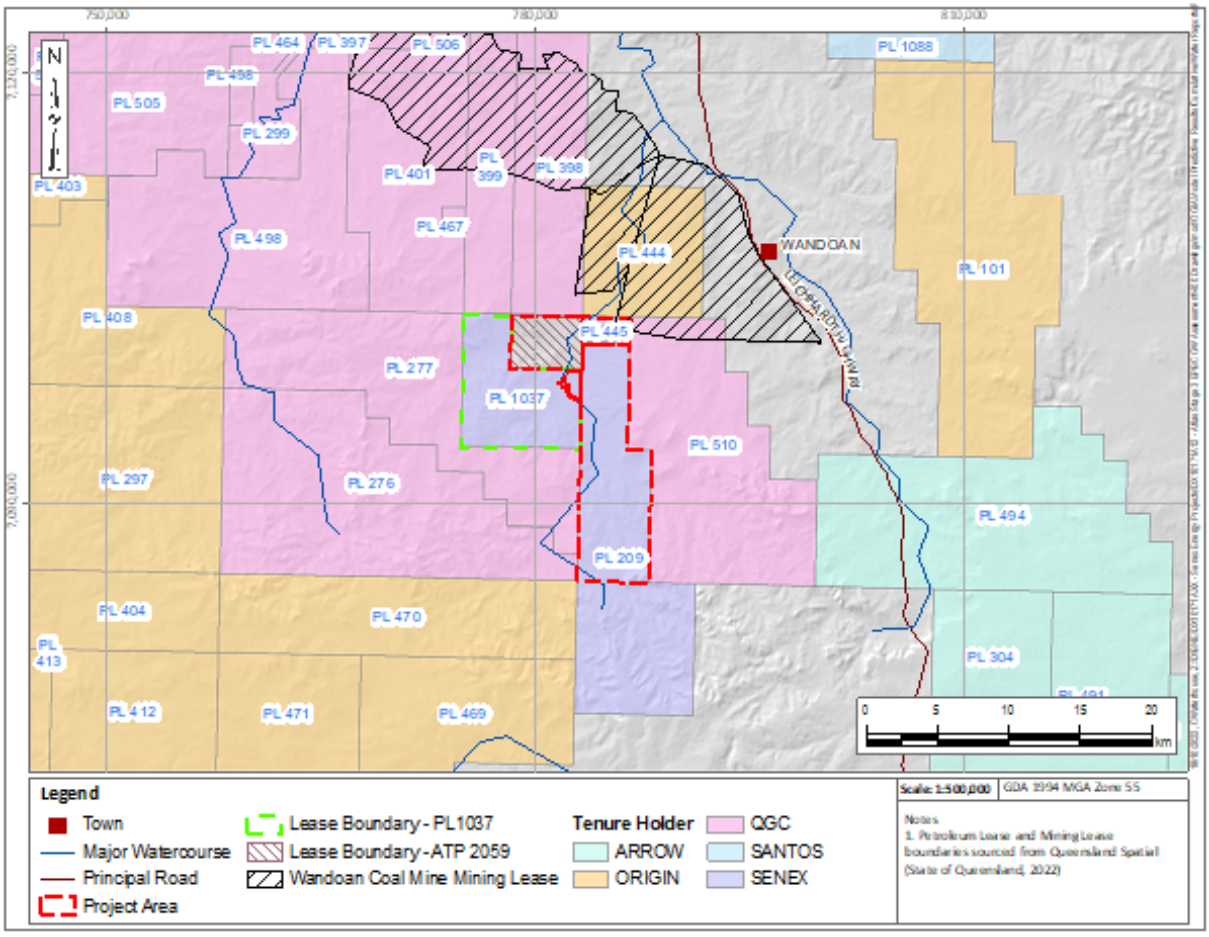


Figure 5-1 Neighbouring Petroleum and Mining Leases

5.1.3.2 Geology

The Project is located within the Surat Basin, a basin of Jurassic-Cretaceous age, which is underlain by the Permo-Triassic Bowen Basin. Cenozoic-age formations are present overlying the Surat Basin units. The Cenozoic-age formations generally comprise unconsolidated alluvial sediments, which have been deposited along pre-existing watercourses (OGIA 2021b).

The Surat Basin underlies approximately 180,000 km^2 of southeast Queensland; and is connected to the Eromanga Basin to the west, the Clarence-Moreton Basin to the east, and the Mulgildie Basin to the northeast. The Surat Basin is bounded to the northeast by the Auburn Arch and to the southeast by the Texas Block. The northern margin of the basin has been exposed and extensively eroded. Basin sediments generally dip southwest (OGIA 2021b).

The maximum thickness of the Surat Basin is approximately 2,500 m, which occurs in the Mimosa Syncline west of the Project Area. Generally, sediment deposition was continuous and widespread within the basin. Deposition in the basin commenced with a period of passive thermal subsidence over much of eastern Australia. During the Early Jurassic, deposition was mostly fluvio-lacustrine, while by the Middle Jurassic coal swamp environments predominated over much of the basin, except in the north where fluvial sedimentation continued (Geoscience Australia 2017; OGIA 2021b).

The target subgroup for CSG production for the Project is the WCM within the Surat Basin, which occurs at approximately 220 to 300 m below ground level; and is approximately 400 m thick. The WCM forms part of the Surat Basin.

5.1.3.3 Groundwater

The Surat Basin forms part of the GAB, which comprises interbedded aquifers and aquitards. The Project is situated in an area where the Springbok Sandstone, Westbourne Formation, and Gubberamunda Sandstone outcrop. Surface geology within PL 209 comprises outcrops of the Gubberamunda Sandstone and Westbourne Formation of the Surat Basin. The Upper Springbok Sandstone outcrops within the northern extent of PL 445. Quaternary-age alluvium is present along the Woleebee, Wandoan and Conloi Creek systems.

The WCM outcrops 14 km to the north and northeast of the Project Area, while the Orallo Formation outcrops approximately 1 km to the south. The WCM is separated from overlying and underlying aquifers by aquitard layers of the Upper WCM aquitard and Durabilla Formation respectively.

Key hydrostratigraphic units in the vicinity of the Project are the Westbourne Formation (aquitard), Upper Springbok Sandstone (aquifer), Gubberamunda Sandstone (aquifer), and the discontinuous Quaternary alluvium (aquifer).

Two cross-sections, oriented North-South and West-East, through the Project Area, are shown on Figure 5-2. The cross-sections were prepared using the OGIA Surat CMA geological model (OGIA 2021d). The sections indicate that the WCM occurs at approximately 220 to 300 m below ground level; and is approximately 400 m thick.

Table 5-1 presents the mean thickness within the Project Area for each of the underlying hydrostratigraphic units.

Table 5-1 Aquifer / Aquitard Thickness within the Project (after OGIA 2021d)

Hydrostratigraphic Unit	Aquifer / Aquitard	Mean Thickness (m)
Orallo Formation	Minor Discontinuous Aquifer	26
Gubberamunda Sandstone	Aquifer	43
Westbourne Formation	Aquitard	41
Springbok Sandstone	Aquifer	104
Walloon Coal Measures	Interbedded aquitard with productive Coal Seams	413
Durabilla Formation	Aquitard	87
Hutton Sandstone	Aquifer	236
Evergreen Formation	Aquitard	203
Precipice Sandstone	Aquifer	73

There are no mapped major geological structures (e.g., faults) within the vicinity of the Project Area. The nearest major fault is the Burunga Fault which is located approximately 26 km to the east of PL 209, 17 km east of Wandoan.

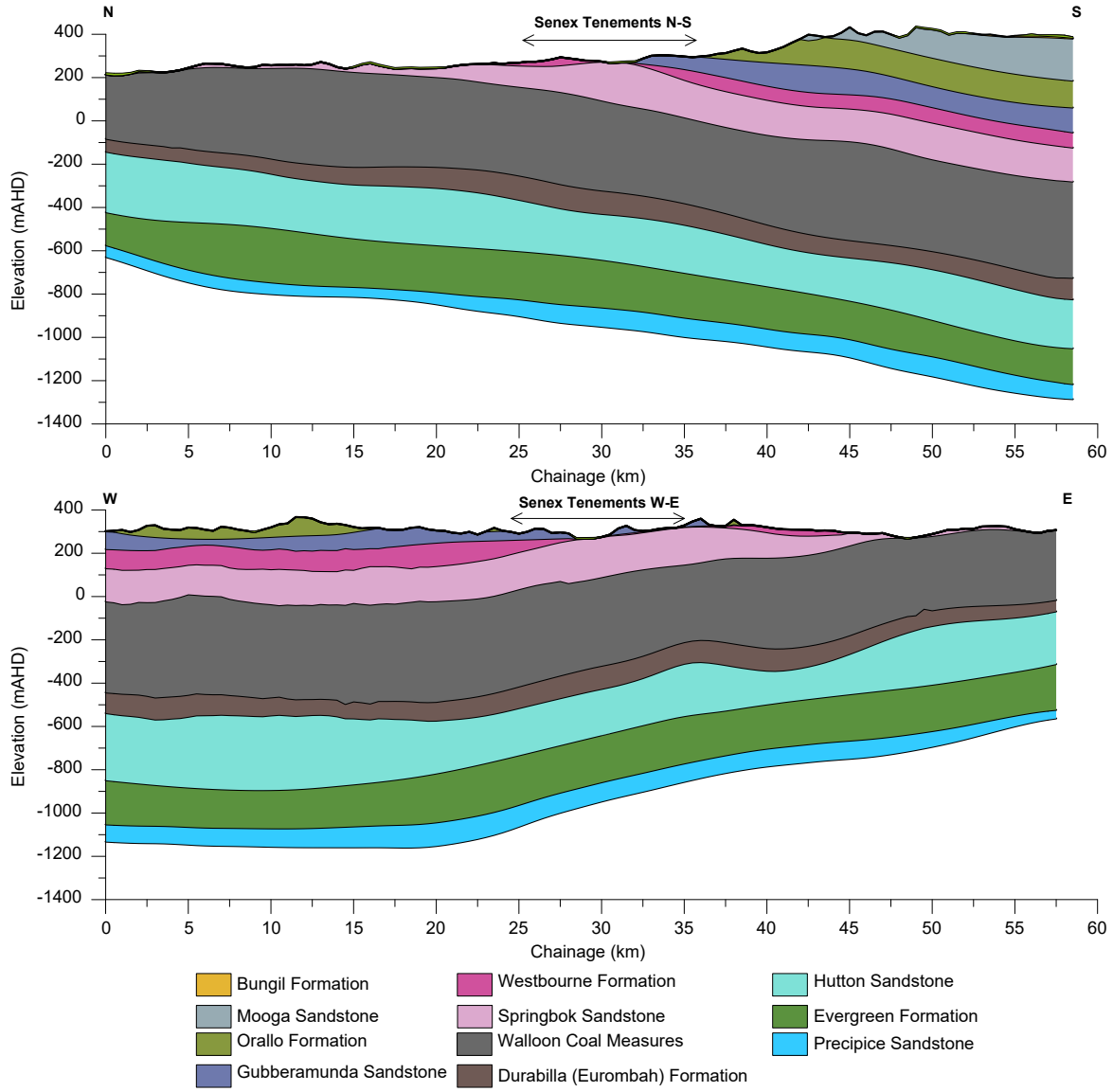


Figure 5-2 Geological Cross-Sections Surat CMA Geological Model (OGIA 2021b)

Across the Project extent, there is potential for interaction between the WCM and hydrostratigraphic units above and below the WCM, specifically the Springbok Sandstone and Hutton Sandstone (separated from the WCM by the Durabilla Formation), respectively. The Durabilla Formation is mapped across the entire Project Area, with a mean thickness of 87 m, which provides a significant low permeable barrier between the WCM and underlying Hutton Sandstone. An upper WCM aquitard has been mapped by OGIA (the Walloon Coal Measures non-productive zone, OGIA 2021b) as being up to approximately 25 m thick across the Project Area, with approximately 40 m of thickness in the central west of PL 209, separating the WCM coal seams from the overlying Springbok Sandstone.

Interaction between the alluvium and underlying units is not evident at the Project. There is both hydraulic and geochemical evidence to identify a disconnection between the alluvium and the Surat Basin units:

- Senex groundwater monitoring bores installed as paired sets in the alluvium and underlying Springbok Sandstone or Westbourne Formation displayed hydraulic separation between the units. Groundwater levels in both underlying units, measured over time, are below the base of the alluvium indicating that there is no contribution from these deeper units to the shallower alluvium. The groundwater level in the Springbok Sandstone was 3 m below the base of alluvium, during

the wet season, in Senex monitoring bores. There may be losses from the alluvium to these deeper units during times of saturation in the alluvium; and

- The groundwater qualities observed in the Springbok Sandstone and Westbourne Formation are distinct from the groundwater quality observed in the alluvium. The deeper units show a proportionally higher chloride concentration in comparison with the Juandah Creek alluvium groundwater which in turn show a proportionally higher carbonate-bicarbonate concentration.

5.1.3.3.1 Groundwater Users

The aquifers of the Surat Basin are a significant source of water used for public water, agricultural, stock, and domestic supply. There are 669 registered existing groundwater bores within a 25 km buffer zone around the Project Area which may be used for water supply. The majority of groundwater use in the vicinity of the Project is for stock and domestic purposes extracted from the Gubberamunda Sandstone, refer to the EPBC Water Resource Impact Assessment Report (Attachment D).

5.1.3.3.2 Groundwater Dependent Ecosystems

Potential surface expression GDEs and sub-surface GDEs are mapped by DES (State of Queensland 2018a) as potentially being present in the vicinity of the Project. These generally correspond with the location of the mapped alluvium associated with Woleebee Creek within the Project Area and Wandoan Creek, Horse Creek and Juandah Creek further afield.

There are no spring vents or complexes within the vicinity of the Project.

Potential terrestrial GDEs have been identified and are generally associated with Wandoan and Woleebee Creeks. These potential GDEs are considered to be sourcing water from shallow soil systems and along the watercourses.

Baseflow-fed reaches of watercourses, or watercourse springs, are sections of a watercourse where groundwater from an aquifer enters the stream through the streambed (OGIA 2021b). A report published by OGIA in 2017 re-maps potential gaining streams (or baseflow-fed reaches, watercourse springs) within the Surat CMA (OGIA 2017). This report identified sections of Woleebee Creek as a potentially gaining stream (i.e. a stream which gains water from the ground). OGIA have re-mapped watercourse springs within the Surat CMA for the 2021 Underground Water Impact Report (UWIR) (OGIA 2021b). OGIA has identified three potential watercourse springs present within the Project Area associated with Woleebee Creek. These watercourse springs are identified as being associated with the alluvium, Gubberamunda Sandstone, and the Orallo Formation. These are noted as springs of interest but not currently affected or listed as a mitigation site (OGIA 2021b).

A verification program undertaken in 2018 and additional surface water and groundwater samples support that Woleebee and Wandoan Creeks and their tributaries within and adjacent to the Project are not gaining streams and are unlikely to support aquatic GDEs:

- Pools of water were encountered in the lower reaches of Woleebee Creek (within the Project Area, which were rainfall derived surface water based on the turbid appearance and the field measured EC of 547 µS/cm.
- Based on the difference between the field water quality measured at Woleebee Creek pools, field observations and groundwater elevation monitoring data from the alluvium and Gubberamunda Sandstone, it is considered unlikely that Woleebee Creek is a baseflow-fed reach (i.e., it is a losing stream).
- Investigations on tenements to the north, concluded the ephemeral creeks feeding Juandah Creek (which includes Woleebee Creek) are not ‘gaining’ from alluvial groundwater (CDM Smith 2022).

The presence of aquatic GDEs along Woleebee and Wandoan Creeks and their tributaries is unlikely.

The DES dataset identified potential terrestrial GDEs within the Project Area (State of Queensland 2018b). These GDEs are present in the vicinity of Wandoan and Woleebee Creeks. Using terminology developed as part of the DES GDE mapping, the following potential terrestrial and Aquatic GDE types have been identified as occurring within the Project Area:

- Riverine wetlands on alluvia overlying sandstone ranges with fresh, intermittent flow; and
- Treed regional ecosystems on alluvia overlying sandstone ranges with fresh, intermittent flow.

These potential GDE types correspond with RE types that occur on alluvial landscapes, associated with watercourses and the adjacent floodplain areas. Based on the DES GDE mapping rule sets, these vegetation communities rely on alluvial aquifers that form from sediments such as gravel, sand, silt and/or clay deposited by fluvial processes in river channels or on floodplains. These deposits store and transmit water to varying degrees through inter-granular voids, pore spaces, fractures and other weathered zones of the rock material (ERM 2022).

The GDEs identified within the Project Area have been described in relation to three key areas delineated based on general characteristics and condition within the Project Area:

1. North: Wandoan and Woleebee Creeks;
2. Central: Woleebee and Conloi Creeks; and
3. South: Hellhole Creek.

All three areas comprised mosaics of remnant and regrowth REs of varying patch sizes and ecological conditions. RE 11.3.25 (Forest Red Gum *Eucalyptus tereticornis* or River Red Gum *Eucalyptus camaldulensis* woodland fringing drainage lines) is the most widely abundant vegetation community identified that the potential to be a GDE, however interconnected patches of other REs are present. Historic land clearing is known to have occurred throughout the Project Area that has impacted the condition of terrestrial GDEs, particularly along creek lines and water courses. Grazing pressure is also likely to influence the ecological condition of RE patches and their value for maintaining biodiversity levels.

1. North: Wandoan and Woleebee Creeks

The northern section of the Project Area is dominated by RE 11.3.25: (Tall woodland of *Eucalyptus tereticornis* with *Angophora floribunda* and *Casuarina cunninghamiana*; tree species present in the field are typically *Eucalyptus tereticornis, Angophora floribunda, Brachychiton X turgidulus*, *Brachychiton populneus var. trilobum*, *Citrus glauca, Acacia salicina, Atalaya hemiglauca, Geijera parviflora, Notelaea microcarpa, E. populnea, Casuarina cunninghamiana*).

The following are also present in smaller more fragmented patches within a wider landscape of modified pastures, cropping and grazing land (ERM 2022): RE 11.3.2 (*Eucalyptus populnea* open grassy woodland on floodplain between braided stream channels: tree species present in the field are typically *Eucalyptus populnea, Acacia excelsa, Casuarina cristata, Geijera parviflora, Alectryon oleifolius*); 11.3.27f (Tall woodland of *Eucalyptus tereticornis* with *Eucalyptus populnea* and *Angophora floribunda* around floodplain billabongs with *Vachellia farnesiana* shrubs and ground layer of Carex, native and introduced grasses. Trees species present in the field are typically *Eucalyptus tereticornis, Eucalyptus populnea, Angophora floribunda, Acacia salicina, Geijera parviflora, Casuarina cristata*), and 11.3.17 (Poplar Box woodland with Brigalow *Acacia harpophylla* and/or Belah *Casuarina cristata* on alluvial plains).

2. Central: Woleebee and Conloi Creeks

The mapped GDEs within the central area of Woleebee and Conloi Creeks are also dominated by RE 11.3.25 (Forest Red Gum woodland fringing drainage lines). These patches have been confirmed to largely be remnant communities although some regrowth is also present. Forest Red Gum woodlands fringing water courses are confirmed to be present following field surveys with other *Eucalyptus spp*. Such as Poplar Box and Silver-leaved Ironbark *Eucalyptus melanophloia* also present throughout the

area. Unlike the northern area, REs that occur in riparian zones and on alluvium in the centre of the Project Area are considerably smaller in size and influenced by increased fragmentation.

3. South: Hellhole Creek

The southern area around Hellhole Creek is dominated almost exclusively with RE 11.3.25 (Forest Red Gum woodland fringing drainage lines). A combination of regrowth and remnant vegetation is found in the southern area with the majority of patches confirmed to be remnant. Much like the central area, many patches found in the southern area are highly fragmented and restricted to thin bands of riparian vegetation.

Groundwater dependence of potential terrestrial GDEs in the Project Area have been assessed considering all information presented in this report.

The following lines of evidence are referred:

- Plant rooting depth and morphology; and
- Evaluation of surface water – groundwater interactions.

The dominant ecosystem, RE 11.3.25, is known to include both ephemeral and permanent wetlands, so aquatic vegetation present will vary depending on the presence of permanent, open water. However, permanent open water/wetlands were not recorded /mapped within the Project. The ecology survey identified flora and fauna that do not depend on the permanent presence of water. The ephemeral nature of these creek systems, which follow the episodic cycle of wetting and drying, with dry periods followed by wet periods in which the creek system flows, support the high resilience in these vegetation communities.

Whilst the presence of tree species that inhabit wetter environments indicate some potential for groundwater use, the leaf water potential and isotope data, from studies undertaken by QGC directly north of the Project on similar RE's along creek tributaries to Juandah Creek, demonstrated that trees are sourcing water largely from soil moisture stores which fluctuate with rainfall (CDM Smith 2022). This is considered to be a function of the dimorphic rooting systems which access water at multiple depths. In this study, depth profiles of soil moisture show that most trees were accessing water at relatively shallow depths (and several metres above the water table) where soil moisture is high.

In summary:

- The field investigations confirmed a lack of groundwater in alluvium within the alluvial plains away from the immediate creek vicinity (during the wet season). The confined groundwater in the units below the alluvium is substantial (38.5 mbgl in the Springbok Sandstone), with the Springbok Sandstone being dry above this depth. This indicates that REs within the alluvial plains away from the immediate creek vicinity do not depend on groundwater. The REs away from the immediate creek vicinity must be reliant on surface water and soil moisture;
- While the presence of tree species that inhabit wetter environments indicate some potential for groundwater use, the leaf water potential and isotope data, from studies undertaken by QGC directly north of the Project Area, on similar REs along creek tributaries to Juandah Creek, demonstrate that trees are sourcing water largely from soil moisture stores which fluctuate with rainfall (CDM Smith 2022). This is considered to be a function of the dimorphic rooting systems which access water at multiple depths;
- The average rooting depth for species of Eucalyptus present at the Project Area is known, based on literature reviews, to range from 9 m to 22.6 m, depending on the species and the interactions between geomorphology and plant physiological traits. The dimorphic rooting system of the Eucalypts (including Forest Red Gums), provides them with the ability to access deep groundwater during periods of time where shallower soil moisture is limited, they have shown physiological responses allowing them to adapt to water stress (CDM Smith 2022). The depth to the confined groundwater strike in the Springbok Sandstone is 38.5 m, with the Springbok Sandstone being dry above this depth. Meaning that it is unlikely that these Eucalypts are accessing the water within the sandstone; and

- In the vicinity of the creeks, groundwater is present in the alluvium during the wet season. Only potential GDEs in the vicinity of the creeks have access to groundwater. For these GDEs accessible groundwater appears to be limited to the alluvium and they may have moderate dependency on the groundwater in the alluvium. The evidence collected to date is such that no impacts are expected to either terrestrial or aquatic GDEs around the creek alluvium as a result of drawdown in the areas of interest as the units are considered unlikely to be hydraulically connected. It is acknowledged that there is some uncertainty in the interconnection of aquifers. To address this, Senex is in the process of a two-year GDE and groundwater level baseline and monitoring program. Should connectivity to GDE dependent units be identified management measures including the development and implementation of a long-term GDE monitoring program will be initiated..

5.1.3.3.3 Stygofauna

Sampling for subterranean fauna was undertaken at 12 existing landholder bores within the Project Area. Only two specimens of one potential stygofauna (from a single bore) were recorded in the 12 samples collected. Given the location of the bore, it is likely that these two specimens are stygofauna, but they could not be formally identified. No stygofauna (stygobites or stygophiles) were recovered from the other 11 bores sampled, although large numbers of stygoxenes (both whole and heavily decomposed) were recorded from most bores. Stygofauna sampling was undertaken on neighbouring areas of PL 1037 at four existing landholder bores. (KCB 2018). Stygofauna were recorded at two bores, the first of which is estimated to be screened across both the Westbourne Formation and Gubberamunda Sandstone, the stygofauna found include two Cyprididae species (*Cyprinopsinae* sp.) and three nematode species (*Nematoda* sp.).

Section 7 of the EPBC Water Resource Impact Assessment Report (Attachment D) provides further detail on the localised hydrogeological conceptualisation, including identification of potential groundwater receptors.

5.1.3.4 Surface Water

The Project is located within the Upper Dawson River sub-basin, which is part of the Fitzroy River Basin. The Fitzroy River Basin is the second largest externally drained basin in Australia and the largest on the eastern coast of the continent. Covering an area of 150,000 km^2, the basin contains several significant tributaries, including the Nogoa, Comet, Mackenzie, and Dawson Rivers. The basin discharges into the Coral Sea east of Rockhampton.

The divide between the Upper Dawson sub-basin and the Condamine-Balonne Rivers sub-basin is located at the southern extent of PL 209, approximately 8 km south of the Project. The Maranoa-Balonne Rivers sub-basin is part of the Balonne-Condamine River Basin which contains several significant tributaries including the Balonne River and the Maranoa River. The basin drains southwest into New South Wales.

Key watercourses (as shown on Figure 5-3) within the vicinity of the Project include:

- Woleebee Creek, which flows north from its headwaters flanking the southwestern boundary of the PL 209, and north along the boundaries of PL 445 and ATP 2059, to join Juandah Creek to the northeast;
- Wandoan Creek, a headwater tributary of Woleebee Creek, present within ATP 2059 to the west of PL 445;
- Conloi Creek, a tributary to Woleebee Creek, which flows west across the central portion of PL 209; and
- Hellhole Creek, a tributary to Woleebee Creek which flows north-west into Woleebee Creek across the southern portion of PL 209.

Watercourses within the Project Area have been classified using the Strahler method as stream orders 1 to 5, with the majority being stream order 1 (minor streams) (State of Queensland 2022b). Woleebee Creek is stream order 5.

Other watercourses of interest in the 25 km buffer include:

- Horse Creek and Horse Creek-East Branch, located to the southwest of PL 445 and PL 209, flows in a general northerly direction to join Juandah Creek in the north; and
- Juandah Creek, which flows towards the north to join the Dawson River, 3 km south of Taroom. Juandah Creek is joined by Woleebee Creek, Horse Creek (from the south) and Bungaban Creek from the east before joining the Dawson River.

Watercourse flows in the Project Area are characteristically ephemeral, episodic in nature, and typically generated only due to significant runoff events. This is likely a consequence of the catchments being in the upper most reaches with limited runoff area.

Section 6 of the EPBC Water Resource Impact Assessment Report (Attachment D) provides further detail on the hydrological regime.

5.1.3.4.1 Surface Water Users

Under the Fitzroy Basin Resource Operations Plan (ROP) (State of Queensland 2015), creeks within the Project Area are within the Dawson Valley Water Management Area. Within this management area Woleebee, Horse and Juandah Creeks are a tributary of the ‘Dawson N Zone’, along the adopted middle thread distance (AMTD) reach 356.5 to 428.0 (km); and, is described as ‘Upstream limit of Glebe Weir and Eurombah Creek Junction’.

There are no resource operations licence holders in the Dawson N Zone of the Dawson Valley Water Management Area (State of Queensland 2021a). No other surface water users have been identified within the vicinity of the Project.

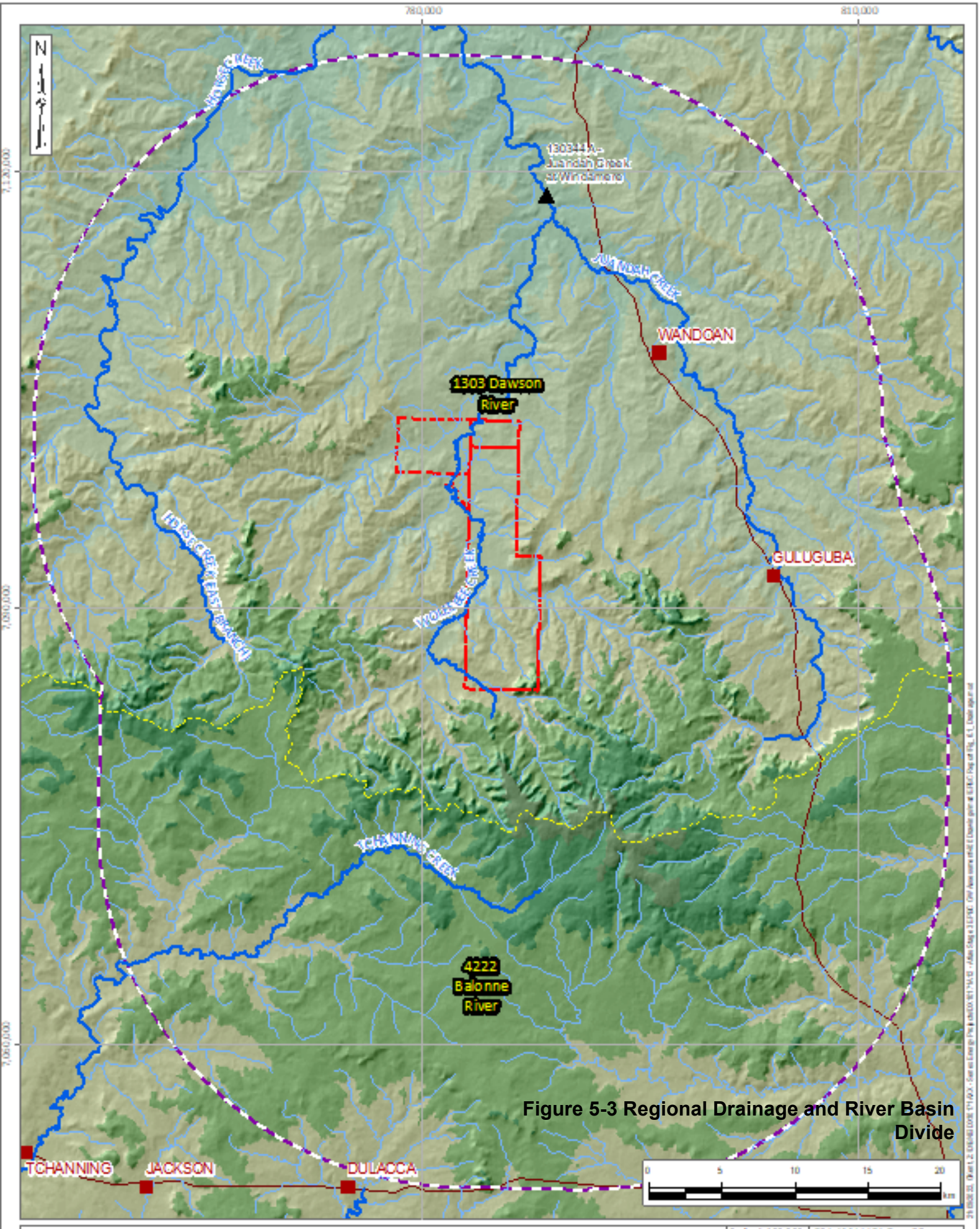


Figure 5-3 Regional Drainage and River Basin Divide

5.2 Summary of Assessment Findings

5.2.1 Impact Assessment

A detailed assessment of impacts to water resources, both directly and indirectly from the proposed Project, has been undertaken and is presented in the EPBC Water Resource Impact Assessment Report (Attachment D). Section 4 of the EPBC Water Resource Impact Assessment Report (Attachment D) defines the adopted methodology for the impact assessment, and Section 9 of the EPBC Water Resource Impact Assessment Report presents the results of the assessment. A separate Chemical Risk Assessment (Attachment L) was undertaken as part of the impact assessment and is discussed further in Section 6 below.

RFI 3.4

The preliminary documentation must include an assessment of direct, indirect and consequential/facilitated impacts on water resources as a result of the proposed action and must be assessed in accordance with relevant departmental policies and guidelines.

The department considers the proposed action may result in, but is not limited to, the following impacts:

- chemical contamination;
- changes to hydrological regimes;
- changes to water quality;
- groundwater drawdown and associated impacts on:
  - groundwater dependent ecosystems; and
  - third-party bores;
- subsidence; and
- cumulative impacts with other CSG operations in the region.

The PD must include a description and assessment of the potential impacts to water resources, giving consideration to relevant departmental policies and guidelines, including the JIF and Significant Impact Guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources (2013). These guidelines can be found at the following website: https://www.dcceew.gov.au/sites/default/files/documents/significant-impact-guidelines-1-3.pdf.

The PD must provide robust scientific information and supporting evidence for every assertion, assumption and/or conclusion made in the assessment of potential impacts, or lack of impacts, on water resource.

RFI 3.4 Response:

Senex agrees that the proposed action may result in, but is not limited to, the following impacts:

- Chemical contamination;
- Changes to hydrological regimes;
- Changes to water quality;
- Groundwater drawdown and associated impacts on:
  - Groundwater dependent ecosystems; and
  - Third-party bores;
- Subsidence; and
- Cumulative impacts with other CSG operations in the region.

These impacts have been assessed and are summarised in the following sections.

5.2.1.1 Chemical Contamination

Potential chemical contamination may occur due to the use of drilling fluids, and seepage of produced water or brine from storage facilities.

A Chemical Risk Assessment (Attachment L) has been undertaken for chemicals to be used as part of CSG production during Project development. The assessment examined the risks associated with the use of drilling fluids and their associated chemicals. It was determined that the risk to the MNES receptors from drilling fluids were limited to above ground chemical spills, the infiltration of chemicals to aquifers (downhole) during well installation, and the eventual disposal of the drilling fluids.

The risk to MNES from drilling fluids was determined both prior to and following mitigation and management measures. The risk assessment concluded that the likelihood of a drilling fluid to adversely affect an MNES is unlikely to highly unlikely. This is due to the proposed controls that will be implemented during drilling and the protocols in place if a spill should occur. The overall risk to MNES from chemical contamination has been assessed as low significance to insignificant. Further information on the chemical risk assessment is provided in Section 6 and in the Chemical Risk Assessment (Attachment L).

5.2.1.2 Changes to Hydrological Regime

Potential impacts to the ephemeral watercourses are associated with the general construction and day to day operations of CSG surface facilities; and, in the absence of Senex's mitigation and management measures, may comprise:

- Localised transport of suspended sediment off-site within surface waters during construction or site works, resulting in the potential to alter flow regimes and quality;
- Localised release of hydrotest water, effluent, or trench water to land (these fluids are not intended for release to the surface water system so has limited potential for any impact to surface water quality);
- Alteration of a watercourse character or changes to riparian buffers due to construction works;
- Unplanned releases from water and brine storage facilities with the potential to impact surface water and associated ecosystems (overtopping and storage facility migration); and
- Potential unplanned release of fuel and chemicals used as part of the Project impacting surface water quality.

No discernible impacts to surface water and associated aquatic systems are predicted as a result of Project development. The Project does not include any:

- Planned discharge to, or abstraction from, the surface water systems; or
- Surface water diversions.

There are no authorised and or licenced surface water users identified within the vicinity or immediately downstream of the Project. Therefore, no impacts to third-party surface water users are predicted as a result of the Project development. Section 6 of the EPBC Water Resource Impact Assessment Report (Attachment D) provides further detail on the hydrological regime, and an impact assessment is provided in Section 9 of the EPBC Water Resource Impact Assessment Report (Attachment D).

Response to RFI 3.5.9 (Section 5.3.1.3) details some of the monitoring, management and mitigation measures to prevent impact to the hydrological regime but which can include:

- Monitoring of regulated structures containing produced water, including facility water level monitoring;
- Maintenance and inspection of regulated structures integrity; and
- Minimisation of land disturbance including using existing watercourse crossings and the use of horizontal directional drilling for pipelines beneath key surface water systems where required.

5.2.1.3 Changes to Water Quality

Potential changes to groundwater quality as a result of Project development activities may relate to the use of drilling fluids during well installation and seepage from surface water storage facilities. Incorrect installation of CSG wells could introduce mixing across geological units potentially altering the groundwater chemistry.

Potential changes to surface water quality from Project activities relate to the use and storage of drilling fluids, surface spills, localised transport of suspended sediment to waters during construction or site works, or unplanned releases from water storage facilities.

Impacts to water quality, related to the use of chemicals by the Project, are discussed in the Chemical Risk Assessment (Attachment L). Monitoring, management and mitigation measures are discussed in the Chemical Risk Assessment Framework (Appendix I of the Chemical Risk Assessment Attachment L). Management and mitigation controls will be implemented to ensure the potential risks with the use of drilling additives have been eliminated or reduced to as low as reasonably practicable. There are a number of key Senex management documents including the Environmental Protocol for Field Development and Constraints Analysis (Attachment B), the Environmental Management Plan (Attachment E), the Water Monitoring and Management Plan (Attachment I), the Contingency Procedures for Emergency Environmental Incidents (Attachment N) and the Spill Response Plan (Attachment O). Based on the assessment results, changes to groundwater or surface water quality, with the appropriate management procedures in place, are not predicted as a result of the Project development.

5.2.1.4 Groundwater Drawdown

Abstraction of groundwater as part of CSG production results in drawdown in groundwater levels / pressure in the target coal seams, which can result in induced flow from overlying hydrostratigraphic units and therefore may impact existing water-dependent assets within the vicinity of the Project, such as groundwater bores, or GDEs.

The OGIA is an independent office that assesses and develops strategies for managing the impacts on groundwater from resource development in Queensland, which includes CSG. OGIA is not a regulator. Its work is primarily focused on scientific investigations, modelling and monitoring relating to groundwater impacts and supporting an adaptive management framework for managing the impacts in the CMAs in Queensland. CMAs are declared where impacts from resource development may overlap. Queensland has one CMA, being the Surat CMA.

The UWIR is a statutory report prepared by OGIA every three years for the Surat CMA. The report provides:

- Assessment of groundwater impacts laying out the effect on groundwater from existing and proposed CSG, conventional oil and gas and coal mining development. It includes information about groundwater aquifers and research on how they interact with each other (i.e. connectivity). Impacts are predicted with a groundwater flow model. It also helps to identify water bores that may be affected by resource development in the short and long term;
- Proactive strategies for managing impacts such as the proactive make good of water bores ahead of predicted impacts, a monitoring strategy and impact mitigation strategies for affected springs and connected watercourses; and

- Assignment of responsibilities to individual tenure holders to implement strategies and for ongoing reporting.

As part of the Surat CMA UWIR (OGIA 2021c), OGIA developed a regional numerical groundwater flow model to predict cumulative groundwater pressure drawdown due to activities from multiple petroleum and gas tenure holders exercising their underground water rights. The model was first developed and utilised as part of the 2012 UWIR (QWC 2012). An updated UWIR and updated numerical groundwater model was published by OGIA in September, 2016 (OGIA 2016); July, 2019 (OGIA 2019); and most recently May 2022 (OGIA 2021c). This Surat CMA groundwater model, accepted by industry and regulators, is used regularly to inform impact assessments for approvals by other proponents across the Surat CMA.

The primary purpose of the model is to predict regional groundwater pressure or groundwater level changes in aquifers within the Surat CMA in response to extraction / production of water from the various producing coal seams. In particular, the OGIA numerical groundwater model is used to assess potential impacts to landholder groundwater bores and springs relative to the Queensland Water Act trigger thresholds.

At the request of Senex, OGIA has simulated an appraisal scenario using the 2021 groundwater model based on production plans provided by Senex. Outputs from this model were used as part of the EPBC water impact assessment (KCB 2023a). The original 2021 UWIR model included the approved APLNG ‘Woleebee’ gas field in PL 445 and PL 209, which is now being partially replaced with the Project Therefore, the ‘Woleebee’ gas field was removed for the modelled scenarios. The OGIA numerical model was used to predict drawdown in groundwater levels for the ‘Project only’ and ’Cumulative’ scenarios, to aid in assessing the potential impact of the Project on groundwater resources. The cumulative scenario includes the simulation of the Project CSG water production as well as all current and foreseen developments from surrounding tenements (including tenements operated by Senex and other proponents and coal mines) within the Surat CMA.

The ‘Project only’ (i.e. the drawdown from this Project’s activities only) scenario (), the predicted long-term drawdown associated with the Project was identified to be limited to the Westbourne Formation, Springbok Sandstone, WCM, and underlying Durabilla Formation.

The predicted cumulative scenario (i.e. the drawdown from all resource operations in the Surat CMA) drawdown results indicate drawdown within the vicinity of the Project Area for the Westbourne Formation, Springbok Sandstone, WCM, and Hutton Sandstone. The majority of the drawdown occurs to the west of the Project and is associated with neighbouring CSG developments. Drawdown is also predicted to the southeast, where other CSG proponents are also operating.

Potential impacts to water-dependent assets have been assessed based on the Water Act spring trigger threshold (0.2 m drawdown) and bore trigger threshold (5 m drawdown in consolidated aquifer; 2 m drawdown in unconsolidated aquifer) using the predicted drawdown for both the ‘Project only’ and ‘Cumulative’ scenarios. There is no prescribed trigger threshold for the Project Area.

The modelled drawdown, predicted to result from the Project development, are presented in Section 8.5 of the EPBC Water Resource Impact Assessment Report (Attachment D), with specific impacts to groundwater assessed in Section 9 of the EPBC Water Resource Impact Assessment Report (Attachment D).

5.2.1.4.1 Groundwater Dependent Ecosystems

Potential impacts to potential GDEs can occur if the following conditions are met:

- Potential GDEs have been identified in the area;
- The potential GDEs are located on a Surat Basin aquifer outcrop/sub-crop;

- It is confirmed that the potential GDEs are sourcing water from the Surat Basin aquifer or the GDEs are sourcing water from an alluvial system connected to a Surat Basin aquifer. Evidence to indicate a connection include;
  - Hydraulic evidence including groundwater levels in the underlying Surat Basin aquifer are in connection with the alluvium or there is sufficient water in the alluvium to support the potential GDE; and
  - Water quality in the Surat Basin aquifer is sufficient for GDEs to survive
- Drawdown of >0.2 m is predicted in the Surat Basin aquifer due to the presence of the Project.

There are outcropping geological formations in the Project Area which have the potential for connection to aquatic and terrestrial GDEs, either directly, or through connections to overlying alluvial deposits;

The areas of interest for assessment of impacts to GDEs are the outcrop areas of:

- Upper Springbok Sandstone – this unit outcrops under PL 445 and to the north / northeast of PL 445 and PL 209;
- Westbourne Formation – this unit outcrops under PL 445 and PL 209; and
- Gubberamunda Sandstone – this unit outcrops under PL 209.

Areas of interest were identified by the 0.2 m drawdown extent for each outcrop formation. Potential drawdown greater than 0.2 m in these outcropping geological units have been compared to locations of potential GDEs and springs from the Queensland GDE mapping (State of Queensland 2018a) and field verification by ERM ecologists for GDEs mapped within the Project Area.

In summary the predictive modelling indicated:

- Drawdown of more than 0.2 m is not predicted for the Gubberamunda Sandstone for the Project only scenario, and cumulatively, the Project does not contribute to any additional potential GDE areas exceeding the 0.2 m trigger. Potential GDEs on the Gubberamunda Sandstone are not considered further in the GDE assessment;
- Project only drawdown in the Westbourne Formation is predicted to be less than 0.2 m on any Westbourne Formation outcrops. The Project does contribute cumulatively to additional drawdown in the outcrop area of the Westbourne Formation (<1%). This occurs in a small area of the Westbourne Formation outcrop in PL 1037 (Atlas) and neighbouring tenement PL 277 (QGC) to the west; and
- The groundwater in the Upper Springbok Sandstone outcrop area is predicted to have a drawdown greater than 0.2 m due to the proposed Project development (Project only simulation), resulting in this formation being the main formation of concern for this GDE impact assessment.

The evidence discussed in Section 5.1.3.3 and presented in Appendix X and XI of EPBC Water Resource Impact Assessment (Attachment D), indicates no impacts are expected to either terrestrial or aquatic GDEs around the creek alluvium as a result of drawdown in the areas of interest as the units are not observed to be hydraulically connected. Further details are presented in Table 5-2.

Table 5-2 Groundwater Dependent Ecosystems Impact Summary

Potential Impact	Discussion
Impacts to Watercourse Springs	OGIA has identified the potential for watercourse springs on-tenement along Woleebee Creek. These are: W279 – alluvium; W280 – alluvium/Gubberamunda Formation; and W281 – alluvium/Orallo Formation.

Potential Impact	Discussion
	These springs have been assessed against the Water Act spring trigger threshold of 0.2 m using the outputs and drawdown predictions from the UWIR numerical model. The Project only scenario does not result in drawdown at these locations in the potential source aquifers. The predicted cumulative drawdown is also <0.2 m. The results indicate that there is no drawdown predicted in the source aquifer at these locations and therefore the spring trigger threshold is not exceeded. Project only drawdown of more than 0.2 m is not predicted for OGIA watercourse springs identified along Juandah Creek 15 km east of PL 445. Woleebee and Wandoan Creeks are not considered to be baseflow-fed with hydraulic and geochemical evidence indicating that these creek systems are 'losing streams' to the underlying alluvium during periods of rainfall and creek flow
Impacts to Aquatic GDEs	These aquatic GDEs have been assessed against the Water Act spring trigger threshold of 0.2 m using the outputs and drawdown predictions from the UWIR numerical model. The Project only scenario does not result in drawdown at these locations in the potential source aquifers. It is also unlikely that these potential Aquatic GDE areas are sourcing groundwater from the deeper Surat Basin units of the Westbourne Formation and Upper Springbok Sandstone and are more likely to be dependent on the alluvium. The alluvium is recharged and replenished by surface water during prolonged periods of rainfall and during periods of creek flow; which is supported by both collected water quality and hydraulic data. Impacts to aquatic ecosystems are expected to be minimal and will be managed through implementation of the appropriate management, mitigation and monitoring practices associated with construction and operation. Based on the characteristics of the aquatic GDEs present a change of less than 0.2 m is unlikely to affect those species that are present or the ecological function of these ecosystems (ERM 2022). Impacts to threatened EPBC-listed aquatic species are considered unlikely
Impacts to Terrestrial GDEs	Potential terrestrial GDEs are mapped along Wandoan Creek and Woleebee Creek, on mapped alluvium, with some areas located on the Springbok Sandstone outcrop within the 0.2 m Project only model scenario drawdown extent. These potential terrestrial GDEs are all located along ephemeral creek systems. The likely source of water for these potential terrestrial GDEs is the alluvium and not the underlying consolidated aquifers. **Westbourne Formation** There are no terrestrial GDEs mapped in the predicted 0.2 m Project only drawdown extent of the Westbourne Formation outcrop. There is only one potential terrestrial GDE mapped on the Westbourne Formation outcrop within the predicted 0.2 m cumulative drawdown extent. Predicted (Project Only and cumulative) drawdown in the alluvium, the likely source aquifer for the terrestrial GDE at this location, is less than the 0.2 m drawdown trigger. The underlying Westbourne Formation at the location of this potential GDE is predicted to experience drawdown of more than 0.2 m without the presence of the Project, with a predicted cumulative drawdown of 2.6 m. The Project contribution to this cumulative drawdown is approximately 6 %. Due to the nature of the Westbourne Formation, being an aquitard, any depressurisation of this unit is unlikely to propagate to the potential GDE at the surface. **Upper Springbok Sandstone** There are four potential terrestrial GDE areas located on the Springbok Sandstone outcrop within the >0.2 m Project only drawdown extent. One of these potential GDEs is

Potential Impact	Discussion
	located on Senex tenement PL 445 (No. 1). The four potential GDEs are cumulatively impacted by surrounding activities (without the presence of the Project). These GDEs are described as: Surat_RS_01A: Quaternary alluvial aquifers overlying sandstone ranges with fresh, intermittent groundwater connectivity regime (moderate confidence in GDE status). Surat_RS_03A: permeable consolidated sedimentary rock aquifers with fresh, intermittent groundwater connectivity regime (low confidence in GDE status). A maximum Project only drawdown of 0.9 m is predicted to occur in the Upper Springbok Sandstone outcrop area, which corresponds to a location along Woleebee Creek on PL 445 where potential terrestrial GDEs are present. This drawdown is predicted to occur approximately 7 years after the start of the development. According to the terrestrial GDE preliminary risk assessment provided in the JIF (DCCEEW 2021), the magnitude (<1 m) and timing of predicted exceedance (7 years) of the drawdown at the potential GDEs, suggests that the risk of impact to potential terrestrial GDEs is low. These potential terrestrial GDEs are all located along ephemeral creek systems. Based on the available characteristics of the GDE physiographic setting, it is interpreted that the potential GDEs may be intermittently supported by groundwater in the alluvium and not the Upper Springbok Sandstone. The regional water quality of the alluvium indicates that it is recharged and replenished by surface water during prolonged periods of rainfall and during periods of creek flow. Field investigations have provided both hydraulic and hydrochemical evidence to support the argument that the alluvium and the underlying Upper Springbok Sandstone are disconnected. This evidence includes water level, and water quality (including isotope data). There are two main lines of evidence that identified disconnection between the alluvium and the underlying Surat Basin units: Hydraulics – Groundwater monitoring bores installed by Senex as paired bore sets in the alluvium and underlying Springbok Sandstone or Westbourne Formation displayed hydraulic separation between the units. Monitored groundwater levels in both of these units underlying the alluvium have always been below the base of the alluvium indicating that there is no contribution from these deeper units to the shallower alluvium. The groundwater level in the Springbok Sandstone is approximately 3 m below the base of alluvium during the wet season in Atlas-14M-D. There may be losses from the alluvium to these deeper units, as a result of infiltration, during times of saturation in the alluvium. Water quality – The water quality of the alluvium and underlying Surat Basin units is distinctly different. Fresher quality groundwater is observed in the groundwater samples of the alluvium (from the larger Juandah Creek catchment), Gubberamunda Sandstone and Hutton Sandstone. Electrical Conductivity (EC) is generally higher in the WCM, Westbourne Formation and Springbok Sandstone. The geochemical disconnect has been assessed through the comparison of alluvium and Upper Springbok Sandstone water quality, including isotope analysis. The results show that: The water quality of the regional alluvium is very similar to the quality of surface water sampled from Wandoan, Woleebee, and Juandah Creeks. The comparable water qualities of the surface water and alluvium indicates that the alluvium is recharged/replenished by, and in connection with, the surface water systems during flow events following prolonged rainfall event/s. The groundwater qualities observed from the Springbok Sandstone are distinct from the groundwater quality of the regional alluvium with the Springbok Sandstone groundwater showing a proportionally higher chloride concentration in comparison with the alluvium groundwater which display a proportionally higher carbonate-bicarbonate concentration.

Potential Impact	Discussion
	This difference in proportional anion concentrations indicates a lack of connection between the units (i.e., the underlying Springbok Sandstone does not discharge into the alluvium). The Springbok Sandstone groundwater sample (ATLAS-14M-D) is grouped with other samples for that unit, illustrating the sample is representative of the Upper Springbok Sandstone. The underlying Springbok Sandstone generally comprises a higher salinity than the regional alluvium system. Based on the available characteristics of the GDE physiographic setting, it is interpreted that these potential GDEs: May be intermittently supported by groundwater in the alluvium which is not predicted to experience drawdown; Have an alluvium source aquifer that is not interpreted to be connected to the Upper Springbok Sandstone which is predicted to experience drawdown; and Are being significantly impacted cumulatively by neighbouring activities without the presence of the Project (by the Wandoan Coal Project and other CSG activities). Considering the GDEs through the source-pathway-receptor conceptualisation: The presence of the Project results in a predicted drawdown of >0.2 m in the Springbok Sandstone in the far north of the Project Area in PL 445 (the source). This may impact an area of approximately 70 ha, of which 0.7 ha of terrestrial GDEs are present along Woleebee Creek (the receptor). The pathway for the potential impact to the potential GDEs (the receptor) is the connection between the Springbok Sandstone and the alluvium, and the potential for drawdown in the Springbok Sandstone to propagate into the alluvium. The alluvium is the most likely water source for the GDEs given the depth to groundwater in the Springbok Sandstone (>20 m). The alluvium is not considered to be hydraulically connected to the Upper Springbok Sandstone, as supported by both hydraulic and hydrochemical data. The water quality of the Springbok Sandstone is different to that of the regional alluvium water quality, with the Springbok Sandstone being a higher salinity. Water levels in the alluvium and Springbok Sandstone differ, with the Springbok Sandstone water level confirmed as being below the base of the alluvium in the site investigations. The disconnect between the Springbok Sandstone and the alluvium infers there is no pathway for drawdown in the Springbok Sandstone (the source) to propagate into the alluvium, and no significant impacts to GDEs (the receptor) are predicted. It is acknowledged that there is some uncertainty in the interconnection of aquifers. To address this, Senex is in the process of a two-year GDE and groundwater level baseline and monitoring program. Should connectivity to GDE dependent units be identified management measures including the development and implementation of a long-term GDE monitoring program will be initiated.
Impacts to Stygofauna	Impacts to potential stygofauna habitats are limited to the unconfined outcrop areas, which have been identified in PL 1037 in the Gubberamunda Sandstone/Westbourne Formations and Upper Springbok Sandstone (KCB 2018). The potential impact is summarised as follow: For ecological systems potentially reliant on groundwater within the shallow aquifers, the cumulative scenario does not predict any drawdown within the Gubberamunda Sandstone from the Project. For ecological systems potentially reliant on groundwater in the Westbourne Formation outcrop, the Project only drawdown in the Westbourne Formation is predicted to be less than 0.2 m. The results of the numerical modelling indicate that there is negligible (at

Potential Impact	Discussion
	most 2%) reduction in saturated thickness in the outcrop areas of the Westbourne Formation to the west and east of the Project. Drawdown is predicted in the Upper Springbok Sandstone within outcrop areas to the north and northeast of the Project. These areas are cumulatively impacted without the presence of the Project, with the Project contributing up to 0.9 m of drawdown within PL 445, which equates to a proportional drawdown contribution of the Project of approximately 20%. Given the overall thickness of the Springbok Sandstone of approximately 100 m, the reduction in saturated thickness from the Project only is negligible

5.2.1.4.2 Third-Party Bores

Immediately Impacted Bores

Chapter 3 of the Water Act provides the framework for managing impacts on underground water that are associated with resource operations, including CSG activities. This underground water management framework ensures that a third-party bore owner is not disadvantaged by such operations.

An 'Immediately Impacted Area' is defined in the Water Act by reference to a map included in a UWIR which shows the area of the aquifer where the water level is predicted to decline by more than the bore trigger threshold, within three years after the consultation day for the relevant UWIR, due to the extraction of water associated with resource operations.

Where a water bore is identified by OGIA to be located in an 'Immediately Impacted Area, the relevant resource holder has legislated 'make good obligations', which includes undertaking a bore assessment in accordance with the relevant legislated guidelines to determine whether the bore has, or is likely to have, an 'impaired capacity'. That is, whether:

1. There is a decline in the water level of the aquifer at the location of the bore and resource operations has, or has likely, caused or materially contributed to the decline, and because of the decline, the bore can no longer provide a reasonable quantity or quality of water for its authorised use or purpose; and
2. Due to the bore being adversely affected by resource operations, such as damage to the bore infrastructure, where there is a health and safety risk or there is free gas caused or materially contributed to by the resource operations.

If the water bore determined to have an impaired capacity, the relevant resource holder is then obligated to enter into a make good agreement with the bore owner to provide 'make good measures', including: ensuring the bore owner has access to a reasonable quantity and quality of water for the bore's authorised purpose, ongoing monitoring of the bore, and/ or monetary or non-monetary compensation.

Under the 2021 Surat Basin UWIR, OGIA have identified one bore on PL 445 that requires make good arrangements. Senex will continue to comply with make good obligations in accordance with the Water Act.

If any other bores are identified in an Immediately Impacted Area in future UWIRs, and/ or any of the landholders with bores in the Project Area reasonably consider their bores have been impacted due to the Project's activities, Senex will comply with its make good obligations under the Water Act.

Long-term Affected Bores

The ‘long-term affected area’ is defined in the Water Act by reference to a map included in the UWIR which shows the area of an aquifer where the water level is predicted to decline due to the resource operations, by more than an identified bore trigger threshold at any time in the future. The prediction of long-term impacts to third-party bores within the Surat CMA are the responsibility of OGIA and

published within revisions of the UWIR. As with Immediately Impacted Area Bores, if a bore is identified in an long-term affected area in a UWIR, the relevant resource holder has make good obligations with respect to that bore .

The OGIA modelling results indicate that there are 23 landholder bores within the vicinity of the Project which are predicted to experience a water level decline greater than the Water Act trigger threshold for the Project only model scenario. Two of these bores are located within the Project Area. These 23 bores are also cumulatively impacted without the presence of the Project.

Within the 25 km radius from the Project, 248 bores are triggered (i.e., >5 m drawdown) in the cumulative model scenario. In comparison to the Project only scenario, five additional bores are triggered as a result of the cumulative scenario (i.e., the contribution of the drawdown associated with the Project development results in five additional bores being triggered in the cumulative scenario. These bores would not have been triggered without the presence of the Project):

Two of these bores are attributed to the Upper Springbok Sandstone and three are attributed to the Upper Juandah Coal Measures (OGIA 2022).

Of the five additional bores, none of the bores are located on-tenement and are all located to the east of the Project. One of these bores is noted as abandoned and destroyed, two are noted as monitoring bores (and not water supply bores), and two are noted as existing bores.

Of the existing bores, a bore baseline assessment has been undertaken and confirmed that one of these bores is blocked and has not been used since 1996 (Arrow 2013). The maximum ‘Project only’ contribution to drawdown within the only existing usable bore is 1.3 m, which is 26% of the predicted cumulative drawdown (i.e., unlikely to result in impaired capacity).

The Project does not contribute additional drawdown of more than 0.1 m to town water supply bores or intensive stock bores.

Section 9.3 of the EPBC Water Resource Impact Assessment Report (Attachment D) provides further detail on potential impacts to third-party bores. Impacts to third-party bores will be managed in accordance with the make good requirements of the Water Act.

5.2.1.5 Subsidence

Depressurisation associated with CSG water extraction and gas desorption from the WCM may result in the compaction of coal seams. Compaction generally occurs as water is removed from the pores of saturated, high porosity layers (such as clay and silt) (IESC 2014). Most of the compaction, in response to depressurisation, occurs in coal seams as they contain cleats and fractures which are relatively more compressible compared to interburden material (such as sandstone, siltstone and mudstone). These layers cannot maintain the increased vertical stress as water pressure reduces, and the layers compact, potentially resulting in subsidence of the land surface (IESC 2014). Some of the compaction is elastic, allowing a degree of recovery and reversal of subsidence when groundwater pressure is returned (i.e. post-depressurisation).

Desorption of gas from the coal seams can result in additional compaction (IESC 2014). This compaction is minor and estimated to be approximately 1% of the coal thickness (Robertson 2005).

The potential for subsidence to occur is influenced by two primary factors: the magnitude of change in groundwater level; and the thickness and type of formations overlying the reservoir (OGIA 2021b). The greatest effect on CSG-induced subsidence is the magnitude of depressurisation, its pattern and how it develops over time across a gas field (OGIA 2021b).

There may be potential impacts to human-use environmental values (EVs) (e.g. agricultural land and water bores) and aquatic ecosystem EVs, such as watercourse springs and terrestrial GDEs, depending on the magnitude of subsidence.

Large-scale subsidence can have the following consequences:

- Change in ground slope and aspect of the land (resulting from variation in ground movement) may affect surface water drainage directions; and
- Change in the integrity of hydrological or hydrogeological connectivity which may cause structural changes to geological units.

The potential subsidence for both 'Project only' and 'Cumulative' model scenario predictions have been calculated based on a methodology of applying a subsidence calculation based on the compaction at a specific location[1] (Sanderson 2012; Coffey 2018).

The predicted cumulative induced subsidence (including the Project) has been estimated to be up to 0.063 m, with a range of 0.006 to 0.063 m across the Project (cumulative). The 'Project only' subsidence is predicted to be between 0.002 and 0.058 m. The maximum change in ground slope from possible CSG-induced subsidence is expected to be less than 0.002% (20 mm over a km). Due to the nature of the subsidence, which is likely to be uniform across large areas, the likelihood of differential settlement resulting in changes to surface water drainage is unlikely. Areas predicted to experience subsidence of less than 0.2 m are considered to be of low risk to environmental values (OGIA 2019). Project only subsidence estimation of a maximum of 0.06 m would be classed as low risk under OGIAs classification. The overall risk to EVs from subsidence is regarded as low.

Section 9.5 of the EPBC Water Resource Impact Assessment Report (Attachment D) provides further detail on predicted subsidence.

5.2.1.6 Cumulative Impact with Other CSG Operations in the Region

Due to the proximity of other CSG operations and coal mines throughout the Surat Basin, there are potential for cumulative impacts to occur. Potential cumulative impacts can result in:

- Additional groundwater drawdown; and
- Higher levels of subsidence.

This can subsequently result in additional impacts to groundwater bores, GDEs and surface water systems. Being located at the top of the Woleebee and Wandoan Creek catchments, there are no cumulative impacts to the surface water system anticipated due to spills, overtopping or unplanned discharges from other proponents.

Both 'Project only' and 'Cumulative' model scenarios used for impact assessments to bores and GDEs have been undertaken in the following sections of the EPBC Water Resource Impact Assessment Report (Attachment D):

- Section 9.3.2 – Cumulative Impact to Third-Party Groundwater Users.
  - The contribution of the Project development results in five additional bores being triggered in the cumulative scenario. These bores would not have been triggered without the presence of the Project. Of these only two bores are existing water supply bores, and one has been identified as being blocked.
  - Cumulative impacts to groundwater bores are mitigated through the requirements of the Water Act and the make good obligations of a resource tenure holder.
- Section 9.4.1 – Impact to Aquatic Ecosystems.
  - Aquatic ecosystems on-tenement are not predicted to be cumulatively impacted (predicted drawdown in the Westbourne Formation is <0.2 m trigger).
- Section 9.4.2 – Impact to Watercourse Springs.

[1] This method considers the axial compression of lateral strain using Poisson's Ratio with Young's Modulus to calculate a coefficient of volume compressibility; and calculates compaction directly due to groundwater pressure changes in the geological unit at a given location. This was the same methodology adopted by Arrow Energy (Coffey 2018) and has been previously accepted by the OGIA.

- OGIA has identified the potential for the presence of watercourse springs on-tenement along Woleebee Creek. The predicted cumulative drawdown is also <0.2 m. The results indicate that there is no drawdown predicted in the source aquifer at these locations and therefore the spring trigger threshold is not exceeded.

- Section 9.4.3 – Impact to Terrestrial GDEs.
  - Drawdown of greater than the 0.2 m trigger at potential terrestrial GDE areas on the Westbourne Formation outcrop is not predicted for the 'Project only' development, and cumulatively contributes approximately 6% of the cumulative drawdown to areas which are cumulatively affected.
  - The cumulative impact of drawdown on the Springbok Sandstone has been assessed and four potential GDE locations have been identified. These locations are impacted without the presence of the Project. The potential terrestrial GDEs align with the presence of alluvium and based on the evidence provided above and in the EPBC Water Assessment Report (Attachment D), it is likely that they are supported by the alluvium which is not considered to be in hydraulic connection with the underlying Springbok Sandstone; and is therefore not predicted to experience drawdown as a result of the Project.
  - It is concluded that the predicted impacts to potential terrestrial GDEs from the predicted drawdown resulting from the Project development are not significant.
- Section 9.4.4 – Impact to Subterranean Fauna.
  - Impacts to potential stygofauna habitats are limited to the unconfined outcrop areas. These impacts have been identified in the Upper Springbok Sandstone (up to 0.9 m of cumulative drawdown predicted) (KCB 2018).
  - The Project contributes up to 0.9 m of drawdown within the Springbok Sandstone outcrop on PL 445, which equates to a proportional drawdown contribution of the Project of approximately 20%. Given the overall thickness of the Springbok Sandstone of approximately 100 m, the reduction in saturated thickness resulting from the Project development is negligible. No discernible impacts to subterranean fauna, as a result of the Project development, are predicted.

5.3 Additional Information Requested

5.3.1 Avoiding, Monitoring and Managing Impacts

Senex has detailed the mitigation, management and monitoring practices for the Project that will be adopted to manage the risk of impacting water resources in Section 10 of the EPBC Water Resource Impact Assessment Report (Attachment D) and in the Water Monitoring and Management Plan (Attachment I).

Key Senex management plans and reports related to the monitoring and management of water include:

- The Water Monitoring and Management Plan (Attachment I);
- The Environmental Management Plan (Attachment E);
- The Atlas Project – Operation Management Plan for Regulated Structures (OPS-QLD-OP-PLN-008);
- Seepage monitoring plan (OPS-ATLW-CS-PLN-002);
- Atlas Dam – Seepage Monitoring Review 2020-2023_REV0 (Streamline Hydro, 25 July 2023, 2023095001-RPT-001);
- Coal Seam Gas Water Management Plan ATP 2059 (Attachment J);
- Coal Seam Gas Water Management Plan PL 445 and PL 209 (Attachment K).

- Contingency Procedures for Emergency Environmental Incidences (Attachment N); and
- Spill Response Plan (Attachment O).

Other documents of importance:

- The Surat CMA Water Management Strategy (WMS) (OGIA 2021a);
- The Joint Industry Framework (DCCEEW 2021); and
- EPBC Water Resource Impact Assessment Report (Attachment D).

RFI 3.5

As discussed above (Section 2.3), the department expects avoidance and mitigation measures to be thoroughly investigated as a part of project design and planning, which must be supported by evidence to demonstrate likely success.

The PD must outline methodologies and commitments for ongoing monitoring, identifying, assessing (including incorporation of a risk assessment) and managing impacts to water resources for the life of the project. Methodologies should be specific to the particular water resource component.

The preliminary documentation must provide the general information requirements set out in section 2.3, as well as the following:

RFI 3.5 Response:

The Water Monitoring and Management Plan (Attachment I) has been prepared to outline Senex's monitoring, management, and mitigation measures to specifically address potential impacts to groundwater, surface water and potential GDEs as a result of the Project development, operation, and decommissioning.

Through the delivery of Senex's existing natural gas projects, Senex has established a management system and operational standards supported by a strong environmental track record demonstrating evidence of success in support of the proposed measures. The proposed mitigation and management measures have been successfully implemented by other proponents across the Surat Basin.

Senex will manage any potential impacts to groundwater in accordance with the JIF.

5.3.1.1 Groundwater

RFI 3.5.7

The department considers that the referral provided insufficient evidence to conclude that there is a lack of hydraulic connectivity between the Quaternary alluvium and underlying geology, provide:

- *additional evidence that conclusively demonstrates a lack of connectivity between the Quaternary alluvium and the underlying geology; or*
- *monitoring, mitigation and management measures relating the impacts of groundwater drawdown that may propagate into the Quaternary alluvium.*

RFI 3.5.7 Response:

5.3.1.1.1 Evidence Demonstrating a Lack of Hydraulic Connectivity

To assist Senex with the understanding of the potential hydraulic connection between the alluvium and the underlying Surat Basin units, drilling and the installation of monitoring bores was completed in the Project Area between December 2022, and mid-2023.

Eight monitoring bores have been installed at four locations. The location of these bores is provided Figure 4.1 of Section 4.1.2 of the EPBC Water Resources Impact Assessment Report (Attachment D). Four of these bores were installed in the alluvium, and four in the underlying Surat Basin units of the Springbok Sandstone and Westbourne Formation adjacent to the alluvium bores. The locations of these bores were based on predicted modelling, and areas of drawdown in the Upper Springbok Sandstone were specifically targeted. These bores have been monitored for water quality and water level data since installation.

The alluvial deposits within the Project Area are generally associated with Wandoan and Woleebee Creeks. Alluvial bank heights of up to 8 m have been observed along Woleebee Creek within PL 445. Alluvium thickness, encountered during the site investigation, varied across the Project from 9 to 13 m, with the thickness of the alluvium decreasing away from Woleebee Creek. Within the Project Area the alluvium overlies the Springbok Sandstone, the Westbourne Formation and the Gubberamunda Sandstone, where they outcrop. Only the Upper Springbok Sandstone outcrop within the Project is predicted to experience groundwater level drawdown greater than 0.2 m.

There is a small area of potential GDEs located on the outcrop of the Upper Springbok Sandstone which is predicted to experience groundwater level drawdown greater than 0.2 m from the presence of the Project. This area of predicted drawdown is approximately 0.7 km^2 in size, or 70 ha (see Figure 9.6 of the EPBC Water Resource Impact Assessment Report, Attachment D). Hydraulic connection between the alluvium and the underlying units is not identified at the bore pairs. There is both hydraulic and geochemical evidence to support a hydraulic disconnection. There are two key ‘lines’ of physical evidence indicating a lack of hydraulic connection between the alluvium and underlying Surat Basin units:

- Senex groundwater monitoring bores installed as paired sets in the alluvium and underlying Springbok Sandstone or Westbourne Formation displayed hydraulic separation between the units. Groundwater levels in both underlying Surat Basin units are below the base of the alluvium indicating that there is no contribution from these deeper units to the shallower alluvium. The groundwater level in the Springbok Sandstone was 3 m below the base of alluvium during the wet season. There may be losses from the alluvium to these deeper units during times of saturation in the alluvium (i.e., when the head in the alluvium is sufficient to facilitate vertical downward flow).
- The groundwater qualities observed in the Springbok Sandstone and Westbourne Formation are distinct from the groundwater quality observed in the alluvium. The deeper units show a proportionally higher chloride concentration in comparison with the Juandah Creek alluvium groundwater which show a proportionally higher carbonate-bicarbonate concentration. This difference in proportional anion concentrations show a lack of connection between the units (i.e., the underlying Springbok Sandstone does not contribute groundwater into the alluvium). The Springbok Sandstone groundwater samples, from Atlas-14M-D, within PL 445, are representative of the Upper Springbok Sandstone.

The groundwater quality of the alluvium is similar to the quality of surface water sampled from Wandoan, Woleebee, and Juandah Creeks. The comparable water qualities of the surface water and alluvium indicates that the alluvium is recharged/replenished by, and in connection with, the surface water systems during flow events following prolonged rainfall events.

Groundwater dependence of potential terrestrial GDEs in the Project Area have been assessed and the following lines of evidence are referred:

- Plant rooting depth and morphology; and
- Evaluation of surface water – groundwater interactions.

A review of available literature on tree rooting depth for those dominant species present in each of the ground-truthed REs has been completed to understand how dependent these species may be on groundwater (ERM 2022). The results of the review are detailed in Section 7.11.2 of the EPBC Water Resources Impact Assessment Report (Attachment D). In summary:

- The field investigations in Q4 2022 confirmed unsaturated alluvium within the alluvial plains away from the immediate creek, even during the wet season. The confined groundwater strike in the units below the alluvium is substantial (38.5 mbgl in the Springbok Sandstone), with the Springbok Sandstone being dry above this depth (i.e., Springbok Sandstone is a confined aquifer). This indicates that REs within the alluvial plains away from the immediate creek vicinity, which include smaller more fragmented patches of Brigalow (*Acacia harpophylla* dominant and co-dominant) vegetation (present in RE 11.3.17), are dependent on soil moisture;
- While the presence of tree species that inhabit wetter environments indicate some potential for groundwater use, the leaf water potential and isotope data, from studies undertaken by QGC directly north of the Project Area on similar REs along creek tributaries to Juandah Creek, demonstrated that trees are sourcing water largely from soil moisture stores which fluctuate with rainfall (CDM Smith 2022). This is considered to be a function of the dimorphic rooting systems which access water at multiple depths;
- The average rooting depth for species of Eucalyptus present in the Project Area is known, based on literature reviews, to range from 9 m to 22.6 m below surface (depending on the species and the interactions between geomorphology and plant physiological traits). The dimorphic rooting system of Eucalypts (including Forest Red Gums) provides this species the ability to access deep groundwater during periods of time where shallower soil moisture is limited. They have shown physiological responses allowing them to adapt to water stress (CDM Smith 2022). The depth to the confined groundwater strike in the Springbok Sandstone is 38.5 m, with the Springbok Sandstone being dry above this depth, indicating that these Red Gums or other tree species present are not accessing the water within the sandstone; and
- Near the creeks, groundwater is present in the alluvium during the wet season and in discrete isolated pockets. Only potential GDEs in the vicinity of the creeks have access to groundwater. For these GDEs accessible groundwater is limited to the alluvium and they may have moderate dependency on the groundwater in the alluvium. However, as the evidence has shown there is unlikely to be hydraulic connection between the Upper Springbok Sandstone and the alluvium. The predicted drawdown in the Upper Springbok Sandstone is unlikely to impact potential GDEs dependent on groundwater in the alluvium. It is acknowledged that there is some uncertainty in the interconnection of aquifers. To address this, Senex is in the process of a two-year GDE and groundwater level baseline and monitoring program. Should connectivity to GDE dependent units be identified management measures including the development and implementation of a long-term GDE monitoring program will be initiated.

5.3.1.1.2 Groundwater Monitoring, Management and Mitigation

Groundwater monitoring (trend analysis) is a key mechanism for the early detection of potential impacts to groundwater levels in the alluvium or underlying bedrock geology resulting from CSG production.

The location of the nested bores, the planned monitoring regime, validation of monitoring data, and analysis of the monitoring data is detailed in the Water Monitoring and Management Plan (Attachment I).

Senex has installed eight groundwater monitoring bores at four nested sites across PL 445 and PL 209. These bores were installed in late 2022 to mid-2023 to provide site-specific hydrogeological characteristics and allow for the monitoring of groundwater levels and quality over time. Bore locations were selected to be in the vicinity of predicted groundwater level drawdown impact areas and monitor hydrostratigraphic units of interest. These bores were installed in the alluvium and the underlying consolidated formations of the Springbok Sandstone and Westbourne Formation. Details of these bores are provided in Table 5-3, which also includes information on other baseline monitoring bores that Senex actively monitor.

Table 5-3 Baseline Groundwater Monitoring Bores

RN	Senex ID	Location	Screen Depth (mbgl)	Source Aquifer	Purpose
180128	Atlas 13M-D	ATP 2059	30.5 – 36.5	Westbourne Formation	Baseline Monitoring
180127	Atlas 13M-S		6.0 – 9.0	Alluvium	
TBC	Atlas 14M-D		40.0 – 46.0	Springbok Sandstone	
TBC	Atlas 14M-S		7.0 – 10.0	Alluvium	
TBC	Atlas 15M-D	PL 209	29.0 – 35.0	Westbourne Formation or Gubberamunda Sandstone	
TBC	Atlas 15M-S		8.4 – 11.4	Alluvium	
TBC	Atlas 19M-D	PL 445	24.0 – 30.0 and 39.0 – 45.0	Springbok Sandstone	
TBC	Atlas 19M-S		4.5 – 7.5	Alluvium	
13030810	-	PL 209	8.4 – 9.4	Alluvium	
13030809	-		36.4 – 38.4	Springbok Sandstone	Baseline Monitoring (GWL only)

RN	Senex ID	Location	Screen Depth (mbgl)	Source Aquifer	Purpose
160631	Wolleebee MB3-S	PL 209	378.0 – 420.0	Upper Springbok Sandstone	WMS obligation (acquired from APLNG)
160764	Woleebee MB1-W		506.0 – 510.0 709.0 – 714.0 786.0 – 791.0	Upper Juandah Coal Measures Lower Juandah Coal Measures Taroom Coal Measures	WMS obligation (acquired from APLNG)

Under the Surat CMA UWIR, Senex is assigned monitoring obligations. Senex is currently obligated to maintain and monitor two WMS monitoring points (a Springbok Sandstone and a multi-level WCM), located within the Project Area (PL 209) (Woleebee MB3-S and Woleebee MB1-W).

Surface water and waste storage facilities have the potential to impact shallow aquifer systems. As a result, shallow groundwater monitoring in the vicinity of water and brine storage facilities has been established for the identification of potential seepage from the CSG water storage facility. The formation most likely to be affected by seepage from containment facilities is the Westbourne Formation. Senex undertakes quarterly monitoring for potential seepage from the water storage facilities via thirteen shallow groundwater monitoring bores and one private landholder bore as under the Queensland EA requirements for PL 1037. This is in compliance with Senex existing obligations to the State.

Additional Monitoring Bores

To account for the spatial variability of the saturated alluvium (e.g. discontinuous nature / heterogeneity) and extent of the alluvium, and further assess the connectivity between the Quaternary alluvium and the underlying Upper Springbok Sandstone, Senex will install an additional (5th) pair of monitoring bores in the vicinity of Wandoan Creek and the area of predicted drawdown near the northern boundary of ATP 2059. Surface geophysical surveys (method to be determined) will be considered to help place the new monitoring bore pair in the optimal location.

The survey will be undertaken as part of a mapping exercise to provide additional information in characterising the heterogeneity in the alluvium at this potential impact area and improve the definition of impact predictions at the individual GDE-scale. The paired monitoring bores will be used as verification points when analysing data obtained through this program. The additional bore will become part of the groundwater baseline monitoring bore network which will include monitoring of groundwater levels and quality and isotope sampling.

Management and Mitigation

Senex has committed to adopting the risk assessment and management framework defined in the JIF, which is applicable for this Project. The risk assessment and management frameworks defined in sections 3 to 7 of the JIF, relating to EPBC-listed springs, Water Supply Bores, Aquatic GDEs, Terrestrial GDEs and Subterranean GDEs will be implemented by Senex.

It is interpreted that potential terrestrial GDEs may be intermittently supported by groundwater in the alluvium which is not predicted to experience drawdown due to the lack of hydraulic connection with the underlying GAB formations. The JIF preliminary risk assessment process has been followed assuming a potential connection of potential terrestrial GDEs to the GAB formations either directly or through the alluvium. The preliminary risk assessment suggests that the predicted risk to terrestrial GDEs from the Project are low because:

- The outcrops of the Westbourne Formation and Gubberamunda Sandstone, which underlie most of the alluvium across the Project Area, are not predicted to experience drawdown of more than 0.2 m due to the Project; and

- A maximum Project only drawdown of 0.9 m is predicted to occur in the Upper Springbok Sandstone outcrop area (of approximately 0.7 km^2) on PL 445, approximately 7 years after the start of the development. According to the JIF terrestrial GDE preliminary risk assessment, the magnitude (< 1 m) and timing of predicted exceedance (7 years) of the impact on the known GDEs, suggests that the risk of impact to potential terrestrial GDEs is low.

Should a UWIR identify that the predicted drawdown or conceptual understanding has changed, Senex will re-evaluate the risk to the potential terrestrial GDE and follow the JIF terrestrial GDE framework. A high risk to terrestrial GDEs results in the following actions:

- Notification to DCCEEW;
- Site-specific risk assessment which is peer reviewed and presented to DCCEEW. This would include the implementation of performance criteria, triggers and limits as required;
- Ongoing monitoring of performance criteria;
- If a trigger is exceeded mitigation actions would be implemented; and
- If a limit is exceeded corrective actions to reverse the impact would be implemented.

If corrective actions were required under the JIF, mitigation options could include injection of groundwater into the alluvium (managed aquifer recharge), artificial drainage basins or trenches, weirs, or dripper lines to replace the volume of groundwater lost from the alluvium. These options would require further investigation and design if such mitigation options were required in the future. This investigation would need to assess the potential for additional impacts or alteration of the surface water systems as a result of the application of mitigation measures.

5.3.1.2 Groundwater Dependent Ecosystems

RFI 3.5.8

If conclusive evidence that demonstrates that there is a lack of connectivity between the Quaternary alluvium and underlying geology is not provided, provide:

- an analysis using the methods in Information Guidelines Explanatory Note: Assessing groundwater-dependent ecosystems (2019); of whether potential terrestrial GDEs in the project area, including Brigalow (*Acacia harpophylla* dominant and co-dominant), are reliant (partially or fully) on groundwater using direct techniques (e.g. plant water stable isotopes, and pre-dawn water stable isotopes); and/or
- monitoring, mitigation and management measures relating the impacts of groundwater drawdown on GDEs. This should also include corrective actions and offsets if required.

RFI 3.5.7 Response:

5.3.1.2.1 Potential Terrestrial GDE Baseline Assessment

An initial round of Terrestrial GDE (TGDE) baseline field botanical surveys and vegetation community assessments was completed in March - June 2022 (Boobook 2022). A further four baselining survey events will be completed over a minimum two-year period (to enable enhanced understanding of any seasonal variation prior to any possible impact from the Project).

The TGDE vegetation community assessments will be undertaken within 50 m x 20 m plots (0.1 ha) in representative locations (including at least one location in each identified RE and regrowth vegetation type) that make up the potential TGDEs within the areas of predicted drawdown in the outcropping Upper Springbok (where >0.2 m drawdown is predicted at Upper Springbok outcrop at the 95% percentile). Vegetation community assessment plots will, wherever possible, be located close to the existing and proposed groundwater monitoring bores.

Baseline botanical surveys in the plots will describe dominant flora and vegetation community structure. Searches will be conducted for EPBC Act and NC Act listed threatened flora. If identified, the species, location and number of individuals will be recorded. Significant weed species, WoNS and Biosecurity Act Restricted Matters, will also be recorded.

BioCondition assessments have been, and will be, used to evaluate ecological functionality of vegetation communities in these areas. These assessments apply the methodologies described by Eyre et al. (2015). This involves the establishment of a 100 m x 50 m plot for measurements relating to canopy layer structure and diversity, a 100 m transect to measure canopy cover, a 50 m x 10 m subplot for measuring plant richness in shrub and ground layers, a 50 m x 20 m subplot for measuring coarse woody debris, and five 1 x 1 m quadrats to estimate ecological components of ground cover within the assessment area. These values are used as indicators of ecosystem function relative to minimally disturbed benchmark sites (Queensland Herbarium 2021) within the same vegetation type.

BioCondition assessments will complement the vegetation community assessments. The following information is recorded at each BioCondition site:

- Date;
- Observers;
- Description of location (bioregion, general description, co-ordinates for plot origin and centre, plot bearing and alignment);
- General habitat description and RE type;
- Median height for canopy, emergent and sub-canopy strata;
- Slope position/slope degree and slope aspect;
- Tree species richness (within 100 m x 50 m plot);
- Native plant species richness (within 50 m x 10 m plot);
- Non-native plant cover (within 50 m x 10 m plot);
- Total length of coarse woody debris (length >10 cm diameter and >0.5 m long within 50 m x 20 m plot);
- Number and average diameter at breast height (DBH) of large eucalypt and non-eucalypt trees (within 100 m x 50 m plot);
- Recruitment of canopy species (within the 100 m x 50 m plot);
- Tree and shrub canopy cover (within 100 m transect);
- Ground cover within 1 m x 1 m plots (native perennial grass and organic litter cover in the ground layer); and
- Disturbances (severity, last event and observation type).

Site photographs will be taken using a digital camera in accordance with Eyre et al. (2015) (i.e. one photograph at plot origin and north, east, south and west photographs at the plot centre). Photograph numbers shall be recorded. Locations of BioCondition sites will be determined using a handheld Global Positioning System (GPS) (Garmin GPSmap 78S) and BioCondition assessment data will be captured by mobile GIS devices (Zebra tablet device).

Scores for BioCondition sites will be calculated in accordance with Eyre et al. (2015) which compares the values obtained at each survey site with values in the benchmark document for that particular RE (Queensland Herbarium 2021).

Subscores will be awarded to each site are totalled and divided by the maximum possible score for that RE. This provides a numeric index along a continuum of biodiversity condition, where scores close to 0 indicate sites that are ecologically ‘dysfunctional’ and scores closer to 1 indicate increasing functional integrity.

Fauna surveys have and will include incidental and targeted searches to detect the presence of threatened vertebrate fauna. Incidental searches will consist of opportunistic active searches in suitable habitat while undertaking the Vegetation Community Assessments. Targeted faunal survey techniques will include spotlighting for arboreal mammals and birds. Spotlighting surveys have

already been undertaken in two sites, in riparian woodland along Wandoan Creek and in similar vegetation along Woleebee Creek, both within the northern part of the Project Area. Each spotlighting survey commenced one hour after sunset and consisted of a two-hour, approximately two-kilometre meandering transect through habitat suitable for arboreal mammals covering all vegetation strata along the route. Four further spotlighting surveys will be completed along these watercourses over the next two years.

Faunal habitat values will also be assessed within the same 50 m x 20 m plot used for vegetation assessments. Data has been and will continue to be collected for fauna habitat features and condition for threatened fauna. Features are assessed semi-quantitatively and include the presence and abundance of:

- Hollow-bearing live trees, stags and logs;
- Logs by size class;
- Leaf and woody litter, stone/rock and grassy ground cover;
- Rock outcrops, gilgais, termite mounds and burrows;
- Mistletoe and other potential food plants;
- Active or potential fauna breeding places are also recorded where found. Such places include:
    - Decorticating trees and logs;
    - Hollow-bearing logs, live trees and stags.

Reference TGDE sites will also be established and assessed outside of the expected Project impact area in comparable TGDEs. Reference sites will be as similar as possible to the ‘impact’ sites in their species composition, environmental setting and potential use of groundwater. It is recognised that reference site options are all likely to be within areas potentially affected by other gas and/or agricultural projects, however being outside of areas with any predicted potential for drawdown immediately underlying the alluvium, these reference sites will be best placed to contextualise any detected changes in the predicted ‘impact’ areas. Should TGDE monitoring be triggered in the future (through exceedance of groundwater trigger values established under the JIF), the data from the reference sites would be available to help indicate whether changes observed in potential TGDEs in the Project ‘impact’ area exceed changes in the TGDEs in the broader area that may be explained by climate or other sources of variability.

The TGDE assessment within and outside of the areas of predicted drawdown in the outcropping Upper Springbok Sandstone will provide a baseline of the TGDE characteristics (including seasonal variability) within these areas prior to there being any potential for these TGDEs to be affected by the Project.

5.3.1.2.2 Potential Aquatic GDE Baseline Assessment

An initial round of Aquatic GDE (AGDE) baseline field assessment has already be completed during the wet season of 2022 (14-21 March 2022). A further three baselining events will be completed within two years of commencement prior to any predicted drawdown in Surat Basin aquifer units (to enable enhanced understanding of seasonal variation prior to any possible impact from the Project).

The aquatic ecology assessment sites will, wherever possible, be located close to the existing and proposed groundwater monitoring bores. Reference sites will also be established.

To the extent that field conditions allow, field sampling of aquatic habitat values consists of:

- Habitat assessment;
- In situ water quality sampling;
- Macrophytes;
- Macroinvertebrate;
- Backpack electrofishing;
- Visual observations; and
- Fyke netting using large nets.

The aquatic habitat assessment is undertaken following the Australian River Assessment System (AusRivAS) protocols (DNRM 2001) by an AusRivAS accredited ecologist. The habitat assessment includes recording quantitative and qualitative measurements and observations of:

- Substrate composition;
- Flow, water depth and wetted width, noting if surface water was connected or comprised of one or more disconnected pools in the channel;
- Channel morphology;
- Physical habitat features, such as large woody debris, undercut banks and aquatic plants;
- Riparian vegetation cover and condition;
- Any notable disturbances including bank erosion, cattle access to waterway and barriers;
- Associated with nearby road crossings or dams; and
- Other on site features, such as presence of filamentous or benthic algae, surface scums, unusual sediment deposits, or fish kills.

An aquatic habitat inventory will be undertaken at each baselining location to assist in the interpretation of ecological data. This inventory includes a general description of the environment within, and immediately surrounding each site, including:

- Channel characteristics.
  - Reach length, bankfull bank height, bankfull stream width, mean water depth, mean wetted width.
- Riparian vegetation characteristics.
  - Riparian vegetation height (max.), riparian zone width (both banks), bare ground, grass, shrubs, trees (< 10 m and > 10 m), canopy cover.
- Mesohabitat composition (%).
  - Riffle, run, rocky pool, sandy pool, dry.
- Substrate composition (%).
  - Bedrock, boulder (>256 mm), cobble (64-256 mm), pebble (4-64 mm), gravel (2-4mm), sand (2-4 mm), silt/clay (<0.05 mm).
- Macrophytes (None, Little 1-10%, Some 10-50%, Moderate 50-75%, Extensive >75%).
  - Free floating, attached floating, submerged, emergent (as per section 3.5).
- In-stream wood (None, Little 1-10%, Some 10-50%, Moderate 50-75%, Extensive >75%).
  - Detritus (leaves etc.), sticks (<2 cm diameter), branches (<15 cm diameter), logs (>15 cm diameter).
- Microhabitat (None, Little 1-10%, Some 10-50%, Moderate 50-75%, Extensive >75%)
  - Periphyton, filamentous algae, submerged macrophytes, bank overhang vegetation, trailing bank vegetation, blanketing silt, substrate anoxia, bank undercuts.

Aquatic habitat will be assessed in accordance with the AusRivAS Sampling and Processing Manual (DNRM 2001). Habitat bioassessment score datasheets (from DNRM 2001) are used to numerically score nine criteria, which are then allocated to one of four categories (excellent, good, moderate and poor).

In situ water quality data is recorded at each AGDE assessment site using portable multiparameter water quality meters that have been calibrated in accordance with the manufacturer's specifications. Calibrations are regularly checked in the field. Parameters tested in situ are: temperature, electrical conductivity (EC), pH, turbidity and dissolved oxygen (DO). In situ water quality testing is undertaken in conjunction with macroinvertebrate sampling to assist with the interpretation of results. All sample collection is completed in accordance with the Monitoring and Sampling Manual: Environmental Protection (Water) Policy (DES 2018) and AS/NZ 5667.6:1998 Guidance on sampling of rivers and streams (AS/NZS 1998).

Macrophyte surveys are undertaken following completion of the fish and macroinvertebrate surveys to increase the chance of observing macrophytes that were not abundant throughout the reach. All native and exotic macrophyte species at the site are recorded. The relative site coverage of each macrophyte species is recorded. Macrophyte species are categorised by growth form in accordance with definitions provided in Sainty and Jacobs (2003), as follows:

- Free floating – Species that are normally unattached and float on the surface but may become attached and rooted in drying mud when water levels drop;
- Floating attached – Species that are rooted in the substrate but normally have at least the mature leaves floating on the water surface;
- Submerged– Species rooted in the substrate or free floating submerged; and
- Emergent – Species rooted in the bank substrate with stems, flowers and most of the mature leaves projecting above the water surface.

No free floating or submerged macrophytes have been recorded to date.

Freshwater macroinvertebrates are also sampled in accordance with the Monitoring and Sampling Manual: Environmental Protection (Water) Policy (DES 2018) which defaults to those methods adopted by the AusRivAS Sampling and Processing Manual (DNRM 2001). Collected macroinvertebrates are sorted in the laboratory and identified to the family taxonomic level and relative abundance enumerated. Organisms are identified to family level with the exception of lower phyla (e.g. porifera, nematoda), oligochaetes (freshwater worms), acarina (freshwater mites) and microcrustacea (ostracoda, copeopoda and cladocera). Chironomids are identified to subfamily level in accordance with standard AusRivAS protocols (DNRM 2001).

Where sufficient water is present, fish and turtle sampling is conducted in line with the approach outlined in the Monitoring and Sampling Manual: Environmental Protection (Water) Policy (DES 2018).

Sampling of frogs is restricted to opportunistic visual encounter surveys and call surveys. These are undertaken during general aquatic ecology surveys. At each site suitable habitat is searched for any frogs present. No frogs have been heard calling and no tadpoles have been recorded to date.

The AGDE assessment within and outside of the areas of predicted drawdown in the outcropping Upper Springbok Sandstone will provide a baseline of the AGDE characteristics (including seasonal variability) within these areas prior to there being any potential for these AGDEs to be affected by the Project.

5.3.1.2.3 Stygofauna Baseline Assessment

A desktop stygofauna baseline assessment has been completed which considered a 50 km radius area centred on the Project. Twelve landholder bores, all outside of the areas of predicted drawdown in the outcropping Upper Springbok Sandstone (where >0.2 m drawdown is predicted at the Upper Springbok Sandstone outcrop for the 95th percentile uncertainty simulation), were sampled for stygofauna in June 2022. It is proposed that stygofauna sampling be completed in Senex's recently installed and future proposed monitoring bores on at least four separate occasions (all at least three months apart) over two years. Where water is present in the alluvial monitoring bores these will be sampled for stygofauna. The non-alluvial bore of each monitoring bore pair will also be sampled.

Groundwater bores are sampled for stygofauna in accordance with the methods defined in Queensland Environment Protection (Water) Policy 2009 – Monitoring and Sampling Manual for Biological Assessment (DES 2018) and following established sampling techniques defined elsewhere in Australia and overseas (DSITI 2015; Hancock and Boulton 2008; Dumas and Fontanini 2001; WA EPA 2003; 2007).

Field samples are logged into a Laboratory Information Management System to record and track sample processing details. Stygofauna samples are then sorted under a stereomicroscope and all aquatic animals present are removed (stygofauna and non-stygofauna) and identified to Order/Family level (or lower taxonomic rank if visually possible) in accordance with standard Queensland Government Terms of Reference for an EIS.

Biannual groundwater quality sampling will also be conducted at each stygofauna sampling bore including for temperature (°C), pH (units), electrical conductivity (µS/cm), dissolved oxygen (mg/L) and turbidity (NTU) using a multiparameter water quality meter to provide a general estimate of standing groundwater quality, at the following bores:

- ATLAS-13-M-D/S;
- ATLAS-14M-D/S;
- ATLAS-15M-D/S; and
- ATLAS-19M-DS.

5.3.1.2.4 Groundwater Dependency Assessment Program

Senex will undertake a GDE Groundwater Dependency Assessment Program to assess the level of potential groundwater dependency of GDEs present in and upstream of the potentially 'impacted' areas. The assessment will include the following:

1. Collection of biophysical data from trees from within areas mapped as Terrestrial or Aquatic GDEs within and upstream of the potentially 'impacted' area, including:
    a. Measurement of pre-dawn leaf water potential (LWP) from selected canopy trees at proposed assessment sites.
    b. Measurement of leaf area index (LAI) from trees assessed for LWP.
    c. Soil auger profiling and collection of downhole soil moisture potential at selected assessment sites.
2. Analysis of stable isotope composition of surface waters, groundwater (from auger holes and dedicated monitoring bores), soil moisture and twig xylem to investigate the partitioning of moisture pools being utilised by woody vegetation within mapped GDE areas;
3. Consideration of the hydrochemical properties of all water samples, particularly salinity (EC) in groundwater samples as an indicator of suitability of the various moisture sources to support transpiration; and
4. Acquisition and analysis of high resolution (World View_GEO Eye 50 cm) NDVI imagery to form a component of a broader dataset applied for temporal monitoring of GDEs.

The proposed sampling method locality and intensity is provided in Table 5-4 below. This program will be undertaken over a two-year (4 sampling events) baseline period. The program will include the assessment of stable isotopes to determine the major water sources being utilised by riparian vegetation that is associated with potential TGDEs or AGDEs. Stable isotope analysis including sampling of twig xylem, soils, any surface water (plus groundwater intercepted in soil augers over two seasonal cycles will allow for the identify any changes to vegetation moisture sources that occur during the baseline - particularly important in a drying climatic cycle where trees can switch abruptly from use of soil moisture to groundwater.

This intensive data collection will form a component of a baseline dataset.

Table 5-4 Groundwater Dependent Ecosystem Dependence Assessment Program Sampling Method Locality and Intensity

Sampling Method	Sampling Location	Sampling Intensity
Pre-dawn leaf wetting potential (LWP)	Wandoan Creek	A minimum of 12 LWP assessment (tree) points across three monitoring sites extending from the inner benches of the creek to lower alluvial terraces.
	Woleebee Creek	A minimum of 20 LWP assessment (tree) points across five monitoring sites extending from the inner benches of the creek to the lower alluvial terraces.
	Wetland areas mapped as AGDEs in the BOM GDE Atlas. Associated with the floodplain of Woleebee Creek	A minimum of 8 LWP assessment (tree) points across two monitoring sites within areas associated with the floodplain of Woleebee Creek.
Leaf area index (LAI)	Wandoan Creek	A minimum of 12 LAI capture (tree) points across three monitoring sites extending from the inner benches of the creek to lower alluvial terraces.
	Woleebee Creek	A minimum of 20 LAI capture (tree) points across five monitoring sites extending from the inner benches of the creek to the lower alluvial terraces.
	Wetland areas mapped as AGDEs in the BOM GDE Atlas. Associated with the floodplain of Woleebee Creek	A minimum of 8 LAI capture (tree) points across two monitoring sites within areas associated with the floodplain of Woleebee Creek.
Stable Isotope	All localities	Sampling for stable isotopes will be completed at a minimum for: a) 40 trees proposed for assessment across 10 proposed GDE assessment sites. b) shallow groundwater stored in sand in the river channel (river sand aquifer) or intersected in deeper auger profiles located on alluvial terraces and sampled with a bailer. c) groundwater from alluvial monitoring bores where sampling with a bailer is suitable. d) groundwater from deeper monitoring bores installed into bedrock aquifers.

Sampling Method	Sampling Location	Sampling Intensity
		e) soil samples from auger holes, including up to 6 auger holes up to 6m depth (two from Wandoan Creek, two from Woleebee Creek and two from AGDE wetlands.
NDVI Capture	Approximately 100 km^2 capture to cover the Project Area and a suitable buffer.	Fresh capture WorldView 2 and GeoEye-1 (0.5 m Resolution 4-8 band Pan) imagery coinciding with the field survey events will be used specifically as a measure of vegetation vigour as a baseline.

At the end of the two-year assessment period, a GDE Dependency Assessment Report will be prepared which includes identification of likely moisture sources utilised by targeted trees (and potential GDEs) at the time of assessment. Reporting will include a statistical analysis to identify trends and correlations between multiple datasets.

5.3.1.2.5 Management and Mitigation

It is interpreted that potential terrestrial GDEs may be intermittently supported by groundwater in the alluvium which is not predicted to experience drawdown due to the disconnect with the underlying Surat Basin units. The JIF preliminary risk assessment process has been followed assuming a potential connection of potential terrestrial GDEs to the Surat Basin units ither directly or through the alluvium. The preliminary risk assessment suggests that the predicted risk to terrestrial GDEs from the Project are low because:

- The outcrops of the Westbourne Formation and Gubberamunda Sandstone, which underlie most of the alluvium across the Project Area, are not predicted to experience drawdown of more than 0.2 m due to the Project; and
- A maximum Project only drawdown of 0.9 m is predicted to occur in the Upper Springbok Sandstone outcrop area (of approximately 0.7 km^2) on PL 445, approximately 7 years after the start of the development. According to the JIF terrestrial GDE preliminary risk assessment, the magnitude (< 1 m) and timing of predicted exceedance (7 years) of the impact on the known GDEs, suggests that the risk of impact to potential terrestrial GDEs is low.

Should a UWIR identify that the predicted drawdown or conceptual understanding has changed, Senex will re-evaluate the risk to the potential terrestrial GDE and follow the JIF terrestrial GDE framework.

5.3.1.3 Surface Water

RFI 3.5.9

Details of the monitoring, mitigation and management measures relating to impacts to surface water (e.g. chemical spill, waste leaching, or seepage into surface water features).

RFI 3.5.9 Response

5.3.1.3.1 Baseline Surface Water Monitoring

Senex will collect surface water samples from a minimum of three sites along Wandoan and Woleebee Creeks (at least one site on each creek), including a reference site near the monitoring bore pair Atlas-15M as indicated in Table 5-5. Given the ephemeral nature of the surface water system, water quality sampling will need to include event-based sampling when watercourse flows occur.

Four baselining events will be completed over a minimum two-year period (to enable better understanding of seasonal variation prior to any possible impact from the Project) until a sufficient baseline has collected, after which sampling frequency will be reviewed and long-term monitoring determined.

Table 5-5 Surface Water Persistent Pool Baseline Sampling Locations

Location ID	Sampling Location		Water Source
	Easting	Northing	
Woleebee-Ck-N	785462	7104179	Woleebee Creek
Woleebee-Ck-S (near Atlas-15M-D/S)	TBC	TBC	Woleebee Creek
Wandoan-Ck	TBC	TBC	Wandoan Creek

The analytical parameters required to be analysed from surface water samples collected from locations previously sampled include, at a minimum:

General field physiochemical parameters: (pH, EC, Turbidity, Dissolved Oxygen, Temperature, ORP), and Total Dissolved Solids (TDS), Suspended Solids.

- Cations: Na+, K+, Ca2+, Mg2+.
- Anions: Cl-, SO42-, CO32- Alkalinity, HCO3- Alkalinity and Total Alkalinity.
- Ionic Balance.
- Sodium Adsorption Ratio (SAR).
- Halides: F-.
- Total and Dissolved Metals: Al, Ag, As, B, Ba, Be, Cd, Cr, Co, Cu, Fe, Ga, Hg, Li, Mo, Mn, Ni, Pb, Sb, Se, Sr, U V, Zn.
- Stable isotopes, oxygen 18 (δ18O) and deuterium (δ2H).

There are no planned discharges to surface water from the proposed Project infrastructure (e.g., water storage facilities), therefore no ongoing monitoring of the surface water system is planned. Should this change, surface water monitoring will be undertaken prior to installation of infrastructure to confirm baseline conditions of the surface water system and to confirm potential impacts associated with discharge from the Project infrastructure.

Monitoring of surface water systems is planned during the construction phase (where applicable):

- Watercourse crossings will be monitored for erosion and sedimentation during construction, weekly during dry conditions, and daily inspections during rainfall of >50 mm in one day or >100 mm over 4 days or as soon as watercourse access is re-established after flooding.

5.3.1.3.2 Regulated Structure Seepage Monitoring

Produced water monitoring is ongoing at the Atlas Aggregation Dam #1 and #2, located on adjacent lease PL 1037 which are classed as regulated structures. The primary objectives for monitoring activities for the regulated structure are:

- To provide data on the produced water level;
- To assess the performance of the regulated structure liner system and leak detection system.
- To provide advanced warning of a loss of structural integrity of the regulated structure embankment/wall;
- To comply with regulatory conditions, including EA conditions, relating to operation and monitoring of the regulated structures; and
- To comply with risk mitigation measures identified in the regulated structure design risk assessment and residual risks identified as part of construction reporting and certification for each regulated structure.

Monitoring includes:

- Produced water level;
- Produced water temperature;
- Produced water chemistry;
- Leakage detection via monitoring water in collection sump/s or flow rate through leakage recirculation pipes; and
- Seepage detection via monitoring water level and chemical properties in shallow and deep groundwater bores surrounding the regulated structure.

The Atlas produced water dam monitoring requirements are presented in Table 5-6.

Table 5-6 Groundwater Dependent Ecosystem Dependence Assessment Program Sampling Method Locality and Intensity

Monitoring Activity	Data to be Acquired	Acquisition Method	Data Acquisition Frequency
Weather	Rainfall (mm) Evaporation (mm) Wind speed (m/s) Temperature (°C)	Weather station nearest to the regulated structure (BOM Station number 035014) On site weather stations	Daily data provided by bureau of meteorology
Water level	Water level in mAHD & %MOL	Level transmitter with telemetry	Minimum hourly recording

Monitoring Activity	Data to be Acquired	Acquisition Method	Data Acquisition Frequency
Water chemistry	As required by the EA and as a minimum - pH - Total Dissolved Solids - Total Alkalinity - EC	Sample and test.	Quarterly
Leakage detection	Sump water level (mAHD or %Volume) and/or Total Leakage Recirculation Volume (m3)	Flow totaliser or level transmitter via telemetry	Hourly recording (level) Daily volume (flow totaliser)
Seepage detection as per Seepage Monitoring Plan OPS-ATLW-CS- -002.	Groundwater level (mAHD) in each monitoring bore and piezometer	Manual measurement	Same frequency as Routine Inspections

5.3.1.3.3 Mitigation and Management

Seepage

The significant consequence category dam operation plan (OPS-ATLW-CS-PLN-002) provides an emergency response trigger and subsequent management procedure for the significant loss of regulated structure liner integrity.

The seepage emergency response procedure is triggered through the following:

- The sudden or unexplained decrease in water level in the water storage facilities (identified through monitoring of automatic water level sensor data);
- Monitoring data indicating leakage rates which exceed trigger leakage rates;
- Monitoring data indicating unusual water level in leak detection sumps and/or shallow groundwater bores; and
- Surveillance inspection identifies evidence of seepage through the dam embankment or tank wall or foundations (e.g. springs, seeps or boggy areas).

Should the emergency response procedure be triggered, the following will occur:

- All inflows to the regulated structure shall be isolated/redirected;
- Reduce Produced Water level in the regulated structure (if possible);
- Undertake Special Inspection;
- Specify liner system remediation requirements;
- Undertake liner system remediation as required;
- Perform investigation of environmental harm;
- Provide report to relevant local authority on environmental harm, if required; and
- Close-out emergency trigger response.

Groundwater quality trigger levels will be calculated for the shallow seepage groundwater monitoring bores once sufficient data is collected (a minimum of eight baseline data samples is required).

Overtopping

The significant consequence category dam operation plan (OPS-QLD-OP-PLN-008) provides an emergency trigger for the imminent or actual regulated structure overtopping (i.e. spillway discharge). This is triggered through the exceedance of the mandatory reporting level (mAHD) and Bureau of Meteorology (BOM) weather forecasts indicate heavy rainfall, or the regulated structure releasing water through the spillway. Should this occur, the emergency response procedure is triggered (OPS-QLD-OP-PLN-008).

Spills

The Contingency Procedures for Emergency Environmental Incidents (Attachment N) provides a framework for Senex to:

- Understand the risks of natural events and Senex activities to the integrity of infrastructure and the environment and safety of persons;
- Respond to emergency environmental incidents;
- Communicate with the appropriate parties in the event of emergency environmental incidents;
- Investigate the cause and impacts of emergency environmental incidents that have occurred; and
- Restore the environment or mitigate any environmental harm caused.

The Contingency Procedures for Emergency Environmental Incidents (Attachment N) addresses a range of potential events including major spill of hazardous materials, CSG water release, pond failure leading to CGS water release and flooding/extreme weather events. The procedure identifies Senex's Emergency Response Process and response measures. The procedure is underpinned by the Spill Response Plan (Attachment O) which includes standard protocols that will be utilised by Senex to respond in an appropriate and timely manner in the event of a spill. The procedure details the following steps:

- Prevention – takes actions to reduce or eliminate the likelihood of effects of an incident;
- Preparedness – takes steps before an incident to ensure effective response and recovery;
- Response – contain, control or minimise the impacts of an incident; and
- Recovery – takes steps to minimise disruption and recovery times.

Senex has adopted the internationally accepted Tiered Response classifications to describe different categories of spill events, based on severity and location. Tier classifications are determined based on spill volume, environmental sensitivity, potential social impacts and other factors specific to the event.

Should a spill occur the Contingency Procedures for Emergency Environmental Incidents (Attachment N) and the Spill Response Plan (Attachment O) will be activated.

Monitoring, mitigation, and management measures relating to impacts to surface water are discussed in detail in the following documents:

- Section 10 of the EPBC Water Resource Impact Assessment (Attachment D), defines the proposed mitigation, management and monitoring for the Project;
- The Chemical Risk Assessment Framework (Attachment L); and
- The Water Monitoring and Management Plan (Attachment I).

Senex has developed a number of management and mitigation measures to reduce the risk of impacts to surface water. These include environmental management practices such as the Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development (Attachment B), CSG Water Management Plan (ATP 2059: Attachment J; PL 445 and PL 209: Attachment K), the Contingency Procedures for Emergency Environmental Incidents (Attachment N) and the Spill Response Plan (Attachment O).

5.3.1.4 Cumulative Impacts

RFI 3.5.10

The proposed action is part of the broader development of CSG resources in the Surat Basin by the proponent and other developers. The PD must identify and assess the scale and extent of all the potential and likely cumulative impacts on water resources from the proposed action and other nearby resource projects. Where cumulative impacts are predicted, avoidance, mitigation and management measures must be proposed. This should also include corrective actions and offsets if required.

RFI 3.5.10 Response:

Cumulative impacts to water resources in the Surat CMA are related to the depressurisation of the coal seams and resultant induced flow from overlying formations, of which there may be overlapping impacts from separate operations. Cumulative impacts are limited to groundwater level drawdown in these hydrostratigraphic units, which can cumulatively result in impacts to landholder bores (impaired capacity) and GDEs (terrestrial, aquatic and watercourse springs), and subsequently subsidence. Being located at the top of the Woleebee and Wandoan Creek catchments, there are no surface water related cumulative impacts anticipated due to spills, overtopping or unplanned discharges from other proponents.

Both 'Project only' and cumulative model scenarios, used in the impact assessments to bores, GDEs, and surface water systems, have been considered in the EPBC Water Resource Impact Assessment Report (Attachment D). The management and mitigation methods in place for the Project only impacts are also applicable to cumulative impacts and are documented in the Water Monitoring and Management Plan (Attachment I).

The JIF framework is key in identifying and mitigating against cumulative impacts. The JIF adopts a risk assessment and management framework based on defined risk thresholds for the key receptors (water supply bores, terrestrial GDEs, aquatic GDEs). These frameworks are based on defined risk thresholds in the Water Act, and link to the predicted cumulative drawdown from the OGIA UWIR model (which is updated every three years).

Should the risk thresholds be exceeded based on the predicted results of the OGIA model, the applicable JIF risk framework will be implemented for the assessment of potential impact and, if required, associated management/mitigation. This includes the mitigation of groundwater bores through the requirements of the Water Act and the make good obligations of a resource tenure holder.

Monitoring is key in managing and mitigating cumulative impacts, and Senex is committed to undertake both groundwater and subsidence monitoring to assist with application of the JIF framework.

Groundwater monitoring will serve as a key mechanism for the early identification of the changes in groundwater levels as a result of cumulative CSG water production, within the WCM and other formations where groundwater receptors have been identified. Groundwater monitoring is detailed in the Water Monitoring and Management Plan (Attachment I). Senex has developed a procedure for review and analysis of groundwater monitoring data to identify any deviations from model predictions and will initiate further investigation as required. Investigations will determine the cause of the deviation and assess both the significance and consequence in relation to water-dependent assets.

Corrective actions are discussed in the Water Monitoring and Management Plan (Attachment I) but may include increased frequency of monitoring, stakeholder consultations, make good arrangements or ultimately a modification in operations.

If corrective actions were required under the JIF, mitigation options could include reinjection of groundwater into the alluvium (managed aquifer recharge), artificial drainage basins or trenches, weirs, or dripper lines to replace the volume of groundwater lost from the alluvium. These options would require further investigation and design if such mitigation options were required in the future. This investigation would need to assess the potential for additional impacts or alteration of the surface water systems as a result of the application of mitigation measures.

6 CHEMICAL RISK

6.1 Chemical Risk Assessment Framework

The Chemical Risk Assessment has been provided as a standalone attachment to the PD (Attachment L). This risk assessment also details the minimum mitigation and management measures to be undertaken as part of CSG operations, Section 10.2 of the EPBC Water Resources Impact Assessment also details these mitigation and management measures (Attachment D).

The chemical risk assessment was undertaken in accordance with leading industry practice risk assessment methodologies both internationally and domestically, which meets the DCCEEW “best practice” requirement. The “best practice” national and international standards and guidelines include:

- The Organisation for Economic Co-operation and Development (OECD) Manual for Assessment Toolkit (OECD 2014); and
- AS/NZS 4360:2004: Risk Management and AS/NZS ISO 31000:2009 Risk Management – Principals and Guidelines (AS/NZS 2004; 2009).

Current “best practice” guidance includes:

- Exposure Draft: Chemical Risk Assessment Guidance Manual: for chemicals associated with coal seam gas extraction (DoEE 2017). This describes the assessment in terms of potential routes of environmental exposure and as well as receptors of the proposed chemical through the conceptual site modelling. The relative hazard profile of the chemical in relation to the environment is assessed with an ecotoxicity review, and environmental fate analysis.
- Australian Industrial Chemicals Introduction Scheme (AICIS) (formerly National Industrial Chemicals Notifications and Assessment Scheme (NICNAS)), National Assessment of Chemicals Associated with Coal Seam Gas Extraction in Australia, 2017.

A CRAF has been developed to assess the risk of chemicals used in CSG operations (drilling and completion and water treatment) for future operations and for the assessment of new information or changed circumstance within the Project. The CRAF incorporates currently leading industry practice risk assessment methodology for the assessment of the potential impacts of the chemicals proposed to be used in or arising from CSG operations on MNES. The CRAF is provided as Appendix I of the Chemical Risk Assessment (Attachment L).

The aim of the chemical risk assessment framework is to enable:

- Evaluation of the potential risks and effects of chemicals used during CSG operations (drilling and completions, and water treatment) to MNES; and
- Evaluation of the potential risks and effects of geogenic chemicals to MNES that may be present in recovered drilling fluids and produced waters during CSG operations.

The goal of the risk assessment framework is to:

- Demonstrate that the potential risks to MNES associated with the chemicals used in CSG operations have been eliminated or reduced as much as practically possible.

The CRAF includes:

- A template for the register of assessed chemicals (also shown in Table 3.7);
- Example toxicological profiles; and
- Example qualitative risk assessment.

RFI 3.6.1

a) Details of how the risks of adverse impacts on protected matters posed by chemicals will be assessed and managed consistent with best practice risk assessment methodology. These details must include:

a) the process lifecycle for chemicals;

b) how risk from geogenic chemicals in CSG produced water and recovered drilling fluids will be managed to prevent adverse impacts to protected matters; and

c) minimum mitigation and management measures to be undertaken as part of CSG operations.

RFI 3.6 (1) Response

Methodology

The CSG Risk Assessment Guidance Manual (DoEE 2017) references the OECD toolbox in developing their Chemical Risk Assessment Framework and their tools to guide “best practice” for human health and environmental risk assessment. The OECD toolkit identifies that an environmental risk assessment should involve the following steps, which have been incorporated into this assessment:

- Hazard / chemical identification;
- Hazard characterisation;
- Exposure assessment; and
- Risk characterisation.

The Chemical Risk Assessment (Attachment L) assesses the chemicals contained within Senex’s proposed drilling fluids for the drilling, construction, and decommissioning of their CSG wells. In assessing the environmental impact from drilling fluid chemicals, the following stages of the chemical lifecycle were considered:

- Transport and storage to and on the drilling site;
- Processing on site at the CSG production well head prior to use;
- During use down hole; and
- Disposal of the fluid (flowback/produced water).

Flowback water is treated as produced water. On completion, the well is immediately connected to the main gathering system and water is transported to the produced water treatment facility where it is treated and stored. Further details on the method and categorisation of chemicals are discussed below.

Geogenic Chemical Assessment

Geogenic chemicals recovered during drilling activities or within produced water will be subject to a screening assessment, and if required qualitatively assessed against published or derived risk-based criteria depending on their end fate (i.e. use and/or disposal).

For aqueous residual drilling material, potentially applicable criteria may include:

- Human Health:
  - National Water Quality Management Strategy (NRMMC) Australian Drinking Water Guidelines (2017);
  - WHO Drinking Water Quality, Fourth Edition (2017);
  - USEPA Regional Screening Levels (RSLs) for tap water (November 2018 update) (2018);

- USEPA Maximum Contaminant Levels (MCLs, 2009).

- Environmental and Ecological:
  - Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018);
  - Risk-Based Screening Levels for the Protection of Livestock Exposed to Petroleum.
- Hydrocarbons, Publication Number 4733 (API, 2004):
  - Republic of South Africa (1993) South African Water Quality Guidelines;
  - USEPA National Recommended Water Quality Criteria for Priority Pollutants (2009);
  - USEPA Region 3 Biological Technical Assistance Group Freshwater Screening Benchmarks (2011c).

The screening criteria hierarchy utilised the following guidance for solid residual drilling material includes:

- Human Health Environmental and Ecological (including phytotoxicity):
  - The National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (ASC NEPM).
  - CRC CARE Technical Report 10: Health screening levels for petroleum hydrocarbons in soil and groundwater (Friebel and Nadebaum, 2011, CRC CARE Technical Report no. 10).
  - USEPA May 2016 RSLs (RSL TR = 1.0, THQ = 0.1).
  - Risk-Based Screening Levels for the Protection of Livestock Exposed to Petroleum Hydrocarbons, Publication Number 4733 (API, 2004).

Management and mitigation measures are detailed below (answer to RFI 3.6.3).

RFI 3.6.2

2) Details of the criteria by which chemicals will be categorised, based on the properties of each chemical. Criteria must include, but not be limited to:

a) combined persistence, bioaccumulative and toxicity assessment;

b) chemical database of concern assessment; and

c) specific persistence, bioaccumulative and toxicity assessment.

RFI 3.6 (2) Response

The Chemical Risk Assessment Framework for review of chemicals to be used in CSG operations follows a two-step process:

- Step 1: Classification; and
- Step 2: Assessment.

Classification involved identifying products and chemicals to be used during the drilling process. It details how the products will be used and assesses the hazardous nature of the products and the chemicals within them. This is summarised in Figure 6-1.

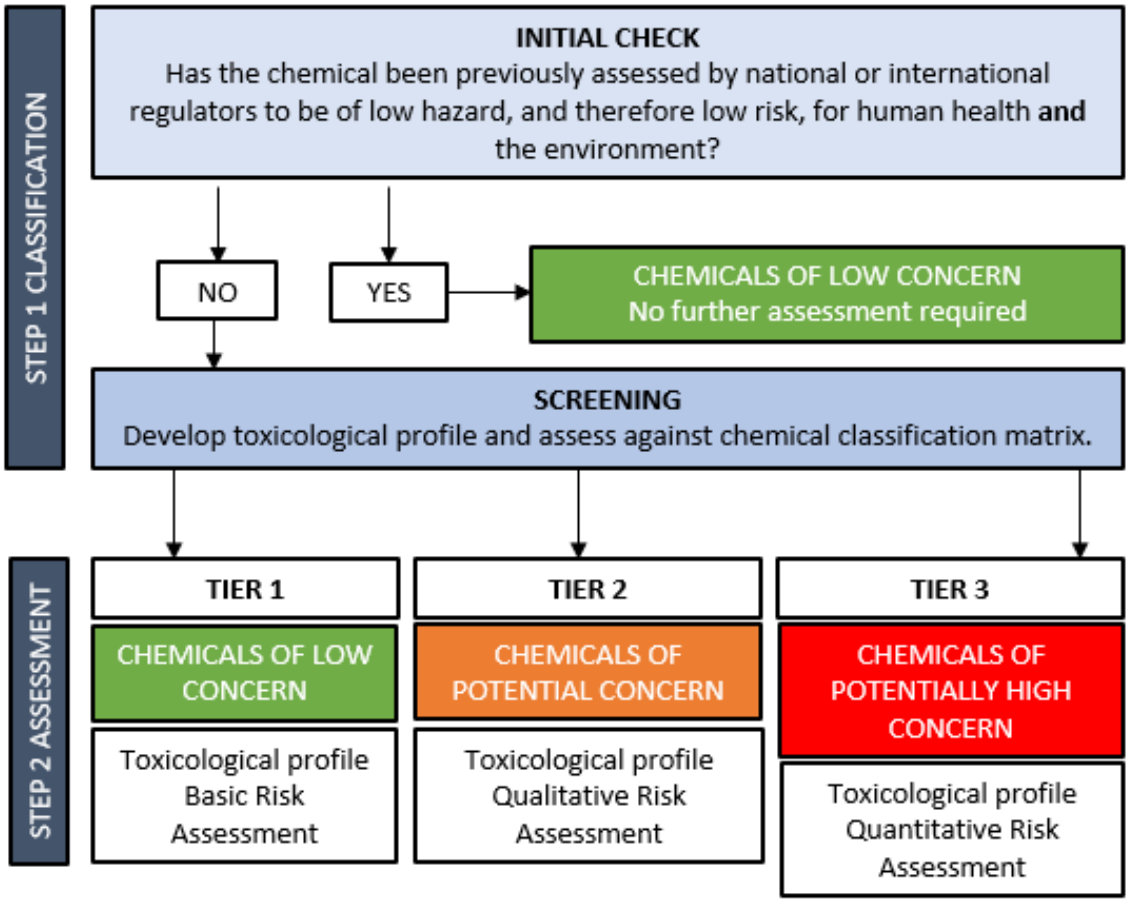


Figure 6-1 Schematic of Chemical Risk Framework (developed using DoEE 2017)

A tiered approach is recommended by DCCEEW (formerly DoEE) (DoEE 2017); based on this guidance chemicals are classified into three tiers. This approach entails increasing levels of complexity, a commensurate refinement of assumptions, and the inclusion of additional, more site-specific data. Based on the classification category of the chemical (and its potential toxicity, persistence and bioaccumulation potential) different levels of assessment will be undertaken. The following are reviewed within the screening assessment to determine the appropriate chemical tier level:

- Persistence:

  Persistence refers to whether, and how fast, a chemical degrades in the environment over time. Chemicals that are persistent in the environment may cause chronic health problems, particularly in humans and animals that are high in the food chain.

  The Stockholm Convention provides scientifically based criteria for identifying persistent organic pollutants and is used in this assessment to define a chemical's persistence in water, soil and air and has been adopted in the *Environmental Risk Assessment Guidance Manual: for industrial chemicals* (EPHC 2009b).

- Bioaccumulation:

  Bioaccumulation is the general term describing a process by which chemicals are taken up by a plant or animal either directly through exposure to a contaminated medium (soil, sediment, water) or by eating food containing the chemical (DoEE 2017).

  The criteria for bioaccumulation used in this assessment has been taken from the *Exposure draft: Chemical risk assessment guidance manual: for chemicals associated with coal seam gas*

extraction (DoEE 2017), which adopts the criteria from the *Environmental Risk Assessment Guidance Manuals* (EPHC 2009b; 2009a).

- Toxicity:

  Ecotoxicity data are used to determine the toxic hazards posed by a chemical to terrestrial and aquatic organisms. The assessment process involves collecting all available acute and chronic data and considering how this data can inform the assessment (DoEE 2017).

  The minimum data set for quantitative CSG chemical risk assessments comprises acute toxicity tests for fish and invertebrates, and a chronic test for algae, however chronic data for fish and invertebrates are preferable if they are available.

  Acute and chronic toxicity are assessed against criteria from the *Exposure draft: Chemical risk assessment guidance manual: for chemicals associated with coal seam gas extraction* (DoEE 2017).

The overall tier level is determined by the highest tier value assigned for each criterion (for example, a chemical which is determined to be Tier 1 for toxicity but Tier 2 for persistence is assigned as a Tier 2 chemical).A general description of the chemical tiers, category and the assessment required is summarised in Table 6-1.

Table 6-1 Description of Chemical Tiers

Tier	General Description	Category	Assessment Required
1	Not persistent, no potential concerns with bioaccumulation in soil and impacts on flora and fauna. Toxicity: harmful	Chemicals of low concern	Toxicological profile and screening assessment
2	Persistent Does not bioaccumulate Acute toxicity: toxic, long-term toxicity – toxic with long lasting effects.	Chemicals of potential concern	Toxicological profile Qualitative Risk Assessment
3	Persistent Does bioaccumulate. Acute toxicity – very toxic, long-term toxicity – very toxic with long lasting effects	Chemicals of Potentially High Concern	Toxicological Profile Qualitative and quantitative Risk Assessment

All Tiers: Toxicological Assessment and Screening

A toxicological assessment was undertaken that includes a summary of the information collected in the screening exercise (above) and includes the following:

- Chemical synonyms and structure;
- Physico-chemical properties;
- Domestic and International Regulator Information;
- Environmental Fate Summary;
- Environmental Effects; and
- Categorisation and other Characteristics of Concern.

Tier 2 and 3: Qualitative Risk Assessment

A qualitative risk assessment was undertaken for all Tier 2 and Tier 3 chemicals. This expands on the characterisation of the chemical to understand how it may react in the receiving environment. The qualitative risk assessment includes:

- Further hazard characterisation;
- Determination of pathways to identified receptors; and
- A risk assessment which examines the likelihood, consequence, and subsequent magnitude to MNES from the chemical. This is undertaken both with and without management and mitigation measures in place.

Tier 3: Quantitative Risk Assessment

For Tier 3 chemicals, a quantitative risk assessment was undertaken in addition to the qualitative risk assessment outlined above. This assessment examines the proposed quantities of the chemical to be applied to the environment versus the known acceptable levels of exposure. The potential for the chemical to degrade and dilute is considered using groundwater transport modelling. The results are used to inform the overall risk assessment and assignment of significance of impact.

This assessment is more site-specific and is tailored towards specific locations including distance to a watercourse.

An analytical 1D contaminant transport model, using industry-accepted contaminant transport equations, was used to predict potential concentration of drilling chemicals that could reach any MNES water receptor. A notional distance of 200 m and 50 m was used to assess the sensitivity of the chemical to the receptor, and how long would it take to reach a receptor.

The model uses analytical equations based on the characteristics of the aquifer, the potential hydraulic gradient within that aquifer and the distance to the receptor. The adopted model uses the Domenico equation (Domenico 1987) which has been modified with the addition of stochastic modelling approaches to provide a range of results, based on the available data. The resulting concentration at the receptor is compared with the short-term and chronic toxicological data to determine whether there could be an impact at the receptor. The results of the quantitative risk assessment determines whether additional mitigation measures are required.

All the compounds utilised in drilling fluids are not considered to be persistent and bioaccumulative and toxic (PBT) in the environment. As such, the compounds are expected to degrade in the sub-surface, or where these compounds are present in drilling waste, they will subsequently readily degrade or dissociate in the environment and will not bioaccumulate in terrestrial or aquatic species. Hence the presence of these constituents in the drilling fluid does not warrant a combined /cumulative evaluation in this risk assessment.

RFI 3.6.3

3) Detail a risk assessment process for each chemical to determine risk to protected matters from the chemical's use. This process must:

a) identify the risk assessment requirements based on the chemical's category;

b) consider the chemical's intended use and function, and an estimation of the quantity of the chemical likely to be used, and at what concentration, in a typical year;

c) consider the likely environmental fate of the chemical; and

d) consider what, if any, mitigation and management measures are needed to prevent adverse impacts to protected matters from that chemical for the duration of this approval

RFI 3.6 (3) Response

For Tier 2 and 3 chemicals, a detailed risk assessment was undertaken. Risk assessment requirements as per the chemical tier are presented in Table 3.1. The risk assessment includes consideration of the hazard posed by the chemical, the likely pathway and the risk to identified receptor(s).

Hazard Characterisation

This characterisation further assessed the drilling additives and their chemical constituents to consider and occurred in the tiered approach, increasing complexity (as per DoEE 2017):

- The nature and state of the chemicals at surface and their solubility, is used to determine the potential for chemicals to enter the environment;
- The fate and transport of the chemical in the environment including an assessment of the mobility, potential for bioaccumulation and degradation; and
- An assessment of the volumes of chemicals proposed to be used in the context of the environment, with a comparison against relevant environmental hazard criteria.

The register of assessed chemicals, records the chemical's use and function, and quantities (Appendix II of Attachment L Chemical Risk Assessment). Concentrations of chemicals are assessed for Tier 2 and 3 chemicals (Appendix IV of Attachment L Chemical Risk Assessment) and are taken into consideration in the hazard characterisation.

The environmental fate of a chemical is dependent on its chemical and physical properties and how the chemical reacts with the environment that it is released into. The environmental fate of chemicals includes it's:

- Dissolution, speciation and partitioning (i.e. solubility in water, solid status);
- Degradation (i.e. is it readily biodegradable/degradable);
- Persistence (how fast, a chemical degrades in the environment over time); and
- Bioaccumulation (binding ability).

All these characteristics are recorded in each chemical toxicological profile and are used to inform the hazard characterisation (Appendix III of Attachment L Chemical Risk Assessment).

Pathway Characterisation and Identification of Water MNES Receptors

The potential contaminant pathways and potential water MNES receptors were identified and documented.

For assessment the exposure pathways are categorised as complete, i.e. there is a source, pathway, mechanisms for exposure and potential receptor present.

The MNES values listed under the EPBC Act, including springs, comprise:

- Listed flora or fauna (terrestrial and aquatic);
- TECs; and
- Water resources.

The potential risks to both the MNES water resources and non-MNES receptors exposed to the water resource are evaluated. This may include humans and livestock through the consumption of water-containing chemicals. Accidental release scenarios are not included; however, the outcomes of the assessment should be used to inform emergency response actions. The chemical risk assessments will be limited to MNES receptors and those non-MNES receptors associated with the MNES water resources.

Risk Characterisation

The risk assessment considers the likelihood of exposure and a rating of the consequence of the exposure to understand the magnitude (significance) of the risk to MNES from drilling chemicals.

The likelihood of exposure was assessed by examining the likelihood that the chemical could reach the receptor based on known pathways (Table 6-2).

Table 6-2 Likelihood of Exposure Assessment

Rank	Descriptor	Likelihood of Exposure
1	Highly unlikely	There is no known connection between the source and receptor – there is no pathway, i.e. source is solid and not soluble – highly unlikely pathway to surface water system.
2	Unlikely	Unlikely connection between the source and the receiving environment. Unlikely for a surface spill to reach the receiving environment.
3	Possible	Possible connection between the source and the receptor (i.e. connection of coal seams with an aquifer being used for extraction). Possible that surface spills could reach the receiving environment.
4	Likely	Likely connection between the source and the receiving environment. Likely that spills could reach receiving environment.
5	Very likely	Confirmed connection between the source and the receiving environment, with the receiving environment (aquifer) being used for drinking water or discharging to an ecosystem. Very likely that a surface spill will reach the receiving environment.

The consequence of each drilling fluid chemical was then assessed using the consequence levels in Table 6-3. The consequence of a chemical to MNES is based on the hazard characterisation of each chemical.

Table 6-3 Consequence Levels

Magnitude	Description	Example
Negligible	Negligible potential for adverse effects	Low severity and short-term impacts restricted to the immediate area of an activity or footprint. Very minor chemical incident. Minimal environmental impacts. Insignificant departure from Federal or State policy or guidance.
Low	Results in some measurable changes in attributes quality or vulnerability	Chemical incident. Impacts likely to persist for short duration only, with rapid recovery when the activity is completed. Impact is restricted to WCM only and other aquifers or users are not affected. Impact causes minor departure from Federal or State policy or guidance.

Magnitude	Description	Example
Moderate	Results in impact on the integrity of attribute or loss of part of attribute at a localised scale	Significant chemical event. Minor, but manageable, environmental impacts. Rapid recovery upon activity completion. Potential health impacts. Impact may occur across aquifers and groundwater features or users may be affected. Moderate potential for adverse effects on aquatic ecosystems.
High	Results in impact on the integrity of attribute or loss of part of attribute at a regional scale	Chemical pollution or contamination is likely. Significant environmental impacts. Significant health impacts. High potential for adverse effects on the aquatic ecosystems.
Severe	Results in loss of attribute	Irreversible or persistent high severity impact likely. No recovery within the foreseeable future. Impacts are at a regional, national or international scale. Impacts to groundwater may include impacts across aquifers regionally. Groundwater discharge features and users are affected.

A final risk rating was determined for each particular risk by combining the consequence level with the likelihood level (refer to Table 6-4). The risk rating adopted is specific to this assessment and is consistent with AS/NZS 4360:2004: Risk Management and AS/NZS ISO 31000:2009 Risk Management – Principals and Guidelines (AS/NZS 2009; 2004).

The risk to water resources MNES from drilling additives was considered using the EPBC Significant Impact Guidelines 1.3 (Commonwealth of Australia 2022b), where a 'significant impact' is described as an impact which is important, notable or of consequence, having regard to its context or intensity.

The likelihood of a significant impact is defined by the Significant Impact Guidelines 1.1 (Commonwealth of Australia 2013):

> *"To be likely, it is not necessary for a significant impact to have a greater than 50% chance of happening; it is sufficient if a significant impact on the environment is real or not remote chance or possibility".*

The subsequent risk rating was determined with regards to the Significant Impact Guidelines and MNES:

- **High significance**: Significant impact with high likelihood of impact to MNES. Levels of chemical risks are regarded as unacceptable or intolerable. Impact results may be irreversible or persistent high severity impact on the quality or availability of surface or groundwater;
- **Moderate significance**: Levels of chemical risks are regarded as unacceptable, moderate severity with impacts persisting over time. Impacts may be tolerable, but risk treatment and mitigation should apply where possible;
- **Low significance**: The MNES will be affected by low severity impact. Impacts are of short duration and the receptor will have a rapid recovery when the activity is complete; and
- **Insignificant**: An insignificant impact exists to an environmental value. Levels of chemical risks are regarded as acceptable, and no risk treatment is necessary. The impact is of low severity and restricted to the immediate area of activity. There are no medium or long-term impacts and recovery is rapid.

Table 6-4 Significance of Impact Adopted for the Chemical Risk Assessment

		Likelihood Level				
		Highly Unlikely (1)	Unlikely (2)	Possible (3)	Likely (4)	Highly likely (5)
Consequence Level	Severe	Insignificant	Low	High	High	High
	High	Insignificant	Low	Moderate	High	High
	Moderate	Insignificant	Low	Moderate	Moderate	Moderate
	Low	Insignificant	Low	Low	Low	Low
	Negligible	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant

The significance of impact was determined for each chemical, both with, and without, the application of management and mitigation measures.

Management and Mitigation Measures

Mitigation and management controls will be implemented to ensure the potential risks associated with the use of chemicals to MNES have been eliminated or reduced to as low as reasonably practicable

Key Senex management documents in relation to the mitigation and management of the use of chemicals include:

- Environmental Protocol for Field Development and Constraints Analysis (Attachment B);
- Environmental Management Plan (Attachment E);
- Contingency Procedures for Emergency Environmental Incidents (Attachment N);
- Spill Response Plan (Attachment O);
- Incident Management Procedure (SENEX-CORP-HS-PRC-004);
- Senex Hazardous Substances and Dangerous Goods Procedure (SENEX-CORP-HS-PRC-010); and
- Atlas Stage 3 Water Monitoring and Management Plan (Attachment I).

Additionally, for flowback/produced water:

- Atlas Project – Operation Management Plan for Regulated Structures (OPS-QLDS-OP-PLN-008).

The key risks to MNES from drilling fluids are identified as:

- Above ground chemical spills and leaks to surface water systems through:
  - Transportation of chemicals;
  - Chemical and fuel storage;
  - Emergency and incident support;
  - Well siting (proximity to watercourses);
  - Well construction (methods used to drill and construct the wells);
  - Management of produced water/flow back water (which may contain drilling chemicals initially).
- CSG production well construction / design/ drilling / integrity results in contamination of aquifers:
  - Well construction;

- Drilling fluid losses; and
- Well siting.

- Inappropriate reuse/disposal of drill cuttings and additives.

Appropriate management plans and documents, and planned mitigation and management measures for each of these risks is presented in Table 3.5. These mitigation and management controls are considered sufficient to address the risk of adverse impact to MNES.

Hydraulic fracturing will not be undertaken as part of the Project.

Table 6-5 Management and Mitigation Measures for Identified Risks

Risk	Key Reference Documents	Mitigation or Management Measures
	Environmental Management Plan (Attachment E); Contingency Procedures for Emergency Environmental Incidents (Attachment N); Spill Response Plan (Attachment O); AS 3780:2008 – The storage and handling of corrosive substances; AS 3833:2007 – Storage and handling of mixed classes of dangerous goods in packaged and intermediate bulk containers; and Senex Hazardous Substances and Dangerous Goods Procedure (SENEX-CORP-HS-PRC-010).	**Transportation of chemicals** To minimise the risk of spillage Senex will ensure that all hazardous materials are transported, stored and handled in accordance with AS1940, Australian Dangerous good Code and EPA guidelines. Bulk fuel tanks stored outside bunded areas must be contained within a self-bunded (double-skinned) tank with safety valves. The requirements for managing hazardous substance and dangerous goods at Senex sites are outlined in Senex Hazardous Substances and Dangerous Goods Procedure (SENEX-CORP-HS-PRC-010).
Above ground chemical spills and leaks	AS 3780:2008 – The storage and handling of corrosive substances; AS 3833:2007 – Storage and handling of mixed classes of dangerous goods in packaged and intermediate bulk containers; and Environmental Management Plan (Attachment E).	**Chemical and fuel storage** All fuel, oil and chemicals are to be stored, transported and handled in accordance appropriate standards including AS 3780:2008 – The storage and handling of corrosive substances, AS 3833:2007 – Storage and handling of mixed classes of dangerous goods in packaged and intermediate bulk containers. AS 3833:2007 – Storage and handling of mixed classes of dangerous goods in packaged and intermediate bulk containers. Storage areas must be sealed, bunded, and adequately ventilated. Storage and refuelling areas will be preferentially located away from watercourses, sensitive areas and any source of ignition as determined by the Senex Site Supervisor. Substances not in use are to be sealed and safely stored in a secure area. Containment bunds and/or sumps will be drained periodically of accumulated rainwater to prevent overflow and subsequent pollution of the surrounding land and watercourses. All chemical, oil and fuel storage areas are to be inspected at least monthly for temporary storage, and quarterly for permanent storage areas during the operating phase by the Contractor Site Supervisor and/or the Senex Site Supervisor.

Risk	Key Reference Documents	Mitigation or Management Measures
		An inventory of all chemicals maintained on each site is to be maintained by the Senex Site Supervisor. Safety Data Sheets (SDS) are to be maintained on site at all times and for all chemicals.
	Incident Management Procedure (SENEX-CORP-PLN-006). Contingency Procedures for Emergency Environmental Incidents (Attachment N). Spill Response Plan (Attachment O). Environmental Management Plan (Attachment E).	**Emergency and Incident Support** In the event of a chemical, oil or fuel spill, the spill will be contained and cleaned up as outlined in the Senex Spill Response Plan (Attachment O). Contractors must have in place procedures for spill response which are in accordance with the Senex Spill Response Plan (Attachment O) and will include details requirements for: Minimising release; Containing spilled material; Raising the alarm and response; Locations of spill kits; and Management of contaminated material if necessary. Any spills will be assessed by the Senex Site Supervisor supported by the Senex Environment Manager as required to determine appropriate remediation options such as the removal of contaminated material. Incident reports must contain information required by the Senex Environment Manager and any relevant plans and procedures. Emergency Response drills will be performed to ensure readiness and identify opportunities for improvement. Senex requires that all incidents including spills are reported and fully investigated in accordance with their specific level of potential risk. Emergency events will be managed in accordance with the contingency procedures in the Contingency Procedures for Emergency Environmental Incidents (Attachment N). Personnel who observe an environmental incident including a spill must immediately notify the Contractor Site Supervisor who will then notify the Senex Site Supervisor.

Risk	Key Reference Documents	Mitigation or Management Measures
	Environmental Protocol for Field Development and Constraints Analysis (Attachment B).	**Well Siting** The environmental protocol for field development and constraints analysis prevents the siting of any CSG wells in locations which may result in the degradation of an environmental value. Petroleum activities must not occur in or within 200 m of a wetland of high ecological significance or a Great Artesian Basin Spring (DES 2016). This includes watercourse springs identified on the tenement.
	Code of practice for Constructing and Abandoning Coal Seam Gas Wells and Associated.	**Well Construction** Standard Operating Procedures will be followed for sumpless drilling and mud mixing during the drilling process. These procedures will include the following: Sumpless drilling – drilling additives and mud are stored in portable, temporary tanks; The use of bunds at surface; Regular site inspections, monitoring and recording mud returns, monitoring, and recording mud volumes in tanks daily; and Undertaking daily drillers instructions.
	Environmental Management Plan (Attachment E). Atlas Stage 3 Water Monitoring and Management Plan (Attachment I).	**Management of produced water/flow back water** Produced water will generally be collected from the water gathering systems into an aggregation dam/s. Water for beneficial use, where treatment is not required, will be drawn from the aggregation dams. Where practical, Senex will use untreated CSG produced water to support ongoing development / construction activities such as dust suppression, drilling, construction and hydro-testing. Any untreated produced water used as part of Project activities will be undertaken in accordance with the End of Waste Codes (ENEW07546918 and ENEW07547018) produced water with moderately low salinities (<4 dS/m [4,000 µS/cm]) will generally be processed by calcium and pH amendment only, however for higher salinities treatment by reverse osmosis (RO) or blending with available fresh water will be undertaken as required. Where suitable, water use options to be considered include stock watering and irrigation.

Risk	Key Reference Documents	Mitigation or Management Measures
		Produced water may be used for dust suppression and construction purposes provided the use: Does not result in negative impacts on the composition and structure of soil or subsoils; Is not directly or indirectly released to waters; Does not result in runoff from the construction site; and Does not harm vegetation surrounding the construction site. Produced water may be disposed of for domestic purposes or stock purposes and must meet the irrigation or livestock watering criteria as relevant to those purposes in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018 revision; online resource). It must be disposed of in accordance with the BUAs where approved by Senex Site Supervisor having consulted with the Senex Environment Manager. All dams must be constructed, operated and maintained in accordance with accepted engineering standards; and be designed with a floor and sides made of material that will contain the wetting front and any entrained contaminants within the bounds of the containment system during both its operational life and including any period of decommissioning. Visual inspection of areas where produced water is used will be undertaken during and post-application daily to ensure conditions are being met. Monitoring and inspections including of water levels, water quality and early signs of loss of structural or hydraulic integrity will be undertaken by a suitably qualified and experienced person to ensure conditions are being met. Dams and regulated structures must be monitored for early signs of loss of structural or hydraulic integrity as specified in the initial hazard assessment. Monitoring and reporting of groundwater to be undertaken as per the Atlas Stage 3 Water Monitoring and Management Plan (Attachment I).
CSG production well construction / design / drilling /	Code of Practice for Constructing and Abandoning CSG Wells and Associated Bores in Queensland (DNRME 2019).	**Well Construction** CSG production wells will be designed, constructed and decommissioned in accordance with the “Code of Practice for the construction and abandonment of coal seam gas and

Risk	Key Reference Documents	Mitigation or Management Measures
integrity results in contamination of aquifers		petroleum wells and associated bores in Queensland (DNRME 2019)". This code outlines mandatory requirements and good practice to reduce the risk of environmental harm. CSG production wells will be designed to: Prevent any interconnection between target hydrocarbon bearing formations and aquifers; Ensure that gas is contained within the well and associated pipework and equipment without leakage; Ensure zonal isolation between different aquifers is achieved; and Not introduce substances that may cause unlawful environmental harm.
	Environmental Protocol for field development and constraints analysis (Attachment B).	**Prevention of drilling fluid losses** Selecting the correct drilling additives based on the drilling conditions and formation to prevent excessive fluid losses in the well. Reference to the geological conditions encountered during the drilling of other nearby bores.
	Environmental Protocol for Field Development and Constraints Analysis (Attachment B).	**Well Siting** Sites for CSG production wells will be selected based on a good understanding of the local conditions and geology to prevent any potential for connections of target CSG reservoirs and aquifers (i.e. avoiding the presence of known faults). Petroleum activities must not occur in or within 200 m of a wetland of high ecological significance or a Great Artesian Basin Spring (DES 2016). This includes watercourse springs identified on the tenement.
Inappropriate reuse / disposal of drill cuttings and additives	Environmental Authority; Environmental Protection Act 1994 (State of Queensland 2022c); The Waste Reduction and Recycling Act 2011 (WRR Act)(State of Queensland 2021c); and Characterisation of Management of Drilling Fluids and Cuttings in the Petroleum Industry (DES 2019).	**Appropriate disposal of drilling additives** Waste solids will be disposed of to landfill. Drilling additives to be recycled where possible. Disposed of on site by mix-bury-cover method if the residual drilling material meets the approved quality criteria as per EA requirements. Disposed of on site by land application following assessment and certification (by a suitably qualified third-party) that the quality and proposed application methods will not result in environmental harm.

Risk	Key Reference Documents	Mitigation or Management Measures
		Records must be kept to demonstrate compliance with Condition Waste 15 and Waste 16 of the EA. The Department of Environment and Science (DES) regulates the management and disposal of wastes in Queensland under the provisions of the Environmental Protection Act 1994 (State of Queensland 2022c), the Waste Reduction and Recycling Act 2011 (WRR Act)(State of Queensland 2021c) and subordinate legislation. Further information on these regulations and management of drilling waste materials is provided in the Characterisation of Management of Drilling Fluids and Cuttings in the Petroleum Industry (DES 2019). ■ Where on site management options are proposed, state approvals require that the quality of material to meet approved quality criteria and / or are assessed and certified by a suitably qualified third-party as being suitable for the application to land and that environmental harm will not result from the proposed disposal. If these options are to be used, Senex will undertake the appropriate assessments and develop management plans as per the requirements of the relevant state approvals. The key chemical constituents in the residual drill muds will be assessed through the CRAF included in Attachment L. ■ Exact locations of onsite disposal of drilling muds will be determined during the operational development of the project and the Constraints Protocol (Attachment B) will be used for the identification of potential sites that will then be subject to a site specific MNES risk assessment. The proposed land application area will be inspected by a suitably qualified ecologist to confirm vegetation characteristics and key species present to identify potential MNES within the proposed application area and surrounds. The criteria for a land application area include: o compliance with the Constraints Protocol (Attachment B) o >200 m from mapped watercourse (for any runoff there is an adequate buffer to observe the physical runoff of the material and for infiltration of dissolved constituents into soils to occur) o slopes <5% o well vegetated with >60% cover o clay subsoils. All waste generated in construction, operations and decommissioning must be stored, handled and transported in accordance with the waste and resource management

Risk	Key Reference Documents	Mitigation or Management Measures
		hierarchy, waste and resource management principles, appropriate standards and regulatory requirements as outlined in the Senex Waste Management Procedure – Qld Operations [SENEX-QLDS-EN-PRC-022]. Only licensed waste contractors may collect, transport and dispose of regulated waste from the site.

Results of the Chemical Risk Assessment

A chemical risk assessment was undertaken on 59 drilling chemicals, and a total of 47 drilling fluids are proposed to be used at the Project. This includes chemicals for drilling, drilling completion and workover, exploration and core holes, and abandonment. The chemicals were categorised into Tiers as per the methodology detailed above. Table 6-6 provides the results of the tiered assessment.

The assessment identified all potential water MNES receptors and potential pathways to identify the likelihood and consequence of exposure.

Table 6-6 Results of the Chemical Risk Assessment: Tiers

Tier	Category	Assessment Required	Number of Chemicals
1	Chemicals of low concern	Toxicological profile and screening assessment	37
2	Chemicals of potential concern	Toxicological profile Qualitative Risk Assessment	16
3	Chemicals of Potentially High Concern	Toxicological Profile Qualitative and quantitative Risk Assessment	0

Note: Six chemicals were pre-screened out of the assessment as had been listed as low concern elsewhere.

Toxicological profiles were developed for all chemicals, and a qualitative risk assessment for Tier 2 chemicals. A qualitative and quantitative risk assessment was undertaken on three chemicals which were initially designated as Tier 3 chemicals but then subsequently downgraded to Tier 2 due to their proposed use.

It was determined that the risk to the MNES receptors from drilling fluids were limited to above ground chemical spills, the infiltration of chemicals to aquifers (downhole) during well installation, and the eventual disposal of the drilling fluids.

The risk to MNES receptors from drilling fluids was determined both prior to, and following, mitigation and management measures. The risk assessment concluded that the likelihood for a drilling fluid to adversely affect an MNES is unlikely to highly unlikely. This is due to the proposed controls that will be implemented during drilling and the protocols in place if a spill should occur. The overall risk to MNES from chemical contamination has been assessed as low significance to insignificant.

The likelihood of chemical migration, either away from a well or through seepage, are considered highly unlikely due to the following:

- drilling and construction and well maintenance activities are short term where the contaminant source is short-lived;
- quantities are restricted to maintain optimal conditions;
- drilling chemicals are designed to maintain CSG well integrity and limit fluid losses;
- operational groundwater pumping associated with CSG extraction will develop a groundwater pressure gradient towards the well, inducing groundwater flow towards the well. For contaminant migration to occur, groundwater flow would need to be away from the well; and
- tight aquitard sediments of the Westbourne Formation act as a barrier to mitigate migration pathways downwards.

All the compounds utilised in drilling fluids are not considered to be persistent, bioaccumulative or toxic (PBT) in the environment. As such, in the unlikely event that the compounds do migrate away from the well or through seepage, the compounds are expected to degrade in the sub-surface, or

where these compounds are present in drilling waste, they will subsequently readily degrade or dissociate in the environment and will not bioaccumulate in terrestrial or aquatic species. Hence the presence of these constituents in the drilling fluid does not warrant a combined /cumulative evaluation in this risk assessment.

RFI 3.6.4

4) Details of the process by which risk assessments for low-risk chemicals will be peer reviewed by an independent chemical risk assessment expert. This process must:

a) consider any checklists completed by the independent chemical risk assessment expert, to demonstrate that risks have been adequately assessed; and

b) include provision of a signed and dated statement from the independent chemical risk assessment expert confirming that the chemical has been correctly categorised.

RFI 3.6 (4) Response

An independent chemical risk assessment expert was appointed to peer review the toxicological profile of low-risk chemicals (Tier 1 and 2). This review assessed:

- Have the physical/chemical properties been documented?
- Was the chemical listed on any data bases indicating chemical of concern?
- Has the toxicity been assessed?
- Has the environment fate (persistence, biodegradation, and bioaccumulation) been assessed?
- Is the categorisation correct?

For tier 2 chemicals the qualitative risk assessment will be assessed:

- Hazard characterisation;
- Pathway characterisation and identification of Water MNES Receptors; and
- Risk characterisation including exposure assessment, assigned consequence levels and potential significance of impact, both with and without mitigation and management measures.

Any new low-risk chemicals will be peer reviewed prior to use.

All peer review documentation will be available through a link on the chemical register which will be made publicly available on the Senex website.

Professor Barry Noller, Principal Research Fellow for Mined Land Rehabilitation, Sustainable Minerals Institute, The University of Queensland was commissioned to undertake the peer review. Professor Barry Noller has over 40 years-experience in human health and environmental risk assessment in Australia. Professor Noller holds a PhD in environmental chemistry and is a Fellow of the Royal Australian Chemical Institute, Royal Society of Chemistry and International Union of Pure and Applied Chemistry.

Based on the peer review completed for all of Tier 1, Tier 2 and Tier 3 chemical risk assessments reviewed (as listed in Attachment B), the following is concluded:

- All chemicals are correctly categorised as Tier 1, Tier 2 or Tier 3 chemicals;
- All chemical risk assessments have been prepared appropriately, in accordance with the requirements of the CRAF, and provide an evaluation of each chemical consistent with current scientific knowledge; and
- Risks relevant to the use of Tier 1, Tier 2 and Tier 3 chemicals have been appropriately assessed.

RFI 3.6.5

5) Details of the process for recording each chemical's risk assessment in a register on the approval holder's website and for the provision of each chemical's risk assessment to the department.

RFI 3.6 (5) Response

The chemical risk assessment register will be provided on the Senex website. The register summarises the classification and screening of the chemicals and provides the assigned tier level and chemical risk. The register will also provide a link to the toxicological profile of each chemical and the qualitative or quantitative risk assessments for Tier 2 and Tier 3 chemicals. An example of the register is provided in Table 6-7. A completed register is provided with the Chemical Risk Assessment (Attachment L).

Senex will review and revise the chemical risk assessment should:

- New drilling additives and chemicals be proposed; and/or
- The advice with regards to toxicology and hazardous nature of the proposed chemicals change as advised by drilling contractors and /or regulatory authorities.

The SDS which include the name, type and quantity of each drilling fluid additive used on each well will be reviewed by Senex as they are updated by the manufacturer. Senex's contractor management systems and processes will ensure that any new drilling contractors or companies undertaking works on site involving the handling and use of drilling additives will be reviewed.

All chemicals listed in the register and still in use will be re-evaluated and peer reviewed every 5-years.

Table 6-7 Example Chemical Register

			Document Control			Stage 1 Initial Check	Stage 2: Screening Assessment							Assessed Drilling Activity					
Chem Name	CAS No.	Contained in the Following Drilling Fluids	Initial Chemical Assessment Date	Independent Peer Review	Chemical Re-evaluation Date	Previously Assessed as low hazard by NICNAS? Y/N	Listed as a COC on relevant databases?	Persistence Tier	Bioaccumulation Tier	Acute toxicity Tier	Chronic toxicity tier	Overall Tier	Concern/ Risk Level	Drilling additive - CSG production well	Drilling additive - completion and workover	Drilling additive - exploration and core holes	Drilling additive for abandonment	Production Operations	Monitoring Wells
Example chemical			Dd/mm/yy		Dd/mm/yy	N	No	1	1	1	1	1	Low	YES	N/A	N/A	X	X	X

RFI 3.6.6

6) Details of a process to monitor and report on the implementation of any mitigation and management measures undertaken during use and handling of chemicals, to demonstrate no adverse impacts to protected matters.

RFI 3.6 (6) Response

Monitoring, auditing of, and reporting on, contractor and Senex on site activities provides a direct measure of Senex's compliance with environmental regulations and EA conditions, together with an indication of the effectiveness of the HSEMS, EMP and supporting procedures and plans.

Environmental inspections, monitoring and auditing will be undertaken in terms of the Environmental Management Plan (Attachment E) by the Senex Site Supervisor and Senex Environmental representatives on a periodic basis to assess whether activities are in compliance with the requirements of these systems and documents.

Data collected as part of any monitoring will be collated and stored in the Senex database system, which will include any groundwater quality sampling results.

Senex and its contractors will maintain an appropriate and auditable record system. Environmental reporting information will include as relevant:

- Inspection / monitoring reports;
- Photographic records;
- Training and induction attendance and associated dates;
- Incident reports;
- Remedial actions taken following incident reports;
- Records of waste removal including waste tracking certificates; and
- Audit reports.

If an adverse impact to MNES is detected during the use and handling of chemicals, the DCCEEW is to be notified in writing within 15 business days of detection. The notification must specify the location, date and time of the adverse impact and include a short description of the adverse impact and the MNES adversely impacted.

All records and data required to be maintained by EA conditions will be retained for a minimum of 5 years. SDS records are kept by drilling contractors on site during each stage of drilling.

Drilling additives are selected, managed and stored, to ensure all products are used in accordance with the manufacturer's recommendations and relevant SDS. The name, type and quantity of each drilling fluid additive used on each well are recorded by Senex (Senex 2022; KCB 2022).

All chemicals listed in the register and still in use will be re-evaluated and peer reviewed by a suitably qualified person every 5 years. The peer review will include:

- Consideration of whether the individual chemical risk assessments listed on the chemical register are consistent with current scientific knowledge with regards to the toxicology and hazardous nature of the proposed chemicals;
- Consideration of whether the risk characterisation including exposure assessment, assigned consequence levels and potential significance of impact, both with and without mitigation and management measures remains unchanged;
- An evaluation of the adequacy of the current monitoring, mitigation and management measures in place; and

- Following receipt of the peer review, if there are any concerns raised, Senex will provide an explanation to the peer reviewer on how items will be addressed and incorporated into the framework.

RFI 3.6.7

7) Details of the process by which information in the risk assessments will be adaptively used to address any accidental release of a chemical to prevent adverse impacts to protected matters.

RFI 3.6 (7) Response

For tier 2 or tier 3 chemicals, the outcome of the chemical risk assessment may inform the need for additional mitigation and management controls which may need to be added to either the Environmental Management Plan (Attachment E) or the environmental protocol for field development and constraints analysis (SENEX-CORP-EN-PRC-019). These controls may include:

- Greater offsets from water related MNES such as watercourses for specific chemicals; and
- Additional early warning indicators or action triggers.

If there is an accidental spill, the Chemical Risk Assessment (Attachment L), will be referred to for guidance on the chemical's nature and potential for harm and to inform management procedures.

The Contingency Procedures for Emergency Environmental Incidents (Attachment N) and the Spill Response Plan (Attachment O) provide the standard protocols for Senex to respond in an appropriate and timely manner in the event of a spill. The procedure provides a common system and focus for spill response support and response hierarchy, which includes preserving life, ensuring the safety of people, and minimising the impact on the environment. This includes mitigation of possible spills, leaks, and fluid losses at the drill sites (hydraulic hose bursts, leaks below the drill rig, refuelling spills, etc.). The environmental emergency activation pathway as presented by the Spill Response Plan (Attachment O) is shown in Figure 6-2.

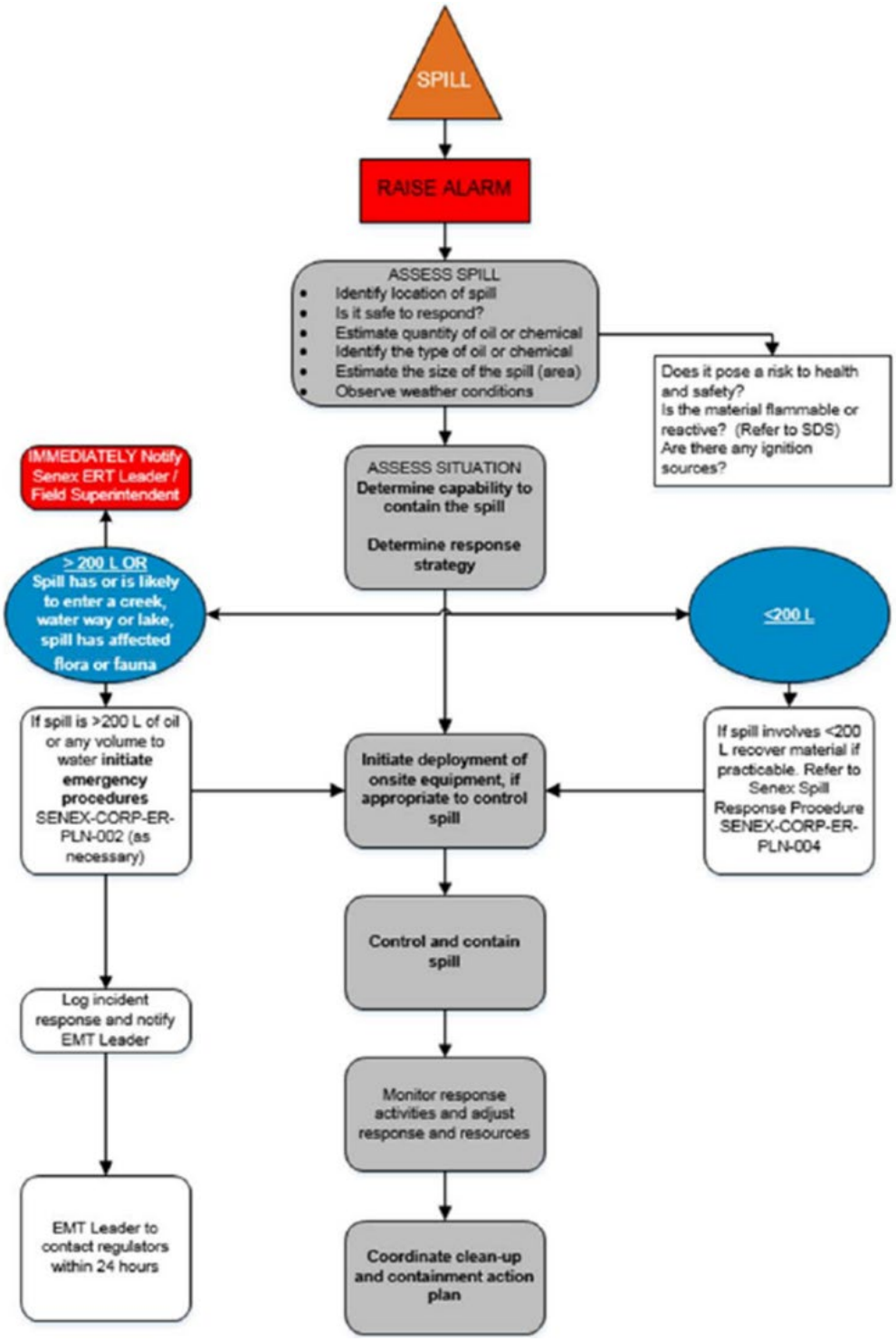


Figure 6-2 Senex Environmental Emergency Activation Pathway

Senex has adopted internationally accepted ‘Tiered Response’ classifications to describe different categories of spill events, based on severity and location (IPECA 2015). Tier classifications are determined based on spill volume, environmental sensitivity, potential social impacts and other factors specific to the event. The Spill Response Plan (Attachment O) details tier event trigger limits and the appropriate response required to assist with effective mitigation and management of associated risk due to accidental spill events.

The chemical risk assessment and associated SDS will be adaptively used to inform the spill response associated with accidental release of a chemical to prevent adverse impacts to MNES. The

Spill Response Plan (Attachment O)uses information from the CRA and SDS throughout the response process (see Table 6-8).

Table 6-8 Spill Response Plan (Adapted from the Spill Response Procedure (Attachment O)

Step	Assess the Spill
Assess the Spill	Use the SDS and CRA to: ■ Inform personnel training requirements. ■ Inform the selection of appropriate spill response kits and PPE located at chemical storage / handling locations. ■ Identify the risk to personal health and safety by the type of pollutant. Determine whether the chemical is flammable or reactive. ■ Determine whether the spill poses a threat to personnel, people, or the environment. ■ Inform the severity assessment and assign the spill classification (Tier 1: emergency/crisis to Tier 3: minor event). ■ The potential for impacts to nearby sensitive environmental areas.
Control the Spill	Use the SDS and CRA to inform spill containment and management. The documents can be consulted for advice on accidental release measures, personal precautions, protective equipment, and emergency procedures.
Clean-up Action Plan	Use the SDS and CRA to inform decisions on clean up and rehabilitation, including protective equipment, dependent on the type and nature of the chemical (as documented in the CRA). For chemicals the SDS is to be referred to for information on appropriate handling and transport.

The monitoring, management and mitigation measures are described in Section 5 of the Chemical Risk Assessment Framework provided as Appendix I of the Chemical Risk Assessment (Attachment L).

7 IMPACT ASSESSMENT

7.1 Assessment Summary

This PD provides further information to inform assessment of the likelihood of the Project having a significant impact on the following MNES:

- Listed threatened species and communities; and
- A water resource, in relation to coal seam gas development and large coal mining.

Impacts to the following matters were assessed and referred to DCCEEW for assessment.

Listed threatened species and communities

The PMST (dated 11 December 2023) identified 39 threatened species and five TEC's as potentially occurring within the FDA and surrounding to be considered in referring the Project to DCCEEW.

As detailed in the updated Ecology Assessment Report (Attachment C), field assessments and habitat assessments confirmed one threatened flora (Ooline), two threatened fauna (Greater Glider (southern and central) and White-throated Needletail and two TEC's (Brigalow (*Acacia harpophylla* dominant and codominant) and Poplar Box grassy woodland on alluvial plains) as known to occur in the FDA. Three threatened fauna (Koala, South-eastern Glossy Black-cockatoo and Dulacca Woodland Snail) are likely to occur within the FDA. There are an additional 16 listed threatened species with potential to occur within the within the FDA. Field validated habitat mapping underpins the impact assessment in Section 7 of the Ecology Assessment Report (Attachment C) and in the Significant Species Management Plan (Attachment H).

Assessments in accordance with the 'Significant Impact Guideline 1.1 – Matters of National Environmental Significance' (DotE, 2013a) and species-specific conservation advice for species which are known, likely or with the potential to occur concluded the Project is unlikely to significantly impact on any threatened species or TEC. However, DCCEEW considered the Project may have a significant impact and requested additional information for assessment by PD.

Significant impact assessments in the Ecology Significant Impact Assessment Report (Attachment G) were undertaken for two TECs, six known or likely occurring threatened species, 16 potentially occurring threatened species in accordance with the EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance (DotE, 2013a). The significant impact assessments determined there was unlikely to be any significant impacts to listed threatened species or communities from the Project.

Migratory Species

Excluding migratory species also listed as critically endangered, endangered or vulnerable (dealt in the previous section), the PMST identified an additional nine migratory species.

Of the nine migratory species, one was likely to occur, six have the potential to occur and two were unlikely to occur within the FDA.

Assessment of the impact on the known to occur (white-throated needletail) (also listed as a threatened species) and the likely to occur (fork-tailed swift) migratory species was conducted in accordance with the 'Referral guidelines for 14 birds listed as migratory species under the EPBC Act' (DotE,2015) and the EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance (DotE, 2013a). Significant impact assessments for the remaining migratory species were deemed unnecessary based on estimations that if populations of these species are present, they are not likely to be an ecologically significant proportion of the overall populations as per the assessment completed in Section 5.5 of the Ecology Significant Impact Assessment Report (Attachment G) and in accordance with the Referral guidelines for 14 birds listed as migratory species under the EPBC Act' (DotE,2015). This concluded no potential for a significant impact from the Project.

Water Resource

As a CSG development, the Project triggered assessment of impacts to water resources. This assessment is prepared in accordance with:

- 'Significant impact guidelines 1.3: Coal seam gas and large coal mining developments – impact on water resources' (DotE,2013b);
- Significant impact guidelines 1.1 – Matters of National Environmental Significance (DotE, 2013a); and
- Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (the IESC) information guidelines (IESC, 2018).

The EPBC Water Resource Impact Assessment (Attachment D) concluded the Project will not have a significant impact on water resources; however, the Minister determined the Project likely to have a significant impact and requested additional information for assessment by PD.

Additional information provided supports the finding that the Project will not have a significant impact on water resources.

7.2 General Assessment Requirements

Background

"The preliminary documentation must include an assessment of direct, indirect and consequential impacts on listed threatened species and communities as a result of the proposed action and must be assessed in accordance with relevant departmental policies and guidelines, including the SPRAT Database.

The department considers the proposed action may result in, but is not limited to, the following impacts:

- *vegetation clearance and loss of habitat;*
- *habitat fragmentation;*
- *introduction and/or spread of weed species;*
- *disturbance or displacement from foraging or roosting habitat, or breeding places;*
- *degradation of habitats as a result of:*
  - *dust;*
  - *erosion; or*
  - *accidental release of hazardous materials.*
- *Fauna injury during construction and operation activities;*
- *Chemical contamination;*
- *Changes to hydrological regimes;*
- *Changes to water quality;*
- *Groundwater drawdown and associated impacts on groundwater dependent ecosystems;*
- *Subsidence; and*
- *Cumulative impacts with other CSG operations in the region."*

RFI 2.2.1

An assessment of the likely impacts associated with the proposed action, including the vegetation clearance, construction, operational, maintenance and decommissioning components of the project.

RFI 2.2.1 Response:

The Significant Species Management Plan (Attachment H) includes additional information on the construction, operation and maintenance phase impacts of the Project including potential impacts to MNES.

A summary of this information is provided below.

The Significant Species Management Plan (Section 4, 5 and 6 of Significant Species Management Plan, Attachment H) describes and addresses the construction and vegetation clearance (Section 5.2), and operational and maintenance (Section 6.2) impacts to MNES as a result of Project. The EPBC Water Resource Impact Assessment (Attachment D) and Water Monitoring and Management Plan (Attachment I) addresses likely water related impacts resulting from the Project. The discussion of likely impacts within these studies considers both direct and indirect impacts to MNES with the level of impact depending on the type and location of the activity proposed.

Table 7-1 summarises the key construction, operational and maintenance impacts, both direct and indirect, as a result of the Project.

Table 7-1 Summary of Construction, Operation and Maintenance Impacts

Potential Impact	Stage of Development	Relevance to the Project
Clearing of native vegetation and habitat for threatened and migratory species and threatened ecological communities, leading to disturbance or displacement of fauna species from foraging or roosting habitat, or breeding place	Construction	Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, except for Koala and Southern Squatter Pigeon dispersal habitat. The areas of potential habitat for MNES that are known, likely or have the potential to occur within the Project Area are: ■ Australian Painted Snipe – 69.7 ha; ■ Belson's Panic – 366.3 ha; ■ Brown Treecreeper (south-eastern) – 272.1 ha; ■ Collared Delma – 259.7 ha; ■ Common Sandpiper – 29.5 ha; ■ Corben's Long-eared Bat – 259.6 ha; ■ Diamond Firetail – 1,287.4 ha; ■ Dulacca Woodland Snail – 666.3 ha; ■ Dunmall's Snake – 259.7 ha; ■ Five-clawed Worm-skink – 209.6 ha; ■ Fork-tailed Swift – aerial only (no impacts); ■ Grey Snake – 431.2 ha; ■ Greater Glider (southern and central) – 528 ha; ■ Koala – 698.5 ha foraging and breeding habitat and 9,072.6 ha of dispersal habitat (up to 530 ha of dispersal habitat to be cleared); ■ Latham's Snipe – 29.5 ha; ■ Northern Quoll – 226.7 ha; ■ Ooline – 118.7 ha habitat (no impact to 118.7 ha of habitat and surveys will be done in all areas of proposed disturbance to enable avoidance to all stands and isolated trees (if present)); ■ Oriental Cuckoo – 896.7 ha; ■ Painted Honeyeater – 272.1 ha; ■ Rufous Fantail – 604.2 ha; ■ Satin Flycatcher – 687.5 ha; ■ Sharp-tailed Sandpiper – 29.5 ha; ■ Slender Tylophora – 122.7 ha; ■ South-eastern Glossy Black-cockatoo– 1,003 ha; ■ Southern Squatter Pigeon – 164.3 ha of breeding and foraging habitat and 316.5 ha of dispersal habitat (up to 2.1 ha of dispersal habitat to be cleared); ■ Southern Whiteface – 938.5 ha; ■ White-throated Needletail – aerial only (no impacts); ■ Yakka Skink – 228 ha; and ■ Yellow-bellied Glider (south-eastern) – 145.8 ha. The maximum area to be disturbed represents a small portion of the overall Project Area (4.3%). A maximum of 5.8% of the previously cleared Koala dispersal habitat will be disturbed. Areas of potential

Potential Impact	Stage of Development	Relevance to the Project
		habitat for Ooline will be surveyed and only disturbed after surveys for individual plants have been completed. The final disturbance footprint will avoid impacts to any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species (with the exception of Koala and Southern Squatter Pigeon dispersal habitat) and further refinements will be made in accordance with the implementation of the Atlas Stage 3 Environmental Constraints Protocol for Planning and Field Development (Attachment B). The Project is not expected to create a significant impact on a MNES TEC or listed threatened species as the Project will be developed on previously disturbed land, and TECs and potential habitat for MNES threatened species, except for Koala and Southern Squatter Pigeon dispersal habitat, will be avoided.
Degradation of threatened species habitats or threatened ecological communities as a result of dust, erosion or accidental release of hazardous materials (indirect impacts)	Construction, Operation and Decommissioning	Disturbances from construction, operation, and decommissioning, such as noise and dust, have the potential to negatively impact adjacent vegetation communities and habitats. Noise disturbances have the potential to influence breeding, roosting or foraging behaviour of native fauna. Studies suggest that the consistency of noise is more important than volume, with irregular and unpredictable noise being more disruptive to wildlife (Jones et al. 2015), as may be emitted during construction. For the general native fauna community, individuals may relocate to adjacent areas during times of noise disturbance. It is noted that noise associated with the Project principally relates to well drilling which on average is completed in 3 days per well. Dust generated by vehicle and machinery movements has the potential to smother vegetation directly adjacent to the works and inhibit plant growth and palatability for native fauna. There are measures available to limit dust generation and dispersion. Without suitable mitigation measures, dust deposition resulting from the Project's construction activities has the potential to lead to degradation of fauna habitat. Additionally, reduced vegetation cover can lead to restricted fauna movement between foraging and breeding habitat. Unmanaged dust can lead to the smothering of native vegetation and an increase in invasive flora within the area. Increased erosion within the Project Area has the potential to lead to the loss of topsoil and soil fertility, in turn reducing native plant species within the area due to reduced optimal soil conditions if not suitably controlled. Erosion may further lead to an increase of invasive plants on disturbed soils or result in a decrease in ecosystem biodiversity. Erosion has the potential to impact the aquatic ecosystems with increased sediment runoff, leading to a reduction in habitat quality for aquatic species. Additionally, soil erosion contributes to longer ecosystem recovery times following soil disturbance. The accidental release of hazardous materials (including chemical contaminants, metals, machinery and equipment fluids etc.) could result in air and water pollution, and soil contamination. Such aspects

Potential Impact	Stage of Development	Relevance to the Project
		affect wildlife behaviours directly and indirectly. Direct impacts of hazardous materials can lead to changes in species physiology, behaviour, reproduction and/or survival. The release of chemicals into aquatic environments results in habitat degradation of wetland and river systems and poor fish health or death. The disturbance footprint will be designed to limit the number of watercourse crossings, and all remnant vegetation will be avoided. The existing aquatic habitat features within the Project Area are generally heavily disturbed drainage features. Given the limited extent water features relative to the Project Area and the typically dry nature of the area, impacts are expected to be minimal. However, there are measures, detailed within the Environmental Management Plan (Attachment E) to limit erosion and potential sedimentation during rainfall events that may produce runoff and overland flows. The Project is unlikely to degrade species habitat as Senex will implement appropriate erosion and sediment controls, implement robust environmental monitoring, and implement appropriate environmental management measures. The Project will also avoid MNES TECs and potential habitat for MNES threatened species (with the exception of Koala and Southern Squatter Pigeon dispersal habitat).
Introduction and/or spread of weed species (indirect impacts)	Construction and Operation	The Project Area is predominantly cleared land for agricultural purposes. The production wells will be located in cleared land, avoiding all potential habitat for MNES threatened species (except for Koala and Southern Squatter Pigeon dispersal habitat), and with appropriate weed management measures implemented throughout the Project lifecycle, the Project is unlikely to impact the overall structure of the vegetation communities present. Weeds have the potential to increase the frequency and intensity of fires, by degrading the landscape and reducing tree densities. However, the risk of this impact to occur within the Project Area is negligible with the implementation of stringent weed washdown procedures, and the Project Area being predominantly cleared land for agriculture. Therefore, there will be no impact on fire frequency. Uncontrolled transport and operation for construction vehicles and machinery has the potential to introduce invasive weeds to the Project Area, and as such, management measures, including weed seed hygiene will be implemented to minimise these risks. Management measures will be implemented throughout the clearing, construction and operational phases of the Project to minimise the introduction of weed species within the Project Area. The majority of the Project Area and surrounding areas is cleared, pastoral property and introduced flora are common. Three Weeds of National Significance (WoNS) species were recorded within the Project Area: tiger pear, common pest pear and velvety tree pear. Three additional species are considered potential to occur due to records within the buffered Project Area: parthenium weed, fireweed and madeira vine.

Potential Impact	Stage of Development	Relevance to the Project
		Two additional species prescribed as Category 3 restricted matters under the *Biosecurity Act 2014*, Harrisia Cactus and Mother-of-millions; and three other weeds of management interest, willows cactus, African Lovegrass and Brazilian Nightshade, were detected within the Project Area during field surveys. With the implementation of appropriate weed management measures and monitoring measures, as well as the avoidance of MNES TECs and potential habitat for MNES threatened species (except for Koala and Southern Squatter Pigeon dispersal habitat) the Project is unlikely to have a significant impact on the introduction and/or spread of weed species within the Project Area.
Fauna injury during construction, operation and decommissioning activities and movement of machinery/ vehicles	Construction, operation and decommissioning	The operation of vehicles and machinery within the Project Area has potential to lead to direct mortality or injury of resident fauna. Peak traffic period will be during the construction period with operational vehicle movements likely to be minimal. It is noted that well pad construction generally involves small crews with minimal truck movements and drill crews travel to site and stay on site whilst drilling. While many fauna groups are highly mobile (e.g., birds) and are likely to move when machinery and vehicles approach other less mobile groups (e.g., reptiles and amphibians) are be more vulnerable to this impact. Similarly, there will be trenches excavated during construction and as required for maintenance of underground infrastructure which may provide a trapping hazard for some fauna groups (e.g., amphibians, small reptiles, small mammals). During Project construction, maintenance and decommissioning, there will be an increase in vehicle and machinery traffic throughout the Project Area, although this is considered a temporary impact. The Project will implement effective vehicle management measures (i.e., reduced speed limits, limited traffic during operation etc.) to minimise the risk of fauna injury or mortality from vehicles and machinery. Additionally, the Project will adopt management measures to minimise the risk of trapped fauna within trenches (e.g., daily inspections of all open excavated trenches). A qualified fauna spotter catcher will conduct a search immediately prior to clearing of woody vegetation for the presence of fauna species. With the appropriate management measures implemented, it is considered unlikely the Project will have a significant impact on fauna through injury and mortality.
Habitat fragmentation	Construction	The Project Area is located in a largely cleared landscape with limited tracts of vegetation to facilitate ecosystem connectivity. Dispersal opportunities within the remainder of the Project Area are largely restricted to riparian areas, primarily in association with Wandoan and Woleebee Creeks. The cleared, non-remnant areas are considered likely to impede dispersal for most (less common) reptiles, amphibians, small ground mammals and arboreal mammals, with the exception of the Koala. The ability for Koalas to disperse across the broader landscape will remain during construction, due to phased development in smaller discrete work packs. Well pad size (typically 0.6 ha) and distance between pads and flexibility in their locations as well as flexibility in the alignment of

Potential Impact	Stage of Development	Relevance to the Project
		gathering so that gathering RoWs will cross watercourses perpendicularly. Also, the majority of the Project Area is made up of previously cleared land, the disturbance footprint will be able to be designed to avoid almost all vegetated corridors with high dispersal opportunity. Consequently, the Project is unlikely to have a significant impact on connectivity and fragmentation.
Inhibiting the ability of ecological communities or species to adapt and survive predicted climate change effects	Construction and Operation	Climate change is a listed threatening process for many ecological communities and species as the associated increase in temperature increases the potential for bushfires to occur. Additionally, temperature changes limit available habitat through removal of optimal conditions. Potential impacts include impeding migration pathways or inhibiting access to refuge areas for listed species or restricting areas for TEC succession. The Project is not predicted to exacerbate these potential impacts of climate change as Project infrastructure has been designed to avoid all forested areas, MNES TECs and potential habitat for MNES threatened species (except for Koala and Southern Squatter Pigeon dispersal habitat), including all important fauna movement corridors along Wandoan Creek and Woleebee Creek.
Loss of habitat, or degradation in vegetation quality from impacts associated with changes to groundwater hydrology.	Construction and Operation	GDEs have been mapped and identified within and adjoining the Project Area. These GDEs occur within the riparian zones of Wandoan Creek and Woleebee Creek and utilise alluvial sources of groundwater. There is potential for the drilling and gas extraction activities to impact on GDEs during construction and operation phases. Reaches of Woleebee Creek within the PL 209 area were assessed during the Senex field verification program in June/July 2018 (KCB, 2018). The assessment was conducted during the dry season and no flow was observed within the area surveyed. Pools of water were encountered in the lower reaches of Woleebee Creek which were considered to be rainfall derived surface water, based on their non-clear appearance and field water quality (547 µS/cm). The field verification identified that there is unlikely to be significant baseflow provided to this creek, however it is likely that during some periods, groundwater levels in the alluvium will rise into the sandy base of the creek. The field verification also concluded that based on the difference between the alluvial groundwater and surface water major ion chemistry signatures, and groundwater chemistry signatures from the Surat Basin units, groundwater within the alluvium is not considered to be sourced from the underlying Surat Basin unit (Westbourne Formation or Springbok Formation). Nonetheless, Senex have committed to ongoing monitoring of groundwater as there remains a level of uncertainty about connectivity between the alluvium and the Springbok Formation close to the northern boundary of the Project. Terrestrial GDEs mapped in the vicinity of the Project Area (DES, 2018) are also considered to source groundwater from the shallow alluvium, rather than the underlying Surat Basin units. However no significant impacts to GDEs are likely to occur as a result of the Project (KCB, 2023).

Potential Impact	Stage of Development	Relevance to the Project
Changes to Water Quality and Chemical Contamination	Construction, Operation and Decommissioning	The Chemical Risk Assessment has been provided as a standalone attachment to the PD (Attachment L) with findings reported in Section 6.1. For Tier 2 and 3 chemicals, a detailed risk assessment was undertaken. A chemical risk assessment was undertaken on 59 drilling chemicals, a total of 47 drilling fluids are proposed to be used at the Project. This includes chemicals for drilling, drilling completion and workover, exploration and core holes, and abandonment. The risk to MNES receptors from drilling fluids was determined both prior to, and following, mitigation and management measures. The risk assessment concluded that the likelihood for a drilling fluid to adversely affect an MNES is unlikely to highly unlikely. This is due to the proposed controls that will be implemented during drilling and the protocols in place if a spill should occur. The overall risk to MNES from chemical contamination has been assessed as low significance to insignificant
Changes to Hydrological Regime	Construction and Operation	The Section 6 of the EPBC Water Resource Impact Assessment Report (Attachment D) provides further detail on the hydrological regime, and an impact assessment is provided in Section 9 of the EPBC Water Resource Impact Assessment Report (Attachment D). A summary of impacts to hydrological regime is provided in Section 5.2.1.2. Potential impacts to the ephemeral watercourses are associated with the general construction and day to day operations of the Project's surface facilities. No discernible impacts to surface water and associated aquatic systems are predicted as a result of Project development. The Project does not include any: ■ Planned discharge to, or abstraction from, the surface water systems; or ■ Surface water diversions There are no surface water users identified within the vicinity or immediately downstream of the Project. Therefore, no impacts to third-party surface water users are predicted as a result of the Project development.

Potential Impact	Stage of Development	Relevance to the Project
Groundwater Drawdown	Construction and Operation	The modelled drawdown, predicted to result from the Project development, are presented in Section 8.5 of the EPBC Water Resource Impact Assessment Report (Attachment D), with specific impacts to groundwater assessed in Section 9 of the EPBC Water Resource Impact Assessment Report (Attachment D). A summary is provided in Section 5.2.1.4. Abstraction of groundwater as part of CSG production results in drawdown in groundwater levels / pressure in the target coal seams, which can result in induced flow from overlying hydrostratigraphic units and therefore may impact existing water-dependent assets within the vicinity of the Project, such as groundwater bores, or GDEs. In summary the predictive modelling indicated: ■ Drawdown of more than 0.2 m is not predicted for the Gubberamunda Sandstone for the Project only scenario, and cumulatively, the Project does not contribute to any additional potential GDE areas exceeding the 0.2 m trigger. Potential GDEs on the Gubberamunda Sandstone are not considered further in the GDE assessment; ■ Project only drawdown in the Westbourne Formation is predicted to be less than 0.2 m on any Westbourne Formation outcrops. The Project does contribute cumulatively to additional drawdown in the outcrop area of the Westbourne Formation (<1%). This occurs in a small area of the Westbourne Formation outcrop in PL 1037 (Atlas) and neighbouring tenement PL 277 (QGC) to the west; and ■ The groundwater in the Upper Springbok Sandstone outcrop area is predicted to have a drawdown greater than 0.2 m due to the proposed Project development (Project only simulation), resulting in this formation being the main formation of concern for this GDE impact assessment. The evidence discussed in Section 5.1.3.3and presented in Appendix X and XI of EPBC Water Resource Impact Assessment (Attachment D), indicates no impacts are expected to either terrestrial or aquatic GDEs around the creek alluvium as a result of drawdown in the areas of interest as the units are not observed to be hydraulically connected.
Subsidence	Construction and Operation	Section 9.5 of the EPBC Water Resource Impact Assessment Report (Attachment D) provides detail on predicted subsidence with a summary provided in Section 5.2.1.5. The predicted cumulative induced subsidence (including the Project) has been estimated to be up to 0.063 m, with a range of 0.006 to 0.063 m across the Project (cumulative). Project only subsidence estimation of a maximum of 0.06 m would be classed as low risk under OGIAs classification. The overall risk to EVs from subsidence is regarded as low.

Impacts associated with decommissioning activities are primarily related to unestablished surface conditions (i.e., risk of erosion and weed infestation), dig-ups of some gathering infrastructure and other infrastructure as well as noise and dust which have the potential to negatively impact adjacent vegetation communities and habitats. These impacts have been considered in Section 3.3 of the Ecology Significant Impact Assessment Report (Attachment G).

RFI 2.2.2

Include the direct, indirect and consequential/facilitated loss and/or disturbance of protected matters and their habitat as a result of the proposed action. This must include the area (in hectares) and quality of the habitat to be impacted and quantification of the individuals to be impacted (where applicable).

RFI 2.2.2 Response:

Project impact assessments describe and assess direct, indirect, cumulative and facilitated impacts with potential to occur during construction, operation and decommissioning. Table 7-1 above provides a summary of the direct, indirect and consequential/facilitated loss and/or disturbance to MNES, with the level of impact depending on the type and location of the activity proposed. Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). Section 5 of the Ecology Assessment Report (Attachment C), the Ecology. Significant Impact Assessment Report (Attachment G) and Section 9 of the EPBC Water Resource Impact Assessment (Attachment D) provide further detail on the direct and indirect impacts.

The Ecology Assessment Report (Attachment C) was prepared in accordance with current Commonwealth Approved Conservation Advice or SPRAT. References to the guidance considered in the species-specific assessment of likelihood and potential for significant impacts are included in Section 9 (References) and Appendix B (Likelihood of Occurrence) of the Ecology Assessment Report (Attachment C) and in the Ecology Significant Impact Assessment Report (Attachment G).

There is not expected to be any consequential or significant impact. The Ecology Assessment Report (Attachment C) and Ecology Significant Impact Assessment Report (Attachment G) found that the Project is unlikely to have a residual significant impact on any listed species or community. Similarly, the EPBC Water Resource Impact Assessment (Attachment D) concluded that the Project will not have a significant impact on water resources.

The Constraints Protocol (Attachment B) is a measure designed by Senex to apply the management hierarchy throughout the life of the Project for each phase of development – being infrastructure planning and design, construction, operation, and decommissioning and rehabilitation. The Constraints Protocol (Attachment B) provides a system to identify, assess, manage and record loss and/or disturbance to MNES individuals and habitat. The quality of habitat impacted and quantification of individuals and habitat area to be impacted is managed through the constraints framework and protocol steps in Section 2 and 3 of the Constraints Protocol (Attachment B). Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land).

The Project also results in produced water which is made available to third-party users. This will predominantly be for irrigation, however other uses e.g. stock water, hydrogen fuel production or other beneficial uses may also be pursued. The exchange of water is regulated through State Environmental Authorities and through the End of Waste Code which provides registered resource producers and the resource user with a framework for ensuring a safe-guard on produced water quality when applied for other uses.

As detailed in Section 7.1.4 of the Ecology Assessment Report (Attachment C) and Section 5.6 of the Ecology Significant Impact Assessment Report (Attachment G) significant impacts are unlikely for all TECs and threatened species when the impacts of the Project are considered cumulatively with the predicted impacts upon MNES from the associated ARC Pipeline (EPBC 2023/09585) (e2m 2024).

The ARC Pipeline has the potential to result in direct and indirect impacts to MNES known and likely to occur (e2m, 2024). A suite of planning and management actions will be implemented to avoid, minimise and mitigate potential impacts from the ARC Pipeline on those matters (e2m, 2024).

Assessment against the SIG 1.1 Criteria was conducted which determined that the ARC Pipeline is unlikely to result in a significant residual impact on MNES. As part of this Project, Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, except for Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). With the implementation of the proposed controls and mitigation measures, it is unlikely the Project and ARC Pipeline will result in any significant indirect impacts to any MNES.

No obvious events or circumstances that would lead to facilitated losses associated with the potential range of legal and approved end uses of the gas and water resources made available through the Project have been identified.

RFI 2.2.3

An assessment of the impacts of habitat fragmentation in the project area and surrounding areas, including consideration of species' movement patterns.

RFI 2.2.3 Response:

Potential impacts resulting from removal of native vegetation can include fragmentation of habitats, decreased ecosystem connectivity, reduced condition and quality of remaining vegetation and habitats, and reduced dispersal opportunities for fauna.

Habitat fragmentation is discussed in Table 5-1 of the Ecology Assessment Report (Attachment C) and Table 3-1 of the Ecology Significant Impact Assessment Report (Attachment G). The Project Area is largely cleared landscape with limited tracts of vegetation to facilitate ecosystem connectivity. Dispersal opportunities within the remainder of the Project Area are largely restricted to riparian areas, primarily associated with Wandoan and Woleebee Creeks. The cleared, non-remnant areas are considered likely to impede dispersal for most reptiles, amphibians, small ground mammals and arboreal mammals. The well pad size, distance between pads and the flexibility of well locations will allow the disturbance footprint to avoid all areas of remnant vegetation and High Value Regrowth. Given this, the proposed action is unlikely to have a significant impact on connectivity and fragmentation, and the fact that the gathering infrastructure is buried and does not require fencing, the Project is unlikely to cause any material fragmentation. Mitigation and management of habitat fragmentation is discussed in Table 6-1 of the Ecology Assessment Report (Attachment C). Key management and mitigation measures to allow habitat fragmentation avoidance and minimisation include:

- Infrastructure will be located to avoid and minimise isolating, fragmenting, creating edge effects or dissecting tracts of native vegetation;
- Gathering and pipeline infrastructure will maximise co-location;
- Maximum RoW width will not exceed 18 m for gathering, and 24 m for trunklines;
- Gathering lines are all below ground;
- No felled vegetation windrows to be more than 50 m in length; and
- RoW rehabilitated to 6 m wide access track post construction and all rehabilitated at the end of the Project, unless landholder requests an access track to be retained for ongoing use purposes.

The Constraints Protocol (Attachment B) outlines measures that will result in the avoidance of all remnant vegetation, minimal fragmentation and protect ecosystem connectivity. Infrastructure siting will preferentially make use of existing gaps between vegetation patches. Final rehabilitation will involve returning the Project Area to a land use that is safe for humans and wildlife, stable and non-polluting and self-sustaining.

RFI 2.2.4

An assessment of the likely duration of impacts to protected matters as a result of the proposed action.

RFI 2.2.4 Response:

Duration of a potential impact is an important consideration in determining whether the impact is significant i.e. important, notable, or of consequence, having regard to its context or intensity.

Section 5 of the Ecology Assessment Report (Attachment C) discusses potential impacts, including duration; generally, duration of impacts at any one location will be limited to the period of construction as the Project progresses in stages across the FDA. As well as magnitude and frequency, duration was a key factor in understanding potential impacts in Table 5-1 of the Ecology Assessment Report (Attachment C) to identify MNES values having elevated potential for significant impacts. Significant impact assessments, including further discussion of duration is presented in the Ecology Significant Impact Assessment Report (Attachment G). Impacts are generally expected to be short term. Short term impacts like land disturbance following clearing and during construction may last up to a year as rehabilitation is progressively carried out, noting that MNES TEC and MNES threatened species habitat (except for Koala and Southern Squatter Pigeon dispersal habitat) will be avoided during the progressive development of the Project.

In respect of the impacts to dispersal habitat, the disturbance to land is short-term and temporary with dispersal passage remaining, such that Koalas and Southern Squatter Pigeons can still access and move across the Project Area. Additionally, the proposed mitigation measures will ensure continued Koala and Southern Squatter Pigeon movement is maintained, and therefore does not impede the ability for these species to disperse across the broader landscape.

The larger and longer-term infrastructure such as the brine storage dam, as managed and designed appropriately will not impact on MNES.

The EPBC Water Resource Impact Assessment (Attachment D) describes and assesses the duration of impacts resulting from groundwater abstraction and produced water management through the impact assessment (Section 9.1.1), risk assessment (Section 9.7) and significant impact assessment (Section 11) in accordance with relevant guidance. As identified in Section 5.3.1.1.2, a maximum Project only drawdown of 0.9 m is predicted to occur in the Upper Springbok Sandstone outcrop area (of approximately 0.7 km^2) on PL 445, approximately 7 years after the start of the development. According to the JIF terrestrial GDE preliminary risk assessment, the magnitude (< 1 m) and timing of predicted exceedance (7 years) of the impact on the known GDEs, suggests that the risk of impact to potential terrestrial GDEs is low.

RFI 2.2.5

A discussion of whether the impacts are likely to be repeated, for example as part of maintenance.

RFI 2.2.5 Response:

The nature of gas field development involves development of well leases, gathering lines and pipelines, construction of wells and production of gas and abstraction of groundwater as the Project progresses in stages across the Project Area. The Project cycle repeats for each well; however, the location of the Project infrastructure may change as the Project gas field is developed.

Once all wells are producing, activities will transition to maintenance and operation of the existing infrastructure. Visual inspections and maintenance of well, gathering and water infrastructure equipment will be undertaken during operation. All wells will also be monitored remotely with field staff accessing relevant wells as required if changes to normal operations are detected. The well bore itself will generally be serviced by a workover rig about every three years, although some wells are expected to require more frequent servicing depending on performance.

The gathering system and access tracks will also be regularly monitored by field staff as they undertake well inspections and maintenance works (e.g. re-grading) completed where required. In the unlikely event maintenance of gathering systems (in the form of pipeline maintenance) is required, ground disturbance and partial trenching will be experienced.

Rehabilitated areas will also be regularly monitored and, where necessary maintained, in accordance with the Rehabilitation Plan (Attachment F) and the requirements of the EA.

Section 5 of the Ecology Assessment Report (Attachment C) and Section 9 of the EPBC Water Resource Impact Assessment (Attachment D) describe and assess direct, indirect, cumulative and facilitated impacts with potential to occur during construction, operation and decommissioning. Management system documentation will apply to manage the Projects activities repeated on a routine basis, with mitigation measures related to MNES implemented via the Environmental Management Plan (Attachment E).

The expected timing of expected impacts is provided in Table 7-1 above and in Section 3.3 of the Ecology Significant Impact Assessment Report (Attachment G). This identifies in which stage of development the impact is expected to occur.

RFI 2.2.6

A discussion of whether any impacts are likely to be unknown, unpredictable or irreversible.

RFI 2.2.6 Response:

Potential impacts are generally known, predictable or reversible through implementation of mitigation, management and rehabilitation measures – refer to Environmental Management Plan (Attachment E), Rehabilitation Plan (Attachment F) and Significant Species Management Plan (Attachment H).

Impacts are well understood as per the assessments undertaken in the Ecology Assessment Report (Attachment C), Ecology Significant Impact Assessment Report (Attachment G) and EPBC Water Resource Impact Assessment (Attachment D). The reports found that the Project is unlikely to have a residual significant impact on any listed species or community and water resources.

In the event monitoring identifies new or unplanned impacts, updated information will feed into understanding of site conditions to inform location of MNES values identified in constraint mapping and preferred infrastructure siting.

Management processes integrate monitoring into the implementation of avoidance, mitigation and management measures in the following management plans:

- Constraints Protocol (Attachment B);
- Environmental Management Plan (Attachment E);
- Significant Species Management Plan (Attachment H); and
- Rehabilitation Plan (Attachment F).

Senex operates under mature management systems and practices to facilitate the developments in a way that manages potential impacts in compliance with legislative requirements and approvals. Senex has extensive experience in developing gas fields in the Surat Basin and is a registered suitable operator for carrying out Environmentally Relevant Activities under the Queensland EP Act.

RFI 2.2.7

Justify, with supporting evidence, how the proposed action will not be inconsistent with:

Australia's obligations under the Biodiversity Convention, the Convention on Conservation of Nature in the South Pacific (Apia Convention), and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and

A recovery plan or threat abatement plan.

RFI 2.2.7 Response:

Section 2.1 and 2.2 of the Ecology Assessment Report (Attachment C) includes additional information on how the Project addresses the Biodiversity Convention and the Convention of Nature in the South Pacific (Apia Convention).

A summary of this information is provided as follows.

Senex considers the Project is not inconsistent with the Convention of Conservation of Nature in the South Pacific. The Project is not proposed in protected areas, conservation reserves or national parks. The Project has assessed both the listed threatened species of national importance and those listed under the *Nature Conservation Act 1992* to determine what protection measures are necessary to safeguard them whilst undertaking the action, including migratory species which are likely or known to utilise the area. The Project prohibits the hunting, killing, capture or collection of any indigenous flora and fauna and includes training for staff on the importance of listed threatened species and the management plans in place for their protection. Additionally, the Project was found to be unlikely to cause significant impacts to any listed threatened communities, threatened species or listed migratory species. These findings and the ability of the proposed action to be developed with minimal impact upon the site's ecological communities, species and systems confirm that the proposed action will not be inconsistent with Australia's obligation under the Apia Convention.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between multiple governments (including Australia, effective 1976) to ensure the international trade in wildlife does not threaten wild populations of flora and fauna. In total, there are approximately 30,000 flora species and 5,600 fauna species listed under CITES. In Australia, the CITES Management Authority is the DCCEEW. CITES primarily deals with the international trade of endangered and threatened species of wildlife and plants, aiming to prevent their exploitation for commercial purposes. Gas extraction involved with the Project, while it may have environmental impacts, is not directly related to the trade of such species.

The Commonwealth and Queensland regulatory framework is designed to ensure environmental sustainability, and the Project is therefore subject to strict environmental impact assessments and mitigation measures as evidenced in this report, the Significant Species Management Plan (Attachment H) and Environmental Management Plan (Attachment E). Through the Constraints Protocol (Attachment B), potential harm to local wildlife is minimised, thereby aligning with the principles of CITES. Through further assessments and proactive conservation efforts, the Project is expected to be compliant with international conservation agreements and safeguards the regions unique biodiversity. The Project does not involve international or any other trade in wildlife and Senex supports the complete suite of domestic measures Australia has adopted for improved conservation and tighter restrictions on trade of CITES listed species. Through further assessments the Project will comply with international conservation agreements and safeguards the regions unique biodiversity.

Senex has adopted relevant recovery plans and threat abatement plans into assessment and management planning for threatened fauna known, likely or having potential to occur in the FDA.

8 AVOIDANCE AND MITIGATION MEASURES

The Constraints Protocol (Attachment B) ensures Senex plans and locates Project infrastructure with strict consideration of relevant MNES which are identified as known, likely or having the potential to occur within the Project Area, preferentially locating infrastructure in the area of the lowest ecological value. Through the Constraints Protocol, Senex commits to avoiding certain MNES values while minimising cumulative impacts to other MNES with agreed maximum disturbance limits representing a conservative maximum development scenario for the impact assessments.

Certainty on how risks will be managed and monitored during construction, operation, maintenance, decommissioning and rehabilitation is given in the form of management plans incorporating Commonwealth and State guidelines and prescribed industry practice, including:

- Constraints Protocol (Attachment B);
- Environmental Management Plan (Attachment E);
- Significant Species Management Plan (Attachment H); and
- Rehabilitation Plan (Attachment F).

This section provides additional information requested in relation to the proposed avoidance, mitigation and management measures.

8.1 General Assessment Requirements

Background

Avoidance and mitigation measures are the primary methods of eliminating and reducing significant impacts on protected matters. The department expects avoidance and mitigation measures to be thoroughly investigated as a part of project design and planning, which must be supported by evidence to demonstrate likely success.

Avoidance of impacts should be prioritised in the first instance. Where not possible to completely avoid impacts on a protected matter, then impacts must be minimised or mitigated as much as possible. The SPRAT Database, and associated statutory documents, may provide relevant mitigation measures for protected matters. Commitments by the person proposing to take the action must be clearly distinguished from recommendations or statements of best practice made by the document author or other technical expert.

Avoidance, mitigation and management measures to protect MNES values are identified in Section 6 of the Ecology Assessment Report (Attachment C), the Significant Species Management Plan (Attachment H), the Environmental Management Plan (Attachment E) and Section 10 of the EPBC Water Resource Impact Assessment (Attachment D). These documents demonstrate how the Project will adopt a preferred management hierarchy to avoid, minimise and mitigate impacts.

Senex has committed to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). This is as a result of the successful implementation of the constraint-based framework with a hierarchy of management principles to avoid, minimise and manage land disturbance and impacts on MNES when planning for and implementing new activities within the Project Area is identified in Section 2 of the Constraints Protocol (Attachment B). As discussed in Section 4.2 of the Ecology Assessment Report (Attachment C), the Project Area includes areas of non-native and regrowth vegetation that could not be assigned a native vegetation community or broad habitat type due to an absence of required floristic composition or structural elements to be defined as such. These areas contain limited habitat values and are unlikely to provide the majority of the habitat functions for the MNES species that are considered known, likely or have the potential to occur in the Project Area. These limited ecological value areas will be prioritised for development and establishment of wells and other structures.

A management strategy for produced water for a purpose beneficial to the environment, water users and water-dependent industries is shown in Section 3.3.1.2 of the EPBC Water Resource Impact Assessment (Attachment D).

The detailed description of proposed avoidance, mitigation and management measures to be implemented during construction, operation and maintenance stages of the Project respond directly to government and industry recommendations, including but not limited to:

- Department's SPRAT (DAWE, 2022b), conservation advice and recovery plans (referenced in Section 3 of the Ecology Assessment Report (Attachment C));
- Code of Practice for the construction and abandonment of coal seam gas and petroleum wells, and associated bores in Queensland Version 1 (DNRME 2019a) (referenced in Section 10 of the EPBC Water Resource Impact Assessment Attachment D));
- CSG Water Management Policy prioritisation hierarchy (DEHP 2012) (referenced in Section 10 of EPBC Water Resource Impact Assessment (Attachment D)); and
- End of Waste (EOW) codes (referenced in Section 10 of the EPBC Water Resource Impact Assessment (Attachment D) for Irrigation of Associated Water (including coal seam gas water) (DES, 2019b) and Associated Water (including coal seam gas water) (DES, 2019a).

RFI 2.3.1

Include any relevant plans relied upon for the mitigation or management of impacts on MNES (in approved or draft format) as Attachments to the preliminary documentation.

RFI 2.3.1 Response:

Senex's commitments to be implemented to manage risks to MNES values are outlined in the management plans provided as attachments to this preliminary documentation package. The management plans are presented as final documents, including:

- Constraints Protocol (Attachment B);
- Environmental Management Plan (Attachment E);
- Rehabilitation Plan (Attachment F);
- Significant Species Management Plan (Attachment H);
- Water Monitoring and Management Plan (Attachment I);
- CSG Water Management Plan ATP 2059 (Attachment J); and
- CSG Water Management Plan PL 445 and PL 209 (Attachment K).

A constraint-based framework to implement the hierarchy of management principles to avoid, minimise and manage land disturbance and impacts on MNES when planning for and implementing new activities within the Project Area is provided in Section 2 and 3 of the Constraints Protocol (Attachment B).

RFI 2.3.2

A detailed summary of measures proposed to be undertaken by the proponent to avoid, mitigate and manage relevant impacts of the proposed action on relevant protected matters (including any measures required through other Commonwealth, State and/or local government approvals).

Proposed measures must be based on best available practices, appropriate standards, evidence of success for other similar actions and supported by published scientific evidence. All commitments must be drafted using committal language (e.g. 'will' and 'must') when describing the proposed measures.

All proposed measures must also be drafted to meet the 'S.M.A.R.T' principle:

- *S – Specific (what and how)*
- *M – Measurable (baseline information, number/value, auditable)*
- *A – Achievable (timeframe, money, personnel)*
- *R – Relevant (conservation advices, recovery plans, threat abatement plans)*
- *T – Time-bound (specific timeframe to complete)*

RFI 2.3.2 Response:

Detailed summary of avoidance, mitigation and management measures proposed to protect MNES values are identified in Section 6 of the Ecology Assessment Report (Attachment C) and Section 10 of the EPBC Water Resource Impact Assessment (Attachment D). The avoidance, mitigation and management measures proposed have been reviewed to ensure they follow the S.M.A.R.T principle and use committal language.

Certainty on how risks will be managed and monitored is provided in the form of management plans including:

- Constraints Protocol (Attachment B);
- Environmental Management Plan (Attachment E);
- Rehabilitation Plan (Attachment F);
- Significant Species Management Plan (Attachment H);
- Water Monitoring and Management Plan (Attachment I);
- CSG Water Management Plan ATP 2059 (Attachment J); and
- CSG Water Management Plan PL 445 and PL 209 (Attachment K).

These management plans are presented as final plans to be approved. Committal language is used throughout these management plans. The measures provided in these plans were designed with consideration of the S.M.A.R.T principle. Management measures provided throughout clearly identify what and how a measure is carried out. Targets are also proposed for applicable measures, such as no clearing of any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land). All measures proposed are considered achievable and relevant and are based on well-established industry practices (e.g. APPEA, 2008). These have been adopted with confidence to limit environmental impacts and ensure no significant impacts. Control measures refer to the relevant conservation advice or SPRAT advice and any other relevant guidelines or material. Measures proposed are tied to phases of the project life cycle (construction, operation and maintenance and rehabilitation) that apply to the impacting activity.

While the Project will be developed progressively to optimise gas production, the specific and measurable components depend on the programmed work schedule. When works with potential for impacts are planned to occur, implementation of proposed avoidance, mitigation, management and monitoring measures, and corrective actions will be appropriate for the programmed work schedule, location of works and activities being undertaken.

The management plans identify timing, frequency and duration of proposed measures. The management measures are made specific to the issue and the MNES.

All the attached management plans reference relevant references, including the Project Constraints Protocol, Government codes and guidance and MNES specific advice.

RFI 2.3.3

Information on the timing, frequency and duration of the proposed avoidance, mitigation and management measures to be implemented.

RFI 2.3.3 Response:

The Project will be developed progressively for Senex to meet their gas supply obligations and opportunities. The Project will be able to utilise approved capacity of existing gas compression and water treatment facilities located on adjoining tenures.

The management plans identify timing, frequency and duration of proposed measures for the activities in general, to be applied in practice as the field development progresses across the Project Area. The Environmental Management Plan (Attachment E) and the Significant Species Management Plan (Attachment H) provide the mitigation and management measures proposed to be implemented across the Project. The Constraints Protocol (Attachment B) provides the avoidance measures proposed to be implemented across the Project. Additionally, the Rehabilitation Plan (Attachment F) is the Project's plan to deliver the outcomes required under the EA at the end of the petroleum activities.

RFI 2.3.4

Details of specific and measurable environmental outcomes to be achieved for relevant protected matters, including an assessment of the expected or predicted effectiveness of the proposed measures.

RFI 2.3.4 Response:

The proposed avoidance, mitigation, management and monitoring requirements identified in the supporting documentation represent commitments, including those identified in the Ecology Assessment Report (Attachment C), EPBC Water Resource Impact Assessment (Attachment D), Environmental Management Plan (Attachment E), Significant Species Management Plan (Attachment H) and Rehabilitation Plan (Attachment F).

Specific and measurable outcomes have been identified by Senex and will be implemented through the Constraints Protocol (Attachment B), Environmental Management Plan (Attachment E) and Significant Species Management Plan (Attachment H).

Biodiversity Related MNES

Senex commits to the following construction environmental outcomes:

- No clearing of any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land);
- Clearing of native vegetation is minimised to that necessary for construction and operational activities;
- No clearing is undertaken without appropriate authorisation and approvals;
- Clearing of vegetation and protected plants is in accordance with relevant permits or exemptions issued under the EPBC Act approval conditions, *Nature Conservation Act 1992* and relevant EA conditions;
- No damage or destruction of Koala trees within the construction footprint, where there is an occupying Koala or tree crown overlapping a tree with an occupying Koala;

- No damage to potential fauna microhabitat features within MNES mapped habitat, particularly those suitable for Greater Glider (southern and central), South-eastern Glossy black-cockatoo including tree hollows. Identified microhabitat features such as hollow logs, woody debris and clumps of leaf litter surrounding will be avoided or relocated outside the disturbance footprint using standard techniques (i.e., stockpiling microhabitat features in retained areas prior to translocation). Translocation of hollow logs is generally undertaken using excavators;
- No injury, entrapment or death of fauna or domestic stock, as a result of Senex's activities;
- No introduction of new declared weed species, as a result of Senex's activities; and
- Appropriate erosion and sediment control measures will be employed to minimise the potential for impacts to potential habitat for listed threatened species and TECs.

Senex commits to the following operations performance criteria and environmental outcomes:

- No unauthorised release of contaminants directly or indirectly to waters;
- No accidental or uncontrolled release of water to waterways or drainage lines;
- Erosion and sediment control measures will be installed according to relevant plan and working effectively;
- No use of pipeline wastewater or produced water on site except in accordance with the conditions of approval;
- Native vegetation retained on site remains undisturbed throughout operation;
- No damage to or destruction areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land); and
- No injury, entrapment or death of wildlife or domestic stock, as a result of Senex's operational activities.

Monitoring and corrective actions are included in Table 8-3 and Section 5.4 and 6.4 of the Significant Species Management Plan (Attachment H). This process will be assessed via the monitoring of environmental outcomes, timing and corrective actions required to ensure that management measures are effectively undertaken and commitments are adhered to. Monitoring activities include the following:

- Checking for evidence of vehicles or machinery leaving designated areas;
- Clearing activities;
- Inspection of breeding places;
- Inspection of trenches;
- Assessment of dust deposition on vegetation;
- Checks of Weed Hygiene Declarations;
- Monitoring for new weed infestations;
- Inspection of spill kits and signs of leaks/releases or signs of contamination; and
- Inspection of erosion and sediment control devices.

Corrective triggers and actions have been identified specifically for the above monitoring activities and involve the reinforcement of key site process and procedures and remediation of impacts (refer to Table 8-3).

Water Related MNES

Potential impacts to groundwater and surface water interactions as a result of the Project are not anticipated and will not affect river and floodplain connectivity. The Project is therefore unlikely to result in a risk to human or animal health, or to the condition of the environment as a result of a change in water quality. Groundwater abstracted from CSG production from the Project will be treated and stored in site-specific infrastructure and fuel and chemicals used during drilling and operations will be stored and handled in accordance with the relevant Australian Standards. In addition, management and mitigation controls as discussed in the Chemical Risk Assessment Framework (Appendix I of Attachment L), will be implemented to avoid or reduce potential risks associated with the use of drilling additives to as low as reasonably practicable.

A groundwater monitoring network has been developed to monitor for changes to groundwater levels and quality of key hydrostratigraphic units and assist with meeting the environmental outcomes, additional information is provided in Section 8.2.

Key environmental outcomes, or targets, for water resource MNES include:

- Bore owners are not disadvantaged by CSG operations. Senex commits to ‘make good’ any impairment caused by a resource operation are ‘made good’ in accordance with the Water Act;
- Water supply bore continues to supply water for its intended purpose or is made good;
- Groundwater impacts due to CSG development must have no impact on the EPBC-listed springs (there are no EPBC-listed springs within 25 km of the Project);
- No adverse effects on the function and environmental values of GDEs due to CSG development resulting in changes in groundwater pressures/levels and/or quality. No adverse effects mean not reaching or exceeding an approved or interim limit as a result of the CSG development; and
- Subterranean GDEs (stygofauna) habitat is maintained or improved.

Senex can abide by such specific targets through the implementation of the Water Monitoring and Management Plan (Attachment I), CSG Water Management Plan ATP 2059 (Attachment J) and CSG Water Management Plan PL 445 and PL 209 (Attachment K). The Water Monitoring and Management Plan (Attachment I) outlines the groundwater monitoring response plan, providing a response framework to any observed change in groundwater quality and levels (data) which may be attributed to Senex’s CSG operations. Where investigations following trigger value exceedance determines that impacts are likely to be Project related and present an unacceptable risk of harm to human health or the environment, appropriate mitigation / remediation actions may be required. The need for appropriate mitigation will be evaluated, and implemented as may be required to mitigate the risk of unacceptable harm. Other specific and measurable environmental outcomes are identified in these plans.

As a “responsible tenure holder” (as that term is defined in the Water Act), Senex understands its responsibilities under section 369 of the Water Act for the implementation of specific obligations assigned under the UWIR to monitor and manage impacts to water resources.

Senex is committed to and will act in accordance with the JIF which provides a risk management framework to achieve stated outcomes for groundwater related MNES. Where a risk threshold has been, or is predicted to be, exceeded and impacts to EPBC-listed springs or GDEs are identified as being high or very high risk (under the JIF), and site-specific assessments will be undertaken to ensure that relevant outcomes are met.

Senex has adapted existing approved management plans to address site-specific MNES values, which encompasses regulatory approval requirements, and extensive experience and learnings in gas field development in the Surat Basin. Through implementation of similar constraint-based planning frameworks, and environmental management and rehabilitation plans, Senex has achieved regulatory compliance, environmental performance outcomes and social-licence to operate.

RFI 2.3.5

Any statutory or policy basis for the proposed measures, including reference to the SPRAT Database and relevant approved conservation advice, recovery plan or threat abatement plan, and a discussion on how the proposed measures are consistent with relevant plans.

RFI 2.3.5 Response:

The detailed description of proposed avoidance, mitigation and management measures to be implemented during construction, operation and maintenance stages of the Project respond directly to government and industry recommendations, including but not limited to:

- Department's SPRAT (DAWE, 2022b), conservation advice and recovery plans, referenced in Section 3 of the Ecology Assessment Report (Attachment C).
- Code of Practice for the construction and abandonment of coal seam gas and petroleum wells, and associated bores in Queensland Version 1 (DNRME 2019a), referenced in Section 10 of the EPBC Water Resource Impact Assessment (Attachment D).
- CSG Water Management Policy prioritisation hierarchy (DEHP 2012), referenced in Section 10 of the EPBC Water Resource Impact Assessment (Attachment D).
- EOW codes referenced in Section 10 of the EPBC Water Resource Impact Assessment (Attachment D) for Irrigation of Associated Water (including coal seam gas water) (DES, 2019b) and Associated Water (including coal seam gas water) (DES, 2019a).

There are no notable inconsistencies with relevant plans. The proposed measures were developed with consideration of relevant approved conservation advices, recovery plans and threat abatement plans.

RFI 2.3.6

Details of ongoing management and monitoring programs, including timing, to validate the effectiveness of proposed measures and demonstrate that environmental outcomes will be, or have been, achieved.

RFI 2.3.6 Response:

Biodiversity Related MNES

The Constraints Protocol (Attachment B) outlines the processes to be implemented to ensure the Project systematically, identifies, assesses, avoids, minimises and manages potential impacts on MNES associated with development of any new petroleum activity within the Project Area. Through the Constraints Protocol, Senex will implement a field development process to ensure potential impacts on MNES associated with development of any new petroleum activity within the Project Area will be systematically planned, identified, assessed and adequately managed. The field development process will apply a hierarchy of management principles to avoid, minimise and mitigate land disturbance and impacts on MNES when planning for and implementing new petroleum activities within the Project Area. These principles are:

- Avoid – preferentially avoiding direct and indirect adverse environmental impacts;
- Minimise – minimise direct and indirect adverse environmental impacts through a reduction in the duration, intensity and/or extent of adverse impacts, where these cannot be avoided;
- Mitigate – implement mitigation and management measures to minimise direct, indirect and cumulative adverse impacts; and
- Restore (remediate and rehabilitate) – actively remediate and rehabilitate impacted areas to promote and maintain long-term recovery.

The Constraints Protocol will ensure Senex plans and locates Project infrastructure with strict considerations of relevant MNES identified as having potential, likely or known to occur within the

Project Area, preferentially locating infrastructure in low constraint areas. This will be based on the findings of ecological pre-clearance surveys.

The Environmental Management Plan (Attachment E) outlines the environmental monitoring and auditing process. Monitoring is undertaken by a suitably qualified person who has professional qualifications, training or skills and experience relevant to the monitored subject matter and includes;

- Monitoring implementation of the Environmental Management Plan (Attachment E) and supporting procedures and plans by the Senex Site Supervisor, as appropriate, or the Senex Environmental representative to establish that performance criteria set for controls are being met and to apply corrective actions to protect environmental values and improve predicted outcomes;
- Regular inspection of construction and operational activities by the Senex Site Supervisor or the Senex Environmental representative;
- Environmental monitoring over time for weed infestations with reference to the Atlas Biosecurity Management Plan and rehabilitation progress; and
- Reporting and analysis of regulated discharges, emissions and waste disposal.

Environmental audits will be undertaken as both scheduled and unscheduled activities as identified in the Environmental Management Plan (Attachment E). The audit program may include the use of external auditors and will include regular environmental compliance audits.

Monitoring and corrective measures are identified for specific environmental outcomes throughout construction and operation periods in the Significant Species Management Plan (Attachment H). A summary has been provided in Table 8-3 below. To validate the management and monitoring measures, collecting additional data during the construction and operational period and analysing it over time will allow Senex to assess whether the proposed management strategies are contributing to the recovery or preservation of species within the region.

Adaptive management processes integrate monitoring into the implementation of avoidance, mitigation and management measures in the following management plans:

- Environmental Management Plan (Attachment E);
- Rehabilitation Plan (Attachment F);
- Water Monitoring and Management Plan (Attachment I);
- CSG Water Management Plan ATP 2059 (Attachment J); and
- CSG Water Management Plan PL 445 and PL 209 (Attachment K).

Environmental inspection, monitoring and auditing is undertaken by the Senex Site Supervisor and Senex Environmental representative on a periodic basis, see Table 8-3, to assess whether activities comply with the requirements of relevant management plans, including those mentioned above and internal systems.

Water Monitoring and Management Related MNES

Senex's ongoing monitoring commitments are summarised in Table 8-1. Baseline monitoring is required to enable the establishment and description of baseline conditions against which to monitor or assess whether, or not, the future development poses environmental risks. Baseline monitoring, for two years of two season cycles (to include wet and dry seasons), is proposed for:

- Groundwater level and quality;
- Groundwater dependent ecosystems (terrestrial, aquatic and stygofauna);
- Surface water quality; and
- Subsidence.

Baseline and ongoing monitoring will assist with demonstrating that environmental outcomes will be, or have been achieved. Groundwater level and quality triggers will be determined using baseline data, to initiate investigation of potential environmental impact.

Table 8-1 Groundwater Monitoring Commitments

Monitoring Commitments	Issues Addressed
Baseline monitoring of groundwater quality and levels	Understanding the receiving groundwater baseline water quality and levels, and the relationship between the key hydrostratigraphic units of the alluvium and the Upper Springbok Sandstone. Monitoring of potentially impacted areas of GDEs to establish groundwater dependence. Establish vertical hydraulic gradients near potential watercourse springs and other GDEs.
Baseline monitoring of groundwater dependent ecosystems	Provide sufficient understanding of the baseline conditions of the GDE to enable identification of potential adverse effects in the future. Determine the likelihood of groundwater dependence.
Baseline monitoring of surface water systems	Provide sufficient understanding of the baseline conditions of the surface water system to enable the identification of potential adverse effects in the future. Establish further understanding of groundwater interaction, determine losing or gaining surface water systems.
Baseline monitoring of produced water quality	Provide an understanding of the typical produced water quality to assist with identifying potential groundwater or surface water impacts from seepage, spills or overtopping.
Baseline subsidence monitoring	Provide a baseline for future analysis of annual trends and changes.
Ongoing groundwater level and quality monitoring	Inform the JIF risk assessment processes. Identify changes in water level or quality which could indicate that the Project is potentially impacting the groundwater system.
Ongoing groundwater seepage monitoring	Monitor for potential seepage or spills from produced water or brine storage facilities constructed for the Project through groundwater monitoring.
Ongoing monitoring of water storage facilities	Monitor water storage facilities to identify when a spill, seepage or overtopping event occurs which may impact groundwater or surface water systems.
Ongoing subsidence monitoring	Annual review of changes in ground elevation to identify whether an unacceptable amount of subsidence is occurring.

Groundwater monitoring as part of the Project has been considered in relation to key legislation, policies, guidelines, and standards. These are outlined in Table 8-2.

Table 8-2 Groundwater Monitoring – Applicable Key Legislation, Policies and Standards

Type	Name
Legislation	*Water Act 2000* *Environmental Protection Act 1994* *Petroleum and Gas (Production and Safety) Act 2004* *Environment Protection and Biodiversity Conservation Act 1999*
Guidelines and Policies	Bore Baseline Assessments Guideline (DES 2022a) Queensland Water Quality Guidelines 2009 (DEHP 2013) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) Monitoring and Sampling Manual: Environmental Protection (Water) Policy (DES 2018) Australian and New Zealand Water Sampling Guidelines – Part 11 Guidance of sampling of groundwater (AS/NZS 5667.11 1998). Australian Groundwater's Sampling and Analysis – A Field Guide (Sundaram et al. 2009). Bore Assessments Guideline (DES 2022b)
Standards	Minimum Construction Requirements for Water Bores in Australia (NUDLC 2020) Minimum standards for the construction and reconditioning of water bores that intersect the sediments of artesian basins in Queensland (State of Queensland 2017)
Reports	Underground Water Impact Report for the Surat Cumulative Management Area (OGIA 2021c) Groundwater Sampling and Analysis – A Field Guide (Sundaram et al. 2009)

RFI 2.3.7

Details of tangible, on-ground corrective actions that will be implemented, including timing, in the event that monitoring programs indicate that the environmental outcomes have not been, or will not be, achieved.

RFI 2.3.7 Response:

Adaptive management processes integrate monitoring into the implementation of avoidance, mitigation and management measures in the following management plans:

- Constraints Protocol (Attachment B);
- Environmental Management Plan (Attachment E);
- Water Monitoring and Management Plan (Attachment I);
- Significant Species Management Plan (Attachment H); and
- Rehabilitation Plan (Attachment F).

Corrective actions are included in the Section 5.4 and 6.4 of the Significant Species Management Plan (Attachment H). This includes monitoring, timing and corrective actions required to assess the management measures and environmental outcomes. The Environmental Management Plan (Attachment E) provides corrective actions related to noise, air quality and odour. A corrective action procedure is provided in the CSG Water Management Plan ATP 2059 (Attachment J) and CSG Water

Management Plan PL 445 and PL 209 (Attachment K) which requires Senex to investigate and report on non-compliances. Senex has committed to investigate incidents and use the findings to assist further compliance.

Table 8-3 below provides a summary of the monitoring activities in relation to the environmental outcomes, detailed above, with relevant corrective actions. Table 8-4 provides a summary of the monitoring activities and environmental outcomes related to water resources.

In addition, pursuant to requirements of the Water Act which outlines make good obligations of a resource tenure holder, Senex are currently in negotiations regarding a bore in an immediately affected area on PL 445 and will monitor this bore in accordance with the finalised make good agreement.

Table 8-3 Monitoring and Corrective Actions – Biodiversity

Phase	Monitoring Activity	Potential impact if not monitored	Environmental Outcomes	Timing	Corrective Actions
Construction	Monitor for evidence of vehicles leaving designated areas and machinery operating outside of designated areas.	■ Destruction of potential MNES habitat. ■ Injury to MNES species. ■ Unnecessary damage to the environment.	■ Destruction of wildlife habitat and injury to wildlife is minimised. ■ Unnecessary damage to vegetation is avoided.	■ Daily on site observations.	Trigger: ■ Vehicles operate outside designated areas. Action: ■ Reinforce during site toolbox / induction meetings.
	Monitor clearing activities	■ Vegetation clearing outside of designated areas.	■ Preservation of vegetation within the Project Area ■ No impact to vegetation beyond the designated clearing area.	■ Daily inspections of clearing area during clearing events	Trigger: ■ Clearing outside the designated clearing areas. Action: ■ Cease work and report the incident. Incident details will be recorded immediately and notified through the Senex Incident reporting systems, reported and investigated. Begin remedial activities immediately, such as rehabilitation in accordance with the Rehabilitation Plan (Attachment F). ■ Reporting on clearing that has occurred to MNES habitat outside the clearance limits to the Senex Environmental Manager.

Phase	Monitoring Activity	Potential impact if not monitored	Environmental Outcomes	Timing	Corrective Actions
	Inspect active breeding places	■ Damage to MNES breeding habitats. ■ Injury to actively breeding fauna.	■ Injury to fauna is minimised. ■ No death to fauna. ■ Harm to active breeding places is minimised.	■ Daily inspections of clearing area during clearing events	Trigger: ■ Fauna injuries due to clearing activities. Action: ■ Reinforce need to conduct daily inspections in designated and approved areas during site toolbox / induction meetings.
	Inspect trenches and/or other excavations prior to commencement of works for trapped fauna	■ Fauna entrapment, leading to dehydration, starvation, stress, increased predation, exposure to inclement weather.	■ Injury to fauna is minimised.	■ Daily inspections of trenches when open and clearing area during clearing events	Trigger: ■ Fauna is trapped within trenches and/or excavations. Action: ■ Reinforce need to conduct daily inspections in designated and approved areas during site toolbox / induction meetings. ■ Trenches and/or excavations are checked daily prior to commencement of works and relocated to suitable nearby habitat by a fauna spotter catcher.

Phase	Monitoring Activity	Potential impact if not monitored	Environmental Outcomes	Timing	Corrective Actions
	Assess dust deposition on vegetation within and adjoining the construction area.	■ Adverse impacts to flora and fauna from dust deposition. ■ Adverse impacts to air pollution from dust generation.	■ Dust levels are kept to a minimum.	■ Monthly inspections during construction period.	Trigger: ■ Visual dust deposition on vegetation Action: ■ Increase frequency of road watering where necessary. ■ Provide cover on soil stockpiles that are proposed to be exposed for a prolonged period. ■ Review appropriateness of vehicle speed limits and reduce if necessary.
	Conduct checks on vehicles and machinery to ensure they hold a valid and up-to-date Weed Hygiene Declaration	■ Introduction and spread of new declared weeds into the construction areas.	■ No new declared weed infestations. ■ Control of existing weed infestations.	■ Daily inspections during the construction phase.	Trigger: ■ Weed hygiene has not been performed or certified. Action: ■ Prevent vehicle and materials access on site if they have not been certified as weed free.

Phase	Monitoring Activity	Potential impact if not monitored	Environmental Outcomes	Timing	Corrective Actions
	Monitor for new weed infestations.	■ New weed infestations arise in the construction areas.	■ Environmental harm is minimised. ■ Prevent the introduction or spread of weed infestations.	■ Daily / weekly project vehicle checks during construction	Trigger: ■ Weed infestations not recorded properly and new weed infestations arise. Action: ■ Implement a control program for any new infestation identified in the construction area to prevent further spread. ■ All weed species to be recorded in a detailed register. ■ Assess weed records regularly for detailed requirements. ■ Assess control program regularly for effectiveness.
	Inspect spill kits to ensure they contain correct materials. Inspect on site machinery and equipment for any leaks / releases. Inspect construction areas for signs of soil contamination.	■ Environmental harm due to machinery / equipment leaks. ■ Soil contamination. ■ Spills not appropriately cleaned.	■ No adverse soil contamination. ■ No faulty or leaking machinery or equipment.	■ Monthly inspections during construction period.	Trigger: ■ Spillages, leaks, or soil contamination. Action: ■ Determine the cause of the release and put in place new process / procedure. ■ Remediate areas of contamination. ■ Replenish spill kits.

Phase	Monitoring Activity	Potential impact if not monitored	Environmental Outcomes	Timing	Corrective Actions
	Inspect on site erosion and sediment control devices in areas of potential MNES	■ Adverse erosion and sediment runoff in areas of potential MNES habitat. ■ Faulty erosion and sediment control devices.	■ No increased erosion and sediment runoff in areas of potential MNES habitat. ■ No damage to erosion and sediment control devices.	■ Daily / weekly during construction periods.	Trigger: ■ Faulty erosion and sediment control devices. Action: ■ Repair and/or modify erosion and sediment control devices if they have failed / not working correctly. ■ Install new or additional erosion and sediment control measures where soil erosion or sediment release is evident.
Construction and Operation	Noise is measured in accordance with prescribed standards in the Environmental Protection Regulation 2008.	■ Interference with fauna communication, masking the sound of predators and prey, causing stress or avoidance reactions. ■ Can lease to changes in reproductive or nesting behaviour or fragmentation of species habitat.	■ Environmental harm is minimised. ■ Injury to fauna is minimised. ■ Harm to active breeding places is minimised.	■ Intermittent review of noise levels.	Trigger: ■ Noise level exceeds the prescribed standards. Action: ■ Incident reporting will be completed and change management as required and appropriate.
Operation	Monitor for evidence of vehicles leaving designated construction and operation areas.	■ Destruction of potential MNES habitat. ■ Injury to MNES species. ■ Unnecessary damage to the environment.	■ Destruction of wildlife habitat and injury to wildlife is avoided. ■ Unnecessary damage to vegetation is avoided.	■ Daily on site observations.	Trigger: ■ Vehicles operating outside of the designated operation areas. Action: ■ Reinforce during site toolbox / induction meetings.

Phase	Monitoring Activity	Potential impact if not monitored	Environmental Outcomes	Timing	Corrective Actions
	Conduct checks on vehicles and machinery to ensure they hold a valid and up-to-date Weed Hygiene Declaration	■ Introduction of declared weeds into the operation area.	■ No new declared weed infestations.	■ Weekly inspections during the operations phase.	Trigger: ■ Weed hygiene has not been performed or certified. Action: ■ Prevent vehicle and materials access on site if they have not been certified as weed free.
	Monitor for new weed infestations.	■ Introduction and spread of weed infestations within the operation area.	■ No new declared weed infestations.	■ Daily / weekly on site obligations.	Trigger: ■ New weed infestations within the operation area. Action: ■ Implement a control program for any new infestation identified in the construction and operation area to prevent further spread.
	Inspect spill kits to ensure they contain correct materials. Inspect on site machinery and equipment for any leaks / releases. Inspect construction areas for signs of soil contamination.	■ Spills not appropriately cleaned. ■ Environmental harm due to machinery and equipment leaks. ■ Soil contamination.	■ No faulty or leaking equipment or machinery. ■ No adverse soil contamination.	■ Monthly inspections during operational period.	Trigger: ■ Spillages, leaks or soil contamination. Action: ■ Determine the cause of the release and put in place new process / procedure as appropriate. ■ Remediate areas of contamination. ■ Replenish spill kits.

Phase	Monitoring Activity	Potential impact if not monitored	Environmental Outcomes	Timing	Corrective Actions
	Inspect any stabilised areas in MNES habitat for any instability, erosion or lack of cover	■ Site instability. ■ Erosion and sediment runoff in MNES habitat.	■ All MNES habitats are stabilised with no erosion or sediment runoff.	■ Quarterly during operational period.	Trigger: ■ Site instability. Action: ■ Commence remedial actions to ensure site remains stable
Decommissioning	Monitor for evidence of vehicles leaving designated areas and machinery operating outside of designated areas.	■ Destruction of potential MNES habitat. ■ Injury to MNES species. ■ Unnecessary damage to vegetation is avoided.	■ Destruction of wildlife habitat and injury to wildlife is minimised.	■ Daily on site observations.	Trigger: ■ Vehicles operate outside designated areas. Action: ■ Reinforce during site toolbox / induction meetings.
	Conduct checks on vehicles and machinery to ensure they hold a valid and up-to-date Weed Hygiene Declaration.	■ Introduction of declared weeds into the operation area.	■ No new declared weed infestations.	■ Weekly inspections during the operations phase.	Trigger: ■ Weed hygiene has not been performed or certified. Action: ■ Prevent vehicle and materials access on site if they have not been certified as weed free.
	All well pads will be rehabilitated to the condition of the adjoining land	■ Land degradation ■ Site instability ■ Introduction or spread of declared weeds.	■ Unrequired land is rehabilitated to the condition of the adjoining land.	■ Weekly inspections during rehabilitation.	Trigger: ■ Disturbed land with an increase in weed infestations. Action: ■ Commence remedial actions to ensure ground cover is re-established with local species.

Phase	Monitoring Activity	Potential impact if not monitored	Environmental Outcomes	Timing	Corrective Actions
	Decommissioned wells are to be rehabilitated progressively throughout the Project life. Rehabilitation of the wells will be in accordance with the Queensland Code of Practice for Constructing and abandonment of petroleum wells and associated bores in Queensland (Department of Natural Resources, Mines and Energy (Version 2), 16 December 2019).	■ Land degradation ■ Site instability ■ Introduction or spread of declared weeds.	■ Unrequired land is rehabilitated to the condition of the adjoining land.	■ Weekly inspections during rehabilitation.	Trigger: ■ Disturbed land with an increase in weed infestations. Action: ■ Commence remedial actions to ensure ground cover is re-established with local species.
	Rehabilitate access tracks not required for use by the landholder, to the condition of the adjoining land.	■ Land degradation ■ Site instability ■ Introduction or spread of declared weeds.	■ Unrequired land is rehabilitated to the condition of the adjoining land.	■ Weekly inspections during rehabilitation.	Trigger: ■ Disturbed land with an increase in weed infestations. Action: ■ Commence remedial actions to ensure ground cover is re-established with local species.
	Surface drainage lines are to be re-established.	■ Site instability. ■ Erosion and sediment runoff in MNES habitat.	■ Project Area is stabilised with no erosion or sediment runoff.	■ Weekly inspections during rehabilitation.	Trigger: ■ Site instability. Action: ■ Commence remedial actions to ensure site remains stable.

Phase	Monitoring Activity	Potential impact if not monitored	Environmental Outcomes	Timing	Corrective Actions
	All disturbed ground cover vegetation are to be re-established.	■ Disturbed land and land degradation ■ Site instability ■ Introduction or spread of declared weeds.	■ Reinstatement of ground cover vegetation. ■ No new declared or spread of weed infestations.	■ Weekly inspections during rehabilitation.	Trigger: ■ Disturbed land with an increase in weed infestations. Action: ■ Commence remedial actions to ensure ground cover is re-established with local species.
	Disturbed land is to be reprofiled to the original contours.	■ Land degradation ■ Site instability ■ Introduction or spread of declared weeds.	■ Project Area is stabilised with no erosion or sediment runoff and no declared weed infestations.	■ Weekly inspections during rehabilitation.	Trigger: ■ Original contours are not reinstated. Action: ■ Commence remedial actions to ensure disturbed land is reprofiled appropriately.

Table 8-4 Monitoring and Corrective Actions – Water Resources

Phase	Monitoring Activity	Potential impact if not monitored	Environmental Outcomes	Timing	Corrective Actions
Construction	Inspect spill kits to ensure they contain correct materials. Inspect on site machinery and equipment for any leaks / releases. Inspect construction areas for signs of soil contamination.	■ Environmental harm due to machinery / equipment leaks. ■ Soil and groundwater contamination. ■ Spills not appropriately cleaned.	■ No adverse soil or groundwater contamination. ■ No faulty or leaking machinery or equipment.	■ Monthly inspections during construction period.	Trigger: ■ Spillages, leaks, soil or groundwater contamination. Action: ■ Determine the cause of the release and put in place new process / procedure. ■ Remediate areas of contamination. Replenish spill kits.
	Inspect on site erosion and sediment control devices in areas of potential MNES.	■ Adverse erosion and sediment runoff into surface water systems.	■ No increased erosion and sediment runoff in areas of surface water systems.	■ Daily / weekly during construction periods.	Trigger: ■ Faulty erosion and sediment control devices. Action: ■ Repair and/or modify erosion and sediment control devices if they have failed/not working correctly. ■ Install new or additional erosion and sediment control measures where soil erosion or sediment release is evident.
	Monitor drilling losses during bore and CSG well drilling and construction.	■ Contamination of groundwater with drilling fluid and associated chemicals.	■ Minimal drilling losses during construction and no adverse groundwater contamination.	■ During daily drilling	Trigger: ■ Drilling fluid losses inside bore. Action: ■ Reconsider the types of drilling fluids being use to reduce losses.

Phase	Monitoring Activity	Potential impact if not monitored	Environmental Outcomes	Timing	Corrective Actions
	Monitor spills/discharge during drilling.	■ Environmental harm to surface water/GDEs from surface water contamination.	■ Minimal spills/discharge during construction and no adverse surface water contamination.	■ During daily drilling	Trigger: ■ Uncontrolled discharge/spills during drilling. Action: ■ Follow the contingency procedures for emergency environmental incidents framework. Contain, control or minimise the impacts.
Operation	Inspect spill kits to ensure they contain correct materials. Inspect on site machinery and equipment for any leaks / releases. Inspect construction areas for signs of soil contamination.	■ Spills not appropriately cleaned. ■ Environmental harm due to machinery and equipment leaks. ■ Soil contamination.	■ No faulty or leaking equipment or machinery. ■ No adverse soil contamination.	■ Monthly inspections during operational period.	Trigger: Spillages, leaks or soil contamination. ■ Action: ■ Determine the cause of the release and put in place new process / procedure as appropriate. ■ Remediate areas of contamination. ■ Replenish spill kits.
	Inspect any stabilised areas in MNES habitat for any instability, erosion or lack of cover.	■ Site instability. ■ Erosion and sediment runoff in surface water systems.	■ Drainage areas are stabilised with no erosion or sediment runoff.	■ Quarterly during operational period.	Trigger: ■ Site instability. Action: ■ Commence remedial actions to ensure site remains stable.

Phase	Monitoring Activity	Potential impact if not monitored	Environmental Outcomes	Timing	Corrective Actions
	InSAR – change in elevation monitoring (Subsidence).	■ Greater than anticipated subsidence which could impact Evs.	■ Minimal change to watercourse drainage lines. Minimal impact to Evs.	■ Data reviewed annually	Trigger: ■ Subsidence greater than 10 mm/year over a 12 month period Action: ■ Exceedances that are assessed to be Project related will be investigated to determine if any asset trigger thresholds are exceeded. Site-specific investigations will then be carried out to identify and assess potentially affected infrastructure and watercourses. Site-specific investigations may include additional monitoring consisting of LiDAR (or similar data) within 12 months of the decline and undertaking additional verification at agreed ground control points to further improve accuracy of the survey data.
	Monitor groundwater levels in monitoring bores.	■ Drawdown of groundwater levels which could subsequently impact groundwater users such as landholder bores or GDEs.	■ Minimal change to groundwater levels outside of predicted groundwater level drawdown by OGIA.	■ Quarterly	Trigger: ■ Greater than anticipated drawdown, abnormal groundwater levels trends Action: ■ Make good bores where required.

Phase	Monitoring Activity	Potential impact if not monitored	Environmental Outcomes	Timing	Corrective Actions
	Monitor groundwater quality in seepage bores.	■ Degradation in groundwater quality.	■ Minimal change to groundwater quality.	■ Quarterly sampling	Trigger: ■ Degradation in groundwater quality, water quality higher than trigger value. Action: ■ Investigation actioned into cause before mitigation measures are applied.
	Produced Water Dam Monitoring (Leakage and seepage Detection).	■ Degradation of groundwater quality in the underlying Westbourne Formation.	■ Minimal change to the water quality of the Westbourne Formation (within environmental limits).	■ Hourly recording (level) ■ Daily volume (flow totaliser)	Trigger: ■ Sudden or unexplained decrease in water level. Unusual water levels. Surveillance identifies evidence of seepage. Action: ■ Follow emergency response procedure, inspect, redirect inflows, remediate liner if required.
	Produced Water Dam Monitoring (overtopping).	■ Overtopping – discharge event to surface water system which may impact GDEs.	■ Prevention of uncontrolled discharge.	■ Minimum hourly recording	Trigger: ■ Imminent or actual regulated structure overtopping (i.e. spillway discharge). Exceedance of mandatory reporting level or heavy rain forecast. Action: ■ Follow emergency response procedure.

Phase	Monitoring Activity	Potential impact if not monitored	Environmental Outcomes	Timing	Corrective Actions
Decommissioning	Surface drainage lines are to be re-established.	■ Changes in volume of water in surface water system. Changes to location and depth of flooding. ■ Erosion and sediment runoff into surface water system.	■ Minimal change to surface water system drainage and flooding.	■ Monthly inspections during rehabilitation.	Trigger: ■ Site instability. Action: ■ Commence remedial actions to ensure change to drainage to surface water is minimal.
	All well pads will be rehabilitated to the condition of the adjoining land.	■ Land degradation ■ Site instability ■ Introduction or spread of declared weeds.	■ Unrequired land is rehabilitated to the condition of the adjoining land.	■ Monthly inspections during rehabilitation.	Trigger: ■ Disturbed land with an increase in weed infestations. Action: ■ Commence remedial actions to ensure ground cover is re-established with local species.
	Decommissioned wells are to be rehabilitated progressively throughout the Project life. Rehabilitation of the wells will be in accordance with the Queensland Code of Practice for Constructing and abandonment of petroleum wells and associated bores in Queensland (Department of Natural Resources, Mines and Energy (Version 2), 16 December 2019).	■ Land degradation ■ Site instability ■ Introduction or spread of declared weeds.	■ Unrequired land is rehabilitated to the condition of the adjoining land.	■ Monthly inspections during rehabilitation.	Trigger: ■ Disturbed land with an increase in weed infestations. Action: ■ Commence remedial actions to ensure ground cover is re-established with local species.

8.2 Groundwater Quality and Drawdown Investigation and Reporting Triggers

A groundwater monitoring network has been developed to monitor for changes to groundwater levels and quality of key hydrostratigraphic units and assist with meeting the environmental outcomes listed in RFI 2.3.4.

Approach

The Queensland guideline, using monitoring data to assess groundwater quality and potential environmental impacts (State of Queensland 2021) (the Guideline) provides a framework for site-specific development of groundwater investigation triggers.

It is proposed that Investigation Trigger Values be derived in a manner that is consistent with the Queensland guidance document (State of Queensland 2021) and that an approach be adopted that considers the site-specific conditions and is targeted towards understanding trends, providing the Project with appropriate triggers to initiate actions and to provide a suitable level of protection for the potential receptors. The Queensland Guideline recommend that groundwater quality assessment be based on comparing a number of consecutive sample tests at investigation trigger monitoring bores to a value based on percentile calculations. This approach is aimed at reducing the probability of a false positive while providing a method that is sufficiently sensitive to detect potential impacts.

Groundwater Quality Triggers

Trigger values are to be set statistically, based on monitoring data, and should guide the management of the site to detect changes in water quality, evaluate those changes, and take appropriate actions, which could include mitigation. The percentiles approach is based on combining the ANZECC 2000 methodology, adapted control charting approaches, and statistics. The approach includes the calculation of the following:

- Value A (80th percentile) of existing time series monitoring data; and
- Value B (95th percentile) of existing time series monitoring data.

Value A is a level for detecting gradual change over the medium term (i.e. 1 to 2 years). Value B provides an indication of change over a longer term.

Control charting is a graphical tool that can be used to visualise the time series monitoring data and trigger values and track changes in measured data over time. Control charts will be utilised as part of the investigation trigger monitoring program.

Preliminary primary and secondary indicator parameters representative of stored produced water, intra-formational flow, auxiliary infrastructure, drilling fluids and material handling and have been selected. Changes in indicator parameters will provide an indication of changing groundwater quality or hydrogeochemical conditions. Indicator parameters will include dissolved concentrations (only) for metals. Dissolved concentrations are more appropriate for understanding the representative aquifer groundwater quality and therefore for the purpose of groundwater monitoring and the development of trigger values. Selection of indicator parameters relevant to drilling additives and chemicals entailed the review of drilling additives proposed to be used at the Project. Drilling additives include a range of chemical groups including suspended clays and other solids, acids and bases, salts, ions and organic compounds.

Site-specific trigger levels will be developed once sufficient data has been collected to determine the natural water quality variability. In the interim, the guideline recommends that Evs and WQOs be reviewed, and conservative generic default guideline values be adopted to protect surface and groundwater. Where local reference conditions are found to exceed published default guideline values for the protection of identified Evs, interim site-specific triggers may be adopted that is greater than the default guideline (State of Queensland 2021).

Assessment of water-related impacts for the proposed development of the Atlas Stage 3 Gas Project indicate the water quality in the key hydrostratigraphic formations generally exceed relevant generic Water Quality Objectives and guideline values. Since site-specific trigger values cannot be calculated due to lack of data, it is recommended that monitoring be continued to establish the required dataset for trigger calculations. It is proposed that available data be assessed after 2 years of monitoring for statistical representativeness, prior to value derivation and adoption of triggers.

For this reason and as a preliminary approach, it is suggested that primary parameters during the first two years be monitored for increasing trends or concentration spikes, as opposed to, against a set trigger level (with the exception of pH). The proposed trigger includes five or more data points that indicate an upward trend or a general increasing trend over a six-month period. Immediate resampling would be required where sharp concentration increases are detected (3 or more times above the dataset average). Where elevated levels are confirmed, immediate investigation pertaining to possible causes should follow.

Groundwater quality triggers have been developed for the seepage monitoring bores which surround the surface water storage facilities. The trigger values are presented in the Water Monitoring and Management Plan (Attachment I).

Groundwater Quality TARP

Senex will review the groundwater quality in monitoring bores for increasing trends on a bi-annual basis until statistically robust triggers have been developed. Following this, monitoring results will be evaluated against prescribed groundwater quality trigger values after each quarterly monitoring round.

Monitoring data will also be added to a control chart for each bore, which includes the historical record. Control charts are a visual method of using monitoring data to determine if a management response is needed, therefore acting as an early warning system using control values identified by statistical methods on site-specific data.

An example control chart is presented in Figure 8-1 and shows the Value A and Value B performance indicators, as well as the Normal, Control and Critical Zones, which have actions defined in the TARP as presented in Table 8-5. If the data review identifies upward trends / exceedance of the groundwater quality trigger values, then the TARP will be used to determine the appropriate actions.

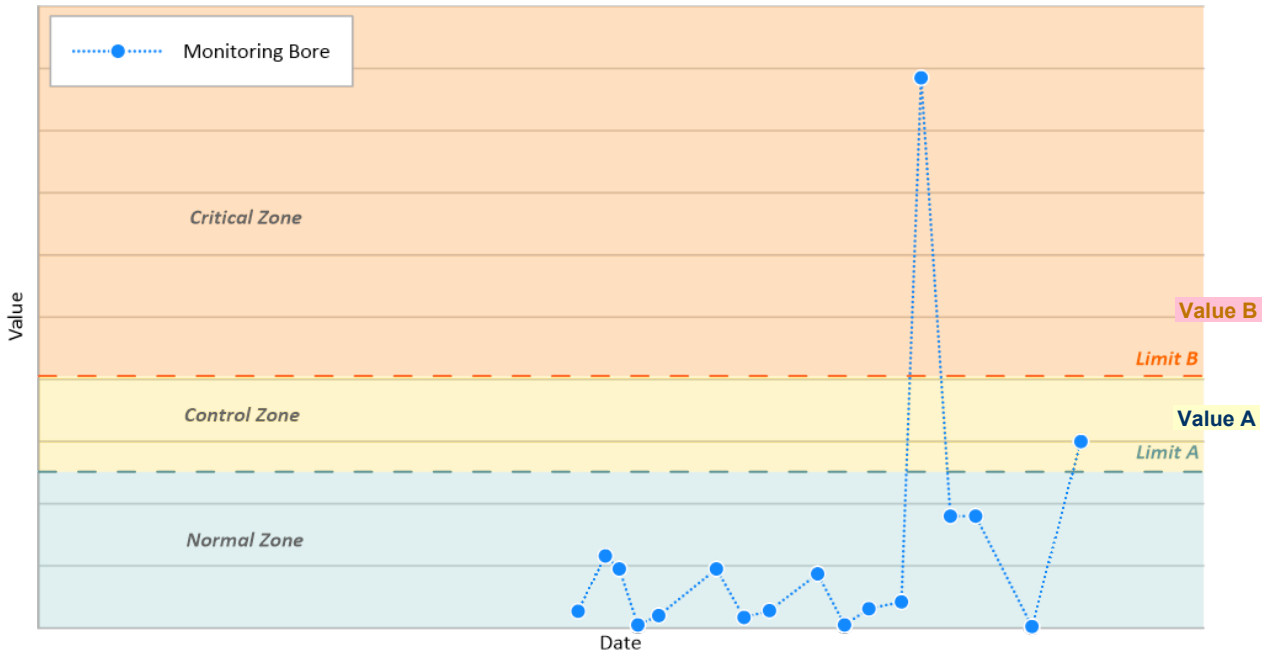


Figure 8-1 Example Control Chart

Table 8-5 Trigger Action Response Plan for Groundwater Quality

Actions	Normal Zone	Normal Zone With Upward Trend Below Value A Level but Upward Trends / Spikes	Control Zone Above Value A (80%) / Below Value B	Critical Zone Exceedance of Value B (95%)
Action Trigger	■ All parameters below Value A. ■ No persistent upward trends.	■ Concentration increases more than 3 times above the dataset average. ■ If five (5) or more data points indicate an upward trend (visual check) ■ A general increasing trend over a 6-month period	■ Five (5) consecutive values above the Value A (80%) level trigger	■ Any three (3) consecutive exceedances above the Value B (95%) level trigger
Recommended Actions	■ No actions apart from continued monitoring as per WMMP Groundwater Monitoring Plan.	■ Confirm that the measured concentrations are correct (e.g., review laboratory, field notes and sample QA/QC results). ■ For sharp concentration increases: resample within one week to confirm results. Where elevated levels are confirmed, immediate investigation pertaining to possible causes should follow. ■ Confirm with site personnel any localised site activity or construction not noted in monitoring records. ■ Increase frequency of monitoring as relevant following assessment of the trend. ■ Assess bore suitably and identify potential external influences.	■ Confirm that the measured concentrations are correct (e.g., review laboratory, field notes and sample QA/QC results). ■ Confirm trends or anomalies by resampling within 7 days. ■ Commence Initial Investigation – perform trend analysis (Mann-Kendal Test) and review concentrations to identify a potential reason for the result. ■ Monitor adjacent bores and/ or evaluate the need to install additional bores to increase robustness of monitoring program and coverage. ■ Perform trend review of Secondary Indicator parameters. ■ In instances where increases are isolated to one bore, investigate other possible	■ Resampling of measurement within 7 days of noting the exceedance. ■ Notification of the exceedance to the environmental manager if the field parameters are confirmed. ■ A Trigger Investigation report to be undertaken by a suitably qualified hydrogeologist to identify the cause of the water quality changes. ■ Implement actions as recommended for the ‘Control Zone’ as relevant to support the investigation. ■ Where an investigation determines that impacts are the result of the Project, evaluate and implement the appropriate mitigation actions.

		■ Implement relevant mitigation actions should external influences be identified (e.g. prevention of surface water ingress). ■ If upward trend is found to be potentially due to project activities / impacts, or if upward trend is likely to exceed Value A, follow Control Zone trigger actions.	sources other than Project activities. ■ If increases are not isolated to one bore commence initial investigation and evaluate the need for mitigation.	
Reporting Level	■ None.	■ Senex Environmental Manager.	■ Senex Environmental Manager.	■ Senex Environmental Manager ■ Administering Authority within 4 months of receiving the analysis results.

Groundwater Level TARP

Site-specific groundwater trigger levels with consideration to the potential drawdown resulting from the Project will be adopted for Senex bores to facilitate targeted impact monitoring and management. The maximum predicted drawdown is estimated from the OGIA cumulative groundwater modelling for the Surat Basin. The tiered trigger strategy system is as follows:

- Tier 1: Value A and B are based on the modelled maximum predicted drawdown at individual bore locations. Value A is intended to provide an early warning and will trigger increased monitoring and observation of potential drawdown impacts when water levels drop to within 2 m of the maximum predicted drawdown. Value B (only) will apply in instances where the maximum predicted drawdown is less than 2 meters. Hydrographs for each bore location will be requested from OGIA together with the maximum predicted drawdown water levels in mAHD.
- Tier 2: A second early warning trigger relates to hydrograph trend analyses and comparison of model predicted hydrographs to actual monitoring data per bore. When Value A is triggered (or decreasing trends are identified for bores where Value A is not relevant), additional control chart assessment would be initiated / required.

Senex will review groundwater levels and trends of monitoring bores in conjunction with the water quality trigger level review. Trigger levels for groundwater levels are based on the numerical model predictions by OGIA. To avoid false triggering, Value triggers for groundwater levels are defined to occur when average values dip below the groundwater trigger for three or more consecutive months.

Tier 1 Assessment

An example control chart is presented in Figure 8-2 which shows the Value A and Value B performance indicators, as well as the Normal, Control and Critical Zones, that have actions defined in the TARP. If the data review identifies exceedance of the groundwater level trigger values and criteria or a persistent decreasing trend, the groundwater level TARP will be used to determine the appropriate actions.

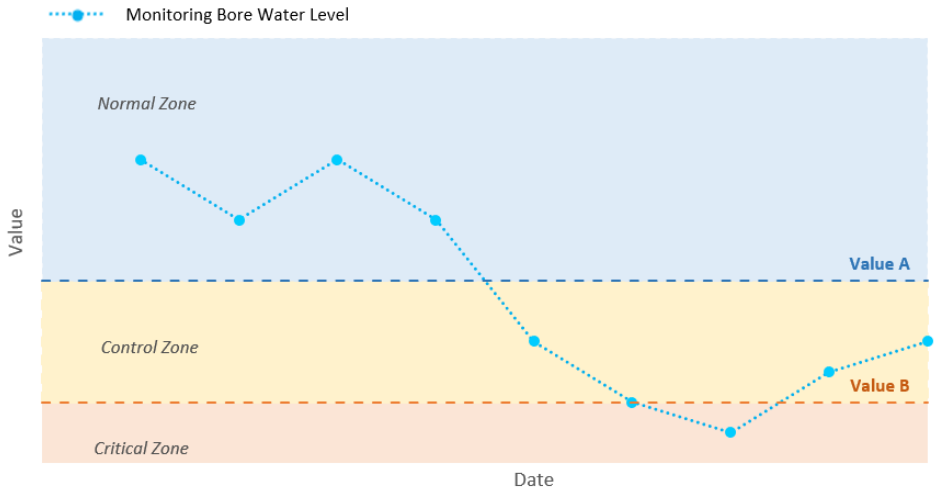


Figure 8-2 Tier 1 Example Control Chart

Tier 2 Assessment

Model predicted hydrographs will be generated for each monitoring bore. When the TARP requires Tier 2 assessment, actual monitoring bore data collected during the Project will be compared with model predicted hydrographs. If monitored trends exceed modelled trends, further investigation would be triggered as per the TARP.

As an extra precaution, an increase in drawdown trend in excess of 10% over the previous year has also been specified as a trigger for follow-up investigation as per the TARP.

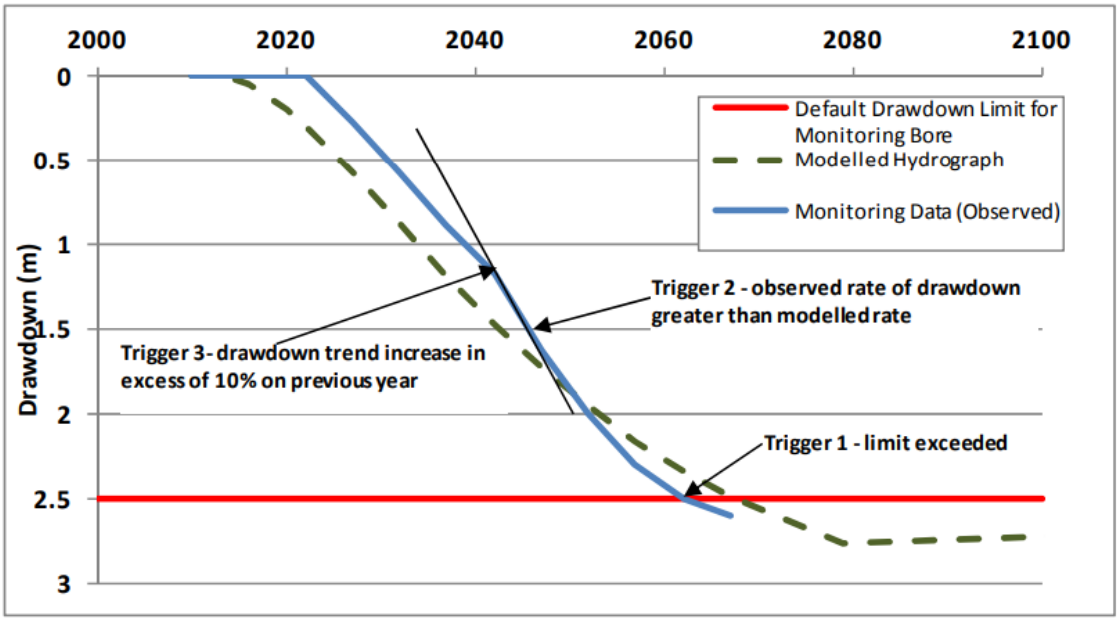


Figure 8-3 Schematic of Monitoring Trend Triggers to Initiate Follow-Up Response

The trigger action response plan for groundwater level change is presented in Table 8-6.

Table 8-6 Trigger Action Response Plan for Groundwater Levels

	Normal Zone	Normal Zone – Increased Monitoring Values Display Decreasing Trend within 5m of / Within Control Zone.	Control Zone Early Warning: Below Value A / Above Value B	Critical Zone Below Value B
Action Trigger	All parameters above Value A. No decreasing trends.	■ If monitoring over a 6-month period displays a decreasing trend (visual check) ■ Any one or more recordings below Value A.	■ Average groundwater level is below Value A and above Value B (within 2m of max. model predicted drawdown) for three or more consecutive months. ■ Monthly average groundwater Level is >2 m different from the model prediction for three (3) consecutive months. ■ Any one or more recordings below Value B.	■ Average groundwater level is below Value B (max predicted model drawdown) for three or more consecutive months. ■ Monthly average groundwater Level is >2 m different from the model prediction for six (6) consecutive months.
Recommended Actions	No actions apart from continued monitoring as per WMMP Groundwater Monitoring Plan.	■ Confirm that the measured water levels are correct (e.g., review field notes QA/QC, validate logger values with hand readings, data handling etc.). ■ Assess possible causes (e.g., climatic conditions, site activities) that may impact groundwater levels. ■ Consider an increase in frequency of monitoring. ■ Evaluate monitoring results and compare with modelled results as per Tier 2 control chart assessments. If model vs monitoring levels / trends are more than 10% different implement 'Control Zone' actions.	■ Confirm that the measured water levels are correct (e.g., review field notes QA/QC, remeasure within 7 days, perform hand measurements, check loggers etc.). ■ Evaluate monitoring results and compare with modelled results as per Tier 2 control chart assessments. If model vs monitoring levels / trends are more than 10% different commence Initial Investigation: ■ Review differences in actual CSG development vs that included in the numerical model. ■ Include trend analysis (Seasonal Kendal Test) to identify a potential reason for the change in groundwater levels for Trigger Bores. ■ The investigation analyses must account for the lag time between	■ Confirm that the measured water levels are correct (e.g., review field notes QA/QC, remeasure within 7 days, perform hand measurements, check loggers etc.). ■ A Trigger Investigation report should be undertaken by a qualified hydrogeologist to identify the cause of any changes. ■ Where investigations indicate that cumulative CSG / mining impact is a likely cause, re-visit latest model predictions (if different than previous) and actual CSG (vs proposed) development plans to understand deviation from the original modelled water levels. ■ Identify and evaluate mitigation measures (e.g. via model scenarios).

			natural events and changes in groundwater levels. ■ Assess possible causes (e.g., climatic conditions, site activities) that may impact groundwater levels. ■ Compare tends with that of other bores. ■ Increase frequency of monitoring (as determined by a specialist). ■ If deviation (in excess of 10%) are not isolated to one bore, initiate assessment (refer to critical zone actions). ■ Evaluate the need to install additional bores to expand monitoring network as determined by a specialist.	■ Drill additional bores to support investigations as determined by a specialist. ■ Where an investigation determines that Project impact exceed modelled results, determine appropriate mitigation actions. ■ Consider undertaking geophysical survey of the alluvium to understand heterogeneity and saturation across the alluvium to assist with understanding potential impacts.
Reporting Level	Senex Environmental Manager.	Senex Environmental Manager.	Senex Environmental Manager.	■ Senex Environmental Manager. ■ Notification of exceedance of Value B to Administering Authority within 28 days of receiving the results or as required by the Administrating Authority. ■ Results of additional drilling and trigger investigation report to Administering Authority within 6 months of initial notification.

Mitigation

Where an investigation determines that Project impacts exceed modelled predictions, and presents an unacceptable risk of harm, appropriate mitigation actions will be evaluated and implemented as required in accordance with Table 8-5 or Table 8-6.

Examples of mitigation options include:

- Modifying the staging of CSG water production in areas that could influence drawdown in specific areas.
- Offset source aquifer impact by retiring landholder's groundwater use from the source aquifer and by introducing stock control measures to improve wetland condition and resilience to any potential impacts on the wetland.
- Artificial recharge of aquifers where water levels have dropped to unacceptable levels.
- Ceasing CSG production in the vicinity of impacted receptors or modifying the field plan.
- Sourcing alternative water to users where the water supply bores are affected due to the Project.
- Potentially offset impacts to GDEs should unacceptable impact be indicated.
- Augmentation of surface water flow.

9 REHABILITATION REQUIREMENTS

9.1 Overview

The Queensland EP Act includes requirements for EA holders to rehabilitate disturbed areas, and to provide financial assurance to the government for the cost of rehabilitation if they are unable to satisfactorily meet this requirement.

The Queensland P&G Act also includes obligations and responsibilities for petroleum authority holders to decommission petroleum wells and pipelines.

A Rehabilitation Plan (Attachment F) has been prepared which responds to conditions set in the EA, relevant standards and legislative requirements and ensuring that any unavoidable impacts to MNES are temporary and minimised. All activities carried out as part of the Project will be rehabilitated in accordance with the Rehabilitation Plan (Attachment F). Further information on rehabilitation requirements is provided in this section.

9.2 Additional Information Requested

9.2.1 Rehabilitation Activities

RFI 4.1

The details of any rehabilitation activities proposed to be undertaken, including any activities required through other Commonwealth, State and/or local government approvals.

All commitments must be drafted using committal language (e.g. 'will' and 'must') when describing the proposed activities.

RFI 4.1 Response:

The overall goal of rehabilitation is to reinstate land to the pre-disturbance land use unless otherwise agreed with the landholder and regulatory authorities. Rehabilitation will occur throughout the life of the Project, transitional, and once the Project Area is no longer required, final. Rehabilitation activities are detailed in the Rehabilitation Plan (Attachment F).

Transitional rehabilitation will be undertaken on disturbance associated with ongoing operational activities where part of the disturbed area is no longer required. This includes:

- The construction area of a well lease pad is reduced from approximately 0.6 ha to an operational area of approximately 0.4 ha;
- The construction width required for an access track is reduced to a narrower operational width; and
- Once underground infrastructure has been installed (such as, gathering and pipelines), the RoW can be reinstated.

The aim of transitional rehabilitation is to stabilise disturbed land during the operational phase, thereby minimising potential impacts on surrounding environmental values.

Final rehabilitation will be undertaken once the Project Area is no longer required for exploration or operational activities. Final rehabilitation will involve (as required):

- Remediating any contamination;
- Re-contouring the landform;
- Replacing subsoil and topsoil;
- Tilling; and

- Direct seeding groundcover species (pasture grass or native grass) and allowing natural recruitment of plant species, with ongoing maintenance undertaken where corrective actions are identified during monitoring.

Acceptance criteria that the final rehabilitation will meet are discussed below. The acceptance criteria for final rehabilitation require additional criteria to those of the transitional criteria to be met, specifically relating to the quality of vegetation.

9.2.2 Rehabilitation Acceptance Criteria

RFI 4.2

The proposed final landform, including rehabilitation completion criteria, and its relation to the pre-disturbance vegetation community. Include an assessment of the expected or predicted effectiveness of the proposed rehabilitation activities.

RFI 4.2 Response:

The Rehabilitation Plan (Attachment F) outlines the proposed final landform including rehabilitation completion criteria.

The final acceptance criteria are presented for both transitional rehabilitation and final rehabilitation. Significantly disturbed areas that are no longer required for on-going petroleum activities, to be rehabilitated within 12 months to meet the following transitional acceptance criteria:

- Contaminated land resulting from petroleum activities is remediated and rehabilitated;
- The areas are:
  - Non-polluting
  - A stable landform
  - Re-profiled to contours consistent with the surrounding landform
- Surface drainage lines are re-established;
- Topsoil is reinstated; and
- Either:
  - Groundcover, that is not a declared pest species, is growing; or
  - An alternative soil stabilisation methodology that achieves effective stabilisation is implemented and maintained.

Significantly disturbed areas to be rehabilitated to meet the following final acceptance criteria measured either against the highest ecological value of the adjacent land use or the pre-disturbed land use:

- Greater than or equal to 70% of native ground cover species richness;
- Greater than or equal to the total per cent of ground cover;
- Less than or equal to the per cent of species richness of declared plant pest species; and
- To determine the individual site-specific rehabilitation requirements to satisfy this condition and achieve the nominated post-disturbance land use, adjacent areas, or the area to be disturbed will be assessed to obtain data used to develop final acceptance criteria for rehabilitation.

This will be obtained by utilising the pre-disturbance ecological assessment results for each project site. Comparative ecological assessments will be conducted in adjacent vegetation as the site is re-establishing and considered near final completion criteria.

Areas to be rehabilitated will be compared with a reference site that occurs proximal to the area to be assessed and has similar environmental conditions, that is, the same vegetation, similar landscape conditions (soil, slope, position in the landscape, geology) and similar natural disturbance (such as fire history).

The rehabilitation activities are considered suitable. The effectiveness of the rehabilitation activities will be assessed in accordance with the criteria specified in Section 7.2.3 of the Rehabilitation Plan (Attachment F). See an excerpt of this in Table 9-1.

Table 9-1 Rehabilitation Effectiveness Criteria

Rehabilitation land use	Criteria	Performance indicators	Corrective actions
Pasture grassland	■ Greater than or equal to total percent groundcover of adjacent vegetation or pre-disturbance assessment ■ Greater than or equal 70 % native groundcover species richness compared to adjacent vegetation/ pre-disturbance assessment. ■ Declared weed species less than or equal to the percent species richness of adjacent area/ pre disturbance assessment.	Comparison with analogue site in the adjacent vegetation or pre-disturbance assessment using: ■ 1 m x 1 m quadrats and the BioCondition Assessment Methodology (Eyre et al 2015) for % groundcover	If site is not progressing or likely not to reach acceptance criteria, assess if it is a result of soil conditions and/or livestock grazing and/or fire management and/or pest animal damage and/or weed infestation. The following will be undertaken: ■ A review and evaluation of monitoring results from previous site assessments to confirm attributable issue; ■ If required, additional targeted surveys to identify the magnitude of the attributable issue; ■ Review of current attributable management measures; and ■ If required, amend attributable management measure to ensure consistency with completion criteria. Actions may include supplementary soil amendment / amelioration and reseeding, control of weeds / pests or stock fencing.

9.2.3 Timing Frequency and Duration

RFI 4.3

Information on the timing, frequency and duration of proposed rehabilitation activities to be implemented, including anticipated time to completion.

RFI 4.3 Response:

Rehabilitation activities are outlined in the Rehabilitation Plan (Attachment F).

Rehabilitation will occur throughout the life of the Project, transitional rehabilitation during the operational phase and once the Project Area is no longer required, final rehabilitation. All areas (except infrastructure items required to be retained for the landholder, such as access roads) will be rehabilitated once the wells are decommissioned. The life of the Project is approximately 52 years. As wells are decommissioned (the life of individual wells is expected to be between 20-35 years) the entire disturbance footprint will be rehabilitated to the existing adjoining land use (excluding landholder retained infrastructure).

The progress of the rehabilitation over time will be monitored and assessed against the transitional rehabilitation acceptance criteria as per Section 3.2.1 of the Rehabilitation Plan (Attachment F) and the final rehabilitation acceptance criteria as per Section 3.3.2 of the Rehabilitation Plan (Attachment F) to determine whether the rehabilitation is progressing toward achieving, or has achieved, the post-disturbance land use. When monitoring indicates that the rehabilitation has achieved the final acceptance criteria and the Project Area meets the rehabilitation objectives identified above, a rehabilitation report that meets the regulatory requirements will be prepared and submitted to the administering authority.

As per the requirements of the Queensland EP Act, EA holders for resource activities are required to calculate the amount the holder considers to be an estimate of the total rehabilitation cost. The administering Authority (DES) will then assess the application and decide the estimated rehabilitation cost (the ERC decision).

The ERC decision made by the administering authority will then be provided to the scheme manager, under the *Mineral and Energy Resources (Financial Provisioning) Act 2018*, who will determine the amount and form of scheme assurance the EA holder must pay.

An ERC decision must be in effect and the scheme assurance must be paid to the scheme manager before any relevant activity under the EA can commence.

Senex will ensure appropriate ERC is in-place prior to commencement of the Project.

9.2.4 Management, Monitoring and Contingency

RFI 4.4

Details of ongoing management and monitoring programs, including timing, to validate the effectiveness of proposed rehabilitation activities and demonstrate that completion criteria will be, or have been, achieved.

RFI 4.4 Response:

Rehabilitation management and monitoring are outlined in Section 7 of the Rehabilitation Plan (Attachment F).

Rehabilitation monitoring will be undertaken to address site specific requirements and inform subsequent monitoring frequency and methods for key project stages:

- Practical completion (when construction works are finished);
- Transitional; and
- Final Rehabilitation.

Rehabilitation progress will be monitored with an aim to:

- Identify any required corrective actions or intervention;
- Measure progress toward transitional and/or final rehabilitation success; and
- Identify rehabilitation acceptance.

A rehabilitation register / disturbance tracker will be maintained in GIS. During the Project lifecycle, a risk-based inspection program is implemented to ensure installed erosion and sediment controls (ESCs) is functioning and disturbed areas are stabilising through vegetation growth. Maintenance and corrective actions will be implemented where monitoring identifies issues with performance indicators and rehabilitation acceptance criteria.

Risk based monitoring will be undertaken with the frequency dependant on the risk category. High risk areas are areas classified as requiring rework or corrective actions to meet the transitional rehabilitation criteria. High risk areas will be monitored annually. Medium risk areas meet the transitional rehabilitation criteria but require time and potentially intervention to meet the final rehabilitation criteria and will be monitored annually or longer depending on weather. Low risk areas are rehabilitated areas that meet all transitional rehabilitation criteria and are projected to meet the final rehabilitation criteria without any active intervention and will be monitored based on previous monitoring data.

RFI 4.5

Details of tangible, on-ground corrective actions that will be implemented, including timing, in the event that monitoring programs indicate that the completion criteria have not been, or will not be, achieved.

RFI 4.5 Response:

Corrective actions are outlined in Section 7.2 of the Rehabilitation Plan (Attachment F). Corrective actions are provided for key project stages; completion of construction, transitional rehabilitation and final rehabilitation.

Corrective actions for the completion of construction includes identifying any corrective actions during the defects liability period (or similar). Corrective actions for transitional rehabilitation are completed as required. These include:

- Remediating contamination;
- Reworking the site and reseeding;

- Limited fencing where stock exclusion is necessary for the establishment of vegetation; and
- Soil amelioration.

Corrective actions for final rehabilitation include:

- If the site is not progressing or likely not to reach acceptance criteria. Assess if it is a result of soil conditions and/or livestock grazing and/or fire management and/or pest animal damage and/or weed infestation, the following will be undertaken:
  - A review and evaluation of monitoring results from previous site assessments to confirm attributable issue;
  - Additional targeted surveys to identify the magnitude of the attributable issue;
  - Review of current attributable management measures; and
  - If required, amendment of attributable management measure to ensure consistency with completion criteria.
- Actions may include supplementary soil amendment / amelioration and reseeding, control of weeds / pests or stock fencing.

10 OFFSETS

RFI 5.1

An assessment of the likelihood of residual significant impacts occurring on relevant protected matters, after avoidance, mitigation and management measures have been applied.

RFI 5.2

A summary of the proposed environmental offset and key commitments to achieve a conservation gain for each protected matter.

RFI 5.3

If an offset area has not been nominated, include a draft OS as an Attachment to the preliminary documentation. The draft OS must meet the information requirements set out in Attachment B.1.

RFI 5.4

Where offset area/s have been nominated, include a draft OMP as an Attachment to the preliminary documentation. The draft OMP must meet the information requirements set out in Attachment B.2, and must be prepared by a suitably qualified ecologist and in accordance with the department's Environmental Management Plan Guidelines (2014), available at: www.environment.gov.au/epbc/publications/environmental-management-plan-guidelines.

RFI 5.1 – 5.4 Response:

Environmental offsets are measures that compensate for residual significant impacts of an action on the environment. 'For assessments under the EPBC Act, offsets are only required if residual impacts are significant' (EPBC Act, Environmental Offsets Policy (2012) p7).

The significant impact guidelines define a significant impact as:

> *'A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on matters of national environmental significance'.* (Matters of National Environmental Significance Significant Impact Guidelines p2, 2013).
>
> *'Avoidance and mitigation measures are the primary strategies for managing the potential significant impact of a proposed action'. 3 'Offsets are not required where the impacts of a proposed action are not thought to be significant or could reasonably be avoided or mitigated'.* (Environment Protection and Biodiversity Conservation Act 1999, Environmental Offset Policy p12, 2012).

The Project has been designed to prioritise avoidance of impacts on protected matters. The remaining impacts are minimised and mitigated to an extent where residual impacts on protected matters are not considered to be important, notable, or of consequence, having regard to the context or intensity of the Project and its impact.

Biodiversity Related MNES

Within the Project Area, the areas containing the highest quality habitats, riparian woodlands along Wandoan Creek and Woleebee Creek and plateau in the extreme southeast with woodland and open forest, are deliberately avoided and identified as no-go zones for proposed petroleum and gas activities within the Constraints Protocol (Attachment B).

The remainder of the Project Area is predominantly highly disturbed. These areas have been subjected to broadscale land clearing in support of ongoing agricultural activities. The values remaining in this area exist as native and introduced grassland. These are areas of limited ecological value.

Given the limited ecological value of the areas impacted and in consideration of the historic and ongoing agricultural impacts to values, the minor impacts associated with the Project are not expected to be important, notable, or of consequence. Significant impact assessments were completed for threatened species and TECs which were concluded as known, likely or with the potential to occur within the Project Area. The significance impact assessment for these species was completed against the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (SIG 1.1) (DoE, 2013) in the Ecology Assessment Report (Attachment C) and Ecology Significant Impact Assessment Report (Attachment G). As detailed in these reports, the Project is unlikely to have a residual significant impact on any listed species or community**.** Therefore, it is not appropriate to draft an Offset Management Strategy or Offset Management Plan as part of this PD.

While not considered necessary for the Greater Atlas project, Senex has an offset property closely situated to the Project Area which is being used to offset MNES values similar to those identified in the Project Area. An offset area management plan for the Bingleburra offset property is currently being developed using the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012). Following approval of this Offsets Action Management Plan it is expected that there will be surplus offset values remaining for use as required. Values are likely to include >500 ha of habitat for koala, greater glider and glossy black cockatoo.

Water Resources Related MNES

The modelled drawdown, predicted to result from Project activities, are presented in Section 8.5 of the EPBC Water Resource Impact Assessment Report (Attachment D), with specific impacts to groundwater assessed in Section 9 of the EPBC Water Resource Impact Assessment Report (Attachment D).

The predicted drawdown from the ‘Project only’ development scenario at the location of aquatic GDEs of interest is predicted to be less than the 0.2 m drawdown trigger. Drawdown is not predicted at the location of identified watercourse springs and therefore the spring trigger threshold is not predicted to be exceeded. The risk to GDEs from the Project is predicted to be low.

Importantly, the alluvium is not interpreted to be connected to the Upper Springbok Sandstone in the Project Area. Field investigations undertaken have provided both hydraulic and hydrochemical evidence that these units are disconnected (refer to Section 5.3.1.1.1). This evidence includes water level, water quality and isotope data.

A summary of the potential impacts assessed against the *Significant Impact Criteria 1.3 (Commonwealth of Australia 2022b), Changes to Hydrological Characteristics* has been provided in Table 11.1 of the EPBC Water Resource Impact Assessment (Attachment D) and *Significant Impact Criteria 1.4, changes to water quality* provided in Table 11.2 of the EPBC Water Resource Impact Assessment (Attachment D). It is concluded that the Project will not have a significant impact on water resources. Therefore, it is not appropriate to draft an Offset Management Strategy or Offset Management Plan as part of this PD.

11 ECOLOGICALLY SUSTAINABLE DEVELOPMENT

RFI 6.1

A description of how the proposed action meets the principles of ESD, as defined in section 3A of the EPBC Act. The following principles are principles of ecologically sustainable development:

- *decision making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations;*
- *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;*
- *the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;*
- *the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making;*
- *improved valuation, pricing and incentive mechanisms should be promoted.*

RFI 6.1 Response:

The Project implementation of the ecologically sustainable development principles outlined in Section 3A of the EPBC Act is reviewed and responded to in this section accordingly.

Senex has drawn from, and adapted mature governance frameworks and management systems, to establish proven operating arrangements, which respond to the principles of ecologically sustainable development (ESD). The following response to RFI 6.1 is therefore based on programs already in place at Senex.

11.1 Integration Principle

Decision making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations.

As part of the planning and design of the Project, Senex has established governance frameworks to ensure economic, environmental, social and equitable considerations form part of the decision-making process. Relevant governance processes are embedded across the business and decision-making at Senex is informed by:

- Company purpose, values and strategies;
- Risk management and assurance requirements; and
- A staged approach to project development.

As a natural gas producer, Senex operates in regional communities, environments and on country to deliver essential energy for life, in a way that supports positive long-term social, environment and economic outcomes. This purpose drives Senex's commitment to forming mutually beneficial, long-term relationships with all stakeholders, including community, landholders, Traditional Owners and customers. To develop and maintain these relationships, Senex has a strong focus on quality and delivery, a culture of compliance and is committed to meeting stakeholder expectations.

To support Senex's ambition to deliver positive outcomes, Senex stages project definition and investment such that feasibility, consultation and design requirements are assessed and adjusted as required against the economic, environment, climate and social considerations, for sustainable outcomes. Stakeholder engagement and approval applications commence only once thresholds of economics, planning and least-impact design are met.

Following is an outline of the primary tools Senex uses to integrate the principles of sustainable development into its business along with relevant examples of their use. These include:

- Code of conduct and policy framework;
- Health, safety and environment management systems;
- Decarbonisation initiatives;
- Promoting sustainable growth of local and regional economies;
- Landholder agreements regarding access to land; and
- Working with traditional owners on country.

11.1.1 Code of Conduct and Policy Framework

Senex has a Code of Conduct and supporting policies that requires all Directors, officers, employees and other people who act on behalf of Senex, to perform their job in line with high ethical standards and applicable legal requirements.

The Code of Conduct 'as it relates to environmental conduct' as it also applies to commercial and other conduct requires all employees, contractors and parties acting on behalf of Senex to:

- Comply with all requirements of environmental legislation and specific requirements of the EA and associated approvals or permits;
- Undertake all activities in accordance with the agreed management plans, procedures, work method statements and safe work methods;
- Ensure they are aware of escalation and reporting protocols and report any activity that has resulted in, or has reasonable potential to result in an environmental incident or non-compliance; and
- Participate in investigations to identify root causes and corrective actions (where required) to reduce and/ or remediate environmental harm and prevent re-occurrence.

11.1.2 Health, Safety and Environment Management Systems

During construction and operation, Senex will manage activities and performance with a formal health, safety and environment management system aligned to Australian Standards AS/NZS 4801:2001 and ISO14001:2015. The health, safety and environment management system is used to identify and address relevant risks and compliance and performance requirements during construction, operation, rehabilitation and closure. The Senex risk management process is based on the 3 Lines of Defence Model consisting of front-line management, continual risk monitoring and improvement, and assurance.

Environment (and safety) risks will be reduced to as low as reasonably practical (ALARP) through a hierarchy of controls approach at each Project stage:

- Avoid or substitute – avoid direct and indirect impacts;
- Minimise – minimise potential impacts;
- Mitigate – implement mitigation measures to manage the risks of adverse impacts;
- Remediate and rehabilitate – actively remediate and rehabilitate impacted areas; and
- Offset – offset significant residual adverse impacts in accordance with regulatory requirements.

Senex continuously reviews these controls to ensure they remain aligned with relevant regulatory and policy changes. These continuous reviews will ensure alignment with Net Nature Positive requirements should they be introduced in Australia.

Senex's approach to implementing the above hierarchy of controls are detailed below.

- Disturbance and rehabilitation:
  - In locating its gas field infrastructure, Senex preferentially avoids high-value biodiversity areas and features in accordance with the Constraints Protocol (Attachment B).
  - Ahead of the development, independent ecology surveys are completed to ensure environmental values are well understood and high value areas are preferentially avoided. In 2022, Senex surveyed 3,101 ha of acreage ahead of development activities.
  - To date, approximately 70% of Senex's activity has been conducted on pre-disturbed agricultural land. For the Project, the activity will occur on pre-disturbed land.
  - For the Project, well pads will be spaced at between approximately 500 and 750 m and connecting pipelines are buried beneath the surface to maximise the ongoing productive capacity of land.
  - For the Project Senex will rehabilitate approximately 35% of the well pad area within 12 months of drilling, returning it to the agreed land use. That is, the initial well pad of approximately 70 m x 80 m will be reduced to 60 m x 60 m as the longer-term operational footprint.
  - In 2022, Senex's total disturbance was 601 ha, with 358 ha as longer-term disturbance, 210 ha in rehabilitation progress during the wet season and 33 ha (5%) to be rehabilitated within the 12 months.
- Water:
  - Gas extraction targets deeper aquifers, protecting shallow aquifers from potential impacts.
  - The Project is within the Surat CMA, a defined water management area. The Project benefits from formal coordinated monitoring, modelling and management to ensure any potential impacts are detected early. Monitoring and groundwater management is coordinated by the Queensland OGIA as an independent regulator, with supporting arrangements to ensure 'make good' arrangements are in place in line with the Queensland regulatory requirements.
    - To date, Senex has entered into a single make good agreement action as a result of its operations.
  - Hydraulic fracturing will not be used for the Project.
  - Senex will direct extracted water to beneficial uses to maximise value of water as a common resource through beneficial water supply agreements.
    - Beneficial use across Senex's existing projects increased by 13% in 2022 to achieve 57% reuse of water produced from Senex's operations.
  - Despite high rainfall from La Nina over 2022/23, Senex's operations remained a water-contained site.

11.1.3 Decarbonisation Initiatives

A balance is required between meeting the short-term needs of the current generation, while taking action through initiatives such as the International Paris Agreement to preserve the environment for the benefit of future generations.

Senex is undertaking a project to facilitate ongoing transition of energy in national electricity markets. The Project presents an opportunity to uphold Senex's relatively low emissions profile as a natural gas producer. Senex produces natural gas from the Walloon Coal Measures, which is naturally low in carbon dioxide (CO_2) and has a high concentration of methane (CH_4). The lower reservoir CO_2 in CSG resources means Senex's natural gas is a lower emission source of methane compared to conventional natural gas. CSG requires less processing, which results in lower carbon 'waste' emissions as part of production compared to conventional natural gas.

Senex is committed to net zero as part of both the national and global challenge, whilst also providing secure and affordable energy for Australian industry and households. Both outcomes are essential in the coming decades to support a secure and prosperous Australia during the energy transformation and beyond. The challenge of a lower carbon world is a global issue, and we are focused on playing our role in supporting a practical pathway to achieve net zero by 2050 while maintaining a healthy and productive Australian economy and society.

11.1.4 Contributing to Sustainable Growth of Local and Regional Economies

Senex is committed to creating a sustainable future for the communities in which it operates by providing local employment, training, education and sustainable development opportunities. The Project will provide an opportunity for Senex to deliver gas to market and support ongoing Senex operations to meet energy demand and continue to support local jobs and the economy.

11.1.4.1 Local Jobs and Procurement

The Senex procurement strategy prioritises local suppliers to share economic and social benefits with the community and businesses operating in regional Australia. Hiring and procuring locally is important to Senex because it supports:

- A reliable, local supply chain that can be flexible and resilient in times of uncertainty;
- Long-term socio-economic benefits for smaller regional communities;
- Upskilling and educational opportunities; and
- Local suppliers to source from other local companies.

11.1.5 Landholder Agreements Regarding Access to Land

Senex takes a proactive, respectful and fair approach to land access arrangements for its activities in accordance with the relevant legislative obligations, the Queensland Land Access Code, and 'social licence to operate' requirements, and aims to be a high-trust organisation.

The Senex landholder agreement process includes independent valuations, agreements on locations, nature of access, and rehabilitation.

Mutually beneficial outcomes achieved through Senex's agreements with landholders include:

- Water supply agreements;
- Conduct and compensation agreements; and
- Property improvement works of existing tracks and roads for co-use.

At the end of 2022, Senex held 85 active landholder agreements and committed/delivered maintenance or upgrades to 57.9 km of private co-use roads.

11.1.6 Working with Traditional Owners on Country

Senex acknowledges the Traditional Owners and Indigenous Stakeholders of the Country on which the Project is proposed on.

Senex holds an active Cultural Heritage Management Plan with the Iman people, including survey, consultation and role as the lead voice in deciding cultural heritage management strategy as part of site scouting, well before any disturbance. There are no agreements to block or restrict the ability of Aboriginal Parties to protect cultural heritage. The Senex cultural heritage program is effective, with regular communication and consultation with Indigenous Stakeholders. Importantly there have been no incidents or harm to heritage to date from Senex's existing projects.

Senex supports indigenous development by providing:

- An annual scholarship program for the Indigenous Stakeholders;
- Face to face cultural awareness training;
- Support of training opportunities in the field: Indigenous Stakeholders spent 70 days on Country in survey activities during 2022 working with Senex for mutual outcomes; and
- National Aboriginal and Islanders Day Observance Committee celebrations.

11.2 Precautionary Principle

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.

RFI 6.1 Response: Senex applies an independent science-informed, measured risk management and execution process supportive of the Precautionary Principle and protection of the environment.

The approach matures and evolves through the life of a project and can be described as:

- At the project select stage: assessment of potential design configurations using known constraints, existing mapping and known associations. Examples of this include:
  - A constraints analysis is undertaken which identifies areas that are not amenable to development or how development should proceed if it was to be developed. In this way, Senex can optimise environmental outcomes by preferentially avoiding environmentally sensitive areas.
  - Where complete avoidance is not able to be achieved, Senex will implement a range of management and mitigation measures. This approach will be maintained throughout all phases of the Project, providing multiple opportunities for refinement of scope and execution to reduce impacts and scientific uncertainty.
- At the project define stage, Senex reduce risk variation and uncertainty through increasing technical confidence and adapting plans. Examples of this include:
  - On-the-ground mapping, surveys or testing (field truth) is undertaken often by independent subject matter experts with experience in the region and specific expertise. This is regularly focused on biodiversity, flora and fauna, presence of wells or groundwater definition to industry standards and practice methodologies.
  - Modelling of system responses and potential impacts to groundwater, surface water and ambient conditions via specialist resources, consistent with Surat Basin and Environment Authority management regimes.
  - Rigorous risk assessment across the spectrum of environment values.

- At the project execution stage, Senex finalise plans and ensure that adequate controls and operating plans are implemented to minimise potential for variation during construction, operation and closure. Examples of this include:
  - Senex has developed the Constraints Protocol (Attachment B), which lays out risk, plans, controls, responsibilities and assurance to coordinate and manage field activities. It will apply through each stage of development, including further planning and design, construction, operation, rehabilitation and decommissioning across the project life cycle. The Constraints Protocol (Attachment B) considers relevant legislative obligations such as the EPBC Act, heritage and other state-based obligations. This includes project commitments identified in project approval documentation, such as the:
    - Ecology Assessment Report (Attachment C);
    - EPBC Water Resource Impact Assessment (Attachment D);
    - Environmental Management Plan (Attachment E);
    - Rehabilitation Plan (Attachment F);
    - Significant Species Management Plan (Attachment H);
    - Water Monitoring and Management Plan (Attachment I);
    - CSG Water Management Plan ATP 2059 (Attachment J); and
    - CSG Water Management Plan PL 445 and PL 209 (Attachment K).
  - As a general principle, infrastructure siting will:
    - Consider MNES when selecting the location of Project activities;
    - Preferential avoidance or minimisation of disturbance to MNES; and
    - Ensure that MNES are not disturbed, except for Koala and Southern Squatter Pigeon dispersal habitat.

11.3 Inter-generational Equity Principle

The principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

The Senex business is a long-term business, with long life resources capable of production over multiple generations, and Senex see their role as providing access to affordable and reliable energy that contributes to economic growth in the context of sustainable development, biodiversity loss reversal and a low-carbon future. Senex, the Australian Energy Market Operator and International Energy Agency project that natural gas will continue to play an integral role in the energy mix within a low-carbon future as an inimitable fuel for industry and electricity grid reliability. Senex and the Project has a role to play in the sustainable future of industry, regional communities, healthy environments as biodiversity and water resources, protection and support of indigenous culture and heritage. In recognising the principle of inter-generational equity in climate change, Senex is committed to:

- Identifying, assessing, managing and reporting material climate-related risks as part of sustainable business and transitions;
- Measuring and reporting Scope 1, 2 and 3 carbon emissions in a transparent manner;
- Evaluating the resilience of Senex's portfolio and investment decisions, including the application of internal carbon pricing and prudent carbon management;
- Delivery of Senex's decarbonisation initiatives; and

- Actively engaging in climate dialogue with governments, industry associations and other stakeholders in the design of practical, sustainable climate regulation and policies for the transition.

In sustainable environments, Senex has a minimal footprint in the landscape and maximise the reuse of water to local agricultural enterprises. Senex progressively rehabilitates land as soon as land is available, dependent on seasons (for germination) and in alignment with agreed outcomes under land access agreements. Overall, the principles are:

- Protection of water and biodiversity values in the region wherever possible;
- Deliver mutually beneficial economic, social and environment outcomes for the community and region through potential impact reduction, and effective resources re-use, rehabilitation or regeneration where Senex operate;
- Ensure any operating sites or travel ways are left as safe, stable, non-polluting landform for humans, native fauna, flora and livestock;
- Protect land capability and production capacity within agricultural areas; and
- Minimise or play a role in reversal of long-term impacts to environmentally sensitive areas and MNES and threatened species habitat.

For Senex's role in contributing to sustainable communities, Senex's operation creates lasting social and economic value for the local towns and regions in capacity building, employment, liveability and health. We invest in areas which give communities independence and capacity building for sustainable outcomes outside of gas and Senex. Sharing and protecting the positive economic and social benefits of regional resources is critical to ensuring sustainability for both Senex and the community in the decades to come, and lasting relationships as part of the shared future.

11.4 Biodiversity and Ecological Integrity Principle

The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making.

Senex supports the conservation of biodiversity and ecological integrity. Senex's approach and controls are discussed in Sections 11.1, 11.2, 11.3 and 11.4.

Senex supports the Precautionary Principle and applies an independent robust, science-informed, measured risk management and execution process aimed at protecting the environment. Senex applies these processes during all Project stages.

Senex manages activities and performance with a formal environment management system (including health and safety) in accordance with Australian Standards AS/NZS 4801:2001 and ISO14001:2015 which is used in decision making. As previously stated, Senex implements a risk management process based on a 3 Lines of Defence Model consisting of front-line management, continual risk monitoring and improvement, and assurance.

11.5 Valuation and Incentive Principle

Improved valuation, pricing and incentive mechanisms should be promoted.

Valuation, pricing and incentive mechanisms are incorporated into the overall Project planning and operation costs, including:

- Provisions for rehabilitation and implementation of progressive rehabilitation and monitoring programs for unplanned and planned closure scenarios;
- Costs and value identification of ecological systems through project progression and lifecycle, including:
  - Scientific/engineering studies, surveys, field assessments, and ecological and hydrological assessments.
  - Implementation of constraints protocol requirements, including implementation of design changes and changes to the siting of infrastructure to ensure protection of environmental values.
  - Risk assessment and management via procedures, infrastructure, equipment and resources required to manage and monitor specific environmental risks such as, produced water, air quality, chemical risk and erosion and sediment control.
  - Engagement with community members and stakeholders and provisions for making good and implementing negotiated agreements with landowners and relevant indigenous parties.
  - Ensuring competency of staff or contractors to oversee the implementation of Project commitments including legislative and approval requirements.
- Inclusion of carbon pricing, and potentially with new nature repair markets – offset pricing into project models; and
- Corporate performance measures adapted as appropriate for business sustainability-related objectives (vary from year-to-year dependent on priority).

12 ECONOMIC AND SOCIAL MATTERS

12.1 Economic and Social Impacts

RFI 7.1

An analysis of the economic and social impacts of the action, both positive and negative.

RFI 7.1 Response:

The Project will provide multiple positive economic and social benefits from the local and regional to national scale and across multiple sources of value. Key benefits include:

- Direct and contractor employment;
- Economic development, including local business support and development;
- Social values development in heritage and co-existence with agriculture;
- Public funds contributions; and
- Contribute to energy security and affordability for Australia.

Employment

The Project will generate direct and cascading employment opportunities, both directly with Senex and indirectly through Senex's contract partners. Senex will directly employ approximately 40 permanent roles on the Project, with at least 10 roles based locally in the town of Wandoan during construction. Types of roles include a range of technical disciplines engineering, health and safety, environment, project controllers, construction and operation. Senex continuously endeavours to hire local staff and has a track record in growing regional employment over the past several years, including traineeship opportunities to community members with career entry roles. When operational, the Project will have an ongoing maximum of around 16 full time staff, to be based locally in Wandoan or surrounding centres. There will be some additional operational roles to be based in Brisbane with onboarding having already commenced.

Senex employment and procurement policy and processes prefer local based candidates where either the required skills and capability already exist in the region, or where external candidates are willing to relocate to local living. Procurement policy encourages contractors to adopt similar practices and principles as part of sustainable development, long term relationships and shared aspirations.

Overall, Senex estimates approximately 170-200 contract roles will be engaged through third-party vendors across drilling for the Project and required completions including workovers, wells and gathering, and water infrastructure. Most roles exist for a period of 2-3 years for construction, and then scale back for the remainder of the gas field development over a period of approximately 7-8 years. Where workers are not living locally, any workers who are driving or flying in will be housed in existing local accommodation facilities run by local businesses. This is a mature process and has been in place for some time for existing Senex operations in the area: it is anticipated that for the Project, Senex will utilise existing accommodation facilities and make suitable arrangements such as booking rooms in 6-month blocks, with the accommodation facility able to re-rent these rooms for other customers if not required for Senex.

In summary, potential positive social impacts include:

- Further employment, business and training for people living in the local and regional area, in numbers and longevity of employment;
- Diversification of employment options and self-determination in communities;
- Financial support for local infrastructure development and maintenance
- Increased financial support in Wandoan and surrounding towns through sustainable development; and

- Improvements in shared infrastructure such as roads and communications.

Potential adverse social impacts through employment changes may include:

- Higher road traffic and loads from and around the Project Area.
  - Mitigated by Senex policies, risk controls and initiatives to manage transport and a mobile workforce who commute through the region. Key large vehicle movements will be schedules outside of peak hours to minimise road traffic disruption at specific times.
- Increased demand on local services, including:
  - Local inflation given the intensity of the Project delivery.
    - This is expected to be minimal impact as the community and region are well equipped for dealing with this demand given the number of gas projects previously developed in the local area.
  - Housing shortages and increased housing prices.
    - The workforce are expected to reside in Wandoan in the Surat region or existing local accommodation as part of our commitment to sustainable development and communities. We do not anticipate significant additional pressures on the housing market given the maturity of the gas industry in the region.

Economic Contribution

Senex's initial economic infrastructure investment in the Surat Basin including the Project and planned Atlas and Roma North developments is estimated to be more than $1 billion, of which approximately $200 million, will directly benefit the region. Senex's investment in the Project alone will be approximately $225 million.

Whilst employment and resources associated with construction will be the most intense initial financial benefit to the local area, Senex implements a procurement philosophy of local and regional preference, enabling economic benefits to be gained across the regional economy and across a range of skills and services. Senex engage local enterprises early, sharing updates and explaining the types of goods and services they need and use broad media to promote local content contracts and share opportunity.

The firmly established practice of Senex reliably utilising family-run and locally owned accommodation providers to house employees and contractors will also directly benefit the local community and local businesses.

The Project is anticipated to result in a range of beneficial economic impacts including:

- Economic stimulus to the regional, state and national economies during the construction and operational phases of the Project;
- Increased employment opportunities within WDRC which would serve to stabilise and reduce unemployment within the region; and
- Opportunities for suppliers in the WDRC and surrounding regions to support the construction and operation of the Project.

The Project may result in the following adverse economic impacts including:

- Minor tightening of the local and regional labour market potentially resulting in increased labour costs;
- Potential for short-term skills shortages. Despite this, the community and region are well equipped to dealing with this challenge given the number of gas projects previously developed in the area;
- Potential for short-term inflationary pressure in the WDRC residential, commercial and industrial property markets; and

- Short-term increased burden on WDRC infrastructure, such as road networks.

Heritage Programs

Completion of the Project will enable additional field survey time for the Indigenous Stakeholders to undertake heritage surveys over a minimum of three months of field work.

Survey time working with Senex opens access to land under private ownership and is an opportunity to build heritage knowledge and country connection whilst also providing an opportunity for Senior Traditional Owners to train junior Traditional Owners in culture, heritage and heritage management processes on the ground. Whilst the process is ultimately in support of Senex activities, Senex also operates in ways to grow the value from the process for Traditional Owners and supports on-ground opportunities for Traditional Owners wherever possible.

Co-existence with Landholders for Reliable Income and Protection of Pastoral Land for Future Productivity

The Project is expected to result in numerous positive outcomes for landholders, via a mutually beneficial co-existence. One significant advantage is the reliable income stream that the Project can provide. Landholders who enter into agreements can receive financial compensation, royalties, or lease payments for access to their land. This income can offer stability and economic security. By diversifying their revenue streams, landholders can mitigate risks and ensure a steady source of income to support their livelihoods and invest in their properties.

Another crucial benefit resulting from the Project for landholders is the protection of pastoral land for future productivity. The exploration and production operations associated with the Project are typically conducted on a relatively small footprint of land, leaving the majority of the landholder's property undisturbed. This means that agricultural activities can continue alongside the Project's operations, preserving the land's long-term productivity. Additionally, Senex will implement measures to minimise the impact on the environment, such as implementing land rehabilitation and conservation practices.

As previously mentioned, the Project will generate local employment opportunities, benefiting landholders and nearby communities. The establishment and ongoing operation of the Project will create jobs across various sectors, including construction, engineering, logistics, and support services. This will lead to increased employment prospects for residents, providing economic stimulus and reducing reliance on traditional agricultural employment alone. By diversifying the employment landscape, the Project can contribute to regional development, attracting skilled workers and retaining young talent within rural areas.

Public Funds Contribution

The Project itself will contribute a total of approximately $300 million in royalties to the Queensland State Government and will continue to deliver these benefits for years to come, providing much needed revenue to fund vital infrastructure, health and education initiatives across the State.

Contribution to Energy Security and Affordable Energy for Australia

The Project will continue to provide energy security and assist in obtaining affordable energy for Australia. Gas is a reliable and flexible energy source that can provide a steady supply of power. Gas-fired power plants can ramp up or down quickly based on electricity generation fluctuations in demand, making it able to complement intermittent renewable energy sources like solar and wind. This flexibility helps stabilise the grid and provides an electricity mix, reducing the risk of blackouts and disruptions. By incorporating gas into the energy mix, Australia can enhance its energy security by diversifying its sources and reducing reliance on a single energy type.

Natural gas is a relatively low-cost energy source compared to other alternatives. Gas prices are often more stable and less susceptible to price volatility than other fossil fuels, such as oil or coal. The stability benefits consumers and businesses alike. The abundance of domestic gas reserves in Australia reduces the country's reliance on costly imports, further contributing to affordability.

12.2 Public Consultation

RFI 7.2

Details of any public consultation activities undertaken and their outcomes.

RFI 7.2 Response:

Stakeholders' participation and consultation is essential to building mutual respect, trust and acceptance of Senex's activities. As outlined in the Sustainability Report 2022 (Senex, 2023g), Senex conducts extensive community engagement across its operational areas. The Sustainability Report outlines how Senex develops Stakeholder Management Plans to help stakeholders understand the scope, purpose, and potential impacts of projects. For the Project, the Stakeholder Management Plan includes:

- Community information drop-in sessions;
- Participation/support in community events;
- Updates and meetings with federal, state and local authorities, and in local media;
- Regulatory functions including submissions/applications, reporting and notices; and
- Landholder engagement.

Senex sponsors and assists with many community events and initiatives in the Wandoan region. Three community information drop-in sessions were held in May 2021 in Miles and Wandoan for the exchange of information with the community, local suppliers, and potential future employees on Senex's activities. Further community information sessions are planned to provide the latest information on the Project once Project approval is received.

Senex has also presented on the Project at the Miles Women's Wellness Day (200 attendees) and the Wandoan Road Ahead Dinner (60 attendees), and published articles on it in local media outlets including the Murilla News delivered to all residents, Window on Wandoan, Country Caller and Chinchilla News as well as social media and web page posts. Through this consultation, key concerns raised generally related to desired improvements to the State Government funded Jackson-Wandoan Road given the location of Senex's proposed developments and housing. There was no negative feedback about Senex's proposed activities. This reflects Senex's operational track record and the local community's growing understanding and acceptance of gas developments over the past 10-12 years.

Senex hold monthly meetings with senior members of the WDRC and the Wandoan Community Commerce and Industry Association about project developments and upcoming events in the Project Area. Also, regular meetings are held with State and Commonwealth representatives to raise their awareness of the Project activities.

Senex is engaging with relevant landholders under its land access strategy via shed meetings, one-on-one sessions, notices of entry, etc., before entering into conduct and compensation agreements with them for the proposed development. Senex engage with landholders in formal land access negotiations per their obligations under the *Mineral and Energy Resources (Common Provisions) Act 2014* to secure agreements for access, the siting of wells and associated infrastructure. These processes are undertaken in acknowledgement of the rights and obligations of both parties.

12.3 Indigenous Engagement

RFI 7.3

Details of any consultation with Indigenous stakeholders.

Indigenous engagement

Identify existing or potential native title rights and interests, including any areas and objects that are of particular significance to Indigenous peoples and communities, possibly impacted by the proposed action and the potential for managing those impacts.

Describe any Indigenous consultation that has been undertaken, or will be undertaken, in relation to the proposed action and their outcomes.

The department considers that best practice consultation, in accordance with The Interim Engaging with First Nations People and Communities on Assessments and Approvals under Environment Protection and Biodiversity Conservation Act 1999 (interim guidance) (2023) includes:

- ensuring cultural safety;
- building and maintaining trust;
- engaging early and often;
- negotiating suitable timeframes; and
- negotiating suitable submission formats.

Describe any state requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action with regards to Indigenous peoples and communities.

RFI 7.3 Response:

Senex works to hold respectful, trusted and mutually beneficial relationships with Indigenous stakeholders. Senex has several policies and procedures in place, including an Indigenous Engagement Policy supported by a Cultural Heritage and Native Title Management Procedure, formalising approaches, principles, and consultation processes with Indigenous Stakeholders.

Within the Project Area, land subject to Native Title has either been:

- Excluded from the tenement;
- Subject to an ancillary agreement with the claimant extinguishing native title rights; or
- Where Native Title land was previously excluded from the tenement, following the right to negotiate process no claimant came forward or identified, and the excluded land was able to be re-included in the tenement.

In February 2018, Senex entered into a joint Cultural Heritage Management Agreement (CHMA) with the Indigenous Stakeholders. This CHMA allows access to undertake survey ahead of disturbance activities on land within the Project Area. This CHMA has not been made publicly available due to commercial and cultural sensitivity reasons. The Indigenous Stakeholders have undertaken ongoing blocks of survey work and Cultural Heritage clearances as part of working with Senex under this CHMA and Senex will continue to act with respect to all Aboriginal Parties and heritage protection.

Under the CHMA, Senex has also committed to building employee, contractor and sub-contractor cultural awareness through induction sessions conducted by the Indigenous Stakeholders on a regular basis.

Senex is also committed to holding annual meetings with the Indigenous Stakeholders in accordance with the CHMA commitments. At the most recent meeting, Senex advised of the PLs 209 and 445 acquisition from APLNG and were able to confirm with the Indigenous Stakeholders that the existing CHMA could be extended to include the new tenements. This outcome is an example of both an

effective legal framework, but also of the collaborative relationship between Senex and the Indigenous Stakeholders.

Senex supports Indigenous training, education, and business participation programs and strongly emphasises cultural awareness training and heritage protection. Senex provide training to ensure employees, contractors and visitors are aware of the cultural heritage in our operating areas and of their responsibilities and obligations to respect and protect it.

12.4 Projected Economic Costs and Benefits

RFI 7.4

Projected economic costs and benefits of the project, including the basis for their estimate through cost/benefit analysis or similar studies.

RFI 7.4 Response:

As previously stated, Senex's total economic investment in the Surat Basin, including the Project and Roma North developments, is estimated to be more than $1 billion, of which a portion, approximately $200 million, will directly benefit the local area and region. Senex's investment in the Project alone will be approximately $200-250 million. Senex's investment in the Project is also expected to create 40 permanent roles and 170-200 contract roles during the construction period and 16 permanent roles during the operational period.

The Project itself will contribute approximately $300 million in royalties to the Queensland State Government and will continue to deliver these benefits for years to come, providing much needed revenue to fund vital infrastructure, health and education initiatives across the State.

Recent electricity crises caused by coal supply shortages and generation outages, combined with lower renewable energy generation and underinvestment in new gas supply since 2015, highlight the need to secure reliable and affordable natural gas supply. Senex's investment in the Surat Basin is anticipated to produce 60 petajoules (PJ) per year of natural gas of which approximately 20 PJ per year will be from this Project. This Project alone represents more than 3.3% of annual east coast domestic gas requirements, around 13% of Queensland's domestic gas requirements, and is equivalent to the electricity used by more than 0.9 million homes each year.

The availability of a stable and affordable energy sources that the Project will provide can attract investment and provide industrial development in the region, State and Nationally. Industries that rely on natural gas as a feedstock can flourish leading to an expansion of operations and create more jobs.

In 2023, Senex entered into eight conditional domestic gas supply agreements (GSAs) (totalling ~150 PJ) in support of the Project. This equates to nearly 30% of forecast annual east coast domestic demand, or electricity used by almost 6.5 million households in a year. It is expected over the total life of the Project, Senex will supply gas to both the Australian domestic and export markets. However, there will continue to be a strong domestic focus to bring much needed new supply to eastern Australia.

The approval of the Project directly relates to the conditionality of all but one of these domestic GSAs, with the timely receipt of the approval being the last requirement for those GSAs to become unconditional. On this basis, an average of at least 90% of the forecast gas production from the Project is directly linked to conditional domestic GSAs through to the end of 2036. It should be noted that Senex manages it supply to customers on a portfolio basis meaning that customers are supplied from gas produced from across Senex tenements and project areas. That means that Senex's supply obligations will be met from the aggregated portfolio over time rather than from individual tenements.

Regarding aggregate portfolio supply, Senex draws attention to the conditional exemption granted by the Federal Government under the new Mandatory Gas Code of Conduct to current Senex producing entities, which requires those Senex entities to supply, in aggregate, at least 50% of their total gas

production each year to the domestic market. This significant commitment goes out to 2030 and builds on Senex's existing domestic supply obligations in Queensland which apply to certain permits e.g. PL 1037 and ATP 2059 within Senex group's portfolio of gas assets.

The Australian Competition and Consumer Commission and Australian Energy Market Operator have forecast structural gas shortfalls in the east coast market without new supply in the coming years and have warned of the urgent investment needed in new supply. The Project will add critical new supply to the domestic market when it's needed most.

These conditional GSAs commence from 2025 and extend as far as 2036. The approximately 150 PJ of natural gas will be delivered to energy retailers (approximately 50%) and commercial and industrial (C&I) customers (approximately 50%), with a portion of sales supporting southern east coast gas market users.

Critically, this gas will keep Australian factories producing bricks, packaging, glass and steel as well as powering households throughout the east coast of Australia.

Examples of the conditional long-term GSAs from the Project include:

- **Orora** – for the supply of more than 14 PJ of natural gas over 10 years to support Orora's glass and packaging business, including its state-of-the-art glass manufacturing facility in South Australia.
- **AGL** – for the supply of up to 42 PJ of natural gas over 6 years that may be used to support AGL's gas-fired electricity generation as well as its gas retail business supplying domestic commercial and residential markets.
- **Visy** – for the supply of 20 PJ of natural gas over 10 years to support Visy's packaging and resource recovery business, including to grow its manufacturing operations in Queensland.
- **EnergyAustralia** – for the supply of 24 PJ of natural gas over 5 years that may be used to support EnergyAustralia's gas-fired electricity generation as well as its gas retail business supplying domestic commercial and residential markets.
- **CSR** – for the supply of 17 PJ of natural gas over 10 years to support CSR's local manufacturing of building products such as bricks and plasterboard.

Each of these agreements are subject to satisfaction of certain conditions precedent, including securing timely Commonwealth environmental approvals for the Project. More information on the recent GSAs signed can be found on Senex's website.

In 2022, Senex directly contributed $209,000 in social investment to further contribute to the sustainability and vitality of the communities in which we operate, including investment and support to health through Royal Flying Doctor Service sponsorship, emergency relief, education, arts and culture, sports and recreation, and economic development.

12.5 Employment Opportunities

RFI 7.5

Employment opportunities expected to be generated by the project (including construction and operational phases).

RFI 7.5 Response:

Full, fair and reasonable opportunities will be provided to local and indigenous individuals and businesses within the region to deliver the Project. The Project will sustain the employment of approximately 40 permanent roles during the construction period. Approximately 170-200 construction contractor roles for gathering, with multiple crews, and wellsite installs will be required for approximately 2-3 years.

Senex aims to buy goods and services from local businesses wherever possible. To further enhance the advantage, capability, and development of local suppliers, Senex allocates a priority weighting to local suppliers. In 2022, Senex directly contributed approximately $17.6 million in local procurement across its existing projects. Senex suppliers were 96% Australian businesses and 18% local businesses.

The Project is also expected to have flow-on benefits for employment, which will be experienced locally, regionally, State and Nationally. The development is likely to require some regional infrastructure improvements and upgrades such as roads. Such infrastructure projects generate additional employment opportunities for construction workers, engineers, local business and other professionals.

As discussed above in Section 12.4, Senex has recently signed customer agreements and anticipates further customer agreements for the Project gas which will provide gas for utilisation across a wide range of industries. Senex's customers are then supported, further expanding the employment opportunities generated because of the Project.

13 ENVIRONMENTAL RECORD

RFI 8.1

Include details of any past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:

- *the person proposing to take the action;*
- *for an action for which a person has applied for a permit, the person making the application;*
- *if the person is a body corporate—the history of its executive officers in relation to environmental matters; and*
- *if the person is a body corporate that is a subsidiary of another body or company (the parent body)—the history in relation to environmental matters of the parent body and its executive officers.*

RFI 8.1 Response:

Senex is an environmentally and socially responsible company committed to conducting its business in a manner which ensures high standards of environmental management and performance and a commitment to ecologically sustainable development.

Senex is a registered suitable operator under the Queensland EP Act (Reference number 601241), as are Senex Assets Pty Ltd (Reference number RSO001534) and Senex Assets 2 Pty Ltd (Reference number 100143807).

Senex has a reputable record of responsible environmental management. There are no past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against either Senex, Senex Assets Pty Ltd or Senex Assets 2 Pty Ltd including the Executive Officers of each body corporate. Otherwise, the following is noted:

- A penalty infringement notice was issued to Stuart Petroleum Cooper Basin Gas Pty Ltd (a subsidiary of Senex) (Stuart Petroleum) by the Queensland DES in May 2022 for an alleged breach of the conditions of the ENEW07547018 End of Waste Code – Associated Water (including coal seam gas water) 2019 under the *Waste Reduction and Recycling Act 2011*. The alleged breach related to the salinity level of water being used in a produced water irrigation scheme at Senex's Western Surat Gas Project in the Surat Basin being marginally higher than the limit specified in Senex's resource management and monitoring plan.

  Senex had undertaken a scientific assessment of the matter and had satisfied itself, the landholder and the specialist consultant that the exceedance would not cause environmental harm, and in fact, that a failure to continue to irrigate could harm the soil structure. However, there was an administrative delay in updating the resource management and monitoring plan resulting in a technical breach arising. The incident did not cause environmental harm, Senex has since amended the applicable resource management and monitoring plan, and salinity is now within the acceptable limits.

- An Environmental Protection Order (EPO) was issued to Stuart Petroleum by the then Queensland Department of Environment and Science (DES) in November 2022. This EPO was varied in January 2023 following Senex's request for a review of specific requirements included in the original. The EPO relates to an alleged miscalculation of impacts on a prescribed environmental matter under the EA for the Western Surat Gas Project. The EPO includes an obligation for Senex to provide a report to the Department providing a calculation of the relevant impacts on or before 17 May 2023. Senex submitted the required report to the Department on 17 May 2023, and is awaiting a response from the Department on the next steps required to close out the EPO. Senex notes that no environmental harm is being alleged by the Department with respect to this matter, and it is not alleged that Senex has exceeded any clearing limits imposed.

- A penalty infringement notice was issued to Stuart Petroleum Cooper Basin Gas Pty Ltd by the then Queensland DES on 19 October 2023 for an alleged breach of the *Environmental Offsets Act 2014*. The DES alleged that the late submission of ecological condition assessment reports by Stuart Petroleum represented a contravention of section 22(2) of the Environmental Offsets Act 2014 and in connection a contravention of section 430(3) of the EP Act. The outstanding ecological assessment reports were submitted to DES on 8 December 2023. The alleged breach is of an administrative nature and no environmental harm is being alleged.
- On 15 November 2023 DCCEEW issued a Show Cause notice to Stuart Petroleum Cooper Basin Gas Pty Ltd. The notice was issued in relation to EPBC 2015/7469 for Senex' Western Surat Gas Project and alleges a failure to submit the 2023 Annual Offset Area Report and 5-year ecological condition assessment report. Further, the notice requests documentary evidence that the Department was notified of the 2020, 2021 and 2022 annual compliance report publication. Senex notes that no environmental harm is being alleged by the DCCEEW with respect to this matter. Senex provided a response to the Show Cause notice on 30 November 2023, and the 5-year ecological condition assessment report has since been submitted to DCCEEW on 8 December 2023. On 20 February 2024 DCCEEW concluded investigation on this matter and issued Senex a warming letter formally closing out the alleged non-compliance.

The Project will be undertaken in accordance with Senex's environmental policy and framework.

14 CONCLUSIONS AND RECOMMENDATIONS

Senex proposes to develop part of the Project Area to supply natural gas to market and facilitate social and economic benefits for surrounding local and regional areas, including direct employment, increased spending and revenue to government through royalties and income taxes.

The Project will be developed progressively to optimise gas production to meet Senex's gas supply obligations and opportunities. Disturbance associated with the Project will be mostly limited to well leases and linear infrastructure and will occur throughout the Project Area in highly disturbed areas due to historical clearing and agricultural practices.

The Constraints Protocol (Attachment B) will ensure Senex plans and locates Project infrastructure with strict consideration of relevant MNES identified as being potential, likely or known to occur within the Project Area, preferentially locating infrastructure in the lowest ecological value areas. Through the application of the Protocol, Senex makes a commitment to not clearing any areas confirmed as MNES TECs or areas confirmed as potential habitat for MNES threatened species, with the exception of Koala and Southern Squatter Pigeon dispersal habitat (being, 530 ha and 2.1 ha respectively, of previously cleared land).

Certainty in how risks will be managed and monitored is provided in the form of management plans incorporating Commonwealth and State guidelines and prescribed industry practice, including:

- Constraints Protocol (Attachment B);
- Environmental Management Plan (Attachment E);
- Significant Species Management Plan (Attachment H);
- Rehabilitation Plan (Attachment F);
- Water Monitoring and Management Plan (Attachment I);
- CSG Water Management Plan ATP 2059 (Attachment J); and
- CSG Water Management Plan PL 445 and PL 209 (Attachment K).

These management plans are presented as final documents to be approved and conditioned for implementation when the action commences. Proposed management measures are assessed as being effective and appropriate.

Potential impacts to MNES are well-understood due to the detailed assessments undertaken to develop the Ecology Assessment Report (Attachment C), Ecology Significant Impact Assessment Report (Attachment G) and EPBC Water Resource Impact Assessment (Attachment D).

The reports conclude that the Project is unlikely to have a residual significant impact on any listed TEC, threatened species, or a water resource.

The additional information provided in the PD supports the findings of the Ecology Assessment Report (Attachment C), EPBC Water Resource Impact Assessment (Attachment D) demonstrating the Project is unlikely to result in significant impacts to known, likely or potential MNES with implementation of Senex's proposed avoidance, minimisation and mitigation measures.

The Project is proposed to be developed in an area that has been subject to substantial historical clearing and disturbance associated with agricultural production, and Senex is committed to avoiding all remaining areas that have not been cleared of remnant vegetation and habitat for MNES species. As such, offsets are not required in accordance with the EPBC Act Environmental Offset Policy (DSEWPaC, 2012).

This submission demonstrates and documents how the Project will be effectively designed and managed to reasonably avoid, minimise or mitigate impacts to a level that supports an approval decision and conditioning for implementation of the management plans provided. In summary, following material and substantial assessments, it is concluded that:

1. No offsets are required for this Project as a result of Senex's:
    a. robust project management plans and procedures; and
    b. commitment to avoid all MNES for the Project (except for previously cleared Koala and Southern Squatter Pigeon dispersal habitat),
2. The Project is unlikely to have a residual significant impact on any listed TECs and threatened species, or a water resource.

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ATTACHMENT A ADDITIONAL INFORMATION REQUIREMENTS

ATTACHMENT B CONSTRAINTS PROTOCOL

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