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10 February 2022

Santos Reference: CB22-02

Attention: Denise Leon
Energy, Extractive and SWQ Compliance
Department of Environment and Science
GPO Box 2453
BRISBANE QLD 4001

Dear Denise,

Application to amend Environmental Authority (EA) EPPG00641613

Santos Limited (Santos) on behalf of Vamgas Pty Ltd, Delhi Petroleum Pty. Ltd., Bounty Oil & Gas NL, Bridgeport (Eromanga) Pty Ltd, Australian Gasfields Limited and Mawson Petroleum Pty Limited (the proponents) has prepared the attached application to amend Environmental Authority (EA) EPPG00641613 in accordance with Section 226 and 227 of the *Environmental Protection Act 1994* (EP Act).

Santos are seeking to amend EA EPPG00641613 to change the scale of activities authorised through an amendment of Conditions A1, A2 and Schedule A - Table 1.

The amendment application is seeking authorisation to construct and operate an additional 2 conventional gas wells on PL 302 (as well as associated infrastructure / activities).

The following information is attached in support of the application:

- Attachment 1 – DES EA Amendment Application Form; and
- Attachment 2 – PL 302 Supporting Information;

Please note: this application is supported by several appendices referred to in the supporting information reports. These appendices have not been included with the application due to file size restrictions. The appendices will be submitted to DES via file transfer following application submission.

The amendment application has been prepared as a major amendment. The application fee of \$346.60 has been paid upon lodgement of the application.

Please contact Janelle Twyman should you have any further enquiries.

Yours sincerely,

A handwritten signature in blue ink, appearing to be 'E. J. P.', written in a cursive style.

**Principal Environmental Advisor
Santos**

ATTACHMENT 1 – DES EA Amendment Application Form

Application form

Environmental Protection Act 1994

Application to amend an environmental authority

This approved form is to be used when applying to amend an environmental authority under sections 222 to 227A of the Environmental Protection Act 1994 (EP Act) for an environmentally relevant activity (ERA).

For applications to the Department of Environment and Science, you can apply through Online Services at: <https://business.qld.gov.au/running-business/environment/online-services>.

Note: For applications to the Department of Environment and Science, the only way to pay fees by credit card is by completing the application online using Online Services. For other fee payment options see Question 31.

It is recommended that prior to making an amendment application, you read the information on what to provide with an application. This information is located on the Business Queensland website at www.business.qld.gov.au (use the search term “Environmental licence”). This website includes a diagnostic tool called a “Forms and fees finder” which will help identify fees and supporting information you need to make an application.

You are encouraged to have a pre-lodgement meeting before applying to amend your environmental authority. If you would like to have a pre-lodgement meeting:

- for prescribed ERAs 2, 3 and 4—contact the Department of Agriculture and Fisheries by email at livestockregulator@daf.qld.gov.au or by phone on 13 25 23.
- for any other ERAs —please fill out and lodge the form *Application for pre-lodgement services* (ESR/2015/1664¹), prior to lodging this application form.

If you require assistance in answering any part of this form, or have any questions about your application please contact the relevant department. Contact details are at the end of this form (Section 33).

Privacy statement

The Department of Environment and Science (the Department) is collecting the information on this form in accordance with and as authorised by Chapter 5 of the Environmental Protection Act 1994 (EP Act). Some of the information may be disclosed to the Department of Resources and Queensland Treasury for the purpose of processing this application.

Pursuant to section 540 of the EP Act, the Department is required to maintain a register of certain documents and information authorised under the EP Act. A copy of this document will be kept on the public register. The register is available for inspection by members of the public who are able take extracts, or copies of the documents from the register. Documents that are required to be kept on the register are published in their entirety, unless alteration is required by the EP Act. There is no general discretion allowing the Department to withhold documents or information required to be kept on the public register. For more information on the Department’s public register, search ‘public register’ at www.qld.gov.au. For queries about privacy matters please email privacy@des.qld.gov.au or telephone 13 74 68.

¹ This is the publication number. The publication number can be used as a search term to find the latest version of a publication at www.qld.gov.au.

Application form
Application to amend an environmental authority

| Section 1 – Environmental authority number | |
|---|--------------|
| Environmental authority number for this application | EPPG00641613 |

| Section 2 – Applicant details | |
|---|--|
| <p>Details of the applicant are to be provided in this section. If there is an agent acting on behalf of the environmental authority holder, details of the agent are to be provided. An agent could be a consultant or contactor for the environmental authority holder.</p> | |
| NAME / COMPANY NAME SANTOS LIMITED, VAMGAS PTY LTD, DELHI PETROLEUM PTY. LTD., BOUNTY OIL & GAS NL, BRIDGEPORT (EROMANGA) PTY LTD, AUSTRALIAN GASFIELDS LIMITED and MAWSON PETROLEUM PTY LIMITED. | TRADING NAME |
| REGISTERED / RESIDENTIAL ADDRESS 60 Flinders Street ADELAIDE SA 5000 | POSTAL ADDRESS (WHERE DIFFERENT) PO BOX 1010 BRISBANE QLD 4001 |
| ABN / ACN 80007550923 | CONTACT NAME Liz Dunlop, Principal Environmental Advisor |
| EMAIL | TELEPHONE |
| <input checked="" type="checkbox"/> INDICATE IF YOU WANT TO RECEIVE CORRESPONDENCE VIA EMAIL <input type="checkbox"/> INDICATE IF THIS FORM IS BEING COMPLETED BY AN AGENT FOR THE ENVIRONMENTAL AUTHORITY HOLDER | |

| Section 3 – Checklist questions | |
|---|---|
| <p>An application to amend an environmental authority is not appropriate in all circumstances. If you answer Yes to any of the preliminary questions below, you cannot use this application form. If you answer No to all of the preliminary questions, you may continue to use this application form.</p> | |
| Is the amendment to correct a clerical or formal error? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| If yes, you cannot use this form. This request should be made in writing directly to the administering authority (no fees apply). | |
| Is the amendment to add an ERA to an amalgamated project authority and the proposed activity does not form part of the single integrated operation conducted under the authority? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| If yes, you cannot use this form. You will need to apply for a new environmental authority. | |
| Is the amendment to add an ERA to the authority and the addition of the activity would result in the environmental authority applying to activities that were not being carried out as an ERA project? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| If yes, you cannot use this form. You will need to apply for a new environmental authority. | |
| Is the amendment to amalgamate two or more environmental authorities? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| If yes, you cannot use this form. Please use either the form <i>Application to amalgamate two or more environmental authorities into an amalgamated corporate authority</i> (ESR/2015/1734), or <i>Application to amalgamate two or more environmental authorities into an amalgamated project or local government authority</i> (ESR/2015/1735). | |

Application form
Application to amend an environmental authority

| | |
|---|---|
| Is the amendment to add an ERA to an amalgamated local government authority and there is not an appropriate degree of integration between the proposed activity and the existing activities on the authority? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| If yes, you cannot use this form. You will need to apply for a new environmental authority. | |
| Is the amendment to amend the financial assurance or estimated rehabilitation cost only? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| If yes, you cannot use this form. Please use the form <i>Application to amend or discharge financial assurance held for an environmental authority</i> (ESR/2015/1752) or <i>Application for a decision on the estimated rehabilitation cost</i> (ESR/2018/4426). | |
| Is the proposed amendment to add a resource activity to an environmental authority for a prescribed ERA project? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| If yes, you cannot add the resource activity to the environmental authority. You will need to apply for a new environmental authority. | |
| Is the proposed amendment to add a prescribed ERA, other than an ancillary activity, to an environmental authority for a resource project? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| If yes, you cannot use this form. You can apply using the standard, variation or site-specific application forms. | |

| | |
|--|---|
| Section 4 – Checklist questions for prescribed ERAs | |
| Is the application to amend an EA for a prescribed ERA? | <input checked="" type="checkbox"/> No – Go to next section |
| Does the proposed amendment involve changes to the relevant activity that require a new development application to be lodged under the <i>Planning Act 2016</i> and the application for the development application has not been lodged. | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| If yes, the development application must be lodged before an environmental authority amendment application can be made. Under EP Act, a development application for a material change of use of premises for an environmentally relevant activity is deemed to be also an application for an environmental authority. In this case, an environmental authority amendment application should not be lodged. | |
| Is the proposed amendment solely to add or remove vehicles for ERA 57 (Regulated waste transport)? | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| If yes, you do not need to submit this application form. You can update vehicle details online through Online Services or use the form <i>Details of regulated waste vehicles</i> (ESR/2015/1851). | |
| Is the amendment for the holder of the environmental authority to transfer all or part of the environmental authority to a person? | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| If yes, you cannot use this form. Please use the form <i>Request to transfer all or part of an environmental authority (prescribed environmentally relevant activities)</i> (ESR/2015/1718). | |
| Is the amendment for the surrender of an environmental authority? | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| If yes, you cannot use this form. Please use the form <i>Application to surrender an environmental authority for a prescribed ERA</i> (ESR/2015/1719). | |

Application form
Application to amend an environmental authority

| | |
|--|---|
| Section 5 – Checklist for resource activities | |
| Is the application to amend an EA for a resource activity? | <input type="checkbox"/> No – Go to next section |
| Is the amendment for a partial surrender of an environmental authority for a mining, geothermal or petroleum resource activity? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| If yes, you cannot use this form. Please use the form <i>Application for surrender or partial surrender of an environmental authority (resource activity)</i> (ESR/2015/1751). | |
| Is the amendment for an EA that has a PRCP Schedule and approval of the amendment application would result in the EA to which the application relates being inconsistent with the relevant PRCP schedule? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| If yes, you cannot use this form. The amendment to the EA must not be inconsistent with the PRCP Schedule otherwise you must apply to amend your PRCP Schedule. Please use the form <i>Application to amend a progressive rehabilitation and closure plan schedule (PRCP schedule) or joint PRCP schedule and environmental authority</i> (ESR/2019/4956). | |

| | |
|---|--|
| Section 6 – Major or minor amendment | |
| Is the application for a major or minor amendment? | |
| <p>Your application is a minor amendment (condition conversion) if you want to convert all conditions of your environmental authority to the standard conditions for the environmentally relevant activities to which the environmental authority relates. By selecting this amendment type you are certifying that you have a complete and thorough understanding of, and can comply with, the ERA Standard (eligibility criteria and standard conditions).</p> <p>For applications other than a minor amendment (condition conversion), the administering authority decides if an application is a minor amendment (threshold) or a major amendment and will send you a notice of the decision.</p> <p>If the application is a major amendment, an assessment fee of 30% of the annual fee for your environmental authority is required to be paid. The assessment of your amendment application will not proceed until the assessment fee is paid.</p> <p>No additional assessment fees apply if your application is determined to be a minor amendment.</p> <p>By considering what type of amendment your application is likely to be, you will have a better idea of whether the assessment fee will be payable.</p> <p>For further information see the guideline <i>Major and minor amendments</i> (ESR/2015/1684) and s223 of the EP Act. If you have questions regarding whether your amendment will be a minor or major amendment you are encouraged to arrange a pre-lodgement meeting with the administering authority. Only an indication can be given as to whether the proposed changes are likely to be a minor or major amendment, at a pre-lodgement meeting as this decision can only be made when the actual application is submitted.</p> | |
| <input checked="" type="checkbox"/> Major amendment <input type="checkbox"/> Minor amendment (threshold) <input type="checkbox"/> Minor amendment (condition conversion) <u>For minor amendment (condition conversion) go to Section 31 (Payment of fees).</u> | |
| <p>For further information see the guideline on <i>Major and minor amendments</i> (ESR/2015/1684) and s223 of the EP Act. If you have questions regarding whether your amendment will be a minor or major amendment you are encouraged to arrange a pre-lodgement meeting with the administering authority. Only an indication can be given as to whether the proposed changes are likely to be a minor or major amendment, at a pre-lodgement meeting as this decision can only be made when the actual application is submitted.</p> | |

Application form
Application to amend an environmental authority

| Section 7 – Amendment options | |
|---|--|
| Complete this section for all applications, tick all that apply | |
| I would like to amend environmental authority: | <input type="checkbox"/> Activities – includes changes to threshold <input checked="" type="checkbox"/> Conditions – includes conversion to standard conditions and variations <input type="checkbox"/> Locations – removal/addition or activity locations |

| Section 8 – Development permits | | | | |
|--|---|--------------------|---------------------------------|-------------|
| Is the activity a prescribed ERA? | <input checked="" type="checkbox"/> No – Go to next section <input type="checkbox"/> Yes – Provide details below | | | |
| Are there any development permits in effect or have any development applications been made under the <i>Planning Act 2016</i> to carry out the proposed amendment? | <input type="checkbox"/> No – Go to next section <input type="checkbox"/> Yes – Provide details below | | | |
| Provide a list of applicable development permits or applications below. | | | | |
| Development permit / application number | Development permit / application name | Assessment manager | Date of application or approval | Expiry date |
| | | | | |
| | | | | |
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| | | | | |
| | | | | |
| <input type="checkbox"/> I HAVE ATTACHED ADDITIONAL DETAILS FOR THIS SECTION. | | | | |

| Section 9 – Amend activities | | | |
|--|-----------|-------------|---|
| Do you wish to amend activities under the EA, including changes to threshold(s)? | | | <input type="checkbox"/> No – Go to next section <input checked="" type="checkbox"/> Yes – Provide details below |
| Section 9.1 - Details of the ERA(s) to be removed. | | | |
| Provide a list of all the ERAs that are to be removed from the EA and identify whether the ERA has commenced. | | | |
| ERA number | Threshold | Name of ERA | Has the ERA commenced? |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> I HAVE ATTACHED DETAILS OF ADDITIONAL ERA(s) TO BE REMOVED. | | | |
| Section 9.1.1 - Rehabilitation conditions | | | |
| Does the proposed amendment remove a prescribed ERA from the EA? | | | <input checked="" type="checkbox"/> No – Continue on below <input type="checkbox"/> Yes – Continue on below |
| Does your EA contain any rehabilitation conditions that are applicable to the ERA(s) that are requested be removed from the EA? | | | <input checked="" type="checkbox"/> No – Go to section 9.2 <input type="checkbox"/> Yes – Provide details below |
| A statement addressing compliance with environmental authority conditions is to be completed by, or on behalf of, the environmental authority holder. Attach a separate document to this application form which states the extent to which: | | | |
| 1. The ERAs being removed from the environmental authority have complied with each relevant condition of approval; and 2. The final rehabilitation report is accurate (include the date of the final rehabilitation report). | | | |
| PROVIDE DETAILS OF THE DATE, METHOD AND EVIDENCE USED TO VERIFY COMPLIANCE: | | | |
| | | | |
| PROVIDE DETAILS OF THE NAME, POSITION AND CONTACT NUMBER OF THE PERSON SIGNING THE STATEMENT: | | | |
| | | | |
| DESCRIBE THE QUALIFICATIONS AND EXPERIENCE OF THE PERSON SIGNING THE STATEMENT: | | | |
| | | | |
| <input type="checkbox"/> I HAVE ATTACHED THE REQUIRED STATEMENT ADDRESSING COMPLIANCE WITH CONDITIONS. | | | |
| For guidance on what a rehabilitation report should contain you may use the final rehabilitation report template available at www.qld.gov.au using the publication number ESR/2015/1616 as a search term. Methods to verify compliance may include a desktop assessment of documentation, an interview with the landowner/holder or a field operator or a site inspection. Evidence used may include photographs, statements and other documents such as maps, plans, approvals, monitoring results etc. | | | |

Application form
Application to amend an environmental authority

Section 9.2 - Details of the ERA(s) to be added.

Provide details of which ERA(s) you wish to add. If the ERA has eligibility criteria and standard conditions², identify whether you can comply with them. Select "N/A" where there are no eligibility criteria and standard conditions for that ERA. If you cannot comply with all of the applicable standard conditions, select "no" and attach details of the standard conditions you cannot comply with.

| ERA number | Threshold | Name of ERA | I can comply with the eligibility criteria | I can comply with all the standard conditions |
|------------|-----------|-------------|--|--|
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |

- I HAVE ATTACHED DETAILS OF ADDITIONAL ERA(s) TO BE ADDED.
 I HAVE ATTACHED DETAILS OF THE STANDARD CONDITIONS THAT I CANNOT COMPLY WITH.

If you cannot comply with the eligibility criteria as a result of the proposed amendment, then an amendment to the relevant eligibility criteria condition will also be required. The department will only approve an amendment of the eligibility criteria condition if it is a result of factors beyond your control such as residential encroachment, rather than a change to the activity.

² ERAs with eligibility criteria and standard conditions are listed at: www.business.qld.gov.au (use the search term "eligibility criteria").

Application form
Application to amend an environmental authority

| Section 10– Amend location(s) | | |
|--|--|---|
| Will the area where the activity is conducted differ from the area currently designated in the existing environmental authority? (i.e. will the area where the activity is conducted increase or decrease?) | | <input checked="" type="checkbox"/> No – Go to next section <input type="checkbox"/> Yes – Provide details below |
| ERA number and threshold | Location (lot on plan(s), tenure(s) or mobile and temporary) | Add or remove |
| | | |
| | | |
| | | |
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| | | |
| | | |
| | | |
| | | |
| <input type="checkbox"/> I HAVE ATTACHED DETAILS OF ADDITIONAL LOCATIONS FOR THIS SECTION. | | |
| Section 10.1 - Rehabilitation conditions Does your EA contain any rehabilitation conditions that are applicable to the locations that are requested be removed from the EA? | | <input type="checkbox"/> No – Go to next section <input type="checkbox"/> Yes – Continue on below |
| Has a statement addressing compliance with EA rehabilitation conditions been attached as per section 9.1.1? | | <input type="checkbox"/> No – Provide details below <input type="checkbox"/> Yes – Go to next section |
| PROVIDE DETAILS OF THE DATE, METHOD AND EVIDENCE USED TO VERIFY COMPLIANCE: | | |
| | | |
| PROVIDE DETAILS OF THE NAME, POSITION AND CONTACT NUMBER OF THE PERSON SIGNING THE STATEMENT: | | |
| | | |
| DESCRIBE THE QUALIFICATIONS AND EXPERIENCE OF THE PERSON SIGNING THE STATEMENT: | | |
| | | |
| <input type="checkbox"/> I HAVE ATTACHED THE REQUIRED STATEMENT ADDRESSING COMPLIANCE WITH CONDITIONS. | | |
| For guidance on what a rehabilitation report should contain you may use the final rehabilitation report template available at www.qld.gov.au using the publication number ESR/2015/1616 as a search term. Methods to verify compliance may include a desktop assessment of documentation, an interview with the landowner/holder or a field operator or a site inspection. Evidence used may include photographs, statements and other documents such as maps, plans, approvals, monitoring results etc. | | |

| Section 11 – Single integrated operation confirmation | |
|---|---|
| Will the activities be undertaken as a single integrated operation? | <input type="checkbox"/> No – Go to next section <input checked="" type="checkbox"/> Yes – Provide details below |
| PROVIDE DETAILS OF THE ERAS THAT WILL BE OPERATED AS A SINGLE INTEGRATED OPERATION AND SUPPORTING INFORMATION SHOWING THEY ARE A SINGLE INTEGRATED OPERATION: There is no change to the way Santos will undertake its activities. This application seeks to change the scale and intensity for the activities authorised. No new ERAs are proposed by the application. Refer to Attachment 2 - Supporting Information | |
| Single integrated operation occurs when all of the below criteria are met: (a) the activities are carried out under the day-to-day management of a single responsible individual, for example, a site or operations manager; (b) the activities are operationally interrelated; (c) the activities are, or will be, carried out at one or more places; and (d) the places where the activities are carried out are separated by distances short enough to make feasible the integrated day-to-day management of the activities. | |
| Section 12 – Amend conditions | |
| Do you wish to amend the condition(s) of the environmental authority? | <input type="checkbox"/> No – Go to next section <input checked="" type="checkbox"/> Yes – Provide details below |
| Provide details of: (a) condition number(s); (b) proposed change; and (c) justification for the change. | |
| Refer to Attachment 2 - Supporting Information | |
| <input checked="" type="checkbox"/> I HAVE ATTACHED ADDITIONAL DETAILS FOR THIS SECTION. | |
| If the activities were assessed as part of a coordinated project declared under the <i>State Development and Public Works Organisation Act 1971</i> , you are only able to amend Coordinator General conditions if the Coordinator General's evaluation report for the project has lapsed. If you are unsure if the Coordinator General's evaluation report has lapsed, contact the Department of State Development, Infrastructure, Local Government and Planning for more information. | |

Section 13 – Describe the proposed amendment

Provide a detailed description of your proposed amendment. Include justification of how your proposed amendment meets the criteria for a major or minor amendment and attach any supporting information to this application. If the amendment is to add or delete a location, tenure or activity, or to change the threshold of an activity, provide details below.

Refer to Attachment 2 - Supporting Information

I HAVE ATTACHED ADDITIONAL DETAILS FOR THIS SECTION.

Section 14 – Describe the land that will be affected by the proposed amendment

Describe if the activity will be carried out within the existing designated areas of the environmental authority, a new area, or if the activity is mobile or temporary.

Refer to Attachment 2 - Supporting Information

I HAVE ATTACHED ADDITIONAL DETAILS FOR THIS SECTION.

| Section 15 – Compliance with any eligibility criteria | |
|--|---|
| Are there any eligibility criteria for the activity(s)? | <input checked="" type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below |
| State whether each relevant activity will, if the amendment is made, comply with any eligibility criteria for the activity. | |
| | |
| Include a declaration (below) that the above statement is correct | |
| <p>I</p> <p style="text-align: center;"><small>(INSERT <u>NAME</u>, <u>POSITION</u> AND <u>COMPANY NAME</u> OF PERSON MAKING THE STATEMENT)</small></p> <ul style="list-style-type: none"> • make the statement by or for the holder of the environmental authority; • confirm that, to the best of my knowledge, all information provided as part of this statement, including attachments, is true, correct and complete. I am aware that it is an offence under section 480 and 480A of the <i>Environmental Protection Act 1994</i>, to give the administering authority information that I know is false, misleading or incomplete; • confirm that, to the best of my knowledge, this statement, including attachments, does not include false, misleading or incomplete information; • confirm that, to the best of my knowledge, I have not knowingly failed to reveal any relevant information or document to the administering authority; • confirm that, to the best of my knowledge, all information provided in this statement, including attachments, address the relevant matters and are factually correct; • confirm that the opinions expressed in this statement, including attachments, are honestly and reasonably held; and • understand that all information supplied as part of this statement, including attachments, can be disclosed publicly in accordance with the <i>Right to Information Act 2009</i> and the <i>Evidence Act 1977</i>. | |
| SIGNATURE | DATE |
| Only a person with appropriate environmental expertise and/or experience in planning and executing site operations should sign this statement. This person may be the environmental authority holder, a full time employee of the environmental authority holder or a consultant to the environmental authority holder. | |

| Section 16 – Environmental offsets | |
|---|---|
| Will the ERA(s) being applied for cause, or be likely to cause, a significant residual impact to a prescribed environmental matter (other than a matter of local environmental significance)? | <input checked="" type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below |
| <input type="checkbox"/> Yes - Attach supporting information that: <ul style="list-style-type: none"> details the magnitude and duration of the likely significant residual impact on each prescribed environmental matter (other than matters of local environmental significance) for the entire activity; demonstrates that all reasonable measures to avoid and minimise impacts on each of those matters will be undertaken; includes a notice of election, if it has not already been submitted; and if the activity is to be staged, details of how the activity is proposed to be staged. | |
| An environmental offset may be required for an ERA where despite all reasonable measures to avoid and minimise impacts on certain environmental matters, there is still likely to be a significant residual impact on one or more of those matters. You must verify the presence, whether temporary or permanent, of those environmental matters. For more information refer to the State Significant Impact Guideline at the Queensland Government website, at: www.qld.gov.au/environment/pollution/management/offsets/index.html . | |

| Section 17 – Regional interest areas | |
|--|---|
| Is the activity a resource activity located anywhere within an area of regional interest? | <input type="checkbox"/> No - Go to next section <input checked="" type="checkbox"/> Yes - Provide details below |
| If yes - Which area of regional interest, has or will require a regional interest development approval (RIDA)? <ul style="list-style-type: none"> <input type="checkbox"/> Priority agricultural areas (PAAs) <input type="checkbox"/> Priority living areas (PLAs) <input type="checkbox"/> Strategic environmental areas (SEAs) <input type="checkbox"/> Strategic cropping area (SCA) <input checked="" type="checkbox"/> No RIDA required, I am an exempt activity. | |
| If you have applied or been approved for a RIDA, provide the application reference: | |
| A regional interests development approval (RIDA) is required when a resource activity is proposed in an area of regional interest under the <i>Regional Planning Interests Act 2014</i> . Further information, including application forms, can be found on the Department of State Development, Infrastructure, Local Government and Planning website at www.statedevelopment.qld.gov.au . | |

Application form
Application to amend an environmental authority

| Section 18 – Matters of national environmental significance | |
|--|---|
| Would the carrying out of the proposed ERA, or where relevant the ERA project, be likely to have a significant impact on any matters of national environmental significance? | <input checked="" type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below |
| Has the proposal been referred to the Federal Government Environment Minister or a delegate for formal assessment and approval? | <input type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below |
| If Yes - Has an approval issued under the <i>Environmental Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) required an environmental offset for the same, or substantially the same, impact and the same, or substantially the same, matters of national environmental significance? | <input type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below |
| If Yes - Are there any matters of national environmental significance which are assessed under the EPBC Act which are the same, or substantially the same as any matters of national environmental significance, but that were not conditioned in the approval? | <input type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below |
| <input type="checkbox"/> I HAVE ATTACHED DETAILS OF MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE. <input type="checkbox"/> I HAVE ATTACHED A COPY OF THE EPBC ACT APPROVAL. | |
| There are currently nine matters of national environmental significance (MNES) which have been defined in the <i>Environmental Protection and Biodiversity Conservation Act 1999 (Cth)</i> . To determine whether the proposed ERA(s) will have a significant impact on MNES and for referral requirements, please refer to the guidance provided by the Federal Government's Department of Environment on www.australia.gov.au and www.environment.gov.au . | |

| Section 19 – ANZSIC code | | | |
|--|--|--|--|
| Is the activity a resource activity? | <input type="checkbox"/> No - Go to next section <input checked="" type="checkbox"/> Yes - Provide details below | | |
| Provide the ANZSIC code for the resource activity. | | | |
| <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> 1101 Black coal mining <input type="checkbox"/> 1102 Brown Coal Mining <input type="checkbox"/> 1311 Iron ore mining <input type="checkbox"/> 1312 Bauxite mining <input type="checkbox"/> 1317 Silver-lead-zinc ore mining <input checked="" type="checkbox"/> 1200 Oil and gas extraction <input type="checkbox"/> Other (provide details): _____ </td> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> 1313 Copper ore mining <input type="checkbox"/> 1314 Gold ore mining <input type="checkbox"/> 1315 Mineral sand mining <input type="checkbox"/> 1316 Nickel ore mining <input type="checkbox"/> 1319 Metal ore mining (other metallic mineral ores) </td> </tr> </table> | | <input type="checkbox"/> 1101 Black coal mining <input type="checkbox"/> 1102 Brown Coal Mining <input type="checkbox"/> 1311 Iron ore mining <input type="checkbox"/> 1312 Bauxite mining <input type="checkbox"/> 1317 Silver-lead-zinc ore mining <input checked="" type="checkbox"/> 1200 Oil and gas extraction <input type="checkbox"/> Other (provide details): _____ | <input type="checkbox"/> 1313 Copper ore mining <input type="checkbox"/> 1314 Gold ore mining <input type="checkbox"/> 1315 Mineral sand mining <input type="checkbox"/> 1316 Nickel ore mining <input type="checkbox"/> 1319 Metal ore mining (other metallic mineral ores) |
| <input type="checkbox"/> 1101 Black coal mining <input type="checkbox"/> 1102 Brown Coal Mining <input type="checkbox"/> 1311 Iron ore mining <input type="checkbox"/> 1312 Bauxite mining <input type="checkbox"/> 1317 Silver-lead-zinc ore mining <input checked="" type="checkbox"/> 1200 Oil and gas extraction <input type="checkbox"/> Other (provide details): _____ | <input type="checkbox"/> 1313 Copper ore mining <input type="checkbox"/> 1314 Gold ore mining <input type="checkbox"/> 1315 Mineral sand mining <input type="checkbox"/> 1316 Nickel ore mining <input type="checkbox"/> 1319 Metal ore mining (other metallic mineral ores) | | |
| The Australian and New Zealand Industrial Classification (ANZSIC) is used by the Australian Bureau of Statistics. It is required to be displayed in the public register. | | | |

Application form
Application to amend an environmental authority

| Section 20 – Environmental impact statement (EIS)* | |
|--|---|
| Is the activity a resource activity? | <input type="checkbox"/> No - Go to next section <input checked="" type="checkbox"/> Yes - Provide details below |
| Has an application been made for a decision on whether an EIS would be required for the proposed amendment activity? | <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes |
| Has a decision been made on the application on whether an EIS would be required for the proposed amendment activity? | <input type="checkbox"/> Yes, a decision was made that an EIS is required – Attach decision. <input type="checkbox"/> Yes, a decision was made that an EIS is not required – Attach decision. <input type="checkbox"/> No, a decision has not yet been made. <input checked="" type="checkbox"/> NA – No application has been made. |
| <input type="checkbox"/> I HAVE ATTACHED THE DECISION. | |
| Has an environmental impact statement (EIS) process that includes the proposed amendment been completed? | <input checked="" type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below |
| If yes – I have assessed the environmental risks of the proposed amendment and consider them to be: <input type="checkbox"/> The same as was assessed in the EIS <input type="checkbox"/> Different to what was assessed in the EIS | |
| <input type="checkbox"/> I HAVE ATTACHED THE ASSESSMENT OF THE ENVIRONMENTAL RISKS OF THE PROPOSED AMENDMENT. | |
| <small>* EIS in section 20 question refers to both the EIS process under the <i>Environmental Protection Act 1994</i> and the EIS process under the <i>State Development and Public Works Organisation Act 1971</i>. * For further information about the EIS process is available at www.qld.gov.au, using the search term 'environmental impact statements'.</small> | |

| Section 21 – Environmental impact statement triggers* | |
|---|---|
| Is the activity a resource activity? | <input type="checkbox"/> No - Go to next section <input checked="" type="checkbox"/> Yes - Provide details below |
| Is the proposed ERA amendment for an increase in the annual extraction of more than 100% or 5 million tonnes per year (whichever is the lesser)? <small>NOTE: Only answer this question if the current ERA project is for an existing mine extracting between 2–10 million tonnes per year of run of mine (ROM) ore or coal; otherwise select N/A.</small> | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| Is the proposed ERA amendment for an increase in annual extraction of more than 10% or 10 million tonnes per year (whichever is the lesser)? <small>NOTE: Only answer this question if the current ERA project is for an existing mine extracting over 10 million tonnes per year of ROM ore or coal; otherwise select N/A.</small> | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| Is the proposed ERA amendment for an increase in annual extraction of greater than 25%? <small>NOTE: Only answer this question if the current ERA project is for an existing mine extracting over 20 million tonnes per year of ROM ore or coal extraction; otherwise select N/A.</small> | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| Is the proposed ERA amendment for a mining activity that will extend into a Category A or B environmentally sensitive area, unless previously authorised by the state? <small>NOTE: Only answer this question if the activity is a mining activity; otherwise select N/A.</small> | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |

Application form
Application to amend an environmental authority

| | |
|---|--|
| <p>Is the proposed ERA amendment for a mining activity that would involve a substantial change in mining operations? For example: from underground to open cut, or (for underground mining) a change in operations that currently causes little subsidence but with the proposed ERA amendment, is likely to cause substantial subsidence?</p> | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| <p>Is the proposed ERA amendment for a mining activity and a novel or unproven resource extraction process, technology or activity, is being proposed? <i>NOTE: Only answer this question if the activity is a mining activity; otherwise select N/A.</i></p> | <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |
| <p>Is the proposed ERA amendment for a petroleum and gas activity that is likely to have a total disturbance area of greater than 2,000 hectares at any one time during the life of the proposed project? This includes areas occupied by well pads (single or multi-directional), access tracks and roads, water storages, and process plants? <i>NOTE: Only answer this question if the activity is a petroleum and gas activity; otherwise select N/A.</i></p> | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A |
| <p>Is the proposed ERA amendment for a petroleum and gas activity that is likely to involve the construction of a high pressure pipeline over a distance of 300 kilometres or greater? <i>NOTE: Only answer this question if the activity is a petroleum and gas activity; otherwise select N/A.</i></p> | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A |
| <p>Is the proposed ERA amendment for a petroleum and gas activity that is likely to involve the construction of a liquefied natural gas plant? <i>NOTE: Only answer this question if the activity is a petroleum and gas activity; otherwise select N/A.</i></p> | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A |
| <input type="checkbox"/> I HAVE ATTACHED DETAILS OF HOW THE CRITERION IS TRIGGERED INCLUDING DETAILS OF THE IMPACT. | |
| <p><small>* EIS in section 21 question refers to both the EIS process under the <i>Environmental Protection Act 1994</i> and the EIS process under the <i>State Development and Public Works Organisation Act 1971</i>.</small></p> <p><small>* There are numerous criteria used to make the EIS decision, for further information about the EIS process is available at www.qld.gov.au, using the search term 'environmental impact statements'.</small></p> | |

| | | | | | | | | |
|---|--|--|--|--|---|--|---|---|
| Section 22 – Environmental values | | | | | | | | |
| <p>Attach a document that provides an assessment of the likely impact of the proposed amendment on environmental values (EVs). Note: All fields below are mandatory, therefore a statement is required where there are no likely impacts to an EV.</p> | | | | | | | | |
| <p>Environmental Values</p> <table style="width: 100%; text-align: center;"> <tr> <td><input checked="" type="checkbox"/> Water</td> <td><input checked="" type="checkbox"/> Wetlands</td> <td><input checked="" type="checkbox"/> Land use</td> <td><input checked="" type="checkbox"/> Acoustic</td> </tr> <tr> <td><input checked="" type="checkbox"/> Groundwater</td> <td><input checked="" type="checkbox"/> Land</td> <td><input checked="" type="checkbox"/> Air</td> <td><input checked="" type="checkbox"/> Waste</td> </tr> </table> | <input checked="" type="checkbox"/> Water | <input checked="" type="checkbox"/> Wetlands | <input checked="" type="checkbox"/> Land use | <input checked="" type="checkbox"/> Acoustic | <input checked="" type="checkbox"/> Groundwater | <input checked="" type="checkbox"/> Land | <input checked="" type="checkbox"/> Air | <input checked="" type="checkbox"/> Waste |
| <input checked="" type="checkbox"/> Water | <input checked="" type="checkbox"/> Wetlands | <input checked="" type="checkbox"/> Land use | <input checked="" type="checkbox"/> Acoustic | | | | | |
| <input checked="" type="checkbox"/> Groundwater | <input checked="" type="checkbox"/> Land | <input checked="" type="checkbox"/> Air | <input checked="" type="checkbox"/> Waste | | | | | |
| <input checked="" type="checkbox"/> I HAVE ATTACHED A DOCUMENT THAT PROVIDES AN ASSESSMENT OF LIKELY IMPACTS ON EVs. | | | | | | | | |
| <p>Note that the EP Act, s226A(1)(f) states the information required relating to impacts on EVs which include:</p> <ul style="list-style-type: none"> (i) a description of the environmental values likely to be affected by the proposed amendment; and (ii) details of any emissions or releases likely to be generated by the proposed amendment; and (iii) a description of the risk and likely magnitude of impacts on the environmental values; and (iv) details of the management practices proposed to be implemented to prevent or minimise adverse impacts; and (v) if a PRCP schedule does not apply for each relevant activity - details of how the land the subject of the application will be rehabilitated after each relevant activity ceases. | | | | | | | | |

| Section 23 – Waste |
|---|
| Attach a document that provides details of the proposed measures for minimising and managing waste generated by any amendment(s) to the relevant activity. |
| <input checked="" type="checkbox"/> I have attached a document that provides the required information; or <input type="checkbox"/> If waste is to be managed according to an existing waste management plan, provide the name of the plan and the relevant page or section numbers below: _____ |

| Section 24 – Coal seam gas (CSG) activities | |
|--|---|
| Does the application relate to an environmental authority for a CSG activity that is an ineligible ERA? | <input checked="" type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below |
| Does the amendment change the way that CSG water is managed? | <input type="checkbox"/> No - Go to next section <input type="checkbox"/> Yes - Provide details below |
| If the amendment will change the way that CSG water is managed the following information must be provided with this application. | |
| <input type="checkbox"/> | The quantity of CSG water the applicant reasonably expects will be generated in connection with carrying out each relevant CSG activity. |
| <input type="checkbox"/> | The flow rate at which the applicant reasonably expects the water will be generated. |
| <input type="checkbox"/> | The quality of the water, including changes in the water quality the applicant reasonably expects will happen while each relevant CSG activity is carried out. |
| <input type="checkbox"/> | The proposed management of water including, for example, the use, treatment, storage and disposal of the water. |
| <input type="checkbox"/> | The measurable criteria ('management criteria') against which the applicant will monitor and assess the effectiveness of the management of the water, including, for example, criteria for each of the following: (i) the quantity and quality of the water used, treated, stored or disposed of; (ii) protection of the environmental values affected by each relevant CSG activity; and (iii) the disposal of waste, including, for example, salt, generated for the management of the water. |
| <input type="checkbox"/> | The action proposed to be taken if any of the management criteria are not complied with, to ensure that the criteria will be able to be complied with in the future. |
| <input type="checkbox"/> | If the application includes a CSG evaporation dam, an evaluation of the following must be provided: (i) best practice environmental management for managing CSG water; (ii) alternative ways for managing CSG water; and (iii) whether there is a feasible alternative to a CSG evaporation dam for managing the water. Note if the evaluation shows that there is a feasible alternative option, the CSG evaporation dam cannot form part of the water management for this amendment application. |
| <input type="checkbox"/> | I HAVE ATTACHED A DOCUMENT THAT PROVIDES THE REQUIRED INFORMATION FOR THIS SECTION. |

Application form
Application to amend an environmental authority

| Section 25 – Underground water rights | |
|--|---|
| Is the activity a resource activity? | <input type="checkbox"/> No - Go to next section <input checked="" type="checkbox"/> Yes - Provide details below |
| Is the activity proposed to be undertaken on a mineral development licence (MDL), mining lease (ML) or petroleum lease (PL)? | <input type="checkbox"/> No - Go to next section <input checked="" type="checkbox"/> Yes - Provide details below |
| Does the proposed amendment involve changes to the exercise of underground water rights? | <input type="checkbox"/> No - Go to next section <input checked="" type="checkbox"/> Yes - Provide details below |
| <input checked="" type="checkbox"/> I have attached a document that details: | |
| <ul style="list-style-type: none"> a) The areas in which underground water rights are proposed to be exercised; b) For each aquifer affected, or likely to be affected, by the exercise of underground water rights: <ul style="list-style-type: none"> a. a description of the aquifer; b. an analysis of the movement of underground water to and from the aquifer, including how the aquifer interacts with other aquifers and surface water and c. a description of the area of the aquifer where the water level is predicted to decline because of the exercise of underground water rights; and. d. the predicted quantities of water to be taken or interfered with because of the exercise of underground water rights during the period in which resource activities are carried out. c) The environmental values that will, or may, be affected by the exercise of underground water rights and the nature and extent of the impacts on the environmental values; d) Any impacts on the quality of groundwater that will, or may happen because of the exercise of underground water rights during or after the period in which resource activities are carried out; and e) Strategies for avoiding, mitigating or managing the predicted impacts on the environmental values of the impacts on the quality of groundwater. | |
| <small>For more information about exercising underground water rights or the associated requirements refer to the guideline <i>Requirements for site-specific and amendment applications - underground water rights</i> (ESR/2016/3275)</small> | |

| Section 26 – Financial assurance / estimated rehabilitation cost | |
|--|---|
| Do you currently have financial assurance or scheme assurance held for the approved environmental authority? | <input type="checkbox"/> No – Go to next section <input checked="" type="checkbox"/> Yes – Provide details below |
| <input type="checkbox"/> I will not need to change the financial assurance or scheme assurance in relation to this amendment. | |
| <input type="checkbox"/> I will be changing the financial assurance and have attached the form <i>Application to amend or discharge financial assurance held for an environmental authority</i> (ESR/2015/1752). | |
| <input checked="" type="checkbox"/> I will be applying for a new estimated rehabilitation cost decision if this amendment application is approved. | |

Application form
Application to amend an environmental authority

| Section 27 – Environmental protection orders or site management plan | |
|---|---|
| Is this land currently subject to an environmental protection order (EPO) or a site management plan (SMP)? | <input checked="" type="checkbox"/> No – Go to next section <input type="checkbox"/> Yes (EPO) - provide details below <input type="checkbox"/> Yes (SMP) - provide details below |
| PROVIDE THE REFERENCE NUMBER AND BRIEF DETAILS INCLUDING: DESCRIPTION OF LAND; LOT AND PLAN NUMBERS; AND LOCAL GOVERNMENT AREA. | |

| Section 28 – Environmental management register | |
|---|---|
| Is any part of the land currently recorded in, or has previously been removed from, the environmental management register? | <input type="checkbox"/> No – Go to next section <input checked="" type="checkbox"/> Yes – Provide details below |
| <input checked="" type="checkbox"/> The land is currently in the environmental management register. <input type="checkbox"/> The land has been removed from the environmental management register. <u>You must attach evidence (e.g. Notice) advising that the details have been removed.</u> | |

| Section 29 - Website address | | |
|---|---|-----------|
| Is the application for a mining activity on a mining lease, or a geothermal, petroleum, or greenhouse gas storage activity? | <input type="checkbox"/> No – Go to next section <input checked="" type="checkbox"/> Yes – Provide details below | |
| Provide the website address for the application notice and application documents. | https://www.santos.com/about-us/corporate-governance/public-notices/ | |
| Provide details of the contact person if technical assistance is required. | NAME Janelle Twyman | TELEPHONE |
| | EMAIL | |

Application form
Application to amend an environmental authority

| Section 30 – Site contact | |
|---|---|
| Would you like to nominate a site contact? | <input checked="" type="checkbox"/> No – Go to next section <input type="checkbox"/> Yes – Provide details below |
| SITE CONTACT NAME | POSITION |
| EMAIL | TELEPHONE |
| <input type="checkbox"/> INDICATE IF YOU WANT THE SITE CONTACT TO RECEIVE CORRESPONDENCE VIA EMAIL | |
| A site contact is an alternative contact nominated by the legal entity which holds, or will in future hold, a relevant authority issued by the department. The department may direct correspondence relating to actual or potential compliance matters to the site contact. | |

| Section 31 – Payment of fees | |
|--|--------|
| Application fee: | \$ 346 |
| Cheque or money order payments | |
| <input type="checkbox"/> Payment by cheque or money order made payable to the Department of Environment and Science (attached). | |
| <input type="checkbox"/> Payment by cheque or money order made payable to the Department of Agriculture and Fisheries (attached). | |
| Credit card payments | |
| <input type="checkbox"/> For credit card payments for applications to the Department of Environment and Science please lodge the application using Online Services at https://business.qld.gov.au/running-business/environment/online-services . | |
| <input type="checkbox"/> For credit card payments for applications relating to the Department of Agriculture and Fisheries please contact me (the applicant) for secure payment; Phone number: Insert phone no. | |
| An application fee is payable at the time the application is made. Information on the fee can be located in the information sheet <i>Fees for permits for environmentally relevant activities (ERAs)</i> (ESR/2015/1721). Where the proposed amendment is determined by the administering authority to be a major amendment, an assessment fee of 30% of the annual fee for the authority at the time of application, is also payable. The assessment fee is payable once notification of the assessment level decision is issued. The assessment fee must be paid before the assessment of the amendment application can proceed. | |
| The supplementary annual fee is payable where the amendment is approved and results in the aggregate environmental score (and hence the annual fee) for the EA increasing. The supplementary annual fee is a pro-rata adjustment to the annual fee for the period from when the amended EA takes effect to the next anniversary day for the EA. This is payable within 20 business days after the approval date. The supplementary annual fee can be calculated using the <i>Fee calculator</i> (ESR/2015/1731). | |

Application form
Application to amend an environmental authority

Section 32 – Declaration

Note: If you have not told the truth in this application you may be prosecuted.

I declare that:


- I am the holder of the environmental authority, or authorised signatory for the holder of the environmental authority.
- If the proposed amendment is made, the relevant activities will continue to comply with the ERA Standard (eligibility criteria and standard conditions) for all eligible ERAs, or where they cannot comply, I have indicated otherwise in my application and provided the required supporting information.
- If the proposed amendment is a minor amendment (condition conversion), I can comply with the ERA Standard (eligibility criteria and standard conditions) for each of the ERAs authorised by the environmental authority.
- The information provided is true and correct to the best of my knowledge. I understand that it is an offence under section 480 and 480A of *the Environmental Protection Act 1994* to give the administering authority or an authorised person a document containing information that I know is false, misleading or incomplete in a material particular.

I understand that I am responsible for managing the environmental impacts of these activities, and that approval of this application is not an endorsement by the administering authority of the effectiveness of management practices proposed or implemented.

Where an agreement is in place between all holders of the environmental authority, one holder can sign on behalf of the other joint holders. Please tick the checkbox below.

I HAVE AUTHORITY TO SIGN THIS FORM ON BEHALF OF ALL THE JOINT HOLDERS OF THE ENVIRONMENTAL AUTHORITY.

Applicant's signature

| | | |
|--|------------------------------------|--|
| APPLICANT'S NAME Richard Nolan | POSITION HSER Manager - Onshore | COMPANY / ORGANISATION Santos Limited Vamgas Pty Ltd |
| APPLICANT'S SIGNATURE  | | DATE 10/02/2022 |

Joint holder(s) signature if applicable

| NAME, POSITION AND COMPANY NAME | SIGNATURE | DATE |
|---------------------------------|-----------|------|
| | | |
| | | |
| | | |

OR I HAVE ATTACHED A DOCUMENT THAT PROVIDES THE REQUIRED INFORMATION FOR ALL JOINT HOLDERS.

Where the environmental authority holder is a company, this form must be signed by an authorised person for that company. Where there is more than one holder of the environmental authority, this declaration is to be signed by all holders, unless there is an agreement between all holders that one can sign on behalf of the other(s).

Section 33 - Submission

Please submit your completed application to:

For ERA 2, ERA 3 or ERA 4:

Post: Senior Environmental Scientist
Animal Industries
Department of Agriculture and Fisheries
PO Box 102
TOOWOOMBA QLD 4350

Enquiries Phone: (07) 4688 1374
Fax: (07) 4529 4192
Email: livestockregulator@daf.qld.gov.au

For a mining ERA where the proposed amendment impacts upon the resource tenure:

Enquiries Mining Registrar
Department of Resources
The Department of Resources has a list of office locations for mining registrars on its website
www.resources.qld.gov.au/.

For all other ERAs:

Post: Permit and Licence Management
Department of Environment and Science
GPO Box 2454
BRISBANE QLD 4001

Enquiries Website: www.business.qld.gov.au
Email: palm@des.qld.gov.au
Phone: 13 QGOV (13 74 68)

The latest version of this publication and other publications referenced in this document can be found at www.qld.gov.au using the relevant publication number (ESR/2015/1733 for this form) or title as a search term.

Application form
Application to amend an environmental authority

| Section 34 - Definitions to terms used in this form | |
|---|---|
| <i>(Where there is inconsistency between the definition of terms used here and the terms used in the EP Act, the terms in the EP Act apply)</i> | |
| Condition conversion | For an environmental authority, means an amendment replacing all the conditions of the authority with the standard conditions for the environmentally relevant activity which the authority relates. The relevant eligibility criteria and standard conditions must be able to be met. |
| Eligibility criteria | For an environmentally relevant activity, means eligibility criteria that are in effect for the activity under – (a) An ERA standard; or (b) A code of environmental compliance; or (c) A regulation in respect of a mining activity. |
| Environmentally relevant activity (ERA) | A resource activity or a prescribed ERA. |
| ERA project | A prescribed ERA project or a resource project. |
| ERA standard | For an environmentally relevant activity, means the eligibility criteria and/ or the standard conditions set by the administering authority. |
| Major amendment | For an environmental authority, means an amendment that is not a minor amendment. |
| Material change of use of premises for an ERA | A category of assessable development requiring a development permit under the <i>Planning Act 2016</i> . Refer Schedule 10, Division 2, Item 8 of the Planning Regulation 2017. |
| Minor amendment | For an environmental authority, means an amendment that is – (a) a condition conversion; or (b) a minor amendment (threshold). |
| Minor amendment (threshold) | For an environmental authority, means an amendment that the administering authority is satisfied— (a) is not a change to a condition identified in the authority as a standard condition, other than— (i) a change that is a condition conversion; or (ii) a change that is not a condition conversion but that replaces a standard condition of the authority with a standard condition for the environmentally relevant activity to which the authority relates; and (b) does not significantly increase the level of environmental harm caused by the relevant activity; and |

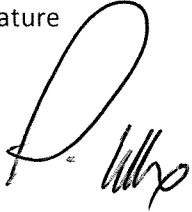
Application form
Application to amend an environmental authority

| | |
|---------------------------------|---|
| | <p>(c) does not change any rehabilitation objectives stated in the authority in a way likely to result in significantly different impacts on environmental values than the impacts previously permitted under the authority; and</p> <p>(d) does not significantly increase the scale or intensity of the relevant activity; and</p> <p>(e) does not relate to a new relevant resource tenure for the authority that is—</p> <ul style="list-style-type: none"> (i) a new mining lease; or (ii) a new petroleum lease; or (iii) a new geothermal lease under the Geothermal Energy Act; or (iv) a new GHG injection and storage lease under the GHG storage Act; and <p>(f) involves an addition to the surface area for the relevant activity of no more than 10% of the existing area; and</p> <p>(g) for an environmental authority for a petroleum activity—</p> <ul style="list-style-type: none"> (i) if the amendment involves constructing a new pipeline—the new pipeline does not exceed 150km; and (ii) if the amendment involves extending an existing pipeline—the extension does not exceed 10% of the existing length of the pipeline; and <p>(h) if the amendment relates to a new relevant resource tenure for the authority that is an exploration permit or GHG permit—the amendment application under section 224 seeks an amended environmental authority that is subject to the standard conditions for the relevant activity or authority, to the extent it relates to the permit.</p> |
| <p>Mobile and temporary ERA</p> | <p>A prescribed ERA, other than an activity that is dredging material, extracting rock or other material, or the incinerating of waste:</p> <p>(a) carried out at various locations using transportable plant or equipment, including a vehicle</p> <p>(b) that does not result in the building of any permanent structures or any physical change of the landform at the locations (other than minor alterations solely necessary for access and setup including, for example, access ways, footings and temporary storage areas)</p> <p>(c) carried out at any one of the locations:</p> <ul style="list-style-type: none"> (i) for less than 28 days in a calendar year, or (ii) for 28 or more days in a calendar year only if the activity is necessarily associated with, and is exclusively used in, the construction or demolition phase of a project. |
| <p>Prescribed ERA</p> | <p>An environmentally relevant activity that is not a resource activity and is prescribed under section 19 of the EP Act.</p> |
| <p>Prescribed ERA project</p> | <p>All prescribed ERAs carried out, or proposed to be carried out, as a single integrated operation.</p> |


Application form
Application to amend an environmental authority

| | |
|------------------------------|---|
| Registered suitable operator | A person who, or a corporation which, under section 318I of the EP Act has been assessed as being suitable to carry out an ERA and has been listed on the suitable operator register. |
| Resource activity | An activity that is any of the following: (a) a geothermal activity (b) a greenhouse gas (GHG) storage activity (c) a mining activity (d) a petroleum activity. |
| Resource project | Resource activities carried out, or proposed to be carried out, under 1 or more resource tenures, in any combination, as a single integrated operation. |
| Single integrated operation | Occurs when all of the below criteria are met: (a) the activities are carried out under the day-to-day management of a single responsible individual, for example, a site or operations manager; (b) the activities are operationally interrelated; (c) the activities are, or will be, carried out at one or more places; and (d) the places where the activities are carried out are separated by distances short enough to make feasible the integrated day-to-day management of the activities. |
| Underground water rights | Means any of the following: (a) underground water rights within the meaning of the <i>Mineral Resources Act 1989</i> ; (b) underground water rights within the meaning of the <i>Petroleum and Gas (Production and Safety) Act 2004</i> ; (c) underground water rights within the meaning of the <i>Petroleum Act 1923</i> , section 87(3). |



Attachment 1 – Application to amend an environmental authority

| Section 32 - Declaration | | |
|--|---|------------------------------|
| Joint holder(s) signature if applicable | | |
| Name, Position and Company Name BOUNTY OIL & GAS NL Philip F. Kelso Chief Executive Officer | Signature  | Date <i>24.1.2022</i> |
| Name, Position and Company Name BRIDGEPORT (EROMANGA) PTY LTD | Signature | Date |
| Name, Position and Company Name DELHI PETROLEUM PTY. LTD | Signature | Date |
| Name, Position and Company Name MAWSON PETROLEUM PTY LIMITED | Signature | Date |
| Name, Position and Company Name AUSTRALIAN GASFIELDS LIMITED | Signature | Date |


Attachment 1 – Application to amend an environmental authority

| Section 32 - Declaration | | |
|--|--|------------|
| Joint holder(s) signature if applicable | | |
| Name, Position and Company Name | Signature | Date |
| BOUNTY OIL & GAS NL | | |
| Name, Position and Company Name BRIDGEPORT (EROMANGA) PTY LTD Barry Smith Chief Technical Officer |  | 24-01-2022 |
| Name, Position and Company Name DELHI PETROLEUM PTY. LTD | | |
| Name, Position and Company Name MAWSON PETROLEUM PTY LIMITED | | |
| Name, Position and Company Name AUSTRALIAN GASFIELDS LIMITED | | |

Attachment 1 – Application to amend an environmental authority

| Section 32 - Declaration | | |
|---|---|---------------------|
| Joint holder(s) signature if applicable | | |
| Name, Position and Company Name | Signature | Date |
| BOUNTY OIL & GAS NL | | |
| BRIDGEPORT (EROMANGA) PTY LTD | | |
| Name, Position and Company Name DELHI PETROLEUM PTY. LTD Jerry Meyer Manager CBJV | Signature  | Date 19/1/22 |
| Name, Position and Company Name MAWSON PETROLEUM PTY LIMITED Jerry Meyer Manager CBJV | Signature  | Date 19/1/22 |
| AUSTRALIAN GASFIELDS LIMITED | | |

Attachment 1 – Application to amend an environmental authority

| Section 32 - Declaration | | |
|--|---|---------------------------|
| Joint holder(s) signature if applicable | | |
| Name, Position and Company Name BOUNTY OIL & GAS NL | Signature | Date |
| Name, Position and Company Name BRIDGEPORT (EROMANGA) PTY LTD | Signature | Date |
| Name, Position and Company Name DELHI PETROLEUM PTY. LTD | Signature | Date |
| Name, Position and Company Name MAWSON PETROLEUM PTY LIMITED | Signature | Date |
| Name, Position and Company Name AUSTRALIAN GASFIELDS LIMITED Graham S. Elliott Director | Signature  | Date Jan. 20. 2022 |

ATTACHMENT 2 – PL 302 Supporting Information

Attachment 2

Supporting Information for an EA Amendment Application EPPG00641613

Petroleum Lease (PL) 302

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Abbreviations and Units

| Acronym | Description |
|---------|---|
| ATP | Authority to Prospect |
| BIM | Block Identification Map |
| BPEM | Best Practice Environmental Management |
| CSG | Coal Seam Gas |
| DEHP | Department of Environment and Heritage Protection, Queensland (now DES) |
| DES | Department of Environment and Science, Queensland |
| EA | Environmental Authority |
| EO Act | <i>Environmental Offsets Act 2014</i> |
| EP Act | <i>Environmental Protection Act 1994</i> |
| EP Reg | <i>Environmental Protection Regulation 2019</i> |
| EPP | <i>Environmental Protection Policy</i> |
| ERA | Environmentally Relevant Activities |
| ESA | Environmentally Sensitive Area |
| GAB | Great Artesian Basin |
| GES | General Ecological Significance |
| ha | Hectares |
| HES | High Ecological Significance |
| km | Kilometre |
| LC | Least Concern |
| m | Metres |
| MSES | Matters of State Environmental Significance |
| N/A | Not Applicable |
| NCA | <i>Nature Conservation Act 1992</i> |
| NCAP | No Concern at Present |
| PL | Petroleum Lease |
| PPL | Petroleum Pipeline Licence |
| RE | Regional Ecosystem |
| RoW | Right of Way |
| SEA | Strategic Environmental Area |
| SMC | Streamlined Model Conditions |
| SMP | Site Management Plan |
| SMS | Santos Management System |
| SWQ | South West Queensland |
| UWIR | Underground Water Impact Report |

1.0 Introduction

Santos Limited, Vamgas Pty Ltd, Delhi Petroleum Pty. Ltd., Bounty Oil & Gas NL, Bridgeport (Eromanga) Pty Ltd, Australian Gasfields Limited and Mawson Petroleum Pty Limited (the proponents) are seeking to amend Environmental Authority (EA) EPPG00641613. This application seeks to change the scale and intensity for the activities authorised by EPPG00641613 on Petroleum Lease (PL) 302.

EA EPPG00641613 currently authorises the conduct of petroleum activities associated with PL 302 situated in the Cooper Basin in South West Queensland, approximately 18 km north-west of the Santos Jackson Oil Facility (refer to Figure 1).

This amendment application is seeking authorisation to construct and operate an additional 2 gas wells on PL 302 as well as associated infrastructure / activities to facilitate the future development of petroleum resources on PL 302. The application seeks changes to the scale and intensity of activities authorised by EPPG00641613.

The holder of an EA may, at any time pursuant to Section 224 of the *Environmental Protection Act 1994* (EP Act), make an application to the assessing authority seeking an amendment to an EA.

Santos has prepared this document in accordance with Sections 226 and 227 of the EP Act and considered the DEHP '*Guideline – Application requirements for petroleum activities*' (DEHP, 2013).

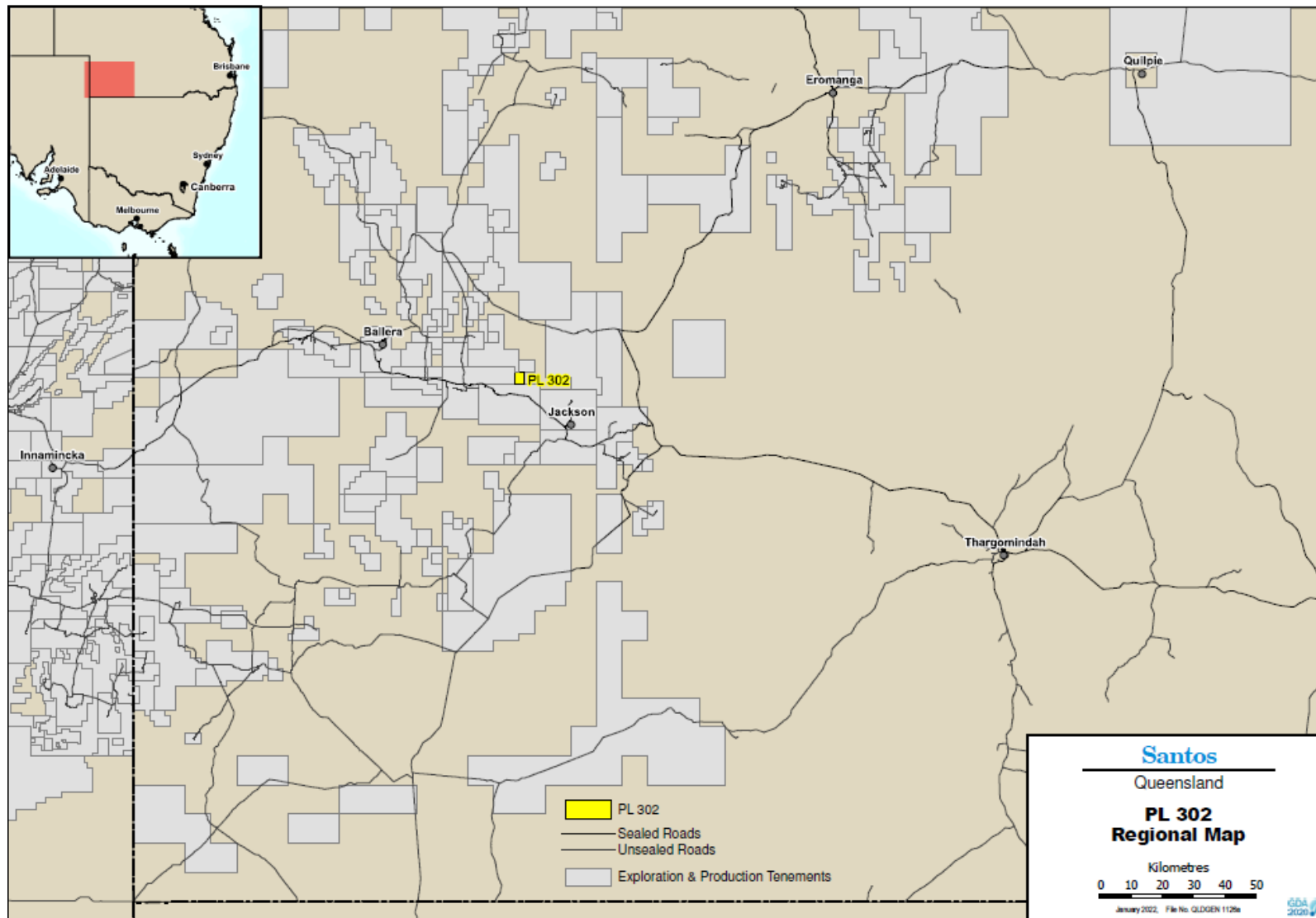


Figure 1: Regional Location of PL 302

2.0 Application Description

As discussed in Section 1.0, this amendment seeks an increase to the scale and intensity for the activities authorised by EPPG00641613. The existing disturbance allowance prescribed in Condition (A1) and (A2) of EPPG00641613 (approximately 1.2 ha) is not sufficient to support future petroleum exploration and production activities. This increase in scale and intensity relates directly to new wells and associated infrastructure on PL 302.

2.1 Existing Activities

PL 302 covers the Bogala oil field authorised under EA EPPG00641613. Three (3) conventional oil wells and associated infrastructure (including access tracks, pipelines, borrow pits and seismic surveys) have been constructed / undertaken within PL 302. All three oil wells drilled in PL 302 are non-operational (as at 31st January 2022).

EA EPPG00641613 authorises the carrying out of petroleum activities and specified relevant activities as listed in Condition (A1), subject to Condition (A2), which limits significant disturbance to land at any one time to no more than 0.1% of the total area of the relevant petroleum authorities as follows:

Existing Conditions - EA EPPG00641613:

(A1) *This environmental authority authorises the carrying out of the following resource activities:*

- (a) *the petroleum activities listed in **Schedule A, Table 1 – Scale of Activities** to the extent they are carried out in accordance with the activity’s corresponding scale and intensity;*
- (b) *petroleum activities, including but not limited to:*
 - i. *linear infrastructure;*
 - ii. *borrow pits / extracting, other than by dredging; and*
 - iii. *compressor stations; and*
 - iv. *sewage treatment – operating sewage treatment works, other than no release works; and*
 - v. *seismic surveys.*
- (c) *the specified relevant activities prescribed by this Environmental Authority at the locations specified on the cover pages of this environmental authority;*
- (d) *incidental activities that are not otherwise specified relevant activities.*

Schedule A, Table 1 – Scale for the Activities

| <i>Petroleum Activities and Infrastructure</i> | <i>Scale (number of activities)</i> |
|--|---|
| <i>Wells</i> | <i>Wells are authorised subject to condition (A2)</i> |
| <i><u>Stimulation</u></i> | <i>Stimulation of all authorised wells</i> |

(A2) Despite (A1), petroleum activities do not cause more than 0.1% of the total land area on the relevant petroleum authorities (excluding pipeline licences) that constitute the petroleum project to be significantly disturbed at any one time.

2.2 Proposed Activities

The disturbance allowance prescribed in Condition (A1) and (A2) (approximately 1.2 ha) is not sufficient to support future petroleum exploration and production activities on PL 302. Accordingly, Santos is seeking authorisation to construct and operate an additional two (2) gas wells on PL 302, as well as associated infrastructure / activities.

Stimulation has the potential to be undertaken at all existing and proposed wells. Associated activities proposed to be undertaken may include construction and/or operation of the following:

- well leases and equipment laydown areas;
- drilling and completions, including well stimulation;
- gathering lines/pipelines;
- access tracks and borrow pits;
- temporary camps and sewage treatment plants and irrigation (<21 EP);
- seismic surveys;
- communication systems; and
- other incidental petroleum activities.

These and other incidental activities are described in Section 2.3

No new production facilities or ponds would be required to support the proposed wells and there would be no change to water management resulting from the additional activities. All produced fluids generated from PL 302 would be sent to existing facilities off-tenure via existing and/or new infield gathering infrastructure.

2.3 Description of Proposed Activities

The following sections describe petroleum activities and infrastructure proposed to be undertaken on PL 302.

2.3.1 Seismic Surveying Activities

Seismic acquisition is the method of investigating subsurface geological structures, and is undertaken to identify locations to conduct drilling activities. During exploration, seismic surveys are the most common geological field assessment method and they are often the first field activity undertaken. Seismic data is collected by recording acoustic (sound) waves that are reflected from geological interfaces at depths of up to several thousands of metres below the surface. Seismic line preparation in the Cooper-Eromanga Basin is undertaken to cause minimal ground, soil and vegetation disturbance. Seismic line preparation generally involves 'walking' a bulldozer with its front blade in the up position along seismic lines to gently flatten terrain and vegetation. Seismic lines are regularly 'offset' and 'weaved' around obstacles to:

- (a) avoid the need to disturb terrain and long-lived perennial vegetation or other sensitivities such as watercourses, and
- (b) reduce the 'linearity' and visual impact of seismic lines.

No seismic line preparation is undertaken in Gibber land systems i.e. seismic lines are simply driven by light vehicles and Vibroseis trucks. In rough or highly vegetated terrain, seismic lines may require light preparation by earthmoving or vegetation slashing machinery to enable safe and efficient vehicle and equipment access. In flat terrain with limited vegetation cover, seismic line preparation is generally not required. Seismic lines generally consist of lightly prepared 3 to 5 m wide lines. Post-survey rehabilitation of seismic survey lines generally consists of utilising a grader to remove and respread any windrows created during line preparation. Seismic lines are checked for any remaining survey pegs or rubbish. Minor areas of compacted soil are ripped (~0.5 m depth and ~1 m tine spacing).

Santos undertakes seismic surveys in accordance with best practice environmental management principles, which have been derived from the Statement of Environmental Objectives (SEO) for Seismic Operations in the Cooper and Eromanga Basins (DSD, 2014; Santos, 2018).

2.3.2 Well Lease Establishment

For each proposed well, well leases up to 1.5 hectares (1.65 ha if well requires stimulation) would be established to accommodate drilling and ancillary equipment including a derrick, power generators, pipe handling equipment, tanks, drilling sumps, flares, and office areas. Well lease establishment would involve:

- surveying and pegging the pad boundary
- constructing a diversion bund if required due to slope or proximity to watercourses
- clearing (usually sparse, shrubby) vegetation that is unable to be avoided
- removing and stockpiling topsoil
- levelling the pad by cutting and filling using material from borrow pit if required
- excavating and capping the rig hardstand
- capping and compacting the lease footprint
- excavating sump pit if required
- installing fencing and gate
- installing cellar and conductor on well centre
- installing pads for ancillary equipment and infrastructure (such a tanks and flowlines), and
- setting up drill rig and associated equipment.

2.3.3 Well Drilling Activities and Associated Infrastructure

2.3.3.1 Drilling

Wells would be constructed in accordance with the *Code of Practice for the construction and abandonment of petroleum wells and associated bores in Queensland* (DNRME, 2018).

Drilling fluid would be continuously circulated down the drill pipe and back to the surface equipment to manage subsurface pressure (if required), cool the drilling bit and carry back formation cuttings. A drilling sump with an operating volume of approximately 630 kL would be used to store drilling fluids and cuttings. Following the completion of drilling, the rig would be rigged down and transported from site.

No oil-based or synthetic-based drilling muds will be used in PL 302 drilling activities.

2.3.3.2 Hydraulic Fracturing

Well stimulation techniques including hydraulic fracturing may be used to increase the recovery of resources (in this case, oil) by increasing the permeability of the reservoir. Hydraulic fracturing involves pumping a fluid under pressure into the reservoir to open up and connect fractures within the reservoir rock, thereby increasing the opportunity for the resource to move within the reservoir rock and flow toward the well. A proppant (typically sand) within the fluids holds the fractures open after the activity ceases. Approximately 99.5% of the material pumped into the well is water and sand. Minor quantities of additives make up the remaining 0.5% of the fluid. The purpose of these additives is to:

- Enhance fracture initiation;
- Help lubricate the flow of proppant (i.e. sand) into the fractures;
- Prevent microbial or chemical reactions following introduction of the fluids; and
- Prevent formation of scale deposits that may affect the well or pumps.

After the fracture process is completed, fluids that return to surface when the pressure is released are captured in tanks or lined pits for reuse, recycling or transported to a licenced water management facility.

All existing and proposed wells within PL 302 have the potential to be hydraulically fractured in the future.

When the well is brought on-line, produced water (which contains entrained degraded fracturing additives), is pumped from the well, allowing the petroleum resource to move through the well to the surface.

The use of specific chemicals such as benzene, toluene, ethyl-benzene and xylene in hydraulic fracturing fluids has been banned in Queensland (above prescribed levels). The use of other chemicals is subject to a risk assessment process as described in Section 5.5.

2.3.4 Gathering Lines

A right-of-way (ROW) for pipeline routes is lightly graded, if required, to allow access for vehicles required for above and below ground pipeline construction. Pipeline sections are transported and temporarily stored along the proposed pipeline route prior to joining together the tubing connections of each pipe section. Above ground pipelines are raised above ground level on prefabricated supports located along the proposed pipeline route. Below ground pipelines are constructed using a standard construction methodology including:

- clearing and grading;
- trenching and padding;
- pipe stringing, laying and welding;
- backfilling and ROW re-instatement; and
- rehabilitation.

Pipeline ROWs are re-instated to the condition and profiles existing at the commencement of activities. Given the nature of the climate within PL 302 (average rainfall is low and evaporation rates are high), re-instatement and rehabilitation activities are focused on promoting the natural re-establishment of vegetation of similar species composition and density to the surrounding undisturbed land.

2.3.5 Access Tracks

Access tracks are required to provide drilling equipment access to the proposed conventional petroleum well sites and for ongoing operational access. Existing access tracks will be utilised as much as possible to minimise the length of proposed access tracks required. A typical access track would be up to 13 m wide to accommodate 6 m wide table drains either side of the roadway. The roadway would be lightly graded and capped with clay or similar locally available borrow pit material. Access tracks are constructed to allow the natural passage of surface waters, to minimise any changes to the natural surface hydrology.

2.3.6 Borrow Pits

Borrow pits provide a source of construction material to provide a stable and supportive surface for well leases and access tracks where required. Borrow pits vary in dimension, depending on the quality and quantity of material available. Borrow pits are sited preferentially in flat areas with limited vegetation, outside of drainage features, with tree removal and woody vegetation avoided as much as possible. The borrow pits will be restored by ripping the floor and sides of the borrow pit to a depth of up to 500 mm generally along the contour. Stockpiled topsoil and vegetation would then be respread to a uniform depth over the entire area from which it was removed. The pit is then re-contoured to be blend in with adjacent undisturbed land.

2.3.7 Other Incidental Petroleum Activities

Other activities necessary to facilitate petroleum extraction and production include, but are not limited to:

- Temporary laydown areas;
- Fencing;
- Power and communication lines / towers;
- Storage tanks;
- Mobile and temporary camps, that may involve sewage treatment works that are no release works or are less than 21 EP;
- Geophysical, geotechnical, geological, topographic, cadastral and ecological surveys;
- Installation of environmental monitoring equipment; and
- Activities necessary to achieve compliance with conditions of the EA (i.e. sediment and erosion control, rehabilitation works).

2.4 Proposed Changes to EA EPPG00641613

To facilitate future development of petroleum resources on PL 302 this application seeks to:

- revise Condition (A1), Schedule A, Table 1 – Scale of Activities to specify the scale (number of activities) of all authorised petroleum activities; and
- remove Condition (A2), that stipulates the percentage of total land area that can be significantly disturbed at one time.

The proposed revision to Condition (A1) and (A2) is consistent with the more recent use of scoping tables by DES for Santos’ Cooper Basin operations. It does not contemplate petroleum activities which have limited environmental impact or are considered “incidental activities” and are not “specified relevant activities”.

Santos therefore seeks to amend EPPG00641613 as follows (changes are identified in red):

(A1) *This environmental authority authorises the carrying out of the following resource activities:*

- (e) *the petroleum activities listed in **Schedule A, Table 1 – Scale of Activities** to the extent they are carried out in accordance with the activity’s corresponding scale and intensity;*
- (f) *petroleum activities, including but not limited to:*
 - vi. *linear infrastructure;*
 - vii. *borrow pits / extracting, other than by dredging; and*
 - viii. *compressor stations; and*
 - ix. *sewage treatment – operating sewage treatment works, other than no release works; and*
 - x. *seismic surveys.*
- (g) *the specified relevant activities prescribed by this Environmental Authority at the locations specified on the cover pages of this environmental authority;*
- (h) *incidental activities that are not otherwise specified relevant activities.*

Schedule A, Table 1 – Scale for the Activities

| <i>Petroleum Activities and Infrastructure</i> | <i>Scale (number of activities)</i> |
|--|--|
| <i>Wells</i> | <i>Wells are authorised subject to condition (A2) 5</i> |
| <i><u>Stimulation</u></i> | <i>Stimulation of all authorised wells 5 wells</i> |

~~*(A2) Despite (A1), petroleum activities do not cause more than 0.1% of the total land area on the relevant petroleum authorities (excluding pipeline licences) that constitute the petroleum project to be significantly disturbed at any one time.*~~

The 5 wells requested in Schedule A, Table 1 above consist of 3 existing and 2 proposed wells.

3.0 Site Description, Land Use and Climate

3.1 Site Description and Land Use

PL 302 is located approximately 18 km north-west of the Santos Jackson Oil Facility in the Bulloo Shire Local Government Area (LGA), south-west Queensland. PL 302 encompasses approximately 1,216 ha of land located primarily on Durham Downs Station, and partially on the Kihee Station (refer to Table 3-1 for lot and plan details).

Durham Downs Station is an 891,000 ha pastoral lease that operates as a cattle station with a stocking capacity of up to 21,500 head of cattle¹. Kihee Station is a 164,255 ha pastoral lease that operates as a cattle station with an estimated stocking capacity of up to 3,000 head of cattle². The area has been subject to long-term grazing of beef cattle. Primary land uses for PL 302, and its surrounding area, include cattle grazing and petroleum exploration and production.

PL 302 is located on graticular blocks / sub-blocks as detailed in Table 3-2.

Table 3-1: Property Lot and Plan Details – PL 302

| Property | Lot | Plan |
|--------------|-----|----------|
| Durham Downs | 1 | SP133822 |
| Kihee | 2 | SP184928 |

Table 3-2: Sub-Block Identification – PL 302

| BIM Name | BIM Code and Block | Sub-Blocks |
|--------------|--------------------|------------|
| Cooper Creek | COOP 3003 | Z |
| Cooper Creek | COOP 3004 | V |
| Cooper Creek | COOP 3075 | E |
| Cooper Creek | COOP 3076 | A |

3.2 Climate

PL 302 is situated in south-west Queensland, an arid region of Australia, where the average rainfall is low and evaporation rates are high. The seasons are generally characterised by hot dry summers and cold dry winters. Temperatures exhibit large seasonal and diurnal fluctuations. In summer, average daily maximum temperatures exceed 36°C and the average minimum is 23°C. Average daily temperatures in winter range from approximately 6°C to 22°C (BOM, 2020).

Rainfall variability is amongst the highest in Australia, while average annual totals are amongst the lowest. There is no distinct seasonal rainfall pattern, but the majority of rainfall occurs during the warmer months from October to March. Summer rainfall is generally associated with thunderstorm activity driven by monsoonal and tropical cyclone weather systems moving inland from northern and north-eastern

¹ S. Kidman & Co Ltd (2020) *Durham Downs Station*, <https://www.kidman.com.au/locations/durham-downs/> (accessed 07/01/2020)

² Fairfax Media (2015) *Usher Pastoral buys Mount Margaret, Kihee*, <https://www.queenslandcountrylife.com.au/story/4556262/mount-margaret-kihee-sold/> (accessed 05/12/2019).

Australia (BOM, 2020). Winter rainfall can occur from the formation of low-pressure systems pushing cool moist air northwards from the Great Australian Bight into central Australia (GABCC, 1998). Average annual rainfall in the region ranges from 164 mm at Moomba Airport to 290 mm at Windorah (BOM, 2020). However, changes in the irregular atmospheric circulation phenomenon known as the El Niño–Southern Oscillation (ENSO) can significantly influence weather patterns in central Australia. Changes in ENSO can lead to exceptionally dry or wet years with annual rainfall ranging from less than 100 mm during a dry event (termed an ‘El Niño’) to as high as 660-730 mm (2010 at Moomba Airport and Windorah, respectively) during a wet event (termed a ‘La Niña’) (BOM, 2020).

There are on average 18 to 28 rainfall days (≥ 1 mm) per year in the region. Larger rainfall events of between 10 to 25 mm or more, occur on average 3 to 8 days per year, respectively. Larger rainfall events predominantly occur during the warmer months from October to March (BOM, 2020).

Average seasonal evaporation rates range from 550 mm in summer to 150 mm in winter. Average annual evaporation is extremely high, ranging from 3,000 to 3,800 mm (Marree Soil Conservation Board, 2004). The most common wind direction throughout the year is from the south-east. Light winds (<20 kph) are most common between May to July, while the greatest frequencies of strong winds (41-61 kph) occur between September to January.

4.0 Relevant Environmental Values

Desktop based methods were used to assess relevant environmental values within PL 302. Desktop methods included searches of environmental databases and government environmental mapping and reporting. Desktop ecological assessment of PL 302 was undertaken by E2M Consulting E2M (2021). Database search results, government environmental reports, and the E2M ecological assessment report are attached as Appendix A. Relevant environmental values for PL 302 include:

- land resources;
- flora and regional ecosystems;
- environmentally sensitive areas;
- fauna;
- surface waters and wetlands;
- groundwater;
- air quality;
- noise; and
- Matters of State Environmental Significance (MSES).

Sections 4.1 - 4.8 discuss relevant environmental values present within PL 302. The risks and potential impacts to these values as a result of the proposed activities, and mitigation measures for potential impacts, are discussed in Section 5.0.

The proposed amendment will not result in any changes to how waste is managed while carrying out authorised petroleum activities, or rehabilitation objectives (i.e. these environmental values will be managed in accordance with existing management practices and relevant EA conditions). The management of waste and rehabilitation are therefore not considered further.

4.1 Land Resources

PL 302 is located in the Channel Country bioregion and Sturt Stony Desert subregion (IBRA version 7, 2012). Land systems mapped in PL 302 are broadly consistent with Landzone mapping. The tenure is predominantly mapped as undulating downs land systems on Landzone 9 (undulating country on fine grained sedimentary rocks), with a northern area of dissected residuals on Landzone 5 (old loamy and sandy plains and plateaus).

The north-eastern corner of the PL 302 is dominated by scarps and flat to gently undulating tops of dissected tablelands, mesas and buttes, which are subject to active erosion. Slopes and flanks are generally sparsely vegetated with hummock and tussock grasses. Tops, gullies and lower flanks are usually timbered. Land systems mapped in PL 302 are summarised in Table 4-1 (DSITIA, 2012).

Soils throughout the sloping areas and upland plains are predominantly shallow earthy loams (Um5.3) below which red-brown hardpan occurs, and (Um5.51) soils with mottled rock below. Dominant soils on scarps and areas of steeper relief are shallow stony loams (Um1 .43), with soils similar to the sloping areas and upland plains on areas of gentler relief. (ASRIS, 2021). Further detail on soils within PL 302 is provided in Table 4-1.

Table 4-1: Land Systems and Soils – PL 302

| Map Code | Land System Description | Agricultural Land Class | % Area of PL 302 |
|----------|---|---------------------------|------------------|
| BE14 | <p>Uneven undulating terrain with many small ridges, pediments, dissection slopes, and flats; silcrete boulders are common.</p> <p>Chief soils throughout the sloping areas and upland plains are shallow earthy loams (Um5.3) below which red-brown hardpan occurs, and (Um5.51) soils with mottled rock below. Associated are (Gn2.12) and less commonly (Gn2.13), both underlain by red-brown hardpan on upland plains; and (Dr2.33) soils often underlain by red-brown hardpan on dissection slopes, pediments, and low-lying flat areas.</p> | C2 – Pasture Land | 80 |
| Fz49 | <p>Dissected low plateaux with scarps, mesas, and buttes; some gently undulating plateau crests; mottled and pallid rock and silcrete boulders are common.</p> <p>Dominant soils are shallow stony loams (Um1 .43) on scarps and areas of steeper relief generally, with porous loamy soils (Um5.51) on areas of gentler relief.</p> <p>Associated are (Gn2.12) soils on areas of gentler relief, and (Dr2.33) and (Ug5.2) and (Ug5.3) soils at the base of scarps in small variable areas.</p> | D – Non-agricultural Land | 20 |

4.2 Flora and Regional Ecosystems

E2M (2021) utilised DES Regional Ecosystem (RE) mapping (version 11.0) to map REs and assess potential flora and fauna habitat located in PL 302.

Vegetation mapped in PL 302 is typical of the Bioregion (Channel Country) and its sub-regions (Sturt Stony Desert subregion). The tenure is predominantly mapped as Mitchell grass tussock grassland and herbland with isolated shrubs on flat and gently undulating slopes. Minor areas of open Acacia shrubland on flat to undulating plains and crests of dissected tablelands are also mapped to be present. Very minor areas of sparse to open herbland and shrubland on infrequently flooded alluvia are also mapped to be present (DES, 2017). Vegetation within PL 302 has undergone historic disturbance due to grazing from the operation of the existing cattle station. REs mapped to be present within PL 302 area summarised in Table 4-2 and displayed on Figure 2. REs mapped to be present in PL 302 are listed as Category B regulated vegetation under the *Vegetation Management Act 1999* with a Least Concern (LC) vegetation management class and a biodiversity status of No Concern at Present (NCAP). Structure of vegetation ranged from sparse to very sparse. Refer to Appendix A for further information.

E2M carried out desktop based likelihood of occurrence assessments to identify the potential presence of Matters of National Environmental Significance (MNES) and Matters of State Environmental Significance (MSES) flora and fauna species within PL 302. These assessments considered species distribution, habitat requirements and historical records in proximity to the PL. The assessment methodology and results are described in the ecological assessment report attached as Appendix A.

Table 4-3 summarises species listed under the NC Act identified to potentially occur within PL 302 (E2M, 2021). No high-risk areas for *Nature Conservation Act 1992* (NC Act) Protected Plants were identified to occur within PL 302.

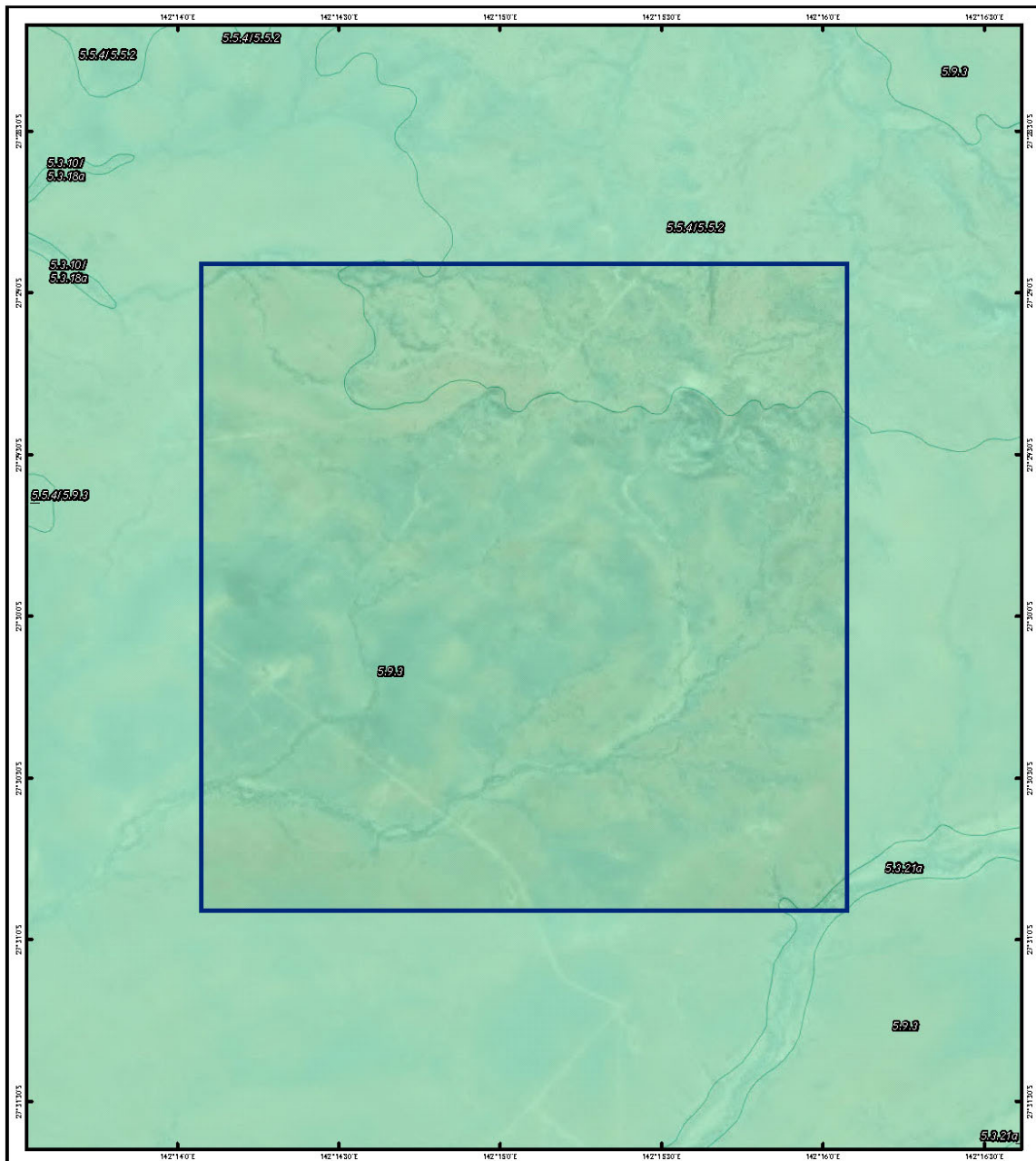
Table 4-2: DES Mapped Regional Ecosystem Descriptions – PL 302

| RE Code | RE Short Description | VM Act Class | BD Status | Structural Category | Area (ha) in PL 302 | % of PL 302 |
|---------------|--|--------------|-----------|---------------------|---------------------|-------------|
| 5.3.21a | Variable sparse to open herbland, <i>Senna</i> spp. open shrubland and bare scalded areas on infrequently flooded alluvia of major rivers their distributaries, drainage channels and creeks. | LC | NCAP | Sparse | 2.4 | 0.2 |
| 5.5.4 / 5.5.2 | <u>5.5.4</u> <i>Acacia sibirica</i> +/- <i>Acacia aneura</i> +/- <i>Corymbia</i> spp. open shrubland on Quaternary sediments. <u>5.5.2</u> <i>Acacia aneura</i> low open woodland +/- <i>Acacia sibirica</i> +/- <i>Eremophila latrobei</i> on Quaternary deposits. | LC | NCAP | Very Sparse | 193.9 | 15.9 |
| 5.9.3 | <i>Astrebla</i> spp. +/- short grasses +/- forbs open herbland on Cretaceous sediments. | LC | NCAP | Sparse | 1,020 | 83.9 |

Key: VM - Vegetation Management class under the *Vegetation Management Act 1999* and BD - Biodiversity status: NCAP – No Concern at Present, LC – Least Concern.

Table 4-3: NC Act Listed Flora Species Considered Likely to Occur within PL 302

| Scientific Name | RE Associations | NC Act Status | Area within the PL (ha) |
|-----------------------------|--|-----------------|-------------------------|
| <i>Indigofera oxyrachis</i> | REs comprising Acacia dominated woodlands, which include the REs 5.5.2 and 5.5.4 that are mapped within the PL. | Vulnerable | 194 |
| <i>Rhodanthe rufescens</i> | REs comprising Acacia dominated woodlands, particularly <i>Acacia cambagei</i> (gidgee) and <i>Acacia aneura</i> (mulga), which include the REs 5.5.2 and 5.5.4 that are mapped within the PL. | Near Threatened | 194 |

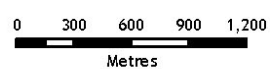


Legend

- Petroleum Lease - PL302
- RE Biodiversity Status**
- No concern at present



Scale 1:30,000 (A4)



Coordinate System: GCS GDA 1994

Document Path: X:\EBS\2019\GE\118\BGE\118_118_AE.mxd

Notes:
 Aerial Imagery: © ESRI 2019
 Cadastre: © DNRM 2018
 Ordoed Drainage: © DNRM 2018
 Road: © PSMA 2014
 Regional Ecosystem: © DES 2019
 Petroleum Lease: © DNRM 2019



FIGURE 2: DOR MAPPED REGIONAL ECOSYSTEMS

Desktop Ecological Assessment - PL 302
 Santos

| | | |
|------------|------------|-----|
| Map Number | Job Number | Rev |
| 1 of 1 | QEJ19118 | 2 |

| Rev | Description | Drawn | Approved | Date |
|-----|----------------|-------|----------|------------|
| 2 | Issued for Use | CD | BD | 16/03/2021 |
| 1 | Issued for Use | CD | BD | 11/12/2019 |

E2M Pty Ltd gives no warranty in relation to the data (including accuracy, reliability, completeness or suitability) and accepts no liability for any loss, damage or costs (including consequential damage) relating to any use of the data in this map.

Figure 2: DES Mapped Regional Ecosystems within PL 302

4.3 Environmentally Sensitive Areas

No Environmentally Sensitive Areas (ESAs) defined under the EP Act are mapped within PL 302 (E2M, 2021).

4.4 Fauna

As discussed in Section 4.2, E2M carried out desktop based likelihood of occurrence assessments to identify the potential presence of MNES and MSES flora and fauna species within PL 302.

The likelihood of occurrence assessment identified that the PL is likely to provide habitat for two species listed as vulnerable, one species listed as near threatened and two species listed as special least concern under the NC Act. Table 4-4 summarises species listed under the NC Act identified to potentially occur within PL 302 (E2M, 2021).

Database searches indicated the possibility of occurrence of six other fauna species listed under the NC Act within PL 302, however, these species were not considered likely to occur due to the absence of previous records within 100 km of the PL or the marginal quality of potential habitat for each species (E2M, 2021). No essential habitat is mapped within PL 302 (refer to Appendix A).

Table 4-4: NC Act Listed Fauna Species Considered Likely to Occur within PL 302

| Scientific Name | Common Name | NC Act Status | EPBC Act status | RE Associations | Area within the PL (ha) |
|-------------------------------|---------------------------|-----------------------|----------------------|--|--|
| <i>Aspidites ramsayi</i> | Woma python | Near threatened | N/A | All REs within the PL provide habitat for the species | 1,216 |
| <i>Apus pacificus</i> | Fork-tailed swift | Special Least Concern | Marine and migratory | All REs provide foraging habitat for the species. This species does not breed within Australia. | Foraging habitat: 1,216 |
| <i>Falco hypoleucos</i> | Grey Falcon | Vulnerable | Vulnerable | The PL is mapped to contain REs that provide both breeding and foraging habitat for the species. Timbered woodlands (REs 5.5.2 and 5.5.2) provide breeding habitat, and adjacent treeless areas (REs 5.9.3 and 5.3.21) provide foraging habitat. | Breeding habitat: 194 Foraging habitat: 1,022 |
| <i>Tachyglossus aculeatus</i> | Short-beaked Echidna | Special Least Concern | N/A | All REs. | 1,216 |
| <i>Hirundapus caudacutus</i> | White-throated Needletail | Vulnerable | Vulnerable | All REs provide foraging habitat for the species. This species does not breed within Australia | 1,216 |

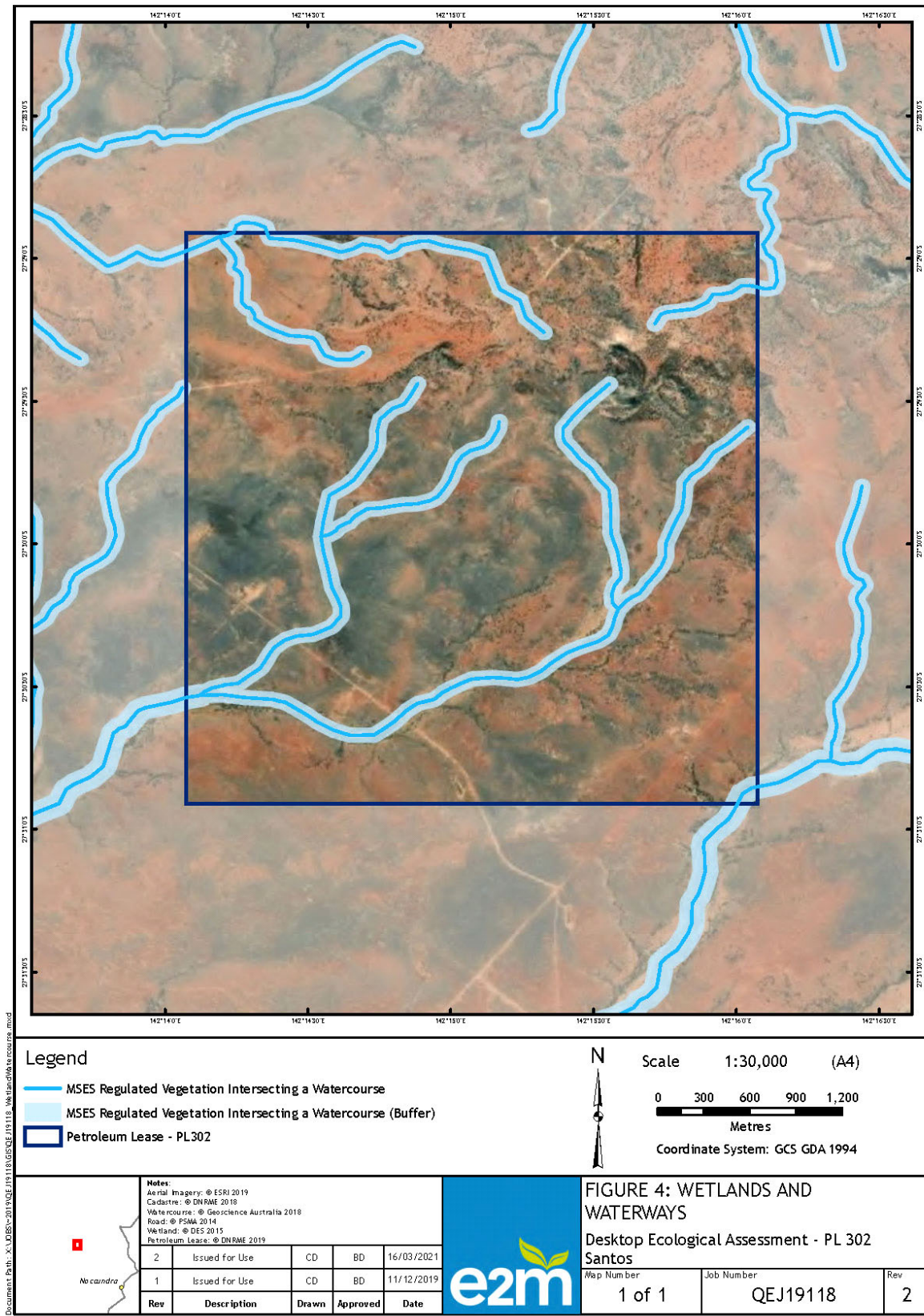
4.5 Surface Water and Wetlands

The environmental values of waters to be enhanced or protected are defined in section 6 of the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* for ‘water mentioned in schedule 1’ and ‘other water’. Water within the Cooper Basin is not mentioned in schedule 1 and so is considered ‘other water’. Its environmental values relate to:

- the biological integrity of particular aquatic ecosystems;
- the suitability of water for certain human uses (such as for drinking water, food production, recreation and aesthetic purposes or industrial uses); and
- the cultural and spiritual values of the water.

PL 302 is wholly located within the Cooper Creek drainage sub-basin with a catchment area of approximately 95,800 km². However, as discussed in Section 4.1, PL 302 is located on elevated land systems (Land zones 5 and 9) approximately 16 km east of the Cooper Creek floodplain. There are no major watercourses present within PL 302. There are a number of minor watercourses and drainage features mapped in PL 302, which merge with the braided channels of Cooper Creek to the west (refer to Figure 3).

There are no wetlands mapped within PL 302. Watercourses within PL 302 are highly ephemeral, with high flow variability in response to infrequent large rainfall events, typical of the majority of the wider Cooper Basin.



4.6 Groundwater

The information in this section, and Sections 5.5 and 6.1.3, is derived from the approved 2019 UWIR (Santos, 2019).

In early 2021, Santos engaged Golder Associates Pty Ltd (Golder) to update the existing Cooper and Eromanga Basin groundwater models used in the 2019 UWIR with a revised number of proposed oil and gas wells, including additional petroleum wells located in PL 302. The assessment used the same groundwater impact assessment methodology described in the approved 2019 UWIR (Santos, 2019). A Technical Memorandum (Golder, 2021) is attached as Appendix C and provides a summary of the findings of this assessment.

PL 302 is situated over the Southwest Queensland portion of the Cooper/Eromanga Basins, sitting directly north of the Bogala structural trend. The Cooper basin is overlain by the Eromanga Basin. The Cooper Basin is for the most part considered to be distinct and separate from the Great Artesian Basin (GAB), whereas the Eromanga Basin is the largest of the three major sedimentary basins comprising the GAB. Both the Cooper and Eromanga Basins are multilayered systems comprising alternating layers of sandstone, shale, mudstone and siltstone formations.

Historically wells drilled in PL 302 have targeted oil reservoirs. No oil or gas wells are currently operational in PL 302. Future petroleum development of PL 302 will target gas resources.

Primary oil reservoirs in PL 302 are encountered in the Hutton, Birkhead, Namur and Murta sandstone members of the Eromanga Basin. Locally within PL 302, the Murta sandstone is the primary oil reservoir target. The Murta Formation is the upper formation of the Hooray Sandstone, with the lower formation being the Namur Sandstone. The Murta Formation comprises of thinly interbedded siltstone, shale, very fine to fine-grained sandstone and minor medium and coarse-grained sandstone. Within PL 302, the Murta Formation is considered to be a confining bed. The confining layer is a basal siltstone at the base of the formation which is widespread across the Cooper region. In Queensland, the average thickness of the Murta Formation ranges from 60 - 85 m, lying approximately 700 - 800 m in depth below the surface. Within PL 302, the Murta Formation is located slightly deeper at approximately 1200 - 1400 m below the surface. The minimum and maximum hydraulic conductivity of the Hooray Sandstone (for which the Murta Formation is a sub-unit of) is 4.3×10^{-4} m/d and 4.3×10^{-1} m/d, respectively.

Primary gas reservoirs in PL 302 are encountered within the deep formations of the Cooper Basin, and they include the Tirrawarra Sandstone, Patchawarra Formation, Epsilon Formation and the Toolachee Formation. Minor gas reservoirs are also present in the Tirrawarra Sandstone, the Wimma Sandstone Member of the Arraburry Formation and the Tinchoo Formation. At this stage, there are no wells that target gas reservoirs within PL 302. Given the primary gas reservoir targets of the neighbouring tenures, it is anticipated that locally within PL 302, the Toolachee, Patchawarra and Epsilon Formations would be the primary gas reservoir targets.

The Patchawarra Formation comprises interbedded, variable size sandstone beds with siltstone, shale and coal beds, sandstone and mudrock beds. The Patchawarra Formation is thickest (up to 550m in SWQ near the SA border) of the Cooper Basin formations and in QLD, the second most widespread Permian unit after the Toolachee Formation (Draper, 2002). The early Permian Epsilon Formation is defined as a series of sandstones, siltstone and shales with minor coals and is widespread across the Cooper Basin. The maximum thickness of the formation is observed in the Nappamerri Trough (156m), but averages between 30 to 40m. The minimum and maximum hydraulic conductivity of the Patchawarra Formation is 3.3×10^{-4} m/d and 3.5×10^{-3} m/d, respectively. No data is available on the hydraulic conductivity of the Epsilon Formation.

The Toolachee Formation comprising sandstones, siltstones and shale with thin coal seams and some conglomerates. It spreads unconformably over older formations across the whole Cooper Basin and is observed at its thickest in the Patchawarra and Nappamerri Troughs. In QLD, the average thickness ranges from 25 to 50m, with maximum thickness of up to 130 m observed north of the Jackson–Naccowlah–Pepita Trend. The minimum and maximum hydraulic conductivity of the Toolachee Formation is 2.0×10^{-3} m/d and 4.3×10^{-3} m/d, respectively.

The Murta, Toolachee, Patchawarra and Epsilon Formations are not typically utilised for water supply in the PL 302 area given their depth, and the presence of hydrocarbons. Only the upper (shallow) aquifers of the Eromanga Basin (e.g. Winton and Glendower) are generally used by landholders due to the significant depth of deeper aquifers (typically associated with petroleum production) and the general unreliability of the groundwater that may be encountered (i.e. it may have a high salinity and contain free and dissolved hydrocarbons). Within PL 302, the typical depth range between the Winton and Glendower Formations and the Murta (shallowest of the anticipated petroleum reservoir targets) is typically >700 m. This vertical separations include the low permeability formations of the Wallumbilla Formation and the Allaru Mudstone, which forms a thick, competent and regionally extensive seal between the Cadna-Owie Formation and the shallower aquifers.

Water quality data for the Hooray Formation (of which the Murta Formation a sub-unit of) is characterised as generally fresh and may be slightly brackish as EC values range from 675 to 3,930 $\mu\text{S/cm}$ with a median value of 1,003 $\mu\text{S/cm}$. Groundwater flow is directed to the south east. Groundwater from Winton and Glendower Formations are characterised as fresh to brackish, with EC values ranging from 900 to 13,000 $\mu\text{S/cm}$.

Refer to Section 5.2 of the approved 2019 UWIR (Santos, 2019) for detailed descriptions of the hydrostratigraphy of the Cooper and Eromanga Basins.

Groundwater Dependent Ecosystems

There are no GAB ROP discharge or recharge springs located within PL 302. The closest GAB springs are located approximately 206 km south-east from PL 302, as shown on Figure 14 of the Approved 2019 UWIR (refer to Appendix B). These springs are too far away to be at risk of hydraulic impact due to the proposed activities on PL 302.

A potential aquifer supporting potential terrestrial GDEs is mapped to occur in the northern section of PL 302. This area is mapped as a permeable sandy plain aquifer with brackish, ephemeral groundwater connectivity regime. Discharge of shallow groundwater typically occurs around the contact between these sediments and less permeable underlying rock. This shallow aquifer may support surface GDEs dependent on sandy plain aquifers (e.g. lacustrine wetlands, palustrine wetlands, riverine water bodies). Potential terrestrial GDEs dependent on sandy plain aquifers may include riverine wetlands and regional ecosystems containing deep rooted tree species (Qld Government, 2015; DES, 2018).

Environmental values relating to, or dependant on groundwater resources, in the Cooper and Eromanga Basins include:

- Groundwater dependant ecosystems (GDEs) including wetlands and springs;
- Drinking water;
- Sandstone aquifer of the GAB; and
- Groundwater uses.

Further information on groundwater is presented in Section 5.5 and 6.1.3.

Water Bores

One (1) groundwater bore, Bogala North 1 (RN 23621) is located within PL 302 (DNRME, 2021). Bogala North 1 was an unsuccessful oil exploration well drilled by Delhi Petroleum in 1987. There are three (3) other bores recorded within 4 km of PL 302 (DNRME, 2021), however these are petroleum wells, not groundwater bores. These wells are all either producing, suspended, or unsuccessful petroleum wells that were subsequently plugged and abandoned.

4.7 Air Quality

The air quality environmental values relevant to PL 302 include environmental values for the air environment provided in Section 6 of the *Environmental Protection (Air) Policy 2019* as follows:

- The qualities of the air environment that are conducive to protecting the health and biodiversity of ecosystems;
- The qualities of the air environment that are conducive to human health and wellbeing;
- The qualities of the air environment that are conducive to protecting the aesthetics of the environment, including the appearance of buildings, structures and other property; and
- The qualities of the air environment that are conducive to protecting agricultural use of the environment.

The existing air quality of PL 302 is typical of a remote environment influenced by agricultural industries including operation of the surrounding pastoral lease.

There are no potential sensitive receptors for air within PL 302. The closest sensitive receptor to PL 302 is the Santos Jackson Camp, which is located approximately 18 km south-east of the PL 302 boundary. This is occupied by Santos staff and contractors. The closest non-Santos owned sensitive receptor to PL 302 is the Noccundra Hotel, which is located approximately 45 km to the south-east of the PL 302 boundary.

There is no ambient air quality monitoring stations (AQMSs) within the vicinity of PL 302 and there is no other source of air quality data available to Santos to the best of our knowledge. The two closest DES AQMS are located at Moranbah and Miles Airport, approximately 850 km north-east of PL 302. The Moranbah monitoring station has been operational since 2011 and was established to measure particles levels (particulate matter (PM10 and PM2.5)) from coal mining operations in the community and surrounding area. The Miles Airport monitoring station has been operational since 2015 and was established as a part of the monitoring network to assess air quality in an area of intensive coal seam gas (CSG) production. The Toowoomba AQMS was the closest station for oxides of nitrogen (NOx) and carbon monoxide (CO) (located approximately 950 km east of PL 302). This station was operational from 2003 to 2010. Table 4-5 provides a very conservative estimate of the background air quality in SWQ. There is an alternative DES AQMS located in south-western Qld (e.g. Miles Airport), but this AQMS is still located ~850km north-east of PL 302 (refer to Table 4-5 below).

Table 4-5: Background Air Quality Data relevant to PL 302

| Parameter | Source | Value (ug/m ³) | Objective (ug/m ³) | Averaging Period |
|-------------------------------------|---------------|----------------------------|--------------------------------|------------------------|
| Carbon monoxide (CO) | Miles Airport | 0.1ppm | 11,000 | 24 hour average |
| Nitrogen dioxide (NO ₂) | Miles Airport | 0.001ppm | 250 | Maximum 1 hour average |

| | | | | |
|-------------------|-----------------------|------|----|----------|
| PM ₁₀ | Moranbah (Utah Drive) | 29.1 | 50 | 24 hours |
| | Miles Airport | | | |
| PM _{2.5} | Moranbah (Utah Drive) | 4.1 | 25 | 24 hours |
| | | 7.2 | 6 | Annual |
| | Miles Airport | | | |

Note – PM₁₀ and PM_{2.5} values have been derived from DES monitoring data for the period 1 August 2019 to 30 July 2020.

4.8 Noise

The noise environmental values relevant to PL 302 include environmental values for the acoustic environment provided in Section 6 of the *Environmental Protection (Noise) Policy 2019* as follows:

- The qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and
- The qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following—
 - sleep;
 - study or learn;
 - be involved in recreation, including relaxation and conversation; and
- the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

The existing noise environment is typical of remote, largely unpopulated areas, with low levels of background noise dominated by natural sources (e.g. wind, animals and insects) and intermittent noise from vehicular traffic and grazing activities (e.g. mustering) from the operation of the surrounding pastoral lease.

There are no potential sensitive receptors for noise within PL 302. The closest sensitive receptor to PL 302 is the Santos Jackson Camp, which is located approximately 18 km south-east of the PL 302 boundary. This is occupied by Santos staff and contractors. The closest non-Santos owned sensitive receptor to PL 302 is the Noccundra Hotel, which is located approximately 45 km to the south-east of the PL 302 boundary.

Background noise monitoring has not been undertaken for this development given the remote nature of the location and the absence of sensitive receptors and other noise generating industries / activities. In the absence of background noise monitoring, the deemed background levels are as per the EA (EPPG00641613) and the DES guideline - *Prescribing noise conditions for environmental authorities for petroleum activities* (ESR/2016/1935) and have been adopted as being representative of the ambient acoustic environment. The deemed background levels are as follows:

- 7:00 am – 6:00 pm 35db(A)
- 6:00 pm – 10:00 pm 30db(A)
- 10:00 pm – 6:00 am 25db(a)
- 6:00 am – 7:00 am 30dB(A)

4.9 Matters of State Environmental Significance

E2M (2021) assessed MSES as defined in Schedule 2 of the *Environmental Offsets Regulation 2014* within PL 302. Three (3) MSES were identified as known or likely to be present, as shown in Table 4-6. These MSES include regulated vegetation, connectivity areas and potential habitat for listed threatened and special least concern species.

Table 4-6: MSES in PL 302

| MSES | Area in PL (ha) |
|---|--|
| Regulated vegetation: | |
| • Intersecting a watercourse | 75 |
| Regulated vegetation – Endangered/Of Concern Cat B, Cat C, Cat R, Essential Habitat | 0 |
| Connectivity areas | 1,216 |
| Wetlands and watercourses - High Ecological Significance | 0 |
| Wetlands | 0 |
| High Ecological Value waterways | 0 |
| Strategic Environmental Areas | 0 |
| Protected wildlife habitat: | |
| - Grey Falcon, listed as Vulnerable; | Breeding habitat (194), foraging habitat (1,022) |
| - <i>Indigofera oxyrachis</i> , listed as Vulnerable; and | 194 |
| - White-throated Needletail, listed as Vulnerable | 1,216 |
| - Short-beaked Echidna, listed as Special Least Concern. | 1216 |
| Protected areas | 0 |
| Highly protected zones of State marine parks | 0 |
| Fish habitat areas | 0 |
| Waterway providing for fish passage | 0 |
| Marine plants | 0 |
| Legally secured offset areas | 0 |

5.0 Potential Impacts and Mitigation Measures

As discussed in Section 2.0, the proposed amendment is requesting an increase to the scale and intensity of activities currently authorised under the EA to support future petroleum exploration and production activities on PL 302.

However, the application does not propose any new environmentally relevant activities. Potential impacts to relevant environmental values from proposed activities will therefore be analogous to those resulting from existing authorised activities. The risk of new or additional significant impacts to environmental values present in PL 302 from the proposed amendment is considered to be low.

Notwithstanding, this section identifies and assesses potential impacts, mitigation measures (control strategies), and environmental risks to relevant environment values resulting from carrying out the proposed activities as required by section 125 of the EP Act.

To assess environmental risks associated with the proposed activities, a risk assessment for each relevant environmental value (as identified in Section 4.0) has been completed. The environmental risk assessment is based on risk factors associated with both the initial construction and ongoing operational phases of the proposed activities.

The proposed amendment will not result in any changes to how waste is managed while carrying out authorised petroleum activities, or rehabilitation objectives (i.e. these environmental values will be managed in accordance with existing management practices and relevant EA conditions). The management, potential impacts and risks associated with waste and rehabilitation are therefore not explicitly addressed in the following sections. However, Table 5-1 contains standard Santos mitigation measures (control strategies) for the management of waste and rehabilitation with regard to a range of potential risks and impacts to relevant environmental values associated with carrying out authorised activities.

Risk assessments for a proposed activity identify a wide range of risks and potential impacts to relevant environmental values as a result of carrying out proposed activities. This should not be interpreted to assume that all identified potential impacts will occur as a result of carrying out activities. Once initial unmitigated risks and potential impacts are identified as part of a risk assessment, appropriate control strategies are identified and implemented. Appropriately implemented control strategies will typically mitigate the likelihood of a potential impact occurring, and/or reduce the severity/consequences of the potential impact.

The risk assessment identifies initial (unmitigated) risks associated with the proposed activities for each relevant environmental value (EV). Following identification of appropriate mitigation measures (control strategies), the residual (mitigated) risk posed to each EV has also been determined.

The risk assessment has been undertaken in accordance with the Santos Management System (SMS) Risk Management Standard. The SMS Risk Management Standard is based on accepted principles and applicable Australian standards. Further detail on the risk assessment process is provided in Appendix D. The results of the risk assessment are summarised in Table 5-1.

Impacts to MSES in context of the *Environmental Offset Act 2014* are discussed in Section 5.7.

5.1 Land Resources

The proposed activities will result in direct and indirect impacts to land resources (as described in Section 4.1), primarily as a result of:

- infrastructure construction (earthworks activities);
- vehicle and plant movements;
- minor spills or leaks of fuels, chemicals or other produced fluids;
- production operations;
- loss of containment;
- storage and disposal of general waste, chemical and process wastes;
- fire (ignition sources resulting from activities); and
- bushfire and flood (natural events).

Santos aims to minimise the operational footprint and significant disturbance associated with its activities as far as reasonably practicable. However, potential direct and indirect impacts to land resources resulting from the proposed activities may include:

- reduction in visual amenity;
- soil erosion, topsoil loss, inversion and compaction;
- disturbance to land use and suitability changes;
- reduction in agricultural productivity; and
- contamination of soil.

The area of direct disturbance within PL 302 would be up to approximately 23.2 hectares (or 1.9% of the total tenure area) for the proposed activities including 2 new wells and associated well leases, flowlines, access tracks and borrow pits. This is a conservative estimate only, as future well locations (and associated infrastructure) are not known at the time of application. A large proportion of disturbance associated with flowline construction will be rehabilitated soon after construction to reduce the total disturbed area per well. The remaining areas of disturbance would be rehabilitated following the cessation of petroleum activities.

Fire is identified as a potential risk associated with both natural events and ignition sources resulting from petroleum activities potentially causing bushfires. For example, vehicle exhausts can be ignition sources for a bushfire when they are driven through dry grass during seismic exploration, field scouting or while undertaking construction activities. Bushfires can cause impacts to infrastructure, agricultural productivity, vegetation / habitat and fauna. Santos implements a range of management strategies to mitigate the risk of causing fire as outlined in outlined in Table 5-1.

Management (control) strategies, risk sources, potential impacts and the level of risk associated with the proposed activities are summarised in Table 5-1. The results of the risk assessment indicate the residual risk to land resources as a result of the proposed activities is classified as 'low'. Furthermore, any short-term reduction in the agricultural availability of the pasture land would be offset by commercial agreements between the proponents and the property owner.

5.2 Flora, Regional Ecosystems and Environmentally Sensitive Areas

The proposed activities will result in direct and indirect impacts to flora and REs (native remnant vegetation) and potentially to ESAs (if they were subsequently identified to be present in PL 302) (as described in Sections 4.2 and 4.3), primarily as a result of:

- infrastructure construction (earthworks activities);
- vehicle and plant movements;
- minor spills or leaks of fuels, chemicals or other produced fluids;
- storage and disposal of general waste, chemical and process wastes;
- loss of containment; and
- fire (ignition sources resulting from activities).

Santos aims to minimise the operational footprint and significant disturbance associated with its activities as far as reasonably practicable. However, potential direct and indirect impacts to flora and REs (native remnant vegetation) and potentially to ESAs resulting from the proposed activities may include:

- loss of ecosystem functioning;
- loss of species population, further endangerment and loss in species diversity; and
- introduction and / or spread of weeds, pest plants, animals and pathogens.

The proposed petroleum activities would directly impact up to 23.2 hectares of remnant native vegetation comprising 'least concern' RE. This estimate is conservative given the explicit locations of proposed wells and infrastructure are currently unknown i.e. final drilling targets are subject to the findings of exploration (seismic surveys and subsurface confirmation through exploration drilling). However, in the case of PL 302, based on past drilling activity and current understanding of prospects in the tenure, future drilling activity is highly likely to be restricted to the southern section of the tenure.

For the purposes of impact assessment, the preliminary disturbance footprint is likely to occur entirely within the southern section of PL 302 in RE 5.9.3, which is predominantly a 'low constraint' area with the exception of minor areas of 'moderate constraint' MSES regulated vegetation - intersecting a watercourse and buffers (refer to Figure 2 to Figure 4). The preliminary disturbance footprint may cause disturbance to areas of 'moderate constraint' MSES regulated vegetation - intersecting a watercourse, but it will otherwise not disturb the 'moderate constraint' DOR mapped timbered woodlands (REs 5.5.2 and 5.5.4) located in the north-eastern section of the tenure (refer to Figure 2). There are no 'High constraint' areas located on PL 302. As such, the assessment of impacts within this report takes an informed approach and simulates a probable disturbance scenario.

Disturbance would occur progressively over a 10 to 20 year period and includes the development of areas, such as flowline alignments, which are subject to temporary disturbance only. The bulk (approximately 7.8 ha) of these areas would be reinstated and permitted to naturally revegetate immediately following completion of construction activities, thereby reducing the overall development footprint.

The proposed RE disturbance represents a very minor portion of the total area the REs occupy in the broader Channel Country bioregion, and the greater Cooper Basin bioregion – disturbance of which is already authorised under the existing EA (EPPG00641613). Santos would maximise avoidance of REs 5.5.2/5.5.4 and 5.3.21a as far as practicable. These REs are moderate constraint areas and may provide suitable habitat for NC Act listed flora and fauna species.

Further, the PL may provide suitable habitat for *Indigofera oxyrachis* (i.e. REs 5.5.2 and 5.5.4). However, as discussed above, the preliminary disturbance footprint is likely to occur entirely within RE 5.9.3, which does not comprise habitat for *Indigofera oxyrachis* (refer to Section 4.2). Management measures have been identified to identify and mitigate impacts on the species should disturbance be required in suitable habitat (refer to Table 5-1). Given proposed management measures, the proposed activities are unlikely to result in a significant impact.

As stated in Section 4.3, no ESAs are mapped or have been identified to be present within PL 302, however future surveys or changes in ESA definitions may result in ESAs being identified in the tenure. If this were to occur, EA conditions contained in EA (EPPG00641613) and management strategies outlined in Table 5-1 would mitigate potential impacts to ESAs.

Management (control) strategies, risk sources, potential impacts and the level of risk associated with the proposed activities are summarised in Table 5-1. The results of the risk assessment indicate that residual risks to flora, REs (native remnant vegetation) and ESAs as a result of the proposed activities are classified as 'low'.

5.3 Fauna

The proposed activities will result in direct and indirect impacts to fauna and/or fauna habitat (as described in Section 4.4), primarily as a result of:

- infrastructure construction (earthworks activities);
- entrapment in voids and pipelines;
- vehicle and plant movements;
- fire (ignition sources resulting from activities);
- storage and disposal of general waste, chemical and process wastes;
- loss of containment; and
- seismic source.

Santos aims to minimise the disturbance and risk posed to fauna associated with its activities as far as reasonably practicable. However, potential direct and indirect impacts to fauna resulting from the proposed activities may include:

- loss of ecosystem functioning
- loss of species population, further endangerment and loss in species diversity
- disturbance, injury or loss of fauna and livestock; and
- introduction and / or spread of weeds, pest plants, animals and pathogens.

As described in Section 5.2, the proposed activities will result in direct disturbance of up to 23.2 ha (or 1.9% of the total tenure area), of which, approximately 7.8 ha will be rehabilitated post-construction. This estimate is conservative given that the locations of proposed wells and infrastructure are currently unknown. However, as discussed in Section 5.2, based on past drilling activity and current understanding of prospects in PL 302, future drilling activity is highly likely to be restricted to the southern section of the tenure.

For the purposes of impact assessment, the preliminary disturbance footprint is likely to occur entirely within the southern section of PL 302 in RE 5.9.3, which is predominantly a 'low constraint' area with the exception of minor areas of 'moderate constraint' MSES regulated vegetation - intersecting a watercourse and buffers (refer to Figure 2 to Figure 4).

Using this approach, E2M (refer to Appendix A) calculated the proposed activities may require clearing of protected wildlife habitat of up to approximately:

- 23.2 ha of suitable habitat for Grey Falcon, which represents 1.9% of the species habitat identified within the PL. The preliminary disturbance footprint is likely to avoid mapped timbered woodlands (REs 5.5.2 and 5.5.4), which comprise breeding habitat for the species. The preliminary disturbance footprint is likely to occur entirely within RE 5.9.3, which provides foraging habitat only for the species. The proposed clearing comprises a negligible proportion of the species foraging habitat, which is widely available within and surrounding the PL. The preliminary disturbance footprint represents a negligible proportion of the home range for Grey Falcon individuals/pairs, which are a highly mobile nomadic species (E2M, 2021).
- 23.2 ha of suitable habitat for White-throated Needle-tail, which represents 1.9% of the species habitat identified within the PL. In Australia, the species is primarily aerial, from heights of 1 m up to 1000 m above the ground, and the species does not breed in Australia. The proposed disturbance is unlikely to interfere with the species foraging activities within the PL. The preliminary disturbance footprint represents a negligible proportion of the habitat available to this wide-ranging nomadic species (E2M, 2021).
- 23.2 ha of Short-beaked Echidna habitat, which represents 1.9% of the species habitat identified within PL 302. As this species' habitat is extensively available throughout the PL, and given proposed management measures, this is unlikely to result in a significant impact.

Santos will maximise avoidance of REs 5.5.2/5.5.4 and 5.3.21a as far as practicable. These REs, as displayed in Figure 4, are 'moderate constraint' areas and that may provide suitable habitat for NC Act listed flora and fauna species.

More generally, other listed species identified in Section 4.4 as likely to occur within PL 302 are NC Act listed near threatened, special least concern and/or migratory species. These species only utilise the project area from time to time, and the area only provides generally suitable habitat for the species. Impacts to these species as a result of the proposed activities are expected to be minor, short-term and localised, or will otherwise be mitigated by a range of management (controls) strategies (as summarised in Table 5-1). As a result, the proposed activities and associated disturbance are unlikely to impact local or broader populations of these species.

Management (control) strategies, risk sources, potential impacts and the level of risk associated with the proposed activities are summarised in Table 5-1. The results of the risk assessment indicate that residual risks to fauna as a result of the proposed activities are classified as 'low'.

5.4 Surface Water

The proposed activities may result in direct and indirect impacts to surface water (as described in Section 4.5), primarily as a result of:

- infrastructure construction (earthworks activities);
- vehicle and plant movements;
- storage and disposal of general waste, chemical and process wastes;
- well control or well head equipment failure;

- minor spills or leaks of fuels, chemicals or other produced fluids;
- production operations;
- loss of containment; and
- flood (natural event).

Santos aims to minimise the operational footprint and significant disturbance associated with its activities as far as reasonably practicable. However, potential direct and indirect impacts to surface water resulting from the proposed activities may include:

- disturbance to natural drainage patterns;
- degradation of water quality from sediment releases, spills or leaks of fuels and chemicals;
- impacts to aquatic flora and fauna from sediment releases, spills or leaks of fuels and chemicals; and
- contamination of surface water.

As described in Sections 4.1 and 4.5, there are no wetlands or major watercourses mapped in PL 302, and the tenure is located on elevated land systems (Land zones 5 and 9) approximately 16 km east of the Cooper Creek floodplain. Watercourses within PL 302 are minor and highly ephemeral, with high flow variability in response to infrequent large rainfall events, typical of the majority of the wider Cooper Basin. These minor watercourses and drainage lines merge with the braided channels of Cooper Creek located to the west.

Management (control) strategies, risk sources, potential impacts and the level of risk associated with the proposed activities are summarised in Table 5-1. The results of the risk assessment indicate that residual risks to surface water as a result of the proposed activities are classified as 'low'.

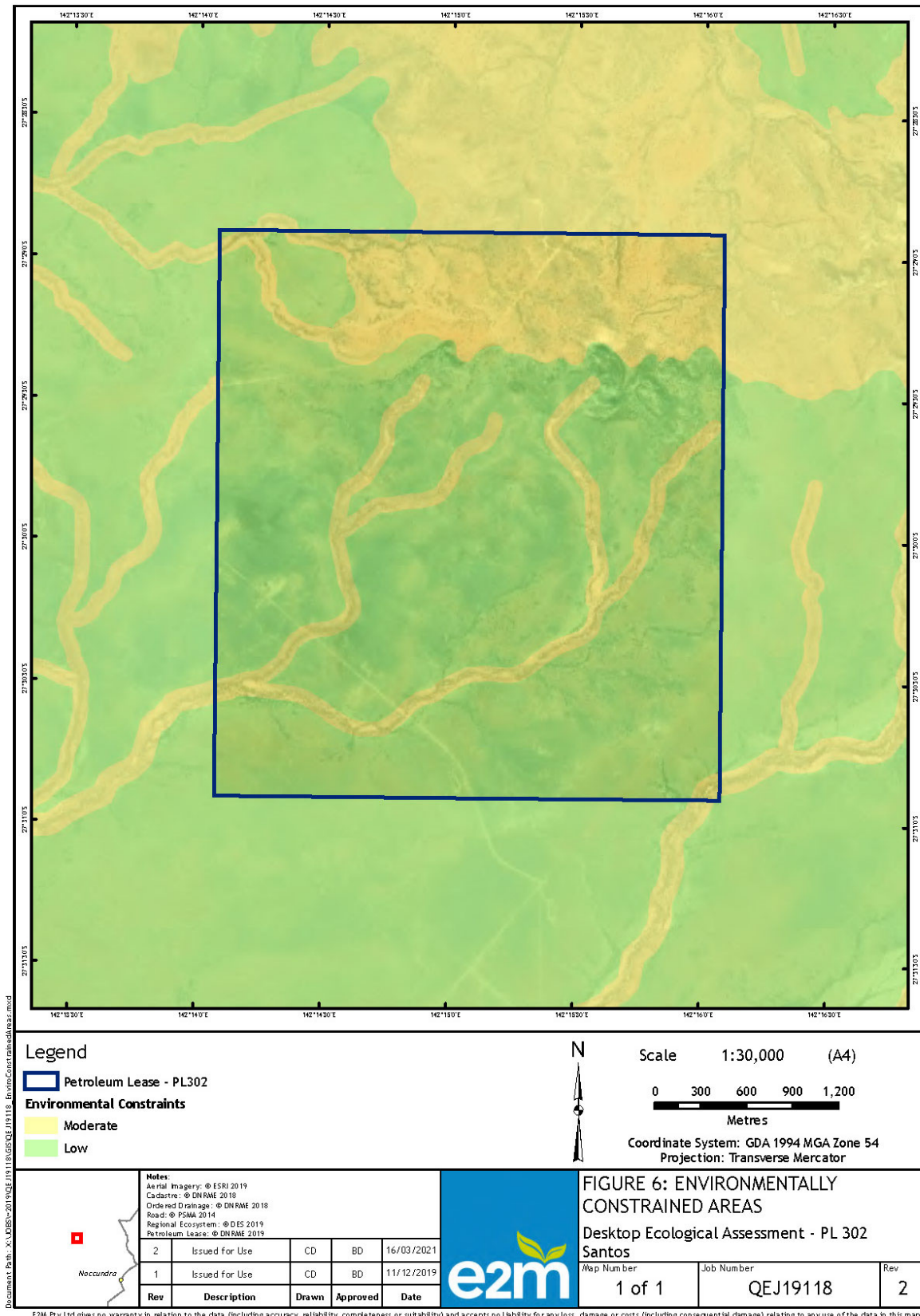


Figure 4: Environmental Constraints Areas by E2M – PL 302

5.5 Groundwater

The proposed activities may result in direct and indirect impacts to groundwater (as described in Section 4.6) primarily as a result of:

- drilling and hydraulic stimulation / fracturing activities;
- production operations;
- well control or well head equipment failure;
- well casing or cement failure (well integrity failure);
- minor spills or leaks of fuels, chemicals or other produced fluids;
- loss of containment;
- storage and disposal of general waste, chemical and process wastes; and
- vehicle and plant movements.

These risk sources may result in the following potential impacts:

- contamination of groundwater resources;
- crossflow, aquifer contamination or reduction in pressure in aquifers;
- reduction in groundwater quantity and/or availability for other users; and
- impacts to groundwater dependant ecosystems.

As discussed in Section 4.6, the proposed activities would co-produce groundwater as a by-product of gas extraction is anticipated from the Toolachee, Patchawarra and Epsilon Formations of the Cooper Basin.

Santos South West Queensland (SWQ) Underground Water Impact Report (UWIR):

As discussed in Section 4.6, the 2019 UWIR (Santos, 2019) assesses cumulative drawdown impacts from oil and gas extraction from the Cooper and Eromanga basins across SWQ.

Since 2013, the decision has been taken to use modelling to generate an “indicative estimate of the magnitude of potential drawdown in the target beds and neighbouring formations in the immediate and long-term scenarios” as stated in the SWQ UWIR.

UWIR Modelling Philosophy:

The modelling philosophy for the successive iterations of the SWQ UWIR comprises a design that provides an indicative estimate of the magnitude of potential drawdown in the target beds and neighbouring formations in the immediate and long-term scenarios” as described in the UWIR.

This approach is considered reasonable given the need to assess the potential connectivity of a conventional hydrocarbon reservoir. In conventional reservoirs, the naturally occurring hydrocarbons, such as crude oil or natural gas, are trapped by overlying rock formations with lower permeability. Conventional reservoirs only exist because the vertical connectivity is so poor that the oil and gas have accumulated over geological timescales (i.e. millions of years). If there were any vertical connectivity, hydrocarbons would continue to migrate through the system and not be able to accumulate. This is the defining feature of conventional reservoirs. The geology of the Eromanga and Cooper Basins, including hydrocarbon trapping mechanisms and environmental values, is discussed in detail in Section 4 of the SWQ UWIR.

Successive iterations of the SWQ UWIR present findings from an analytical and 'steady-state' (as opposed to numerical and 'time-dependent') groundwater model. As presented in the SWQ UWIR, the decision to model the system in this way was based on the following constraints and opportunities:

- Depth of extraction: Santos extracts associated / produced water from depths greater than 2,000m bgl in the Cooper Basin and for more than 90% of Eromanga Basin wells, deeper than 1,000m bgl. It is noted that most private bores in the Eromanga Basin target the upper (Quaternary and Tertiary) formations (upper 300m) where economic hydrocarbons are not present.
- Stratigraphic settings: numerous confining beds separate the deeper target hydrocarbon bearing formations and the upper aquifers which are accessed primarily by private users for water supply.
- Geographic extent: Santos' SWQ operations cover an area in excess of 8,000km² and are classified as remote. The density of all extraction activities (comprising both oil and gas extraction from reservoirs and water extraction from aquifers) is very low.
- Data availability: Any modelling is constrained by the availability of data to inform that model. There is a general paucity of data, given the depth of extraction, stratigraphic setting and geographical extent of Santos' SWQ operations, which means it is only possible to model the system at a coarse scale.

The following model assumptions are incorporated to compensate for a lack of data to inform a more detailed model parameterisation and are commensurate with the modelling philosophy. These assumptions will typically overestimate drawdown in overlying formations such as water bearing aquifers:

- Steady-state drawdown calculations: These assume the drawdown after pumping for effectively an infinite amount of time. It defines the new 'steady-state equilibrium' that will be reached if extraction continues forever. This is in contrast to time dependent modelling which will model the drawdown at a specific time-step (e.g. at 3 years, or the worst drawdown throughout an operational lifetime of 40 years before pressures are allowed to recover).
- Extraction rates higher than observed or predicted: The modelled extraction rate used to estimate drawdown will exceed the actual extraction rate (refer to Section 7.1.2 of the SWQ UWIR) insofar that:
 - o For the purposes of Immediately Affected Area (IAA) predictive modelling of both the Eromanga and Coopers Basins, Santos has used extraction data from the last year of historical data (2019) to represent future extraction rates. These values are considered to be representative over the next three years. This was considered conservative as the actual extraction is likely to decline over this period.
 - o Long Term Affected Area (LTAA) predictive modelling assumes the water production rate increases linearly with the number of additional wells planned in the future (where in fact the number of operational wells is unlikely to increase at the same rate as older wells would be expected to be decommissioned from service) – and continue in perpetuity.
- High model permeabilities: The model assumes high permeabilities for the reservoir production zone, and also the immediately overlying formations/aquitards (i.e. model layers 3-5). The Kh (horizontal permeability) range is 1 x 10⁻² to 1 x 10⁻³ m/d, and Kv (vertical permeability) range is 1 x 10⁻⁴ to 1 x 10⁻⁵ m/d. For comparison, the 2019 UWIR for the Surat CMA had Kh range of 1 x 10⁻² to 1 x 10⁻⁴ m/d, and Kv range of 1 x 10⁻⁴ to 1 x 10⁻⁷ m/d.

This shows the SWQ UWIR assumes two orders of magnitude greater horizontal permeability and one order of magnitude greater vertical permeability. Noting that this comparison demonstrates higher vertical permeabilities in formations overlying the conventional reservoirs in SWQ versus the unconventional (coal seam gas) reservoirs of the Surat Basin. Since conventional reservoirs must be overlain by low permeability units, this demonstrates the modelled vertical permeabilities values are extremely conservative.

- Stratigraphy typical of the shallowest part of basin: 90% of wells in the Eromanga Basin extract from reservoirs located ~1000m below ground level. However, the model assumes these wells are much shallower, from 620m to 900m below ground level.

The approved approach to assessing potential groundwater impacts within the successive iterations of the SWQ UWIR is commensurate to the lack of risks and impacts due to a lack of receptors and hydraulic connectivity in general. Monitoring of reservoir pressures would provide limited value in validating the model assumptions, since the assumptions are intentionally conservative. If the predicted drawdown do not result in any unacceptable prediction of impact or the management or mitigation of potential impact to other environmental values other than make good of impact to water bore supplies (none of which have yet required any make good measures), then validation of a highly conservative model should not be required, other than to confirm that shallow and useable aquifers remain unaffected by resource development, as proposed.

In early 2021, Santos engaged Golder to update the existing Cooper and Eromanga Basin groundwater models used in the 2019 UWIR with a revised number of proposed oil and gas wells, including additional petroleum wells in PL 302. The number of wells was revised to assess the potential effect of the additional oil and gas wells being sought by this application (and future development plans). The assessment used the same groundwater impact assessment methodology described in the approved 2019 UWIR (Santos, 2019). A Technical Memorandum (Golder, 2021) is attached as Appendix C and provides a summary of the findings of this assessment.

The number of existing wells has not changed, thus the predicted IAA is not updated from that reported in the 2019 UWIR. The number of long-term oil and gas wells were updated based on an updated configuration of proposed wells. This results in an updated assessment of the LTAA relative to the 2019 UWIR. The outcomes of the revised assessment show a small change as compared to the 2019 UWIR. For example, the revised simulated LTAA drawdown contours identified an increase in the number of registered groundwater bores (from 2 bores to 5 bores) to be affected by modelled impacts (Golder, 2021). Refer to the Technical Memorandum for further information (attached as Appendix C).

Underground Water Monitoring

Section 9 of the SWQ UWIR presents the past and future Underground Water Monitoring in relation to the findings of the SWQ UWIR, as well as the current monitoring strategy.

The stated objective of the monitoring strategy described in Section 9, and which has been approved by the DES since 2013, is the early detection and protection for impact to shallow aquifers and the Hooray Sandstone aquifer within, and adjacent to, the study area.

This monitoring has been undertaken in accordance with the monitoring strategy articulated in each successive iteration of the SWQ UWIR which have been approved by DES.

Features of the water monitoring strategy include:

- implemented since the first SWQ UWIR was approved in 2013, and currently provides ~7 years of reliable trend data.
- monitoring of water depth/pressure and water quality at bores within the IAA.

- monitoring of third-party water supply bores. These are “low-use” stock bores which are adequate for the purpose of monitoring long-term groundwater level trends; and
- monitoring data is reviewed annually. The data, and the conclusions which can be drawn from the data, is provided to DES each year as part of the SWQ UWIR annual report.

Monitoring to date has shown that groundwater levels in usable aquifers are stable, and there is no clear depressurisation of the monitored aquifers throughout the monitoring period.

This is supported by observations recorded from 1990 to 2011, as reported in Section 5.5 of the SWQ UWIR, which show that for all except the target reservoir formations, water level trends are generally stable or upward trending.

Monitoring plans have been revised in subsequent iterations of the South West Queensland UWIR to reflect the practical operability of each monitoring point. Most monitoring points remain operational and provide a good time series of data points since monitoring commenced in 2013.

Monitoring of the reservoirs is not proposed as it will not provide data that can be used to validate the model. This is because the model incorporates highly conservative assumptions (refer to UWIR Modelling Philosophy above) to demonstrate a general lack of potential for depressurisation impact to overlying formations. Monitored reservoir depressurisation is almost certainly not going to be adequately modelled, for example:

- by overestimating the water abstraction rate and duration, the monitored depressurisation of the reservoir may be greater than predicted by the model because less water is extracted and over a much shorter duration than assumed by the model.
- by overestimating the vertical permeability and connectivity with aquifers, the monitored depressurisation of the reservoir may be far less than predicted by the model because there is far less ‘leakage’ from overlying formations than assumed by the model.

Santos SWQ UWIR Modelling – PL 302:

- The modelling predicts the IAA (after 3 years) and LTAA (after 20 years) from groundwater extraction from existing and planned wells. The IAA model used extraction rates from the last historical extraction year (2019) to represent future extraction rates.
- The LTAA used these historical extraction rates (2019) and added the extraction from 861 petroleum wells in the Cooper Basin (212 existing wells, 649 new wells) and 692 petroleum wells in the Eromanga Basin (250 existing wells, 442 new wells) –
 - the modelling considered extraction from up to 6 proposed gas wells within PL 302 (refer to Golder, 2021 attached as Appendix C).
 - Note: as discussed in Section 2.0, this application considers an additional 2 gas wells located within PL 302. The modelling was run to consider a potential long-term development scenario for PL 302.
- The ‘affected area’ was defined as those areas with two metres of drawdown in the shallow alluvial aquifers or more than five metres of drawdown in the deeper consolidated aquifers.
- The modelling identified:
 - development of up to 6 gas wells within PL 302 is predicted to result in an insignificant change to the predicted impact to groundwater resources.
 - a summary of the bores that may be potentially impacted in the long-term is summarised in Appendix C, and shows an additional two bores (RN358, RN16066) in the long-term

affected area, however these bores only just exceed the drawdown impact threshold as defined by Chapter 3 of the *Queensland Water Act 2000* (QWA).

- Under Chapter 3 of the QWA, mitigation would only be required when the impact was in the Immediately Affected Area, and so immediate management action is not required, and the UWIR reporting framework will adequately ensure appropriate action is taken to manage and mitigate these drawdown effects at the right time.
- As discussed in Section 4.6, there are no GAB discharge or recharge springs within or near PL 302. The closest GAB springs are located more than 200km from PL 302. These springs are too far away to be at risk of hydraulic impact due to the proposed activities on PL 302. Potential impacts to groundwater environmental values due to exercising underground water rights are further discussed in Section 6.1.3.
- Terrestrial GDEs, and shallow alluvial aquifers supporting potential GDEs are mapped to potentially occur within the tenure (DES, 2018). UWIR groundwater modelling demonstrates that groundwater pressure in the shallowest formations, which may be hydraulically connected to and support GDEs, will not be impacted by the exercise of existing underground water rights on PL 302. This would remain the case for the development of any additional wells on PL 302 due to the vertical separation between hydrocarbon target formations for the proposed wells and the location of any potential GDEs that may be dependent on shallow groundwater.
- There is one registered groundwater bore located within PL 302 (Bogala North 1, RN 23621). Bogala North 1 was an unsuccessful oil exploration well drilled by Delhi Petroleum in 1987. The well was completed as a water well in the Winton / Surficial Formation of the Eromanga Basin. Impacts to this bore are possible if it is still in use.
- As discussed above, the maximum estimated drawdown in the IAA due to extraction from the Eromanga Basin in the Tertiary and Quaternary strata (including the Glendower and Winton Formations) is predicted to be less than 2 metres. The maximum estimated long term drawdown in the same units is predicted to be less than 4 metres. Santos will ensure that water quality baseline monitoring and stimulation impact monitoring is conducted in accordance with EA conditions, approved UWIR and the *Water Act 2000*. This will ensure that any impacts to this bore are detected early and action taken if required, by agreement with the affected bore owner (i.e. remediation of the bore or make good arrangements).
- The SWQ UWIR modelling results are conservative and worst-case. The actual drawdown is expected to be less than predicted based on the intermittent and time-limited operation of extraction wells, and the conservative assessment of flow rate assigned to each well in the model.

Potential impacts to groundwater environmental values due to exercising underground water rights are discussed further in Section 6.1.3.

Hydraulic Fracturing Activities:

There are key differences between coal seam gas and conventional oil and gas operations, both in the geographic and geological setting of the resource and the methodology for assessing the resource, that have substantial bearing on the risk profile presented by hydraulic fracturing activities. These include:

- Santos' conventional oil and gas operations in South West Queensland (SWQ) are located in an arid, sparsely populated area of central Australia. Whilst groundwater is an important water supply source to support rural land uses, the extent of groundwater supply development is limited.

- In Santos' SWQ operations, the hydrocarbon reservoirs generally occur in anticlines capped with thick, laterally-extensive low permeability formations that isolate the reservoirs from overlying water-bearing formations.
- The oil and gas reservoirs in SWQ are very deep, of the order of 1,500 to 3,000 m below ground level, which provides hundred to thousands of metres vertical separation between the formations in which fracturing activities have occurred or are proposed to occur and the shallow groundwater resources.

As discussed in Section 4.6, the additional wells planned as part of the proposed amendment application will target gas extraction from the Toolachee, Patchawarra and Epsilon Formations of the Cooper Basin. The Toolachee, Patchawarra and Epsilon Formations are located at vertical depths of greater than 2,000m. There is a vertical separation between the Toolachee formation and groundwater users of over 1,300m. The large vertical separation between the depth to extraction of the gas reservoirs and groundwater users, and the low permeability seal rocks over the Murta formation help to ensure limited vertical connectivity between the oil and gas reservoirs and groundwater users and as such minimise potential for environmental harm to groundwater. Within formations that host both aquifers and hydrocarbon reservoirs (e.g. Hooray Sandstone), the water-bearing zones are separated from hydrocarbon reservoirs by intra-formational seals. Santos operational procedures monitor fracture design to stay within the target formation.

Santos also ensures that the risk of environmental harm to groundwater formations is negligible by ensuring that hydraulic fracturing processes are undertaken in accordance with the Queensland Government's *Code of Practice for the Construction and Abandonment of Coal Seam Gas and Petroleum Wells, and Associated Bores in Queensland* (DNRME, 2018).

A hydraulic fracturing risk assessment (HFRA) for Santos' oil and gas production operations throughout South-West Queensland, including PL 302 areas, has been prepared by Golder Associates (attached as Appendix E).

The HFRA has 2 volumes:

- Volume 1 discusses the environmental and geological settings within which Santos' fracturing operations take place and the general techniques for the drilling, completion and fracturing of wells. The HFRA details why hydraulic stimulation is essential in SWQ and outlines Santos' forward program (subject to ongoing review) for fracture-stimulation.
- Volume 2 relates specifically to the fracturing fluids used by Santos' Fracturing Service Providers (e.g. Halliburton, Schlumberger) and considers the ecological and human health toxicity of the chemical constituents in the fracturing fluids and includes an exposure assessment and risk characterisation based on a review of complete exposure pathways and controls to mitigate exposure.

The Queensland Government's Gasfields Commission publishes data on well integrity. They have concluded that when such national and international codes are used then the likelihood, and therefore risk, of well integrity failure resulting in underground leakage is assessed to be low to near zero (Queensland Gasfield Commission, 2015). In summary, the combination of remote project location, limited water supply development, best practice operational procedures and controls and vertical separation of the petroleum reservoir from any primary groundwater supply aquifers results in a low risk profile to groundwater from petroleum activities.

Management (control) strategies, risk sources, potential impacts and the level of risk associated with the proposed activities are summarised in Table 5-1. The results of the risk assessment indicate that residual risks to groundwater as a result of the proposed activities are classified as 'low'.

5.6 Air Quality

The proposed activities may result in impacts to air quality primarily as a result of:

- infrastructure construction;
- vehicle and plant movements;
- seismic source;
- minor air emissions generated from vehicles and equipment; and
- air emissions vented from testing and production activities.

Santos aims to minimise the operational footprint and significant disturbance associated with its activities as far as reasonably practicable. However, potential direct and indirect impacts to air quality values resulting from the proposed activities may include:

- air pollution and localised reduction in air quality;
- nuisances caused by dust and light; and
- disturbance to fauna and livestock.

These potential air quality impacts from the petroleum activities within PL 302 would be consistent with those associated with the existing petroleum activities and pastoral activities.

The primary air pollutants generated during construction, drilling and operations would consist of minor dust and exhaust emissions (NO_x, CO, volatile organic compounds and PM₁₀) from operating vehicles, plant, machinery and wellhead equipment (e.g. pumps).

These relatively minor dust and exhaust emissions would be localised and highly unlikely to significantly impact the air quality environmental values of PL 302 provided that the mitigation measures listed in Table 5-1 are carried out.

These emissions would be unlikely to cause nuisance to the nearest sensitive receptors (Santos Jackson Camp and Nockaburrawarry Outstation), which are located approximately 18 and 45 km from the boundary of PL 302. Many of the sources will also be temporary, occurring only through the construction period, or by workovers or intermittent site visits during operation.

An air quality impact assessment has not been undertaken for this development given the small number of new emission sources, the remote nature of the location, the lack of other industry / pollutant sources in the region and the absence of sensitive receptors. The application seeks authority to construct, drill and operate petroleum wells and associated supporting infrastructure. It does not propose the use of fuel burning or combustion equipment that has the potential to emit more / different pollutants on a continuous basis.

Management (control) strategies, risk sources, potential impacts and the level of risk associated with the proposed activities are summarised in Table 5-1. The results of the risk assessment indicate that residual risks to air quality and acoustic / noise values as a result of the proposed activities are classified as 'low'.

5.7 Noise

The proposed activities may result in impacts to acoustic / noise values (as described in Section 4.8), primarily as a result of:

- infrastructure construction;

- vehicle and plant movements;
- seismic source; and
- noise generated during drilling and hydraulic stimulation / fracturing activities and production operations.

Santos aims to minimise the operational footprint and significant disturbance associated with its activities as far as reasonably practicable. However, potential direct and indirect impacts to acoustic values resulting from the proposed activities may include:

- nuisance caused by vibration and noise generation; and
- disturbance to fauna and livestock.

Potential noise emissions from the proposed petroleum activities within PL 302 would be consistent with those associated with the existing petroleum activities and pastoral activities.

Santos manages noise generating activities in accordance with the 'management hierarchy for noise' set out in the *Environmental Protection (Noise) Policy 2019* (EPP Noise). Noise generated by the proposed activities will be generally consistent with 'typical sound power levels for petroleum activities' as described in Table 1 of the *Guideline Noise Assessment - Prescribing noise conditions for environmental authorities for petroleum activities* (DES, 2013).

Noise generated by the proposed activities is expected to be generally consistent with that generated by existing agricultural activities undertaken in the region. Furthermore, noise generated by the proposed activities is highly unlikely to cause nuisance to the nearest sensitive receptors (Santos Jackson Camp and Nockaburrawarry Outstation), which are located approximately 18 and 45 km from the boundary of PL 302. Therefore, nuisance impacts from noise generation by the proposed activities at the nearest sensitive receptor are highly unlikely. Noise levels associated with the proposed activities may result in localised impacts (disturbance) to fauna and livestock located in the immediate area surrounding operational sites (i.e. the immediate 100-200 m buffer around a well lease) however, these impacts are largely expected to be short-term and are not expected to result in significant ongoing impacts to local fauna populations, or impact use of the area by livestock.

Management (control) strategies, risk sources, potential impacts and the level of risk associated with the proposed activities are summarised in Table 5-1. The results of the risk assessment indicate that residual risks to acoustic / noise values as a result of the proposed activities are classified as 'low'.

5.8 Matters of State Environmental Significance

The proposed activities will potentially result in direct and indirect impacts to MSES (as described in Section 4.9). Desktop assessment conducted by E2M concluded that after the application of avoidance, minimisation and mitigation measures (as outlined throughout this application, in relevant sections of the risk assessment, and in Appendix A), the proposed activities are unlikely to have a significant residual impact on MSES occurring within PL 302. The risk of a Significant Residual Impact to MSES is assessed in Section 6.2.

Table 5-1: Environmental Risk Assessment

| Identification | | | | Unmitigated Risk | | | Control Strategies | Residual Risk | | |
|--|----------------|--|---|------------------|------------|--------|--|---------------|------------|------|
| Risk Event / Activity | Relevant EV | Potential Impact | Risk Source | Consequence | Likelihood | Risk | | Consequence | Likelihood | Risk |
| <p>Seismic surveys</p> <p>Construction and operation of wells, gathering lines, access tracks, borrow pits and incidental activities</p> <p>Well drilling and hydraulic fracturing</p> | Land Resources | <p>Reduction in visual amenity</p> <p>Soil erosion, topsoil loss, inversion and compaction</p> <p>Disturbance to land use and suitability changes</p> <p>Reduction in agricultural productivity</p> <p>Contamination of soil</p> | <p>Infrastructure construction (earthworks activities)</p> <p>Vehicle and plant movements</p> <p>Minor spills or leaks of fuels, chemicals or other produced fluids</p> <p>Production operations</p> <p>Loss of containment</p> <p>Storage and disposal of general waste, chemical and process wastes</p> <p>Risks posed by fire (ignition sources resulting from activities); and</p> <p>Bushfire and flood (natural events)</p> | III | d | Medium | <p>General</p> <ul style="list-style-type: none"> Compliance with relevant Environmental Authority conditions, and all relevant internal and external approvals in place before work undertaken. All disturbance undertaken in accordance with Santos standards. Appropriate emergency response plans in place. Restricted access to site/s. Industry standards and good industry practices are followed. <p>Land Resources</p> <ul style="list-style-type: none"> Surface disturbance restricted to the minimum area required to safely carry out activities. Consider alternate routes, locations and construction methods during planning and scouting phases to minimise environmental impacts. Where practicable, use existing routes / disturbed ground, and co-locate access tracks and gathering lines to reduce the total disturbance area. Existing unrestored borrow pits are used in preference to establishing new pits. Impacts to sensitive areas are mitigated through implementation of appropriate construction and maintenance practices as detailed in the scope of works, approval documents and company procedures. Topsoil stockpiles separated from subsoil and maintained to preserve the seedbank (where practicable). Erosion and sediment control measures in place where appropriate. Infrastructure and seismic lines located to minimise impacts to drainage patterns, soil and vegetation, and avoid significant cut and fill. Vehicle and plant movements <ul style="list-style-type: none"> No unauthorised off-site driving. Access track maintenance (and watering) carried out as required to reduce dust generation. Active promotion of appropriate road use behaviours, and the setting of appropriate speed limits for Santos personnel and contractors. Work is scheduled to fit in with stock locations and the mustering schedule. Fire / Flood <ul style="list-style-type: none"> Activity planning will consider seasonal conditions and the risk of bushfire and flood. Work programs in riparian / water crossing areas scheduled to take into account seasonal conditions and rainfall / flood likelihood. Emergency response procedures should contain a fire and flood response procedure. Personnel are informed on the fire danger season and associated restrictions. Ignition sources are controlled via permit to work. Measures undertaken to reduce potential impacts of fire and flooding where appropriate (e.g. installation of fire breaks, bunds, removal of fuels/chemicals and sump contents (where appropriate / safe to do so) prior to arrival of fire or flood event). Construction activity not undertaken during or immediately prior to flooding. Fuel, oil and chemical storage and handling <ul style="list-style-type: none"> Fuel, oil and chemical storage and handling undertaken in accordance with Australian standards and guidelines (i.e. in bunded areas) and in small volumes wherever practicable. Spill leak and drip trays provided to address minor drips and spills resulting from re-fuelling operations. Spill response equipment and materials kept on site and in operational vehicles (where appropriate). In the event of expected flooding, non-essential items/facilities such as chemicals, fuel and oil storages and waste receptacles removed from areas at risk of inundation (where appropriate / safe to do so). Contaminated areas will be fenced if a threat is posed to stock or wildlife. Maintain a register of incidents and implement corrective actions based on outcome of investigations. Vehicles and equipment are operated and maintained in accordance with specifications to minimise the potential for a spill or leak (e.g. oil leak or hydraulic hose failure). Production operations <ul style="list-style-type: none"> Plant and equipment designed, constructed and operated in accordance with Santos Engineering Standards and relevant Australian/International standards. Infrastructure design process to address location and non-location specific threats (e.g. pipeline corrosion) and develop adequate controls to mitigate environmental and public/third party safety risk. Safety, testing, maintenance and inspection procedures implemented. Prestart-up checklist prior to commissioning and decommissioning activities. Pipeline construction integrity verification e.g. hydrotest. | III | c | Low |

| Identification | | | | Unmitigated Risk | | | Control Strategies | Residual Risk | | |
|---|-------------------------------------|--|--|------------------|------------|------|---|---------------|------------|------|
| Risk Event / Activity | Relevant EV | Potential Impact | Risk Source | Consequence | Likelihood | Risk | | Consequence | Likelihood | Risk |
| | | | | | | | <ul style="list-style-type: none"> Loss of containment <ul style="list-style-type: none"> Regular monitoring of control systems (e.g. emergency shutdown valves) to ensure that protection levels are adequate. Emergency spill response equipment on site. Loss of containment is managed via appropriate Santos incident management system, and implementation of corrective actions is based on incident investigation. Emergency response training for emergency response personnel. Waste <ul style="list-style-type: none"> Waste managed in accordance with the Waste Management Hierarchy, defined in Schedule 1 of the Environment Protection (Waste Management) Policy 2000. Where practicable, Santos would implement the waste management hierarchy, and reduce risks to environmental values from waste storage and disposal, by: <ul style="list-style-type: none"> designing activities to incorporate less resource-intensive materials and more efficient processes. designing contracts which encourage waste avoidance and set waste reduction targets. identifying and separating waste streams for re-use, recycling, treatment or disposal. storing waste in appropriate receptacles or designated areas prior to their re-use or collection for recycling, treatment or disposal. ensuring wastes are removed by transporters which are appropriately licensed or authorised to transport that particular waste type. ensuring all wastes removed from the site are recycled, treated or disposed of at an appropriately licensed waste facility. reviewing and auditing waste management practice to confirm legal compliance and identify opportunities for improvement. Treated sewage effluent (<21 EP) will be released to land provided it: <ul style="list-style-type: none"> is a signed contaminant release area(s); does not contain any properties nor contain any organisms or other contaminants in concentrations that are capable of causing environmental harm; does not result in pooling or run-off or aerosols or spray drift or vegetation die-off; minimises deep drainage below the root zone of any vegetation; and does not adversely affect the quality of shallow aquifers. Covered bins are provided for the collection and storage of wastes. Rubbish loads are covered during transport to a licensed waste facility. On site disposal of residual drilling material undertaken in accordance with mix bury cover method, or alternative method and quality criteria as certified by a suitably qualified third party. Hydraulic fracturing flowback fluid contained in lined pits or tanks, and removed from site for authorised reuse or disposal upon completion of operations. In the event of expected flooding, waste will be removed from areas at risk of inundation (where appropriate / safe to do so). Waste materials and non-essential infrastructure removed from operational areas as soon as reasonably practicable following petroleum activities. Rehabilitation <ul style="list-style-type: none"> Gathering line / pipeline ROW are immediately re-instated following gathering line / pipeline installation. Rehabilitation of significantly disturbed areas will commence within 12-months of no longer being required (unless an exceptional circumstance in the area to be rehabilitated (e.g. a flood event) prevents this timeframe being met). Areas potentially exposed to contamination will be assessed and remediated where required. Final rehabilitation of disturbed areas would be undertaken to achieve the final rehabilitation criteria conditions (as specified in the EA). Rehabilitation aims to reshape and stabilise disturbed areas to provide appropriate site conditions to facilitate natural revegetation processes, and will include the following activities (where appropriate): <ul style="list-style-type: none"> ripping of areas of compacted soil (except on sensitive soils / environments). respreding of stockpiled topsoil, vegetation and seed stock (where available) to facilitate natural revegetation; and restoration of natural landform contours. | | | |
| Seismic surveys Construction and operation of wells, gathering lines, access tracks, borrow pits and incidental activities | Flora, Regional Ecosystems and ESAs | Loss of ecosystem functioning Loss of species population, further endangerment and loss in species diversity Introduction and / or | Infrastructure construction (earthworks activities) Vehicle and plant movements Minor spills or leaks of fuels, chemicals or other | III | c | Low | <p>General</p> <ul style="list-style-type: none"> Assess proposed disturbance locations for the potential presence of high value flora and regional ecosystems before commencement of construction, and implement appropriate avoidance or mitigation measures. Refer to general control strategies listed under the Land Resources EV. <p>Flora, Regional Ecosystems and ESAs</p> <ul style="list-style-type: none"> Maximise avoidance of 'moderate constraint' areas (e.g. regulated vegetation - intersecting a watercourse and associated buffers). Maximise use of pre-disturbed areas (where practicable). Where practicable, clearing of mature trees avoided. Where practicable, branches lopped rather than removing whole trees or shrubs Ensure activities are located and undertaken in compliance with EA conditions F7, F8 and F9. | II | c | Low |

| Identification | | | | Unmitigated Risk | | | Control Strategies | Residual Risk | | |
|---|---------------|--|---|------------------|------------|--------|--|---------------|------------|------|
| Risk Event / Activity | Relevant EV | Potential Impact | Risk Source | Consequence | Likelihood | Risk | | Consequence | Likelihood | Risk |
| | | spread of weeds, pest plants, animals and pathogens | produced fluids Storage and disposal of general waste, chemical and process wastes Loss of containment Fire (ignition sources resulting from activities) | | | | <ul style="list-style-type: none"> <u>Introduction and / or spread of weeds, pest plants, animals and pathogens</u> <ul style="list-style-type: none"> Hygiene protocols implemented as appropriate to minimise the introduction, spread and persistence of weeds, pest plants, animals and pathogens. Access to and from the site via designated access tracks only. Vehicle and equipment wash-down when operations have been undertaken in areas of known weed infestations. Monitor for presence of weeds within the construction and operational areas, and where necessary implement control measures. Ensure that imported material is from an area or source considered to be pest plant/disease free. Threatened Flora <ul style="list-style-type: none"> Maximise avoidance of areas that may represent habitat for threatened flora (REs 5.5.2 and 5.5.4) and 'moderate constraint' areas as far as reasonably practicable. Should clearing of threatened flora be required, approval under the EPBC Act and/or NC Act may be required. Refer to control strategies for 'Vehicle and plant movements', 'Fuel, oil and chemical storage and handling', 'Waste', 'Loss of containment' and 'Fire' under the Land Resources EV. | | | |
| Seismic surveys Construction and operation of wells, gathering lines, access tracks, borrow pits and incidental activities | Fauna | Loss of ecosystem functioning Loss of species population, further endangerment and loss in species diversity Disturbance, injury or loss of fauna and livestock Introduction and / or spread of weeds, pest plants, animals and pathogens | Infrastructure construction (earthworks activities) Entrapment in voids and pipelines Vehicle and plant movements Fire (ignition sources resulting from activities) Storage and disposal of general waste, chemical and process wastes Loss of containment Seismic source | III | c | Low | <p>General</p> <ul style="list-style-type: none"> Refer to general control strategies listed under Flora and Regional Ecosystems and Land Resources EVs. <p>Fauna and Livestock</p> <ul style="list-style-type: none"> Maximise avoidance of 'moderate constraint' areas and REs 5.5.2/5.5.4 and 5.3.21a as far as reasonably practicable. Hollow logs (located on ground) within disturbance areas retained and shifted to adjacent undisturbed areas. Seismic energy sources are not operated within the distance defined by Santos standards of landholder infrastructure. Measures implemented to reduce risks to fauna from entrapment and injury in pipes and excavations, including: <ul style="list-style-type: none"> Facilities (e.g. borrow pits, well cellars) are designed and constructed as far as practicable to minimise impacts to fauna. Borrow pits are not established in locations which pose an unacceptable hazard to livestock. Sumps, mud pits and other pits holding fluid are fenced as appropriate to minimise fauna (medium to large) and livestock access. Pipes capped to prevent fauna entrapment during construction or after abandonment. Minimising the period trenches remain open to as short as reasonably practicable. Regular inspections of open trenches and prior to backfilling. Provision of escape ramps and refuge material for fauna that do enter trenches. <p>Threatened Fauna</p> <ul style="list-style-type: none"> Where threatened species nests are identified to be present, disturbance should be avoided. If disturbance cannot be avoided, clearing of the nest and a surrounding area should be postponed until after the relevant breeding season and/or incubation period. Clearing must not occur while the nest is active, with adults, eggs or nestlings. <u>Grey Falcon</u> <ul style="list-style-type: none"> Field and desktop based assessments will be undertaken to preferentially place infrastructure / disturbance outside of areas that are likely to represent Grey Falcon habitat (where practicable). Disturbance of areas that are likely to represent Grey Falcon habitat will be preferentially timed to occur outside of the breeding season for the species where practical. Preliminary disturbance footprint will avoid timbered woodlands (REs 5.5.2 and 5.5.4), which comprise breeding habitat for the species. Refer to control strategies for 'Vehicle and plant movements', 'Fuel, oil and chemical storage and handling', 'Waste', 'Loss of containment' and 'Fire' under the Land Resources EV. | II | c | Low |
| Seismic surveys Construction and operation of wells, gathering lines, access tracks, borrow pits and | Surface Water | Disturbance to natural drainage patterns Degradation of water quality from sediment releases, spills or leaks of fuels and chemicals | Infrastructure construction (earthworks activities) Vehicle and plant movements Storage and disposal of general waste, chemical and | IV | c | Medium | <p>General</p> <ul style="list-style-type: none"> Refer to general control strategies listed under the Land Resources EV. <p>Surface Water</p> <ul style="list-style-type: none"> Well leases constructed on high ground wherever practicable. Preferentially select dry crossing sites for linear infrastructure with minimal earthworks requirements. Pre-existing areas of disturbance used to place infrastructure or seismic lines wherever practicable. Culverts and floodways installed where required to maintain natural water flows, drainage and surface runoff. Areas subject to inundation are assessed for conduciveness to support vehicles prior to access. | IV | b | Low |

| Identification | | | | Unmitigated Risk | | | Control Strategies | Residual Risk | | |
|--|-------------|---|--|------------------|------------|--------|---|---------------|------------|------|
| Risk Event / Activity | Relevant EV | Potential Impact | Risk Source | Consequence | Likelihood | Risk | | Consequence | Likelihood | Risk |
| incidental activities Well drilling and hydraulic fracturing | | Impacts to aquatic flora and fauna from sediment releases, spills or leaks of fuels and chemicals Contamination of surface water | process wastes Well control or well head equipment failure Minor spills or leaks of fuels, chemicals or other produced fluids Production operations Loss of containment Flood (natural event). | | | | <ul style="list-style-type: none"> Erosion and sediment controls installed where necessary. Infrastructure and seismic lines located, prepared and constructed to maintain pre-existing surface water flows. Refer to control strategies for 'Vehicle and plant movements', 'Fuel, oil and chemical storage and handling', 'Waste', 'Production operations', 'Loss of containment' and 'Flood' under the Land Resources EV. Refer to control strategies for 'Drilling operations' under the Groundwater EV. | | | |
| Construction and operation of wells, gathering lines and incidental activities Well drilling and hydraulic fracturing | Groundwater | Contamination of groundwater resources Crossflow, aquifer contamination or reduction in pressure in aquifers Reduction in groundwater quantity and/or availability for other users Impacts to groundwater dependant ecosystems | Drilling and hydraulic stimulation / fracturing activities Production operations Well control or well head equipment failure Well casing or cement failure (well integrity failure) Minor spills or leaks of fuels, chemicals or other produced fluids Loss of containment Storage and disposal of general waste, chemical and process wastes Vehicle and plant movements | IV | c | Medium | <p>General</p> <ul style="list-style-type: none"> Refer to general control strategies listed under the Land Resources EV. Well drilling operations undertaken in accordance with the Code of Practice For the construction and abandonment of petroleum wells and associated bores in Queensland (DNRME, 2018). Hydraulic fracturing processes undertaken in accordance with the Code of Practice for the construction and abandonment of petroleum wells and associated bores in Queensland (DNRME, 2018). <p>Groundwater</p> <ul style="list-style-type: none"> <u>Drilling operations</u> <ul style="list-style-type: none"> Formation evaluation program and drilling program in place. Well design to leading practice. Blowout preventers (BOP) used once surface casing is installed. Regular BOP drills, testing, certification, and maintenance. Implementation of control measures and monitoring as documented in the Santos SWQ Underground Water Impact Report (UWIR) (refer to Appendix B). <u>Hydraulic fracturing operations</u> <ul style="list-style-type: none"> During the hydraulic fracturing process, Santos implements the following: <ul style="list-style-type: none"> Pressure tests of well casing and cement are conducted prior to hydraulic fracturing to confirm well integrity. Fluids utilised in hydraulic fracturing are subjected to a risk assessment prior to use. The material will not contain restricted fluids, including BTEX or the use of polycyclic aromatic hydrocarbons in concentrations above the reporting limit. Hydraulic stimulation procedures utilised by Santos and its contractors follow a design philosophy predicated on international best practice. This includes practices for ensuring mechanical well integrity and surveillance. Operational procedures monitor fracture design to stay within the target formation, thereby preventing interconnectivity between the target formation and an aquifer and minimising the potential for migration of stimulation fluids beyond the simulation impact zone. Hydraulic fracturing fluids and flowback are stored to prevent seepage to shallow groundwater. Fluids will be removed at the cessation of the hydraulic fracturing activity to an appropriate facility for reuse or disposal. Implementation of control measures described in Sections 4.6 and 6.1.3. Implementation of control measures and monitoring as documented in the Santos SWQ Underground Water Impact Report (UWIR) (Appendix B) and SWQ Hydraulic Fracture Risk Assessment (HFRA) (Appendix E). Implementation of the Santos Stimulation Impact Monitoring Program (SIMP). Refer to control strategies for 'Vehicle and plant movements', 'Fuel, oil and chemical storage and handling', 'Waste', 'Production operations' and 'Loss of containment' under the Land Resources EV. | IV | a | Low |

| Identification | | | | Unmitigated Risk | | | Control Strategies | Residual Risk | | |
|--|-----------------------|--|--|------------------|------------|------|---|---------------|------------|------|
| Risk Event / Activity | Relevant EV | Potential Impact | Risk Source | Consequence | Likelihood | Risk | | Consequence | Likelihood | Risk |
| <p>Seismic surveys</p> <p>Construction and operation of wells, gathering lines, access tracks, borrow pits and incidental activities</p> <p>Well drilling and hydraulic fracturing</p> | Air Quality and Noise | <p>Air pollution and localised reduction in air quality</p> <p>Nuisances caused by dust, light, vibration and noise generation</p> <p>Disturbance to fauna and livestock</p> | <p>Infrastructure construction</p> <p>Vehicle and plant movements</p> <p>Seismic source</p> <p>Minor air emissions generated from vehicles and equipment</p> <p>Air emissions vented from testing and production activities</p> <p>Noise generated during drilling and hydraulic stimulation / fracturing activities and production operations</p> | III | c | Low | <p>General</p> <ul style="list-style-type: none"> Refer to general control strategies listed under the Land Resources EV. Emergency shutdown systems in place. Fit for purpose equipment. Conduct regular testing, inspections and maintenance of site equipment. <p>Air Quality and Noise</p> <ul style="list-style-type: none"> Identification of sensitive receptors during planning: <ul style="list-style-type: none"> Nearest sensitive receptors are located approximately 18 to 45 km from the boundary of PL 302 (refer to Sections 5.6 and 5.7). Landholders consulted as required where activities may affect sensitive receptors and/or agricultural operations. Systems in place for logging stakeholder / landholder complaints to ensure issues are recorded and addressed as appropriate. Noise managed in accordance with 'management hierarchy for noise' set out in the Environmental Protection (Noise) Policy 2019 (Noise). Vehicles, engines and equipment operated and maintained in accordance with manufacturer specifications and planned maintenance systems. Use of attenuation / suppression devices where required e.g. silencing equipment on mobile plant Majority of vehicle movements will be limited to daylight hours. Dust suppression measures carried out where required e.g. road watering. Preference to flare rather than vent, and venting only in extreme circumstances. Seismic energy sources are not operated within the distance defined by Santos standards of any pipeline, infrastructure / utilities, installations or buildings. <p>Refer to control strategies for 'Vehicle and plant movements' under the Land Resources EV.</p> | II | c | Low |

6.0 Legislative Considerations

6.1 Environmental Protection Act 1994 (EP Act)

6.1.1 General Requirements for an EA Amendment Application (s226 EP Act)

Section 226 and 226A of the EP Act specifies the requirements for an EA amendment application. Table 6-1 contains a summary of the EP Act requirements assessed against this proposed amendment application.

Table 6-1: Requirements EA Amendment Application (s226 and s226A EP Act)

| Section of the EP Act | Relevance to amendment application |
|---|---|
| s226(1)(a) be made to the administering authority | The EA amendment application has been lodged with Department of Environment and Science (DES) who is the administering authority for the EP Act. |
| s226(1)(b) be made in the approved form | Refer to Attachment 1 of the application package, which includes the form Application to amend an environmental authority. |
| s226(1)(c) be accompanied by the fee prescribed under a regulation | The prescribed application fee was paid at lodgement of the EA amendment application. |
| s226(1)(d) describe the proposed amendment | Refer to Section 2.0. |
| s226(1)(e) describe the land that will be affected by the proposed amendment | Refer to Section 4.0. |
| s226(1)(f) include any other document relating to the application prescribed under a regulation. | Refer to the information provided throughout this supporting report. |
| s226A(1)(a) describe any development permits in effect under the Planning Act for the carrying out of the relevant activity for the authority; and | Not applicable - No development permits are in effect under the <i>Planning Act 2016</i> for the activities, which are the subject of this amendment application. |
| s226A(1)(b) state whether each relevant activity will, if the amendment is made, comply with any eligibility criteria for the activity | Not applicable – There are currently no eligibility criteria relevant to the activities proposed by the amendment application. |
| s226A(1)(c) if the application states that each relevant activity will, if the amendment is made, comply with any eligibility criteria for the activity— include a declaration that the statement is correct | Not applicable – There are currently no eligibility criteria relevant to the activities proposed by the amendment application. |
| s226A(1)(d) state whether the application seeks to change a condition identified in the authority as a standard condition | Not applicable - The respective EA does not contain any standard conditions. |
| s226A(1)(e) if the application relates to a new relevant resource tenure for the authority that is an exploration permit or GHG permit—state whether the applicant seeks an amended environmental authority that is subject to the standard conditions for the relevant activity or authority, to the extent it relates to the permit | Not applicable - the application does not relate to a new resource tenure that is an exploration permit or a GHG permit. |

| Section of the EP Act | Relevance to amendment application |
|--|---|
| s226A(1)(f) include an assessment of the likely impact of the proposed amendment on the environmental values, including— | |
| (i) a description of the environmental values likely to be affected by the proposed amendment; | Refer to Section 4.0. |
| (ii) details of any emissions or releases likely to be generated by the proposed amendment; | Refer to Section 5.0. |
| (iii) a description of the risk and likely magnitude of impacts on the environmental values; | Refer to Section 5.0. |
| (iv) details of the management practices proposed to be implemented to prevent or minimise adverse impacts; | Petroleum activities will be conducted in compliance with EA EPPG00641613 conditions and implementation of the environmental management practices/control measures outlined in Section 5.0. |
| (v) details of how the land the subject of the application will be rehabilitated after each relevant activity ceases; | Land within PL 302 subject to significant disturbance would be rehabilitated to meet the rehabilitation conditions required by EA EPPG00641613. |
| s226A(1)(g) include a description of the proposed measures for minimising and managing waste generated by any amendments to the relevant activity | The proposed amendment would not result in the generation of additional waste within the PL 302 area (outside of that already authorised by the existing EA). Waste management practices would continue to be implemented in accordance with the conditions of EA EPPG00641613. |
| s226A(1)(h) include details of any site management plan or environmental protection order that relates to the land the subject of the application; | Not applicable – There is no relevant site management plan or current Environmental Protection Orders (EPOs) relating to land located within PL 302. |

6.1.2 CSG activities requirements for an EA amendment application (s227 EP Act)

Section 227 of the EP Act, specifies the requirements for an amendment application for CSG activities where the application:

- a) relates to an EA for a CSG activity; and
- b) the proposed amendment would result in changes to the management of CSG water; and
- c) the CSG activity is an ineligible ERA.

The proposed amendment does not relate to CSG activities. This section of the EP Act is not relevant.

6.1.3 Underground Water Rights - EA Amendment Applications (s227AA EP Act)

Section 227AA of the EP Act specifies the requirements for an amendment application where the application involves changes to the exercise of underground water rights for a petroleum lease. These requirements are addressed in Table 6-2.

Table 6-2: Underground Water Rights (s227AA)

| Section 227AA EP Act | Relevance to amendment application |
|--|---|
| (a) Any proposed exercise of underground water rights during the period in which resource activities will be carried out under the relevant tenure | The proposed amendment would result in the exercise of existing underground water rights by extracting produced water from petroleum wells. |
| (b) The areas in which underground water rights are proposed to be exercised | The proposed amendment would result in the exercise of existing underground water rights within PL 302. |
| (c) For each aquifer affected, or likely to be affected, by the exercise of underground water rights (i) A description of the aquifer | <p>A brief description of the major formations of the Eromanga basin is provided below:</p> <p>Quaternary and Tertiary Alluvium</p> <ul style="list-style-type: none"> • These formations that cover a large portion of the study area and are often associated with the very flat structures of the flood plains. In general, they are absent where the Winton Formation outcrops. <p>Winton Formation</p> <ul style="list-style-type: none"> • The Winton Formation is a locally important aquifer. Based on the information available through the DNRME groundwater database, the Winton Formation is accessed by many stock and domestic bores in the broader region. The Winton Formation is on average located around 50m below ground level (bgl) and in some areas may be up to 970m thick. <p>Wallumbilla Formation or Rolling Downs Group</p> <ul style="list-style-type: none"> • This formation occurs throughout the Eromanga Basin, and has equivalents in the Surat and Carpentaria Basins. The fine-grained nature of the sediments is reflected in the low to very low porosity and permeability of these units. The thickness is on average 500 m, but may attain a maximum thickness of 1000 m. <p>Cadna-Owie Formation</p> <ul style="list-style-type: none"> • The Cadna-Owie Formation is considered a major unit of the GAB. Its upper section, the Wyandra Sandstone, is an aquifer however, its thickness is limited over SWQ. The Lower Cadna-Owie is considered an aquitard. The proportion and spatial distribution of aquifer bearing sandstones and siltstones in the Cadna-Owie is much lower than that in the Hooray Sandstone. The Wyandra Sandstone is recognised as the most permeable unit in this formation. It is a highly permeable shallow marine sandstone that is most prevalent in the eastern regions of Eromanga Basin. <p>The target formations for petroleum activities may also bear water, and include:</p> <p>Hooray Sandstone</p> |

| Section 227AA EP Act | Relevance to amendment application |
|---|---|
| | <p>The Hooray Sandstone system is a major GAB unit. Oil reservoirs and minor gas reservoirs are also present within this unit. Two sub-units are identified in the Hooray Sandstone and include:</p> <p>The Murta Formation: the equivalent in other GAB basins are the productive Mooga and Gubberamunda Sandstones. However, in the study area the Murta is a confining bed. The confining layer is a siltstone at the base of the formation which is widespread across the Eromanga Basin. Oil and some gas reservoirs are present in the Murta Formation. The McKinlay Member, which forms part of the Murta Formation, is not always present and contains only minor oil reservoirs.</p> <p>The Namur Sandstone: is the major water bearing unit of the Hooray Sandstone. Oil can also be present in this unit.</p> <p>Westbourne Formation, Adori Sandstone and Birkhead Formation</p> <p>Limited hydrogeological information is available for the Westbourne Formation, Adori Sandstone and Birkhead Formation. In general, the Westbourne Formation is considered to be a confining bed with homogeneous characteristics (lacustrine deposits associated with a large transgression). However, in the south- eastern region of the study area, a number of private bores have been completed in the Westbourne Formation, most likely in some of the minor sandstone beds/lenses of the formation.</p> <p>Hutton Sandstone</p> <p>In other regions the Hutton Sandstone is an important GAB aquifer. However, given its depth (~2,000mbgl) and the presence of hydrocarbons, the Hutton Sandstone is not typically accessed by groundwater bores in the Eromanga Basin.</p> <p>Poolowanna Formation</p> <p>Also referred to as the Basal Jurassic Formation (older name in the nomenclature), the Poolowanna Formation is the equivalent of the Precipice Sandstone in other areas of the GAB.</p> <p>As discussed in Sections 4.6 and 5.5 of this report, co-produced groundwater extraction from the proposed activities would Toolachee, Patchawarra and Epsilon Formations of the Cooper Basin.</p> <p>These formations are not considered sandstone aquifers of the GAB. Drawdown from this extraction would potentially extend to the Tinchoo Formation and Arraburry Formation, but is not predicted to extend into the sandstone aquifers of the overlying Eromanga Basin. This is due to the hydraulic separation of these basins and the relatively low extraction rates associated with conventional gas.</p> <p>Springs</p> <p>As discussed in Sections 4.6 and 5.5, there are no springs located on PL 302. The nearest springs are located ~200km away. Spring locations are presented in Section 4.3.8 of the 2019 UWIR.</p> |
| (ii) an analysis of the movement of underground water to and from the | Refer to Figures 16-18 in the 2019 UWIR. These figures display groundwater level and flow directions that could be |

| Section 227AA EP Act | Relevance to amendment application |
|--|---|
| <p>aquifer, including how the aquifer interacts with other aquifers and surface water; and</p> | <p>established by all available groundwater level data. In general, groundwater flow in the GAB is towards the low-lying areas of Central Australia. From the eastern margin of the basin, groundwater flows are predominantly to the west, south and southwest. From the Western Australian recharge beds, flow is generally towards the east. Groundwater flow in each of the following formations (GAB aquifers) is briefly described:</p> <p>Quaternary and Tertiary Alluvium</p> <p>In general, groundwater flow follows the topographical profile of the study area, with the only limitations imposed by the fluvial nature of the sediments. A hydrogeological map of the area (presented as Figure 16 in the SWQ UWIR) indicates that the hydraulic gradient is small.</p> <p>Winton Formation</p> <p>Based on the information available, the groundwater flow direction is broadly from the north-east to the south-west.</p> <p>Cadna-Owie Formation</p> <p>Insufficient water level information is available to describe water flows and water levels and therefore a hydrogeological map has not been generated.</p> <p>Hooray Sandstone</p> <p>It is noted that a number of bores within the Hooray Sandstone may be artesian. Groundwater bores are concentrated in the south-eastern region of the study area however, water level and salinity data is limited for the majority of the bores in the study area (i.e. within Santos tenements). Based on the information that is available, the groundwater flow direction is generally towards the southeast and the water salinity is fresh to slightly brackish.</p> <p>Westbourne Formation, Adori Sandstone and Birkhead Formation</p> <p>There is no data available to characterise groundwater flow in these formations within the project area.</p> <p>Hutton Sandstone</p> <p>The groundwater flow is expected to be to the south west i.e. consistent with the flow of the major GAB units as described in the literature (Note: there is insufficient water level data in the Hutton Sandstone to characterise groundwater flow direction further).</p> <p>Poolowanna Formation</p> <p>As per the Hutton Sandstone, groundwater flow is expected to be to the south west, which is consistent with the flow of the major GAB units as described in the literature.</p> <p>Preferential flow paths</p> <p>There is a very negligible risk of vertical preferential flow paths that may bypass the lack of vertical connectivity throughout the system because:</p> <ul style="list-style-type: none"> • The absence of connecting geological structures such as faults and other connecting features (such as unconformable contact zones) that would permit vertical migration. This statement seems particularly |

| Section 227AA EP Act | Relevance to amendment application |
|--|---|
| | <p>pertinent because there is an accumulation of petroleum at the location of the project. If there was any vertical connectivity, the petroleum product (which is less dense than water) could not have accumulated within the reservoir at all; and</p> <ul style="list-style-type: none"> • The implementation of production well construction to industry standards in order to manage the risk of gas migration into overlying formations due to inadequate seal between formations in poorly constructed wells. <p>Springs</p> <p>As discussed in Sections 4.6 and 5.5, there are no springs located on PL 302. The nearest springs are located ~200km away. Spring locations are presented in Section 4.3.8 of the 2019 UWIR.</p> |
| <p>(iii) a description of the area of the aquifer where the water level is predicted to decline because of the exercise of underground water rights; and</p> | <p>The groundwater model prepared for the 2019 UWIR and Technical Memorandum (refer to Appendix C) specifically contemplate the development of PL 302.</p> <p>The predictive modelling used to assess groundwater impacts is described in Section 7 of the 2019 UWIR. Revised drawdown maps are provided in the Technical Memorandum attached as Appendix C.</p> <p>As discussed in Section 5.5, the impact of extraction from the Cooper Basin strata does not affect areas beyond the assumed extraction well locations at the top of the Cooper Basin stratigraphy. These impacts can therefore be discounted from the analysis of the overlying Eromanga Basin.</p> <p>The maximum predicted drawdown in the Eromanga Basin stratigraphy, the strata directly overlying the unconfined Tertiary and Quaternary strata, is 4 m under steady state conditions. This is a worst-case scenario due to the limited number of extraction wells used in the calculation and the steady state analysis conditions applied in the computation. The impact on the Tertiary and Quaternary strata is likely to be less than 4 m.</p> <p>A maximum pressure decline of 268 m (LTAA) was estimated for the Westbourne, Adori and Birkhead Formations / Hutton Sandstone and Poolowanna Formations under the long-term model. The 5 m drawdown contour does not extend outside of Santos tenements and no private water supply bores targeting those formations have been identified.</p> <p>A maximum pressure decline of 115m (LTAA) is estimated for the modelled unit contain the Cadna-Owie Formation and Hooray Sandstone in the Eromanga Basin, however the 5m drawdown contour line does not significantly extend outside of Santos tenements. Additionally, no private water supply bores targeting the Cadna-Owie Formation and Hooray Sandstone have been identified in the Qld Groundwater Database within the extent of the 5m contours (DNRME, 2021).</p> |

| Section 227AA EP Act | Relevance to amendment application |
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| <p>(iv) the predicted quantities of water to be taken or interfered with because of the exercise of underground water rights during the period in which resource activities are carried out;</p> | <p>The long-term/conservative modelled extraction rates for petroleum wells targeting the Cooper and Eromanga Basins modelled was 4.01 m³/day/well and 49.92 m³/day/well, respectively. The volume of water predicted to be extracted by proposed gas wells (Cooper Basin target) (2) within PL 302 is up to 8.02 m³/day/well.</p> |
| <p>(d) the environmental values that will, or may, be affected by the exercise of underground water rights and the nature and extent of the impacts on the environmental values;</p> | <p>Impact to water bores</p> <p>As discussed in Section 5.5, there is one groundwater bore PL 302 (Bogala North 1, RN 23621) located on PL 302 that likely accesses the Winton/Surficial Formations. This water bore may potentially be impacted by cumulative extraction from the Eromanga Basin.</p> <p>Impact to springs</p> <p>There is no predicted impact to springs predicted due to the proposed amendment. The nearest springs are located ~206 km away. Refer to Section 4.6.</p> <p>Impact to other surface waters</p> <p>No impact would occur to the shallowest aquifers that have the potential to interact with surface waters as a result of petroleum activities within PL 302. Accordingly, no impacts are expected to surface water bodies dependent on groundwater-surface water interactions as a result of petroleum activities within these tenures.</p> <p>Impact to formation integrity and surface subsidence</p> <p>Subsidence is a potential impact only if associated to extraction of sufficient volumes of water to depressurise one or several aquifers to the extent that the vertical effective stress (i.e. the stress that is carried on the rock skeleton due to the weight of the overburden to the surface) may increase sufficiently to cause settlement.</p> <ul style="list-style-type: none"> The risk of subsidence impacts due to reservoir depressurisation in the subject PL is considered low because largescale depressurisation of formations was not predicted. |
| <p>(e) any impacts on the quality of groundwater that will, or may, happen because of the exercise of underground water rights during or after the period in which resource activities are carried out;</p> | <p>There are no expected impacts on groundwater quality due to:</p> <ul style="list-style-type: none"> a pre-existing vertical gradient exists, whereby the deeper formations tend to be under greater a hydraulic pressure than overlying formation. The difference in pressure is greater than 150m throughout the full stratigraphic sequence; the change to the hydraulic pressures induced by development on PL 302 will not be sufficient to reverse change the general direction of migration that drives water from deeper formation up into shallower formations; and deeper formations have generally poorer quality water than shallower formations. A reduction in the vertical upward gradient will therefore not induce |

| Section 227AA EP Act | Relevance to amendment application |
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| | <p>more saline water from deeper formations to migrate into shallower formations.</p> <p>The following section presents the basis of these assertions. While the 2019 UWIR does not assess impacts to groundwater quality directly, it does provide baseline aquifer information to support a qualitative assessment.</p> <p>Baseline groundwater quality</p> <ul style="list-style-type: none"> • Quaternary and Tertiary Alluvium - the salinity of the aquifer is brackish, with electrical conductivity (EC) values ranging from 3,000 to 7,000µS/cm or 2,000 to 4,700mg/L Total Dissolved Solids (TDS). • Winton Formation - The water quality in the Winton Formation is brackish (to saline) with ECs ranging from 900 to 13,000µS/cm or 600 to 9000mg/L TDS. • Cadna-Owie Formation - The limited data available in the DERM groundwater database indicate fresh to slightly brackish water quality with the Wyandra Sandstone. • Hooray Sandstone - The water quality in the Hooray Sandstone is generally fresh to slightly brackish. EC values range from 675 to 3,930µS/cm or 450 to 2700mg/L TDS. A number of Hooray water supply bores have salinity values measured over a 40 year period, the latest of which compare well with historical values. • Westbourne Formation, Adori Sandstone and Birkhead Formation - Salinity data are not available for the Westbourne, Adori and Birkhead Formations. • Hutton Sandstone - Salinity data are not available for the Hutton Sandstone is not known. • Poolowanna Formation – Salinity data are not available for the Poolowanna Formation. |
| <p>(f) strategies for avoiding, mitigating or managing the predicted impacts on the environmental values stated for paragraph (d) or the impacts on the quality of groundwater mentioned in paragraph (e).</p> | <p>The proposed activities within PL 302 are unlikely to result in significant impacts to groundwater values as demonstrated in the 2019 UWIR and described above.</p> <p>The monitoring strategy proposed by the UWIR will be implemented in accordance with the requirements under the <i>Water Act 2000</i> commensurate to the risk of groundwater impact that is predicted by the 2019 UWIR. This monitoring may be periodically reviewed and adapted in accordance with the requirements under the <i>Water Act 2000</i>.</p> |

6.1.4 Assessment Level Decision for Amendment Application (s228 EP Act)

Within 10 business days after receiving an amendment application, the administering authority must decide on the assessment level decision for the amendment application. The assessment level decision will determine whether the amendment application is a major or minor amendment. Table 6-3 provides information to support the assessment of this EA amendment application as a major amendment.

Table 6-3: Minor Amendment (Threshold) Assessment

| Minor amendment (threshold), for an environmental authority, means an amendment that the administering authority is satisfied - | | Relevance to amendment application |
|--|---|--|
| (a) is not a change to a condition identified in the authority as a standard condition, other than | ☑ | The EA does not identify any standard conditions. |
| (i) a change that is a condition conversion; or | ☑ | |
| (ii) a change that is not a condition conversion but that replaces a standard condition of the authority with a standard condition for the environmentally relevant activity to which the authority relates; and | ☑ | |
| (b) Does not significantly increase the level of environmental harm caused by the relevant activity; and | ☑ | The activities associated with the proposed amendment are not new and are consistent with the activities authorised in the EA. The EA amendment seeks an additional 2 conventional gas wells and associated infrastructure. As described in Section 5.0, there will be no significant increase to the level of environmental harm. |
| (c) Does not change any rehabilitation objectives stated in the authority in a way likely to result in significantly different impacts on environmental values than the impacts previously permitted under the authority; and | ☑ | The amendment does not seek to change any rehabilitation objectives or conditions. |
| (d) Does not significantly increase the scale or intensity of the relevant activity; and | x | The amendment would increase the scale of the relevant activity on PL 302 from 3 wells to 5 wells (noting that all 3 existing oil wells drilled in PL 302 are non-operational (as at 25 th January 2022). |
| (e) Does not relate to a new relevant resource tenure for the authority that is – (iii) a new mining lease; or (iv) a new petroleum lease; or (v) a new geothermal lease under the Geothermal Energy Act; or (vi) a new GHG injection and storage lease under the GHG storage Act; and | ☑ | The amendment does not relate to a new resource tenure. |
| (f) Involves an addition to the surface area for the relevant activity of no more than 10% of the existing area; and | x | Additional surface area will be required (up to 23.2 ha) for the 2 proposed new wells and associated infrastructure within PL 302. This is greater than a 10% increase of the existing authorised disturbance area. |

| | | |
|--|-------------------------------------|---|
| <p>(g) For an environmental authority for a petroleum activity –</p> <p>(i) if the amendment involves constructing a new pipeline – the new pipeline does not exceed 150km; and</p> | <input checked="" type="checkbox"/> | <p>The amendment does not involve constructing a new pipeline more than 150 km in length.</p> |
| <p>(ii) if the amendment involves extending an existing pipeline- the extension does not exceed 10% of the existing length of the pipeline; and</p> | <input checked="" type="checkbox"/> | <p>The amendment does not involve extending an existing pipeline.</p> |
| <p>(h) If the amendment relates to a new relevant resource tenure for the authority that is an exploration permit or GHG permit - the amendment application under section 224 seeks an amended environmental authority that is subject to the standard conditions for the relevant activity or authority to the extent it relates to the permit.</p> | <input checked="" type="checkbox"/> | <p>The amendment does not relate to a new relevant resource tenure that is an exploration permit or GHG permit.</p> |

6.1.5 The Standard Criteria (EP Act)

The standard criteria (as defined by Schedule 4 of the EP Act) are required to be considered by the administering authority for both a major and minor amendment applications. Refer to Table 6-4 for an assessment of the proposed amendment against the standard criteria.

Table 6-4: Standard Criteria (EP Act)

| Schedule 4 EP Act | Relevance |
|---|--|
| <p>a) the following principles of environmental policy as set out in the Intergovernmental Agreement on the Environment –</p> <p>(i) the precautionary principle;</p> <p>(ii) intergenerational equity;</p> <p>(iii) conservation of biological diversity and ecological integrity; and</p> | <p>The precautionary principle was considered for the application. It is considered that the proposed activities will use 'proven' technology and sufficient scientific data exists that a reverse onus does not exist.</p> <p>The principle of intergenerational equity was considered for the application. It is considered that the proposed activities would not impact the use of environmental values by future generations.</p> <p>The principles of conservation of biological diversity and ecological integrity were considered for the application. The proposed application would not result in significant impacts to biological diversity or ecological integrity.</p> |
| <p>b) any Commonwealth or State government plans, standards, agreements or requirements about environmental protection or ecologically sustainable development</p> | <p>The proposed activities will be undertaken in accordance with the applicable requirements of the following:</p> <ul style="list-style-type: none"> • EP Act; • EPBC Act; • NC Act; • Petroleum and Gas (Production and Safety) Act (P&G Act); • Regional Planning Interests Act 2014 (RPI Act); and • Vegetation Management Act 1999 (VM Act). |

| Schedule 4 EP Act | Relevance |
|--|---|
| | The relevance of these Acts to this application is referenced throughout the supporting information. |
| c) any relevant environmental impact study, assessment or report | N/A – an EIS has not previously been prepared for the amendment application. |
| d) the character, resilience and values of the receiving environment | Refer to Sections 3.0 and 4.0. |
| e) all submissions made by the application and submitters | The EA amendment should not be subject to public notification as there is not likely to be a substantial increase in the risk of environmental harm under the amended EA, nor a substantial change in the contaminants permitted to be released to the environment. |
| f) Best Practice Environmental Management (BPEM) for activities under any relevant instrument, or proposed instrument, as follows- (i) an environmental authority; (ii) a transitional environmental program; (iii) an environmental protection order; (iv) a disposal permit; (iv) a development approval; | BPEM of the proposed activities would be achieved through compliance with the conditions of EA (EPPG00641613) and implementation of management measures as described in Section 5.0 of this document. |
| g) Financial implications of the requirements under an instrument, or proposed instrument, mentioned in paragraph (g) as they would relate to the type of activity or industry carried out, or proposed to be carried out under the instrument; | Santos will continue to provide adequate funds, equipment and staff time to comply with the conditions of the EA. |
| h) Public Interest | The proposed amendment is in the public interest, as it will facilitate the production of petroleum to meet the needs of customers in Queensland and other Australian states / territories. Petroleum produced by Santos will also generate taxes and royalties to the Queensland State Government, which provide an ongoing source of revenue to support Government services provided to the public. Furthermore, in Australia and Queensland, oil and gas plays an important role in domestic energy security and diversification, supporting intermittent renewable energy sources. |
| i) Site management plan (SMP) | There are no SMPs applicable to the application. |
| j) Integrated environmental management system (IEMS) or proposed IEMS | The Santos Management System (SMS) will be implemented for the proposed activities. |
| k) Other matters prescribed under a regulation | The <i>Environmental Protection Regulation 2019</i> (EP Reg) prescribes an environmental objective assessment relating to an environmental management decision as an additional matter for the standard criteria. Section 2.0 to 5.0 addresses the matters raised in the environmental objective assessment. |

6.1.6 Prescribed Matters for Particular Resource Activities (s24AA EP Reg)

Section 226 of the EP Act, specifies the general requirements for an EA amendment application. This includes item (1)(n) which specifies any other documents relating to the application prescribed under a regulation. Section 24AA of the EP Reg describes the prescribed documents for an application for environmental authority for a CSG activity.

This amendment does not involve the management of CSG water.

6.2 Environmental Offsets Act 2014

In accordance with s207(1)(c) of the EP Act, the administering authority may impose an environmental offset condition on an EA. However, s14(1) of the EO Act states that an offset condition may only be imposed on an EA if the proposed activity will, or is likely to have a significant residual impact on the prescribed environmental matter, and all reasonable on-site mitigation measures for the prescribed activity have been, or will be, undertaken.

As discussed in Section 5.7, the proposed activities are unlikely to result in significant residual impacts to prescribed environmental matters (MSES) provided the proposed measures to avoid, minimise and mitigate potential impacts are carried out (as outlined in the following sections and in Section 5.0 and Table 5-1). Table 6-5 summarises the relevant MSES present in PL 302.

Table 6-5: Prescribed Environmental Matter Assessment

| Schedule 2 Environmental Offsets Regulation 2014 | Relevance to PL 302 | |
|--|---------------------|--|
| 2. Regulated vegetation | ✓ | Regulated Vegetation is mapped within PL 302, including: <ul style="list-style-type: none"> 75 ha of REs intersecting a watercourse. |
| 3. Connectivity areas | x | <p>While connectivity areas are present, the proposed resource activity does not relate to a fixed footprint and therefore cannot be assessed using the Landscape Fragmentation and Connectivity Tool. However, the current extent of remnant vegetation in PL 302 largely represents the pre-clearing extent. Therefore, impacts are unlikely to trigger for significance under the Landscape Fragmentation and Connectivity Tool irrespective of infrastructure locations.</p> <p>Using the Queensland Environmental Offsets Policy, Significant Residual Impact Guideline, a development impact on connectivity areas is determined to be significant if either of the following tests are true:</p> <p>Test 1 — change in core remnant ecosystem extent at the local scale is greater than the threshold. The change in the core remnant ecosystem extent at the local scale (post impact) is greater than a threshold determined by the level of fragmentation at the regional scale.</p> <p>PL 302 is mapped as 100% remnant vegetation (regional scale extent of core remnant ecosystem > 90%), therefore change threshold for local core scale remnant ecosystem is 50%. Future disturbance will not result in a reduction of more than 50% of the core remnant ecosystem extent around any disturbance. Test 1 would be false irrespective of infrastructure locations.</p> <p>Test 2 — Loss or fragmentation of core remnant ecosystem at the site scale. Any core area that is greater than or equal to 1 hectare is lost or reduced to patch fragments (core to non-core). If the number of core areas that are greater than or equal to one hectare in area is greater pre-impact than post-impact that part of the significant impact test is true. PL 302 is mapped as 100% remnant vegetation; the</p> |

| Schedule 2 Environmental Offsets Regulation 2014 | Relevance to PL 302 | |
|--|---------------------|--|
| | | connectivity tool sees this as one patch. The number of core areas that are greater than or equal to one hectare in area will not be greater pre-impact than post-impact. The proposed disturbances will not result in the removal of the one existing core patch. Test 2 would also be false. |
| 4. Wetlands and watercourses | x | HES or GES wetlands are not present within PL 302. |
| 5. Designated precinct in a strategic environmental area | x | PL 302 is not located in an area mapped as a designated precinct in a strategic environmental area. |
| 6. Protected wildlife habitat | ✓ | <p>The prescribed activity:</p> <ul style="list-style-type: none"> • will not be undertaken in an area identified as essential habitat on the essential habitat map for an animal or plant that is endangered or vulnerable wildlife; • will not be undertaken in an area that is shown as a high risk area on the flora survey trigger map; and • may be undertaken in an area of habitat (e.g. foraging, roosting, nesting or breeding habitat) for an animal that is vulnerable or endangered. <ul style="list-style-type: none"> ○ Grey Falcon, listed as Vulnerable; ○ <i>Indigofera oxyrachis</i>, listed as Vulnerable; ○ White-throated Needletail, listed as Vulnerable; and ○ Short-beaked Echidna, listed as Special Least Concern. |
| 7. Protected areas | x | Protected areas (estates and nature refuges) are not present within PL 302. |
| 8. Highly protected zones of State marine parks | x | State marine parks are not present within PL 302. |
| 9. Fish habitat areas | x | Areas declared under the <i>Fisheries Act 1994</i> to be a fish habitat area are not present within PL 302. |
| 10. Waterway providing for fish passage | x | <p>The <i>Queensland Environmental Offsets Policy Significant Residual Impact Guideline</i> provides the criteria for determining significant impacts on a waterway providing for fish passage. Based on these criteria, the proposed activities would not have a significant residual impact on this prescribed environmental matter due to:</p> <p>(a) The highly ephemeral streams within PL 302 only provide potential for fish passage during periods of high rainfall causing streamflow.</p> <p>(b) Construction within watercourses would not occur during periods of streamflow, avoiding potential fish mortality or injury. Accordingly, construction of infrastructure within watercourses would not:</p> <ul style="list-style-type: none"> a. reduce the extent, frequency, or duration of fish passage; b. result in a substantial change to the hydrological regime of the watercourse; or c. lead to significant changes in water quality parameters within the watercourse. |
| 11. Marine plants | x | Areas containing marine plants are not present within PL 302. |

| Schedule 2 Environmental Offsets Regulation 2014 | Relevance to PL 302 | |
|--|---------------------|--|
| 12. Legally secured offset areas | x | Legally secured offset areas (offset register areas and vegetation offsets through a Property Map of Assessable Vegetation) are not present within PL 302. |

As per Section 8 of the EO Act, a significant residual impact is generally an adverse impact, whether direct or indirect, of a prescribed activity on all or part of a prescribed environmental matter that:

- a) remains, or will or is likely to remain, (whether temporarily or permanently) despite on-site avoidance and mitigation measures for the prescribed activity; and
- b) is, or will or is likely to be, significant.

The *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* (DEHP, 2014) has been developed to assist in deciding whether or not a prescribed activity will, or is likely to have a significant residual impact on a MSES. The criteria contained in the guideline provides direction for identifying when an impact on a prescribed environmental matter that is MSES, may be ‘significant’. Table 6-6 considers this criteria for each of the relevant prescribed matters present in the subject tenures.

Impacts have been assessed for activities associated with development of two additional wells and associated infrastructure.

The precise location of infrastructure is subject to the progressive development of the gas/oil field within the study area over a 10 - 20 year timeframe.

The proposed petroleum activities would directly impact up to 23.2 hectares of remnant native vegetation comprising ‘least concern’ RE. This estimate is conservative given that the explicit locations of proposed wells and infrastructure are currently unknown i.e. final drilling targets are subject to the findings of exploration (seismic surveys and subsurface confirmation through exploration drilling). However, in the case of PL 302, based on past drilling activity and current understanding of prospects in the tenure, future drilling activity is highly likely to be restricted to the southern section of the tenure. For the purposes of impact assessment, the preliminary disturbance footprint is likely to occur entirely within the southern section of PL 302 in RE 5.9.3, which is predominantly a ‘low constraint’ area with the exception of minor areas of ‘moderate constraint’ MSES regulated vegetation - intersecting a watercourse and buffers (refer to Figure 2 to Figure 4). The preliminary disturbance footprint may cause disturbance to areas of ‘moderate constraint’ MSES regulated vegetation - intersecting a watercourse, but it will otherwise not disturb the ‘moderate constraint’ DOR mapped timbered woodlands (REs 5.5.2 and 5.5.4) located in the north-eastern section of the tenure (refer to Figure 2). There are no ‘High constraint’ areas located on PL 302.

An upper disturbance limit of 23.2 ha for MSES has been utilised for this assessment. As such, the assessment of impacts within this report (as undertaken by E2M – refer to Appendix A) takes an informed approach and simulates a probable disturbance scenario.

Table 6-6: Significant Residual Impact Summary Table

| Prescribed Environmental Matters | Significant Residual Impact Criteria | |
|----------------------------------|--------------------------------------|--|
| 2. Regulated vegetation | x | Table 1 of the <i>Significant Residual Impact Guideline</i> (EHP 2014) details the significant residual impact test criteria for Regulated vegetation. Where disturbance to regulated vegetation exceeds the clearing limits for |

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| | | <p>appropriate criteria set out in Table 1, a significant residual impact to Regulated vegetation will occur.</p> <p>The proposed prescribed activities may involve clearing of regulated vegetation within the defined distance from the defining banks of VMA watercourses and drainage features (as identified on the vegetation management watercourse and drainage feature map). A significant impact to this MSES is unlikely as the placement of infrastructure within the MSES will be avoided where practicable, or will otherwise be undertaken in compliance with SRI clearing limits. Where disturbance occurs within the defined distance of VMA watercourses and drainage features and within 5m of the defining bank, it will comply with SRI clearing limits: 20 m wide in a sparse or very sparse RE; or 25 m wide in a grassland RE for linear infrastructure, and 2 ha within a sparse or very sparse RE; or 5 ha within a grassland RE. As such, a SRI to this MSES is unlikely.</p> |
| 6. Protected wildlife habitat | x | <p>PL 302 is not located within a mapped high-risk area on a Protected Plant Flora Survey Trigger Map.</p> <p>PL 302 may provide suitable general habitat for a small number of listed species. However, the proposed prescribed activities are unlikely to constitute a significant residual impact. Refer to Section 6.2.1 for further information.</p> |

6.2.1 Protected Wildlife Habitat

The prescribed activity is likely to have a significant impact on protected wildlife habitat if:

For endangered and vulnerable wildlife habitat (including essential habitat), an action is likely to have a significant impact on endangered and vulnerable wildlife if the impact on the habitat is likely to:

- lead to a long-term decrease in the size of a local population; or
- reduce the extent of occurrence of the species; or
- fragment an existing population; or
- result in genetically distinct populations forming as a result of habitat isolation; or
- result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat; or
- introduce disease that may cause the population to decline, or
- interfere with the recovery of the species; or
- cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.

For special least concern (non-migratory) animal wildlife habitat, an action is likely to have a significant impact on a special least concern (non-migratory) animal wildlife habitat if it is likely that it will result in:

- a long-term decrease in the size of a local population; or
- a reduced extent of occurrence of the species; or
- fragmentation of an existing population; or
- result in genetically distinct populations forming as a result of habitat isolation; or
- disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species.

As discussed in Sections 4.2 and 4.4, PL 302 contains potential habitat for the following 4 species subject to protected wildlife habitat:

- Grey Falcon (NC Act listed Vulnerable);
- *Indigofera oxyrachis* (NC Act listed Vulnerable);
- White-throated Needletail (NC Act listed as Vulnerable);and
- Short-beaked Echidna (NC Act listed Special Least Concern).

E2M (2021) assessed the potential impacts of the proposed disturbance on the above listed species against the significant impact criteria described above, and determined that a significant residual impact to these species was unlikely (refer to Appendix A). Detailed summaries of the E2M assessment are provided in Table 6-7 to Table 6-10.

Further information and mitigation measures in relation to the management of potential impacts to fauna is provided in Section 5.3, Table 5-1 and Appendix A.

Table 6-7: Significant Residual Impact Assessment for Grey Falcon

| MSES Significant Residual Impact Guideline criteria. The activity is likely to: | Assessment |
|---|--|
| Lead to a long-term decrease in the size of a local population | <p>No Significant Impact</p> <p>The proposed disturbance will require the clearing of approximately 23.2 ha of grey falcon foraging habitat, which represents 1.9% of Grey Falcon habitat identified within the PL. The proposed vegetation clearing is unlikely to lead to a long-term decrease in the size of the Grey Falcon population as:</p> <ul style="list-style-type: none"> • The preliminary disturbance footprint is likely to avoid timbered woodlands (REs 5.5.2 and 5.5.4), which comprise breeding habitat for the species. • The preliminary disturbance footprint is likely to occur entirely within RE 5.9.3, which provides foraging habitat only for the species. The proposed clearing comprises a negligible proportion of the species foraging habitat, which is widely available within and surrounding the PL. • Approximately 7.8 ha of disturbed area will be immediately rehabilitated post-disturbance. Rehabilitation is expected to rapidly reinstate a vegetation community consistent with the pre-disturbance vegetation community. • The preliminary disturbance footprint represents a negligible proportion of the home range for grey falcon individuals/pairs, which are a highly mobile nomadic species (E2M, 2021). <p>Management measures have been identified to mitigate impacts on the species habitat (refer to Section 5.3 and Appendix A).</p> |
| Reduce the extent of occurrence of the species | <p>No Significant Impact</p> <p>The proposed clearing comprises a minimal proportion of the overall extent of occurrence of the species and will not impact connectivity of suitable habitat.</p> |
| Fragment an existing population | <p>No Significant Impact</p> <p>The project is unlikely to impact the movement of Grey Falcon individuals among habitat areas within and surrounding the PL and is unlikely to fragment the local Grey Falcon population.</p> |
| Result in genetically distinct populations forming as a result of habitat isolation | <p>No Significant Impact</p> |

| | |
|---|--|
| | The project is unlikely to impact the movement of Grey Falcon individuals among habitat areas within and surrounding the PL. |
| Result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species habitat | <p>No Significant Impact</p> <p>Feral cats and grazing by exotic herbivores are listed as threatening processes to the species (E2M, 2021). The project is unlikely to increase the abundance of these invasive species above their current levels or result in the introduction of new invasive species.</p> |
| Introduce disease that may cause the population to decline | <p>No Significant Impact</p> <p>Disease is not listed as a potential threat to the species (E2M, 2021). The project is unlikely to introduce a disease that may cause the species to decline.</p> |
| Interfere with the recovery of the species. | <p>No Significant Impact</p> <p>The proposed works are unlikely to interfere with the recovery of the species due to the minimal impact on the Grey Falcon population. No actions proposed are in contrast to the specific recovery actions for the species (E2M, 2021).</p> |
| Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species. | <p>No Significant Impact</p> <p>The precautionary principal was applied to consider all Grey Falcon habitat mapped within the PL to represent ecologically significant locations for the species.</p> <p>The project is unlikely to cause disruption to ecologically significant locations as:</p> <ul style="list-style-type: none"> • The preliminary disturbance footprint is likely to avoid timbered woodlands (REs 5.5.2 and 5.5.4), which comprise breeding habitat for the species. • The preliminary disturbance footprint is likely to occur entirely within RE 5.9.3, which provides foraging habitat only for the species. The proposed clearing comprises a negligible proportion of the species foraging habitat, which is widely available within and surrounding the PL. • Approximately 7.8 ha of disturbed area will be immediately rehabilitated post-disturbance. Rehabilitation is expected to rapidly reinstate a vegetation community consistent with the pre-disturbance vegetation community. • The preliminary disturbance footprint represents a negligible proportion of the home range for grey falcon individuals/pairs, which are a highly mobile nomadic species (E2M, 2021). <p>Management measures have been identified to mitigate impacts on the species habitat (refer to Section 5.3 and Appendix A).</p> |

Table 6-8: Significant Residual Impact Assessment for *Indigofera oxyrachis*

| MSES Significant Residual Impact Guideline criteria. The activity is likely to: | Assessment |
|---|--|
| Lead to a long-term decrease in the size of a local population | <p>No Significant Impact</p> <p>The preliminary disturbance footprint avoids clearing within mapped REs that provide suitable habitat for <i>I. oxyrachis</i>. As such, the proposed disturbance is unlikely to lead to a long-term decrease in the size of an important population of the species (E2M, 2021).</p> |

| | |
|---|--|
| | Management measures have been identified to mitigate impacts on the species habitat (refer to Section 5.2 and Appendix A). |
| Reduce the extent of occurrence of the species | No Significant Impact The preliminary disturbance footprint avoids clearing within mapped REs that provide suitable habitat for <i>I. oxyrachis</i> . As such, the project is likely to avoid clearing of the species or altering the species habitat. |
| Fragment an existing population | No Significant Impact The preliminary disturbance footprint avoids clearing within mapped REs that provide suitable habitat for <i>I. oxyrachis</i> . As such, the project is likely to avoid clearing of the species or altering the species habitat. |
| Result in genetically distinct populations forming as a result of habitat isolation | No Significant Impact The preliminary disturbance footprint avoids clearing within mapped REs that provide suitable habitat for <i>I. oxyrachis</i> . As such, the project is likely to avoid clearing of the species or altering the species habitat. |
| Result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species habitat | No Significant Impact The project is unlikely to increase the abundance of invasive species above their current levels or result in the introduction of new invasive species. |
| Introduce disease that may cause the population to decline | No Significant Impact The project is unlikely to introduce a disease that may cause the species to decline. |
| Interfere with the recovery of the species. | No Significant Impact The proposed works are unlikely to interfere with the recovery of the species as the project is likely to avoid clearing of the species or altering the species habitat. |
| Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species. | No Significant Impact The preliminary disturbance footprint avoids clearing within mapped REs that provide suitable habitat for <i>I. oxyrachis</i> . As such, the project is likely to avoid clearing of the species or altering the species habitat (E2M, 2021). Management measures have been identified to mitigate impacts on the species habitat (refer to Section 5.2 and Appendix A). |

Table 6-9: Significant Residual Impact Assessment for White-throated Needletail

| MSES Significant Residual Impact Guideline criteria. The activity is likely to: | Assessment |
|---|--|
| Lead to a long-term decrease in the size of a local population | No Significant Impact The proposed disturbance will require the clearing of approximately 23.2 ha of White-throated Needletail habitat, which represents 1.9% of species habitat identified within the PL. The proposed vegetation clearing is unlikely to lead to a long-term decrease in the size of the White-throated Needletail population as: <ul style="list-style-type: none"> In Australia, the species is primarily aerial, from heights of 1 m up to 1000 m above the ground. The species does not breed in Australia. The proposed disturbance is unlikely to interfere with the species foraging activities within the PL. |

| | |
|---|---|
| | <ul style="list-style-type: none"> The preliminary disturbance footprint represents a negligible proportion of the habitat available to this wide-ranging nomadic species. Approximately 7.8 ha of the disturbance footprint is proposed for rehabilitation, which includes pipeline right of ways, sump pits and a proportion of the lease areas. These areas are expected to re-establish to pre-disturbance vegetation communities (E2M, 2021). <p>Management measures have been identified to mitigate impacts on the species habitat (refer to Section 5.3 and Appendix A).</p> |
| Reduce the extent of occurrence of the species | <p>No Significant Impact</p> <p>The proposed clearing comprises a minimal proportion of the overall extent of occurrence of the species and will not impact connectivity of suitable habitat.</p> |
| Fragment an existing population | <p>No Significant Impact</p> <p>The project is unlikely to impact the movement of White-throated Needle-tail individuals between habitat areas within and surrounding the PL and is unlikely to fragment the local species population.</p> |
| Result in genetically distinct populations forming as a result of habitat isolation | <p>No Significant Impact</p> <p>The project is unlikely to impact the movement of White-throated Needle-tail individuals among habitat areas within and surrounding the PL.</p> |
| Result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species habitat | <p>No Significant Impact</p> <p>No species are listed as a threatening process to the species (E2M, 2021). The project is unlikely to result in an invasive species that is harmful to the species becoming established.</p> |
| Introduce disease that may cause the population to decline | <p>No Significant Impact</p> <p>Disease is not listed as a potential threat to the species (E2M, 2021). The project is unlikely to introduce a disease that may cause the species to decline.</p> |
| Interfere with the recovery of the species. | <p>No Significant Impact</p> <p>The proposed works are unlikely to interfere with the recovery of the species due to the minimal impact on the White-throated Needle-tail population. No actions proposed are in contrast to the specific recovery actions for the species (E2M, 2021).</p> |
| Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species. | <p>No significant impact</p> <p>The project is unlikely to cause disruption to ecologically significant locations as:</p> <ul style="list-style-type: none"> In Australia, the species is primarily aerial, from heights of 1 m up to 1000 m above the ground. The species does not breed in Australia. The proposed disturbance is unlikely to interfere with the species foraging activities within the PL. The preliminary disturbance footprint represents a negligible proportion of the habitat available to this wide-ranging nomadic species. Approximately 7.8 ha of the disturbance footprint is proposed for rehabilitation, which includes pipeline right of ways, sump pits and a proportion of the lease areas. These areas are expected to re-establish to pre-disturbance vegetation communities (E2M, 2021). <p>Management measures have been identified to mitigate impacts on the species habitat (refer to Section 5.3 and Appendix A).</p> |

Table 6-10: Significant Residual Impact Assessment for Echidna

| MSES Significant Residual Impact Guideline criteria. The activity is likely to: | Assessment |
|--|--|
| Lead to a long-term decrease in the size of a local population | <p>No Significant Impact</p> <p>The proposed disturbance will require the clearing of approximately 23.2 ha of echidna habitat. As the species is widely distributed and has no particular habitat preferences, except for the supply of ants and termites, the project is unlikely to lead to a long-term decrease in the local population of the species (E2M, 2021).</p> |
| Reduce the extent of occurrence of the species | <p>No Significant Impact</p> <p>As the species is widely distributed and has no particular habitat preferences, except for the supply of ants and termites, the project is unlikely to reduce the extent of occurrence of the species (E2M, 2021).</p> |
| Fragmentation of an existing population | <p>No Significant Impact</p> <p>The project will have negligible impact on the species local and regional movement.</p> |
| Reduced gene flow among populations | <p>No Significant Impact</p> <p>The project will have negligible impact on the species local and regional movement.</p> |
| Disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species | <p>No Significant Impact</p> <p>The proposed disturbance will require the clearing of approximately 23.2 ha of echidna habitat. As the species is widely distributed and has no particular habitat preferences, except for the supply of ants and termites, the project is unlikely to lead to a long-term decrease in the local population of the species (E2M, 2021).</p> |

7.0 References

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8.0 Appendices

Appendix A: PL 302 Desktop Ecological Assessment (E2M, 2021)

Appendix B: Underground Water Impact Report - Santos Cooper Basin Oil and Gas Fields, South-West Queensland

Appendix C: Technical Memorandum – Updating Groundwater Impact Estimation – Santos Cooper Basin Oil and Gas Fields, South-West Queensland

Appendix D: Santos Risk Assessment Process

The environmental risk assessment contained in Section 5.0 was undertaken in accordance with the Santos Management System (SMS) Risk Management Standard. The risk assessment process involves:

- identifying the potential hazards or threats posed by the activities;
- categorising the potential consequences and their likelihood of occurring; and
- using a risk matrix to characterise the level of risk (Figure D1).

Control Measure Identification

Based on identified potential impacts, and the ranking of their unmitigated risk, 'Management Practices' ('Control Strategies') were identified to eliminate, prevent, reduce or mitigate consequences associated with each of the identified potential impacts. Appropriate control strategies were identified from previous activities, current Santos management practices, and through review of best practice techniques across the industry.

Determination of Severity of Consequence

The potential level of impact (consequence) was assessed and assigned in line with potential hazards and receptors, using the 'Santos Environmental Consequence Classification' (see Figure D1) from the Santos Risk Matrix. The consequence level for each risk source is documented in the risk assessment tables in Section 5.0. To describe the severity, scale and duration of potential impacts, six categories of consequence are used (as displayed in Figure D1).

Determination of Likelihood

Likelihood relates to the potential for a consequence to occur. This includes the likelihood of an event occurring and the subsequent potential consequence. This is defined using the Santos Risk Matrix (See Figure D1). To describe the likelihood of a potential environmental consequence occurring, six categories of likelihood are used. The Santos Risk Matrix is then used to characterise the resultant risk into one of five levels.

Determination of Residual Risk

Risk is expressed in terms of a combination of the consequence of an impact and the likelihood of the impact occurring. Santos uses a risk matrix (see Figure D1) to plot the consequence and likelihood to determine the level of risk.

Figure D1: Santos Risk Matrix

Santos Risk Matrix



| Consequence | Safety | Negligible Harm + No bodily damage or minimal harm or impairment (hours to days) | Minor Harm + Short term impairment (days to weeks) | Moderate Harm + Temporary disablement or medium term impairment (weeks to months) | Severe Harm + Long term/life altering disablement or impairment | Single Fatality OR Critical Life Threatening Injuries | Multiple Fatalities | |
|-------------|---|---|--|--|---|---|--|-----------|
| | Environment | + No impact to Environmental Value (EV). | + Small-scale impact to EV(s) of conservation significance + Potential surface or groundwater impact. | + Moderate-scale impact to EV(s) of conservation significance + Localised surface or groundwater impact. | + Large-scale impact to EV(s) of conservation significance + Moderate-scale surface water impact; + Localised impact to groundwater with potential or known beneficial use. | + Extensive population or community scale impact to EV(s) of conservation significance + Extensive impact to other EV(s). | + Irreversible impact to EV(s). | |
| | Community & Reputation | + No actual or potential community criticism + Details remain within Santos sites and/or offices | + Minor level local community criticism (< week) + No reputation impact | + Local community criticism (> week) or one-day community protest + Local company reputation impacted | + State-level community criticism or protest over multiple days/locations + State-based company reputation impacted + Very short-term share price impact (< week) | + National community criticism or large scale protest + Company reputation and approvals impacted + Shareholder intervention or short-term share price impact (< month) | + Sustained national community criticism or widespread protest + Industry reputation and approvals impacted + Changes at executive/board level or long-term share price impact (> month) | |
| | Financial (A\$) | < \$30k | \$30k to \$300k | \$300k to \$3m | \$3m to \$30m | \$30m to \$300m | > \$300m | |
| | Workforce | + Will require some staff attention over several days. + No actual or potential impact to culture | + Will require several days local management time. + Minor impact to employee engagement and limited staff turnover | + Will require head office staff and take several weeks of site management time. + Moderate impact to employee engagement and staff turnover above industry average with some key roles | + Will require several weeks of senior management time + Impact to employee engagement (< 6 months), moderate turnover of key roles and no succession | + Will require several months of senior management time + Impact to employee engagement (< 18 months), high staff turnover and attraction issues | + Will require more than a year of senior management involvement and operations severely disrupted + Impact to employee engagement (> 18 months), significant key role turnover and attraction issues | |
| | Compliance | + Non-conformance with legislation, instruments (e.g. tenure licence) or contract + No regulatory or punitive action | + Minor breach of legislation, instruments or contract + Notification/report to; request for information by; and/or administrative/warning notice from the regulator + LOCI Tier 3 or non-hydrocarbon releases notifiable to the regulator | + Limited number of minor breaches of legislation, instruments or contract + Statutory notice from the regulator + LOCI Tier 2 or non-hydrocarbon releases immediately reportable to the regulator | + Systemic minor breaches (or one moderate breach) of legislation, instruments or contract + Company charged with an offence with minor penalty/fine + LOCI Tier 1 or cumulative regulator notification of non-hydrocarbon releases | + Systemic moderate breaches (OR single material breach) of legislation, instruments or contract + Company charged with an offence with moderate penalty/fine | + Material breaches of legislation, instruments or contract + Company or officers charged with an offence with material penalty/fine, or loss of tenure/operatorship | |
| | | | I | II | III | IV | V | VI |
| Likelihood | ALMOST CERTAIN (< 4 monthly) Occurs in almost all circumstances OR could occur <i>within days to weeks</i> | f | Low | Medium | High | Very High | Very High | Very High |
| | LIKELY (4 monthly - 1 yearly) Occurs in most circumstances OR could occur <i>within weeks to months</i> | e | Low | Medium | High | High | Very High | Very High |
| | OCCASIONAL (1 - 3 yearly) Has occurred before in Santos OR could occur <i>within months to years</i> | d | Low | Low | Medium | High | High | Very High |
| | POSSIBLE (3 - 10 yearly) Has occurred before in the industry OR could occur <i>within the next few years</i> | c | Very Low | Low | Low | Medium | High | Very High |
| | UNLIKELY (10 - 30 yearly) Has occurred elsewhere OR could occur <i>within decades</i> | b | Very Low | Very Low | Low | Low | Medium | High |
| | REMOTE (30 - 100 yearly) Requires exceptional circumstances and is unlikely even in the long term OR only occurs as a "one in 100 year event" | a | Very Low | Very Low | Very Low | Low | Medium | Medium |

Operational Risk Assessment Requirements

| Risk Level | Action | Governance Mechanism | Authority for Continued Tolerance of Risk | Control Development and Timeframe | Control Ownership |
|------------|--|--|---|--|--|
| Very High | + Following verification of the risk at 'Very High' activity must stop + Activity cannot recommence until controls are implemented to reduce risk to 'High' or lower + For incidents, a dedicated multi-disciplinary incident investigation team will be formed + Level 3 Manager or Excom member will be included in the investigation team | + Controls will be governed at the Operations Committee meeting or equivalent forum + Sponsorship of incident investigation by EVP or Level 2 Manager | + CEO | + Intolerable Risk Level + Develop and implement controls urgently to reduce risk to 'High' or lower as soon as practicable | + Level 2 Manager (e.g. Executive Vice President) |
| High | + Assess risk to determine if it is reduced So Far As Is Reasonably Practicable (SFAIRP) + If SFAIRP, activities related to maintenance of controls will be prioritised and managed + If not SFAIRP, improve existing controls and/or implement new control(s) + For incidents, a dedicated multi-disciplinary incident investigation team will be formed | + Controls will be governed at Divisional level meeting or equivalent forum + Sponsorship of incident investigation by Level 3 Manager | + EVP or Level 2 Manager | + Action to reduce risk level to 'Medium' or below | + Level 3 Manager (e.g. General Manager) |
| Medium | + Assess risk to determine if SFAIRP + If SFAIRP, activities related to maintenance of controls will be prioritised and managed + If not SFAIRP, improve existing controls and/or implement new control(s) + Incidents are assessed using Mining the Diamond and investigated relative to the incident potential | + Controls will be governed at Area level meeting or equivalent forum + Sponsorship of incident investigation at Level 4 Manager | + General Manager or Level 3 Manager | + Manage and monitor risk efficiently in accordance with business management plans | + Level 4 Manager (e.g. Asset or Functional Manager) |
| Low | + Assess risk to determine if SFAIRP + If SFAIRP, activities related to maintenance of controls will be prioritised and managed + If not SFAIRP, improve existing controls and/or implement new control(s) + Incidents are assessed using Mining the Diamond and investigated relative to the incident potential | + Controls will be governed at site level meeting or equivalent forum + Sponsorship for incident investigation at Level 5 Manager | + Level 4 Manager | + Manage and monitor risk efficiently in accordance with business management plans | + Level 5 Manager (e.g. Area Manager, Team Leader, Superintendent or equivalent) |
| Very Low | + Risk to be managed as stipulated by the related work processes | + Governed if required | + Level 5 Manager | + Manage and monitor risk efficiently in accordance with business management plans | + Any individual contributor |

Appendix E: SWQ Hydraulic Fracture Risk Assessment