



Ms Sam McLean
Executive Director
Office of the Independent Planning Commission of NSW
Via email: samantha.mcLean@ipcn.nsw.gov.au

14 August 2020

Dear Sam

Narrabri Gas Project (SSD 6456)
Response to Independent Planning Commission Questions

Thank you for your letters dated 29 June 2020 and 28 July 2020 requesting advice on number of points related to the assessment of the Narrabri Gas Project (SSD 6456).

The attachments to this letter seek to address these questions in detail.

If you have any questions, please contact me.

Yours sincerely

A handwritten signature in black ink, appearing to read 'D Kitto', with a horizontal line underneath.

David Kitto
Executive Director
Special Projects

Summary of Comments on Microsoft Word - Letter to IPC Response to Questions - Narrabri Gas Project.docx

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Number: 1 Author: Tony Subject: Sticky Note Date: 21/08/2020 10:33:24 AM

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This is my (Mr Tony Pickard) third group of submissions to the NGP IPC process.
Please see the first and supplementary as they are both referred to in these two responses.

This Annotated document by Mr Tony Pickard, is by way of an objection to the NGP and the way the Department Planning Industry and Environment is conducting itself in regards to answering the IPC questions.

This is one of two annotated documents that were posted on the IPC web page for comment on August 14 2020.

The second annotated document is Santo,s "Submission to IPC following Public Hearings" to the IPC Public Hearings.

Ecologically Sustainable Development

Provide details regarding whether and how the Department considers that the Project (if approved) would be Ecologically Sustainable Development (ESD) and what principles and programs of ESD have been implemented in the Department's assessment of the Project and the Department's recommended conditions of consent

Under Section 4.15 of the *Environmental Planning & Assessment Act 1979*, a consent authority must consider the public interest of a development proposal when it determines the development application.

This includes considering the objects of the Act to the extent that they are relevant to the evaluation of the development application.

During its detailed assessment of the Narrabri Gas Project, the Department determined that at least six of the 10 objects of the Act, including the object to facilitate ecologically sustainable development, were relevant to evaluation of the project; and considered the merits of the project against each of these objects.

Based on this assessment and subject to the recommended conditions, the Department has concluded that the project:

- represents a safe and sustainable use of the State's natural gas resources that would promote the social and economic welfare of the community without compromising the needs of any future generations (Object a);
- represents ESD (Object b – see below);
- is a permissible land use under the relevant planning controls and can be carried out in an orderly and economic way subject to the recommended conditions (Object c);
- would not significantly affect the environment, including protected conservation areas such as the Brigalow State Conservation Area and Brigalow Nature Reserve and listed threatened species and communities (Object d); and
- would not significantly affect the cultural heritage of the region, including Aboriginal cultural heritage, and that the culturally significant resources within the project area can be managed in a sustainable way in consultation with key Aboriginal stakeholders under the recommended conditions of consent (Object j).

Throughout the assessment process, the Department has consulted extensively with key stakeholders and sought to encourage community participation (Object f). Further, the recommended conditions will ensure there are further opportunities for community participation during the implementation of the project. These conditions include requiring Santos to establish and operate a Community Consultative Committee, Water Technical Advisory Group and Aboriginal Cultural Heritage Advisory Group for the project. They also require Santos to make all relevant information on the project publicly available.

Under NSW legislation, ESD requires the effective integration of economic, environmental and social considerations in decision-making processes.

This has been a key driver for the Department in its detailed assessment of the merits of the Narrabri Gas Project, which has included investigating the complex interaction between each of these considerations and weighing up what is in the public interest and consistent with the requirements in Government legislation, policy, guidelines and codes of practice.

The Department has summarised the findings of this assessment in its assessment report and considers ESD to be at the heart of the whole report. Essentially, the report represents the



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Number: 1 Author: Tony Subject: Sticky Note Date: 20/08/2020 2:32:05 PM

I object to Santos being the operator of any new CCC or any of the listed Committees/Groups.

I have been on the two (2) CCC's that have been in operation since Santos took over from Eastern Star Gas. I found the first CCC with an independent Chair to be more open and co-operative while the second was more along the lines of participation directionally guided along certain paths.

The current Narrabri Gas Project CCC replace an existing CCC called the Santos CCC after that CCC was suddenly terminated in November of 2014.

According to the last Chair, Mr Jock Laurie, the current Narrabri Gas project CCC is a Ministerial CCC and not subject to any conditions that may be imposed by the Department of Planning nor any current conditions/rules that govern the newer CCC's
The Chair, I am led to believe was appointed by the Minister.

Exactly when a new CCC will come into effect is not stated here, however the New CCC for the NGP should be appointed within 30 days of approval should the Narrabri Gas Project be approved.

This new CCC should be better balanced in its membership and views than the existing CCC with only one position per body being represented, this included Narrabri Council.

The CCC meetings are to be conducted in a sort of informal way with full minutes to be taken.
Santos not to hold any position of influence and definitely not be the minute taker.

The requirement that "Santos make all relevant information available", must be qualified with a time limit, say 14 days after a meeting is held.

The information made available should include Meeting Minutes, Presentations or other tabled information and answers to questions.

This is not the practice with the current CCC and it is getting worse.

Number: 2 Author: Tony Subject: Sticky Note Date: 20/08/2020 2:39:00 PM

This "Public Interest" bothers me as it seems that public Interest is not local by statewide and should this NGP be approved there will be members of the "public" whose interest's were not served and will be the ones subject to the most convenience without any form of compensation, so that the "public interest" criteria is met.

The IPC and the Department of planning should look at this matter and come to some sort of binding condition with Santos over what action to take.

Department's attempt to effectively integrate the economic, environmental and social considerations of the Narrabri Gas Project in a simply and practical way, and to inform the Commission's determination of the development application.

It also reflects the Department's practice of seeking to avoid a formulaic or template approach to the assessment of ESD on major projects where every principle and program is considered explicitly and in isolation in assessment reports, even if they are irrelevant to the specific circumstances of the project, as this can lead to significant repetition and duplication in reports - due to the complex interaction of economic, social and environmental matters on major projects - and quarantine these matters in a manner that fails to integrate and communicate the key components of ESD with the broader assessment of the merits of the project.

Similarly, the recommended conditions seek to establish a strict regulatory regime for the project should it proceed and represent the Department's attempt to deal with a whole range of economic, social and environmental matters in a wholistic way. It would therefore be a difficult and somewhat arbitrary process to disaggregate the conditions and link them in an explicit way with each of the principles of ESD. The Department is not aware of any other examples where such an exercise has been undertaken for a State significant project, and for the reasons described above, does not consider it is necessary or appropriate in this case either.

Project Represents ESD

Based on its detailed assessment and subject to the recommended conditions, the Department has concluded that the Narrabri Gas Project represents ESD as it:

- is development that meets the needs of the present generation without compromising the ability of future generations to meet their needs;
- would exploit a significant natural gas resource in a sustainable way and provide substantial economic and social benefits for NSW and the Narrabri region;
- would not cause serious or irreversible environmental damage;
- would not adversely affect the biological diversity and ecological integrity of the region, including the Pilliga State Forest;
- is consistent with the principle of internalising the environmental costs of development as Santos would be liable for meeting all the costs associated with avoiding and/or minimising the impacts of the project, with monitoring and reporting on its environmental performance during operations, and with fully rehabilitating the site following operations.

In reaching this conclusion, the Department considered all the principles expressly referred to in the definition of ESD under the legislation that "can be used" to implement ESD, and their relevance to the assessment of the specific impacts of the Narrabri Gas Project.

The Precautionary Principle

Under NSW case law, there are two preconditions for the application of the precautionary principle:

1. Threat of serious or reversible environmental damage; and
2. Scientific uncertainty as to the nature and scope of the threat of environmental damage.

Based on its detailed assessment, the Department concluded that the Narrabri Gas Project would not cause any serious or irreversible environmental damage, and consequently that it did not trigger the first of the pre-conditions for the precautionary principle to be triggered.

While there is some scientific uncertainty about the likely localised impacts of the project, principally due to the limited information available on the deeper geological strata due to the lack of development in these strata historically, the Department considers these uncertainties have been adequately addressed in the assessment through the use of conservative assumptions, and that this assessment clearly identifies the range and magnitude of the potential impacts of the project.

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Number: 1 Author: Tony Subject: Sticky Note Date: 20/08/2020 2:53:53 PM

Models used to make the case for tis dot pint can be wrong especially if fed poor quality or insufficient information.

Remember that if an aquifer is contaminated there is no real way of fixing it. Likewise aquifers are found to be contaminated by material from one aquifer into another and there is a plugged and abandoned well near by, what is the likely cause and how will the cause be fixed?

Likewise the existing Kill Areas as a result of past Spills/Dischargers. it has been almost 8 years since Santos started to Rehabilitate these areas and still the Kill Areas are not back to the original Forested state they were prior to the Spill/Discharge.

This statement is a bit ambitious in its content, unless the standards or repair of environmental harm are about to be reduced.

Number: 2 Author: Tony Subject: Sticky Note Date: 20/08/2020 3:01:33 PM

Dewhurst 13C is a perfect example of how a well site has never recovered back to the original state.

Dewhurst 13C is about one third of a hectare in size, it was p&a about 11 years ago and has only low scrub and 2 small trees on it. The EPA signed off on the site without viewing it or reading the REF rehabilitation conditions.

The point here is the same as stated above.

In addition, there is significant potential to reduce these uncertainties further during the carrying out of the project, and the Department has recommended conditions to ensure this occurs, and that the findings of these investigations are factored into any future decisions about the design and implementation of the project. It has also recommended conditions requiring Santos to implement additional preventative measures to avoid and/or minimise the environmental impacts of the project, and to adapt its operations in response to any new findings or changes in circumstances.

Several speakers at the public hearings claimed the Narrabri Gas Project triggers the precautionary principle, and either may or would result in serious or irreversible damage to the region's groundwater resources, to certain listed threatened species or communities, and to the global climate.

In the Department's view, these speakers focussed primarily on some of the scientific uncertainties associated with the assessment, without providing any new information that materially changes the Department's assessment of these uncertainties, rather than identifying and providing clear evidence of the specific serious or irreversible environmental damage that may or would occur as a result of the project and how likely the threat of this damage is.

For the reasons outlined in the Department's assessment report, which have been expanded upon in the Department's briefings to the Commission during the public hearings, the Department does not believe there is any evidence available to support a conclusion that the project would result in serious or irreversible environmental damage, or even poses a credible threat of such damage occurring. This conclusion is supported by the advice from government and independent experts.

In summary, following detailed assessment the Department has concluded that the project:

- would have negligible impacts on the quantity or quality of water in the region's shallower aquifers, which are highly valued by the community and sustain the regional economy;
- would not result in any significant impacts on listed threatened species or communities, principally because Santos can avoid and/or minimise the impacts of the project on these species and communities during the detailed design and implementation of the project, and that any residual impacts can be significantly reduced by the progressive rehabilitation of the site and offset in accordance with the requirements in the NSW Government's *Major Projects Offsets Policy*; and
- project would not generate significant greenhouse gas emissions either incrementally or in a cumulative sense, particularly when you consider that it would be used to sustain existing gas use in East Coast gas market which has been occurring for decades, and is likely to be more than offset by a range of other initiatives in NSW that are being pursued by the State and Commonwealth governments as well as the private sector. This includes the forecast closure of all of NSW's existing coal-fired power stations in the life of the Narrabri Gas Project and the transition to an energy market dominated by renewable energy as outlined in the recent release of the Australian Energy Market Operator's *Integrated System Plan 2020*.

Intergenerational Equity

During its detailed assessment of the Narrabri Gas Project, the Department considered the three key components of intergenerational equity (intergenerational, intragenerational, and interspecies equity), the three key principles forming the basis of intergenerational equity (conservation of options, quality and access) and the distributive and procedural matters which are fundamental to any consideration of matters of equity.

At a broad level, the Department concluded that the Narrabri Gas Project is consistent with the principle of intergenerational equity as it can be carried out in a way that would maintain the health, diversity and productivity of the environment now and into the future; and that it would promote the social and economic welfare of the current generation without imposing any significant burdens on

individuals or groups within the existing local or regional community and without compromising the needs of any future generations.

The key reasons for reaching this conclusion are set out in the Department's assessment report, and the Department has subsequently expanded on these reasons in its meetings with the Commission and at the recent public hearings.

These reasons include that:

- the project would allow the community to access and use a small proportion of the State's natural gas resources to address a demonstrable demand for gas in NSW and forecast gas supply shortages over the next 25 years, and is important for energy security and reliability in NSW and consistent with current government policy which is seeking to establish a safe and sustainable gas industry in NSW;
- the project would use a very small amount of the region's water resources, particularly when compared to other agricultural water users in the region, and represents a very small fraction of the current sustainable extraction limit for each of the relevant water sources (see below); and like all other water users and in accordance with the water sharing regime established by the NSW Government, Santos would be required to obtain water licences for all of the project's water take, including any direct or induced take;
- all of the direct water take of the project (as opposed to induced water take) would come from the target coal seams; this water has limited beneficial value at this stage due to its high salinity levels and the costs associated with extraction, which is why most of the water in this water source – the Gunnedah Oxley Basin aquifer – remains unallocated;
- all wastes associated the project would be properly managed and either reused or disposed of in a safe and sustainable way, consistent with the waste hierarchy that underpins the objectives of the *Waste Avoidance and Resource Recovery 2001*: in particular, the vast majority of water extracted during the project would be treated to a high standard and put to beneficial use on site or in the surrounding area; and the salt generated during treatment would either be reused or disposed of to a suitably licenced landfill;
- the project would not affect any strategic agricultural land or any designated State conservation areas;
- all the land disturbed by the project would be progressively rehabilitated to a high standard and returned to its previous use;
- all the gas wells would be plugged and abandoned strictly in accordance with the *Well Integrity Code* to ensure they do not create a liability for future generations or create a potential pathway for polluting the region's beneficial water resources;
- the project would not have significant impacts on any of the region's natural or cultural resources (gas, water, land, air, flora and fauna, cultural heritage or built environment, including the Siding Springs Observatory) either now or in the future, and it would not prevent future generations from being able to inherit and benefit from a region that has extensive and diverse natural and cultural resources;
- the project would not adversely affect the health or safety of the community: it can comply with the relevant standards set out in Government legislation, policies and guidelines (air, noise, hazards, bushfire, aquifer interference, lighting, well integrity, etc.), and the likelihood of the project increasing the fire risk of the region during operations remains remote (the lowest possible rating under the relevant risk criteria); if anything, the project is likely to increase the fire-fighting capability of the region during operations;
- the project would result in significant economic and social benefits for both NSW and the local community (investment, jobs, regional spending, gas supply, benefit sharing,

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Number: 1 Author: Tony Subject: Sticky Note Date: 20/08/2020 3:24:06 PM

Not quite true, there are individuals within the existing local to the NGP area community that will be significantly burdened by the project and seem to be treated as if these individuals are just "collateral" damage.

Number: 2 Author: Tony Subject: Sticky Note Date: 20/08/2020 3:26:56 PM

Please, qualify the extent and size of the word "Community" as used in the context.
To me this is just a very confusing statement.

Number: 3 Author: Tony Subject: Sticky Note Date: 20/08/2020 3:32:50 PM

Remember if you take water out of a aquifer that is linked to another fuller aquifer then the the water from the fuller one flows into the emptied one and so on until it is good water going to replace water of poorer quality.
This principle seems to have been ignored or not taken into account.

Also all water is beneficial even the waters of the coal seams as they are part of a weight bearing mechanism that supports the stratas above.

Number: 4 Author: Tony Subject: Sticky Note Date: 20/08/2020 3:47:38 PM

Santos could not grow a decent Lucerne crop on Leewood.

As an idea of what is needed in terms of soil conditioning in order to fully utilize the Treated water I suggest that the IPC read the REF Leewood Produced Water Treatment and Beneficial Reuse Project Review of Environmental Factors, especially the Appendix on irrigation and soil by BeneTerra.

Conditioning the soils to grow a commercially viable crop and to accept this treated produced makes the venture of treated water usage in the very expensive bracket, that is if the Reports in the REF are correct and the recommendations followed. Cutting corners will happen with unknown consequences. Is this an acceptable risk to take and possibly burden future generations with?

Number: 5 Author: Tony Subject: Sticky Note Date: 20/08/2020 3:53:15 PM

Within the Pilliga Forest this has not happened yet.
Still what little land has been returned has not been to a high standard and it is far from being fit for its previous purpose.

An example with Dewhurst 13C has been mentioned, there are more throughout the NGP area within the Pilliga Forest.

The IPC should make a tour, but not by Santos, but by others with Santos and the EPA invited to come along.

Number: 6 Author: Tony Subject: Sticky Note Date: 20/08/2020 3:54:53 PM

Some problems covered in my supplementary submission and in the original submission.

royalties and taxes), and would provide an opportunity for Narrabri Shire Council and others to stimulate local economic development and diversify the economic base of the regional economy; and

- the project would not impose any significant or unreasonable burdens on the local or regional community: development would only occur on private land with the agreement of the landowner; the project can comply with the relevant standards for environmental performance at all private residences; Santos is required to minimise any adverse impacts the project may have on the local employment and housing market or the demand for local infrastructure and services; the State Government will continue to provide to provide essential services to the region (hospitals, schools, etc.) and adjust the provision of these services to match any fluctuations in population levels during the project; under the recommended conditions, the community would be involved in the implementation of the project; and finally, there would be several safeguards in place to protect the local community – including those provided in the recommended conditions – and ensure that they are not burdened by the project and that Santos is responsible bearing the costs associated with the project.

Several speakers at the public hearings claimed the Narrabri Gas Project was contrary to the principle of intergenerational equity because there should be no new extraction and use of fossil fuels, or because the cumulative greenhouse gas emissions (scope 1, 2 and 3 emissions) of the project would exceed the carbon budget approach to climate stabilisation and contribute to unacceptable impacts on the global climate, which would have adverse effects on current and future generations.

These claims have been raised consistently by objectors throughout the assessment process and have been fully considered by the Department in accordance with the requirements in Clause 14 of the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP), having regard to any applicable State or national policies, programs or guidelines concerning greenhouse gas emissions.

Climate change is a critical global issue requiring urgent action, and the success of this action will be essential for ensuring intergenerational equity.

The responsibility for reducing greenhouse gas emissions and addressing climate change is spread across the globe and global action is driven principally through the Paris Agreement.

Australia is a signatory of the Paris Agreement and has committed to reduce its emissions by 26 to 28% from 2005 levels by 2030.

The NSW Climate Change Policy Framework:

- seeks to maximise the economic, social and environmental wellbeing of NSW in the context of a changing climate and current emerging and national policy settings and actions to address climate change;
- endorses the Paris Agreement and commits to taking action that is consistent with the level of effort to achieve Australia's commitments to the Paris Agreement and complement national action; and
- has a long-term aspirational objective of achieving net zero emissions by 2050.

This framework is supported by the *Net Zero Plan 2020-2030*, which seeks to reduce greenhouse gas emissions in NSW by 35% from 2005 levels by 2030 and has four net zero priorities:

- drive uptake of proven emissions reduction technologies that grow the economy, create new jobs or reduce the cost of living;
- empower consumers and businesses to make sustainable choices;

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Number: 1 Author: Tony Subject: Sticky Note Date: 20/08/2020 4:08:14 PM

This is assumed and unproven as yet.

True some sections of the Narrabri Shire and Community have the potential to benefit in ways of employment and economically while other with the Shire will not.

Remember that there are only a certain amount of jobs available to the Narrabri Shire community from this project and once those positions are filled then we are back to the same old problem with regard to job availability.

The combined pupils leaving our two high schools each year currently would be around 120, so if all these got one of the jobs available to Narrabri Shire locals on the NGP, within 3 years all the positions both during construction and operational would be filled. But the available jobs will not be filled exclusively with the school leavers, there will be a number of older persons that will take those jobs. So really this Job creation is really a misnomer especially when it comes to long term local employment creation

Number: 2 Author: Tony Subject: Sticky Note Date: 20/08/2020 4:10:40 PM

Again not quite true. The landowner has no say when it comes to State Significant Pipelines, and the landowner gets peanuts in the way of compensation for having these on his land.

Number: 3 Author: Tony Subject: Sticky Note Date: 20/08/2020 4:14:47 PM

Explain how Santos is supposed "to minimise any adverse impacts the project may have on the local employment and housing market or the demand for local infrastructure and services".

Bold words but where is the "how are they going to do this' bit?

Number: 4 Author: Tony Subject: Sticky Note Date: 20/08/2020 4:39:32 PM

This involvement in the implementation of the project, how is this to work?

- invest in the next wave of emissions reduction innovation to ensure economic prosperity from decarbonisation beyond 2030; and
- ensure the NSW Government leads by example by bringing sustainable goods, services and practices into the market and maximising the environmental values of the assets it oversees.

There is nothing in Australia's commitment under the Paris Agreement or the NSW climate change policy and associated action plan that would support claims for stopping or prohibiting the approval of any further fossil fuel projects or the ongoing use of fossil fuels in NSW over the next 20-30 years or the lifetime of the Narrabri Gas Project.

Instead, both Commonwealth and State policies are seeking to facilitate an orderly transition to a lower emissions economy in a sustainable way through the implementation of various programs and plans, including the *Integrated System Plan 2020*.

The Integrated System Plan notes that Australia is currently amid one of the world's fastest energy transitions during a period of "great complexity and uncertainty" and identifies a range of future scenarios for the future development of the East Coast energy market. These scenarios essentially involve:

- the gradual closure of most existing coal-fired power stations over the next 20 years;
- ongoing use of gas (particularly for heavy industry but also potentially for providing dispatchable energy); and
- the development of an augmented electricity grid dominated by distributed energy resources (rooftop solar), variable renewable energy (wind and solar) and dispatchable energy (pumped hydro, batteries and gas).

So, in the Department's view the Narrabri Gas Project is consistent with all government policy on climate change and the aim of ensuring an orderly transition to a lower emissions economy, just as it is consistent with the policy of the NSW government to facilitate the development of a safe and sustainable gas industry in NSW.

Several groups have advocated for the adoption of a "carbon budget", both globally and at a national and regional level, and for its use in the assessment of the Narrabri Gas Project. However, carbon budgets have not been adopted in any international agreements on climate change and there is no policy support for their use in Australia or NSW.

While they provide useful tools for policy analysis, there are significant conceptual difficulties with developing carbon budgets for countries and regions within countries, such as NSW, and using them to assess the merits of individual projects.

Consequently, the Department does not support the use of the carbon budget approach to the Narrabri Gas Project. Instead, the project should be assessed in accordance with existing government policy, which is set out in the Mining SEPP.

Under Clause 14 of the Mining SEPP, a consent authority must consider an assessment of the greenhouse gas emissions (including any downstream emissions) of a project and consider whether conditions are required to ensure that greenhouse gas emissions are minimised to the greatest extent practicable.

The Department has done this in its detailed assessment of the project.

This assessment concluded that the direct emissions of the project (around 17% of the total emissions) are likely to be low, and could be reduced by prohibiting the use of flares for pilot wells (given the gas could be used in the nearby Wilga Park power station) and targeting the more prospective gas resources within the project with lower CO₂ levels. Under the recommended conditions, this would be achieved through the assessment and approval of the Air Quality and Greenhouse Gas Management Plan.

The remaining emissions (or indirect or downstream emissions) are associated with the ongoing use of gas in NSW over the next 20-25 years by heavy industry, business and over 1.4 million households.

As the Department pointed out in its assessment report, these emissions are likely to occur whether the Narrabri Gas Project is approved or not.

Essentially, these emissions form part of the “background” emissions in NSW and would be more than offset by the substantial reduction in greenhouse emissions that is likely to occur as a result of NSW’s coal-fired power stations and as a result of the implementation of a range of other State and Commonwealth policy initiatives aimed at ensuring there is an orderly transition to a lower emissions economy in NSW.

Certainly, there are no express policy initiatives at present that would lend any support to calls to phase out gas use in NSW over the next 20-30 years. On the contrary, gas is seen as being an important part of the energy mix in NSW during this period.

Given the current policy setting in NSW, the Department does not consider it to be necessary or reasonable to impose conditions on Santos requiring it to reduce the greenhouse gas emissions of its customers.

These emissions are the direct emissions (scope 1 and 2 emissions) of their customers, and it should be up to these customers to determine the best way to reduce their emissions. This is consistent with the approach taken to greenhouse gas emissions in all national and international agreements and the associated arrangements for accounting and reporting on these emissions.

Again, there is no policy support at either the State or Commonwealth level that would support the imposition of conditions on an applicant to minimise the scope 3 emissions (i.e. the downstream emissions of third parties) of its development proposal.

Consequently, the Department has not recommended any conditions requiring Santos to reduce the scope 3 emissions of the Narrabri Gas Project.

This is consistent with the valuation principle of ESD where environmental goals – such as reducing greenhouse gas emissions – should be pursued in the most cost effective way.

In summary, the Department does not consider the Narrabri Gas Project to be inconsistent with the principle of intergenerational equity.

The simple fact is no single project can affect the global climate on its own, and the direct and indirect greenhouse gas emissions of the Narrabri Gas Project would be very minor compared to annual global emissions.

Climate change is a collective problem that requires urgent strategic action across the globe; and in the Department’s view the Narrabri Gas Project is consistent with all State and Commonwealth policy settings to transition to a lower emissions economy in an orderly and sustainable way, and for NSW to meet its long-term aspirational goal of achieving net zero emissions by 2050.

Finally, during its assessment the Department has consulted extensively with key stakeholders and sought to encourage community participation. These efforts have gone well beyond the statutory requirements in the EP&A Act, and they have included making all the information associated with the project publicly available, exhibiting the EIS for 90 days, holding public information sessions, meeting with key stakeholders, and visiting the site and surrounds. The Department has also considered and weighed up all the matters raised during this consultation, including submissions received during the public exhibition period, in its evaluation of the project. Further, the recommended conditions seek to encourage ongoing community participation during the implementation of the project should it be approved and provide for community involvement via the Community Consultative Committee, Water Technical Advisory Group and Aboriginal Cultural Heritage Advisory Group. They also require Santos to make all relevant information on the environmental performance of the project, including compliance with the recommended conditions, publicly available during the project.

This is consistent with the concept of ensuring a fair process, which is implicit in the principle of intergenerational equity.

Conservation of Biological Diversity and Ecological Integrity

These matters were a fundamental concern during the Department's detailed assessment of the biodiversity impacts of the project.

Following this assessment, the Department concluded that there is strategic support for the use of the land for the project under the *Brigalow and Nandewar Conservation Act 2005*, Santos's assessment of the biodiversity impacts of the project was conservative and carried out in accordance with the requirements of the *Major Projects Offset Policy*, and the project would not have any significant impacts on any State or Commonwealth-listed threatened species or ecological communities.

It also concluded that the biodiversity impacts of the project could be reduced substantially during operations, principally through the detailed design of the gas field, the implementation of standard mitigation measures and the progressive rehabilitation of the site to a high standard.

It has recommended conditions to ensure this occurs, and to require all residual biodiversity impacts to be fully offset in accordance with the government's *Major Projects Offset Policy*.

With these conditions in place, the Department considers the Narrabri Gas Project would not result in adverse impacts on the biological diversity or ecological integrity of the region.

Improved Valuation, Pricing and Incentive Mechanisms

The Department has applied this principle in its assessment of the Narrabri Gas Project.

Consistent with both the polluter pays and user pays principles, Santos will be required to pay the full costs associated with:

- ensuring the project is designed and implemented in accordance with the relevant standards, including the *Well Integrity Code*;
- mitigating and/or offsetting the impacts of the project;
- managing any waste produced by the project in a safe and sustainable way and in accordance with the NSW government's waste minimisation hierarchy;
- using any natural resources, including obtain water licences for all the water take of the project, paying royalties for the right to extract gas, and compensating landowners for the use of their land.

Under the recommended conditions and other statutory instruments, Santos will also be liable for being the full costs associated with addressing any incidents or compensating landowners for any property damage in the unlikely event they occur.

With these requirements and safeguards in place, the Department considers the Narrabri Gas Project is consistent with the valuation principle of ESD.



Recommendations – Chief Scientist & Engineer Review

Response to the Chief Scientist and Engineer's 2014 report and recommendations on Coal Seam Gas Activities in NSW, with respect to how the major concerns were addressed in the Department's Assessment Report and are reflected in the draft conditions

In 2013-14, the NSW Chief Scientist & Engineer conducted a review of coal seam gas (CSG) activities in NSW which included detailed community consultation and extensive investigations by experts into a range of technical and regulatory matters.

This review was based on the potential development of a significant gas industry in NSW, with the Camden Gas Project already operating, the Gloucester Gas project approved for production, and over 60% of the State being subject to petroleum exploration licences.

Following this review, the Chief Scientist found that the risks of gas development in NSW could be effectively managed with the right regulation, engineering solutions and ongoing management and research.

In her final report, the Chief Scientist made 16 recommendations.

In November 2014, the NSW Government adopted all these recommendations and published the *NSW Gas Plan* which seeks to establish a safe and sustainable local gas industry in NSW that balances the needs of the community, the economy and the environment.

The Government has subsequently responded to 15 of the 16 recommendations and is currently finalising its response to the last recommendation (cost recovery for regulatory).

As indicated in its assessment report, the Department has considered the findings and recommendations of the Chief Scientist's review as well as the government's response to the review and the major reforms it has introduced since 2011 to address community concerns about coal seam gas development in NSW, including:

- cancelling and buying-back petroleum exploration licences so only 5% of the State is now subject to a licence;
- establishing the Strategic Release Framework for the release of any new petroleum exploration licences;
- establishing the EPA as the lead regulator of gas development in NSW;
- passing legislation to harmonise the regulation of onshore minerals and petroleum and strengthen the compliance and enforcement tools;
- expanding the state's groundwater and surface water monitoring network;
- establishing codes of practice for well integrity, produced water management and fracture simulation;
- strengthening the landowner compensation requirements, including providing advice on benchmark compensation rates for gas development;
- establishing the community benefit framework under the petroleum legislation to allow gas projects to share the benefits of production with local communities;
- establishing the Legacy Wells initiative to ensure existing gas wells were properly rehabilitated in accordance with the *Well Integrity Code*;
- establishing a duties-based framework to ensure workers in the petroleum industry were appropriately trained and competent to perform work safely;
- putting in place coal seam gas exclusion and buffer zones;

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This section is rather controversial due to the fact that there was an NSW Upper House Inquiry in 2019/2020 into the Implementation of the Chief Scientists Recommendations and its findings found that the majority of the Recommendations were either not done, or not completed as per the Recommendations found in the Review.

I have made a comment on this matter in my original submission, so have others, so it is best I leave this prickly matter to the IPC to decide if the Chief Scientists Recommendations were in fact implemented in full, in part, or not at all when it comes to the entire process Santos adopted from 2014 to now including the EIS Information.

- banning the use of BTEX chemicals; and
- establishing the *Aquifer Interference Policy*.

With these reforms in place, the Government considers the existing legislative and policy framework is consistent international best practice and is suitable for ensuring the development of a safe and sustainable gas industry in NSW.

In addition, the Department notes that the scale of the gas industry in NSW is likely to be substantially smaller now than was envisaged during the Chief Scientist's review with the Camden Gas Project scheduled to close in 2023, AGL announcing it will not proceed with the approved Gloucester Gas Project, and only 7% of the State now being subject to petroleum exploration licences.

Consistent with the principle of ensuring the regulatory response to any matter should be proportionate to the risk of the matter, the Government is likely to implement some of the specific recommendations of Chief Scientist – particularly those recommendations relating to cumulative or basin-wide impacts using complex automated systems and a standing expert advisory body – in stages, starting on a project by project basis and expanding this to an industry-wide basis should the scale and nature of the industry warrant it at some stage in the future.

Finally, it should be noted that many of the Chief Scientist's recommendations were directed to the broader regulatory and policy framework for gas development in NSW, and in many cases are not directly applicable to the assessment of individual gas projects such as the Narrabri Gas Project.

Nevertheless, the Department has considered all relevant aspects of the Chief Scientist's review during its assessment of the project and sought to ensure the recommended conditions give effect to the intent of these recommendations, and that these conditions are proportionate with the relevant risks of the project.

These conditions would be supported by additional conditions under the pollution control, petroleum and water legislation as well as other actions undertaken by the NSW Government during the ongoing implementation of the recommendations of the Chief Scientist's review.

Based on its detailed assessment, the Department considers the Narrabri Gas Project to be precisely the type of project that is consistent with the recommendations of the Chief Scientist and the subsequent *NSW Gas Plan*.

The table below provides a simple summary to the consideration of the Narrabri Gas Projects against the Chief Scientist's recommendations.

Table 2 | Reconciliation of Chief Scientist and Engineer's 2014 Review Recommendations

| <i>Recommendation</i> | | <i>Application to Narrabri Gas Project (NGP)</i> |
|-----------------------|--|--|
| 1 | That government make clear its intent to establish a world-class regime for extraction of CSG. | <p>A world class regime is already in place in NSW and applies to the NGP.</p> <p>The Department has assessed the Narrabri Gas Project against this regime, including the:</p> <ul style="list-style-type: none"> • Strategic framework – NSW Gas Plan: commitment to develop a safe, sustainable local gas industry & Mining SEPP • Regulatory framework – EP&A Act, POEO Act, Petroleum (Onshore) Act & WM Act • arrangements for ensuring fair compensation for landowners – statutory reforms to arbitration, IPART benchmarks for compensation rates, compensable loss provisions in PO Act • Policies, guidelines and codes of practice identifying relevant standards and performance requirements for coal seam gas; and • Ongoing research being conducted by both GISERA and IESC. |
| 2 | That government ensure clear and open communication on CSG matters is always maintained . | <p>The NSW Government has maintained clear and open communication with the community on its coal seam gas reforms and will continue to do so.</p> <p>The Department has carried out extensive community consultation during its detailed assessment of the Narrabri Gas Project and considered all the issues raised by the community during this assessment. It has also published all the information on the Narrabri Gas Project on the Major Projects Portal.</p> <p>If the Narrabri Gas Project is approved, it will need to comply with strict regulatory requirements set in the development consent, environment protection licence and petroleum production licence.</p> <p>These requirements require Santos to involve the community in the implementation of the project, including setting up several advisory groups with community representatives. They also require Santos to monitor and publicly report on its environmental performance, and to make all relevant information associated with the project publicly available.</p> <p>As the lead regulator for gas development in NSW, the EPA will continue to keep the community informed about its regulatory activities on the project</p> |

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| 3 | That government investigate as a priority a range of practical measures for implementation (or extension of current measures) to allow affected communities to have strengthened protections and benefits including fair and appropriate | <p>There are already measures in place to protect affected communities, and these measures will apply to the NGP, including:</p> <ul style="list-style-type: none"> • Statutory changes to land arbitration procedures in the PO Act • IPART benchmarking of compensation rates for landholders • Compensable loss provisions in the PO Act • Voluntary Land Acquisition & Mitigation Policy, which can be applied through development consents to address exceedances of applicable environmental standards • Voluntary Planning Agreements to provide local councils to provide infrastructure and services for projects • Financial insurance/assurance obligations that can be applied under the EP&A Act and POEO Act • Compliance powers under the regulatory regime to require proponents to rectify any damages caused by development • State Government grants to support mining-impacted communities, such as the Regions for Regions program. <p>Subject to the recommended conditions, the Narrabri Gas Project is not expected to result in any significant impacts of the community or the environment.</p> <p>Nevertheless, there will be several safeguards in place to protect the community.</p> |
| 4 | That the full cost to government of the regulation and support of the CSG industry be covered by the fees, levies, royalties and taxes paid by industry, and an annual statement be made by government on this matter as part of the Budget process. | Not applicable. |
| 5 | That government use its planning powers and capability to designate those areas of the State in which CSG activity is permitted to occur, drawing on appropriate external expertise as necessary. | <p>The Government has done this.</p> <p>The Narrabri Gas Project is located where CSG development is permitted to occur. It sits within existing petroleum titles and is permissible with development consent under both the <i>Mining SEPP</i> and <i>Narrabri Local Environmental Plan</i>.</p> <p>The Department's assessment, which incorporates the advice of independent experts, has found that the project can be carried out in a safe and sustainable way without causing any significant impacts on people or the environment.</p> |

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| 6 | That government move to a single Act for all onshore subsurface resources (excluding water) in the State, constructed to allow for updating as technology advances. This will require a review of all major Acts applying to the resources sector. | Not applicable. |
| 7 | That government separate the process for allocation of rights to exploit subsurface resources (excluding water) from the regulation of the activities required to give effect to that exploitation (i.e. exploration and production activities); and that it establish a single independent regulator. | The EPA is lead regulator for all coal seam gas activities in NSW and has the technical capability and powers to be able to do this effectively on the Narrabri Gas Project should it be approved. |
| 8 | That government move towards a target and outcome-focused regulatory system. | <p>This is system already in place and applies to the NGP.</p> <p>In particular, there are clear policies, guidelines and codes of conduct in place setting out the relevant standards and performance requirements for coal seam gas activities in NSW. These documents are all publicly available on the Major Projects Portal.</p> <p>The recommended conditions set clear standards and performance measures for compliance on the Narrabri Gas Project, and would be strictly enforced by the EPA as the lead regular for all gas development in NSW</p> |
| 9 | That government consider a robust and comprehensive policy of appropriate insurance and environmental risk coverage of the CSG industry to ensure financial protection short and long term. | <p>Government has committed to using a three-layered policy to provide suitable safeguards for any risks associated with CSG activities, and this will be implemented on the NGP (if it is approved).</p> <p>The three layers are comprised of:</p> <ul style="list-style-type: none"> • security deposits for rehabilitation under the PO Act • insurance/assurance mechanisms required under the EP&A Act or POEO Act • ongoing implementation of the Legacy Mine Program to deal with any impacts associated with legacy petroleum wells. <p>All three layers will be in place for the Narrabri Gas Project, and supplemented by the recommended conditions and other statutory protections.</p> |

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| 10 | That government commission the design and establishment of a Whole-of-Environment Data Repository for all State environment data including all data collected according to legislative and regulatory requirements associated with management, gas extraction, mining, manufacturing, and chemical processing activities. | <p>The Government has set up the SEED portal and will continue to enhance its capabilities over time.</p> <p>All relevant information on the Narrabri Gas Project will be made publicly available, on the SEED and/or the Major Projects Portal.</p> <p>The Government is also installing a deep groundwater monitoring network in the Narrabri region, which will provide robust baseline data against which any impacts of the Narrabri Gas Project can be compared should it proceed.</p> |
| 11 | That government develop a centralised Risk Management and Prediction Tool for extractive industries in NSW. This would include a risk register, a database of event histories, and an archive of Trigger Action Response Plans. | <p>Given the limited scale of coal seam gas activity in NSW, the Department does not support the establishment of such a sophisticated tool at this stage. Instead, it considers projects should be assessed on their merits on a project by project basis.</p> <p>The cost of establishing such a tool may be warranted in the future once the gas industry matures in NSW.</p> <p>However, the Narrabri Gas Project has been subject to detailed risk assessment by the NSW Government in accordance with relevant:</p> <ul style="list-style-type: none"> • Australian standards • NSW policies, guidelines and codes of practice. <p>If it is approved, the Narrabri Gas Project will be subject to strict conditions that:</p> <ul style="list-style-type: none"> • set clear limits and performance standards • require regular monitoring and public reporting on compliance • require detailed management plans to be submitted for approval prior to each stage of the project • require regular independent environmental audits to be carried out. |
| 12 | That government establish a standing expert advisory body on CSG (possibly extended to all the extractive industries). | <p>There is insufficient coal seam gas activity in NSW at present to justify the establishment of such a body at this stage.</p> <p>During the assessment of the Narrabri Gas project, the Department has sought and considered expert advice from:</p> <ul style="list-style-type: none"> • key NSW Government agencies • the NSW Gateway Panel • the Commonwealth Independent Expert Scientific Committee |

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| | | <ul style="list-style-type: none"> • key Queensland government agencies responsible for regulating coal seam gas activities in Queensland • independent experts from a broad range of fields (including geology, petroleum engineering, hydrogeology, surface water treatment, hazards and risks, Aboriginal heritage, economics and social impacts), some of whom provided advice to the Chief Scientist during the review • experts appointed by special interest groups who are opposed to the project. <p>The Department has also reviewed and applied the relevant findings of the following to its assessment of the Narrabri gas Project:</p> <ul style="list-style-type: none"> • the inquiries into unconventional gas activities that have been held in Victoria, WA and the NT since the Chief Scientist completed the review of CSG activities in NSW; • Bioregional assessment for the Namoi subregion of the Northern Inland Catchments bioregion, which provides useful baseline information on the land and water resources that could be affected by the NGP; • the research commissioned by the IESC on CSG activities; • the research prepared by GISERA on CSG in Australia, including the Narrabri region; and • the findings of the research on the potential health impacts of unconventional gas development in different jurisdictions across Australia and overseas. <p>The Department has recommended the establishment of an independent Water Technical Advisory Group to oversee the implementation of the project and provide advice to government.</p> <p>The Department will recover the costs associated with operating this body from Santos.</p> |
| 13 | <p>That government establish a formal mechanism consisting of five parallel but interacting steps. The five steps include.</p> <ul style="list-style-type: none"> • Companies or organisations seeking to mine, extract CSG or irrigate as part of their initial and ongoing approvals processes should, in concert with the regulator, identify impacts to water resources, their pathways, their consequence and their likelihood, as well as the baseline conditions and their risk trigger thresholds before activities start. These analyses and systems should be incorporated in project management plans to meet regulator-agreed targets. Appropriate monitoring and | <p>This is either in place already or will be addressed prior to the commencement of the Narrabri Gas project should it proceed:</p> <ul style="list-style-type: none"> • full risk assessment has been carried out • detailed assessment of risks and potential mitigation measures has been provided in the EIS and other associated information provided by Santos • detailed baseline information has been gathered and will be enhanced prior to operations (if the Narrabri Gas Project proceeds) • Government is gathering additional information to supplement this baseline data, especially on the region's groundwater resources • the public has had access to all the available information and been given several opportunities to comment • independent experts have provided advice to the Department on key risks, and consulted with key stakeholder groups and their experts • the Department has consulted extensively with other jurisdictions, including the Commonwealth and Queensland. |

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| <p>characterisation systems would be developed as part of these project management plans and then installed. The monitors would measure baseline conditions and detect changes to these, as well as providing data on impacts and triggered risk thresholds.</p> <ul style="list-style-type: none"> • Data from the monitors should be deposited (either automatically or in as close to real time as possible) in the State Whole-of-Environment Data Repository by all the extractive industries. Increasingly automated tools to interrogate data in the Repository should be developed, and these used to search data for discontinuities and compliance alerts. • As a separate process, the expert advisory body would examine on a frequent basis all data relevant to a region or a sedimentary basin. This data would come from a range of sources (the companies' monitoring data along with triangulation/cross validation data such as that from satellites, reports from local councils, seismic data, subsidence maps, information from cores, etc.). The expert body would use this data review to check for any factors signalling problems in that region and, if any are found, recommend to government the appropriate action to be taken with regard to the relevant parties. • In a parallel process, the government should commission, construct and maintain a variety of models of each region and in particular one that seeks to address cumulative impacts. These models should feed into the land use planning process and the activity approvals processes, and should assist in target setting for new projects. | <p>If the Narrabri gas Project is approved, it will be subject to strict conditions (see above) requiring public reporting on performance.</p> <p>Given the limited scale of coal seam gas activities in NSW, there is no justification for the Government to develop detailed models of each subregion at this stage, particularly because no cumulative impacts are expected to occur as a result of the Narrabri Gas project or other resource projects in the Gunnedah basin.</p> <p>However, the Government remains committed to improving its understanding of the various sedimentary basins across NSW and the impacts of mining on these basins.</p> |
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| | <ul style="list-style-type: none"> government, working with other appropriate Australian governments, should commission formal scientific characterisation of sedimentary basins starting with the East Coast basins, and concentrating initially on integration of groundwater with the geological, geophysical and hydrological context. Viewing these integrated systems in models and in interpretation could be described as a 'Glass Earth' approach to understanding the dynamics of activities and impacts in the basins. | |
| 14 | That government ensure that all CSG industry personnel, including subcontractors working in operational roles, be subject to ongoing mandatory training and certification requirements. Similarly, public sector staff working in compliance, inspections and audits should be given suitable training and, where appropriate, accreditation. | This is already in place, under the mine safety legislation, and will apply to the Narrabri Gas Project. |
| 15 | That government develop a plan to manage legacy matters associated with CSG. This would need to cover abandoned wells, past incomplete compliance checking, and the collection of data that was not yet supplied as required under licences and regulations. There will also need to be a formal mechanism to transition existing projects to any new regulatory system. | Not applicable. |

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| 16 | That government consider whether there needs to be alignment of legislation and regulation governing extraction of methane as part of coal mining and the application of buffer zones for gas production other than CSG with the relevant legislation and regulation provisions governing CSG production. | Not applicable. |
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Water Sharing Plans

Provide further details on the relevant water sharing plans for the region and whether any reviews of these plans are occurring.

Under the water legislation, Water Sharing Plans set the strategic framework for the management of each water source across NSW.

The key drivers for these plans are to:

- allocate water to users and set rules for water trading;
- protect the environmental health of the water source; and
- ensure the use of the water source is sustainable in the long term.

In general, they are reviewed and updated every 10 years.

To ensure consistency with the Commonwealth Basin Plan, the Water Sharing Plans relevant to the Narrabri Gas Project were recently reviewed and updated, and copies of the revised plans were published on the NSW legislation website in June/July 2020.

The revised plans included new sustainable extraction limits (Long-term Annual Average Extraction Limits – LTAAEL) for each of the groundwater sources in the region.

The table below summarises the maximum predicted water take from each of the relevant water sources relative to the sustainable extraction limits or LTAAEL.

This water take includes the direct take of water from the target coal seams, which forms part of the Gunnedah Oxley Basin (GOB) groundwater source, and the induced take of water from the shallower aquifers, which form part of the Namoi Alluvial and Great Artesian Basin (GAB) groundwater sources.

The direct take of water from the GOB groundwater source would be capped at 37.5 GL over the life of the project with a maximum take of 3.55 GL a year during the early years of the project and an average take of 1.5 GL a year. This take represents less than 2.8% of the sustainable extraction limit of the GOB groundwater source.

As there is limited demand for the water in this groundwater source, due to its depth and high salinity levels, most of this water (77%) remains unallocated. Consequently, Santos should have no difficulties in securing the necessary water licences to extract the water it requires from this water source.

The induced water take from the shallower aquifer is predicted to be very low (less than 60 ML a year) and to peak well into the future (200-250 years). This water would come from the Lower Namoi Alluvial (4 ML a year), Upper Namoi Alluvial (1 ML a year – from Management Zone 5), GAB Southern Recharge (57 ML a year) and GAB Surat (0.2 ML a year) groundwater sources.

This take represents a very small fraction of the sustainable extraction limit of each of these groundwater sources, ranging from 0.02 to 0.15% of this limit.

As the take of water from each of the groundwater resources is fully allocated, Santos would be required to obtain a water licence for the take of water from each groundwater sources on the open water market, and in accordance with the water trading rules in the relevant Water Sharing Plan.

Given the small amounts of water involved, the Department cannot see any reason why Santos would be unable to do this, and has recommended a condition (B28) which requires Santos to demonstrate to the satisfaction of the Planning Secretary prior to each phase of the project that it has adequate water licences to account for the maximum predicted take of the project (including both short term and long term direct and indirect water take) during that phase of the project.

Table 1 | Water Sharing Plans

| Water Sharing Plan | Relevant Water Sources | Status | Predicted peak water take due to coal seam gas extraction (ML) ⁽¹⁾ | LTAEL (ML) ⁽²⁾ / Peak Take % of LTAEL |
|---|---|---|---|--|
| <i>Upper Namoi and Lower Namoi Regulated River Water Sources 2016</i> | Lower Namoi Regulated River Water Source | <ul style="list-style-type: none"> Commenced July 2016 In effect until June 2026 | Nil | N/a |
| https://www.legislation.nsw.gov.au/#/view/regulation/2015/631 | | | | |
| <i>Water Sharing Plan for the Namoi and Peel Unregulated Rivers Water Sources 2012</i> | Namoi Unregulated Management Area comprising 26 water sources | <ul style="list-style-type: none"> Commenced October 2012 In effect until June 2023 Project area predominantly located within Bohena Creek and Bundock Creek Water Sources. | Nil | N/a |
| https://www.industry.nsw.gov.au/_data/assets/pdf_file/0012/313500/namoi-and-peel-unregulated-rivers-ws-2012.pdf | | | | |
| <i>Water Sharing Plan for the Namoi Alluvial Groundwater Sources 2020</i> | Lower Namoi Alluvial (LNA) | <ul style="list-style-type: none"> Commenced July 2020 In effect until June 2030 Replaced <i>Water Sharing Plan for the Upper and Lower Namoi Groundwater Sources 2019</i> LTAEL effectively fully allocated across most management zones | 4 | LNA 88,255 (0.00%) |
| | Upper Namoi Alluvial (UNA) | | 1 | UNA total 123,403 (0.00%) UNA (Zone 5) 16,128 (0.02%) |

| Water Sharing Plan | Relevant Water Sources | Status | Predicted peak water take due to coal seam gas extraction (ML) ⁽¹⁾ | LTADEL (ML) ⁽²⁾ / Peak Take % of LTADEL |
|---|--------------------------|---|---|--|
| https://www.legislation.nsw.gov.au/regulations/2020-346.pdf | | | | |
| <i>Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020</i> | GAB Southern Recharge | <ul style="list-style-type: none"> Commenced June 2020 In effect until June 2030 | 57 | 38,700 (0.15%) |
| | GAB Surat | <ul style="list-style-type: none"> Replaced the <i>Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2008</i> GAB Southern Recharge LTADEL fully allocated GAB Surat around 70% LTADEL allocated | 0.2 | 43,446 ⁽³⁾ (0.00%) |
| https://www.legislation.nsw.gov.au/regulations/2020-354.pdf | | | | |
| <i>Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2020</i> | Gunnedah Oxley Basin MDB | <ul style="list-style-type: none"> Commenced June 2020 In effect until June 2030 Replaced the <i>Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2011</i> Around 23% of the LTADEL allocated for stock and domestic and water licences. | 3,553 | 127,500 (2.8%) |
| https://www.legislation.nsw.gov.au/regulations/2020-349.pdf | | | | |

(1) Based on base-case water take of 37.5 GL water from the Gunnedah Oxley Basin MD Water Source which the Department has strictly conditioned (Condition A14) as the maximum take of water over the life of the project, including the water production profile used for the groundwater assessment.

(2) Long-term average annual extraction limit (LTADEL) which also equates to the long-term average sustainable diversion limit of the Basin Plan under the Commonwealth's *Water Act 2007*

(3) This is the minimum LTADEL currently set– the WSP allows for an increase subject to success of water savings from cap and pipe projects

Salt Management

Provide particulars of the storage and beneficial reuse of salt waste in the Queensland gas field context

The Queensland government has implemented policies encouraging the beneficial use of coal seam gas (CSG) water through the *Coal Seam Gas Water Management Policy 2012* (https://environment.des.qld.gov.au/data/assets/pdf_file/0034/89386/rs-po-csg-water-management-policy.pdf).

This policy is consistent with the NSW EPA's waste management hierarchy which would be applied to the Narrabri gas project, and includes a hierarchy for managing saline waste including:

- **Priority 1:** Brine or salt residues are treated to create useable products wherever feasible
- **Priority 2:** After assessing the feasibility of treating the brine or solid salt residues to create usable and saleable products, disposing of the brine and salt residues in accordance with strict standards that protect the environment.

The policy identifies management options and principles for salt and brine management options for beneficial reuse or disposal including:

- For beneficial reuse:
 - Identify potential uses; and
 - undertake feasibility assessment of potential uses
- For disposal:
 - demonstrate that all reasonable and feasible reuse options have been considered;
 - convert the waste to solid product where feasible;
 - undertake risk assessment of disposal options
 - dispose of brine and salt away from sensitive receiving environments and good quality agricultural land

The policy identifies brine injection underground and/or disposing of salt waste to regulated waste facilities as suitable options.

The Department has recommended conditions consistent with Queensland's approach to the management of waste and the waste management hierarchy outlined in the NSW Government's *Waste Avoidance and Resource Recovery Act 2001* which promotes avoidance, followed by resource recovery, followed by disposal options.

The recommended conditions include:

- **Condition B35** – Water Management Performance Measures for Salt Management requiring the proponent to:
 - maximise beneficial reuse of produced salt, as far as reasonable and feasible;
 - dispose salt waste not able to be beneficially reused to appropriately licenced waste facility
- **Condition B38** – Water Management Plan including:
 - Salt Management Plan including a program for investigating and implementing beneficial reuse options for the salt product, in accordance with the Produced Salt Beneficial Reuse and Disposal Study;
- **Condition B63** – Waste Operating Conditions including requirements to:
 - implement all reasonable and feasible measures to maximise beneficial reuse of waste;



Number: 1 Author: Tony Subject: Sticky Note Date: 21/08/2020 10:31:07 AM

I find the use of the use by the Department of Queensland government policies, and then linking those policies to the NSW EPA waste management hierarchy to be rather amusing and offensive.

I say this because when it came to the problem of Microbial Corrosion of Queensland Gas wells (see Att 4.7 Sub 13 in my first submission) is a subject that the EPA said it would not take interest in because the case was in Queensland and the NSW EPA only considers NSW.

I suppose the mistrust of the EPA and NSW Government Departments to properly administer any Salt Management Plan/Policy, in landfill or secured sites all stems from the disposal of the Salts and can be likened to the what happened a few years back when the 150 kilometer maximum radius requirement for waste disposal in NSW was ignored by both the EPA and NSW Departments. The poor administration of the rules by the EPA was only brought to light after a television program exposed the problem.

I have to wonder if the problem will resurface should the legislation and Development Consent conditions be weak on the subject of Salts and brine disposal or usage by a second or third party third.

Santos in conjunction with a NSW Copper mine has already tried to use the so called Bicarbonate Brine to correct the acid tailings waste (see Att 3.2 Sub 8 in my original submission). The EPA initially supported the trial but then changed its mind, yet Santos claimed on the IPC tour that it was still going ahead (my question around the trial asked on the IPC tour is still unanswered as are all the rest (see supplementary and my first Submission), so the public are still in the dark over that one, and most likely will be for any other so called Beneficial reuse trials of the Salts and Brine that Santos creates from the produced water.

Another point to remember is that the salts content of the produced water in Queensland is no where near the level of the Salts content in the produced water from the NSW NGP, as such the reference to the Queensland Policy of 2012 should be ignored,

NSW needs to have its own up to date Regulation around the Salts and Brine, not adopt someone else's with the provisions actually in the stated NSW Act prior to any more approvals being granted to Santos in regards to the NGP.

Talk is cheap, so are many written words phrases and plans such as "reasonable and feasible" along with "investigating and implementing" along with words such as "minimise" and the Santos "Produced Salt (s) Beneficial Reuse and Disposal Study to be part of the Santos Water Management Plan" really mean nothing until placed in legislation, and this should be done Prior to any approval of the Santos NGP.

- minimise the residual waste generated by the development
- dispose of all waste at appropriately licensed waste facilities;
- monitor and report on the effectiveness of waste avoidance, minimisation and management measures;
- *Condition B65* – Produced Salt Beneficial Reuse and Disposal Study including:
 - an assessment of reasonable and feasible beneficial reuse options;
 - strategy for maximising beneficial reuse for identified reasonable and feasible reuse options; and
 - a strategy for disposal of any produced salt that is not able to be beneficially reused, including demonstrating that occupiers of waste facilities can lawfully accept and will permit the volume and composition of salt waste.

Currently in Queensland, brine from the treatment of produced water is currently being stored in appropriately engineered storage ponds in accordance with Queensland's regulatory requirements. As the brine is predominantly a chloride-based salt there are fewer beneficial reuse options than is the case for carbonate-bicarbonate salts that would be generated by the Narrabri Gas Project. The CSG companies

Secretary's Environmental Assessment Requirements

Provide details regarding how the Secretary's Environmental Assessment Requirements have been addressed by the Applicant

The Department undertook a comprehensive review of the contents of the Environmental Impact Statement (EIS) prior to accepting it for exhibition to ensure that it adequately addressed the Secretary's Environmental Assessment Requirements (SEARs), including the general requirements required under Schedule 2 Clauses 6 and 7 of the *Environmental Planning & Assessment Regulation 2000*.

In undertaking this review, the Department was satisfied the EIS addressed the SEARs and incorporated the relevant information.

However, consistent with other complex state significant projects of high public interest, throughout the assessment process the Department sought a broad range of additional technical information from Santos to address concerns raised in submissions, advice from agencies and independent technical experts.

This is consistent with the statutory process envisaged for State significant development under the EP&A Act.

All of this information was made publicly available on the Department's Major Projects Portal.

Appendix A of the EIS includes a complete list of the environmental assessment requirements and references to the relevant sections of the EIS wherein these are addressed.

This Appendix is available on the Department's website under "EIS" at <https://www.planningportal.nsw.gov.au/major-projects/project/10716>.

Narrabri Gas Project (SSD 6456)

Submission to IPC following public hearing



10 August 2020

Summary of Comments on 200810 SN Santos _Final Submission incl

Page: 1

 Number: 1 Author: Tony Subject: Sticky Note Date: 21/08/2020 10:39:01 AM

20200821

I, Tony Pickard of 75 Rockdale Road, Jacks Creek Narrabri, 2390, am opposed to the Narrabri Gas Project.

I make this submission as summarized annotated notes to the first 45 pages of Santos' Submission to the IPC following the public Hearings.

Executive Summary

The Narrabri Gas Project is in the public interest, critical for energy security and reliability in New South Wales and would deliver significant economic benefits to NSW and the Narrabri region, including jobs, investment and regional development. At the same time, the Project is unlikely to result in any significant impacts on the local community or the environment. These are the findings of the Department of Planning, based on a rigorous, multi-year assessment process that relied on science and evidence, and independent expert opinion. Thank you for the opportunity to present to the Panel during the public hearing and to now provide a further submission on behalf of Santos.

Many of the key themes addressed in this submission have previously been raised through the extensive and comprehensive assessment process so far and were also covered in my presentation to the Panel.

Santos has relied upon the best available science, expert research and opinion in our application to develop the Narrabri Gas Project so that the community can be confident it will not harm people, water resources or the environment. As the Department of Planning found, it is “difficult to reconcile the significant community concerns about the Narrabri Gas Project with the technical advice from experts that the risk of any significant impacts occurring is generally low and can be controlled using standard engineering practice and imposing strict conditions on Santos”.

While I outlined Santos’ capability in my presentation to the Panel, one thing I would like to reiterate in this further submission is our strong track record of coexistence with farmers. We have worked in partnership for more than 65 years across the country and most recently as we have developed a coal seam gas industry in Queensland that is welcomed by farmers and rural and regional communities. Landholders have welcomed payments that help drought-proof their farms by providing a second source of income from hosting gas field infrastructure, allowing them to expand their business in other directions, purchase additional land and add value to their properties. Some have also gained a new, clean source of water supply, available only because of gas production.

Santos has more than 2000 land access agreements in place throughout the Bowen and Surat regions in Queensland and we have safely drilled and operated more than 2300 coal seam gas wells since 2006, without harm to water resources or the environment.

Many presenters and submitters were generally opposed to any new fossil fuel projects, including gas, pitting them against a renewable energy future.

However, the two must coexist to deliver the energy security and reliability that our society demands. The International Energy Agency says that natural gas will grow to supply a quarter of all global energy demand in 2040 in all its scenarios. On Australia’s east coast, the Australian Energy Market Operator’s Integrated System Plan has found that more gas supply needs to be developed each year from 2023-2024 to meet residential, commercial, industrial and power generation demand in southern Australia.

We have seen examples of large economies switching to gas from other fuels to reduce their emissions. In the United Kingdom coal-fired power generation has been phased out over the last two decades with gas now accounting for almost 40 per cent of total power generation. This has resulted in a reduction in CO2 emissions of 38 per cent compared to 1990 levels. And, as our EIS outlines, the United States has also achieved large-scale emissions reductions from coal-to-gas switching, which the International Energy Agency says is critical to meet global climate goals. The Department of



Number: 1 Author: Tony Subject: Sticky Note Date: 17/08/2020 12:57:32 PM

As Santos has admitted that there will be some impact on the "local community", although Santos does say it in an of-hand way almost as if those who are in some way affected are "collateral damage" and not worthy of note.

It is my belief that like the coal mines, Santos should be required to make a 'reasonable' offer to purchase properties that have a reasonable chance of being impacted by the Narrabri Gas Project (NGP), especially in the light of the neighboring properties NOT being covered by Insurance for damage done due to CSG and the lack of Government interest in looking after the interests of the neighboring properties should any problems arise due to any part of the CSG operation.

Number: 2 Author: Tony Subject: Sticky Note Date: 17/08/2020 1:13:37 PM

Maybe if Santos and the Government did not hide behind the Confidentiality clause and actually got the information portal going and allowed the public to see more information then this problem may not have arisen.

The SEED portal was one of the Chief Scientists Recommendations and as noted by the EPA in the NSW Upper House Inquiry into the Implementation of those recommendations, the SEED portal is a long way from being what it is supposed to be.

I was a member of the Narrabri Gas Project Community Consultative Committee until November 2019 and I can assure the IPC that the last 24 or so months of membership was a very difficult time in obtaining answers to the questions raised by concerned members of the public (see my main submission) so much so that the group I represent decided to temporarily suspend membership of that NGPCCC and I tendered my Resignation from the CCC over the restrictive and obstructive attitude of both Santos and the new Chair towards anyone who asked the difficult questions.

That attitude is still current today with Santos not knowing the questions that were taken on notice during the IPC Tour of Santos' Operation in July 2020. (see my supplementary Submission.

Planning has also identified the role Narrabri gas could play in reducing emissions as aging coal-fired power stations close in eastern Australia over the coming decades.

Santos has set an aspiration of net zero emissions by 2050, we are driving change by deploying renewables, implementing energy efficiency projects, investing in technologies like carbon capture and storage and investigating the potential for hydrogen production. We are committed to a lower carbon future and taking practical measures to reduce our emissions, including at Narrabri where our appraisal gas is already being beneficially used for power generation at Wilga Park.

The economics of the Narrabri Gas Project stack up – Santos would not have already invested \$1.5 billion in the Narrabri Gas Project if they didn't. Narrabri is an economically robust investment opportunity for Santos and one that will deliver numerous economic benefits for the community.

ACIL Allen has updated its assumptions on the Narrabri Gas Project to reflect current economic conditions.

In short, what the new analysis has found is that the impact for the local community and New South Wales more broadly has strengthened. It finds more jobs would be created. It confirms the Project would put downward pressure on gas prices and would create increased levels of regional development.

Simply, the Narrabri Gas Project will offer large volumes of gas to the domestic market on long-term contracts. This will support Australian industries like manufacturing to drive the economic recovery out of the COVID-19 pandemic.

The tightness in supply in the New South Wales gas market, where around 95 per cent of gas currently has to be imported from other states, has meant this has been difficult in recent years.

As our economy comes out of hibernation from the COVID-19 health crisis, every effort must be made to drive economic growth, investment and job creation, also mindful that such development must be ecologically sustainable.

Santos submits that the Narrabri Gas Project can be developed safely and sustainably, without harm to people, water resources or the environment. The Project will bring jobs and business opportunities to regional communities in New South Wales at a critical time.

Santos submits the following submission for consideration by the Panel.



Kevin Gallagher
Santos Managing Director and Chief Executive Officer



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Number: 1 Author: Tony Subject: Sticky Note Date: 17/08/2020 7:28:13 PM

At least half of that amount went into the purchase with another sum going on meeting the carry over obligations from Eastern Star Gas, then there is the upgrading of the Wilga Park power station with the leasing of new generators which use the exploration and appraisal gas with no payment of Royalties to the state despite the income that Santos gets from the sale of the electricity generated.

Santos has drilled a few new gas wells, and put in some gas and water lines, built dams and the like, but all that becomes a tax write-off and hence Santos might have spent an amount but the overall tax benefits and the non payment of royalties would have canceled any of this stated amount spend.

Santos is not stupid, you do not get to be in the position Santos is by being silly with your dollars, If Santos can afford to put in a gas field, Dewhurst North and then 'moth-ball ' it, Santos knows how to get a good return on the stated \$1.5 billion without having the Narrabri Gas Project approved.

Number: 2 Author: Tony Subject: Sticky Note Date: 17/08/2020 7:41:30 PM

It is all very well to say that the Narrabri Gas Project "will deliver numerous economic benefits for the community", so why not give a few examples along with the expected times when these benefits will be available, otherwise this is all just talk and nothing more.

There is an old saying, "Put your money where your mouth is" and another 'Shut-up and Put-up".

The population of Narrabri Shire is yet to see any tangible benefit from Santos investment so far, unless you count the donations and sponsorships with the tag of displaying the Santos logo, as being of and economic benefit for the community.

If Santos cannot provide the above without strings attached then to me that is just advertising.

A few select businesses are getting a benefit but that is all. Shops are still closing in the main streets of our towns and have been since before the COVID-19 out break and youth unemployment is still to high. o where is the Economic Benefit from the stated spend?

Number: 3 Author: Tony Subject: Sticky Note Date: 17/08/2020 7:47:02 PM

If this "new" ACIL Allen report is so good then why did Santos wait until now to release it, when the IPC process has been going on since mid June. Surely this "new" report should have been introduced then and not now at the end of the public submission period.

This "new" report could almost be seen as a last ditch attempt to create mischief.

Number: 4 Author: Tony Subject: Sticky Note Date: 17/08/2020 7:52:03 PM

This so called COVID-19 recovery led by gas and especially the gas from the NGP is a bit of a red-herring as Santos has stated that it will be at least 2-3 years after approval is given before gas production will commence in any sizable quantity.

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■ Why the Project is needed

Some submitters questioned the strategic need for the Project in relation to gas market forecasts.

The NSW Government has recognised the need to secure future gas supplies through the development of an onshore gas industry in NSW. The *NSW Gas Plan* provides the framework for the regulation and management of the energy sector. The Narrabri Gas Project is identified as a Strategic Energy Project in the *NSW Gas Plan*.

The Project has the potential to supply up to 200 terajoules of natural gas per day, which is sufficient gas to meet up to half of NSW's natural gas demand. This is the natural gas that heats and powers more than one million family homes in NSW and fuels some 33,000 businesses. About 500 heavy industrial users consume approximately 75 per cent of the gas supplied to NSW and it is estimated that about 300,000 jobs rely on a safe and secure supply of natural gas. The gas would be made available for the NSW market to optimise the opportunities for the use of gas as a source of energy including via a high-pressure gas transmission pipeline.

The Australian Competition and Consumer Commission's inquiry into gas supply in Australia stated in its January 2020 interim report:

With declining production from established southern gas reserves, there is significant uncertainty about whether future supply from gas reserves and resources will be sufficient to meet overall demand on the east coast.

A growing component of energy demand will need to be met by natural gas supply to complement renewables growth and battery storage in Australia as ageing coal-fired power plants close over coming decades.

NSW Government's Net Zero Plan

As stated on the NSW Government's website¹, the *Net Zero Plan Stage 1: 2020-2030*, is the foundation for NSW's action on climate change and goal to reach net zero emissions by 2050. The plan aims to enhance the prosperity and quality of life of the people of NSW, while helping the state to deliver a 35 per cent cut in emissions by 2030 compared to 2005 levels. The plan will support a range of initiatives targeting electricity and energy efficiency, electric vehicles, hydrogen, primary industries, coal innovation, organic waste and carbon financing.

Several proposed initiatives as outlined in the Memorandum of Understanding – NSW Energy Package executed by the NSW and Commonwealth Governments included:

- improving transmission interconnection and network access, including accelerating and delivering:
 - NSW's first Renewable Energy Zone; and
 - upgrades to the Queensland to NSW interconnector;
- setting a target to inject an additional 70 petajoules of gas per year into the NSW market, and agreeing to a gas market review if this target is not met by 2022;
- ensuring emissions reduction in the electricity sector stays on track;
- committing to invest \$2 billion in reducing emissions in NSW; and
- supporting new generation investment in NSW.

In order to fulfil the Net Zero Plan objectives, the NSW and Commonwealth governments committed to jointly fund over \$2 billion in energy and emissions reduction initiatives subject to the NSW Government's supply of an additional 70 petajoules per year (PJ/y) of natural gas into the east coast gas network.

1. <https://www.environment.nsw.gov.au/topics/climate-change/net-zero-plan>



Number: 1 Author: Tony Subject: Sticky Note Date: 17/08/2020 8:03:34 PM

The term "NSW market" needs to be better defined, as the way it stands now it is too open ended geographically.

Does it mean the whole of NSW or just a small portion, say the Narrabri Industrial hub?

The 70 petajoules of gas per year until 2022, is this made up from the NGP Appraisal and Beneficial gas with a little early development gas thrown in?

Australian Energy Market Operator's (AEMO) Integrated System Plan

On 30 July 2020, AEMO released its 2020 Integrated System Plan (2020 ISP) for the National Electricity Market. The 2020 ISP sets out the optimal development path needed for Australia's energy system considering factors such as affordability, security, reliability and emissions outcome for consumers through the energy transition.

The 2020 ISP noted:

After gas fields cease production between mid-2023 and mid-2024, gas supply restrictions and curtailment of GPG (gas-powered generation) may be necessary, particularly during peak winter days.

To avoid this, southern Australia will need to either develop new local sources (and pipeline infrastructure), progress liquefied natural gas (LNG) import terminals or address pipeline limitations from northern Australia. ISP modelling forecasts approximately 120 PJ to 285 PJ of additional gas will be needed each year between 2024-25 and 2036-37 to meet residential, commercial and industrial gas demand, gas for LNG export, and gas supply for GPG.

GPG can provide the synchronous generation needed to balance variable renewable supply, and so is a potential complement to storage. The ultimate mix will depend upon the relative cost and availability of different storage technologies compared to future gas prices.

Additional gas is required in the domestic gas market to meet residential, commercial and industrial gas demand.

AEMO's 2020 ISP suggests gas-fired power generation may have a more substantive role once coal generators are retired from 2030 onwards. The 2020 ISP identifies that 63 per cent of Australia's coal-fired generation will reach the end of its technical life by 2040. In NSW, this reduction in generation would include coal-fired generators at Liddell, Vales Point, Eraring and Baywater.



Number: 1 Author: Tony Subject: Sticky Note Date: 19/08/2020 10:08:56 AM

Santos has obviously placed this quote in this response for a reason, yet has not explained why.

Is Santos and/or the AEMO suggesting that more gas-fired generation is needed, but what type? Remote to the gas field thermal units similar to the existing coal fired ones or a number of small localized engine driven generation plants located on future NSW gas fields? Remember that 2040 is not far away from the anticipated end of life of the NGP.

Vague comments on such an important topic which has wide reaching consequences for regions of NSW must be fully qualified and quantified as to what is required in the future especially in the light of Santos having control over most of the gas leases from Willow Tree to the Queensland Border.

Many people on the North West Plains of NSW including those who utilize the land for growing food and fiber are concerned that the NGP is just the thin edge of the wedge and if the NGP goes through then Santos will move on the other leases it holds applying the same criteria as Santos used with the NGP.

■ Downward pressure on NSW gas prices and more jobs

Some submitters queried whether the Project can put downward pressure on pricing and generate jobs in the Narrabri region. Comments were also made on projected future gas demand in NSW.

The 2016 economic analysis contained in the Narrabri Gas Project Environmental Impact Statement (NGP EIS) was recently updated by ACIL Allen to address issues raised during the IPC hearing.

The updated analysis reaffirms that the Project is vital for security of gas supply and job creation in NSW. The updated analysis also confirms that the Project will put downward pressure on NSW gas prices.

In summary the updated ACIL Allen analysis found that:

- Increasingly the southern states will require development of onshore resources as the existing developed and underdeveloped reserves are depleted. By the later 2020s and beyond, the Project will be among the lower cost resources.
- The Project can place downward pressure on gas prices in NSW, potentially by between 4 per cent and 12 per cent from 2025 onwards. Even if 40 TJ per day is provided to establish a local fertiliser plant, a 3 per cent to 9 per cent price reduction in Sydney is estimated.
- The Project will offer large volumes of gas on long term contracts. This has been difficult in recent times due to the tightness in supply and the lack of competition.
- Because of Santos' commitment that all the gas produced from the Project will be available for the domestic market, a new competitive source of supply close to Sydney is expected and this will lead to more competitive prices on long term gas contracts, particularly into the late 2020s and 2030s.
- This Project will create more jobs than previously estimated due to the economic restrictions placed on the previous model – the number of jobs created is 17 per cent higher (a total of 222 jobs) in the Moree-Narrabri region than in the NGP EIS and 78 per cent higher for NSW (a total of 912 jobs).
- The Project will significantly increase real economic output with the Gross Regional Product of the Moree-Narrabri region up by over \$12.6 billion and NSW Gross State Product up by \$14.7 billion compared to modelling without the Project. This is an increase of 14 per cent and 23 per cent respectively compared to the NGP EIS.

Appendix A contains further information on the updated economic analysis.

LNG imports

As some submitters identified, LNG imports may be an important addition to the east coast supply mix. However, these imports will not result in lower prices. LNG spot prices are at historically low levels brought about by the impact of COVID-19 on the world's economy. However, these LNG prices are forecast to return to normal levels according to the Japan Korea Marker (JKM) reference price which reflects the spot market value of LNG cargoes delivered into Japan and South Korea and was used in submissions as a relevant reference point for LNG import pricing. JKM also produces forward prices for the next 3 years which are pricing in a correction to these historic lows.

Charting these forward prices, converting them into Australian dollars per gigajoule and including shipping and re-gasification shows that LNG imports could be up to \$3 higher than the cost of Narrabri gas in 2023-4 (see chart below).



Number: 1 Author: Tony Subject: Sticky Note Date: 18/08/2020 12:21:12 PM

The increase in both employment and Gross Regional Product as a result of gas development can really only occur if there is an increase in the gas field numbers. The Narrabri Gas Project just does not have that long term sustainable capacity.

What I find interesting with the new updated Economics Report is not only the timing of the new report, but also the use of words such as "assumptions" and "Model".

This Report seems to be based on a COVID-19 Infrastructure Project led recovery of which mining/gas extraction is a par and is hinted at in various places within the Report.

It seems that the Report assumes that there will be a larger pool of potential employees from which the Gas Companies and other related industries will be able to selectively choose their employees.

This may work in the big cities and for a short time in the smaller regional cities and towns as the big money offered attracts workers, not only from areas outside but from workers who have or have just lost their current local employment.

The problem in bring in employees from the larger populated towns and cities to the smaller regional towns, is that these people in the main are used to a standard of living that is much higher than the regional towns where the gas is, and as such will be loath to bring their families to settle as a result most will not stay, so the long term benefit that a increase in population could bring is not as productive as first thought, as many outside employees will resort to Fly-in fly-out or drive-in drive-out.

The problem with taking on an increase in local employees is that the majority of these people have to come from some other employment and unless the positions they left are filled then one of two things happens, The business they left goes out of business because of not being able to fill the lost positions: or the Business gets 'smarter' and replaces the lost positions with Technology, which in the long term means a general down tern in the local economy and lost short and long term jobs.

Using increased employment is a double edge sword, on one hand, usually short term, it is good for a few and for a while for the local economy, but long term it has devastating results as contrary to what this Report says, Businesses including Agriculture and retail will adapt to few workers in the employment pool, the higher wages that the people in this pool will demand, the higher prices that non gas business will demand due to the higher wages they have to pay, will drive people to shop out of the area in order to make the lower income dollar go further and as a result the pool of businesses gets smaller as businesses close, either for good or go into a less labor intensive way of trading in an effort to stay competitive.

That is already occurring in Narrabri.

Basing the case for approval on the unproven increase in possible local employment has to be handled very carefully, for which ever way it goes there will be bigger problems to solve than are already known due to the original employment numbers as per the EIS, RTS and the first part of this IPC process.

I leave the new Economic output due to the increased Regional product to others, except I will say that Economists are real optimists when it comes to forecasts.

Before leaving I must ask why Moree-Narrabri and not Narrabri-Gunnedah-Moree, both the towns are equal distance from Narrabri? Has it something to do with the Coal Industry and the jobs sharing? Interesting.

Number: 2 Author: Tony Subject: Sticky Note Date: 18/08/2020 11:50:15 AM

In the Allen Report there is mention that once the initial Development Construction purchases have been made then any extra materials needed will be sourced locally, this may be true but will the account be local or will the account be outside of the local area.

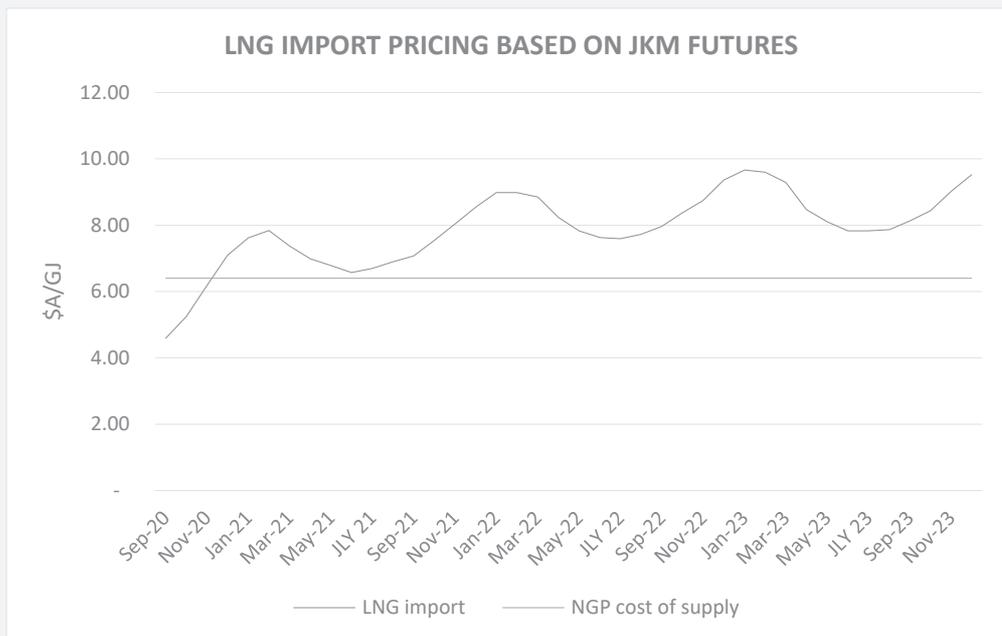
There is a difference in the local economic benefit between ordering and paying locally and ordering locally and paying out of the area. yet when put on paper and verbally stated the real understanding of the exact benefit is lost.

I believe, and there is nothing in print to point otherwise that Santos will order locally for most of its requirements, but pay outside of the area, just to save costs. The local business may get a small handling fee but nowhere near the profit that would have been made on the wholesale/retail mark-up, which generally ranges fro 15-30%.

I was in business in the retail trade as Blackheath Heating Centre, so I do have some first hand experience.

Some submissions referred to the current low LNG prices that have been seen through the COVID-19 pandemic. These references apply only to spot prices. Spot prices vary significantly throughout the cycle, with LNG spot prices being as high US\$14/GJ (~A\$20/GJ) just a couple of years ago.

It should be noted that most LNG, including Santos' projects, is sold under long-term contract, to underpin the many tens of billions of dollars of investments in LNG supply. That's why, in the first half of this year, despite the oil price war between Saudi Arabia and Russia, and despite the demand side shock caused by a mild northern winter and the coronavirus pandemic, Santos has realised relatively strong LNG prices, averaging US\$8.57/mmbtu, which is around A\$12 per gigajoule, much higher than spot LNG prices and also higher than average realised domestic gas prices of around A\$5.40 per gigajoule.



Note: Cost of shipping and gasification assumed to be AU\$1.20 per GJ, AUD/USD 0.70, MMBTU/GJ 1.055

SOURCE: PLATTS JKM MARKER PRICE FOR LNG AS AT 22 JULY 2020

■ The role of natural gas in a low-carbon economy

Some submitters suggested that the Project should not be approved as it would contribute to an unacceptable increase in greenhouse gas emissions and that any forecast shortage in energy demand could be met by renewable sources of energy generation.

These submissions ignore the critical role of natural gas in the transition to a low-carbon economy, recognised by the International Energy Agency, or the relative contribution of the Project to Australia's overall greenhouse gas (GHG) emissions, which is not significant.

Natural gas can help meet growing global energy demand while reducing relative global GHG emissions. The International Energy Agency says that global emissions would have been 15 per cent higher in 2018 without coal-to-gas switching. If the natural gas produced by the Project was simply used to displace coal-fired power generation in the Australian energy market, it would be expected that this would also reduce CO₂ emissions.

Natural gas is the natural partner for renewable energy power generation as Australia and the world transitions towards a low-carbon economy. Gas is not considered a replacement for renewables but is required to complement renewables growth in solar and wind in Australia, which is intermittent. Similarly, battery storage is currently suitable for short term backup supply but cannot sustain the NSW electricity grid for extended durations.

Under the UNFCCC Paris Agreement, the Australian Government committed to a quantified economy-wide nationally determined contribution (NDC) to reduce national emissions by between 26 and 28 per cent on 2005 levels by 2030¹. This Australian Government report went on to state the total net emissions were 12.9 per cent lower in 2018 than 2005 levels with a further reduction of between 13.1 per cent and 15.1 per cent required by 2030. Natural gas will perform an important role to achieve this commitment while ensuring reliable and secure energy supply, as recognised by the Australian Government.

Fuel switching to natural gas for electricity generation can deliver an improvement in emissions intensity of the electricity grid. As set out on page 20 of Appendix R of the NGP EIS, in the United States of America, fuel switching to natural gas enabled by the shale gas boom has resulted in an emissions reduction of 200 Mt CO₂-e per year. Similarly, in the United Kingdom, coal-fired power generation has been phased out over the last two decades, with gas now accounting for almost 40 per cent of total power generation. This has led to a reduction in CO₂ emissions of 38 per cent compared to 1990 levels. This gas-led reduction in emissions has allowed the United Kingdom to have one of the fastest declines in domestic emissions of the past 30 years¹.

Compared to coal and some existing sources of natural gas in the east coast gas market, Narrabri gas has a very low CO₂ content, so would be displacing higher-emissions energy sources.

Santos supports limiting global temperature rise to less than 2°C in line with the Paris Agreement. The International Energy Agency's 2018 World Energy Outlook Report explored three pathways for energy sector development in 2040. Under an International Energy Agency scenario consistent with the 2°C target, global gas demand grows by 14 per cent by 2040 compared to 2016 and forms approximately a quarter of the global energy mix.

The International Energy Agency has subsequently released further reports including The Role of Gas in Today's Energy Transitions (July 2019) and Energy Technology Perspectives Report (July 2020), which found that:

While there is a wide variation across different sources of coal and gas, an estimated 98% of gas consumed today has a lower lifecycle emissions intensity than coal when used for power or heat. This analysis takes into account both CO₂ and methane emissions and

shows that, on average, coal-to-gas switching reduces emissions by 50% when producing electricity and by 33% when providing heat.

Similarly, AEMO's 2020 Integrated System Plan report forecasts a shortfall in natural gas supply and coal-fired power generation while also identifying a key role for gas in Australia's clean energy transition with the following statement.

After gas fields cease production between mid-2023 and mid-2024, gas supply restrictions and curtailment of GPG (gas-powered generation) may be necessary, particularly during peak winter days.

To avoid this, southern Australia will need to either develop new local sources (and pipeline infrastructure), progress liquefied natural gas (LNG) import terminals or address pipeline limitations from northern Australia. ISP modelling forecasts approximately 120 PJ to 285 PJ of additional gas will be needed each year between 2024-25 and 2036-37 to meet residential, commercial and industrial gas demand, gas for LNG export, and gas supply for GPG.

Gas power generation is expected to continue to provide a reliability and security role to complement renewable generation in the National Energy Market according to forecasts by the AEMO and State and Federal Government policy (AEMO 2020 ISP, AEMO 2020 Gas Statement of Opportunities).

The GHG emissions assessment for the Project was undertaken in accordance with the *National Greenhouse and Energy Reporting Act 2007* (NGER Act) and the National Greenhouse and Energy Reporting Regulations 2008. The NGER Act is a national system for reporting GHG emissions, energy production and consumption by corporations. The data gathered under the NGER Act assists with compiling Australia's national GHG inventory in order to meet Australia's reporting obligations under the United Nations Framework Convention on Climate Change.

Amendments to the NGER Act in late 2014 introduced a framework for a GHG Safeguard Mechanism which came into effect on 1 July 2016. The associated rules were tabled in Parliament in October 2015. The Safeguard Mechanism provides a framework for Australia's largest facilities to measure, report and manage their emissions.

The Safeguard Mechanism applies to facilities that emit more than a threshold of 100,000 tonnes of CO₂-e per year and requires facilities to pay a penalty if an "excess emissions situation" exists in relation to the facility. An excess emissions situation exists where the net emissions number for the facility is greater than its baseline emissions number. It is likely that in a typical operating year, the Project will trigger the 100,000 tonnes threshold and will therefore be subject to the Safeguard Mechanism.

Santos will report the Project's GHG, energy consumption and energy production in accordance with the NGER Act and manage any compliance obligations under the Safeguard Mechanism or any future carbon policy.

Annual direct GHG emissions for the Project in a typical operating year would be approximately 0.96 Mt CO₂-e with the on-site power generation facility, or 0.53 Mt CO₂-e with electricity sourced from the national grid. This is the equivalent of less than 0.2 per cent of current annual emissions in Australia and less than 0.002 per cent of current global emissions.

The relatively small increase (less than 0.2 per cent) in Australia's annual GHG emissions should be considered in terms of the net environmental benefit of the natural gas generated by the Project. In the transition to a lower-carbon economy, natural gas offers a unique opportunity for Australia by providing a lower-carbon alternative to existing fossil fuel energy sources.



Number: 1 Author: Tony Subject: Sticky Note Date: 18/08/2020 12:57:18 PM

With regard to burning Methane (CH₄), it must be stated that there can be serious side effects if the combustion process is not complete, are the ignition temperatures are too low even if every thing is correct CO₂ is still produced, if not CO and the Nitrous Oxide gases are emitted along with water vapor. These gases when combined with the water vapor form various acids which have consequences for the environment or building material such as iron and cement.

As mentioned in the previous section I was in the Retail Trade more specifically the Heating by both gas and wood.

The gas central heating systems we installed were in the main the High efficiency type which produced both a wet exhaust and liquid condensate.

Both were slightly acidic due to the CO₂ combining with the condensed water vapor. The manufactures of the units we sold, Bravis, carried a warning that pointed out the dangers of the condensate coming into contact with cement and earth stakes.

This acid condensate is not just restricted to one manufacturer or one type of appliance, but many of the mid efficiency range units also across all Manufactures making such units and free standing heaters.

Next time there is a cold day look up at the roofs where there is steam coming from a heater exhaust and note the roof material condition, mostly you will find that the tiles are loosing their coating and the roof iron either loosing the colourbond coating or rusting, That is the acidic exhaust doing that.

Nitrous Oxide gases have the same effect but on a greater scale.

Most gases produced as a result of combustion of Methane based gas are not good for the environment in many different ways.

How the problem of curtailing these effects has yet to be explained in any of Santos' or Government documents.

The Narrabri Gas Project may only have a small GHG footprint but that footprint can have a very consequence into the future. The people need to see some leadership on this score, and not the usual fall back lines as stated here.

Aspirations are one thing putting those quoted Aspirations into effect in a timely manner, another, 2050 is 30 years away and miles to late.

This whole Santos argument as to why the NGP should be approved should be dismissed by the IPC for what it is.

The GHG emissions assessment (Appendix R of the NGP EIS) identified a range of measures to mitigate and manage the GHG emissions of the Project. These mitigation measures are primarily designed to reduce the Project's Scope 1 and Scope 2 emissions, and would be secured by the GHG conditions of consent which the IPC is required to consider in accordance with clause 14 of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*.

Santos has a long-term aspiration of achieving net-zero emissions by 2050 and has introduced a number of projects focused on carbon emissions reduction and renewable energy projects across our assets including:

- Moomba Carbon Capture and Storage Project, which proposes to capture the 1.7 million tonnes of carbon dioxide currently separated from natural gas at the Moomba gas processing plant each year and to reinject it into the same geological formations that have safely and permanently held oil and gas in place for tens of millions of years;
- Beam Pump conversion from oil to solar and battery power;
- Solar power introduction into Santos' Port Bonython processing plant in South Australia through a 2.12MW ground-mounted solar photovoltaic system;
- Heat recovery project at Moomba to reduce emissions;
- Santos' Darwin LNG battery project which will reduce carbon emissions from power generation by 20 per cent, as well as cut fuel gas consumption and operating costs; and
- Santos' Devil Creek in Western Australia is replacing existing power generation turbines with more fuel-efficient ones reducing emissions by more than 25 per cent and generating Australian Carbon Credit Units as a registered project with the Emissions Reduction Fund.

Santos will continue to identify and pursue opportunities to offset GHG emissions and beneficially re-use CO₂ where relevant in further support of achievement of emissions reduction targets.

In relation to downstream (Scope 3) emissions, as gas produced by the Project would be exclusively available to the domestic market, all Scope 3 emissions would be converted into either Scope 1 or Scope 2 emissions of the end users and as previously stated would be displacing higher emitting energy sources. This means that these emissions would be reported, mitigated and managed in accordance with Australian best practice standards, guidelines and policies.

Importantly, it also means that all emissions generated by or associated with the Project will be considered by the Commonwealth Government in the context of Australia's global commitment to reduce its GHG emissions by 26-28 per cent emissions below 2005 levels by 2030.

1. The Australian Government Submission to the United Nations Framework Convention on Climate Change, Australian National Greenhouse Accounts, 2020
2. Hausfather, 2019, Analysis: Why the UK's CO₂ emissions have fallen 38 per cent since 1990.

■ Consistency of the Project with the principles of ecologically sustainable development

Some submitters referred to the principles of ecologically sustainable development (ESD) and the proper application of those principles, in particular the precautionary principle in relation to groundwater impacts and ecological impacts and the principles of inter-generational equity in relation to climate change and social and economic impacts.

Attached as **Appendix B** is an Opinion of Richard Lancaster SC addressing the ESD issues mentioned above as well as:

- the contention advanced in the NWA Submission about the Minister's Statement of Expectations for the Independent Planning Commission and procedural fairness to the NWA;
- the operation of clause 14 of the Mining SEPP; and
- the submissions made during the public hearing to the effect that the Project should not be approved because it has no "social licence".



1

Number: 1 Author: Tony Subject: Sticky Note Date: 17/08/2020 10:44:54 PM

"Social licence" is all important especially in a rural setting as Social licence is the basic fabric that holds rural communities together. Without a basic Social licence a rural community, or parts of it, will always be divided.

Rural Communities are totally different from the cities. The rural community has to rely on itself for advancement where as the city has it all provided for them.

Social licence has to be earned and not bought if it is to mean anything.

Social licence is based on trust and honesty as well and a willingness to fully communicate with all sections of the community.

Respect for the opinion of others is another part of Social Licence.

If something goes ahead without a Social licence then the whole approval system is autocratic and not democratic, and I do not believe that is the way that the NSW system of Government, its administration and Departments are set up to be.

I do not believe that the NGP has done enough to be able to lay claim to having a Social Licence with the majority of the residences of the three townships in the Narrabri Shire let alone with the whole population.

Santos and others have always made a big thing of being accepted, well it now appears that Santos is backing away from that stance mainly due to well informed opposition.

It is such a pity that Santos could not mount their own defence but rather had eminent Council do it for them.

To be honest that just shows the failings of Santos' to be able to communicate with the population of the whole of the Narrabri Shire.

■ Greenhouse gas and climate change

■ Reservoir CO2 production

Some submitters stated gas produced by the Project would have CO₂ content of at least 25-30 per cent not 10 per cent as assessed.

The NGP EIS assessed a conservative average of 10 per cent CO₂ content across the Project area over the 25-year assessment period.

Santos has not misrepresented the CO₂ content of the coal seams in the Project site. The data available from appraisal well gas continues to show that the composition of gas produced by the Project over 25 years would be no more than the average of 10 per cent CO₂ assessed.

Between 2014 and 2019, over 250 gas samples were taken from approximately 32 operating appraisal wells. The average CO₂ content of the gas in these samples is less than 5 per cent. This sampling data, which is Commercial in Confidence due to commercial considerations linking gas content, composition to resource and asset value was provided to the EPA. While produced gas CO₂ content is below 5 per cent in these areas, the average in-situ CO₂ content is around 15 per cent and up to 24 per cent in some locations.

The difference between in-situ and produced CO₂ content regrettably led to some confusion in the submissions during the public hearing. Multi-isotherm science, the physics of relative gas sorption affinities, observation data gathered from field appraisal pilots and Santos' Queensland CSG operating experience, shows that CO₂ is produced at a much lower level than the proportion in-situ. Dr Andrew Grogan said that based on his analysis of data on the Geological Survey of New South Wales' DIGS website, the average CO₂ content of the gas would be at least 25-30 per cent. The table below shows the difference between the observed CO₂ content of produced gas and that of in-situ gas which is reported on DIGS.

Table 1: CO₂ Production Versus In Situ Analysis

| Well | Pilot Location | Avg. CO ₂ produced | Produced CO ₂ estimated by Dr Grogan |
|---------------|-----------------|-------------------------------|---|
| Dewhurst 26 | Dewhurst South | 8.6% | 20.8% |
| Biblewindi 13 | Biblewindi East | 4.3% | 13.9% / 74.0% * |
| Biblewindi 22 | Biblewindi West | 2.1% | 75% ** |

* Biblewindi 11C is a corehole located alongside Biblewindi 13. Dr Grogan's submission refers to 13.9% CO₂ from the Maules Creek Formation and 74% CO₂ from the Hoskissons Formation for Biblewindi 11C. Santos has only produced from the Maules Creek Formation selectively and exclusively.

** Biblewindi West 1C is a corehole located alongside Biblewindi 22. DR Grogan's submission refers to 75% CO₂ from the Hoskissons Formation for Biblewindi West 1C. Santos has only produced from the Maules Creek Formation.

The NGP EIS described and assessed approximately 95 per cent of production from the Early Permian Maules Creek Formation. The Late Permian Hoskisson's coal seam within the Black Jack Formation is a chronologically and stratigraphically separate coal seam with distinctive and varied gas composition. The 25-30 per cent CO₂ content suggested by Dr Grogan incorrectly assumes significant production from the Late Permian. Santos can and will selectively and exclusively develop independent coal seams based on best available science gathered during Project



Number: 1 Author: Tony Subject: Sticky Note Date: 18/08/2020 1:32:57 PM

Santos cannot just base the project justification on the low CO₂ content on just the 32 operating appraisal wells, some of which are not in operation today and some of these have not been in operation for up to 4 years (Dewhurst North Appraisal Pilot).

I refer the Commissioners to my Submissions where gas desorption analysis have been provided. These Analysis are not from the existing producing wells but from wells in areas that were producing and now left idle but still equipped with well heads, and they show some disturbing figures in CO₂ content should Santos re-enter these areas.

While I am no industrial Chemist or an expert on gases within coal seams, I do know what I read, especially if it is a Santos document, and I do know what I smell. And I have smelt Hydrogen Sulphide in the produced water from the Dewhurst South Appraisal Gas field (refer to video in my main submission and I do believe what I read especially if it is in a Santos Document (see submissions).

So there are at least three gases present in at least one, if not all, of the accessed coal seams, these gases are Methane, Carbon Dioxide and Hydrogen Sulphide and I believe that these gases are in "pockets" in varying concentrations which are impossible to predict where they are and when they will be drawn to the surface.

I and others are not fabricators of the truth but both the Regulator, The Department and the Company are hell-bent on trying to paint many questioners that way.

Santos cannot hide behind "Commercial-in-Confidence", when it comes to any form of possible greenhouse gas emissions. There must be some way that can be worked out where Santos informs the Community in real time, with regard to the gases found in the taken gas samples.

Until there is that openness on the gases within the extracted gas, then this Project Application must be stopped.

Number: 2 Author: Tony Subject: Sticky Note Date: 18/08/2020 1:34:26 PM

Bibblewindi West 1C was a core hole well that was plugged and abandoned in the days of Eastern Star Gas.

So why the Santos comment about "only producing from the Maules Creek Formation"?

I cannot see the relevance.

development. Should the Project be approved, further appraisal is required in order to refine those areas that are most economic. Santos remains confident that over the 25-year Project the average CO₂ content of the gas will not exceed the 10 per cent assessed.

Finally, in a typical operating year the Project will trigger the 100,000 tonnes threshold in the NGER Act as set out above. Therefore, the Project will be subject to the Safeguard Mechanism which is one of the key elements of the Commonwealth Government's plan to meet Australia's Paris commitments.



1

■ Fugitive emissions

Some submitters stated that the Narrabri Gas Project EIS had underestimated the predicted fugitive methane emissions

Santos is aware that several submissions made during the public hearing suggested that fugitive methane emissions would be much higher than those assessed in the NGP EIS.

Santos maintains that its assessment of fugitive emissions in the NGP EIS is accurate, based on best available science and data, and was prepared in accordance with all relevant policies and guidelines.

Under clause 14(2) of the *State Environment Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*, the IPC is required to consider:

...an assessment of the greenhouse gas emissions (including downstream emissions) of the development, and must do so having regard to any applicable State or national policies, programs or guidelines concerning greenhouse gas emissions.

The NGP EIS Greenhouse Gas Assessment (Chapter 24 and Appendix R) was prepared in accordance with the following standards, guidelines and legislation:

- The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard, Revised Edition, developed by the World Resource Institute and the World Business Council for Sustainable Development (GHG Protocol);
- The NGER Act and associated legislative instruments;
- American Petroleum Institute, Compendium of greenhouse gas emissions methodologies for the oil and gas industry, August 2009 (API Compendium);
- The Commonwealth Department of the Environment National Greenhouse Accounts (NGA) Factors, August 2016 (DoE 2016); and
- The Commonwealth Department of the Environment and Energy National Inventory Report 2014 (Revised), August 2016 (DoEE 2016).

The above documents are considered to represent current best practice in Australian GHG accounting. Conservative estimates were used so that emissions are overestimated rather than underestimated. For example:

- It was assumed that the Project would produce 200 TJ per day (TJ/day) of sales gas for the full 25-year assessment period. This volume is the maximum quantity of gas that would be produced for availability to the market at any time during the assessment period. In reality, at commencement of the Project, the quantity of gas will be significantly less than 200 TJ/day given that the Project will still be under construction. Using 200 TJ/day for the life of the Project is therefore a conservative estimate of the amount of methane and carbon dioxide emitted during gas processing.
- Similarly, power and heat requirements for the Project were assumed to be those that would be required to produce 200 TJ/day of sales gas. Basing the power and heat

requirements on the maximum daily production will also result in a conservative estimate of the quantity of methane combusted and/or the quantity of electricity sourced from the grid in order to power Project operations.

By contrast, fugitive emissions estimating techniques adopted in the public submissions, including by Lock the Gate, Dr Grogan and Tim Forcey, are not appropriate reference points for the Australian Coal Seam Gas industry.

CSIRO has undertaken a number of studies attempting to directly measure (quantify) fugitive emissions and their results show that the emissions reported under the Commonwealth NGER framework are acceptable. As there is national emissions reporting legislation in place for all industries, it would be inconsistent to use any other emissions forecasting methodology to estimate emissions for the Project.

Direct comparisons to international examples are inherently flawed due to differences in geology, regulation and development standards. CSIRO ('What does science tell us about fugitive methane emissions from unconventional gas?', May 2017) has explained that:

Gas production in the US has many differences compared to Australia due to history of gas development, size of the industry, dominance by shale gas over CSG production, differences in environmental regulatory controls and laws governing landowner rights over resources.

It is important to recognise that, in the absence of the Project, there is, and will remain for the foreseeable future, a demand for energy generation to meet the basic needs of the Australian population. That demand will remain irrespective of whether the Project is approved and, if the Project is refused, the demand will simply need to be met by other energy sources including but not limited to LNG import into NSW via approved and planned facilities. These alternative sources of gas could be expected to have higher emissions impacts due to transportation requirements including liquefaction, transportation, regasification and other sources of emissions.

Santos accepts that any consent for the Project should be issued subject to conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure that GHG emissions are minimised to the greatest extent practicable. This is consistent with the approach undertaken to regulate the industry through the use of the Leak Detection and Reporting program, which is an existing licence condition regulated by the NSW EPA, with results reported annually.



Number: 1 Author: Tony Subject: Sticky Note Date: 19/08/2020 10:18:35 AM

This reporting of results annually should be looked at and maybe the reporting times should be every four (4) to six (6) months with the information available to the public within 14 days of being received by the relevant NSW Department.

As a suggestion - If this change as noted above, were to be implemented it would lead to a stronger and more rigorous compliance checking and as a side effect, add at least one or two more real jobs to the NGP', total.

■ Public liability insurance for landholders

Some submitters stated that public liability insurance was no longer available for landholders that host gas infrastructure.

Public liability insurance policies remain available, from various insurers, to farmers who host natural gas activities.

The suggestion made and repeated by some submitters during the public hearing that farmers who host natural gas activities are not covered by public liability insurance is incorrect.

Santos understands that a single insurer has decided to no longer insure farmers with oil and gas infrastructure on their property.

Consequently, on 29 June 2020 the Insurance Council of Australia, the Australian Petroleum Production & Exploration Association, National Farmers Federation, Queensland Farmers' Federation, AgForce, and Cotton Australia issued a joint statement, to reaffirm that public liability insurance cover remains available for farmers who host natural gas activities.

Farmers who host natural gas activities continue to benefit from the combined effect of insurance, legislative protections, and indemnities provided by petroleum operators.

Santos indemnifies landholders that host Santos infrastructure for losses arising out of petroleum operations. This indemnity is provided in Santos' land access conduct and compensation agreement that is entered into with landholders prior to the commencement of activities.



1

Number: 1 Author: Tony Subject: Sticky Note Date: 19/08/2020 10:28:51 AM

This is all very well and good, however the whole Insurance thing seems to have left out the neighboring property and landowner.

The forgotten people in all this are the neighbors, that for one reason or another, do not host Santos' activities, there is nothing in the way of acknowledgment of harm and any recompense stated for them.

Spills, leaks, discharges even pollution of groundwater by drilling chemicals, has no confining fence, so where does the neighbor stand in all this?

The IPC should ask and receive answers around this subject from both Santos and the Department.

■ Salt waste

Some submitters stated that the NSW EPA Waste Classification Guidelines are not 'fit for purpose' and were not intended to apply to the classification of salt. Submitters also stated that because of the leachate that would be generated salt should not be disposed of at general solid waste facilities. Additionally, submitters stated that the volume of salt waste cannot be readily accommodated by existing waste facilities.

There are a substantial number of waste facilities available, including government and privately owned facilities, that are licensed to receive general solid waste in the order of hundreds of thousands of tonnes per annum. Submitters incorrectly suggested that existing waste facilities do not have the capacity to take the salt waste, and that it is not feasible to dispose of the salt waste at existing waste facilities. The average volume of salt produced annually by the Project would be a very small proportion of the overall capacity of any one such facility.

Submitters incorrectly stated that the NSW EPAs 2014 *NSW Waste Classification Guidelines* do not apply to salt. The *NSW Waste Classification Guidelines* apply to the classification of all waste in NSW, including salt waste. Testing was undertaken in accordance with the *NSW Waste Classification Guidelines* based on the chemical composition of the produced water. The results are summarised in the NGP EIS and show the salt waste would classify as general solid waste and was significantly below relevant thresholds.

General solid wastes leach both organic and inorganic substances. Some submitters incorrectly suggested the general solid waste facilities could not or should not receive salt waste because of the leachate that would be generated. The design of landfills that would be suitable to receive the salt waste, in accordance with EPA guidelines, include barriers and leachate collection and extraction systems to perform in the long-term. Designs incorporate both natural and manufactured barriers, drainage layers and plant selection to prevent rainfall infiltration once a landfill is capped and rehabilitated. These types of controls require minimal maintenance in the long-term.

In accordance with the waste hierarchy, Santos will continue to explore all beneficial use opportunities. Beneficial re-use opportunities include but are not limited to:

- Natural Soda Bicarbonate production following the recent completion of the pre-feasibility study and subsequent MOU to progress the Concept Design and Engineering Study, and the Front End Engineering Design through 2021.
- Assisting to neutralise acid mine leachate in mine rehabilitation, following extensive laboratory trials and discussions with the EPA, Santos and a trial partner are planning field trials through a trail heap leach pad within an existing mine.

In accordance with the recommended conditions of consent, prior to Phase 2 of the Project Santos will provide a Produced Salt Beneficial Reuse and Disposal Study to Department of Planning, Industry and Environment (DPIE) for approval.



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2



3

Number: 1 Author: Tony Subject: Sticky Note Date: 19/08/2020 12:57:35 PM

I can remember a time when Santos referred to the dried product as SALTS not SALT.

To me the dried product will always be SALTS as the biggest percentage contents of the dried product are Bicarbonate Salts and Sodium Salts, that is two (2) hence the use of the plural term.

"Salt" implies a Sodium Salt, which if allowed to leach into the environment causes all sorts of problems and plastic liners in the local waste disposal facilities are well known to get holes in them. So leaching out of a general landfill Council facility is areal problem.

I just find it interesting that the Salts that have been classed as General Waste, especially when you read the Eastern Star Gas Analysis of the produced water from one of the Bibblewindi Nine Spot wells as found in the "200612 REF. R.00070462. Water Treatment and Disposal Project".

This REF, although dated, has an analysis of the produced water which shows that the produced water has some heavy metals in its TDS. It is these heavy metal salts that most likely will "carry over" during the treatment process that are of a concern, as is the safe disposal of any of the "trapped" heavy metal salts removed during the treatment process.

Santos has not mentioned the amount, in tonnage or Kilograms, of these Heavy Metal Salts anywhere in this response, nor how and where these heavy metal salts could be deposited, and I have to wonder, why?

Santos does not seem to acknowledge any of these concerns in this reply

Number: 2 Author: Tony Subject: Sticky Note Date: 19/08/2020 12:19:44 PM

Is this mine trial is with the use of Soda Ash Brine to correct the acid conditions existing in the leachate heap at the NSW "Aeris" Copper Mine?

Information on that trial was included in my main submission in attachment "Att 3.2 Sub7".

From a GIPA the following information was obtained: "The EPA wrote a letter withdrawing their support of the trial on the Aeris leachate back in April 2019".

There is no current information available to the public on this trial or any other trial that Santos might be involved with where a by-produce of the CSG NGP operation is being used.

This is a very big problem as Santos can make statements as shown, with the knowledge that it is next to impossible for anyone to check the validity of those statements due to "Confidentially" and the whole GIPA process which allows any party to VITEO the Information Request.

Just an example of the lack of "openness" on the part of Santos and the Relevant NSW Government Authorities.

In a sense a perfect example of how at least part to the Chief Scientists Recommendations are not being implemented.

Number: 3 Author: Tony Subject: Sticky Note Date: 19/08/2020 12:28:47 PM

This Study along with all the other Reports and Management Plans should have been done prior to the EIS being submitted and at the very latest at the time of Santos' RTS.

This is a perfect example of "We have no idea what to do with the 800,000 plus tonnes of Salts, but given time we might be able to work something out".

Does the IPC think that this is a really good Development Strategy, which will produce a very good outcome sometime in the future for everyone and the environment?

Suggestion - The IPC should make a recommendation to be included in the Development Consent, that all Management Plans, Studies and Reports be done, submitted and signed off prior to the NGP being able to commence phase 1

■ Incident notification protocol

Some submitters stated that in the event of a pollution incident notification response protocols were inadequate or did not exist. Others said that relevant state agencies and the community should be notified.

If there is an incident there is a statutory obligation under the NSW *Protection of the Environment Operations Act 1997* for Santos to notify the EPA immediately, and the recommended conditions of consent also require Santos to notify DPIE and other relevant agencies immediately.

If an incident were to occur, it would also be an offence for Santos not to notify the EPA and members of the community identified in a Pollution Incident Response Management Plan. A Pollution Incident Response Management Plan has been developed for the current exploration and appraisal activities in the Project area to manage potential environmental emergencies or incidents in accordance with the requirements of the NSW *Protection of the Environment Operations Act 1997*.

The Pollution Incident Response Management Plan details responsibilities for site staff managing environmental incidents, regulatory and community notification requirements and provides details of potential pollutants and safety equipment. If the Project is approved the Plan would be reviewed and updated to apply also to the Project.

Santos has a long history of working across multiple jurisdictions with vast experience of having response plans in place. Stringent internal governance and testing of processes along with regular response exercises ensure the performance and effectiveness of these plans to protect people and the environment.



1

Number: 1 Author: Tony Subject: Sticky Note Date: 19/08/2020 1:19:13 PM

The current way the Reporting of Incidents to the relevant Authority is rather open to possible abuse, in that there are levels of "Importance" that govern when the incident has to be reported. These levels, although they are written down, it is up to the Company to interpret what "level" the incident is and what clean-up action a Company can take prior to any notification.

To be fair to everyone this system of Incident levels and Reporting Requirements should be scrapped altogether and replaced with the mandatory reporting of any incident with no clean-up until inspected.

This may seem a bit restrictive to the operator of a Gas Project, however to overcome this perspective problem the Regulator or Relevant Department has to employ extra staff at the Operators expense, to be local and available 24/7 to check any reported incidents and Record and advise the Operator, Regulator or Relevant of the required remedial work.

Any person given this responsibility must have an office provided and located within the NGP Area and live within 60 minutes drive of the NGP area.

Water

Water access licences

Some submitters stated that Santos must hold Water Access Licences, and that there may be insufficient market depth for Santos to acquire the Water Access Licences required by the recommended conditions of consent.

All water extraction for each water source will be under a Water Access Licence issued by DPIE in accordance with the *Water Management Act 2000*, as is the case for other water users in NSW including irrigators and industrial users. Santos has purchased entitlement for the Gunnedah Oxley Basin (GOB) groundwater source and holds in excess of 3.5 GL, an annual limit sufficient for full development of the Project.

Regarding the other groundwater sources trades in Water Access Licences over the past three years are summarised in the table below. These trades demonstrate sufficient market depth. The relatively small entitlements can be obtained through the open market in accordance with recommended conditions of consent without disadvantaging other licence holders.

| Groundwater source | NGP EIS Base Case (37.5 GL) Peak flux change at source base | | Average volume traded annually since 2017 ML/y |
|-----------------------|--|---|---|
| | ML/y | Time (years after start of FDP, to nearest model time step) | |
| Gunnedah-Oxley Basin | 3,553 | 3 | Required entitlement has been purchased |
| GAB Southern Recharge | 57.3 | 190 - 200 | 1,900 |
| GAB Surat | 0.16 | 950 – 1,000 | 340 |
| Lower Namoi Alluvium | 4.19 | 250 – 300 | 6,600 |
| Upper Namoi Alluvium | 1.00 | 250 – 300 | 350 |

Groundwater

9.2.1 New studies said to prove faults connect target coal seams with shallow aquifers

Some submitters stated that scientific studies published recently provide new evidence of connectivity between target coal seams and shallow aquifers that was not considered by DPIE in its assessment of the Project. They state that the Project's groundwater model may significantly underestimate predicted groundwater impact on shallow aquifers. A recent scientific paper by Iverach et al (2020) was cited by a number of submissions as providing evidence of connectivity between Project target coal seams and shallow aquifers, such as the Pilliga Sandstone and the Lower Namoi Alluvium.

Contrary to statements made in a number of such submissions, Santos has previously acknowledged the detection of methane in shallow aquifers, and in particular in the shallow Namoi Alluvium (NGP EIS Response to Submissions 6-74).

In general, methane is observed at low and varying levels in all formations above the target coal seams, though most groundwater samples do not record methane above limits of reporting. Alluvium groundwater with elevated methane occur along the Namoi River, north-east of the Project. It is this dissolved methane which was the subject of analysis by the Iverach et al. (2020) paper.

Multiple lines of evidence indicate most known faulting within the Project area is of small scale and does not extend into the overlying formations. Potential impacts to groundwater flow due to faulting is highly unlikely at the local and regional scale. As referred to in the NGP EIS Response to Submissions (5-16, 6-90), Santos has undertaken an in-depth review of the existing data that supports its findings on fault characterisation. The inferred fault data presented by Iverach et al. (2020) is not new. Most faulting within the Project area is considered to be compressional and associated with closure of the Bowen-Gunnedah-Sydney basinal systems during the middle Triassic.

The connectivity between the Great Artesian Basin (GAB) and the overlying alluvial aquifers is well documented. While the evidence presented in the Iverach et al. (2020) paper is consistent with very small volumes of gas migrating over geological time scales into the Namoi Alluvium, other reasonable and competing hypotheses for the presence of methane are equally probable.

There are a number of issues with the analysis and conclusions presented in the Iverach et al. (2020) paper in regard to its relevance to the Project groundwater impact assessment.

1. The area of study is located outside the Project area. The paper considers evidence of connectivity in shallow aquifers located to the north of the Project, not within the Project footprint. Drawdown impacts in the target coal seams due to the Project are not expected to extend more than 5 km beyond the tenement. The area of relatively high fault density studied will not be affected by Project activities. The Project area avoids high density fault areas and also areas of locally intrusive volcanic rock.
2. The paper's characterisation of faults relies on a qualitative assessment of lineaments and does not adequately describe or characterise faults with any rigour (e.g. fault length, depth, orientation, throw, stress regime, age, formation mechanism, etc.). Based on the information reported in the paper (e.g. a low-resolution and highly stylised geological cross section; uninterpreted seismic data and coarse-scale maps of 'inferred' fault locations), it is not clear whether an adequate and appropriate peer review could have been undertaken regarding geological structures. Cited references do not provide the detail nor supporting investigations to validate the inferences made in the paper regarding fault characterisation and their potential effect on hydrogeological connectivity.
3. The geochemistry data do not confirm that the low concentrations of dissolved methane observed in the Namoi Alluvium is sourced from the coal seams of the GOB. There are other reasonable and competing hypotheses not presented by the paper that may explain how the observed methane has migrated from other sources:
 - a. No data are presented describing dissolved gas isotope signatures of the Pilliga Sandstone or any other aquifers or aquitards of the GAB which are alternative potential sources of methane in the region (e.g. Herzeg & Torgeson, 1991; DMR, 2002).
 - b. There is an absence of supporting groundwater chemistry data to support the conclusion that faults are responsible for upward migration of dissolved methane from the GOB. For example, given there is a natural upward hydraulic gradient (i.e. deeper units are under greater pressure than shallower units), changes in

- water quality such as increased chloride would be expected because the deeper aquifer units and coal seams of the GOB are far more saline than shallow aquifers.
- c. The paper estimates that the concentration of methane in underlying formations that would be required to explain the changes in methane isotopic signatures in the alluvial sediments is 4,062ppm. Iverach, et al. report (in Table 1b) methane concentrations in the formations underlying the GAB are 800,000ppm and explain that this supports a hypothesis of upward gas migration. However, this appears erroneous, as the data presented appears to have been transcribed incorrectly and actual concentrations are up to 800ppm (i.e. 800,000 µg/L). Hence the reported evidence shows a decrease in methane concentration at depth, not the increase in concentration as described.
 - d. Irrigators on the Namoi Alluvium extract groundwater from the underlying Pilliga Sandstone to irrigate crops. Excess water infiltrates and adds to the alluvium groundwater, hence introducing water with a “GAB signature” into the local alluvial groundwater. This complicates the process of quantitatively assessing the natural flux between the GAB and the alluvium in this region based on water chemistry alone.
 - e. Gas isotopes presented for the alluvial groundwaters outline a distinct signature, separate from the Gunnedah Basin groundwaters (Figure 7a in Iverach, et al., 2020), with the former exhibiting a relatively heavier carbon signature in methane for a given carbon dioxide value, reflecting a methyl fermentation origin and not the methane oxidation origin proposed in the paper.

Based on the evidence presented, conclusions that can be drawn from the paper are:

1. There is likely connectivity between the Namoi Alluvium groundwaters and the underlying groundwaters of the Great Artesian Basin.
2. Biogenic methane in deeper layers of the alluvium likely undergoes oxidation as it rises to the surface.
3. Where there is elevated sulphate and/or oxygen, methanogenesis is inhibited.
4. Gas may be migrating over geological time scales from deep coal seams, but there is no evidence to support significant connectivity through faults.

9.2.2 Assessment of impacts to water bores of the Gunnedah Oxley Basin

Some submitters stated that there is potential for significant impact to landholder bores that source water from aquifers of the GOB based on the NGP EIS, but this was not subsequently assessed by DPIE.

This scale of potential impact to water bores can be adequately managed through monitoring and adaptive management as prescribed in the recommended conditions of consent which allow for early detection of drawdown effects in the Gunnedah Basin.

The NGP EIS (GIA, Section 4.8.1) identifies that approximately nineteen bores within 30km of the Project area are identified as accessing deeper groundwater sources of the GOB. These bores are located east of the Project area and within the outcrop area of the GOB, which is situated between the southern recharge beds of the Pilliga Sandstone and the Namoi Alluvium.

Number: 1 Author: Tony Subject: Sticky Note Date: 19/08/2020 2:44:24 PM

the Namoi Alluvium also is recharged from the waters of the Namoi River as the Alluvium is unconsolidated material through which the Namoi river passes.
The Namoi Alluvium was created from weathered sediment material carried by the river waters and spread over the surrounding base rock by the 'flooding' of the river waters.
For the Namoi Alluvium to be recharged from the GAB would imply that the GAB is under some sort of hydraulic pressure from a higher source of water.

This higher source of water can only come from a RECHARGE AREA for the GAB. Part of this RECHARGE area is located under the Pilliga Forest and under the surface infrastructure of the NGP.

So in point "d" is Santos acknowledging that the area under the NGP is in fact an important RECHARGE source for the Namoi Alluvium and the GAB?

I am pretty sure that the vast number of Irrigators on the Namoi Alluvium are NOT accessing directly the Pilliga Sandstone as their water source.

Santos needs to provide a full explanation of the claim made here regarding where the Irrigators on the Namoi Alluvium actually extract their water from.

Number: 2 Author: Tony Subject: Sticky Note Date: 19/08/2020 2:48:20 PM

Biogenic, because the methane is created by Bacteria breaking down the organic material deposited when the Namoi Alluvium flood plain was and still is being created and maintained.

So now Santos is admitting to Bacteria being present in an area close too and just inside the NGP.

Number: 3 Author: Tony Subject: Sticky Note Date: 19/08/2020 3:00:28 PM

But there is no evidence to say that geological faults are not present.

GISERA is supposed to be doing a Study of just a small area of the NGP area, along Bohena Creek, it is uncertain to what dept this study will extend as the study has been put on hold and the results are not due until December 2020, according to the latest on the GISERA Web site (see my original submission).

The Narrabri Underground Expansion Application Documents indicate that the expansion will cause problems with the GAB floor strata material, (again see my original submission).

Eastern Star Gas presented to Narrabri Shire Council and included in that presentation was a statement and slide that there were faults in the GAB floor strata material (see my original submission). Santos should have this presentation provided it has not been lost.

Really when it comes down to it it is a matter of who the IPC believe when it come to any possible conductivity between the GAB and the GOB.

Number: 4 Author: Tony Subject: Sticky Note Date: 19/08/2020 3:33:52 PM

I believe that the video of one of these bores (1000m deep that passed through shale and basalt) producing enough gas to be ignited after pumping down the water column, should show that Santos' removal of water from the coal seams of the GOB to extract the gas along with the CH2MHILL Report (see my original submission) on the draw down levels and recovery time from just 42 wells over 6 pilots more especially those pilots operating on the eastern edge of the NGP, should be enough to raise the IPC's concern, especially when Santos could place in the same vicinity some 300 well sets with many of the horizontals being multi and tri-level some even both in the same coal seam if the recent statements from Santos can be believed (Source of this information was the IPC tour of July 2020).

At this stage on the eastern edge of the NGP there is only Santos' DAMB at Dewhurst 8a and the NSW Office of Water bore nest that are capable of monitoring the water levels in the coal seams. The other coal seam monitoring bores are all down stream of these two and would not show a result with regard to recharge from the up-stream aquifers of the higher levels of the GOB.

As the Office of Water bore nest is only new, just on than 12 months, there is no independent before gas operation or even early gas operation water level data to go on to show what was and what is happening with regard to groundwater recharge of the coal seams.

The potential risk of impact to these bores greater than the minimal impact criteria of two metres drawdown is considered negligible. Even if it is assumed that these bores extract water from the same coal seams targeted by the Project (i.e. Early Permian formations of the GOB), groundwater modelling shows only four of these bores are located close enough to be potentially affected (see figure below).

The monitoring network would identify any issues many years (likely decades) in advance of any effect and if required make good provisions would be straightforward and effective. This is consistent with the Department's Assessment Report, and advice to the Department from the Water Expert Panel, that the risk to stock and domestic bores is low.

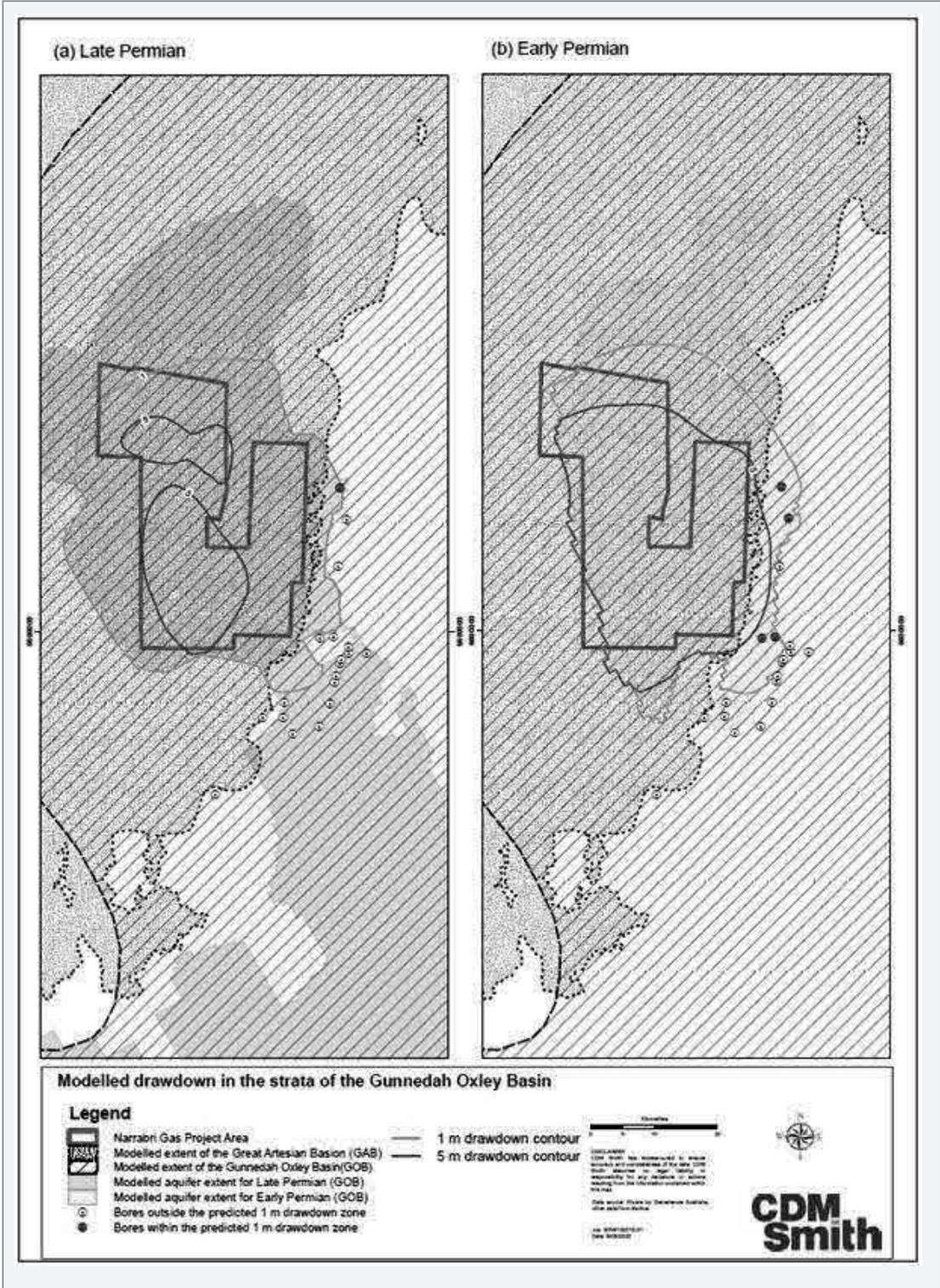


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Number: 1 Author: Tony Subject: Sticky Note Date: 19/08/2020 4:21:10 PM

Any drawdown in a deep domestic bore is problematic to the owner especially if his pump becomes "gas bubble locked" or worse if the water head above the pump should become so low as to cause the pump to be damaged by 'cavitation'.
1000 ft of water filled poly pipe is not an easy thing to lift nor is having to deepen a borehole that deep and having to drill through tough strata material.

So to dismiss the concerns of landowners who rely on these very deep bores for water in times of hardship is very callous of Santos and the IPC should the NGP be approved.



Number: 1 Author: Tony Subject: Sticky Note Date: 19/08/2020 4:23:06 PM

These figures appear to be an adaption of earlier information supplied to the 2013/2014 EIS for Dewhurst Gas Exploration pilot Expansion namely documents Appendix 3 Groundwater Impact Technical report by CH2MHILL (see my original submission) and Supplementary Groundwater Impact Assessment of December 2013.

The figure is so distorted as to be difficult to read as to the extent of the draw down level which in the left hand side ranges from 5m at the center to 1m at the outer ring.

No times for recovery are given in the legend and the quantity of wells in these locations is also not given. So really the maps are totally meaningless as an explanation in the context of this Santos Final submission.

9.2.3 Assertions that aquitards in the groundwater model were not adequately characterised or conceptualised

Some submitters had concerns about the way in which the Project groundwater model characterised aquitards. Firstly, it was suggested that the vertical permeability values were not conservative, and that higher permeability values could reasonably be expected. Secondly, some submissions further suggested that the aquitards may not be laterally continuous as assumed by the model, and so this would also underestimate vertical permeability.

The adequacy of the vertical permeability values derived for aquitard layers has been addressed in the NGP EIS Response to Submissions on pages 6-73 to 6-74 and 6-77 to 6-78.

Within the NGP EIS, Table 5-2 in the groundwater Impact Assessment (NGP EIS Appendix F) describes a limited number of very localised measurements of hydraulic conductivity in Great Artesian Basin and Gunnedah Basin strata. These, however, are local-scale point measurements that do not directly scale to model cells, which represent a minimum area of one square kilometre in the NGP EIS groundwater model.

CSIRO (p 40 – 41, Turnadge et al. 2018) derived a single equivalent vertical permeability value for each of four aquitard units, their interburden units, and the combined aquitard-interburden unit utilising information from exploration well geophysical wireline logs, and porosity and permeability measurements of core samples from key aquitard formations. The permeability values used in the NGP EIS groundwater model can be compared to the median values derived by CSIRO. The values are similar for the Watermark and Porcupine formations, less for the permeability of the Purlawaugh Formation by one order of magnitude, and greater for the Napperby Formation by a factor of approximately 50. This results in a model that is conservative in terms of potential drawdown as compared to the CSIRO model. That is, the NGP groundwater model is more likely to over-estimate drawdown in shallower aquifers.

On the suggestion that aquitards may not be laterally continuous, an independent review of all permeability data by CSIRO found no evidence that regional aquitards were discontinuous. In a study on multiscale aquitard hydraulic conductivity characterisation applicable to the Gunnedah Basin, New South Wales (p 39 – 42, Turnadge et al. 2018) CSIRO concluded:

- For the Purlawaugh and Napperby aquitards that “Based on the distribution of permeability data displayed in Figure 28, with median values of the “Combined” results consistently estimated at approximately 3.2×10^{-3} mD (equivalent to a hydraulic conductivity of 2.4×10^{-6} m/d), there is no evidence of discontinuity in the sealing capacity of the aquitard formations. Furthermore, an overall maximum hydraulic conductivity of 10^{-5} m/d (based on a maximum permeability of approximately 10^{-2} mD) is not indicative of a loss of sealing capacity.”
- For the combined lower (Permian age) aquitard sequence, “Based on the distribution of permeability data displayed in Figure 29, with median values of the “Combined” results consistently estimated at 3.2×10^{-2} to 10^{-2} mD (or hydraulic conductivity around 2.4×10^{-5} to 7.6×10^{-6} m/d), there is no evidence of discontinuity in the sealing capacity of the aquitard formations. Although the overall maximum hydraulic conductivity of 0.7 mD is about two orders of magnitude larger than the median (Table 8), this is not indicative of a loss of sealing capacity.”

Furthermore, the regional geological model was not based solely on interpolated borehole data (as suggested by submissions), but also many thousands of kilometres of 2D seismic data that gives confidence in the extent and continuity of strata across the model domain. This is especially of relevance when it comes to the continuity of aquitards deposited in a marine or large lacustrine depositional environment which are typically laterally continuous.

The WEP states (p 28) that “In the NGP EIS, the Project has used standard depositional models for the Gunnedah and Surat sedimentary systems and in the hydrogeological models, which is a realistic approach given the level of data availability” and further “The NGP EIS approach of bounding the problem based on extrapolation of existing data is seen as plausible. This suggests that even with higher assumed permeability, drawdown can be predicted with a reasonable level of confidence”.

References:

Turnadge C, Esteban L, Emelyanova I, Nguyen D, Pervukhina M, Han T and Mallants D (2018) Multiscale aquitard hydraulic conductivity characterisation and inclusion in groundwater flow models: Application to the Gunnedah Basin, New South Wales, prepared by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Canberra.

NSW Department of Planning, Industry and Environment (2020) Groundwater Resource Description - NSW Great Artesian Basin, PUB20/74, February 2020.

9.2.4 The timing of updates to the groundwater model

Some submitters stated that the recommended conditions of consent require a Class 2 or Class 3 model when it was “practical and feasible”, and that this is not acceptable given the lack of certainty that is inferred from results of a Class 1 groundwater model.

Santos is committed to periodically reviewing the Project groundwater model using the best available data, and as described in the NGP EIS and in accordance with the recommended conditions of consent.

A detailed response to the requirement of updating the NGP EIS groundwater model to confidence level Class 2 and 3 has been given on pages 2-7 and 2-8 of the NGP EIS Supplementary Response to Submissions.

One of the requirements for achieving a groundwater model with a Class 2 or Class 3 confidence level is a “transient calibration”. This means the model must be calibrated to aquifer monitoring data that shows a clear drawdown response in aquifers over time due to Project activities.

A meaningful transient calibration for impact to a shallow aquifer due to Project activities will not be possible if there is no measurable effect to that aquifer. It is important to acknowledge that the change in groundwater pressure in shallow aquifers due to Project activities is expected to be negligible and may not therefore be practically measurable.

Furthermore, the maximum drawdown influence is not expected to peak for many decades. In Queensland, the Office of Groundwater Impact Assessment have not yet undertaken meaningful transient calibration of its groundwater model for impact to aquifers due to CSG activities in the Surat and Bowen Basins, an area with up to 8,000 active CSG wells and more than 20 years of CSG production. This is principally because the observed changes in groundwater pressure are limited to the coal seams and have not propagated into aquifers to any meaningful extent that could be used to calibrate groundwater impact model predictions.

Model calibration to satisfy requirements of a Class 2 or Class 3 confidence level may, at best, take many decades to achieve. Furthermore, it may not be possible to achieve unless drawdown effects in an aquifer are practically measurable. In this context, a condition of consent that requires a groundwater model with a Class 2 or Class 3 confidence level only when “practical and feasible” is appropriate.

9.2.5 Assertions that temperature dependency of groundwater pressure has not been modelled

Some submitters expressed concerns that the groundwater model was not designed to account for temperature dependency of modelled groundwater pressures. This was inferred to demonstrate that the findings of the groundwater model were not reliable.

Temperature effects on predictive estimates of groundwater head distribution in the Pilliga Sandstone aquifer was raised by the WEP as a potential source of error. Temperature data for the Pilliga Sandstone does not suggest this discrepancy will materially affect the findings of the groundwater impact assessment because the effect of temperature dependent groundwater density on pressure heads will be negligible.

The Pilliga Sandstone range in depth between 50 m and 400 m, and temperature between 24°C to 29°C where potential water take may be induced due to the Project.

Hydraulic conductivity changes due to changes in dynamic viscosity with temperature are very small for a temperature range between 24°C to 29°C (approximately 10 per cent change in hydraulic conductivity) when compared to the range of hydraulic conductivity due to variability in the lithofacies across the Pilliga Sandstone (i.e. variability across several orders of magnitude).

9.2.6 Assertions that groundwater model uncertainty analysis demonstrates the potential groundwater impacts are unacceptable

Some submitters stated that the NGP EIS did not present adequate uncertainty analysis and that the findings of the uncertainty analysis undertaken by the CSIRO demonstrated that the risk of groundwater impact was unacceptable.

Contrary to suggestions made by several submissions, Santos undertook uncertainty analysis of groundwater model predictions for the Project. This is addressed in NGP EIS Response to Submissions p. 5-17 to 5-18. The Santos and GISERA analyses informed the WEP's finding (as reported in the DPIE's assessment report, p 58) that the risk of unintended groundwater movement due to the Project is small.

Uncertainty analysis has been undertaken by GISERA (Sreekanth et al. 2017a), addressed in NGP EIS Response to Submissions p 6-76. GISERA's groundwater modelling considered probabilistic results based on 500 realisations of various model parameters, generating a range of water production volumes between 4.4 gegalitres and 107 gegalitres. This is compared to the NGP EIS maximum extraction of 37.5 gegalitres over the life of the Project.

GISERA reports the 5th, 50th (median) and 95th percentile maximum flux between the Pilliga Sandstone and deeper with a high level of confidence using a parsimoniously parameterised model. Using this model, the 95th percentile predicted induced water-take from the Pilliga Sandstone was 2,299 ML/year. Estimated flux impacts peak after approximately 30 years of CSG production and decline to below 220 ML/year after 80 years.

It is important to acknowledge that GISERA's upper estimates of flux from the Pilliga Sandstone, besides being based on a very wide range of modelled connectivity parameters, makes some deliberately conservative assumptions about the Project's extraction from the coal seams. GISERA's model assumes that half of the CSG wells abstract water from the shallower Hoskissons coal seam. However, around 95 per cent of total Project production will come from the deeper

Maules Creek coal seam. The Hoskissons coal seams are stratigraphically much closer to the Pilliga Sandstone than the deeper coal seams of the Maules Creek Formation.

The GISERA model estimates an extraction rate of up to 107 GL of water extracted from the coal seams over the life of the Project. However, the proposed conditions of consent limit extraction to 37.5 gigalitres over the life of the project. There is no uncertainty in the estimate of water production. The maximum extraction volume which approval is sought is 37.5 gigalitres over 25 years without contingency on the performance of the field.

In this context, the CSIROs upper estimate of 2,299 megalitres of year peak induced flux from the Pilliga Sandstone does not inform an assessment of the possible impacts of the Project, particularly since 95% of production will come from the deeper Maules Creek Formation and Santos will not be permitted to extract more than 37.5 gigalitres over the life of the project.

In any case, and to put a highly conservative estimate into perspective, an induced flux of 2,299 ML/year from the Pilliga Sandstone is similar in scale to the average volume traded annually since 2017 in the GAB southern recharge groundwater source (i.e. 1,900 ML/year). The approach for improving model confidence is addressed in the NGP EIS, Appendix G3 and the NGP EIS Response to Submissions p 5-13 to 5-14, 5-36, p 5-41 to 5-42 and p 5-58. The recommended conditions of consent require Santos to prepare a Groundwater Management Plan including a groundwater management and monitoring system. The key principal of the groundwater management and monitoring system is that monitoring activities are designed to improve model certainty over time, as well as inform whether the Project is contributing to changes in water quantity or quality within water assets, particularly the high valued groundwater sources in the Great Artesian Basin and Namoi alluvial aquifers.

9.2.7 Assertions that the Project groundwater model cannot adequately predict impact to Namoi Alluvium

Some submitters asserted that the groundwater model could not accurately predict impact to the Namoi Alluvium since the Project groundwater model does not accurately model connectivity between the GAB and the Namoi Alluvium as compared to other groundwater models of the same system.

The WEP report highlights differences between the Project groundwater model and a groundwater model designed to inform water management policy for the Namoi Alluvium, reviewed by Noel Merrick in 2001 (the NA Model).

The discrepancy between the NA Model and the Project model relates to the modelled net flux (i.e. discharge) from the GAB to the Lower Namoi Alluvium *in absence of any potential CSG effects*. These fluxes are very small compared to the annual water usage from the Namoi water source (as acknowledged by the WEP report, p 50).

A detailed discussion on the spatial variability of the Namoi Alluvium and natural leakage (i.e. the flux) between the alluvium and the underlying Great Artesian Basin has been provided in the NGP EIS Response to Submissions, p 6-79 to 6-88.

The discrepancy between the Namoi Alluvium model and Project model does not affect the findings of the Project groundwater impact assessment. The discrepancy of modelled fluxes is

insignificant when considered at the spatial scale of the different models and the scale of abstraction from the water resource itself.

The Project groundwater model is well-suited to assess the potential effect of coal seam water extraction on overlying aquifers of the Great Artesian Basin and the Namoi Alluvium. This is supported by numerous independent reviews, including by the CSIRO in 2015 and NSW DPI in 2017. The overarching conclusion from the WEP report is that the Project groundwater model is “fit for purpose and the predicted impacts minor”.

9.2.8 Risk to aquifers from loss of containment

Some submitters stated that the likely and scale of spills of CSG water throughout the life of the Project would pose an unacceptable risk to groundwater receptors, such as aquifers of the GAB.

Submissions referred to case-study data from the US to infer particularly high spill rates for CSG operators in Australia. Such submissions failed to recognise the successful operation of CSG in Queensland, which is a better analogue of the regulatory and operational regime under which the Project will operate than case-studies from the US. For example, in Queensland, no regulatory enforcement action has been required in a period where up to 8,000 CSG wells have been operating and all spills greater than 5m³ in volume must be reported to the regulator.

The Project will operate under all applicable Australian Standards and an EPA approved Pollution Incident Response Management Plan will be in place that includes provision for management of spills and notification of the EPA and landholders. Potential impacts from spills and responses have been considered in the NGP EIS (Chapters 11, 12, 14 and 25), the NGP EIS Response to Submissions (sections 5.4, 5.7, 6.6, 6.7, 6.12 and 6.14) and Question 19 from the WEP.

Given the proposed risk controls that will be in place, the likelihood of a significant spill going undetected and unmanaged is very small. The likelihood of small spills causing significant impact on groundwater receptors is extremely small since the spill would be limited to a small area (less than a few hectares) and CSG water is generally free from potentially harmful contaminants.

9.2.9 Assertions that the Project is located in a major recharge zone for the GAB

Some submitters stated that the Project is located in a major recharge area of the GAB, contrary to claims made in the NGP EIS, and that this poses an unacceptable risk to aquifers of the GAB.

This issue was addressed in the NGP EIS Response to Submissions (Section 6.11.1, pages 6-68 to 6-70). The Project is not located in a significant recharge zone of the GAB in NSW.

Water Expert Panel’s Key Observation 1 “The volume of water that provides the recharge in the Project area to be developed by Santos is relatively small compared to that of the dominant area of recharge in NSW to the south along the eastern flank of the Coonamble Embayment of the GAB.” (Report of the Water Expert Panel, Review of the Narrabri Gas Project, page 23, February 2020).

DPIE’s most up-to-date assessment of recharge rates (published Feb 2020) confirms that the Project location does not overlie a major recharge zone for the GAB. (Full reference: Southern and Eastern Recharge Groundwater Sources: Literature Review and Recommended Recharge

Number: 1 Author: Tony Subject: Sticky Note Date: 19/08/2020 4:40:32 PM

I trust Santos is not hinting at any spill or discharge into the environment of less than 5m³ or 5000 liters does not need to be reported here in NSW.

The spill/discharge at Bibblewindi Water Treatment Facility in 2011 was reported to be only 10,000 liters and look at what that did and to the depth that the contamination penetrated (see the CH2MHILL and Golders Associates Reports in Attachments to my original submission).

Queensland is not NSW, our produced water is much more environmentally damaging as it contains more sodium salts and other salts than Queensland's.

Comparing Queensland to NSW is like comparing chalk and cheese.

Number: 2 Author: Tony Subject: Sticky Note Date: 19/08/2020 4:54:06 PM

This maybe the case, however CSG water is Alkaline while most of the shallow aquifers in the NGP area are Acidic. The vegetation in the Pilliga Forest, at least, has adapted to the acidic shallow water conditions so any change in the pH will affect it. Another point to remember is that raw produced water contains what can only be described as Bacteria food so this has the potential to cause population growths with possible uncontrollable consequences to the gas infrastructure namely the outer cement casings of the gas wells, leading to possible aquifer X contamination or the early destruction of parts of the well casings themselves.

Spills /Discharges of raw produced water or even semi-treated have the potential to cause harm to the environment and to the property, enjoyment an livelihood of others.

We have now turned full circle back to the Insurance problem.

Number: 3 Author: Tony Subject: Sticky Note Date: 19/08/2020 5:13:51 PM

It is so easy to dismiss the importance of the GAB Recharge Area that is located in the area which Santos wants to place the Narrabri Gas Project.

I have heard it all even the one that says the Pilliga Forest section of the mapped Recharge Area for GAB cannot be classed as a recharge area because of all the trees as they extract all the available recharge water.

All I can say to this is this; If the Federal and State Authorities and Bodies map the Pilliga Forest and beyond as a Recharge Area for the Great Artesian Basin, then that is what it is.

Remember in times of drought every little bit of rain fall going into the GAB is vital in maintaining the waters of the GAB.

Earlier in this Santos submission I read about the Namoi alluvium being recharged from the GAB, well this can only happen if the recharge area is higher and local to the Namoi Alluvium, that then means that the Pilliga Forest Recharge Area is one of those sources of resupply. So the shallow collection Recharge area under the NGP must be a major local Recharge area for the GAB.

Rates, final report prepared for NSW Department of Planning, Industry and Environment, D10200A04 (KCB, 2020)).

The simple fact is that Project activities pose very little risk to regional-scale groundwater recharge processes whether or not the Project is located in an area of significant recharge zone of the GAB. The likelihood that a significant surface spill that could affect a regional aquifer is negligible and, regardless of the magnitude, aquifer drawdown effects do not influence aquifer recharge rates.



 Number: 1 Author: Tony Subject: Sticky Note Date: 19/08/2020 5:19:29 PM
Spills/Discharges affecting Regional aquifers maybe but local supply aquifers more definite.

No mention of Drill fluid contamination of groundwater of dry geological strata in this Santos Submission and that is almost an admission that there is a greater chance of significant impact to both Regional and local aquifers from this source than from a spill or discharge.

■ Aboriginal cultural heritage

■ Compliance with consultation guidelines

Some submitters stated that consultation was not undertaken in accordance with the government policy, *Aboriginal cultural heritage consultation requirements for proponents* (NSW Government 2010).

A number of submissions on the NGP EIS stated that the consultation with Aboriginal communities had not been undertaken in accordance with the relevant guidelines. The same claim was repeated in submissions to the IPC. This issue was addressed in the NGP EIS Response to Submissions.

Consultation was undertaken in accordance with the Secretary's environmental assessment requirements and *Aboriginal cultural heritage consultation requirements for proponents* (NSW Government 2010). The process captured responses from a very large geographical catchment, as is made clear in the Aboriginal Cultural Heritage Assessment Report in Appendix N1 of the NGP EIS. There were over 550 Registered Aboriginal Parties from a wide geographic area, all of whom were provided with hard copies of the draft Aboriginal Cultural Heritage Assessment Report and draft Cultural Heritage Management Plan, and all of whom were given the opportunity to make a submission.

The DPIE Assessment Report and the independent expert engaged by the department found that consultation had been undertaken in accordance with the relevant guidelines. The Assessment Report states that:

Santos has complied with the Aboriginal cultural heritage consultation requirements and should be able to avoid most of heritage items in the project area.

Engagement with the Aboriginal community was not confined to the specific requirements of the Secretary's environmental assessment requirements. Discussions were held at approximately 10 towns / localities across the Gomeri Nation, often at the invitation of the local Aboriginal community including Toomelah in the north, Coonabarabran and Gunnedah in the south, and Walgett in the west. At some of these locations discussions were held on several occasions. Field tours or field inspections were also offered, including providing transport to Narrabri.

■ Cultural values of Aboriginal people

Some submitters stated that the Aboriginal Cultural Heritage Assessment Report was not thorough or adequate when considering cultural values of Aboriginal people. Submitters asserted the assessment did not meet the relevant assessment requirements and government policies in that regard.

During the consultation process all Registered Aboriginal Parties were expressly provided the opportunity to provide information regarding Aboriginal cultural values. Santos committed to undertake an Additional Research Program to address this issue the details of which are described in the Aboriginal Cultural Heritage Assessment Report in Appendix N1 of the NGP EIS, and in the draft Cultural Heritage Management Plan.

In addition to the Secretary's environmental assessment requirements, additional measures were taken to provide an opportunity for elders to participate in information sessions and field tours,

including examination of elements of the Project and to provide input. Elders from the region participated in field tours and information sessions.

The assessment concluded that by application of the avoidance principle there would be no impact on cultural heritage sites that have been assessed of high significance. The assessment also concluded that in relation to cultural values the impact of the Project would either be non-existent for some, minimal for others, and operate in the short to medium term to the extent that there is an impact for others.

The avoidance principle and precautionary principle will be implemented through the Cultural Heritage Management Plan (CHMP), Appendix J of the NGP EIS Response to Submissions. In accordance with the recommended conditions of consent the CHMP must be finalised in consultation with the Aboriginal community. Under the terms of the CHMP all currently known sites and the most sensitive site types will be completely avoided by the Project.

Aboriginal people are responsible for the management of their heritage. The CHMP establishes an Aboriginal Cultural Heritage Working Group that will select the appropriate Cultural Heritage Officers to walk country, and select the Cultural Heritage Coordinator. The CHMP outlines the process for pre-clearance surveys and for the management and protection of new finds discovered during carrying out of Project activities.

■ Ecology

■ Offset land availability

Some submitters stated that there is insufficient offset land available to meet the requirements of the Project. Submissions also stated that Santos would not be able to secure adequate offsets due to the uniqueness of the Pilliga

The Project requires approximately 6,400 hectares of 'like for like' native vegetation to offset impacts to biodiversity. The recommended conditions of consent require 70 per cent of the total offset liability to be retired before the commencement of Phase 2 (construction). With the proposed mitigations and the processes set out on the Field Development Protocol for the siting of infrastructure, it is unlikely offsets in addition to 70 per cent will be required.

An analysis of freehold land in the region was undertaken and reported in the NGP EIS Response to Submissions. The analysis showed there is over 280,000 hectares of suitable 'like for like' native vegetation available in the region. This analysis was supported by a real estate search in December 2017 which focussed on large rural properties. While over 6,700 hectares of suitable 'like for like' native vegetation was available for purchase at that time establishing offset sites is not confined to land for sale at any particular time.

In addition to land available for purchase, Santos currently has more than 5,000 hectares of suitable native vegetation available for offsetting identified by private landholders through an expression of interest undertaken in accordance with the *NSW Biodiversity Offset Policy for Major Projects*.

■ Suitability of offsets

Some submitters raised issues regarding the suitability of biodiversity offsets to account for the impacts of the Project suggesting the proposed offsets do not conform to relevant guidelines.

The Biodiversity Offset Strategy included in the NGP EIS is consistent with the *Framework for Biodiversity Assessment* and *NSW Biodiversity Offsets Policy for Major Projects*. Offsets requirements for the Project were calculated in accordance with the *Framework for Biodiversity Assessment* for all residual impacts on biodiversity values (ecosystem and species credits).

The offsets package includes a range of measures, including land-based offsets, supplementary measures, complementary measures (such as Koala research) and the use of the Biodiversity Conservation Fund to acquit remaining offset liability. These measures are mandated by policy.

■ Indirect impacts

Some submitters claimed that indirect impacts as a result of the Project had not been adequately assessed in the NGP EIS. Written submissions stated that indirect impacts had been grossly underestimated and that a number of species are disproportionately affected by indirect impacts.

Indirect impacts have been quantified and assessed in detail in the NGP EIS. This includes detailed consideration of site impacts such as fragmentation, noise, traffic, feral animals, fencing, downstream impacts such as sedimentation, hydrological change and accidental spills, and facilitated impacts such as hunting. The magnitude and extent of indirect impacts were quantified and assessed for each infrastructure type. While the effect of fencing was assessed, the

contribution to the indirect impact of the Project was minimal because the gathering system will not be fenced.

For the purposes of offsetting only and despite not being required by policy, Santos has committed to offset the 180 hectare indirect impact of the Project as if that area was fully cleared. Indirect impacts are approximately 0.18 per cent of the 95,000 hectare Project area.

Fragmentation

Some submitters stated that fragmentation as a result of the Project has not been assessed, others said that fragmentation has not been adequately assessed.

The part of the Pilliga in which the Project is located has been variously disturbed by a long history of forestry activities including the establishment of more than 1,000 km of roads and trails in the Project area.

The fragmentation impacts of the Project have been assessed in detail in the NGP EIS including evaluation of the impacts based on the scale of fragmentation, width of open spaces, dispersal potential and home ranges of threatened species.

Linear clearing would be an average of 10 metres wide during construction (up to 12 metres wide in some cases) and rehabilitated to approximately 5 metres wide during operation. Infrastructure will be co-located with existing access roads, tracks or other existing linear features wherever possible. Wells will be at least 750 metres apart.

Assessment of the significance of impacts was undertaken for each threatened species. The assessment found that due to the progressive development of the Project, the narrow width of linear infrastructure and progressive rehabilitation proposed to be undertaken immediately following construction, the fragmentation associated with the Project is not considered likely to inhibit dispersal of any species, including Pilliga Mouse.

Feral animals

Some submitters stated that the Project will result in an increased impact from feral animals in the Pilliga.

Impacts of feral animals on threatened species have been assessed in detail in the NGP EIS. This includes consideration of feral animal populations currently present, existing disturbances including over 1,000 km of roads and trails, and impacts such as predation, competition and habitat modification.

It is widely accepted feral animals are widespread and abundant in the Pilliga and that current levels of feral animals are likely to be the single largest threat to biodiversity in the Pilliga. Predators such as foxes, dogs and cats are known to use roads as movement corridors through the landscape. In the Pilliga and due to its largely open nature feral animals are not confined to roads.

Feral animal control activities are planned to occur within the Project area. Strategies for management of feral animals will be implemented during all phases of the Project including construction, operation and rehabilitation. The relevant measures of the Biodiversity Management Plan will ensure that feral fauna present within operational areas are managed effectively to avoid additional impacts from feral animals.

Approach to impact assessment / uncertain forward footprint

Some submitters raised concerns that the approach to the impact assessment and the uncertain forward footprint make it difficult to assess the impacts of the Project. In particular concerns were expressed that the scale of direct impacts are not certain and are likely to be underestimates as they do not include access tracks.

The assessment of biodiversity impacts of the Project is robust and was undertaken in accordance with the *Framework for Biodiversity Assessment*.

Unlike more traditional resource projects, the precise location of surface infrastructure is unknown and is guided by progressive exploration, appraisal and development. Santos engaged a specialist consultant to develop upper disturbance limits based on a rule set and range of development scenarios. The upper disturbance limits include all Project infrastructure. The direct and indirect impacts of the project equate to the removal of about 1.5 per cent of the native vegetation in the project area, with impacts to threatened fauna species accounting for less than 2 per cent of the total habitat available in the study area, and less than 1.6 per cent of the total abundance of any threatened flora species.

The avoidance of significant ecological values has been prioritised in every stage of the assessment, including the upper disturbance limits. The NGP EIS has assumed worst case and that all limits for every ecological feature including vegetation, habitat and individuals will be cleared (despite this not occurring). This is the impact which has been assessed. The project will not have a significant impact on threatened species and ecological communities as the magnitude of direct, indirect and cumulative impacts are considered unlikely to effect the long-term survival of the species or ecological communities in the project area. This is due to the small proportion of habitat being removed relative to that retained in the study area; the removal of habitat not being at a scale likely to result in the isolation or fragmentation of populations; that the project is unlikely to result in invasive species or diseases becoming established; and that progressive rehabilitation of disturbed areas will be implemented as part of the project.

Survey effort

Some submitters raised concerns regarding the level of survey effort undertaken for the NGP EIS. In particular, submissions were made that the survey effort is insufficient for some key threatened species including Koala, Pilliga Mouse, Eastern Pygmy-possum and the Five-clawed Worm-skink and that important areas of habitat were not identified.

The biodiversity assessment undertaken for the NGP EIS draws upon more than 13,000 hours of field survey effort, which is the most comprehensive assessment undertaken for a development Project in NSW.

The surveys undertaken as part of the NGP EIS have been undertaken in accordance with the methodology, habitat stratification and replication as outlined in State and Commonwealth Survey Guidelines, with specific consideration of the scale and distribution of threatened species habitat across the landscape and the amount of habitat likely to be directly impacted by the Project.

Ten threatened flora species were identified through comprehensive threatened flora survey, only two of which were known to occur in the area prior to surveys. Fauna survey, including targeted survey for a range of key species including Koala, Pilliga Mouse and the Spotted-tailed Quoll, identified a large diversity of threatened fauna species including 18 threatened birds, 11 threatened mammals and one threatened reptile. The most detailed fine-scale vegetation map in

the Pilliga was also prepared for the NGP EIS. These surveys informed the impact assessment, and with the proposed mitigations risks can be managed and the impacts are not significant.

■ Koala

Some submitters raised concerns regarding the status of Koala, with a few submitters also stating that the Koala is 'functionally extinct' in the Pilliga.

The Koala and potential habitat were assessed and described in detail in the NGP EIS. The NGP EIS included surveys for the Koala and identified the likely presence of the Koala, based on potential habitat. Surveys for the Koala and habitat mapping were conducted as required by the *Framework for Biodiversity Assessment*, State and Commonwealth legislation and impacts were assessed in accordance with relevant legislation.

Historically, the Pilliga forests have had a koala population of variable density. Population trends appear to have fluctuated from common in the late 1800's to sparse after 1930, then increasing from the early 1980s until the late 1990s (van Kempen 1997, Kavanagh and Barrott 2001). However, it was not until recent decades that repeatable research methods provided a strong measure of koala abundance.

The north-east Pilliga (including the Project area) has been surveyed for Koalas at various times, including during periods when the Koala populations in the Pilliga were considered to have been at historical peaks. Very few koalas have ever been found in the north-east Pilliga. The vast majority of Koala records are in the central and western Pilliga, areas supported by more productive soils, fewer fires, and greater access to permanent water along major drainage lines.

The combination of low soil fertility, associated nutrient-poor vegetation, periodic fires and fewer major watercourses with permanent water are considered likely to be the key reasons why Koala populations have always been low in the Project area, and there has been a low correlation between mapped habitat and the presence of Koala.

A regional Koala survey, including significant areas of the Pilliga outside of the Project area was undertaken by Koala experts and these results informed the assessment. The aims of this study were to identify and locate the key habitat and/or climate refuge areas where koalas were able to persist and from which population recovery may occur. This information is regarded as of great significance to conservation and forest managers.

All surveys of the Koala in recent times (for the Pilliga) have highlighted that population has been declining and this is acknowledged in the NGP EIS. The declining population and low correlation between mapped Koala habitat and the presence of Koalas are the primary reasons why the regional Koala survey was commissioned.

The NGP EIS concluded that the impacts of the Project on the current Koala population will not lead to a long-term extinction of a viable local population.

Offsets have been proposed for the Koala in the Biodiversity Offset Strategy. In addition to the offsetting requirements, the NGP EIS has provided a commitment to undertake a Koala research project to identify where the remnant populations of Koala are in the Pilliga in order to effectively target resources for the maintenance and improvement in the health of the population.

The avoid, mitigate and offset hierarchy

Some submitters raised concerns that the avoid, mitigate and offset hierarchy had not been followed. Others stated that offsets were too heavily relied on and that avoidance and mitigation were not sufficient.

Offsets requirements for the Project were calculated in accordance with the *Framework for Biodiversity Assessment* for all residual impacts on biodiversity values (ecosystem and species credits), following avoid, minimise and mitigate principles as outlined in the NGP EIS.

Measures to avoid and minimise impacts are embedded and at the heart of the NGP EIS and proposed conditions of consent and include design alterations and stage by stage infrastructure siting plans to maximise use of areas within or adjacent to existing disturbance or with lower sensitivity. This strategy will continue to reduce the overall extent of clearing required and will minimise additional fragmentation and additional edge effects within the landscape. The strategy includes:

- Implementation of the Field Development Protocol and the Ecological Scouting Framework;
- Placement of seismic infrastructure in previously cleared areas where practicable to avoid vegetation clearing;
- Placement of central water and gas processing facilities at the Leewood site outside of the Pilliga Forest to minimise vegetation clearing;
- Co-location of linear infrastructure with existing roads, access tracks and disturbance corridors wherever possible;
- Minimising widths of linear infrastructure corridors to 10 metres wide on average (up to a maximum of 12 metres); and
- Utilisation of the 'plough-in' technique where possible to reduce linear corridor widths and minimise disruption to topsoil.

A suite of mitigation measures including the development and implementation of a Biodiversity Management Plan, Rehabilitation Strategy, clearing procedure and Pest Plant and Animal Management Plan as well as specific measures such as implementation of speed limits and minimisation of night driving, lighting controls, dust suppression, sediment and erosion control have been proposed in the NGP EIS and will be implemented subject to Project approval.

The Biodiversity Offset Strategy is the mechanism to provide the offsets and has been presented in the NGP EIS as a commitment to deliver the Biodiversity Offset Package. The Offset Strategy is consistent with the principles of the Framework for Biodiversity Assessment and NSW Biodiversity Offset Policy for Major Projects.

11.10 Groundwater dependent ecosystems and stygofauna

Some submitters stated that impacts on stygofauna has not been assessed, and that impacts to stygofauna may be significant.

Information previously provided by Dr Serov was considered by Santos, and a response provided in the NGP EIS Response to Submissions. The stygofauna confirmed by Dr Serov were collected in the Namoi Alluvium. The diverse stygofauna of the Namoi Alluvium were acknowledged by Santos in the NGP EIS Response to Submissions. Santos also assessed that stygofauna may be present in the Bohena Creek alluvium, noting that if taxa are present in Bohena Creek they are also highly likely to be present in the Namoi Alluvium.



Number: 1 Author: Tony Subject: Sticky Note Date: 18/08/2020 4:09:07 PM

Stygofauna in the Narrabri Gas project are were first located and collected on the property "Rockdale" (see the location of the property "Rockdale" noted in my first submission) which is nowhere near the Namoi alluvium. The property "Rockdale" is not considered, by Santos documents, to be part of the Bohena Alluvium either unless Santos considers that at least one of its gas Pilots (Dewhurst 13-18H) is located on the Namoi Alluvium or the Bohena Alluvium. In which case the EIS Chapters and Appendix have to be rewritten, because the property "Rockdale" is an immediate Southern neighbor to Dewhurst 13-18H. (see the EIS for the Dewhurst Gas Exploration Pilot Expansion RTS Groundwater Impact Assessment "Surface Geology of the Narrabri Gas Project Area" fig 5-10. Also see Appendix H of the NGP EIS figure 4-3 "Narrabri Tuf flow Model set-up" for the elevation of the property "Rockdale" and Dewhurst 13-18H in relation to both the Namoi River and its Alluvium and Bohena Creek and its Alluvium).

While it is true that Dr Serov collected some Stygofauna from a private bore just beside the Namoi Alluvium, it is my understanding from Santos' very brief comment that Santos is trying to muddy the waters as to the extent of Stygofauna in the NGP area by not stating all the known information but rather picking and choosing the bits best suited to Santos' purpose.

Santos' statement needs to be addressed and if found to be misleading should place doubt on correctness of other statements Santos has made.

There is an insignificant risk of impact to alluvial groundwater dependent ecosystems due to the large degree of physical separation, both vertically in the sub-surface and horizontally at the surface, and therefore lack of connectivity between the target coal seams and groundwater dependent ecosystems.

The effect of the Project on the Namoi alluvium is predicted to be 0.003 per cent of the water currently allocated under licences to landholders. Project impacts on groundwater dependent ecosystems and their respective communities including stygofauna will be negligible.

The effect of the Project on the GAB is predicted to be 0.23 per cent of the water currently allocated under licences to landholders. Project impacts on groundwater dependent ecosystems and their respective communities including stygofauna, if present, will be negligible.

The Project assessment also examined groundwater dependent ecosystems to the east of the Project, including three sites that the Government identified as high priority Groundwater Dependent Ecosystems (GDEs). These three sites Eather Spring, Hardy Spring and Mayfield Spring are currently farm dams. Given proximity to the interface between the Pilliga Sandstone and the Purlawaugh Formation these farms dams are fed by water table springs (contact springs). As operational farm dams all three sites are highly modified through excavation and damming of drainage lines upstream, land use and through stock access. None of the sites retain ecological values and processes associated with groundwater and are therefore no longer GDEs.



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Number: 1 Author: Tony Subject: Sticky Note Date: 18/08/2020 4:32:43 PM

I acknowledge that at this point in time, any draw down in the upper Pilliga Sandstone should pose a very small risk to the three (3) ground water ecosystems, however having said that the combined effects on these three GDE sites, by the de-watering of the coal seams by the Underground Mine Expansion and the NGP needs to be fully investigated.

It is not only a decrease in water table height that effects GDE's of all types including Stygofauna, but the exchange of drilling fluids with biocides with the aquifers that does occur, and the possible effects that an increase in the number of gas wells along with the increase in the amount of drilling chemicals with biocides exchanged and stored in the dry strata, will have on any GDE currently present in Groundwater Dependent Ecosystem including Stygofauna.

From the last paragraph Santos seems to have a low opinion of what is important to the environment and of other respected bodies that set about to list and protect these three (3) sites.

In the past Santos has always acknowledged these three sites respectfully and favorably.

So what has changed? Maybe the IPC can find out.

■ Assessment of light from the Project

Some submitters stated that the light assessment was not accurate, measurements taken of flares with shields were not representative and cumulative impacts with other light sources were not assessed.

A Gas Flare Light Assessment was undertaken and provided as Appendix K to the NGP EIS Response to Submissions. It found that operation of the flares would result in limited light impacts well below the threshold in the *Dark Sky Planning Guideline* (Department of Planning and Environment 2016). The assessment considered the cumulative effect of the Project with existing background light sources including the towns of Narrabri, Baradine, Coonabarabran, Boggabri and mines in the region. Measurements were taken from existing flares, none of which are shielded.

Light spills from other Project sources would be limited through compliance with Australian Standard *AS/NZS 4282 – 1997 Control of the obtrusive effects of outdoor lighting*. This may include the use of narrow beam floodlights with spill light limited either through appropriate luminaire selection or through the use of “barn door” or similar shading devices fitted to the light fittings. To minimise skyglow, the standards require no light output above the horizontal plane.

Santos will continue to liaise with the Siding Spring Observatory during construction and operation of the Project. In accordance with the request from the Observatory, Santos has agreed that routine maintenance requiring use of the safety flares will be scheduled during periods when the moon is more than 50 per cent illuminated.

■ Social impact

Some submitters claimed that Santos did not have adequate mitigation strategies in place to manage the social impacts of the Narrabri Gas Project.

Consistent with Santos' core value of "Building a better future", Santos will continue to work in partnership with local communities and invest in social infrastructure and economic development opportunities that address impacts created by the Project and/or to leave a positive legacy for future generations. These benefits will be applied across the local community in the areas of health, education, environment, economic development, heritage, sport, arts and culture.

If approved, the Project will contribute up to \$120 million to a Community Benefit Fund (CBF). Some submissions raised concerns with the current CBF framework which is currently under review by the NSW State Government. Santos will continue to engage with Narrabri Council and the NSW Government to finalise the CBF framework including governance, long-term community benefit and the process for identifying projects.

In accordance with the NSW State Significant Project's approval process, Santos has committed to preparing a detailed Social Impact Management Plan (SIMP), for approval by the Secretary of the DPIE, following determination and prior to commencement of construction. Following determination, the SIMP will be prepared in consultation with relevant stakeholders in the region and will address Project approval conditions. The SIMP will include detailed action plans including impacts, corresponding mitigation/management strategies, monitoring measures, reporting and reviewing processes.



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Number: 1 Author: Tony Subject: Sticky Note Date: 19/08/2020 5:35:37 PM

Social Impact is not all about the CBF it included all the aspects and influences around of health and wellbeing, relationships between peoples of differing views and cultures, to the type of products in shops, and all Santos can state here is the CBF and its possible value.

The people living within PEL 238 required more of a Response to the Social impact problem that the NGP will cause than just the CBF value and a few commitments to a SIMP that may or may not be acted upon.

Problem with the CBF is that if the Narrabri Council gets to control the Fund, based on how little the Narrabri Council was able to obtain in the development Consent for the local roads over the life of the project, and from the make up of the body administrating the Fund that Narrabri Council proposed. I fear that the CBF will become some sort of wasted slush fund with no real objectives other than Santos'.

There is also the problem of the final value of the Fund, given all the conflicting information of the past few months and the uncertainty as to when the Royalties will start.

No Royalties - No Fund.

■ Hazard & Risk: Bushfires & Flaring

■ Climate change & Bushfire Risk Analysis

Some submitters made statements relating to increased frequency and intensity of bushfires due to climate change related extreme weather conditions:

As previously stated through the NGP EIS Response to Submissions and associated technical reports, bushfire risks have been addressed based on the extremely conservative weather conditions with the analysis conducted based on a Forest Fire Danger Index (FFDI) rating of 120. This conservative approach is suitable to ensure any increase in bushfire frequency or intensity as a result of climate change is addressed as part of the assessment.

Background:

The Secretary's environmental assessment requirements for the Project included a requirement to assess likely risks to off-site safety including potential bushfire risk and risks associated with the transport, storage, handling and use of dangerous goods. A hazard and risk assessment was undertaken Appendix S of the NGP EIS. A desktop bushfire risk assessment was also carried out, complemented by publicly available information. The assessment considered the risk of a bushfire being started by a Project related activity during construction or operation.

The risk of a bushfire being caused by the Project was assessed with consideration of both Project activities and surrounding environmental factors. The assessment found that with the implementation of appropriate mitigation and management measures, the:

- risk of uncontrolled loss of gas leading to a fire or explosion was low to very low;
- the likelihood of bushfire ignition from a Project related activity was remote; and
- the overall risk was assessed to be medium given the potential consequences associated with bushfire.

The assessment identified mitigation and management measures to control the identified risks, including a Fire Management Plan prepared in conjunction with landholders, the Forestry Corporation of NSW and the NSW Rural Fire Service. The Plan would formalise and build on measures already in place as informed by Santos' participation in the Resource Industry Fire Management Group.

The likelihood of a Project activity causing a bushfire is remote given the range of measures proposed in addition to measures already in place, again as informed by Santos' participation in the Resource Industry Fire Management Group. These measures would be documented in a Fire Management Plan in accordance with recommended condition of consent B75, which would be developed in consultation with the landholders, NSW Rural Fire Service and Forestry Corporation of NSW.

Bushfire risk would also be reduced through features incorporated into the engineering design of the Project, including remotely operated well infrastructure with fail safe valves allowing for isolation of the source of gas, gas blowdown systems to reduce the inventory of gas contained within bushfire affected area, buried gathering lines and appropriately rated electrical instrumentation and equipment. This is consistent with the approach used in Queensland.

■ Bushfire Impacts on Project Infrastructure

Some submitters made a number of statements relating to bushfire impacts on Project infrastructure:

Some submitters asserted that the radiant heat flux of 150 kW/m² and bushfire temperatures in the order 1,600°C at the reaction zone would impact on infrastructure based on a CSIRO report Bushfire in Australia: Understanding hell on earth, 2015.

The radiant heat flux of 150kW/m² is not representative of Pilliga forest types and represents radiant heat flux within the flame front of an extreme crown fire in wet sclerophyll forest with extreme fuel loads on steep slopes.

The dominant vegetation type in the Pilliga is Western Slopes Dry Sclerophyll Forest, which the NSW Rural Fire Service (NSW RFS) Comprehensive Vegetation Fuel Loads publication (NSW RFS, 2019) identifies as having a surface and elevated fuel load of 14 tonnes per hectare (those being the fuels used to calculate radiant heat flux using the Australian Standard AS3959:2018 Construction of buildings in bushfire prone areas). The Radiant Heat Flux at 20 metres (representative of the setback distance between gas well infrastructure and vegetation) is 18.3 kW/m². This radiant heat flux level is just 12.2 per cent of the 150 kW/m² cited during the public hearings.

In accordance with Australian standards steel pipework at the well head must withstand 650°C for 30 minutes and maintain integrity (NGP EIS Hazard and Risk assessment Appendix S). Well head infrastructure will be surrounded by an asset protection zone, and will not be exposed to reaction zone temperatures. The 2015 CSIRO report estimates the temperature at the tips of flames is around 600°C. Elevated temperatures on the steel pipe at the well head will therefore be less than 650°C, and duration will be significantly less than 30 minutes.

■ Risk to NSW Rural Fire Service & Forestry Corporation of NSW in the event of bushfire

Some submitters stated concerns relating to NSW Rural Fire Service staff and volunteers being exposed to heightened risk due to Project infrastructure

Throughout the project assessment process Santos has had extensive engagement with both NSW RFS and Forestry Corporation of NSW to address questions raised, as well as extensive engagement at an operational level with local NSW RFS and Forestry Corporation of NSW staff through Santos' participation in the Resource Industry Fire Management Group.

As previously stated through the NGP EIS and NGP EIS Response to Submissions, there is no obligation or expectation that NSW Rural Fire Service or Forestry Corporation of NSW firefighters will be required to protect Project infrastructure in the event of a fire.

Fire detection and reduced response times in the Pilliga has been demonstrated to be significantly enhanced by the provision of fire detection cameras by Santos, and the presence of Santos staff and contractors.

Santos supports fire response agencies by providing access to water resources and equipment, earth moving equipment, a fire detection camera, telecommunications infrastructure and access to refuge zones should they be required. Santos' presence in the Pilliga assists the fire response agencies and Santos will continue to support these agencies through the proposed development and ongoing operations.

Infrastructure Design

As part of the Fire Management Plan and facility design, the radiant heat exposure will be determined using the current proposed asset protection zone, and a prioritised risk management response applied that will include construction design measures and operational protocols.

As discussed in Chapter 6 of the NGP EIS (Project description) and Response to Submissions, the Project would include a number of systems that would enable Santos to quickly cease operations in the event of a bushfire. Gas wells would be equipped with telemetry systems that provide real time information on well operations. The telemetry systems can be used to remotely 'shut in' wells. Further, gas wells would have automated shutdown systems that would be triggered in the event of non-routine operating conditions.

These systems, in combination with automatic gas blowdown systems, would serve to isolate the well from the well head skid and gathering system minimising the amount of gas stored in pipelines and gas processing infrastructure.

The infrastructure downstream of the well head, including the gas gathering lines and vents or drains, would be depressurised to the gas compression units or flare system and, as such, the operating pressure in the gas gathering network would rapidly approach atmospheric pressure.

These automated systems would minimise risk to the public and the Project workforce in the event of a bushfire.

The proposed Fire Management Plan will address all operational aspects associated with fire response agencies and Santos employee bushfire risks including evacuation procedures. This Plan is prepared in conjunction with bushfire response agencies.

■ Firefighting equipment impacting Project infrastructure

Some submitters stated that there was potential for NSW RFS / Forestry Corporation of NSW equipment including bulldozers, damaging Project infrastructure including underground pipelines.

As stated in the NGP EIS Response to Submissions, all gas pipelines for the Project will be designed and constructed to relevant Australian Standards. The applicable standard for steel gas transmission pipelines is AS2885.6:2018 (the Standard), and for HDPE gathering line it is the AGPA Code of Practice for Upstream Polyethylene Gathering Networks – CSG Industry Version 4.0 Supplementary (2017). Both provide risk-based methodologies for safety management.

Minimum depths of cover are specified for gathering lines. In rural locations, such as the Pilliga, the minimum Depth of Cover (DOC) for the HDPE gathering pipelines is 750 mm.

Typically, when constructing control lines through forest, bulldozers operate with their blade just above the ground level, or at the soil surface. The bulldozers would also be operating at the direction of incident controllers. Santos provide information on the nature and location of Project infrastructure to the NSW RFS and Forestry Corporation of NSW to include on its maps during fire incidents.

Given the DOC at which pipelines are installed, they will not be damaged by bulldozers or other equipment constructing emergency control lines during bushfire control operations.

■ Flare Design and Operation

Some submitters stated the use of flares in the forest would ignite bushfires, including that wind-blown debris could be ignited.

The design parameters used for flares exceed the NSW RFS requirements to address radiant heat flux.

Safety flares at Leewood and Bibblewindi would be up to 50m tall and be surrounded by a vegetation free zone of up to 130 metres radius. The maximum radiant heat flux at the nearest vegetation would be 6.31 kW/m² at both ground level and at the tree canopy under a catastrophic bushfire danger level (FFDI 120) which is considered extremely conservative. As such, the radiant heat flux would be significantly less than 10kW/m² specified by NSW RFS.

Santos design standards were described in the NGP EIS Response to Submissions are summarised below:

Radiation contours must be produced for flares. The maximum allowable radiation levels for flare design are listed in the table below and are based on API STD 521.

| Location | Maximum Allowable Total Thermal Radiation Level (kW/m ²) ⁽¹⁾ |
|--|---|
| Maximum at grade, typically directly below flame centre | 9.46 |
| Sterile area boundary ⁽²⁾ | 6.31 |
| Vegetation (grass, trees) | 6.31 |
| Flare Knock-Out Drum, Liquid Seal Drum ⁽³⁾ | 4.73 |
| Nearest Process Plant Boundary | 3.15 |
| Facilities Boundary Without Public Access Within 70 m from Boundary | 3.15 |
| Facilities Boundary With Limited Public Access ⁽⁴⁾ up to Boundary | 2.37 |
| Areas where workers or members of the public are continuously exposed ⁽⁵⁾ | 1.58 |

Notes

(1). Total thermal radiation level includes solar radiation equal to 90% of the value tabulated for the typical average spring and autumn day for locations detailed in 1515-010-DSG-0002. This solar radiation level is typically the yearly average radiation level between the hours of 10 AM to 2 PM. For locations not covered by 1515-010-DSG-0002, local solar radiation data for a typical spring and autumn day must be used, or in the absence of local data, a value of 0.8 kW/m² must be used.

The maximum allowed radiation level where any vegetation occurs is 6.31 kW/m², (sum of solar radiation 0.8 kW/m² and the maximum allowable radiation from flaring combustion 5.51 kW/m²). Modelling of radiation contours are calculated for worst case scenarios (i.e. maximum flaring rate, maximum ambient, low humidity, high wind), that would coincide with an FFDI > 120. While vegetation growth is continually suppressed in the sterile area (by appropriate ground cover such as blue metal and weed management) the maximum allowed radiation level anywhere at ground level is 9.46 kW/m² and as such would be below the radiation limit specified by the NSW RFS.

The radiant heat from flares at the nearest vegetation has been conservatively reported by Santos at <=6.31 kw/m² and in all likelihood is actually significantly lower. It is therefore well under the 10 kw/m² required by the NSW RFS.

In recent years Santos has modified existing development consents to connect all operating pilot wells to the gas gathering network, enabling beneficial re-use of gas through the Wilga Park Power Station. The Narrabri Gas Project intends to continue with this philosophy and tie in proposed pilot wells where feasible. This is consistent with the Santos wide philosophy to minimising flare, fuel and vent activities across our operations.

Flares & Windblown Debris

Several submitters made reference to the whirly-whirly wind scenario and the potential to start fires by means of lofted vegetative material being ignited in gas flares and falling to ground starting a bushfire.

This is not supported by evidence of vegetation fires starting in such a manner, with no identifiable record of fires having started from such causes. Gas flare operation will be in full compliance with the requirements of the Rural Fires Act 1997.

The potential for windblown debris to pass through safety flares or pilot flares and result in the ignition of a bushfire is considered negligible. This is because of the distance to potential ignitable sources of wind carried debris, and because the heavier debris types required to ignite and spread fire are most likely to be blown along or near the ground, not at the height of the flares. Small airborne particles (if they were to pass through the flares) are expected to incinerate within the flare or burn to extinction prior to reaching the edge of the sterile zone.

■ Ignition probability understated due to climate change

Several submitters made reference to the likelihood of a loss of containment creating a fire being estimated at once in 70 years and it being a likelihood that there will be a 150 per cent increase in the probability of bushfire conditions due to climate change, raising the probability to 1 in 28 years of the Project starting a bushfire.

Some submitters contended that the 1 in 70 years for fire starts as outlined in the Departments Assessment Report, would be more like 1 in 28 years considering climate change. The 1 in 70 years is the estimated frequency for methane gas ignitions only and is therefore highly conservative and not impacted by climate change. It does not mean that this would lead to a fire-related event as it does not consider the probability of these ignitions escalating and leaving the site boundaries and further escalating to cause a bushfire, which is an even more remote risk.

The two sources of fire start are independent of each other, as climate change will not affect the frequency of fire starts from any potential methane gas releases from Santos infrastructure.

When considering the risk associated with ignitions escalating beyond the Project site boundaries, this assessment would need to consider a range of mitigation measures in place which further reduce the likelihood of Project activities causing a bushfire. For these fire events to escalate to a bushfire, the fire must be large enough and the conditions conducive for it to extend offsite to a vegetated area and not be extinguished in a suitable time. There are no known incidents within the CSG sector causing large scale bushfires.

Various considerations and mitigation measures to prevent escalation beyond the site boundary include:

- low operating pressure of the wellhead equipment and gathering system and very low frequency of wells being shut in resulting in higher pressures;
- methane dispersion in open air very readily to concentrations well below its flammability limits;
- valid hazardous area equipment ratings;
- a permit to work system, which is mandatory across the industry, includes a hot work permit and associated controls, including ensuring firefighting equipment is available and a trained fire watcher onsite;
- the wellsite infrastructure is located within the vegetation controlled 100m x 100m lease area, such that the distance to the fence line from any release point is larger than ~37.5m;
- facility infrastructure being located within a much larger cleared footprint with designated asset protection zones; and
- orientation of release and if ignited the extent of 12.6 kW/m² heat flux beyond the fenced area.

When considering the cumulative likelihood of a gas release, failure of control measures resulting in ignition and then that ignition scenario impacting beyond the site boundary, the cumulative likelihood would be considered in the order of 1 in 2,600 years which is considered improbable.

Santos is committed to making bushfire risk as low as reasonably practicable through the implementation of appropriate engineering design principles, the Fire Management Plan and working with the NSW Rural Fire Service and Forestry Corporation of NSW in relation to bushfire management activities in the Pilliga.