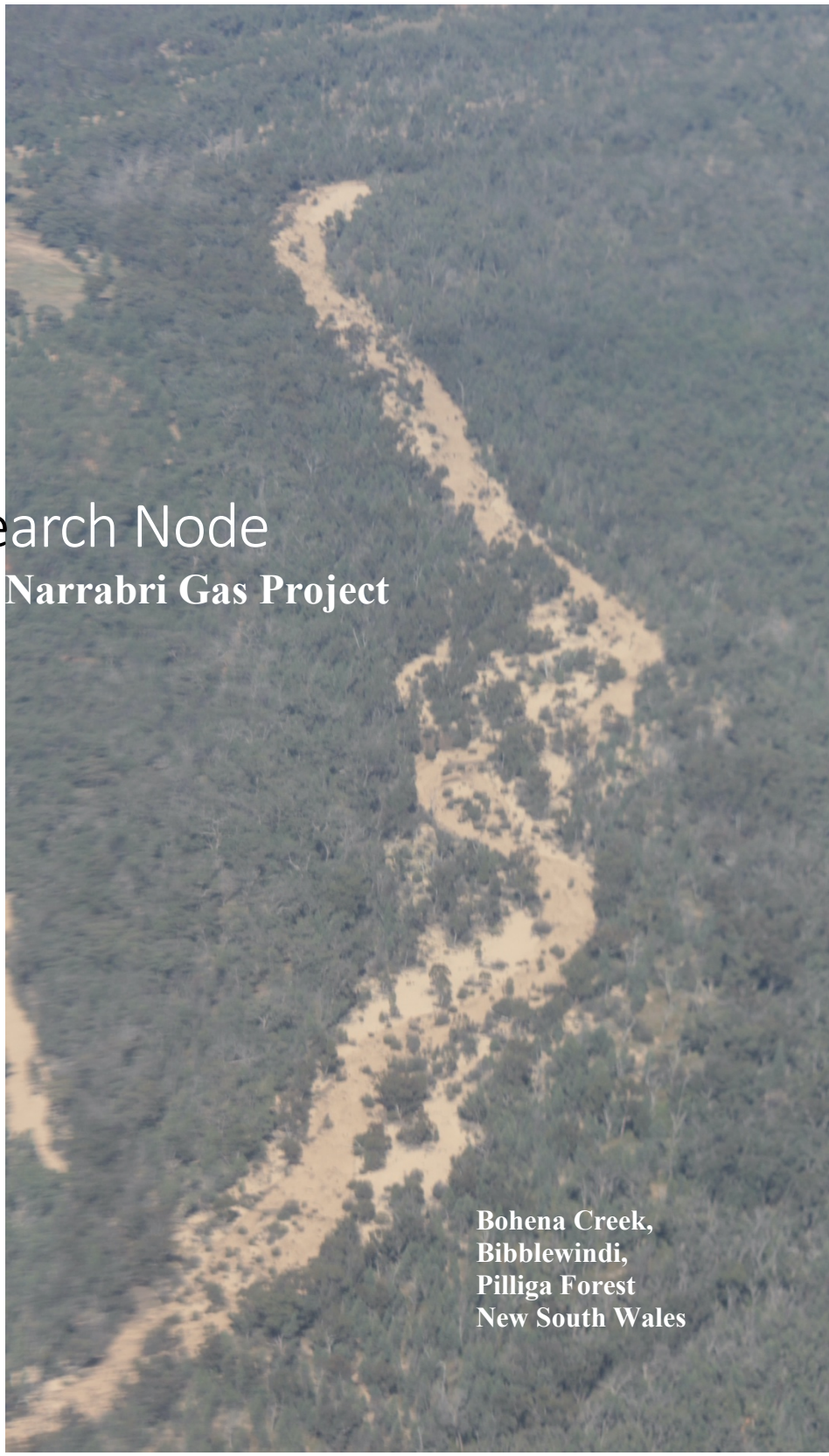
LEARD FOREST RESEARCH NODE
Science Community Ecology

Leard Forest Research Node

Submission objecting to Narrabri Gas Project



Bohena Creek,
Bibblewindi,
Pilliga Forest
New South Wales

We are visitors to Gomeroi country, and We acknowledge and honour the Gomeroi traditional owners of this land, and offer our respects to the Gomeroi Elders.

Submitted to the NSW Independent Planning Commission, August 2020

Email: leardforestresearchnode@gmail.com

CONTENTS

1. Introduction: concern for lack of evidence-based decision making

Leard Forest Research Node (LFRN) is a citizen science group based in Maules Creek in Narrabri Shire, comprising academics, community members and university students, conducting environmental observations, data collection, research and analysis, submissions, field trips and educational activities in relation to the impacts of coal and gas mining in the Leard and Pilliga Forests and the Namoi Valley.

Being a citizen science group, it goes without saying that scientific integrity, transparency of information and evidence-based decision making are high priority matters to us. In our judgement, the Narrabri Gas Project (NGP) EIS has unacceptable gaps in information, and is severely lacking in evidence based assessment of the risks.

This lack of evidence can be clearly seen in relation to:

- **Gas field plan.** Much of the environmental impact of the NGP is linked with the proposed locations of the 850 plus gas wells, which Santos steadfastly refuses to disclose. It is clear from the evidence provided by independent chemical engineer and gas industry veteran, Dr Andrew Grogan, to the Commission that the gas reserves in PEL 238 are extremely variable, containing anywhere between 5% and 90% of carbon dioxide. Therefore, knowledge of the well locations is essential to understanding the value of the reserve, calculating the greenhouse gas emissions, and assessing a range of environmental impacts including potential cumulative impacts with Narrabri Underground coal mine.

- **Proposed depth of drilling.** Although the EIS states that Santos is targeting the Hoskissons seam, recent statements by Santos and the DPIE appear to suggest that this is no longer the case. Santos is not being open and transparent about drilling depth, to avoid entering into discussion about CO2 levels which vary as to depth just as they vary as to horizontal distribution. Statements attesting to Santos no longer targeting Hoskisson's were made by Santos Chairman Keith Spence at the Santos Annual General Meeting ("The areas where we would expect elevated levels of CO2 are typically in the shallower coal seams, where we're not really interested to be quite honest with you") and also by DPIE's David Kitto ("Most of the bores in the beneficial aquifers are less than 150 metres deep, whereas 95 per cent of the development here would be between 800 and 1000 metres deep, and the last – you know, only 5% of that would be – even the 5% in the shallower coal seams are still, you know, at least 350 metres below most of the registered bores in the shallower aquifers.")

- **Chemical composition of the crystallised brine.** This was not provided in the EIS but subsequently in response to NSW government agency submission, information about the crystallised brine was provided in Santos' Response to Submissions. It does not appear that Santos has conducted its analysis in conformance with the NSW Waste Classification Guidelines, having selected a limited range of contaminants to test for, and ignoring NORMS – Naturally Occurring Radioactive Materials. We do not have confidence that the sample selection for testing was representative, nor that Santos has complied with the Waste Classification Guidelines requirement that "*If a waste generator reasonably suspects that a*

waste contains chemical contaminants that are not listed in Tables 1 and 2 below, the waste generator must test for these contaminants and contact EPA's Waste and Resource Recovery Branch for advice". Also "*Generators of waste must be able to justify the chemical contaminants selected for testing".* We believe these aspects of the Guidelines have been ignored and therefore it cannot be asserted that the crystallised brine is as stated in the RTS.

- **Disposal or beneficial use.** Santos continues to claim that there are viable forms of reuse that could qualify as "beneficial reuse", without any evidence.

- **Ignoring the available evidence about public health risks.** Despite the existence of a health study of a gasfield community, Chinchilla Queensland, and a growing rate of research and publications from Australia and abroad, Santos in concert with the NSW Health department choose to completely ignore this knowledge, with the NSW Environment Protection Authority telling NSW Parliamentary Inquiry into the Implementation of the Chief Scientists' Recommendations on CSG the EPA was not aware of this.

- **Drilling chemicals.** The CSG Parliamentary Inquiry Portfolio Committee No. 4 heard evidence about the chemical assessment under NICNAS (the National Industrial Chemicals Notification and Assessment Scheme) – now replaced with Australian Industrial Chemicals Introduction Scheme (AICIS). NICNAS surveyed all of the chemicals used in the drilling process and other parts of the coal seam gas process and found that 30 of them were not already listed as hazardous substances in the information system so they did not already have a way of handling and an assessment done for them. There were 57 hazardous chemicals that they assessed and they looked at exposure pathways for workers and the public in the transport and use of those chemicals. (Ref: Transcript CSG Inquiry Portfolio Committee No. 4 - Industry Inquiry Into The Implementation of the Recommendations contained in The NSW Chief Scientist's Independent Review Of Coal Seam Gas Activities In New South Wales, p 20)

External sources of information that help us plug that gap include:

- accessible sources like DPIE's DIGS database is contesting Santos' gas composition assertions.
- Information obtained by LFRN through Government Information Public Access (GIPA) refutes claims by Santos that beneficial use of crystallised brine at a copper mine (below)
- Circumstantial information that Santos selected an inappropriately narrow range of substances to assess under the NSW Waste Classification Guidelines
- or in the alternative that the crystallised brine is general non-putrescible waste.

Whilst Santos and the DPIE cite lack of evidentiary basis to invoke the **Precautionary Principle**, we disagree. We contend that in relation to many aspects of the potential impacts of the NGP, sufficient **evidence exists to trigger a reversal of the onus of proof and call for Santos to disprove the threat of catastrophic harm if NGP proceeds**.

We believe that Santos has deliberately withheld available data, on faults, CO2 content, chemical composition of crystallised brine, potential beneficial reuse, and – critically – the composition of the drilling fluids they will use.

We wish to quote the submission of Dr Ian Taggart an expert on sub-surface development of gas projects and carbon capture storage from the University of Newcastle. This expert opinion states:

> "At the present time, given the information in the public domain about native CO2 levels in the CSG gas in the Narrabri area, it is difficult to reliably compare likely native CO2 levels against the assertions currently made by Santos, and by David Kitto [DPIE], to claim that the carbon dioxide content of all the gas in the Narrabri gas project is only 5%.
>
> Specifically the assertion contained in the DPI a final assessment report, that: 'there are known to be some high CO2 wells in the Gunnedah Basin, but overall, there is little publicly available information on CO2 in the NGP area'. This statement is challenged given that there are some 40 wells with composition data in EPL238 on the DIGS database system.
>
> As a professional in the area of subsurface development… I consider that any claim as to the clean nature of the Narrabri CSG project needs to be further assessed and validated. This conclusion is driven by the sheer weight of local well data that provides for native CO2 levels in local CSG gas seems being much higher than claimed by the project proponents. The existence of this data needs to be acknowledged and any differences to that stated by the project requires up front resolution.
>
> Consequently, I considered premature to consider a project development decision be made today until these assertions can be properly evaluated. What is required is an independent assessment of both the available public data and the Santos datasets of likely native (or Wellstream) CO2 levels of the CSG to be produced. The finding of this independent report should be made publicly available.
>
> The risk of not doing this validation now is to potentially approve what turns out to be a dirty CO2 project, namely one whose emissions of tonnes CO2 emitted per kilowatt hour power generated, falls outside any prior stated target. With local data suggesting Conservative estimates of native CSG levels of 20 to 25% CO2 (mole basis), then this risk is considered high at the present time. If project approval requires this target to be met, then more due diligence needs to be done."
>
> - Dr Ian Taggart, Stockton, NSW

This submission will address the following aspects of the Narrabri Gas Project:

- Cumulative impacts with Narrabri Underground coal mine
- Brine waste
- Draft Condition B35
- Beneficial reuse
- Tritton mine beneficial reuse application
- Drill cuttings
- Precautionary Principle
- Cumulative impacts of "speculative" developments and matters

2. Cumulative impacts with Narrabri Underground mine not considered

David Kitto, Executive Director DPIE told the Commission:

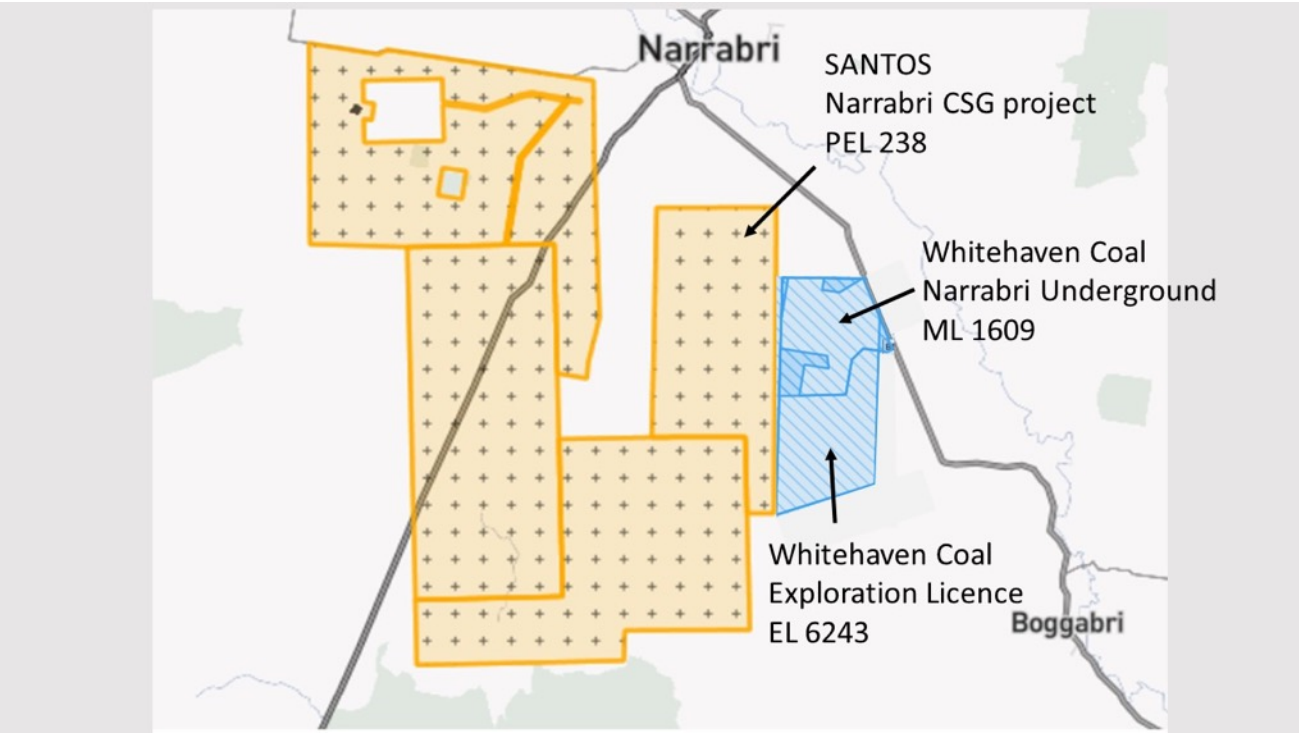
> *"…there's limited scale[sic] for cumulative impacts. With the Narrabri Gas Project, although there are several coal mines in the area, most of them are too far away, and even the closest coal mine, which is the Narrabri Underground Mine, which is located on the eastern boundary of the – of – of the project area, is not expected to – to cause any significant cumulative impacts with the Narrabri Gas Project. And again, this compares to Queensland where you have several large coal seam gas operations operating side by side, and where there is a detailed regulatory regime that has been put in place to manage the cumulative impacts of those projects."* (Day 1 Transcript, 20 July 2020, p. 10 – note: we think Kitto meant "limited scope" not "limited scale")

We disagree that there is limited scope for cumulative impacts.

Figure 2.1 below shows how Narrabri Underground mine is precisely contiguous with Santos' PEL 238.

Rather than present any supporting data to support Santos' and the DPIE's opinion that there is no cumulative risk to be assessed, Kitto merely says proximity of Narrabri Underground "is not expected to cause any significant cumulative impacts" without citing what – if any – investigations have been undertaken to validate this claim. In the absence of relevant evidence the cumulative impacts have not been considered either by the proponent or the DPIE.

Figure 2.1 Santos PEL 238 in relation to Whitehaven Coal's Narrabri Underground Mining Lease ML1609



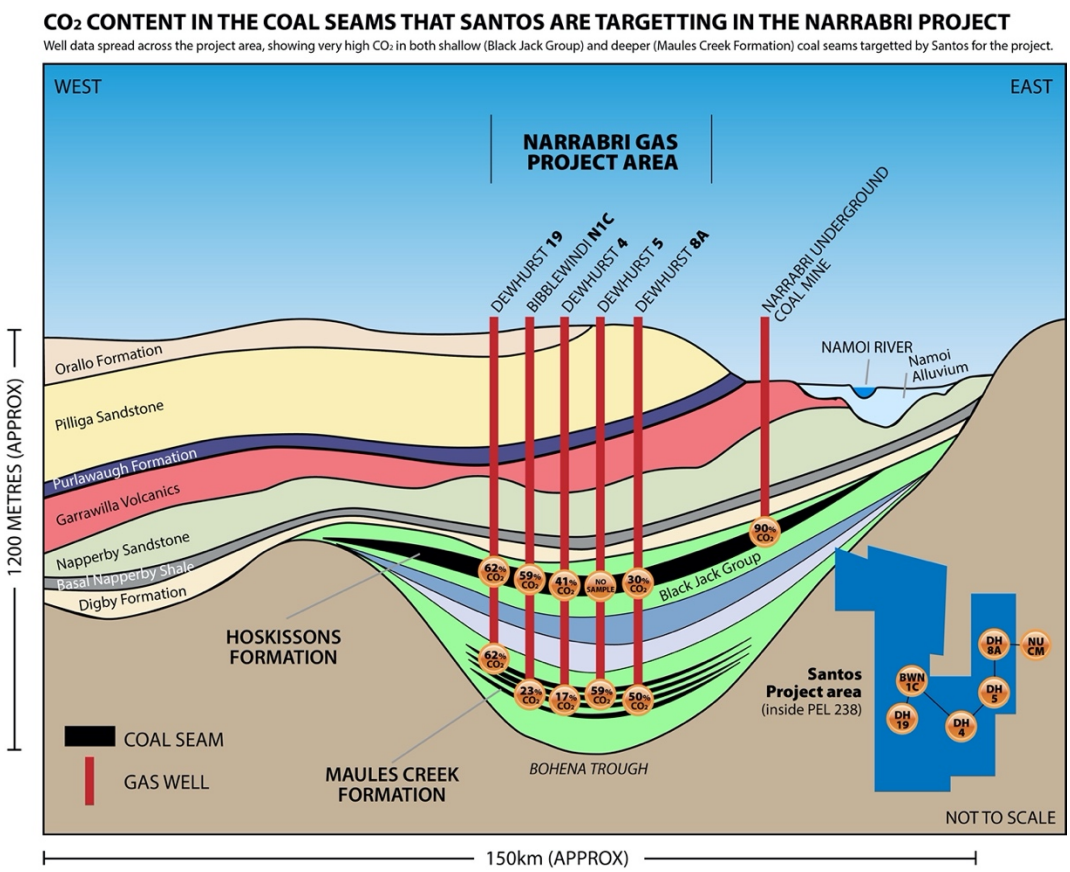
The fact that Santos and Whitehaven Coal are mining the same coal seam, Hoskissons in the Black Jack Formation, is well-known. LFRN signalled concerns about the high CO2 known to be vented into the atmosphere at Narrabri Underground mine. This is known from the Narrabri Underground EIS, which stated that the presence of 90% CO2 in the gas preventing flaring gas which was being vented direct into the atmosphere. This corroborated long-standing concerns about high CO2 levels, since analysed by a citizen informatics project by North West Protection Advocacy, and a study by gas industry engineer Dr Andrew Grogan published by Michael West Media, prompting the Chairperson of Santos Keith Spence to deny Santos is targeting Hoskissons and claiming to be only targeting some vague ***"lower seams"***.

Similarly, David Kitto was obfuscating about Santos' target areas, on Day 7 when he said: "Now, I think what the – what everyone has said is the CO2 levels will vary across that project area. So in some levels CO2 levels might be low within the target coal seams and in others they may be higher. So certainly I think ***on some of the eastern boundary of the project area***, you would expect areas of higher CO2 levels."

And from DPIE Stephen O"Donoghue:, "You know, there's acknowledgement that there is variability in CO2 levels and, certainly as David said, ***further to the east where the coal seams, you know, start dipping up and shallower and you're getting into those volcanics in closer proximity*** that you're getting, you know, higher CO2 levels. So that's – I mean, that's something that has been acknowledged through the CCC meeting and it would put constraints in on viability for going, you know, after the high CO2 level sources."

However, below is a West-East cross-section of the Pilliga sub surface, indicating the relative locations of the Narrabri Gas Project Area and the Narrabri Underground mine. Given the proximity of the two developments and the fact they are utilising the same coal seam (Hoskissons) assessment of cumulative impacts is imperative.

Figure 2.2 Cross section of Pilliga Forest and surrounding areas indicating relative locations of Hoskissons and Maules Creek formations, and proximity of Santos drilling with Whitehaven's mine.



In the submission of the Narrabri Mine (Whitehaven Coal) to the Narrabri Gas Project dated 3 May 2017, and available on the DPIE website, **cumulative groundwater impacts between the gas fields and the underground mine were definitely envisaged**:

> *"The groundwater sections detailing the cumulative impacts of the Narrabri Gas Project and the Narrabri Mine should be reviewed against the latest available information for the Narrabri Mine, being a Groundwater Assessment report developed by HydroSimulations (2015) to support a modification to the mine's approval. This assessment included an update to the site's groundwater model, which includes updated groundwater inflows and predicted drawdowns…"*

Figure 2.3 Submission of Narrabri Underground Coal mine to NGP, May 2017

WHITEHAVEN COAL

3rd May 2017

Major Projects
Department of Planning and Environment

To Whom it may concern,

RE: NARRABRI GAS PROJECT ENVIRONMENTAL IMPACT STATEMENT (SSD 6456) – NARRABRI MINE SUBMISSION

We refer to the above mentioned application made by Santos NSW (Eastern) Pty Ltd for the Narrabri Gas Project. While the Narrabri Mine is supportive of the Narrabri Gas Project and the potential benefits it will provide to the Narrabri Shire the following comments are provided on the publicly exhibited Environmental Impact Statement (EIS):

- The groundwater sections detailing the cumulative impacts of the Narrabri Gas Project and the Narrabri Mine should be reviewed against the latest available information for the Narrabri Mine, being a Groundwater Assessment report developed by HydroSimulations (2015) to support a modification to the mine's approval. This assessment included an update to the sites groundwater model, which includes updated mine groundwater inflows and predicted drawdowns; and
- Section 29.3.15, pg. 29-15 – reference is made to a coal fines tailings dam at the Narrabri Mine. It should be noted that the Narrabri Mine has no coal fines tailings dam as all coal fines produced from coal processing onsite are dewatered and added to the product coal stockpiles.

Should you have any queries or require any further information please contact myself on (02) 6794 4755.

Yours sincerely

Owen Salisbury
Technical Services Manager – Narrabri Mine

Narrabri Coal Operations Pty Ltd ABN 76 107 813 963
10 Kurrajong Road, Baan Baa NSW 2390 | P 02 6794 4755 | F 02 6794 4753
Locked Bag 1002, Narrabri NSW 2390
WHITEHAVENCOAL.COM.AU

We are not aware if Whitehaven Coal's submission was ever considered, and whether in particular the Commission has been provided with information about the cumulative impacts of the Narrabri Gas Project and the Narrabri Mine as reviewed against the latest available information for the Narrabri Mine, being a Groundwater Assessment report developed by HydroSimulations (2015) – or updated modelling.

We request the Commission to ensure that:

1. Cumulative impacts of the Narrabri Gas Project and the Narrabri Mine have **actually been assessed in a material, and not a superficial way, by the DPIE**.
2. Specifically to examine **whether the HydroSimulations 2015 modelling has been considered** by Santos, DPIE and Water Expert Panel.
3. Whether there is any newer modelling post-2015 that has been prepared

We request the Commission to bear in mind the changing conditions at the Narrabri Mine, and the fact that according to the mine's Independent Environmental Audit, the groundwater model was to be recalibrated by AGE Consultants. Every 5 years the Narrabri Mine is required to undertake a transient calibration of the groundwater model, which "must include forward impact predictions of brine re-injection into the mine's goaf at the conclusion of mining operations." (Item 4.9A)

This must be assured to be done.

4. Waste

Total salt volumes from Narrabri gas are now estimated to reach 840,000 tonnes over life of project according to the Assessment Report. Previous (2017) estimate was 430,500 tonnes of salt over 25 years.

That is a very large increase in predicted waste – nearly twice as much as stated in 2017.

There are two options:

- Store produced salt on-site within weather-proof structure, prior to off-site transport for reuse or disposal – as presumably is currently being done in Qld with the salt stockpile
- Dispose salt waste not able to be beneficially reused to appropriately licenced waste facility

On the face of it, there is no evidence that supports the claim that crystallised brine from coal seam gas extraction should be treated as non-putrescible general solid waste, as claimed by Santos and the Department of Planning, to be disposed of at any old non-putrescible landfill.

In our estimation, claims by Santos and the Department that the crystallised brine would be acceptable non-putrescible general solid waste are unsubstantiated, fanciful and not based on evidence. Based on the opinion of the Independent Expert Scientific Committee, the experts said "Complicating storage and disposal is the likelihood of metals and radionucleotides in the waste".

This raises the possibility that the waste may have to be classified as hazardous waste.

In the Response to Submissions, Santos presents Tables 5-3, 5-4 and 5-5, which purport to conform with the NSW Waste Classification Guidelines.

These tables (at p 5-68) of the Response show contaminants, pesticides and polycyclic aromatic hydrocarbons to be significantly below the Specific Contaminant Concentration, with almost all being BLOR (**below limit of reporting**). The list is far from exhaustive, and we question why the list is so small, omitting such analytes as boron, barium and strontium which may be commonly be found in fracking waste water and pose potential risks to public health or ecological harm.

Santos is obligated under the NSW Waste Classification Guidelines to undertake testing for chemical contaminants likely to be present. **Barium and boron** are two such elements known to be of concern in "'co-produced water' (another term for wastewater) as having environmental issues with salinity, sodicity, elements such as strontium, fluoride, barium, boron and radioactive salts, among others."

Of these, all but fluoride are omitted from the list Santos tested.

Comparing the range of elements tested for by Santos for its Specific Contaminant Concentration, with LFRN list of analytes for soil suspected of being polluted by drilling activities in Pilliga East, and those required to be tested in relation to Marcellus Shale gas fields in the US, we found the following.

Table 4.1 Comparison table of analytes, including Santos list used for Waste Classification Guidelines

This shows Santos sampled for just 9 elements (not including volatile organic compounds and NORMs), compared with 18 by LFRN and 25 in one US jurisdiction.

Contaminant		Santos crystallised brine tested	LFRN testing	Form 26R Required Analytes for Marcellus Shale or other gas wells
Aluminium	Al		✓	✓
Arsenic	As		✓	✓
Barium	Ba		✓	✓
Beryllium	Be	✓		✓
Boron	B		✓	✓
Bromide	Br			✓
Cadmium	Cd		✓	✓
Calcium	Ca			✓
Chromium	Cr	✓		✓
Cobalt	Co		✓	✓
Copper	Cu		✓	✓
Fluoride	F	✓		
Iron	Fe		✓	✓
Lead	Pb	✓	✓	✓
Lithium	Li		✓	✓
Magnesium	Mg			✓
Manganese	Mn		✓	✓
Mercury	Hg	✓	✓	✓
Molybdenum	Mo	✓	✓	✓
Nickel	Ni	✓	✓	✓
Selenium	Se	✓	✓	✓
Silver	Ag	✓		✓
Sodium	Na			✓
Strontium	Sr		✓	✓
Uranium	U		✓	✓
Zinc	Zn		✓	✓
Total number of analytes		**9**	**18**	**25**

We believe Santos has ignored the known science, and conducted a superficial testing program to respond to demands of the EPA that it must disclose the nature of the crystallised brine.

Naturally Occurring Radioactive Materials, ("NORMs") usually consist of radioactive elements that exist in the natural environment. This includes uranium, thorium, potassium, radium and radon**.** Based on the known presence of NORMs in unconventional gas mining, and the past history of Santos with its past prosecution for contaminating an aquifer with uranium in this very project area, it should have reasonably predicted that NORMs would be present and tested for them. The source of this obligation is here, in the words of the NSW Waste Classification Guidelines:

> *"Generators of waste must select the chemical contaminants that are known to be present, or are likely to be present in the waste. This may be informed by the site activities, site history, or the processes which produced the waste. Generators of waste must be able to justify the chemical contaminants selected for testing and keep records of that decision for three years.*
>
> *If a waste generator reasonably suspects that a waste contains chemical contaminants that are not listed in Tables 1 and 2 below, the waste generator must test for these contaminants and contact EPA's Waste and Resource Recovery Branch for advice."*
>
> - NSW Waste Classification Guidelines, p, 7

Under the Waste Classification Guidelines, if a waste has not been classified under Steps 1-4, which the brine has not, "waste generators must chemically assess their waste in accordance with Step 5 to determine the waste's classification". (p. 6)

> *"If the waste generator does not undertake chemical assessment of the waste, the waste must be classified as hazardous waste. Waste classified as hazardous waste cannot be disposed of in NSW and must be treated prior to disposal.*
>
> *The chemical assessment process is based around the waste's potential to release chemical contaminants into the environment through contact with liquids, which leads to the production of leachates."*
>
> - NSW Waste Classification Guidelines, p, 6

The Assessment Report does not mention the list of Chemicals of Particular Concern (COPS) referred to by the WEP. The presence of these substances should trigger a responsibility under the NSW Waste Classification Guidelines to undertake chemical assessment in the form of Specific Contaminant Concentration testing of the crystal waste pursuant to Step 5 of the Guidelines. This assessment should have been done for the IPCs assessment, and not some time in the future, post-approval.

We dispute whether Santos has correctly followed the NSW Waste Classification Guidelines in conducting the necessary steps in identifying which chemicals should be tested for. The Guidelines have not been properly applied.

4.1 Secretary's Environmental Assessment Requirements

The Secretary's Environmental Assessment Requirements for the NGP said Environmental Planning Instruments, Guidelines and Policies should be complied with, and as a General Requirement *"a*

waste management strategy, having regard to the NSW Environment Protection Authority's (EPA) requirements".

In the SEARS, under "CSG waste management", Santos was required to discuss in its EIS,

1. Proposed storage, management and disposal of CSG produced water and waste products, including, but not limited to:

   i. beneficial reuse
   ii. re-injection into groundwater aquifers
   iii. irrigation
   iv. transfer to a licensed waste management facility.

The environmental impact statement must address the environmental assessment requirements of the Secretary, but it does not.

Re-injection seems to have fallen off the agenda, but managed release into Bohena Creek, a magnificent pristine ephemeral sandy waterway is envisaged.

Despite being required in the EIS, the waste management strategy does not exist 7 years after starting exploration and even now 3 years after the EIS was lodged, and Santos is unable to provide any disposal or beneficial use options.

As the years progress, the inability of Santos to identify any disposal options or beneficial uses other than highly speculative MOU's for explosives or baking soda creates a presumption that there are no lawful or acceptable options.

The latest attempt by Santos to get rid of its waste, referred to by Professor Barlow when questioning the Santos CEO, is to enter into an MOU with US company Natural Soda. Santos have signed an MOU to conduct a "concept study" on this speculative project.
that will inform a final investment decision to produce sodium bicarbonate in Narrabri. Natural Soda produce various personal care items like toothpaste and bath bombs. Instead of certainty about the potential reuse of the crystallised brine, we have an unenforceable MOU – not to do anything more than conduct a concept study.

It has taken 12 months for Santos just to get a signature with Natural Soda so who knows how long until we see any actual data to prove the Sodium Bicarb factory is a feasible reality. The proposal is at concept stage and it's highly doubtful that it will ever be more than just that. Coincidentally, the announcement of this MOU was timed to coincide with the tour of the gas project area by the Independent Planning Commission.

Details of the planned disposal of the crystallised brine should be agreed ahead of approval, not after, approval. They should have been provided in the EIS. However, we have seen how the Department of Planning constantly shifts this, and other deliverables into the future, after approval.

In this respect, among others, the DPIE is not honouring the Precautionary Principle.

4.2 Which landfills can accept Santos' crystallised brine

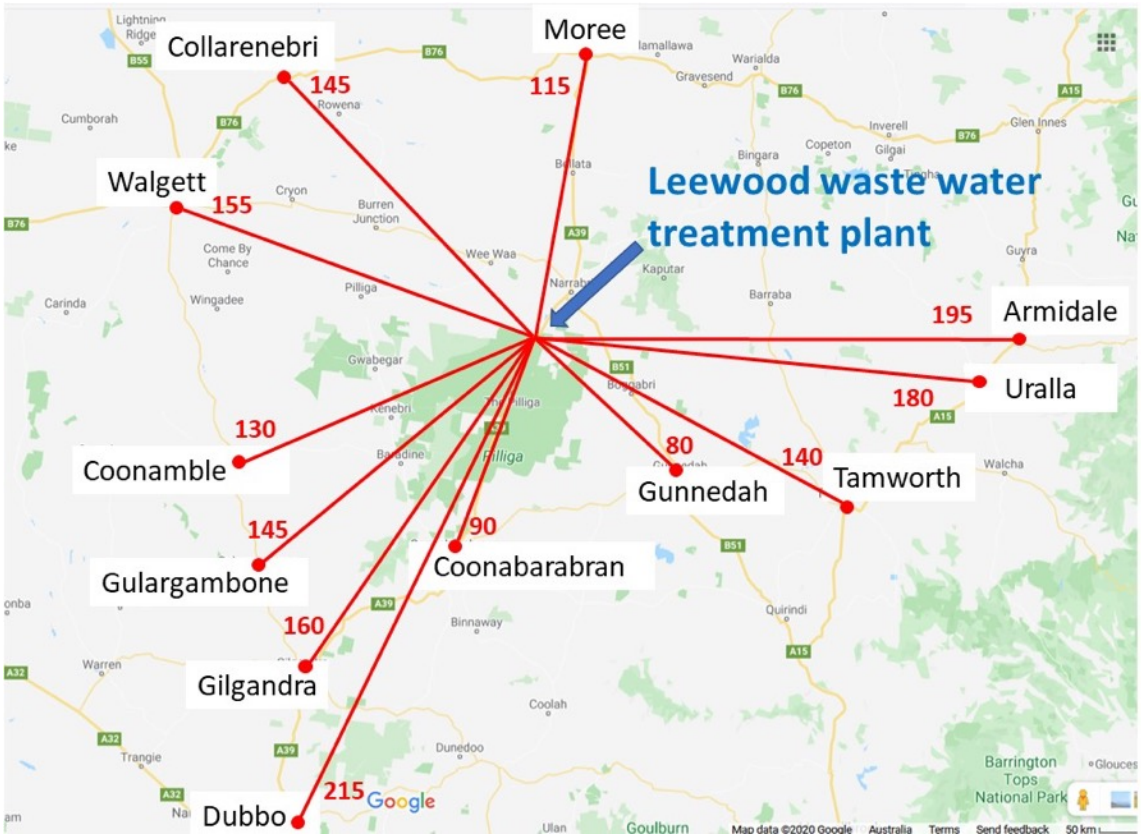
Assuming the NSW EPA ignores the inadequacy of the Waste Classification of the crystallised brine, and permits Santos to dispose of the waste as non-putrescible general waste, DPIE's Recommended Conditions are ineffective to provide a safe regulation of disposal.

The DPIE Assessment Report (p. xiv) states that Santos proposes to "send all salt recovered during the water treatment process to a licensed waste facility for disposal" and that "it can routinely be disposed of at one of the 11 licensed waste facilities within 150km of the site".

As to which regional landfills are in line to accept this enormous burden, we refer to the infographic showing the location of some regional landfills and it would appear based on distance from Leewood that under 150km you will find Collarenabri, Coonamble, Gulargambone, Coonabarabran, Gunnedah, Tamworth and Moree.

Two questions for the Commission to consider:

- How do these communities feel about being the dumping grounds for Santos' waste?
- Furthermore, how can Narrabri Shire justify exporting the Leewood waste to Shires which are not party to the approval, and do not stand to benefit from the Voluntary Planning Agreement?



The Leard Forest Research Node has extensive experience monitoring coal and gas mining activities in the Namoi Valley and we assert with confidence and can back this up with lengthy sources, that post-approval regulation of these developments is abysmally lacking due to uncertain, vague and

subjective consent conditions (which we observe to be the case in the Santos draft conditions), the ease of obtaining consent modifications (made easier subsequent to the Productivity Commission Report), and the process of "adaptive management" endorsed by the Department which is a catch-all provision to allow changes to respond to changing conditions without undergoing environmental impact assessment.

The EPA has stated it supports the Recommended Conditions. According to the Assessment Report,

> *"Following detailed investigations into … waste (particularly produced salt, produced water and drill cuttings) - the EPA has no outstanding concerns about the project. And the project is predicted to comply with the relevant standards and criteria, and any residual issues can be addressed through the recommended conditions."*

However, there have not been detailed investigations. This statement is not substantiated in the available documentation. Santos did not even provide a chemical analysis of the crystallised brine in its EIS, and only did so in the Response to Submissions after prompting by the EPA.

Thus the EPA appears to be predicting, without evidentiary basis what would be the results of a proper consideration under the Waste Classification Guidelines

In this situation we would argue that the onus of proof is now effectively reversed and it is for Santos, now, to demonstrate the safety of its waste rather than the contrary. The Waste Classification Guidelines also say that generators of waste must select the chemical contaminants that are known to the present or are likely to be present in the waste and this may be informed by the site activities, site history or the processes which produce the waste. I won't read the whole guideline out to you but suffice to say that this industry, like all other industries, should be complying with the New South Wales Waste Classification Guidelines.

Moreover it is not just the chemical characteristics of the brine waste but the sheer quantity also of concern. DPIE's Assessment Report refers to the Water Expert Panel (which was echoed by Kevin Gallagher in his testimony to the IPC) trivialises the quantity of salt,:

> "In relation to the production of wastes, the WEP noted that although average salt extraction rates would be high given the salinity levels of the produced water, total salt volumes (around 33,600 tonnes a year) would be relatively small compared to other coal seam gas projects in Australia and the Murray Darling Basin Authority's salt interception scheme, which generates about 500,000 tonnes of salt a year.
>
> The WEP found that the recovered salt would be comprised primarily of sodium carbonate and would be low in heavy metals and other undesirable components when compared to the EPA's Waste Classification guidelines. Consequently, the salt is likely to be classified as general solid waste which can routinely be disposed of at one of the 11 licensed waste facilities within 150 kilometres of the site."

It states it is "low" in heavy metals as compared to the EPA's Waste Classification Guidelines, yet the designated process to determine this has not been undertaken correctly.

5. Draft Condition B35

Draft condition B35 requires the Applicant must ensure that the development complies with the water management performance measures in **Table 6**.

Table 6, in turn, states in relation to salt waste that Santos must:

- Maximise beneficial reuse of produced salt, ***as far as reasonable and feasible***
- Classify produced salt in accordance with the EPA's Waste Classification

We reject the use of the term "as far as reasonable and feasible". This is a performance standard which is determined by the Secretary of Planning, with no objective standard of performance, and no recourse for the public other than a complaint to the NSW Ombudsman[1], or third party litigation under the NSW Environmental Planning and Assessment Act which is expensive and in reality prohibitive in all but the rarest of cases. Due to the history of mining approvals in the Namoi Valley, the public has had ample opportunity to observe the functioning of conditions like B35. We refer to the submission of the Leard Forest Research Node objecting to Vickery coal mine due to regulatory failure and the well-documented inability, or unwillingness, of the DPIE to regulate major projects in a transparent way, observing probity, and enforcing conditions of approval.

We respectfully urge the IPC to reject Draft Condition B35. This is typical of the vague, uncertain and subjective conditions that have been habitually placed into consent conditions of major projects by the department.

This project should not be approved in the absence of known, proven and lawful means of disposal or beneficial re-use of waste. To do so would be to approve the Narrabri Gas Project on the basis of speculation, which Counsel Assisting Mr Beasley SC has made clear is not within the Commission's powers.

6. "Beneficial re-use"

Theoretically there is the option of beneficial re-use, but to date no such solution has been achieved. Despite the Assessment Report assurance that "Santos would investigate potential

[1] The Wando Conservation and Cultural Centre Inc, of Maules Creek Narrabri, complained to the NSW Ombudsman in 202 about the conduct of the DPIE in relation to its acquiescence over a water pipeline constructed by Maules Creek coal mine during late 2019 contrary to the lawful Project Approval. This shameful episode was covered by the Northern Daily Leader (the main newspaper of record in NW NSW) in a series of two news articles and a scathing Editorial *"Our say: Whitehaven Coal pipeline backflip reeks of easier to ask forgiveness than permission"* has been forgiven by the NSW Ombudsman leading to the conclusion that the NSW Ombudsman is ineffective in its role.

This is what The NDL wrote: "A mining company's retrospective development applications for two pipelines have been approved by the state government after just four days. Whitehaven Coal had already completed two pipelines, which transfer groundwater from nearby farms to the Maules Creek mine, before it sought approval. Environmental groups and concerned locals are disappointed no opportunity was provided for public feedback on the pipelines, and claim the projects were 'rubber stamped'." DECEMBER 28 2019 - 5:30AM:
"Whitehaven Coal pipelines to Maules Creek approved by state govt in just days"

beneficial reuse options for the material" (par. 53) the evidence is clear that despite years of trying to develop Narrabri Gas, there is no viable beneficial reuse option in sight.

Santos has not provided a solution to the waste management problem. Why else would they stockpile crystallised brine in the State of Queensland.

The Commission has heard evidence about Santos' attempts to beneficially reuse this salt, but we do know that there is a massive stockpile of unknown quantity currently being stored in Queensland. It is our view that, if the company cannot deal with it in Queensland, we are heading for another stockpile in NSW, with all the monitoring and compliance obligations associated with that.

On 25th June 2020, the Panel Chair Mr O'Connor probed Santos over the stockpile of salt in Queensland, where the CSG industry has been operating for some 12 years – still without a solution and having to keep stockpiling while, as we know, using every endeavour to dispose of the produced water – sometimes in its raw form – such as by spraying on roads.

Here is what was said:

> Mr O'Connor: "There was mention made in that presentation regarding the potential for salt to be – some sort of beneficial reuse. And from the department's presentation this morning, we understand Santos and others in the Queensland coal seam gas industry have stockpiled supplies of salt because of the potential for reuse and investigating those reuse options. We'd just like to hear from your experience in Queensland what sort of progress you're making with those investigations and what are some of the options that you're looking at.
>
> MS WINTERS: Chair, it's Tracey Winters here. Look, we can certainly provide you with a response on what's happening with salt in Queensland. We're probably not in a position to do that today, just to make sure that we give you very accurate information. When it comes to Narrabri, we're in the process of considering, you know, a beneficial reuse option there, but we haven't – we're not – it remains a commercial-in-confidence issue and, again, we'll take that away and come back to you. But certainly in the case of Narrabri, we are making very good progress on that front and we can give you a – you know, we'll also give you the details for the Queensland salt stockpiles and so on in – you know, promptly after this meeting."

We wish to comment on this exchange.

1. Ms Winters was unable to respond to questions from Chairman Mr O'Connor about what experience, progress and investigations for "reuse options" for the brine waste: "We're probably not in a position to do that today" …"we are in the process of considering". It is somewhat of an affront to the Commission to come so unprepared.
2. there is no progress,
3. and minimal investigations

4. Tritton mine beneficial reuse application

Through Government Information Public Access (GIPA), Leard Forest Research Node obtained details of one failed attempt by Santos to provide Soda Ash brine to copper miner Aeris Resources

which operates the Tritton and Murrawombie mines nears Girilambone, New South Wales. Aeris wanted to be able to treat their tailings ponds which, are acid, with the Santos brine waste which is alkaline.

The Soda Ash Brine was thought to be “an efficient source of alkalinity” and RGS Environmental (a leading consultancy specialising in mining waste and rehabilitation) were engaged to perform studies.

This has been repeatedly rejected by the EPA as an approved beneficial ruse, nevertheless Santos continues to suggest it might still be an option.

5. Drill cuttings

The proposal to leave drill cuttings containing Naturally Occurring Radioactive Materials (NORMs) and Chemicals of Particular Concern (COPs) in situ to leach in to the recharge zone of the Great Artesian Basin is deeply concerning. This has not been properly assessed.

NGP is Stage 1 – Stage 1 alone will produce up to 1.1 million cubic metres of drill cuttings which would be mixed, turned and buried on-site or sent to a licensed waste facility.

Assessment Report, par. 55. States: “Drilling fluids, cement slurry and other waste generated would also be disposed of at licensed waste facilities”. This kind of material is also being produced in the Pilliga East by Whitehaven Coal. Drill cuttings from nearby Narrabri Underground mine have for a long time been transported cross-border to Queensland by the same contractor that services Santos.

The suggested alternative of being sent to a licensed facility is also unacceptable, as the company does not state in what circumstances this would occur. There are no details on whether this waste might be intended to be transported cross-border for disposal.

In other words there is a complete lack of environmental impact assessment and risk assessment.

We have studied the disposal of drill cuttings from the surface to seam degassing activities from the nearby Narrabri underground mine. The composition of the drill cuttings which are sent to Queensland, though obviously not identical, could have some similar attributes so what makes the drill cuttings so different over in Santos. The drill cuttings we have observed range from sacks of solids to vacuum trucks filled with slurry, as shown in “Polluting the Pilliga”, a short video made by the Leard Forest Research Node in 2018.

As at the time of our study the drill cuttings were being transported to Queensland for disposal, we understand to NuGrow a company that was subjected to a Qld government Clean up order in 2018 for also accepting water laced with Pfas for so-called “beneficial reuse”. Even so, if the intention were to send drill cuttings to a facility like NuGrow, no way is there capacity for over 800,000 tonnes per annum.

6. Precautionary Principle

In our view, several factors have triggered the shifting of the burden of proof to Santos to prove that the NGP will not lead to irreversible or catastrophic damage to the environment, particularly groundwater. The DPIE seeks to persuade the Commissioners that there is insufficient evidence of potential irreversible or catastrophic harm sufficient to trigger the Precautionary Principle (PP) but we believe this is a misreading and misunderstanding of the PP, which is an evidence-based, not an opinion-based principle of decision making.

Our approach is well described by Emeritus Professor of Law, University of Wollongong Prof David. Farrier, a leading exponent of the PP in his chapter in *Perspectives on the Precautionary Principle* Eds R. Harding and E. Fisher (1999) Federation Press, p 108:

> "The first point to make is that the precautionary principle is concerned with how decision-makers should approach situations where the facts relating to environmental impact are uncertain. Once those advocating measures to prevent environmental degradation have satisfied the threshold test (ie they have shown the existence of a *threat* … short of 'full scientific certainty'), decision-makers must assume that the threat is a reality. The burden of showing that this threat does not in fact exist effectively reverts to those engaging or wishing to engage in the activity."

How this approach relates to the NGP is,

- **Point 1.** There are known threats which are short of scientific certainty, but ranging from serious through to catastrophic and irreversible (ie irreversible at least on a time scale of hundreds of years). These have occurred in other regions worldwide and in Australia – eg migration of contaminants into groundwater and rivers, depressurisation, brine disposal problems, and public health problems in communities living in and near gas fields. There is also evidence of NORMs and COPCs being residues in crystallised brine and waste water, which would have a tendency to accumulate

- **Point 2.** Although these are so numerous and well documented, particularly from the US and Queensland, the NSW Government refuses to recognise the fast-growing body of scientific evidence, including peer-reviewed articles on the harmful impacts of the coal seam gas industry. This was made clear at the Legislative Council Inquiry into the Chief Scientist's Recommendations on coal seam gas (4 February 2020, p 40)

> **Ms ABIGAIL BOYD:** Are you aware of any reports being made regarding negative human health impacts to the EPA?
>
> **Ms DWYER:** Not off the top of my head, but we could take it on notice.
>
> **Ms ABIGAIL BOYD:** That would be really good, and also what were the outcomes of those investigations. That would be very useful.

Subsequently, in response to Abigail Boyd MLC question, "Are you aware of any reports being made regarding negative human health impacts to the EPA", the DPIE responded in behalf of the EPA as per the following Response to Questions on Notice, claiming only 2 reports.

Question	Answer
Transcript Page 40 / PDF p.-17 **Ms ABIGAIL BOYD:** Are you aware of any reports being made regarding negative human health impacts to the EPA? **Ms DWYER:** Not off the top of my head, but we could take it on notice. **Ms ABIGAIL BOYD:** That would be really good, and also what were the outcomes of those investigations. That would be very useful.	Since becoming the lead regulator for gas activities in NSW in 2015 the EPA has received two reports alleging potential impacts on human health from CSG activities. The EPA investigated both matters and has not identified any link between CSG activities and the alleged impacts on human health.

This doesn't prove anything, except that the EPA is out of touch and also that it should be the NSW Health Department – not the EPA – which should be responsible for human health not the EPA which is mainly concerned with compliance with licence conditions.

Contradicting the EPA's poor knowledge of the scientific literature are some facts about the growing body of knowledge. Taken from the presentation of Prof Melissa Haswell at the CSG and Public Health Conference, Narrabri, 15 August 2018, is this slide showing the rapid rise in peer-reviewed research publications on health and unconventional gas, which stood at >685 papers in 2015.

Figure 5.1 Rapid rise in peer-reviewed research publications on health and unconventional gas (>685 papers).

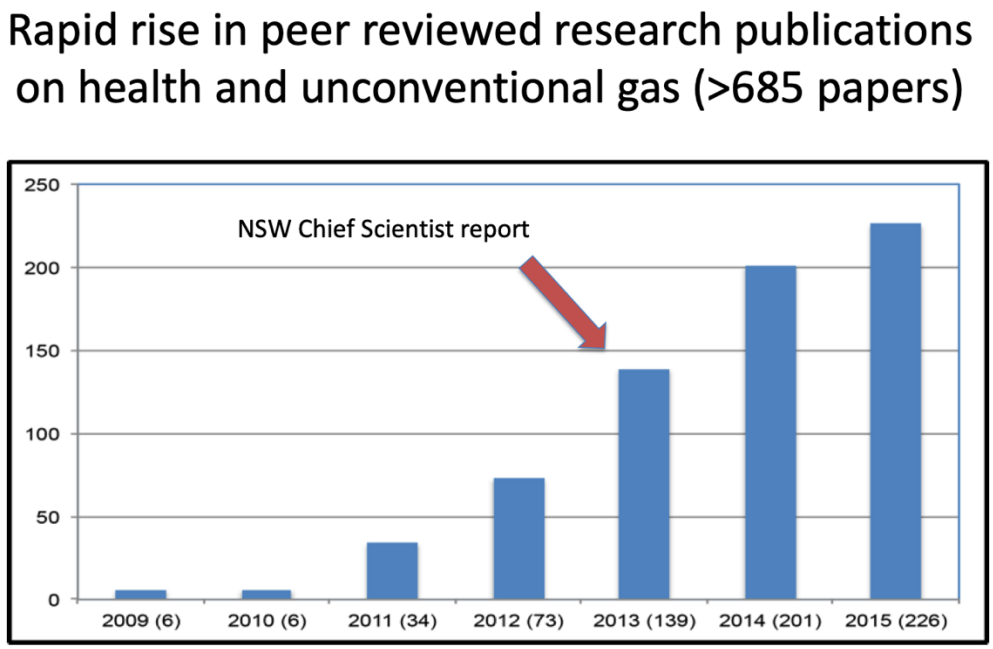


Figure taken from Hays & Shenkoff (2016), Towards an understanding of the environmental and public health impacts of unconventional gas development: a categorical assessment of the peer-reviewed scientific literature, 2009-2015. PLOS One http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0154164

On the subject of groundwater impacts, there is also a predominance of research on the impacts of shale gas mining which link potential positive association or actual incidence of water contamination (see Figure 5.2 below), also from Professor Haswell. Both the gas industry and DPIE are at pains to distinguish between the chemical composition of waste water from coal seam gas, compared with Shale gas, as well as all other parameters of harm. While we should be mindful of the differences, nevertheless we can't ignore the weight of opinion which is that on a risk-weighted basis there is sufficient evidence of the impacts of unconventional gas that can't be ignored.

Figure 5.2 Summary of literature on water quality, courtesy of Prof Melissa Haswell, CSG and Public Health Conference, Crossing Theatre Narrabri, 15 August 2018.

Summary of the literature on Water Quality

Of 58 original research studies on shale gas operations and water quality, "40 (69%) have findings that indicate potential, positive association or actual incidence of water contamination…, while 18 studies (31%) have findings that indicate minimal potential, no association, or rare incidence of water contamination".

Hays, J., Shonkoff, S. (2016). Toward an understanding of the environmental and public health impacts of conventional natural gas development: a categorical assessment of the peer-reviewed scientific literature, 2009-2015. PLOS One, April 20, 2016; http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0154164

Point 3. In light of the foregoing, the precautionary principle now calls on us to reverse the burden of proof.

- **Re crystallised brine**

It is now up to Santos to go through the procedures in the NSW Waste Classification Guidelines with the likelihood it should be treated as a hazardous waste or treated as a separate waste stream like Pfas. The Precautionary Principle requires that waste classification be formally and transparently conducted for the IPC's consideration, and not at some time in the future. We noticed a narrow range of analytes was attempted by Santos in the Response to Submissions, significantly less than the analytes elsewhere tested in waste water from unconventional gas

mining. Santos should be asked to provide analysis on a full range of analytes that represents known substances of concern.

- **Re drill cuttings**

It is now up to Santos to provide specific analysis which includes the composition of drill cuttings and a safe alternative that does not include depositing them on site to leach into the Great Artesian Basin.

- **Re public health impacts**

Santos needs to stop ignoring the available science.

- **Re risk of migration of contaminants via underground**

Santos to disclose seismic data about underground faults and corrosion of well casings due to bacteria, for the IPC's consideration.

6.1 DPIE misunderstands Precautionary Principle

On Day 2 of the Public Hearing Mr Beasley SC Counsel assisting the Commission said:
"MR BEASLEY: I had a discussion with Mr Kitto from the department yesterday … but I understood his evidence to be, well, I don't – we don't think the precautionary principle applies, because we don't see any threat of serious or irreversible environmental damage here on the basis of the expert evidence."
*"(*Transcript Day 2, 21 July 2020)

David Kitto told Mr Beasley SC: *"So if you go to the precautionary principle and you take the two strands that, you know, Judge Preston has outlined there, it's – you first need to establish that there will be significant and irreversible harm."(*Transcript Day 1, 20 July 2020, p 22)

This is wrong. Opponents of the NGP **do not** "first need to establish that there will be"… at all. Harm does not need to be proven, because the point about the precautionary principle is to aid decision-makers in situations of scientific uncertainty. **We hope the IPC will recognise that Mr Kitto has misunderstood the Precautionary Principle and what this presumably means to the DPIE's understanding of the burden of proof and evidence generally.**

We disagree with Mr Kitto and the DPIE. We are strongly of the view that there are threats of serious or irreversible environmental damage here that have to be considered in some way or another within the precautionary principle.

Telstra Corporation Ltd v Hornsby Shire Council [2006] NSWLEC 285 is the leading case and one of a line of cases in New South Wales, one thing is common to the case law. The Precautionary Principle is based on risk weighted decision-making. It's not based on opinions and general suppositions.

The DPIE has not used risk-weighted evidence to inform itself and has left far too much to conjecture in the Assessment Report. That is not an application of the Precautionary Principle, but uninformed guesswork.

In *Telstra Corporation Limited v Hornsby Shire Council* (par 38], Preston CJ stated: "A fear without rational or justified foundation is not a matter which can properly be considered". Preston CJ drew a distinction between such fears, and "probative evidence … matters which were capable of measurement and testing against established standards." [par 14]

Definitely in relation to the drill cuttings. The idea of disposing the drill cuttings in situ in the recharge zone of the Great Artesian Basin definitely is not "A fear without rational or justified foundation is not a matter which can properly be considered". It definitely triggers the precautionary principle.

We are gravely concerned at the thought that these drill cuttings containing NORMs would be deposited on site.

So that's in relation to the drill cuttings. And then in relation to the precautionary principle in relation to the waste, we would say, given that the material is being stockpiled in Queensland, and given that the IESC has already stated that these chemicals – that these radioactive materials, and so on are in there, this does warrant to go through a proper process, a transparent process, to undergo to undergo the step 5 of the Waste Classification Guidelines

To summarise, (1) there is a threat of serious damage; (2) there's scientific uncertainty about that; so (3) applying the precautionary principle, there has got to put a precaution in place, and our submission would be to the Commissioners, that precaution should be to not approve the project at the moment.

7. Cumulative impacts of "speculative" developments and matters

NGP State 1 is a precursor to very large further expansion of CSG in NSW, ie Phases 2 and 3, Phase 2 being referred to in the Draft Conditions. In fact, Santos and the DPIE appear to be using Narrabri as the "guinea pig", and assuming that the impacts will be acceptable.

However, regarding cumulative impacts, we note that Mr Stephen Beasley SC, made it clear to the Public Hearing that the Commission may not consider "speculative" matters such as other major projects which are under development although not yet approved. This is technically true, but if so, why would the IPC be permitted to consider other speculative matters such as the unproven beneficial reuses that Santos relies on?

We urge the Commissioners to apply the same standard of avoiding speculative matters equally to matters contained in MOUs for soda, explosives or fertilizer, just as they are applying to the avoidance of future unapproved projects which could have cumulative impacts, such as Phases 2 and 3 of Santos' plans, and the Narrabri Underground expansion, which hasn't even been mentioned at all to our knowledge. This proposed major expansion to the south of the Narrabri Underground mine is under development, notwithstanding that Whitehaven's Exploration Licence 6452 has been suspended for nearly a year for breaches of the conditions of exploration.

The waste conditions recommended by DPIE are largely of a speculative nature, assuming many things which it is not reasonable to assume at the present time.

"WASTE

Operating Conditions

B63. The Applicant must:

1. (a) implement all reasonable and feasible measures to:
    1. (i) maximise beneficial reuse of waste generated by the development;
    2. (ii) minimise the residual waste generated by the development;
2. (b) classify all waste in accordance with the EPA's Waste Classification Guidelines (2014, as may be updated or replaced);
3. (c) dispose of all waste at appropriately licensed waste facilities, or as otherwise approved in an EPL or RREO in the case of treated water or drilling-related waste;
4. …

B64. Except as expressly permitted in an applicable EPL, specific resource recovery order or exemption under the *Protection of the Environment Operations (Waste) Regulation 2014*, the Applicant must not receive waste in the project area for storage, treatment, processing, reprocessing or disposal.

Produced Salt Beneficial Reuse and Disposal Study

B65. Prior to the commencement of Phase 2, the Applicant must undertake a Produced Salt Beneficial Reuse and Disposal Study, to the satisfaction of the Planning Secretary. The study must:

1. (a) be prepared by a suitably qualified and experienced person/s;
2. (b) be prepared in consultation with the EPA, Council and the owner of any waste facilities identified under (c)(iv) below;

NSW Government 33 Narrabri Gas Project Department of Planning, Industry and Environment (SSD 6456)

(c) include:

1. (i) detailed assessment of salt volumes and composition, including chemicals of potential concern;
2. (ii) an assessment of reasonable and feasible beneficial reuse options;
3. (iii) a strategy for maximising beneficial reuse for identified reasonable and feasible reuse options; and
4. (iv) a strategy for disposal of any produced salt that is not able to be beneficially reused, including demonstration that occupiers of waste facilities can lawfully accept, and will permit, the volume and composition of salt waste produced by the development for disposal at their premises.

Waste Management Plan

B66. Prior to the commencement of Phase 2, the Applicant must prepare a Waste Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:

1. (a) be prepared by a suitably qualified and experienced person/s;
2. (b) be prepared in consultation with the EPA, Council, and the owner of any waste facilities or land on which waste is proposed to be disposed;
3. (c) describe the measures to be implemented to ensure:
    1. (i) compliance with the waste operating conditions in this consent;
    2. (ii) compliance with the *Protection of the Environment Operations (Waste) Regulation 2014*; and
    3. (iii) reasonable and feasible waste minimisation and management measures are being employed;
4. (d) identify all waste streams generated by the development;
5. (e) describe the waste management system in detail, including a contingency strategy if beneficial reuse and/or disposal options become unavailable; and
6. (f) include a monitoring program that:

1. (i) evaluates and reports on:
    - the effectiveness of the waste management system;
    - ongoing classification of waste (including salt); and
    - compliance against the waste operating conditions and the EPL; and
2. (ii) defines what constitutes a waste-related incident or non-compliance and includes a protocol for identifying and notifying the Department and relevant stakeholders of these events.

B67. The Applicant must implement the approved Waste Management Plan."

8. Conclusion and post-script concerning Waste Classification Guidelines

Concerning waste, we note that eminent water expert Professor Stuart Khan of the University of NSW provided evidence to the IPC on Thursday, 23rd July, that:

> "For such an enormous mass of salt waste the Environmental Impact Statement submitted with the Development Application for this project is very brief on the issue of salt disposal, but it does state that the salt would be classified as general solid waste under the NSW EPA Waste Classification Guidelines. In their response to submissions Santos further emphasised that the salt would be classified as general solid waste, **and to support this they provided chemical analysis of potential chemical contaminants in the salt to demonstrate that they are expected to be below the contaminant thresholds included in the Waste Classification Guidelines, as to be classified as general solid waste**." [Emphasis added]

Respectfully, we do not agree that Santos has provided "chemical analysis of *potential chemical contaminants* in the salt".[Emphasis added] As pointed out in our submission (above at p 11) Santos failed to test for a number of chemicals that might be expected to be found in the brine, including barium and boron. This indicates that the 5-step process required by the NSW Waste Classification Guidelines has not been applied, and we have no confidence of the results that led to Santos' conclusion that the crystallised brine is general waste.

Even the NSW EPA has failed to pick this up. We trust that the Commissioners will not.

Our overriding concern is the failure of the NSW Government to understand its role in applying the Precautionary Principle. Data gaps in a wide range of areas has caused the DPIE to assume no, or minimal, impacts from the Narrabri Gas project and then to extrapolate that as objectors have not proven serious potential harm, the Precautionary Principle has not been triggered.

This is a fundamental misunderstanding of the Principles, and poses grave risks to NSW and our climate.

Thank you.

Leard Forest Research Node
August 2020