

SCIENTIFIC INQUIRY INTO HYDRAULIC FRACTURING IN THE NORTHERN TERRITORY



Santos
Submission #420

Mr Tom Baddeley
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By email: [REDACTED]

Dear Mr Baddeley

RE: HYDRAULIC FRACTURING INQUIRY – INFORMATION REQUEST

I refer to the *Scientific Inquiry into Hydraulic Fracturing of Unconventional Reservoirs in the Northern Territory (the Inquiry)*, which was established by the Northern Territory Government under the *Inquiries Act 1945 (NT)* in late 2016 to investigate the impacts and risks of hydraulic fracturing of onshore shale gas reservoirs and associated activities on the environmental, social, economic and cultural conditions in the Northern Territory. The Hydraulic Fracturing Taskforce (**the Taskforce**) has been established in the Department of the Chief Minister to support the Inquiry.

The Inquiry is seeking further information from Santos on certain issues identified in the Interim Report. Detail on the information requested is outlined below.

1. Flowback and produced water

The Inquiry's Interim Report includes a discussion on the composition of flowback and produced water.¹ As set out in the report, these waters may contain inorganic and organic chemicals of potential environmental significance in addition to those that were originally found in hydraulic fracturing fluid.

The Inquiry understands that interest holders are required to disclose the chemicals used in hydraulic fracturing fluids to the government. However, the identities and concentrations of geogenics (chemicals extracted from the shale formation as a result of the hydraulic fracturing process) do not need to be disclosed. At this stage the Panel has no Australian information on the actual composition of flowback or produced water from shale gas operations.

¹ Interim Report, chapter 5.5.3 (page 29) and 7.4.2 (page 54).

The Inquiry's preliminary view is that the regulatory framework should include a requirement for:

- (a) a risk assessment of the geogenic components of flowback and produced water; and
- (b) disclosure of the chemical composition of flowback and produced water.

Please comment on this proposal.

2. Spills

The Inquiry has been provided with submissions to the effect that the likelihood of contaminants in a spill rapidly reaching a surface aquifer prior to any clean up action is low because:

- groundwater aquifers are quite deep (for example, between 50 and 200m below surface in the Beetaloo Sub-basin);
- appropriate containment facilities are used; and
- the interaction with the soil zone reduces the concentrations of many of the contaminants.

The Panel has no specific information regarding the potential for toxic contaminants in flowback and produced water to be 'removed' in passing through the soil profile, including in the Beetaloo Sub-basin.

In that regard, the Panel requests specific information on the likelihood that on-site surface spills of chemicals or wastewater could reach the groundwater aquifer, and if they do, what could be done to remediate the system.

3. Groundwater systems

Please advise if there has been any research undertaken in respect of the deeper groundwater systems in the Beetaloo Sub-basin or other prospective shale gas regions. Please indicated what is known of them, including their depth, extent, quality, and prospectivity for use in hydraulic fracturing.

If deeper groundwater systems are present, please indicate whether Santos is considering using these resources for hydraulic fracturing rather than the better quality surface aquifer, that is, the Cambrian Limestone Aquifer.

4. Solid waste management

As noted in the Interim Report, the solids produced by drilling represent a substantial waste stream associated with the production of shale gas.² In the United States, the disposal of large amounts of drill cuttings produced by a full-scale industry is the cause of concern given the nature of this material and its potential to leach organic and inorganic components into the near surface environment.

² Interim Report, chapter 5.7 (page 31).

A strategic management issue for any potential shale gas industry in the Northern Territory will be the question of whether this solid waste should be contained in a purpose-built and engineered centralised facility, or contained and managed on a per well pad basis as is currently the case for the exploration regime.

Please comment on this matter.

5. Infrastructure requirements

The proposals around infrastructure requirements require careful scrutiny. Experience in the United States has shown that well production and field production typically declines over time, requiring additional wells to be commissioned to meet demand. Shale gas plays in the United States invariably have had “core” areas or “sweet spots”, where individual well production is highest and hence the economics are best. Sweet spots are targeted and drilled off early in a play’s lifecycle, leaving lesser quality rock to be drilled as the play matures. Therefore, the number of wells required to offset field decline inevitably increases with time. Shale gas plays have high field production declines, typically in the range of 30-45% per year, which must be replaced with more drilling to maintain production levels.

The Inquiry has received submissions to the effect that the potential infrastructure needs of a possible development in the Beetaloo Sub-basin is approximately 200 drill pads and over 1000 wells.³ In light of the above discussion, please comment on the proposed infrastructure requirements. Please also comment on the figures provided by the Department of Primary Industry and Resources in their submission. Please also provide details on the expected:

- initial size of well pads;
- size of well pads during the operation phase;
- length and clearing width for collector pipelines; and
- lengths and clearing widths of any access roads that are not contained within pipeline corridors.

If the moratorium were lifted but the number of well pads were limited within a project area (e.g. to 50), please comment on the relative merits of the two scenarios described below:

- a) **Scenario 1:** wider spacing (5-10 km) between well pads, such that the effective project area would be larger (900 – 3,600 km²), but less-intensively developed; and
- b) **Scenario 2:** narrower spacing (2-3 km) between well pads, such that the effective project area would be smaller (144 – 322 km²) but more-intensively developed within that footprint.

6. Baseline data

If the moratorium were lifted, describe Santos’ annual work program for baseline data acquisition for the first five years. Describe the level of effort that is proposed with regard to water quality and biodiversity.

³ Interim Report, page 43.

7. Traffic

Of considerable concern to the community is the potential for greatly increased numbers of vehicle movements along the Stuart and Carpentaria Highways. This is not just a matter of road safety and potential for spills but also an issue of “amenity” for road users in general, noting that the Stuart highway is a major route for grey nomad traffic during the dry season.

Please indicate the nature and extent of the increase, relative to current conditions, in vehicle movements during each state of development. Please indicate whether transportation by rail has been considered given the proximity of the rail line corridor to the relevant lease areas in the Beetaloo.

8. Health assessment

The Panel understands that Santos undertook a detailed human health risk assessment (**HHRA**) on its GLNG GFD Project Area across the Bowen and Surat Basins in Queensland. I understand a HHRA report was produced by Consultants EHS Support and peer reviewed by EnRiskS. This HHRA report was quite thorough and included assessment of risks associated with chemical transport, spills and management of flowback water. Given that it related to CSG operations, and that the composition of flowback water from shale gas operations is likely to be different, please indicate whether Santos plans to undertake a similar HHRA exercise for its projected NT shale gas operations, as outlined in Appendix B of its submission.

Further, Chapter 10 of the Interim Report includes a proposal that a site specific human health risk assessment should be required for each shale gas project in order to fully inform the impact of the project on public health. Please comment on this proposal.

9. Greenhouse gas emissions

The Panel has formed a preliminary view that, if the industry is given approval to proceed, the following mechanisms will be required to minimise greenhouse gas emissions, and in particular, methane emissions:

- implementation of leading practice standards for emission reduction, such as the United States Environmental Protection Agency’s New Source Performance Standards, Permitting Rules for the Oil and Natural Gas Industry;
- baseline measurements of methane levels prior to development; and
- ongoing monitoring of methane levels at key points during exploration, development and production.

The Inquiry invites comments on the above. In addition, please comment on:

1. the technologies that are currently available to obtain baseline measurements of emissions, including the possible use of drones;
2. the scope, including the location, of any emissions monitoring that should occur during the exploration, development and production phases, such as,

- for example, wellheads during completion, liquids unloading, compressor seals and gathering stations;
3. the use of emission limits that, if exceeded, would trigger an investigation, make-good requirements and/or a penalty;
 4. the need for transparency when setting emission limits; and
 5. whether or not baseline measurements and on-going monitoring should be undertaken by an independent body.

The Inquiry requests Santos' comments on section 9.8 of the Interim Report, which has been duplicated at **Attachment A**.

10. Further information

Please provide the Inquiry with a copy of the following report, which was referenced in Santos' submission:

AECOM. (2016). *Exploration Environmental Plan – Beetaloo Basin, Northern Territory*.

Hearings

Santos has been scheduled to present at upcoming hearings of the Inquiry and the Taskforce will confirm the time and date of Santos' presentation in the near future.

To the extent reasonably practicable, the Inquiry requests Santos address the matters outlined above at the upcoming hearings. If this is not possible, then, in order to meet reporting deadlines, please provide your response by **18 August 2017**.

Yours sincerely



THE HON JUSTICE RACHEL PEPPER
Chair

25 July 2017

Attachment A

9.8 Preliminary Assessment

Risk assessment

While carbon dioxide emissions dominate the life cycle GHG emissions (because downstream combustion of natural gas generates high amounts of carbon dioxide), methane emissions dominate the upstream GHG emissions. Furthermore, the quantity of methane emissions is more uncertain and they are more amenable to reduction. Accordingly, the focus of the proposed risk assessment is on methane emissions. A framework for an interim risk assessment is given in Table 9.2 for a number of hazards which may prevent lower levels of methane emission performance from being achieved. These levels of methane have been discussed previously.

At this stage, the Panel has insufficient information to make an informed assessment of risk. This risk assessment will be used to identify areas where mitigation of risks is required and to assess strategies to mitigate those risks.

Table 9.2: Interim risk assessment framework for hazards that may prevent lower levels of methane emission performance from being achieved

Hazard	Comments	Likelihood	Consequences	Risk
Regulations are not implemented at either State or Federal level.	Regulations are required for reduced emissions completions, compressor emissions and pneumatic controllers			
Regulations are not fully complied with	This may have the effect of allowing increased emissions			
Monitoring of regulatory compliance is not undertaken or is inadequate	Monitoring by a regulatory authority may not occur because of lack of resources.			
Monitoring of both baseline emissions and emissions during production is not undertaken	Monitoring emissions is one means for assuring compliance and also to possibly detect "super emitters"			
Low production performance means emission performance is not achieved	Wells that have low ultimate gas recovery can give rise to higher emission rates. Such wells may also be uneconomical			
Failure of plant or equipment occurs during the lifetime of the well	Consequences can range from a minor to a catastrophic release of gas for a relatively short period over the life of a well			