



Central Australia Frack Free Alliance (CAFFA) Initial Submission to the Scientific Inquiry into Hydraulic Fracturing

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Presented by:

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The Central Australian Frack Free Alliance (CAFFA)

CAFFA is a group of community members who have serious concerns over the impacts of the unconventional (shale) gas industry in the Northern Territory. Over the last two years our commitment has been to raise awareness and inform the wider community about the risks posed by this relatively new and poorly regulated industry, we are calling for transparency, clarity, and independent, scientific research, as well as thorough community consultation.

Our work, which is largely done by volunteers, has seen CAFFA engaging with the community through market stalls, letterboxing, community surveying and other social events. This has provided us with statistical information as to the mood of our community on this issue. We saw hydraulic fracturing (fracking) in unconventional gas extraction announced as one of the top three election issues in 2016, outlining clearly the distrust felt towards this illusive industry.

CAFFA's engagement

We applaud the newly elected Chief Minister in following through with his election commitment to impose a moratorium on fracking. We believe the moratorium is a vital step to ensuring that this industry does not continue to rush ahead considering there is such widespread community concern and the industry lacks the social license to operate anywhere in the NT. In 2015, the residents of Adelaide River township and the Katherine Town Council passed a moratorium on fracking in unconventional gas extraction. In the Alice Springs community survey conducted by CAFFA last year in the suburb of Old East Side, we found that 89% of residents are against fracking. Only 2.8% (or 17 people) supported the development of shale gasfields in Central Australia. The remainder of the survey participants were unsure.

These results were tabled at the Alice Springs Town Council (ASTC) meeting on 30th May 2016. Specifically we asked the ASTC Council to advocate the following on behalf of Alice Spring residents:

1. Call on the NT Government to establish a ‘no-go’ zone for shale gas fracturing activities through the drinking water aquifer for Alice Springs in the Amadeus Basin.¹

Feedback on the Issues Paper

We ask that the issues paper is expanded to include a specific section on the question of social licence to operate, and whether the unconventional shale gas fracking industry has that licence in the Northern Territory.

The risks associated with unconventional fracking are unacceptable, and the industry is a direct threat to our way of life now and into the future.

1 Assess the scientific evidence to determine the nature and extent of the environmental impacts and risks, including the cumulative impacts and risks, associated with hydraulic fracturing of unconventional reservoirs and the associated activities in the Northern Territory.

To date, there are no scientific peer-reviewed studies that reflect the risks associated with the onshore gas industry in the NT. The NT is a unique environment, and diverse in flora and fauna. Due to the remoteness and small population much of the NT is lacking in basic base line studies, including but not limited to: ground and surface water, emissions, and geological and fault line mapping. To date there has been inadequate research and a lack of transparency about the potential risks and effects of areas highlighted for exploration. We strongly urge the inquiry to not even consider “best available evidence” as a point of measure as it exposes far too much risk.

Multiple scientific studies show that unconventional wells leak at a rate of greater rate than conventional ones. A study of shale wells in Pennsylvania show that 6.2% of unconventional gas wells have a well-barrier or integrity failure, and that the number of failures increases as the gas wells age². When wells fail, gas and contaminants can find pathways into aquifers and underground water systems. Given that can only refer to the past 20 years for this evidence, clearly the further risks of contamination will increase as the wells age, exposing more risk to our water sources.

¹ Council minutes:

<http://www.alicesprings.nt.gov.au/sites/default/files/meetings/24.%20TS%20Agenda%20Item%2010.3%20-%20EAC%20Minutes%203%20Oct%202016.pdf>

² [Ingraffea](#), Wells, [Santoro](#) and [Shonkoff](#), Published online 2014 Jun 30, Assessment and risk analysis of casing and cement impairment in oil and gas wells in Pennsylvania, 2000–2012, [Proc Natl Acad Sci U S A](#). 2014 Jul 29; 111(30): 10955–10960.

At this stage evidence also exists that the geography of the area in which wells are drilled can also impact upon the reliability of the well. Studies have shown that well failure has been up to 8.5 times worse in certain areas and while research hasn't yet been able to pin point exactly why this might be the case, it is suggested that it could be due to complex geological formations and or/history of extensive mining in a given area³.

Most well integrity problems are caused by faulty casing and cementing. Steel casing can leak at the connections or corrode from acids. Cement can deteriorate with time too, but leaks also happen when cement shrinks, develops cracks or channels, or is lost into the surrounding rock when applied. If integrity fails, gases and liquids can leak out of the casing or, just as importantly, move into, up, and out of the well through faulty cement between the casing and the rock wall⁴.

Current drilling in Central Australia, is for conventional gas. As previously mentioned, there are currently no NT specific studies that have examined the extent of leaks and fugitive emissions from these existing wells. It is however important to distinguish the current drilling that has taken place from the method of drilling that is the concern of this Inquiry- Hydraulic fracturing for Shale gas. Whilst both methods involve a well travelling through an aquifer, drilling for shale gas requires much higher pressures to retrieve the gas and the impact this pressure could have on well casing over time needs to be considered⁵.

The limited research that does exist into the potential of shale gas in the Northern Territory suggests that up to 12,000 wells could be drilled to extract gas from the Amadeus basin alone⁶. This creates significant potential for well failure and fugitive emissions and poses a real threat to the water supply of Central Australia.

What assurance can be given to communities that rely entirely on clean aquifers that their drinking water will not be contaminated now or into the future? Alice Springs, like many communities in the NT is one of these communities, any risk to our water is clearly unacceptable.

In fact, the Concerned Health Professionals of New York (2015) clearly concluded that fracking threatens drinking water. They wrote that:

“Cases of drinking water sources contaminated by drilling and fracking

³ [Ingraffea](#), Wells, [Santoro](#) and [Shonkoff](#), Published online 2014 Jun 30, Assessment and risk analysis of casing and cement impairment in oil and gas wells in Pennsylvania, 2000–2012, [Proc Natl Acad Sci U S A](#). 2014 Jul 29; 111(30): 10955–10960.

⁴ Jackson, 2014 Jul 29, The integrity of oil and gas wells, Published online 2014 Jul 9. doi: [10.1073/pnas.1410786111](https://doi.org/10.1073/pnas.1410786111)

⁵ <https://www.csiro.au/en/Research/Energy/Hydraulic-fracturing/What-is-unconventional-gas>

⁶ Frogtech. Jan 2013, Potential Geological Risks Associated with Shale Gas Production in Australia. Project Code AAS801.

activities, as well as associated waste disposal, are now proven. The U.S. Environmental Protection Agency's (EPA) assessment of fracking impacts on drinking water resources confirmed specific instances of water contamination caused by drilling and fracking-related activities and identified the various pathways by which this contamination has occurred. According to the EPA, documented cases of drinking water contamination have resulted from spills of fracking fluid and fracking wastewater; discharge of fracking waste into rivers and streams; and underground migration of fracking chemicals, including gas, into drinking water wells. Independently, researchers working in Texas found 19 different fracking-related contaminants—including cancer-causing benzene—in hundreds of drinking water samples collected from the aquifer above the heavily drilled Barnett Shale, thereby documenting widespread water contamination. In Pennsylvania, a solvent used in fracking fluid was found in drinking water wells near drilling and fracking operations known to have well casing problems. In California, state regulators admitted that they had mistakenly allowed oil companies to inject drilling wastewater into aquifers containing clean, potable water.^{7 8 9 10}

The fact that the use of fracking in unconventional gas extraction has been permitted while there is no independent scientific evidence to determine the nature and extent of the environmental impacts and risks in the Northern Territory is a key concern of CAFFA members and supporters.

To date we as a community group have been unable to access base line water studies for the Alice Springs and surrounding regions. This information should be publically accessible to all.

2 Advise on the nature of any knowledge gaps and additional work or research that is required to make the determination in Item 1, including a program for how such work or research should be

⁷ California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (2015, July 1). Analysis of Oil and Gas Well Stimulation Treatments in California, Volume II. Retrieved from http://www.conservation.ca.gov/dog/SB4DEIR/Pages/SB4_DEIR_TOC.aspx

⁸ Hildenbrand, Z. L., Carlton, D. D., Fontenot, B. E., Meik, J. M., Walton, J.L., Taylor, J. T., . . . Schug, K.A. (2015) A comprehensive analysis of groundwater quality in the Barnett Shale region. Environmental Science & Technology, 49(13), 8254-62. doi: 10.1021/acs.est.5b01526

⁹ U.S. EPA. (2015). Assessment of the potential impacts of hydraulic fracturing for oil and gas on drinking water resources (External review draft). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-15/047, 2015. Retrieved from <http://cfpub.epa.gov/ncea/hfstudy/recordisplay.cfm?deid=244651>

¹⁰ Llewellyn G. T., Dorman, F., Westland, J. L., Yoxheimer, D., Grieve, P. Sowers, T., . . . Brantley, S. L. (2015). Evaluating a groundwater supply contamination incident attributed to Marcellus Shale gas development. Proceedings of the National Academies of Science, 112, 6325-30. doi: 10.1073/pnas.1420279112/-DCSupplemental

- prioritised and implemented, that includes (but is not limited to):***
- a baseline surface water and groundwater studies***
 - b baseline fugitive emissions data***
 - c geological and fault line mapping***
 - d focus areas for baseline health impact assessment.***

As already stated, there are inadequate scientific peer-reviewed studies that reflect the risks associated with the onshore gas industry in the NT, and therefore the knowledge gaps are on all above listed studies and assessment. Until relevant information is published and peer reviewed, this industry cannot be permitted. This is not a strategy to delay drilling from taking place. The research that does exist indicates that there are many risks as a result of hydraulic fracturing. Until research is adequate in assessing those risks specifically for the case of the NT, it is unsafe to proceed with any drilling.

All works outlined need to be addressed transparently and without pressures to produce documents within unrealistic time frames. The NT is a diverse place, and weather patterns vary year-to-year, decade-to-decade. Any study needs to factor in data that ranges across decades to account for the “once in a life time wet” that we have just seen flood much of the NT and cut off many communities from basic supplies. When a singular source of water can be affected by hydraulic fracturing the risk to the water users escalates dramatically. Studies must also include impacts to threatened species.

The unconventional gas industry poses one of the biggest risks to the future of this planet. It must be stated that all bores and pipelines fail at sometime, and there are alarmingly high levels of shale gas leakages in the United States and “methane is 84 times more potent than carbon dioxide over a 20 year time scale”.¹¹

The National Pollutants Inventory shows a large increase in air pollution for Kenya Processing Plant and compressor stations near Tara, QLD.

72,000 tonnes of formaldehyde
1,300 tonnes of nitrous oxides
1000 tonnes of carbon monoxide
180 tonnes of volatile organic compounds
Dangerous dust particles (particular matter) increased to 1,113,000 kg (from 5,400 in 2013-14)

This is just one source of emissions in the Queensland gasfields. The air pollution from a shale gasfield compared to a coal seam gasfield is similar, and several scientific papers on shale gasfields have documented serious health impacts.

¹¹ <https://www.edf.org/methane-other-important-greenhouse-gas>

While the industry is in the process of being mapped by NASA, it is imperative that this highly polluting industry does not go ahead in the NT, further contributing to climate change on a massive scale. The scale of the shale deposits being measured in the NT would require tens of thousands of shale gas wells, and large scale associated infrastructure. US research shows that about 40% of oil and gas wells are likely to be leaking methane into the atmosphere¹². NASA shows measurable methane leaks over gasfields¹³. Within the first 10 years from the industry reaching production phase in the NT, we could see thousands of wells and infrastructure leaking methane into the environment, further distancing ourselves from any hope of curbing climate change.

That being said, this inquiry must take a holistic approach. From the underground pressurised chemical extraction to the end user including all the processes, by products, waste and side effects, need to be considered. Atmospheric pollution from burning fossil fuels is also a part of the gas industry and therefore it is vital that this aspect is included as part of the investigation and findings.

As for gas wells there is little evidence in the NT on hydraulic fracturing as a process of gas mining. There were three gas wells targeting unconventional gas in the Southern Georgina basin drilled and attempted for hydraulic fracturing in 2011/12: MacIntyre-2H, Owen-3H and Baldwin-2Hst1.

According to a Petrofrontier operational update in 2012, "During the hydraulic stimulation program of the Baldwin-2Hst1 well, a shallow casing failure occurred and as a result, PetroFrontier was unable to complete the program."¹⁴

From NT Government wrote on the matter:

In 2012, Petrofrontier re-entered the Baldwin-2HST1 well to perform hydraulic fracturing (after obtaining approval from NTDME). At the beginning of the hydraulic fracturing, during pumping, the frac water leaked from 5-1/2" casing (but was contained in the well within the next layer of larger diameter casing). It was a well integrity issue.¹⁵

A hydraulic stimulation was performed on another well, MacIntyre-2H, however, after recovering approximately one-third of the hydraulic stimulation fluid, traces of biogenic hydrogen sulfide gas, produced from organisms in the completion fluid, were detected and the well had to be suspended.

¹² <http://www.news.cornell.edu/stories/2014/06/four-10-wells-forecast-fail-northeastern-pa>

¹³ <http://earthobservatory.nasa.gov/Features/MethaneMatters/>

¹⁴ http://www.barakaenergy.com.au/pdfs/2012-10-15-012917Confirmation_of_Oil_in_the_Southern_Georgina_Basin_15Oct2012.pdf

¹⁵ <https://frackinginquiry.nt.gov.au/information/other-australian-inquiries/2014-northern-territory-inquiry-terms-of-reference/?a=389138>

In 2014, Statoil, the joint venture partner, submitted application for abandonment of these wells. To our knowledge, there has been no ongoing monitoring of these abandoned wells for water quality, methane leaks, or other pollutants.

The unconventional gas fields in the NT, for example the Mereenie Gas Fields, that although are a conventional source of gas, may provide some evidence of leakages, industrial practices and side effects. The pipeline that transports gas from the Mereenie field to Darwin may show evidence of its durability and leakage rates that would inform this investigation. If there is no evidence then the research needs to be conducted before a sound decision can be made. Findings from such research need to be transparent and available to the public.

There is evidence from other parts of the world and other jurisdictions in Australia of unconventional shale gas mining. There are hundreds of peer reviewed reports into shale gas development impacts. The documentation that is available may provide some empirical data, however it is not site nor even field specific, therefore scientific evidence cannot be seen as complete, reliable or relevant. A publicly funded, publicly available research project of all unconventional gas bores is required for definitive findings.

3 For every environmental risk and impact that is identified in Item 1, advise the level of environmental impact and risk that would be considered acceptable in the Northern Territory context.

As we have 100% reliance on aquifers to live in the arid region of Central Australia, there is no acceptable risk worth taking and therefore this industry must be banned from entering the NT.

4 For every environmental risk and impact that is identified in Item 1:

- a describe methods, standards or strategies that can be used to reduce the impact or risk***
- b advise whether such methods, standards or strategies can effectively and efficiently reduce the impact or risk to the levels described in Item 3.***

We are responding to points 3 and 4 together as we firmly believe that there are no acceptable environmental impacts or risks. We are not willing to accept any risks to our water supply and aquifers, or an industry that assuredly risks contributing to climate change.

Gas was once seen as a “cleaner fuel”, one that could help the world economy transition from its reliance on coal and oil to the zero-carbon economy required to prevent dangerous climate change. But those days are over. It is simply too late. After 25 years of global inaction the climate

science makes clear that there is no longer the time for a halfway house like gas.

Not only is the gas industry too late, it is now too dirty. In addition to pumping harmful chemicals into the ground, the process of fracking can release naturally occurring substances such as lead, mercury and uranium into the surrounding soil and water. The fracking chemicals and sand also help to keep the newly created fissures open so the methane gas can leak out. The process ensures that fracking wells capture a far smaller proportion of the gas that comes to the surface than is captured by “conventional” wells. And a tonne of methane is 20 times more potent as a source of global warming than a tonne of carbon dioxide.

Despite a decade of widespread fracking in unconventional gas extraction in Australia, no comprehensive analysis of the extent that these “fugitive emissions” seep through the soil and water and into the atmosphere has been published. Evidence that we draw upon is from other countries and jurisdictions and does not take into the unique virgin landscape that is the Northern Territory. The Australian government has chosen to estimate the level of fugitive emissions from fracked wells based on the assumption that the level of fugitive emissions from conventional gas wells in the United States. Where actual measurements have been taken of the fugitive emissions from unconventional gas wells in the US, the figures have been up to 25 times higher than the assumed figures used in Australia’s national inventory of greenhouse gas emissions. The Australian government and the Australian gas industry continue to assume that fugitive emissions from fracking in unconventional gas extraction are low rather than collect evidence to the contrary.¹⁶

We repeat that we strongly believe there are no risks worth jeopardising our water and that we do not support an industry that blindly risks dangerous levels of climate change.

5 Identify any scientific, technical, policy or regulatory requirements or resources that are in addition to the reforms being implemented through the existing environmental reform process that are necessary to reduce environmental risks and impacts associated with the hydraulic fracturing of unconventional reservoirs to acceptable levels.

Due to the impact on climate change and risk to water aquifers this industry must not be allowed. This most extreme measure to continue and expand the use of fossil fuels for generating electricity and production of various products like fertiliser is demonstrably against the renewable targets established in the

¹⁶ Sourced from the article, “Feeding the Beast” by Richard Denniss in *The Monthly*, November 2016

Paris Accord. Expanding and mining more and more extreme and difficult to extract methane gas will continue to warm the planet and produce discharges affecting watercourses and the oceans.

The mining history in NT and the somewhat cavalier responses to mine rehabilitation, air and water contamination may also be considered (in the absence of gas field data) as indicators of the gas and mining industry's attitude and commitment to the environment. They have in many cases left the sites rehabilitated. Even in highly regulated circumstances in the NT's mining history, there have been serious breaches and accidents. This is related industry data that may inform the consultation for expectations of gas miners¹⁷.

6 Identify priority areas for no go zones.

We call for a complete ban on unconventional fracking in the NT, and ask that all aquifers in the NT be put off-limits. In an arid environment, water access is essential for all life. Hydraulic fracturing processes, particularly for shale gas extraction, use very large amounts of water and thereby compete with existing community water needs. Alice Springs has a limited water supply that we draw from the Amadeus Basin. The water drawn from the Amadeus Basin Aquifers is estimated to be between 10 000 to 30 000 years old and contemporary recharge is minimal in the context of the resource. This water resource is therefore considered a non-renewable water resource.¹⁸

With expectations of expanding inland populations and extending agriculture this estimate will tighten putting pressure on communities, we cannot risk contamination or drainage in order to meet the fracking industry processes.

The aquifers of the region are dynamic systems in which characteristics such as storage volumes, flow rates, yields and water quality vary over time, within a range of possible values.

At this stage knowledge about groundwater dependent ecosystems also remains limited, and there is uncertainty about which ecosystems are groundwater dependent, how much water is needed to maintain groundwater dependent ecosystems, or how sensitive they may be to changes in water quality or availability.

Conclusion

To conclude, then, we, the members of CAFFA, are seriously concerned that

¹⁷ <http://www.abc.net.au/radionational/programs/backgroundbriefing/the-race-to-avert-disaster-at-the-nts-mcarthur-river-mine/7159504>

¹⁸ Alice Springs Water Allocation Plan 2016:
https://denr.nt.gov.au/__data/assets/pdf_file/0020/271415/alice-springs-water-allocation-plan2016.pdf

the use of fracking in unconventional gas extraction has been permitted while there is no independent scientific evidence to determine the nature and extent of the environmental impacts and risks. We strongly oppose this industry because of its threat to our precious aquifers, water supply and our way of life, as well as its contribution to global warming and on going climate change. We believe that there are no risks or impacts worth jeopardizing our water, health, our children's future, and the future of our planet. "Climate change is intergenerational theft" (Naomi Klein) and a fracking industry in the NT would be a significant contributor to such theft. Nothing is worth that.

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