

From: [Alex Read](#)
To: [OriginPetroleum_DENR](#)
Cc: [ALEC_Director](#)
Subject: Origin Velkerri comments
Date: Friday, 1 November 2019 3:31:04 PM
Attachments: [ALEC_submission_Origin_EMP_Velkerri.pdf](#)

Dear DENR Petroleum,

Please find attached a submission from the Arid Lands Environment Centre on the Origin Velkerri 76 S2 EMP. Approval should be refused according to our comments detailed in the submission.

Regards,

Alex Read

Policy Officer
Arid Lands Environment Centre (ALEC)

Please note I work part time from Tuesday - Thursday

Ph. 08 8952 2497 or 0407 770 157

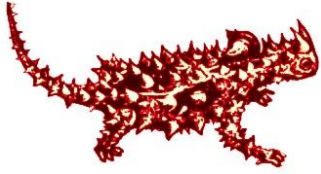
'Healthy futures for arid lands and people'

Street Address: 90 Gap Rd, The Gap, Alice Springs

Postal Address: PO 2796, Alice Springs, NT, 0871

Web: www.alec.org.au

Facebook: <http://www.facebook.com/pages/Arid-Lands-Environment-Centre/>



**Arid
Lands
Environment
Centre**

Office: 90 Gap Road Alice Springs NT
Mail: PO Box 2796 Alice Springs 0870 NT
Web: www.alec.org.au
Phone: 08 89522497
Email: policy@alec.org.au

Origin Environment Management Plan Velkerri 76 S2 ALEC submission

ALEC welcomes the opportunity to provide comment on the Origin Environment Management Plan for the Velkerri 76 S2 project in the Beetaloo basin.

The Arid Lands Environment Centre (ALEC) is central Australia's peak environmental organisation that has been advocating for the protection of nature and ecologically sustainable development of the arid lands since 1980. ALEC is opposed to the development of an onshore unconventional petroleum industry for the Northern Territory as it poses an unacceptable level of risk to groundwater, climate and local communities. Notwithstanding this opposition, ALEC is regularly engaged in regulatory reform to ensure there is full accountability and transparency over the industry enforced through robust regulatory controls.

No acceptable risk to the climate and groundwater

ALEC formally objects to the granting of an environmental approval for the proponent to frack the Beetaloo.

This Environment Management Plan (EMP) should be refused on the grounds that it does not fulfill the requirements of ecologically sustainable development, that the level of risk posed to groundwater and the environment is unacceptable, there is no effective free prior and informed consent and potential emissions will breach our national greenhouse emission reduction targets.

Further, the EMP does not contain sufficient information to make a fully informed decision about the full scale of risk failing to acknowledge the high degree of uncertainty about groundwater resources as required by the *Petroleum Environment Regulations* (PER).¹ Accordingly the EMP should be returned to the proponent to include more information regarding cumulative impacts and uncertainty over risks to groundwater and climate change.

1. Flow back fluid and wastewater management:
 - a. The Code of Practice (CoP) permits the use of lined storage ponds for evaporation of water, however the EMP is not clear on what volume will be stored in open tanks compared to enclosed tanks. How will the proponent decide when it is appropriate to cycle the water?
 - b. The CoP requires the EMP to outline a plan to transfer produced water, however there is no plan detailed in the EMP simply a statement that the CoP will be complied with. This is not enough. What is a significant rainfall event, how is the fluid being transferred to enclosed tanks?

¹ *Petroleum (Environment) Regulations (PER) 2006* schedule 1, s. 2(c)

- c. Cycling between tanks is a high-risk activity, regulators have suggested this is not desirable. Once water has been transferred how long will it remain in the enclosed tanks?
 - d. The EMP states that fauna will be protected from water by vertical walls, but there is nothing preventing birds from landing in and drinking from the open tanks. This is a serious risk to local bird populations, especially considering there is yet to be a full chemical analysis of flowback and produced water.
 - e. There is no clear process for transferring waste into enclosed tanks throughout the wet season.
 - f. The process for cycling between enclosed tanks and open tanks is fraught with risk. What if pumps fail before a large rainfall event and the site is inaccessible? How does the proponent intend to address mechanical failure if the site is not accessible?
2. Greenhouse emissions
- a. The assessment against environmental factors and objectives did not identify fugitive emissions as a potential source of greenhouse emissions. This is therefore an unmitigated risk.
 - b. The EMP fails to outline the cumulative impact of greenhouse emissions from other projects that the proponent is responsible for and potential prospective emissions from future wells. This is a breach of the PER.²
 - c. There is still no clear process to guarantee that emissions are offset as required by the Final Fracking report. This is therefore a significant risk that is not mitigated.
3. The Origin EMP does not align with the principles of ecologically sustainable development, specifically the principle of inter-generational equity, intra-generational equity, the precautionary principle and the polluter pays.
- a. This EMP authorises exploratory drilling which is essential work for the development of a production scale onshore petroleum industry. The development of such an industry is inconsistent with actions that are necessary to keep global climate change below 1.5°C. In order to slow climate change the vast majority of remaining fossil fuel resources need to remain in the ground. This EMP could facilitate the large-scale development of the industry jeopardising global mitigation efforts and compromising the health and stability of future generations.
 - b. The EMP does not properly apply the precautionary principle. While the Fracking Report stated that risks could be reduced to an acceptable level, it also stated that there was insufficient information available to make a fully informed decision about the potential impact on groundwater resources. The EMP does not properly assess the risk as it fails to acknowledge that uncertainty in knowledge, as required by schedule 1 of the PER.
 - c. The economic benefits of fracking are not distributed equitably, and the project is unlikely to become a profitable enterprise considering the intense capital required to develop the necessary infrastructure.
 - d. There is no chain of responsibility legislation in place in the Northern Territory yet, which creates a risk of shifting legacy and rehabilitation costs to the people of the NT.
4. Water

² PER at schedule 1, s.3(2)(b).

- a. The EMP states that two additional groundwater bores *may* be drilled. When will the proponent determine if two additional bores will be drilled? While any useage will be added to the existing licence, will that increase the total volume that is authorised under the current licence?
- b. Section 3.5.1 states that pressure testing will use fresh water which can be reused. Is the proponent therefore proposing to recycle water used in the fracturing process? The recycling of water for fracture stimulation should be assessed as a key risk in the EMP.

From: [Ross Brown](#)
To: [OriginPetroleum DENR](#)
Subject: New frack site
Date: Thursday, 31 October 2019 8:53:51 PM

Dear NTG,

It would be irresponsible to risk our precious water resources for gas. Even if we are told the chance of contamination is low when we factor in the level damage this contamination could do, displacing entire townships in the NT and ruining NT agriculture.

The flow on costs that the NT will have to bare in the future are astronomical. As a born and bred Alice Springs local, I object the proposal from origin and I ask you to please not risk the NT for something as trivial as gas profit.

Yours sincerely Ross Grant Brown

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From: [Dianna Newham](#)
To: [OriginPetroleum DENR](#)
Subject: Origin Energy B2 Pty Ltd Beetaloo Basin Velkerri drilling and hydraulic fracturing program (EP76) -- response to EMP
Date: Wednesday, 30 October 2019 9:39:20 PM
Attachments: [Origin EMP CAFFA comment 201910.pdf](#)

Good evening,

Please find attached a response from the Central Australian Frack Free Alliance to the environmental management plan for Origin Energy B2 Pty Ltd Beetaloo Basin Velkerri drilling and hydraulic fracturing program (EP76).

Regards,

Dianna Newham
Tel: 0429 598946

**Origin Environment Management Plan Velkerri 76 S2:
Comments from the Central Australian Frack Free Alliance**

First and foremost, the Origin EMP does not align with the principles of ecologically sustainable development, specifically the principle of inter-generational equity, intra-generational equity and the polluter pays. The development of an onshore unconventional gas industry is inconsistent with actions that are necessary to keep global climate change below 1.5°C. This EMP could facilitate the large-scale development of the industry, thereby jeopardizing global mitigation efforts and compromising the health and stability of future generations.

Secondly, while the Scientific Inquiry Into Hydraulic Fracturing In The Northern Territory stated that risks could be reduced to an acceptable level, it also stated that there was insufficient information available to make a fully informed decision about potential impact on groundwater resources. The EMP does not properly assess the risk by failing to acknowledge that uncertainty in knowledge.

We also have strong concerns about specific aspects of the EMP:

- a. The lack of detail as to how the flowback fluids will be stored and managed. There is no information on the volumes which will be stored for evaporation. There is no plan as to how the water will be transferred to enclosed tanks should there be a significant rainfall event. Once water has been transferred how long will it remain in the enclosed tanks?
- b. Greenhouse emissions: the EMP did not identify fugitive emissions as a potential source of greenhouse emissions and there is still no clear process to guarantee that emissions are offset as required by the final fracking report.
- c. Waste disposal: there is no clear process for transferring waste into enclosed tanks throughout the wet season.

From: [Jimmy Cocking](#)
To: [OriginPetroleum_DENR](#)
Subject: Objection to Origin Velkerri 76 S2 EMP
Date: Friday, 1 November 2019 3:40:45 PM

To Whom It May Concern;

This submission is lodged as an official objection on the following grounds:

- 1) The EMP authorises the use of open waste-water storage tanks in direct defiance of recommendation 7.12 from the Fracking Inquiry.
- 2) There is no information provided on how emissions, including fugitive emissions will be offset as required by recommendation 9.8 from the Fracking Inquiry.
- 3) Hydraulic stimulation should not be conducted over the wet season because of the high risk of flooding and extreme weather that will be impossible to accurately predict. This risk is simply too great and should operationalise the precautionary principle.
- 4) The uncertainty around baseline groundwater information, acknowledged by the Fracking Inquiry has not been addressed. No fracking should commence unless this information has been developed by comprehensive and long-term baseline groundwater studies.

It is not acceptable to permit this application as it stands against the intent of the Pepper Inquiry to reduce the risks of fracking. Allowing it to proceed undermines trust in Territory institutions and goes against what the community expects from this process.

Please don't approve this EMP until the above 4 points are dealt with.

Kind regards

Jimmy Cocking

From: noreply@denr.nt.gov.au
To: [OriginPetroleum_DENR](#)
Subject: DENR - Consultation Form - 749906
Date: Friday, 1 November 2019 11:01:23 AM

Contact details

First name: Tanya
Surname: Dodds
Email address: dodds_watson@hotmail.com
Country: Australia
Postcode: 0870
Phone number: 0413220282
Stakeholder type: Community

Feedback

Activity you are providing feedback on: Origin Energy B2 Pty Ltd Velkerri Drilling, Hydraulic Fracturing and Well Testing EP76 S2

Category type: Social and cultural, Flora and fauna, Water, Waste Management, Human health, Chemicals

If other, please specify::

Comments: 1) The EMP authorises the use of open waste-water storage tanks in direct defiance of recommendation 7.12 from the Fracking Inquiry. 2) There is no information provided on how emissions, including fugitive emissions will be offset as required by recommendation 9.8 from the Fracking Inquiry. 3) Hydraulic stimulation should not be conducted over the wet season because of the high risk of flooding and extreme weather that will be impossible to accurately predict. This risk is simply too great and should operationalise the precautionary principle. 4) The uncertainty around baseline groundwater information, acknowledged by the Fracking Inquiry has not been addressed. No fracking should commence unless this information has been developed by comprehensive and long-term baseline groundwater studies. 5) The possible impacts on humanity and the environment far out way the the solutions that could be done to rectify any issues. Hindsight is a wonderful thing, but how about prevention I the first place with so much happening across the country.

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From: noreply@denr.nt.gov.au
To: [OriginPetroleum_DENR](#)
Subject: DENR - Consultation Form - 749029
Date: Wednesday, 30 October 2019 2:39:20 PM

Contact details

First name: Georgina
Surname: Gartland
Email address: gegart21@gmail.com
Country: Australia
Postcode: 3132
Phone number: 0412396388
Stakeholder type: Community

Feedback

Activity you are providing feedback on: Origin Energy B2 Pty Ltd Velkerri Drilling, Hydraulic Fracturing and Well Testing EP76 S2

Category type: Water, Climate change, Human health, Chemicals

If other, please specify:: No to Fracking the NT, traditional owners have not given "free , prior and INFORMED consent.

Dear Sir / Madame We work closely with NT Elders in the NT, the news is clear- they do not want fracking on their lands. This will destroy songlines and country that they have cared for since time immemorial. Clans/nations'/community leaders across the NT want to work with you in their priorities for their lands. Solar energy are viable and healthy options, which will also employ local people. Why destroy the land, why place water supplies and people at risk when water supplies are already in jeopardy and when climate change/ the climate emergency is a reality. This dirty energy of Origin ad others will add to climate change. People are divesting from dirty energy -it just does not make sense. Water supplies in the NT are already fragile. Though further north from the current drilling sites communities at risk and require water to be shipped in e.g. 1. "Darwin residents fear for future water security as underground aquifers run critically low "(24th Oc) t <https://www.abc.net.au/news/2019-10-24/darwin-drought-water-berry-springs-southport-aquifer-hits-low/11634340> 2. "Water supply failure in Kakadu's largest Aboriginal homeland triggers emergency review" ABC News (October 24th) <https://www.abc.net.au/news/2019-10-23/jabiru-water-supply-emergency-review-aboriginal-homelands/11626958> 3. "Yuendumu in Central Australia at 'severe risk' of running out of water " <https://www.abc.net.au/news/2019-08-13/remote-community-yuendumu-running-out-of-drinking-water/11405024> 4. I know of many occasions when e.g. even health clinics , in other communities , have run out of water Aside from these we know the disaster with the water supplies already , consequent

Comments:

to Macarthur river mine, and also due to Airforce chemicals- the water supplies in Katherine! This impacts on food industry etc etc Scientific and other reports show serious concerns. It is NOT safe yet drilling has commenced and another site to commence! There is NO consent. I urge the NT Government to immediately halt the drilling stop. This will add to the climate emergency. The NT has an abundance of solar energy, prioritize that. "A significant majority of people who took part in the Northern Territory government's inquiry into fracking said the industry was not safe, trusted or wanted. "It must be noted that the strong antipathy surrounding hydraulic fracturing for onshore shale gas demonstrated during the consultations did not abate," the inquiry committee, headed by Justice Rachel Pepper, wrote in its final report." The report continues, "It's impossible to overstate the importance of groundwater in the territory. About 90 per cent of regional water demand is supplied by groundwater, through bores. The Beetaloo Basin sits below the Tindall limestone aquifer, a large underground water system that feeds springs and rivers throughout the region. Dixon is concerned that fracking will reduce the availability of groundwater for traditional owners and local communities as the climate crisis continues and imperil Mudburra country. Petroleum companies have failed to properly consult with the region's traditional owners, he says. "The Mudburra went with the agreement because they didn't know this mining mob were coming around and talking the smooth way," says Dixon. "They made agreements and didn't understand what they were signing up for."Mudburra elder Ray Dimakarri Dixon NT. Water security is a serious issue across the NT, "Regional Councils shout out on water security crisis in the bush", NLC CEO Marion Scrymgour told the joint regional council meeting that water security across the NT was a serious issue, (August 2019) <https://www.nlc.org.au/media-publications/nlc-regional-councils-shout-out-on-water-security-crisis-in-the-bush> That fracking has begun without true consent of clan/ Nations groups in the NT is indeed shocking. Read, e.g. "Fractured future: Water fears as drilling for gas begins in the NT", (October 6th, 2019 <https://www.smh.com.au/national/fractured-future-water-fears-as-drilling-for-gas-begins-in-the-nt-20191003-p52xfj.html>). People within this show serious concerns. Listen also to three NT First Nations' men of the NT, whom will be impacted by Beetaloo basin drilling -Scott McDinny, Bradley Farrar and Nicholas Fitzpatrick <https://player.fm/series/989-fm-for-the-best-country/lets-talk-scott-mcdinny-bradley-farrar> . They say of their communities 98-99% of the community members do NOT want fracking; they also fear the destruction of their lands and water supplies destruction of songlines; their physical and mental wellbeing will be adversely impacted - cultural genocide. Already they experience climate change, fracking will just add to this and kill life. You cannot guarantee that water overflows in the wet season will not spread the toxins. I urge the NT government to stop drilling as a matter of urgency and to works with clan/nations' and community leaders of the NT in their priorities. Solar is a viable option. Water is life Sincerely yours Georgina Gartland 25 Highland Ave Mitcham, 3132 Please know I was an origin energy user and divested .

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From: [Hannah Green](#)
To: [OriginPetroleum DENR](#)
Subject: No Fracking 300km South East of Katherine
Date: Tuesday, 8 October 2019 2:10:17 PM

Dear Origin Energy,

I have recently become aware of your plans to drill 300km South East of Katherine.

As you may be aware many areas in the Northern Territory and Australia are in extreme drought. New water extraction for oil and gas fracking - an industry whose pollution will make the problem worse by fuelling a warming climate and more extreme weather, is unacceptable. It is unfair to expose surrounding communities to this, who are already suffering acute health problems relating to climate. Further pollution and waste from fracking will only exacerbate these issues. Your plans are unfair and inhumane.

Traditional owners are being excluded from meetings regarding such plans, giving them no say in what will be happening in their community, let alone the chance to suggest strategies that will help protect their environment. I urge you to consider the perspectives of Traditional owners and put a stop to harmful developments. Considering the current position of Australia, and the world in terms of global warming and harmful emissions, fracking is just not acceptable.

Regards,
Hannah Green
[13 Hickory Street](#), Nightcliff
[0424864041](#)

Sent from my iPad

From: [Isabella Claire Hughes](#)
To: [OriginPetroleum_DENR](#)
Subject: Objection to Origin Velkerri 76 S2 EMP
Date: Friday, 1 November 2019 3:08:14 PM

- 1) The EMP authorises the use of open waste-water storage tanks in direct defiance of recommendation 7.12 from the Fracking Inquiry.
- 2) There is no information provided on how emissions, including fugitive emissions will be offset as required by recommendation 9.8 from the Fracking Inquiry.
- 3) Hydraulic stimulation should not be conducted over the wet season because of the high risk of flooding and extreme weather that will be impossible to accurately predict. This risk is simply too great and should operationalise the precautionary principle.
- 4) The uncertainty around baseline groundwater information, acknowledged by the Fracking Inquiry has not been addressed. No fracking should commence unless this information has been developed by comprehensive and long-term baseline groundwater studies.

Sent from my iPhone

From: [Heidi Jennings](#)
To: [OriginPetroleum_DENR](#)
Subject: Origin Energy ep76
Date: Friday, 1 November 2019 11:52:57 PM
Attachments: [originenergy.docx](#)

Hello DENR.

Attached is my submission regarding Origin Energy ep76.

Heidi Jennings

originenergy.ep76@nt.gov.au

Department of Environment and Natural Resources.

This submission in regards to Origin Energy B2 Pty Ltd Beetaloo Basin Velkerri drilling and hydraulic fracturing program (EP76) application.

I am writing this as a concerned Territorian.

The Northern Territory is a beautiful place, with ancient culture, scenery & natural wonders.

The applications for Hydraulic Fracturing is being rushed.

The Fracking Inquiry recommendations are being ignored by this government.

Selective pieces from the Recommendation are being implemented, but not in the context of the recommendations.

The recommendation to study the underground ecosystem, prior to approvals, have not been conducted.

Minimising the risks, have not actually protected the environment, nor the people of NT communities.

The waterways in the NT are not fully understood, as stated by the Water resources.

This is being ignored & compromised.

Sadly in the future, the landscape will be covered in Fracking wells.

Fracking has no social licence & the people of the NT have said no to Fracking.

Water is a basic human right & is now being compromised.

Factual Evidence from around the world has shown the damages that occur from Fracking, but is being ignored. More investigations are needed instead of rushing.

Australia is being ripped, shipped & destroyed to benefit overseas. This is actually Treachery.

Please do not accept this application if you care about future generations, that will have to live with the allowed rushed destruction of Australian soil, before adequate scientific evidence to show it will not cause any harm to the water, environment and communities.

Heidi Jennings.

From: noreply@denr.nt.gov.au
To: [OriginPetroleum_DENR](#)
Subject: DENR - Consultation Form - 749987
Date: Friday, 1 November 2019 7:24:41 PM

Contact details

First name: [REDACTED]

Surname: [REDACTED]

Email address: [REDACTED]

Country: Australia

Postcode: 0830

Phone number: [REDACTED]

Stakeholder type: Community

Feedback

Activity you are providing feedback on:

Origin Energy B2 Pty Ltd Velkerri Drilling, Hydraulic Fracturing and Well Testing EP76 S2

Category type: Social and cultural, Waste Management, Regulation and compliance

If other, please specify::

Comments:

Dear Onshore Gas division, I am writing to express my objection to the Environmental Management Plan submitted by Origin Energy for the Kyalla frack site in the Northern Territory. My key concerns with this plan are outlined below. **FRACKING SUBSTANCES ARE POISON** The fracking chemicals Origin plans to use are harmful to health. The list of substances Origin want to use have known health impacts. An independent review of the substances shows they are linked to: acute toxicity, respiratory irritation, tissue damage, burns, and cancer. Some are very toxic to aquatic life with long lasting effects. Plus there are 'trade name' fracking chemicals that do not have any health data available. **OPEN AIR WASTEWATER TANKS POSE UNACCEPTABLE RISK** It is unacceptable that Origin would use open air wastewater dams or 'tanks' to store the toxic flowback fluid. This flowback and drilling fluid is full of nasties including heavy metals, fracking chemicals and naturally occurring radioactive materials. Evaporation pits and open toxic tanks pose a risk to the incredible threatened birdlife that visits the site, including the Gouldian Finch, and should not be open and accessible to birdlife at any time. **WET SEASON RISKS WITH WASTE ON SITE** It is deeply concerning that instead of storing toxic wastewater in enclosed tanks, Origin are planning open dams all through the wet and dry seasons. Not only could this kill birds, but extreme weather events could cause downstream pollution impacts. Origin's site is upstream of Lake Woods, a place of international significance for biodiversity. The catchment should be off limits to fracking. **TRANSPORT RISKS AND TOURISM**

IMPACTS Origin says they care about cumulative impacts, but have failed to talk to tourism operators about the risks of increased traffic on the Stuart Highway, or to people living downstream from their fracking exploration activities. Plus, Origin want to dump on Queensland and truck the toxic waste to an undetermined site. Already Queensland has millions of tonnes of toxic salt waste that there is no permanent disposal solution for. This is unacceptable. BUSHFIRE RISKS AND TOTAL FIRE BAN DAYS This area is sensitive to bushfires. Rural Fire Brigades have been calling for gas companies to stop ignition sources and flaring on total fire ban days. Origin must be made to stop all flaring on total fire ban days. Thank you for considering my concerns.

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Privacy: Tick this box if you wish for your name and contact details to be treated as confidential. While the department will use their best endeavours to comply with your request, you are advised that your complete submission may be disclosed in accordance with the Information Act 2002 and if otherwise required by law.

From: noreply@denr.nt.gov.au
To: [OriginPetroleum_DENR](#)
Subject: DENR - Consultation Form - 749475
Date: Thursday, 31 October 2019 11:39:19 AM
Attachments: [LTG_NT_ShaleGas_2019_A4_SML.pdf](#)

Contact details

First name: Trisha
Surname: Leeman
Email address: grushaleeman@gmail.com
Country: Australia
Postcode: 0810
Phone number:
Stakeholder type: Community

Feedback

Activity you are providing feedback on: Origin Energy B2 Pty Ltd Velkerri Drilling, Hydraulic Fracturing and Well Testing EP76 S2

Category type: Social and cultural, Flora and fauna, Water, Waste Management, Climate change, Human health, Chemicals, Regulation and compliance, Well integrity

If other, please specify::

The NT is already sweltering from elevated greenhouse gases and it is projected by CSIRO that it will soon become untenable to live in the NT due to unabated climate pollution. Where do you live?
<https://myclimate.acf.org.au/> If this project goes ahead it will produce unacceptable levels of climate polluting gases, even if all the fugitive gases are somehow controlled and the wells capped forever. It is known that well integrity is impossible to maintain for the periods required to prevent the levels of fugitive emissions that the fracking industry is reknown for around the globe. Unless we cease polluting our climate there will continue to be a diminishment of our extraordinary biodiversity, leading to extinction of many species. There can be no doubt that projects like this that contribute enormously to climate change have no social licence, elevate social unrest and cultural diminishment. If this project is allowed to go ahead, it is clear that the regulatory processes are mere red tape and might as well be abolished for they are mere deckchairs on the titanic. The levels of clean water that are expected to be wasted for this project and allowed to become polluted by chemicals that are unmanageable in a place that suffers both long dry periods as well as extensive flooding. Water is precious and lack of water is detrimental to both human health and the environment. On all fronts, this project should be rejected: it is expected to contribute to death of humans, native animals, plants, as well as loss of clean water, soil air, quietness, truck-free roads, beautiful scenery, and a diminishment of society

and ancient (yet still current and precious) cultural knowledge and practices. Allowing projects like this to go ahead will contribute to suicide. The Traditional Custodians have been clear they do not give consent for this project to happen. All who contribute to allowing this and other similar projects to happen contribute to annihilation of our beloved NT and its peoples. Please desist and instead let us be an intelligent society that works on safe and nourishing projects.

Attachment: LTG_NT_ShaleGas_2019_A4_SML.pdf, type application/pdf, 1.5 MB

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CLIMATE CHANGE IMPACTS

OF PROPOSED SHALE GAS DEVELOPMENT IN THE NORTHERN TERRITORY



**OCTOBER
2019**

PROFESSOR IAN LOWE



PROFESSOR IAN LOWE

Professor Ian Lowe (BSc, NSW; DPhil, York, UK; DSc, NSW) is an emeritus professor in the School of Environment and Science at Griffith University and an adjunct professor at two other Australian universities. He was the president of the Australian Conservation Foundation from 2004 to 2014. His principal research interests are in policy decisions influencing the use of energy, science and technology; energy use in industrialised countries; large-scale environmental issues and sustainable development. Professor Lowe chaired the group which produced Australia's first independent national report on the state of the environment in 1996, and has been a referee for the UN's Inter-governmental Panel on Climate Change. He has made countless contributions to newspapers, radio, television and periodicals.

The author of 20 books and more than 1000 other publications, Professor Lowe's contributions to environmental science have won him a Centenary Medal, the Eureka Prize for promotion of science, the Prime Minister's Environment Award for Outstanding Individual Achievement, the Queensland Premier's Millennium Award for Excellence in Science, the University of NSW Alumni Award for achievement in science and the Konrad Lorenz Gold Medal, awarded biennially by the International Academy of Sciences, Health and Ecology for contributions to sustainable futures. He was made an Officer of the Order of Australia in 2001 for services to science and technology and for contributing to public understanding of environmental issues.

INTRODUCTION

As the Australian Academy of Science said five years ago, to have a 50 per cent chance of keeping the increase in average global temperature below two degrees, the less ambitious Paris target, global emissions need to peak by 2020 and then go steeply down. That means it is criminally irresponsible to be proposing new fossil fuel projects, whether they are coal, oil or gas. This report refers to the potential impacts of the proposed shale gas development in the Northern Territory, a particularly dangerous contribution to accelerating climate change, but similar conclusions apply to other fossil fuel developments. Shale gas is especially inappropriate because its extraction inevitably involves fugitive emissions of methane, which has a much greater capacity to increase global warming than carbon dioxide in the short term.

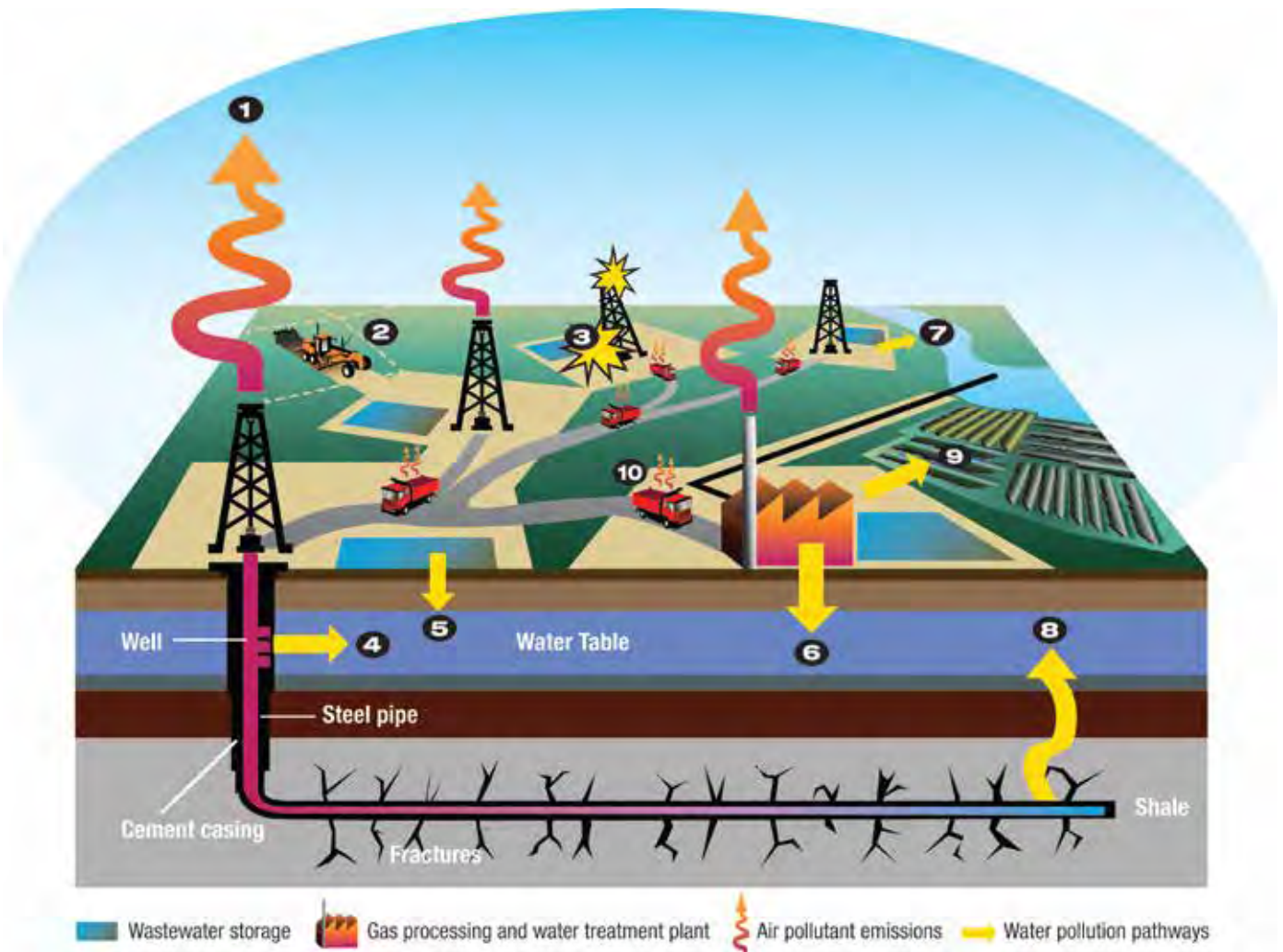


FIGURE 1: Potential emissions and pollution pathways in unconventional gas operations
(Adapted from UNEP, 2012)

THE POTENTIAL SCALE OF DEVELOPMENT

The Memorandum of Understanding between the Australian government and the government of the Northern Territory states that exploration wells indicate a P50 gas-in-place resource of “at least 500 trillion cubic feet”, in the old Imperial measures, in just one of the prospective layers in the Beetaloo Sub-basin. It has also been claimed that the sub-basin is “geologically analogous to the giant Marcellus Shale in the USA which delivers over 11 trillion cubic

feet of gas to market per year". That rate is about ten times total Australian gas consumption, but the scale of the claimed resource is so large that it would allow gas to flow at that rate for about fifty years if its development were to be approved. The sub-basin is only a part of the larger McArthur Basin, in which other resources have been identified. It is clear that approving development of these resources would have a catastrophic impact on Australia's efforts to slow climate change, totally incompatible with our obligations under the Paris agreement.

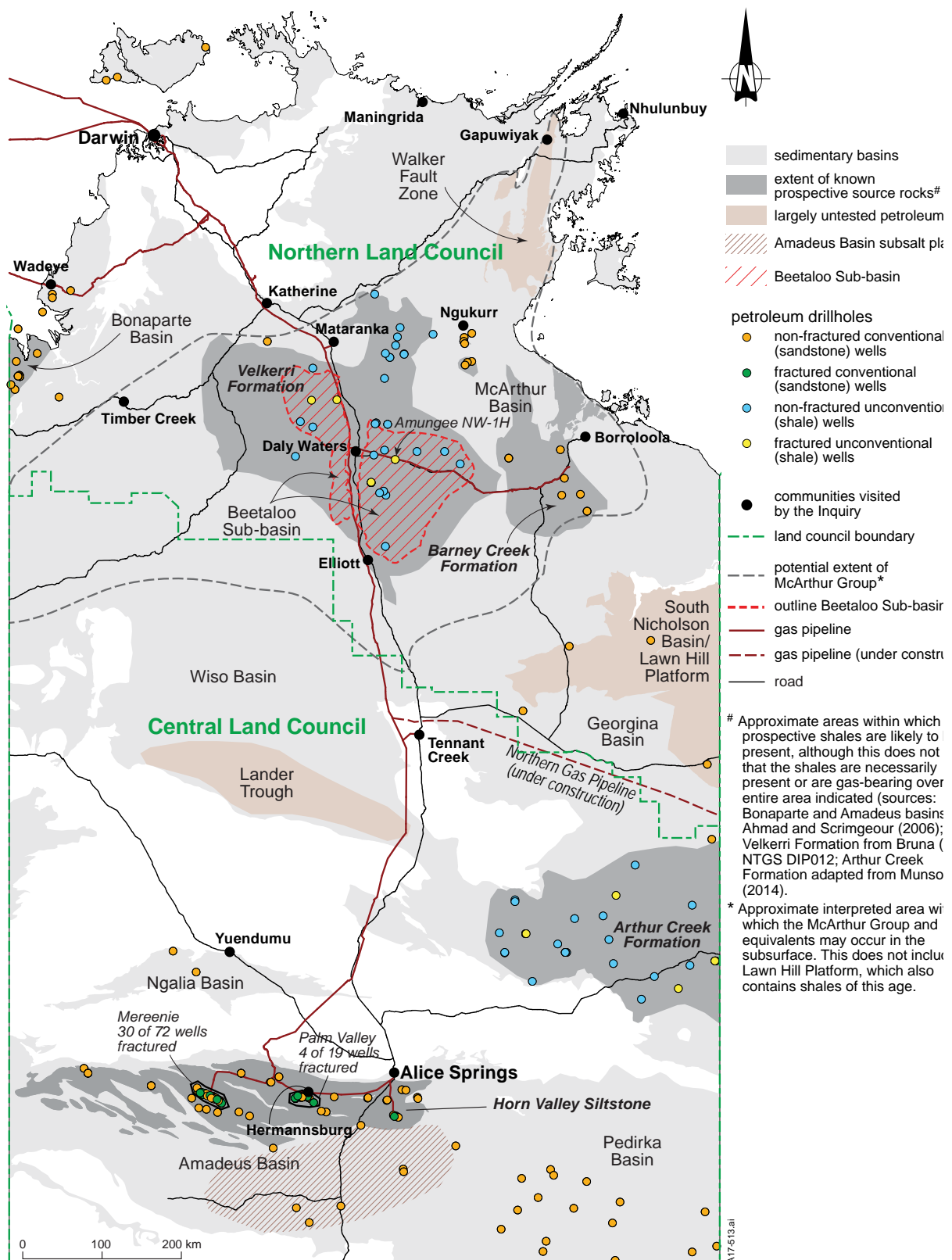


FIGURE 2: MAP OF BEETALOO BASIN

Petroleum wells in the Northern Territory showing the extent of known prospective source rocks. Source: DPIR.

The grey areas show the extent of known prospective shale gas source rocks, that is, rocks that are considered to have the necessary prerequisites for shale gas occurrence and commercial development. The taupe areas are those that are considered to have the potential prerequisites for shale gas to occur but that have not been tested through drilling. (Extract from Pepper et al, (2018))

SPECIFIC CALCULATIONS

The contributions of proposed developments have been calculated using the most recent edition of the Australian government's guidelines for greenhouse gas emissions, published by the Department of Environment and Energy. This gives values for the direct emissions from various forms of natural gas. The problematic issue in calculating the total impact is estimating the scale of fugitive emissions and deciding what multiplier to use to calculate the Global Warming Potential [GWP] of the leaked methane. In the scientific literature, there are various estimates of life-cycle methane emissions from shale gas. A comparative analysis recently observed that most of these values are based on sparse and poorly documented data (Howarth et al, 2012). The exception is a paper based on measurements from an actual US shale gas field over a year (Petron et al, 2012) which found leakage rates varying between 2.3 and 7.7 per cent, concluding that the best estimate for current practice is 4 per cent. This is significant because the NT Fracking Inquiry was urged to accept that best practice could reduce the overall rate of fugitive emissions to as low as 1.7 per cent. While that seems extremely optimistic, for the purpose of this study three calculations were undertaken: the optimistic assumption of only 1.7 per cent leakage, an intermediate figure of 5 per cent based on Forcey's observations in Queensland, (Forcey, 2018) and a worst-case of 7.7 per cent based on the US measurements.

The IPCC have used a GWP of 25 to calculate the impacts over a 100-year time frame, but "more recent research that better accounts for the interaction of methane with other radiatively active materials in the atmosphere suggests a mean value for the global warming potential of 33 for the 100-year integrated time frame" (Shindell et al, 2009). The same summary suggested that it might be more appropriate to compute the impact of methane over a twenty-year time frame, given that the Paris agreement is based on 2030 emissions. The choice is significant because the relevant figure for the GWP of methane on the shorter time frame is 105. For the purpose of this study, the 100-year time frame with a GWP of 33 and the 20-year time frame with a GWP of 105 were calculated for the three selected scales of fugitive emissions.

RESULTS OF CALCULATIONS

As a boundary case, this study computed the scale of emissions if it were possible to utilise the finding that the Beetaloo sub-basin is geologically analogous to the Marcellus Shale deposit in the USA and extract gas at a rate of "11 trillion cubic feet" per year. That would be equivalent to 0.31 trillion cubic metres per year. Using the Australian government's figures for the energy content of extracted gas (0.037 Gigajoules per cubic metre) and the emission factor of 51.4 kg CO₂-e per Gigajoule, **that scale of production would contribute about 600 million tonnes of carbon dioxide equivalent per year. To put that figure in context, Australia's total emissions for the most recent year – the highest ever recorded – were 560 million tonnes.** So just extracting and burning gas at the rate projected, without taking into account the extra contribution from fugitive emissions, would do more to accelerate climate change than Australia's entire current activity. That would clearly be totally unacceptable.

The following graphs consider two possible scales of gas production, 365 PJ/year and 1240 PJ/year. These figures were chosen because they were the production estimates provided by the industry to the NT Fracking Inquiry. The initial submission assumed a potential shale gas field would produce 800-1100 TJ/day, a nominal 365 PJ/yr, while a further submission provided a best estimate for a later development scenario that equate to 3,400 TJ/day, or 1240 PJ/yr. For each of those cases, the graph gives the base emissions from extracting and burning the gas, then a range of calculations for different levels of fugitive emissions and two time-scales, 100 years and 20 years. All figures are in millions of tonnes per year of carbon dioxide equivalent.

FIGURE 3:
Emissions from 365 PJ/year production
100-year timescale with a methane global warming potential of 33

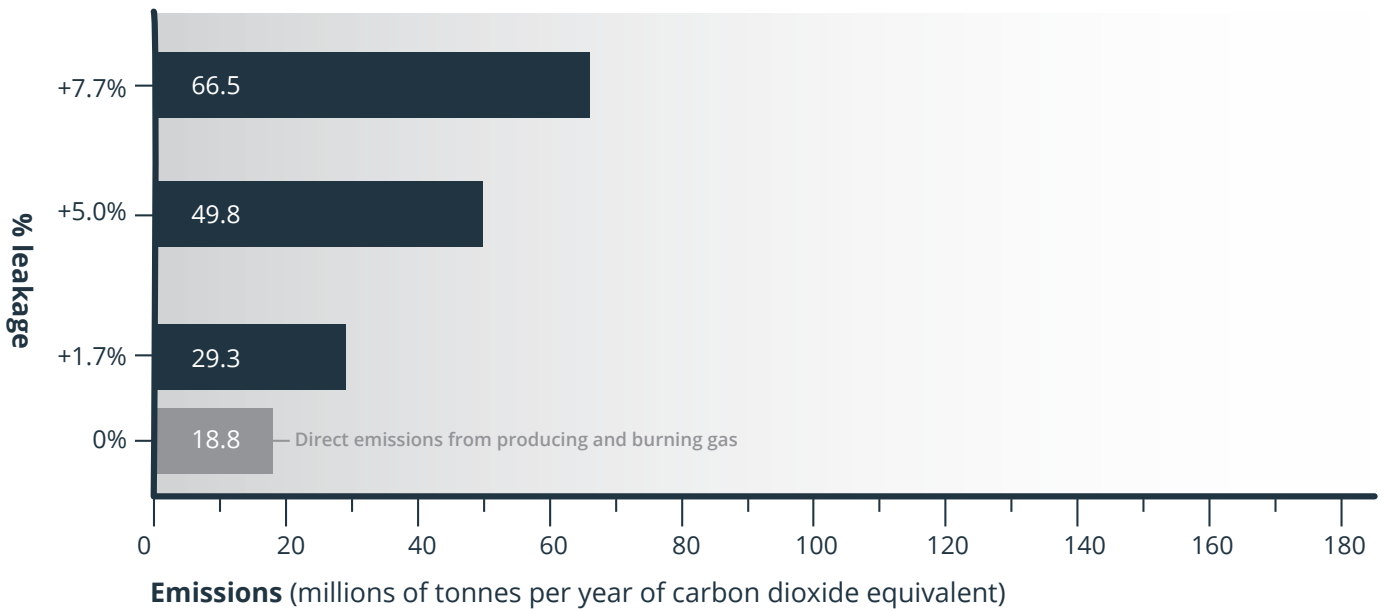
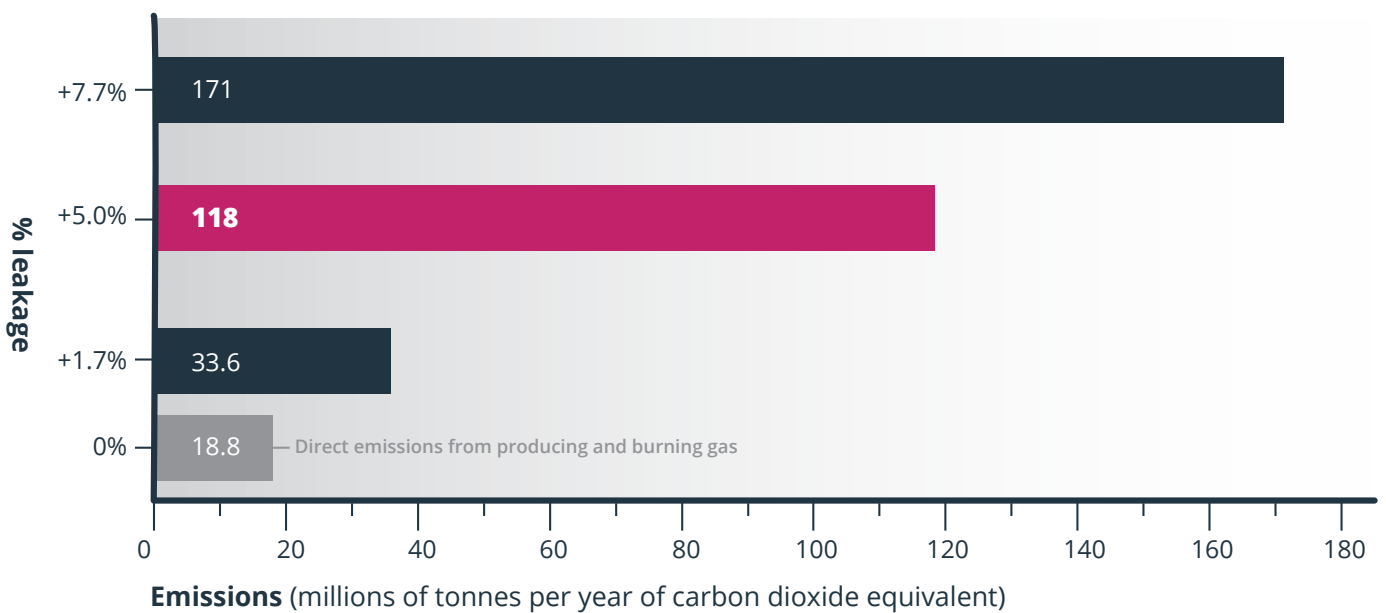


FIGURE 4:
Emissions from 365 PJ/year production
20-year timescale with a methane global warming potential of 105



In the above graphs, the row highlighted in pink is probably the most appropriate case to consider: fugitive emissions about 5 per cent of production and the impact of the released methane considered on a twenty-year timescale.

FIGURE 5:
Emissions from 1240 PJ/year production
100-year timescale with a methane global warming potential of 33

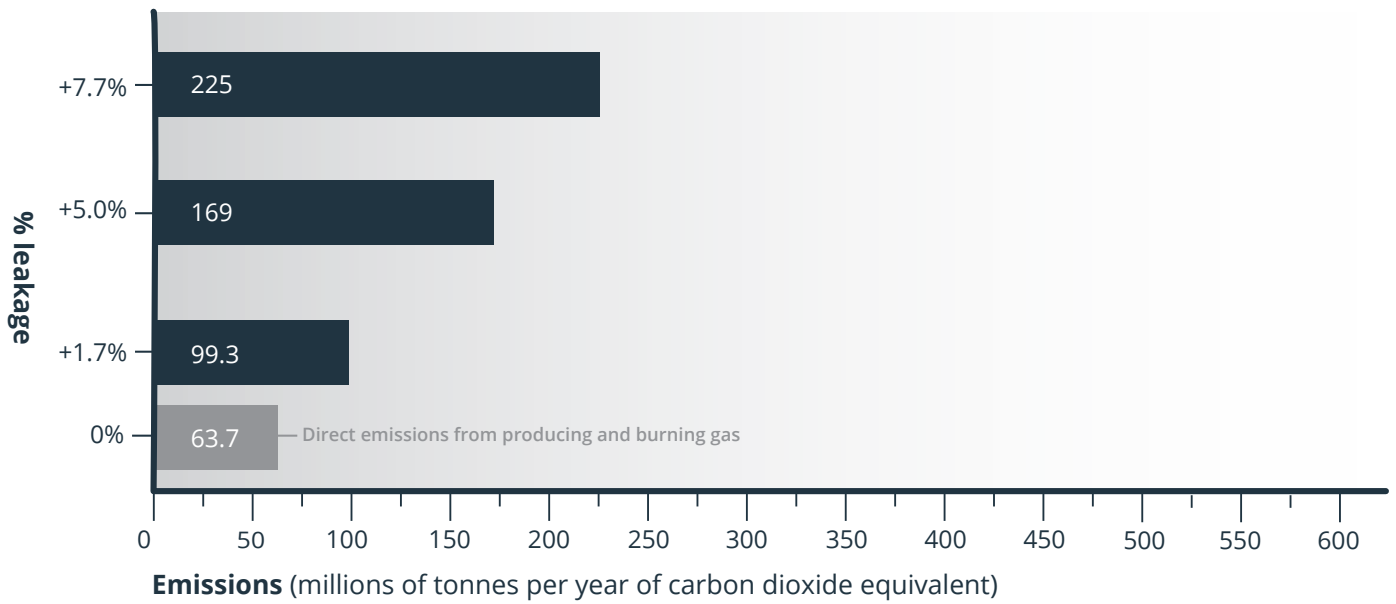
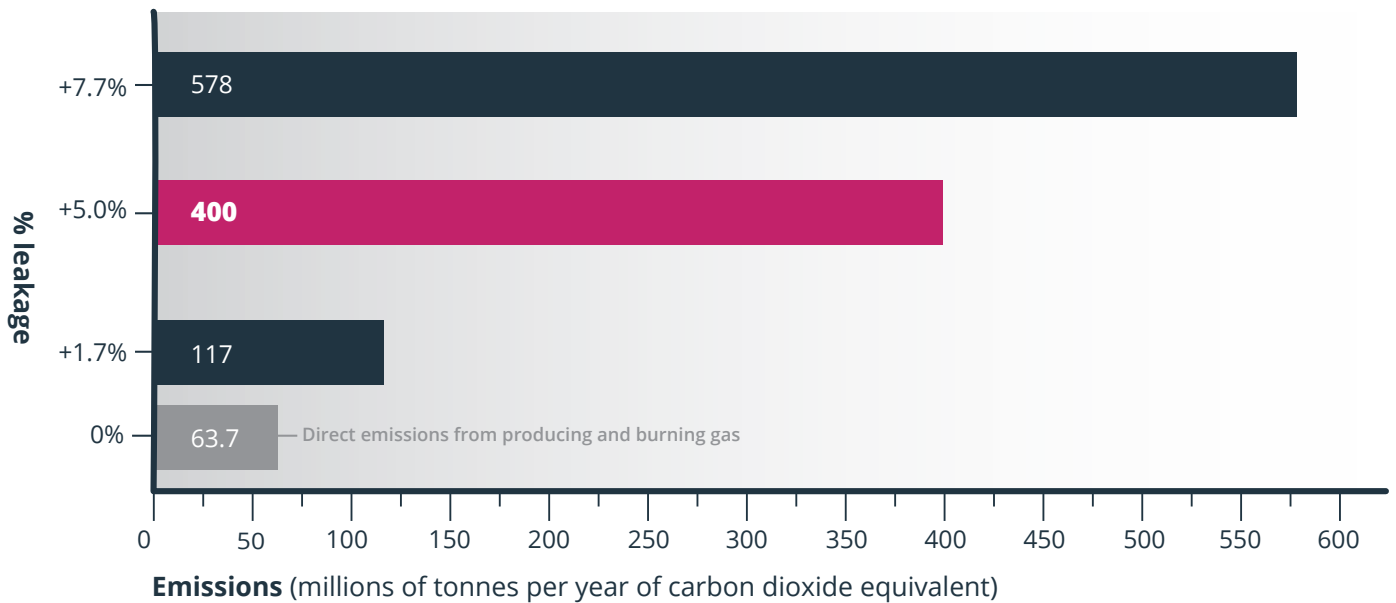


FIGURE 6:
Emissions from 1240 PJ/year production
20-year timescale with a methane global warming potential of 105



In the above graphs, the row highlighted in pink is probably the most appropriate case to consider: fugitive emissions about 5 per cent of production and the impact of the released methane considered on a twenty-year timescale.

In the graphs, the row highlighted in pink is probably the most appropriate case to consider: fugitive emissions about 5 per cent of production and the impact of the released methane considered on a twenty-year timescale. The calculation shows that even the lower rate of production, 365 PJ/year, would add about 20 per cent to Australia's total national emissions, while the higher rate of production (1240 PJ/year) would add nearly 75 per cent to our total. That higher production rate with a higher level of leakage would more than double Australia's emissions. **Even on the heroic assumption that leakage could be constrained to 1.7 per cent, the proposed development would add very significantly to our national emissions.**

DISCUSSION

These results are consistent with other studies. For example, Schanell et al (2019) estimated the whole-of-life greenhouse gas emissions from coal seam gas operations in the Surat Basin. They concluded that producing 576 PJ per year of coal seam gas would result in emissions of 4-6 Mt CO₂-e per year in Australia plus about 39 Mt/yr on combustion overseas, adding up to total impacts of 43-45 Mt/yr, assuming fugitive emissions could be held to 2 per cent of production and using the 100-year time-scale to compute the impacts of methane. Scaling that calculation would give about 28 Mt/yr for 365 PJ of production and about 95 Mt/yr for 1240 PJ, very similar to the results in the graphs for 1.7 per cent leakage on a 100-year timescale.

The question of whether using gas could slow climate change is hotly disputed. It has been stated, for example, that "natural gas from the Northern Territory could play an important role in helping to reduce the world's reliance on high emissions coal in countries such as China and India" (Origin Energy, 2019). This claim actually has no foundation. Schanell et al note "a general consensus" in the literature that "climate benefits of natural gas replacing coal are lost where fugitive emissions from all upstream operations are greater than 3% of total production". The same study cited US estimates of fugitive emissions ranging from 2.3 to 2.85 per cent, a range in which any benefits are marginal. Given that estimates based on actual production are in the range from 4 to 5 per cent, as noted above, it is totally invalid to claim that gas production reduces the overall greenhouse gas impact of electricity generation, even when it directly replaces coal-fired generation. Of course, there is also no evidence that Australian production of gas replaces burning of coal; in many cases, it produces extra energy. **Schanell et al conceded that it is impossible to calculate whether LNG exports reduce greenhouse gas emissions "because we do not know the proportion of gas used to displace what would have been produced from coal". So it is just dishonest to claim that producing more gas from Australian deposits will slow climate change.**

CONCLUSION

Approving the proposed development of shale gas from the Beetaloo Sub-Basin or McArthur Basin would add very significantly to Australia's greenhouse gas emissions in the critical period before 2030, when we are required by the Paris agreement to achieve significant reductions. **While the NT Fracking Inquiry suggested that emissions from gas production could be offset by savings in other areas, the scale of reductions that would be needed for even the lower level of production is totally impractical.** For example, offsetting the lower rate of production computed in this study for 5 per cent leakage would require reducing emissions in other areas by more than the entire transport sector. **Even the heroic assumption that fugitive emissions could be constrained to 1.7 per cent – a lower figure than any measured for any shale gas development – would still require offsets comparable to the emissions from all industrial processes.** At the higher production rate for which emissions have been calculated, even assuming unprecedented success in reducing leakage and using the 100-year timescale instead of 20 years, the scale of offsets required would be about the same as all emissions from the entire transport sector. There is no conceivable way of achieving reductions on that scale before the 2030 deadline for us to meet our Paris obligations.

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From: [David Liddle](#)
To: [OriginPetroleum DENR](#)
Subject: Submission regards Origin Energy B2 Pty Ltd Velkerri Drilling, Hydraulic Fracturing and Well Testing EP76 S2
Date: Friday, 1 November 2019 1:05:36 PM

Hi,

I object to the proposal "Origin Energy B2 Pty Ltd Velkerri Drilling, Hydraulic Fracturing and Well Testing EP76 S2" on the following grounds:

Emission of greenhouse gases is a very serious environmental issue and in contradiction to recommendation 9.8 of the Fracking Enquiry the EMP does not provide information on offset of emissions, including fugitive emissions.

The proposal includes handling waste water in a mix of open and enclosed structures. This contradicts recommendation 7.12 of the Fracking Enquiry which includes "... enclosed tanks must be used to hold all wastewater ...".

Uncertainty regards baseline groundwater information has not been addressed and to accord with the spirit of the Fracking Enquiry a comprehensive assessment should be undertaken prior to fracking.

The recognition of the need for weed management is supported, however, the focus on declared weeds means that environmental weeds have not been given the attention they require to manage the potential adverse environmental outcomes of the project. For example, when undertaking a word search of the EMP I could not find "buffel" or "Cenchrus" or "Pennisetum". Buffel Grass is a serious environmental weed in the Northern Territory.

Yours faithfully
David Liddle

From: [Samantha Lillie](#)
To: [OriginPetroleum DENR](#)
Subject: SL Origin EMP ep76 - Origin Energy B2 Pty Ltd Beetaloo Basin Velkerri drilling and hydraulic fracturing program (EP76)
Date: Friday, 1 November 2019 11:47:29 PM
Attachments: [SL Origin EMP ep76.odt](#)
[Attachment A Climate-Action-Darwin-Submission-446.pdf](#)
[Attachment C Josephe-Costelloe-Submission-85_Redacted.pdf](#)
[Attachment D 39 lakewoods.pdf](#)
[Attachment E Submission Appendix - Birdlife.docx](#)
[Attachment F Submission Appendix - Chemicals.odt](#)
[Attachment G Research & Consulted Sources.odt](#)

to whom it may concern,

attached comments below. will send attachment B via online form
reference: SL Origin EMP ep76

please let me know if there are issues with the document format.

kind regards

SLillie

Comment on: Origin Energy B2 Pty Ltd Beetaloo Basin Velkerri drilling and hydraulic fracturing program (EP76)

To: Whom it may concern

From: SLillie

Date Submitted: 01 November 2019

I write as a member of the greater Northern Territory community in response to Origin B2 Pty Ltd's recently submitted Environmental Management Plan (EMP) for assessment under the Petroleum (Environment) regulations 2016, in regards to proposed civic works involving the drilling, hydraulic fracture and well testing program at exploration permit 76.

I volunteer across several organisations in the NT. The attached submission is a supplementary to another submission by Climate Action Darwin, but is being lodged as an individual member of a community organisation.

Climate Action Darwin

Climate Action Darwin (CAD) is a local, unincorporated community group with a network of approximately 700 volunteers. We advocate for strong policies to reduce the Territory's Greenhouse gas emissions and the transition of the NT economy to a sustainable, renewable and thriving economy. We do so in response to growing community awareness and push for improved regulation, administration, and urgent action in response to the global climate crisis.

As the largest Territory-based climate-focussed volunteer group, we are dedicated to advocating for the ongoing care and management of the Territory's land and waters. We are particularly concerned that communities in the Beetaloo Basin vicinity have not been afforded 'No-Go Zone' protection by the Northern Territory Government, and that environmental risks to the broader environment and surrounding communities that will be directly and indirectly affected by Origin's fracking plans, have not been considered in the EMP.

We believe there are several grounds in which the EMP should not be approved. The grounds for which this EMP should be declined can not be exhausted in this submission, but it is important to note key concerns below:

1. Failure to properly consult landowners as part of the Stakeholder Engagement Plan (SEP)

The SEP fails to disclose current legal proceedings between the applicant and the owners of Amungee Mungee cattle station, who are listed in the EMP as a key stakeholder. The case alleges improper consultation about the environmental risks associated with the applicant's proposed plan of work. This demonstrates contrasting viewpoints about acceptable environmental risk between mining and pastoral interests and reflects concerns held by the broader pastoral and Northern

Territory community about the short and long term impact of proposed activities. We ask that no decision is made until legal proceedings are resolved.

2. Failure to consider climate change

Climate Action Darwin has previously presented several submissions in response to *The Scientific Inquiry into Hydraulic Fracturing in the Northern Territory*. Chief amongst these submissions are repeated concerns in relation to anthropogenic climate change and their link to Greenhouse Gas Emissions. CAD has previously raised concerns about methane and fugitive gas emissions associated with fracking activities.

We ask that your assessment consider these concerns outlined in the attached documents (Attachment A). We also ask that the NT government considers its own previous climate change policy outlining a carbon emission reduction target. This document is also attached. (Attachment B).

We note that this EMP is for one of several exploration wells Origin wants to frack prior to the production stage of fracking gas fields, requiring hundreds of gas wells. Each EMP approval exponentially increases the threat of substantial and irreversible damage to our environment. It would therefore be misleading to not consider the environmental impact of this application as part of a larger suite of EMPs. We encourage consideration for the accumulative and long-term, intergenerational impact of hydraulic fracturing activities on the surrounding environment from current and proposed activities.

3. Failure to disclose previous allegations of corporate malfeasance.

We express serious concern about previous allegations of mis-conduct and non-compliance to safety and environmental considerations as alleged in a Federal Court statement of claim, arising from a dispute under the Fair Work Act in which a former employee (turned whistleblower) was made redundant by the applicant.

Allegations include:

- failing to maintain hundreds of gas wells across Australia and New Zealand for periods of “10 years or more”, in addition to failing to properly plug abandoned wells – a legislative requirement meant to stop leaks;
- Instructing staff not to report incidents related to the contamination of aquifers, leaking oil and gas, and spills of radioactive materials in audit reports;
- Under-paying gas royalties to the Queensland state government;
- Systemic negligence associated with an explosion nearly causing multiple deaths in Western Australia described by an executive as the ‘worst he had seen ...in his 35 years in the oil and gas industry’;
- Deliberately failing to disclose regulatory violations for fear that public scrutiny would force regulators to close down current projects or put further approvals on hold; and
- Strategically electing to pay fines as a cheaper alternative to complying with regulations.

The Northern Territory government received further claims of poor corporate behaviour by the applicant as part of the Fracking Inquiry. I refer you to Submission #85 in the attached documents. (Attachment C).

The applicant’s poor industry and corporate responsibility track record are substantial grounds to decline its application on the basis that it can not be trusted to comply with Northern Territory

regulations, no matter the extensive risk assessment detailed in the applicant's EMP. The applicant's demonstrable negligence, corruption and deliberate irresponsibility pose an unacceptable risk to the Northern Territory on all grounds of the guiding principles in the Petroleum Environment Regulations.

CAD RESPONSE TO PETROLEUM ENVIRONMENT REGULATION GUIDING PRINCIPLES

Although CAD welcomes the comprehensive detail from the *Final Report from the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory*, we disagree that the myriad of risks exposed by the Inquiry from the process of fracking could ever be mitigated to an acceptable level.

The expert panel stated that "the recommendations in this Report are a complete package. That is, they must be implemented in their entirety in order to mitigate the risks associated with any onshore shale gas industry in the NT to an acceptable level. Further, if the Government lifts the moratorium, the recommendations must be implemented in a clear, timely and transparent manner".

GUIDELINE: *The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;*

We are concerned that exploration activities leading to potential production will pose unacceptable risks to the biological diversity and ecological integrity within the Beetaloo Basin and surrounding areas. As this EMP is for one of 9 exploration wells proposed by Origin for fracking across its permit acreage on cattle stations in the Beetaloo Basin, each approved EMP will have an increasingly detrimental impact on the immediate and surrounding environment, beyond the life of proposed fracking activities.

We note that work is still progressing on the Fracking Inquiry recommendations 7.5, 7.16, 7.19 and 7.20 in regards to the Strategic Regional Environment Baseline Assessment (SREBA) in relation to local, regional, surface, subterranean, groundwater-dependent ecosystems, and that there is particular emphasis on the Roper River Region and its aquatic ecosystems.

We also note that work is still progressing on Recommendation 8.1 in regards to strategic terrestrial biodiversity assessments as part of a SREBA.

We are concerned the applicant's EMP downplays the potential risk and significance to biodiversity and ecological integrity of Newcastle Creek and Lake Woods (primarily fed by Newcastle Creek) through the technical claim that Lake Woods is just outside the applicant's permit area and that there are therefore 'no conservation reserves, national parks, world heritage places, Commonwealth land, heritage places of critical habitat areas under the EPBC Act located within or immediately adjacent to the proposed exploration area'.

According to Northern Territory Government documentation, Lake Woods is considered a site of conservation significance on account of (but not limited to the following factors):

- It meets potentially 5 criteria of international significance under the Ramsar Convention;
- It is a wetland of national significance;
- It is of regional significance (Northern Territory);
- It is a site of significant refugia for biological diversity in arid and semi-arid Australia;
- It supports at least 7 fish species and 8 frog species (data may need to be updated);

It is likely that an assessment under SREBA would shed more information in support of further environmental protection, to further mitigate the effects of changing climate conditions. In its own

document, the conservation assessment notes that Lake Wood will likely “become increasingly important in the coming decades, if global climate change results in even minor rises in sea level, and saltwater inundation occur on the vast floodplain wetlands of coastal northern Australia.” Please see statement of conservation significance attached. (Attachment D).

Of further concern is the applicant’s EMP disregard of Recommendation 7.12 that states that prior to any further exploration approvals, all wastewater is to be held in enclosed tanks, to reduce the risk of contamination of surface aquifers from on-site spills of wastewater’. The applicant’s EMP proposal to use mostly open-top tanks in the dry season to maximise evaporation, and hybrid combination of enclosed/covered and open-top working tanks in the wet season is dangerous for the following reasons:

- There is a genuine risk that surrounding wildlife - birds in particular - will drink from poisonous wastewater tanks and mud sumps. Wastewater measured at previous Origin sites in the NT have found traces of BTEX, naturally occurring radioactive material and other toxic chemicals. The applicant has previously caused water pollution through fracking activities in Queensland. It claimed to not use BTEX chemicals at the time, but BTEX is listed in this current submission, despite being identified as a serious water contaminant. The risk of birds drinking contaminated water will continue to increase if insufficient rain diminishes available watering sites. The applicant’s EMP does not specify netting or bird deterrents in the event of bat or bird mortality in particular, to factor the risk to bird life known to frequent the area, such as the Gouldian Finch, listed as Endangered under the Federal *Environment Protection and Biodiversity Conservation Act 1999*. A summary of Lake Woods bird life is attached here. (Attachment E).
- The proposal to only use covered storage tanks in the event of a predicted, significant rainfall event, unnecessarily increases the risk of spillage, due to the requirement that all on-site flowback fluids will be transferred to covered storage within 72 hours and prior to the onset of the event. Given the high volume of flowback fluid anticipated to be recovered (4-16 million liters) it is unacceptable to create such a risk to both workers and the environment. It is concerning that such an important measure is not seen by the applicant as a priority investment, and an indication of its commitment to corporate responsibility, in light of previously alleged corporate misconduct. It is also unclear in the EMP if proposed covers have been heat and moisture-tested to endure NT’s extreme weather conditions.
- In assessing the applicant’s EMP, we also ask that due consideration is given to the applicant’s chemical risk assessment in Appendix A-G. The applicant’s EMP proposal to use open air wastewater storage for drilling muds and fluid flowback is concerning. Not only will chemicals be used down the well in the high pressure fracking process, but chemicals will also pose a risk at the surface when in open storage as flowback fluid. There are 360 instances in the chemical data sheets supplied by the applicant in which there is ‘no data available’. It is not possible to know from the EMP the effect of mixing drilling or fracking chemicals and it is an alarming deficiency of information. International bodies such as the World Health Organisation have stated the importance of assessing the cumulative load of chemicals used and their effect when mixed in the wastewater from flowback. The EMP downplays the risks from some of the chemicals listed in its application. A sample list of chemicals with additional information is attached. (Attachment F).
- If overlooked in this response or the applicant’s submission, we ask that methane levels in groundwater are given serious consideration. Comprehensive monitoring should determine if shale gas fracking releases fugitive methane via water sources. Are there thorough measurements for fugitive methane emissions in shale gas fields in Australia? If not, why should this EMP be approved?

- We also ask that due consideration is given to other significant risk areas including soil erosion, the impact of chemical sprays on introduced weeds, groundwater, insufficient evapotranspiration, downwinds and the likelihood of the applicant's assessment not minimise or downplay real dangers to the environment in EMP criteria not raised in this response here.

In assessing the applicant's EMP, we question the capacity for any applicant to consistently meet such extensive criteria through all short, long-term and post-production phases of the applicant's proposed project. We do not share the view that comprehensive monitoring of potential risks for pollution or contamination could ever be mitigated to an acceptable level.

GUIDELINE: *Decision-making processes should effectively integrate both long and short-term economic, environmental, social and equitable considerations;*

SHAREHOLDER ENGAGEMENT

We believe that concerns over failure to properly consult landholders as part of its SEP requirements are shared by many pastoral lease and Native Title holders under Origin Energy exploration permit areas in the Beetaloo Basin, and that current and potential legal challenges are sufficient grounds to refuse approval of this, and future EMPs based upon likely irreconcilable differences.

The current legal proceedings between Origin Energy and the owners of Amungee Mungee cattle station demonstrate potentially serious conflicting interests between mining and pastoral industries over the definition of acceptable environmental risk, and the specific likelihood that underground fracking activity will cause significant (potentially irreparable) harm to pastoral businesses interests and their farmland's ongoing contribution to the Territory economy.

There are also several unsatisfactory media accounts alleging the applicant's failure to disclose documentation underpinning consent claims from Traditional Owners for its fracking projects in the NT. We encourage a decision on this EMP to consider community claims that elders did not give proper, informed consent back in 2004 and 2005 when the agreements were first made and that elders did not understand how many wells would be drilled, or the risks to their land and water. We support refusal of further exploration permits until this is resolved.

We are further concerned by alleged applicant attempts to block participation by members of Aboriginal communities in consultation and stakeholder meetings, in both Tennant Creek and at Origin's Annual General Meetings interstate. Although parts of the EMP are necessarily site-specific in focus, the applicant fails to appreciate the significance of ownership and kinship ties beyond a specific geographic mining region, and the interconnected, collective responsibility of Aboriginal and non-Aboriginal communities as custodians to all surrounding lands and waters. We believe the applicant is in contempt of its own stakeholder engagement strategy which states that 'Origin will listen, seek to understand and respond to the interests and concerns of other stakeholders'. Allegations of such behaviour are not in line with an organisation committed to both social responsibility and genuine reconciliation with First Nations communities.

ECONOMIC, ENVIRONMENTAL, SOCIAL AND EQUITABLE CONSIDERATIONS

CAD believes it represents community interests in advocating for cleaner, cheaper, renewable energy alternatives that have a less intrusive impact on the environment and contribute to lower long term greenhouse gas emissions.

Developing partnerships between existing NT industries and the renewables sector will have far greater long and short term benefits to the Territory's environment and economy. The framework for

this has already been investigated by the Northern Territory government in its own Climate Change policy, which not only identifies an emission reduction target, but also encourages expansion of green business and industry. Please refer attached. (Attachment B).

We are particularly concerned for communities outside larger residential areas that will be most affected by non 'No-Go Zone' protection recently announced by the Northern Territory government. The NT government's decision compromises fair and equitable human rights in regards to access to drinking water and protection of sites of 'ecological and cultural value' for Aboriginal communities in particular (eg, cultural significance of Lake Woods) and leaves communities exposed to further land and resource insecurity through potential pressure from mining companies. From a community perspective, how can this be considered environmental justice?

Alternatively, we know the global market is trending towards more growth in the Renewable Energy sector. We also know that solar projects in the Northern Territory would especially empower remote communities in the following ways:

- Increased energy independence;
- Increased living standards and connections to country;
- Provision of local remote jobs with long-term benefits rather than the unsustainable boom/bust economic cycles of extractive industries;
- Reduced diesel haulage or gas infrastructure;
- Cheaper and cleaner for all.

Continued investment in fossil fuel industries undermines the growth of the renewable sector, a sector that Territorians want to see grow. It also undermines the relationship between the Government and its public constituents through the public's inability to trust that their environmental, social and equitable interests will be prioritised first.

We also understand that activities from shale gas extraction pose known and unknown health risks to human health and to the surrounding fauna and flora. For example, drill cuttings at the Amungee Origin well have included naturally occurring radioactive material as well as readings of Radon. Radon is a naturally occurring radioactive gas. It has no smell, colour or taste. It is produced from the natural radioactivity of uranium, which is found in all rocks in soil, and can also be found in water. According to the World Health Organisation, Radon is the most important cause of lung cancer in humans after smoking. We ask that the accumulative effect of Radon exposure be considered in this assessment as a potential concern to workers and wildlife, should Origin proceed to the production phase of fracking gas fields requiring potentially hundreds of gas wells.

In terms of cost to the economy, The Australia Institute has identified that off-setting NT's fracking emissions as identified in the fracking inquiry will cost up to \$4.3 billion in 2030 alone, and \$146 billion from 2030 to 2040. This does not include further clean-up or long-term environmental rehabilitation costs, and requires cooperation with state and federal jurisdictions to ensure and implement gas emission off-sets.

In assessing this EMP, we ask that the cost to taxpayers for previously poorly rehabilitated mining ventures such as Pine Creek, Redbank Mine and pollution at Hanrahans' Creek, MacArthur River Mine and the Impex release of PFAS chemicals over Darwin Harbour, are taken into consideration as to the difficulty in enforcing environmental regulatory practices at various, often geographically distant mines sites, regardless of mining activity (eg, uranium, copper, zinc, lead and gas). In 2017, it was estimated that the then-cost of cleaning legacy mines had already reached \$1 billion.

Furthermore, we ask that an assessment of this EMP consider the very real and likely scenarios that will cause wells to fail - corrosion, earthquakes, floods, fire and extreme heat, as but a few scenarios.

Although the applicant's EMP acknowledges the risk of well-integrity failure, if not outlined by the applicant already, we would then ask that an assessment of this EMP requires the EMP to commit to long-term, post-operational monitoring of its well infrastructure. We do not feel that land holders be liable for the inevitable failure of the applicant's technology and the release of fugitive emissions or groundwater contamination now or years into the future. We ask this be considered as a genuine measure of long-term corporate responsibility.

As a reminder, previous allegations by the applicant's own staff in regards to regulatory compliance include:

- failing to maintain hundreds of gas wells across Australia and New Zealand for periods of "10 years or more", in addition to failing to properly plug abandoned wells – a legislative requirement meant to stop leaks;
- Instructing staff not to report incidents related to the contamination of aquifers, leaking oil and gas, and spills of radioactive materials in audit reports;
- Under-paying gas royalties to the Queensland state government;
- Systemic negligence associated with an explosion nearly causing multiple deaths in Western Australia described by an executive as the 'worst he had seen ...in his 35 years in the oil and gas industry';
- Deliberately failing to disclose regulatory violations for fear that public scrutiny would force regulators to close down current projects or put further approvals on hold; and
- Strategically electing to pay fines as a cheaper alternative to complying with regulations.

If the applicant wishes to participate in the Northern Territory economy, it is encouraged to follow community-led initiatives that will deliver modern, cleaner, renewable, independent and self-sustainable modes of energy production, based on requirements expressed directly by the communities themselves. We encourage the applicant to appreciate its status as a guest of the Northern Territory community and to genuinely practice reconciliation. We also encourage the applicant to listen to its own corporate shareholders encouraging its transition to cleaner energy

In the words of the fracking enquiry final report summary: 'it must be noted the strong antipathy surrounding hydraulic fracturing for onshore shale gas demonstrated during the consultations did not abate.... For a significant majority of the people participating in the inquiry, the overwhelming consensus was that hydraulic fracturing for onshore shale gas in the NT is not safe, not trusted and is not wanted'.

In short, we do not feel there to be equitably distributed economic, social and environmental considerations proposed by either this EMP or future applicant activities. It is unacceptable that communities in and in the vicinity of the EMP's proposed activity site are not afforded No-Go Zone protection and that landowners do not have the power of veto on their lands. It is deeply concerning that non-urban hubs are afforded less protection of their right to clean water or that the ecological and cultural values of these communities are less important than others. It is unacceptable to approve any current or future EMP that puts a major drinking supply at risk to spills and deep groundwater contamination. We support the refusal of further permit work whilst land access permit issues remain unresolved.

GUIDELINE: *Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;*

There are no amount of precautions that will prevent the increase of the Northern Territory's greenhouse gas emissions through activities proposed in this EMP. We refute entirely any claim that proposed activities in either the exploration or production phases can be conducted in any way that

would not dangerously increase Australia's and global greenhouse emissions, with direct impact on Territorians.

The key environmental concern for this exploration phase is that 9 exploration wells will become hundreds of wells in production.

The proposed expansion of this industry is already the single greatest source of increased NT emissions in recent and future years. The NT Climate Discussion Paper showed from 2016 to 2020 NT emissions will grow by around 50% as a result of the Ichthys LNG Project. Other onshore fracking gas projects could see overall emissions double again by 2030.

The United Nations Intergovernmental Panel on Climate Change (IPCC) state that emissions from burning fossil fuels are a prime cause of human-induced (anthropogenic) climate change.

That is:

- Gas production is a part of the largest contributing sector to Australia's greenhouse gas emissions;
- Methane is considered to have a warming potential of up to 87 over 20 years
- Methane is the major contributor to upstream greenhouse gas emissions for shale gas

Total greenhouse gas emissions generated during exploration activities are anticipated to be approximately 76,477tCO₂e (tonnes of Carbon Dioxide equivalent) for the duration of the activity. We question how flaring and venting activities will not raise greenhouse emissions.

The EMP can not, by virtue of its current and proposed, accumulative activities, be undertaken in a manner that will not pose a threat of serious or irreversible environmental damage to land, air and water spaces.

GUIDELINE: *The principle of inter-generational equity, meaning that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.*

In assessing this EMP, we again ask that first priority and consideration is given to the wishes of the NT local community. We ask that the concerns of communities excluded from No-Go Zone protection are heard. We ask that this site-specific EMP be seen in the broader context of the applicant's plan to potentially operate hundreds of gas fields in the Beetaloo Basin area. We ask the contentious claims of free and informed consent are seriously considered. We ask that Traditional Owners, who are the gatekeepers of keeping country safe are not dismissed for their knowledge. We ask that community-led initiatives to deliver a safer environment based on a renewable energy economy are given prior consideration, noting that this and proposed EMPs were not initiated by the affected communities.

Given previous difficulties in enforcing regulatory practices at other geographically distant mines in the Northern Territory, we believe that a requirement to implement 135 recommendations to mitigate the potential identifiable risks associated with hydraulic fracking processes are 135 risk-factors too many.

The remediation considerations lie well beyond the project life of current and future gas fields and are simply not worth it. It is not worth gambling with our natural resources and opening further lands in and within the vicinity of ep76 to the prospect of:

- eventual land quality deterioration for pastoralists, cattle and wildlife;
- eventual deterioration in drinking water quality across the inter-connected waterways;
- and the deterioration in personal health through chemical and pollution-related illnesses.

In assessing the applicant's EMP, it is worth pointing out that equitable consideration should require applicants - not landholders – to be liable for inevitable and accumulative environmental damage caused by drilling and fracking activities - including damage to aquifers. We ask this to be given serious consideration, especially in view of alleged corporate malfeasance by the applicant. Despite the extensive documentation submitted by the applicant for review, it is not realistic to assume minimal environmental impact well beyond the gas field production phase. In terms of human health, ground and surface water contamination, fugitive emissions etc, it is known that the effect of either human or technological error in operations can appear many years after exploration and production operations cease. In view of that, we ask there to be consideration as to whether such scenarios will ensure that the 'health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations'.

We suggest that expanding the renewable energy sector will diminish the likelihood of exposure to such substantial remediation risks identified above and will greatly diminish the regulatory onus on government bodies to ensure that remediation and "polluter pays principles" are strictly monitored.

The best way to avoid the resultant climate breakdown from continuing to burn fossil fuels and raising gas emissions that will render much of the Territory as uninhabitable for future generations, is to simply say no to current and future highly-intensive, greenhouse gas emitting proposed projects. such as this one set out for ep76.

Second Climate Action Darwin Submission to NT Fracking Inquiry - Response to the [Interim Report](#)

by Grusha Leeman and others
31 August 2017

Thank you for for considering Climate Action Darwin's response to the Interim Report on the Fracking Inquiry. Climate Action Darwin is a community based group who work together to support a vision for a safe climate and a sustainable future. We currently have 270 members.

It is commendable that this Inquiry is comprehensive. There are a broad range of facts across the economic, cultural, health, social and environmental facets that discount the expansion of the gas industry as a sensible plan. Indeed each could stand on their own as valid reasons to halt the industry.

However, it is due to the undeniable threats to our fragile and vital climate that Climate Action Darwin is again presenting a submission, to reiterate that this is the overwhelming reason to ban all fracking plans.

The Final Fracking Inquiry Report CAN recommend no fracking

Section 6 in the [Terms of reference](#) of this Inquiry states that:

The Inquiry will identify priority areas for no go zones.

Due to the climate change, the only responsible course is to recommend that the whole of the Northern Territory be a no-go zone for fracking.

Climate change is happening faster than expected

Most concerningly, the effects of current greenhouse gas emissions are actually exceeding what has been projected by the IPCC estimates.

The Director of the Fenner School of Environment and Society at the Australian National University indicated such in the following quote:

Both observed temperature and sea-level rise are tracking at or near the top of the envelope of model projections.

(from: https://crawford.anu.edu.au/research_units/eeerh/pdf/EERH_RR108.pdf)

Climate change is tracking to the worst predictions

If we continue with business as usual, approving more gas extraction, climate change is likely to track to the worst scenarios as outlined by the [Australian Government](#).

Allowing further fracking for gas in the Northern Territory is following the path of the worst future scenario expected by the IPCC (International Panel on Climate Change): that of [RCP8.5](#) which could see the temperature rises up to 5 °C by the end of this century, as shown in the fourth column of the following table.

If we ban new fracking projects, we have a better chance of realising a RCP4.5 scenario. This will save much of our economy and avoid the high costs of adaption.

Projected temperature changes for Australia

	2090RCP4.5	2090 RCP8.5
Australia	1.9 (1.4 to 2.7)	4.1 (2.8 to 5.1)
Northern Australia	1.7 (1.3 to 2.6)	3.7 (2.7 to 4.9)
Rangelands	2.1 (1.5 to 2.9)	4.3 (2.9 to 5.3)
Eastern Australia	1.9 (1.3 to 2.6)	3.9 (2.8 to 5)
Southern Australia	1.7 (1.2 to 2.1)	3.5 (2.7 to 4.2)

Table 1: Projected temperature change (°C) for Australia and regions with the confidence interval (10th and 90th percentile) given in brackets. Source: CSIRO and Bureau of Meteorology 2015. From: <https://coastadapt.com.au/climate-change-and-sea-level-rise-australian-region>

Please note: A global temperature rise of 2°C will have serious detrimental effects on all aspects of our life on Earth. Given that we are likely to be more adversely impacted by climate change than other comparable countries, Australia has a strong interest in achieving deeper and more rapid reductions in global emissions. From: <http://www.climateinstitute.org.au/articles/media-briefs/why-avoiding-2-degrees-of-global-warming-matters-for-australians.html>

The climate change models are likely to be conservative

To make matters even worse, it seems most climate models still don't even factor in some of the harder to measure, less predictable impacts and tipping points. For example: how vegetation will respond to changes in climate; or ice sheet collapses and carbon and methane release from thawing permafrost aren't yet included in climate models.

"For these reasons my colleagues and I believe that the catalogue of abrupt shifts we found is actually at the lower end of what might occur in reality. Dangerous

climate change isn't restricted to 2°C global warming – to avoid unpleasant surprises we should limit it as much as possible.”

<https://theconversation.com/what-climate-tipping-points-are-and-how-they-could-suddenly-change-our-planet-49405>

Do we have more time to dither?

Not at all. We can expect to reach 1.5°C around the year 2024 if we follow our current emissions trend. The less ambitious 2°C ceiling could be surpassed in 2036.

When will global warming reach 1.5°C and 2°C?

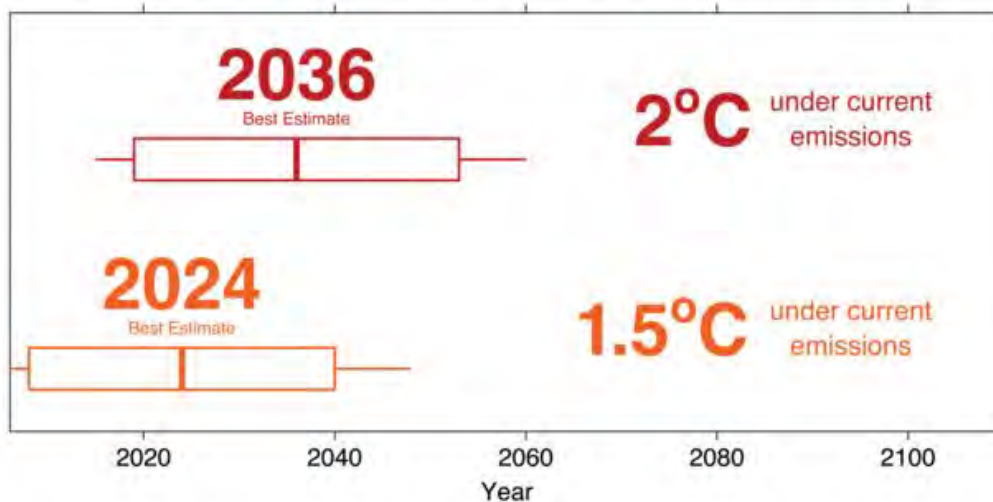


Figure 1: Timeline showing best current estimates of when global average temperatures will rise beyond 1.5°C and 2°C above pre-industrial levels. Boxes represent 90% confidence intervals; whiskers show the full range. From: <https://theconversation.com/we-have-almost-certainly-blown-the-1-5-degree-global-warming-target-63720>

“Ignoring climate change will be the most costly of all possible choices, for us and our children.” Peter Ewins, British Meteorological Office from: <http://climatesafety.info/the-bad-news/>

Even if we stopped all greenhouse gas emissions right now, we would likely experience about [another half-degree of warming](#) as the oceans “catch up” with the atmosphere.

Close to the edge of catastrophe

A [report](#) by Washington-based think tank, Oil Change International, using data from Norwegian energy consultants Rystad, figured out how close to the edge of catastrophe we’ve come. The Rystad data showed fossil fuel extraction in operation worldwide contained 942 gigatons worth of carbon dioxide.

When the world's leaders met in Paris, they said: Every effort, would be made to *limit the temperature increase to 1.5°C above pre-industrial levels, recognising that this would significantly reduce the risks and impacts of climate change.*

To have even a 50% chance of meeting that limit, we can only release about 353 gigatons more CO₂. Clearly 942 is much greater than 353. To have just a break-even chance of meeting that 1.5°C limit, we need to close all coal mines and have a phase down of most of the oil and gas fields currently operating long before they're exhausted.

Figure 2 shows how only 68% of global fossil fuel reserves are unburnable if we are to have a fighting chance of staying below the 2 degree ceiling. If we wish to keep the world more like we know it then we must not burn 85% of the fossil fuel reserves!

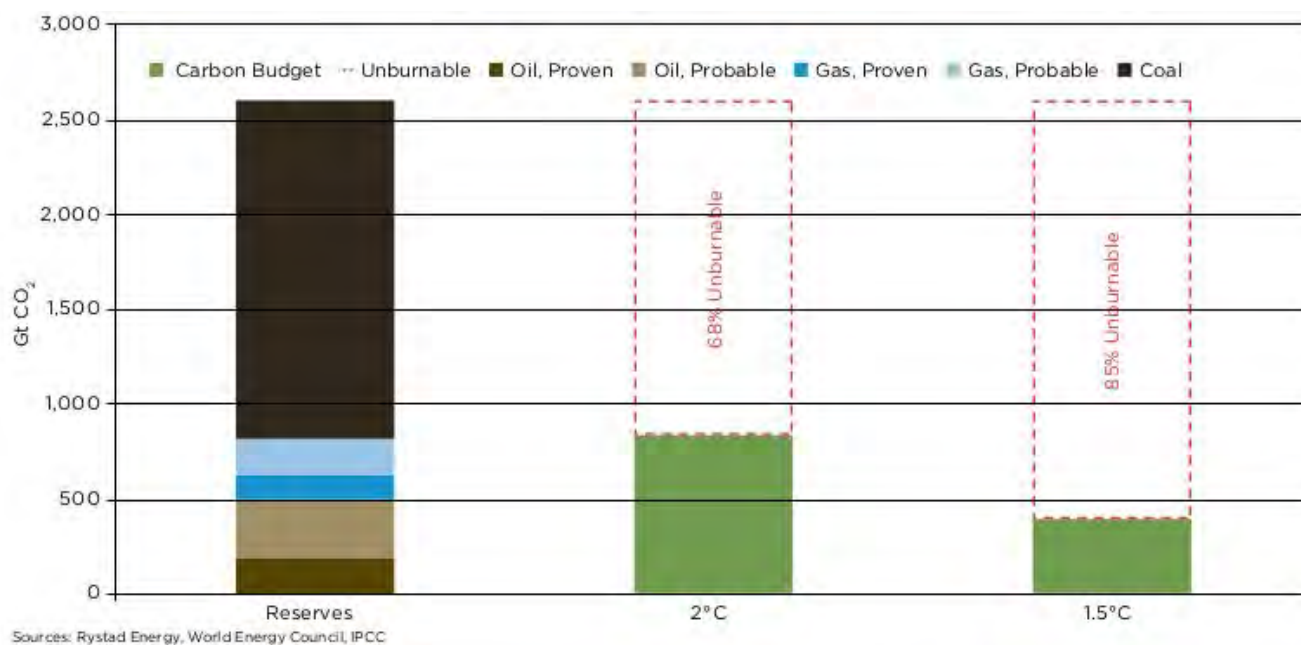


Figure 2: Global Fossil Fuel Reserves Compared to Carbon Budgets for Likely Chance of 2°C and Medium Chance of 1.5°C. From: http://priceofoil.org/content/uploads/2016/09/OCI_the_skys_limit_2016_FINAL_2.pdf

We simply cannot afford to open up new gas mining projects! We don't have to flick the switches off tomorrow, but we must start a steep managed decline in the fossil fuel industry immediately. This reason alone should be enough to ban fracking in the NT. If we want to have a livable climate, we literally cannot keep promising profits from extracting and burning fossil fuels. Leaving them in the ground is our only hope for a sustainable future.

There is no alternative to a global effort at deep cuts of carbon emissions coupled with fast-tracked CO₂ sequestration: *We're simply talking about conserving the*

very life support system of this planet (including those which support human life).
<https://theconversation.com/what-climate-tipping-points-should-we-be-looking-out-for-27108>

Technology will save us = wand waving

As for the proposal that we can overshoot the climate targets, then at a later date suck carbon dioxide out of the air: this depends on scenarios that would be [no less realistic if they involved sorcery](#).

A “popular” proposal is to combine the capture and storage fantasy with biofuel plantations covering an area between one and three times the size of India, then harvesting the material they grow, burning it in power stations and burying the emissions. The use of a mere few hundred million hectares of fertile land would have to compete with all the other problems the biofuel wand is meant to magic away, such as the use of petroleum in cars and kerosene in planes, as well as the minor issue of feeding the world’s people.

All this nonsense is a substitute for a simple proposition: leave fossil fuels in the ground.

The reality is that this will require leadership by governments to ensure the right decisions are made for the longer term, beyond the typical three year political cycle.

Fracking is in direct conflict with the Northern Territory reducing its greenhouse gas emissions

Contemplation of plans to continue down the fracking pathway is the very reason the NT Government presently has no targets to reduce greenhouse gases - they know that the gas is too dirty.

Chapter 9: Greenhouse Gas emissions

It is commendable that you have dedicated a whole chapter to greenhouse gas emissions. Chapter 9. Unfortunately, it is alarmingly misguided.

From the beginning, the Report states *GHG emissions may add to the risk of climate change...* Clearly a fence-sitting denial viewpoint. This understates the well-established scientific fact (by the IPCC) that emissions from burning fossil fuels are a prime cause of human-induced climate change. It is appalling that this statement is included in a report from an Australian scientific inquiry; clearly emissions **do** contribute to climate change.

Fortunately, the very next paragraph makes it clear you do understand that: *GHG emissions are known to be major contributors to climate change*. We hope you desist from using the word “may”, when this is known.

It is heartening that there is recognition of:

- the immense task that our agreeing to the Paris Agreement is;
- gas production is a part of the largest contributing sector to Australia's GHG emissions;
- the largest contribution to Australia’s GHG footprint is stationary energy which includes gas production and combustion, (9.1);
- methane is considered to have a warming potential of up to 87 over 20 years (9.2) and
- that methane is the major contributor to upstream GHG emissions for shale gas (9.3).

Cradle to grave issues

It is appropriate to see consideration of the cradle to grave contributions of GHG emissions, but it is likely there are several underestimations in the Report.

It’s not clear, but it is possible, that not all the upstream emissions were included in the quoted study. Things like long distance tankers, FIFO flights and concrete plugging seem to have been omitted. Together over decades these can be notable.

Secondly, there are the hidden Fugitive emissions to consider. In the studies quoted in the Interim Report, there was no clear mention of measurements taken for fugitive methane emissions that are not associated with the direct activities: those that are off-site. As this has been reported to be potentially very high, the figures quoted are likely to be an underestimation. Most likely a massive underestimation. It’s important to avoid the mistake of assuming all methane emissions are from the wellhead.

In the last CAD submission we requested that the [Melbourne Energy Institute Report](#) about methane emissions from unconventional oil and gas production be considered. Please examine this report this time.

Researchers from Southern Cross University recently also found environmental fugitive emissions to be significant. They demonstrated there are clearly elevated atmospheric methane emissions in Queensland gas fields. The link for their video is [here](#), it is well worth watching.

Thirdly, although it is awesome that finally efforts are being made to be less polluting, relying on projected figures as fact is just not acceptable. Section 9.4 states: "*the parameters were adjusted to reflect potential emission reduction technologies*"... and "*the hypothetical well scenario has GHG emissions that are ... lower than historical practices*". It is difficult to rely on hypothetical rates of pollution from new technologies and practices that have not been tested in the field. These look like hopes, and as such cannot be relied on until proven, and completely adopted.

The fact that technologies like Reduced Emission Completions are only recently being rolled out is a testament to the immaturity of this industry. It is alarming that we still see intent for flares and venting. This cheap and nasty mentality has been a major contributor to climate change today.

Monitoring must be comprehensive but does not equate to cleanliness

Monitoring and reporting in themselves do nothing to diminish risk; they only exist to prevent mistakes from repeating. If emissions were reported to be increasing would the operations be shut down? For that would really be the only way to prevent environmental fugitive emissions from recurring.

The pressure to appear clean is the fundamental reason why monitoring must be comprehensive and properly independent and monitored in itself.

Instead there is mention of focusing on "cost-effective risk mitigation strategies" [section 9.9] which include venting and flaring. Cost-effective usually means cheap and nasty strategies are chosen before those which are less polluting.

It is concerning that the Interim Report states: "*It is essential to undertake baseline monitoring of methane levels in soils and atmosphere before drilling commences*" [Section 9.6].

Firstly, if we wait until after initial drilling (during exploration) has been done, the test is no longer a "baseline measurement". Any time a hole is drilled into the ground, potential pathways for gases are created. So-called "baseline measurements" completed after exploration should be much more extensive to ameliorate any possible increases from exploration.

Secondly, why is there no recommendation to monitor methane levels in groundwater? (only soils and atmosphere were indicated for monitoring).

In section 5.3.2, the Interim Report quotes a WA report which recommended monitoring of groundwater for methane prior to hydraulic fracturing, yet here, in 9.6, a section dedicated to monitoring for greenhouse gases, water monitoring is omitted.

There *are* vast water sources in the arid outback: people have lived there for tens of millennia. This includes precious groundwater, springs, ephemeral water bodies, periodically mass floodings, and rivers. Comprehensive monitoring should determine whether shale gas fracking releases fugitive methane via water sources.

Shale gas is dirty

The most glaring inadequacy in the Greenhouse chapter is the pretence that the NT fracked gas replaces coal and therefore should be seen as 'better' or 'cleaner'. It is still a fossil fuel, it still contributes to climate change. Indeed it's possible that shale gas is as polluting as coal when all the emissions are actually accounted for. In 2017, we no longer have any wriggle room for more pollution.

Our shale gas extraction possibilities are not part of any strategy to bring stationary energy emissions to zero. That would be impossible.

If all we can say for an energy source like shale gas is that it may be slightly cleaner than coal, then we have nothing to say in its favour at all.

The preliminary assessment of life-cycle GHG emissions (9.8.3) repeats this ill-founded and illogical justification for the roll out of more shale gas mining, assuming without any basis of evidence, that the shale gas will displace coal, and falsely concluding that this is a good deal, when of course we should instead be displacing coal with large scale renewables.

Shale gas is still a dirty fuel. Mining and burning it will only elevate our GHG emissions. Leaving it in the ground will deliver the best outcome for our climate.

"Air" is not a suitable title for greenhouse gases

Section 4.2.4 of the Interim Report discusses the main greenhouse gases which are minute components of air: methane is currently at [1.8ppm](#) and CO² is [409ppm](#), both rapidly rising. It is not their composition in the air that is of importance, but their potency as greenhouse gases. It would be less deceptive to put them under the title of Greenhouse Gases or Climate Change since this issue is deserving of a section of its own.

It is pleasing to see that there are many critical climate change aspects covered in the report and that it is clear that climate change was a major issue for a significant number of community participants. However, the Interim Report seems to suggest it is merely better measurement and monitoring of methane that we request, ignoring our concern about opening new basins, extraction and ultimately burning the fossil fuel. There is no acceptable mitigation or offset for the extraction and export of shale gas, it simply causes unnecessary harm to our climate.

Rehabilitation leaves a legacy of pollution [Section 5.3]

We put this to the panel: how safe are cement plugs over time? There are earthquakes, floods, fire and endless sunshine. How will they be prevented from failing? Is this even possible? Have the risks been properly assessed?

As you, and the public at large are well aware, the NT is littered with badly rehabilitated mining ventures, many mitigated in their effects at great taxpayer cost. It is highly likely that some plugs will leak even more methane in the years after the gas companies are gone, leaving us with more legacy messes.

Shale gas is not a transition fuel

Gas was once touted as a “transitional fuel” but now Australia, and the rest of the world, can leap directly to renewables: a new University of Melbourne [report](#) demonstrates the gas pathway as a detour. It is cheaper to employ solar and wind-power, pumped hydro and batteries, to provide baseload power and manage energy supply/demand fluctuations which are the major functions of gas in the electricity system.

Shale gas is not sufficiently less polluting than coal to garner any climate benefit. <http://www.climatecouncil.org.au/price-of-gas>

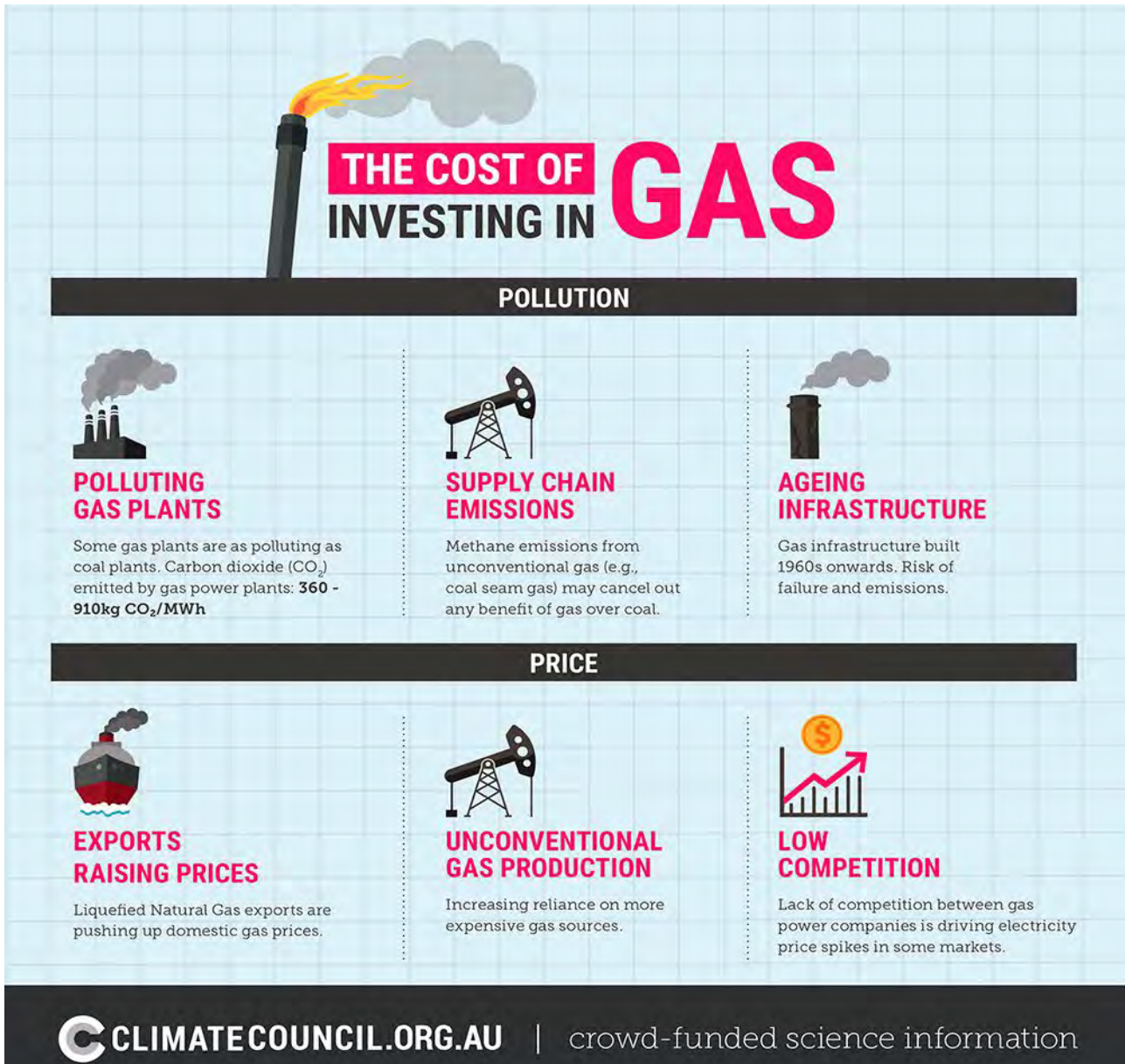
Shale gas is expensive

Renewable energy such as wind and solar are now the cheapest kind of power it is possible to build right now – less than new gas plants.

<https://probonoaustralia.com.au/news/2017/05/renewable-energy-jobs-reach-10-million-worldwide/>

Investing in more gas will lock in high electricity prices and pollution for decades to come. The report: [‘Pollution and Price: The cost of investing in gas,’](#) shows that tackling climate change and protecting Australians from worsening extreme weather requires our electricity system to produce zero emissions before 2050.

Besides gas being similar in climate pollution to coal, a greater reliance on gas drives up power prices. Renewable energy can provide a secure, affordable alternative to new fossil fuels.



Source: <http://www.climatecouncil.org.au/price-of-gas>

Turning away from fracking and going renewable

If we are to save our planet from the more dangerous and unpredictable impacts of climate change, we must stop all new fossil fuel development immediately. Every day is critical because greenhouse gases are cumulative.

Our Federal Government is weak on climate change policy, yet increasingly, state and local governments are showing leadership by acting decisively to turn the corner on fossil fuels and roll out renewable energy. Like more and more governments across the USA and Europe, they have decided that fracking is just too great a risk and that it is no longer worth continuing to pander to the fossil

fuel industry. Already Victoria has banned fracking, Tasmania also has a moratorium and a growing list of councils are declaring their regions Frack Free. Increasingly, towns and cities such as Canberra have pledged to be 100% renewable in the short term.

The NT can join other states in showing leadership for the sake of our water, land and climate by banning fracking and switching to a jobs-rich renewable energy economy. We have the capacity to go 100% renewable through a well-paced, well-considered strategy to reduce emissions to zero. The NT is rich in sunshine and we are in the privileged position of hosting electricity grids independent of the National Electricity Market.

It's time we stopped wondering what monitoring and regulations we need in order to expand pollution and take decisive action for the future. If we don't, we may find ourselves left behind in the renewable technology market.

The future is 100% renewable. Let's put our focus and limited tax dollars there.

More jobs in a renewable economy than in a fracked one

A good start to understanding the awesome potential of avoiding catastrophic climate change by shifting our efforts from fossil fuels to renewable energy sources is by reading the 2016 Climate Council report: [Renewable Energy Jobs: Future Growth in Australia](#), though as is often the case the NT is rarely mentioned.

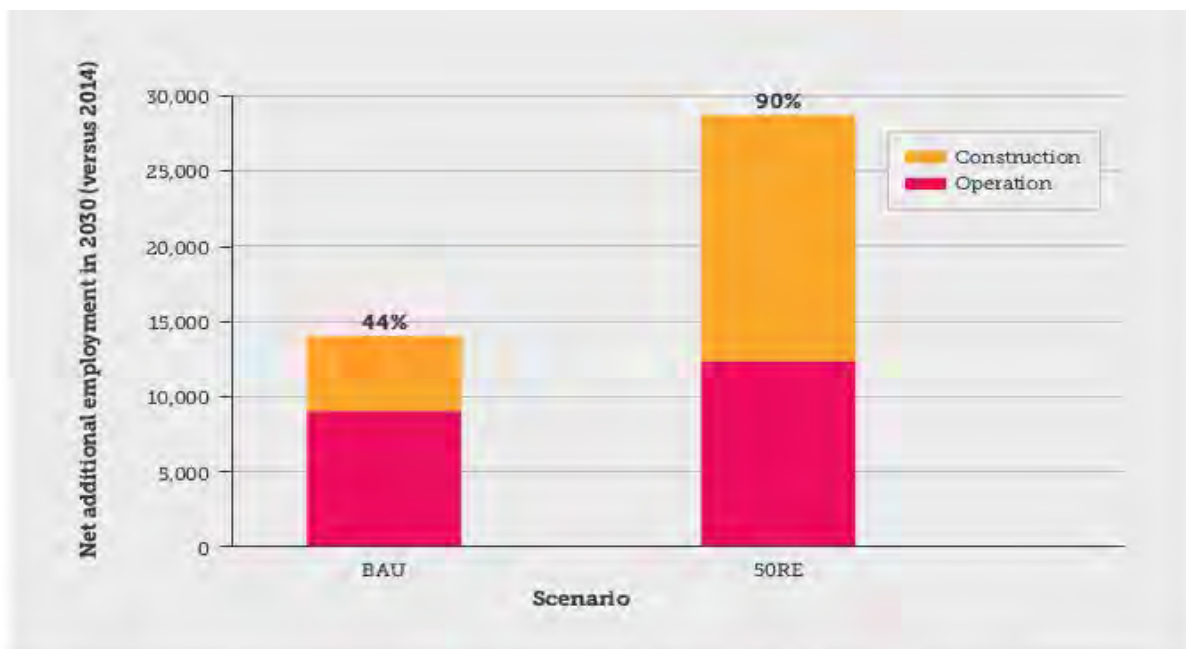


Figure 3: Net additional employment in the electricity sector in 2030 versus 2014, Business As Usual (BAU) and 50% Renewable Energy (50RE) scenarios. From: <https://www.climatecouncil.org.au/uploads/7b40d7bbefbdd94979ce4de2fad52414.pdf>

This [Report](#) compares two scenarios for the national energy sector - business as usual renewable energy growth (34% renewable electricity in 2030) and 50% of electricity derived from renewable sources in Australia by 2030.

Both scenarios show increased uptake of renewable electricity will create employment nationwide:

- 50% Renewable Electricity (50RE) scenario in 2030 will lead to over 28,000 new jobs, nearly 50% more employment than a business as usual (BAU) scenario [Note: 28,000 does not include the NT!].
- Jobs are created in the construction, operation and maintenance of renewable energy installations, as well as in related industries.
- Job losses in fossil fuel electricity generation are more than compensated for by increased employment in the renewable energy sector.

Renewable jobs are booming and the RE industry is leading investment across the world

Building renewables and a smart grid will generate millions of mostly blue collar jobs around the world, according to a recent report from the intergovernmental [International Renewable Energy Agency](#).

More than 9.8 million people were employed in the renewable energy sector in 2016, which could rise to 24 million by 2030 according to a 2017 International Renewable Energy Agency (IRENA) report, [Renewable Energy and Jobs – Annual Review 2017](#). The number of jobs in the solar and wind sectors has more than doubled in the last 4 years.

“Renewables are directly supporting broader socio-economic objectives, with employment creation increasingly recognised as a central component of the global energy transition” said IRENA director-general Adnan Z. Amin.

“As the scales continue to tip in favour of renewables, we expect that the number of people working in the renewables sector could reach 24 million by 2030, more than offsetting fossil-fuel job losses and becoming a major economic driver around the world.”

<https://probonoaustralia.com.au/news/2017/05/renewable-energy-jobs-reach-10-million-worldwide/>

The energy giants China and the USA have embraced the opportunities for increasing employment by going renewable as shown in the following graphs. In 2015, the number of jobs in solar energy overtook those in oil and natural gas extraction in the USA, helping drive a global surge in employment in the clean-energy business as fossil-fuel companies faltered.

<https://www.bloomberquint.com/technology/2016/05/25/clean-energy-jobs-surpass-oil-drilling-for-first-time-in-u-s>

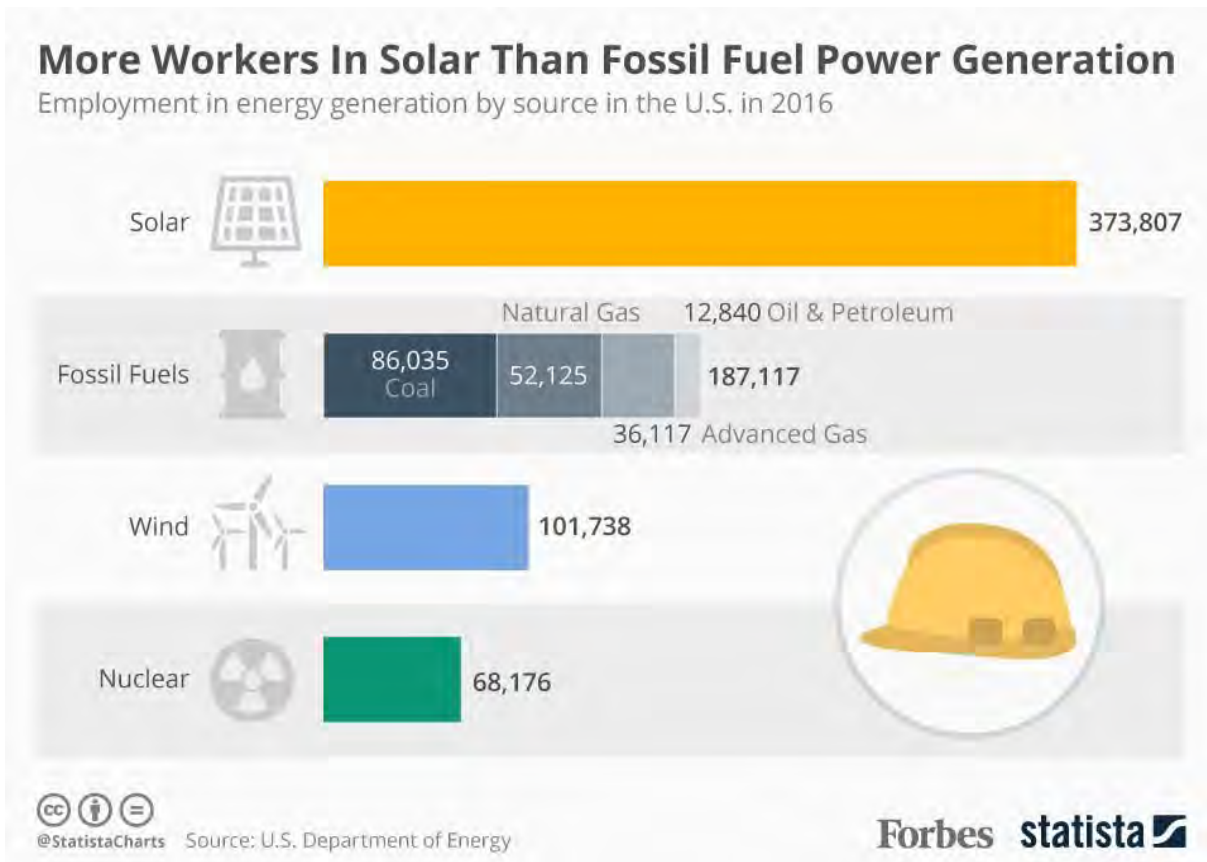


Figure 4: More people work in renewables than oil and gas and nuclear in the USA.
 Source: <https://www.forbes.com/sites/niallmccarthy/2017/01/25/u-s-solar-energy-employs-more-people-than-oil-coal-and-gas-combined-infographic/#6a5fb9d02800>

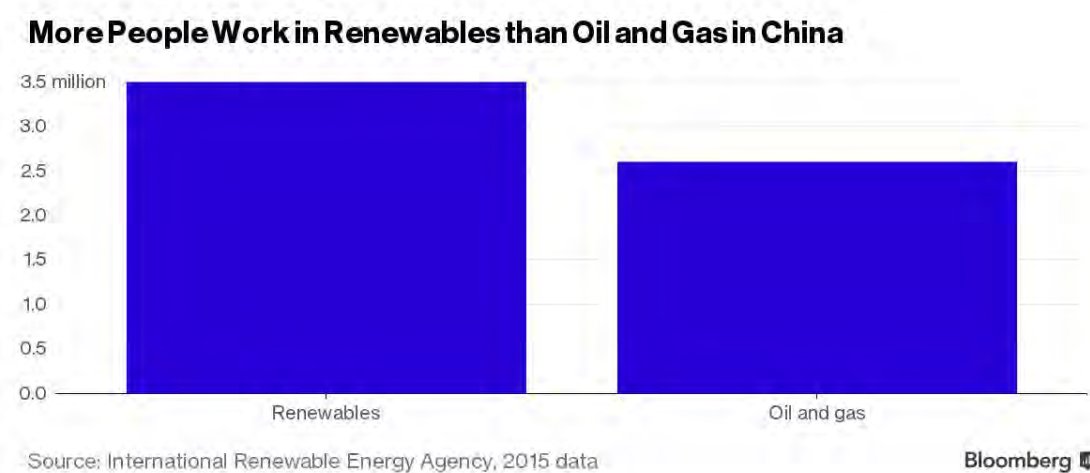


Figure 5: More people work in renewables than oil and gas in China.
 Source: <https://www.bloombergquint.com/technology/2016/05/25/clean-energy-jobs-surpass-oil-drilling-for-first-time-in-u-s>

Besides the many social and economic benefits from a roll of renewable energy jobs, the gender balance will be improved, which could well reduce depression and suicide rates. There is an indication that the renewable energy sector employs larger shares of women than the broader energy sector.

<https://irenanewsroom.org/2016/05/25/8-1-million-people-now-work-in-renewables-new-study-finds/>

If it is jobs that are wanted: the future is clearly renewable.

Conclusion - Make the NT a fracking no-go zone

The full lifecycle greenhouse gas burden of our fracked gas is an unacceptable climate destroying disqualification.

We have three choices:

- First: a gradual, managed decline of existing fossil fuel production and its replacement with renewable energy and low-carbon infrastructure, which offer great potential for employment.
- Second: allowing fossil fuel production to continue at current rates for a while longer, followed by a sudden and severe termination of the sector, with dire consequences for both jobs and economies.
- Third: continuing to produce fossil fuels as we do today, followed by climate breakdown rendering places like Darwin and the rest of the Territory virtually unlivable.

Clearly option one is the only sensible choice. It entails an end to exploration and all new gas projects, and the roll out of renewables. Yet here we are contemplating option three. Sticking to science and facts, as this Inquiry promises to do, means we simply cannot accommodate climate-sceptics and climate-cleaning dreamers.

Fossil fuel production must halt if we are to curb climate disaster. Climate Action Darwin compels you, the panel, to stick to the facts:

- ❖ Fact: climate change is real.
- ❖ Fact: climate change is already happening faster than predicted.
- ❖ Fact: we need to stop burning fossil fuels like fracked gas.
- ❖ Fact: what you, the panel, choose WILL make a difference.

Climate Action Darwin requests the Final Fracking Inquiry Report recommends a cessation to new fracking activities in the NT, by power of Section 6 in the [Terms of reference](#) which states: *The Inquiry will identify priority areas for no go zones, ie the whole of the Northern Territory.*

On behalf of the thousands of Territorians concerned about climate change as well as future generations, thank you for considering and referring to our feedback in your final recommendations.

From: [Samantha Lillie](#)
To: [OriginPetroleum DENR](#)
Subject: Re: SL Origin EMP ep76 - Origin Energy B2 Pty Ltd Beetaloo Basin Velkerri drilling and hydraulic fracturing program (EP76)
Date: Friday, 1 November 2019 11:56:24 PM

Hello,

the online site and email would not let me send Attachment B.

this is the Climate Action Darwin Submission #1159 from the fracking inquiry.

to access this refer:

<https://frackinginquiry.nt.gov.au/submission-library> Climate Action Darwin Submission #1159

thank you.

SLillie

Origin Energy B2 Pty Ltd Velkerri Drilling, Hydraulic Fracturing and Well Testing EP76 S2

On Saturday, 2 November 2019, 12:46:21 am ACDT, Samantha Lillie <goofoo2@yahoo.com> wrote:

to whom it may concern,

attached comments below. will send attachment B via online form reference: SL Origin EMP ep76

please let me know if there are issues with the document format.

kind regards

SLillie

From: Joseph Costelloe
To: [fracking inquiry](#)
Cc: [REDACTED]
Subject: Have your say comment
Date: Tuesday, 25 April 2017 10:24:56 AM

To whom it may concern

I am an Origin Energy ex-employee.

I was employed in a full-time role as a Senior/Lead Instrument and Electrical Draftsperson in Brisbane for the Upstream Gas and then Intergrated Gas Business Units from September 2014 to December 2015.

While employed there I sustained a serious psychological injury within the first 6 months of my employment, which I still receive counselling and medication for today.

I had worked previously for many businesses in many varied roles in my 23 years of full time employment without any mental health concerns, let alone being diagnosed with a psychological injury. I had a total of 6 months off work due to this illness and I made 2 unsuccessful attempts to return to work, before resigning due to my poor mental health.

Quite unbelievably, to date I have been denied 2 workers compensation claims for these injuries; Essentially due to Origin Energy management engaging in insurance fraud (see email below) and subterfuge.

.....

On Friday, March 17, 2017, 1:23 PM, [REDACTED] wrote:

Dear Joe,

Thank you for your email.

I confirm the Prosecution Services unit is a completely separate unit to both the Review unit and Appeals unit. I also confirm that the decision made regarding whether it is appropriate to pursue a prosecution is not affected by the outcome and/or status of your review application or your appeal.

I am unable to give you an exact timeframe for a final outcome as there are multiple layers in the approval process for decisions regarding whether or not prosecutions should be undertaken.

However, I would expect a decision to have been made within the next month.

You will be formally notified of this decision once it has been finalised.

Kind Regards,

[REDACTED]
Prosecution Services
Office of Industrial Relations
[REDACTED]

.....

I claim that the Business Units I was part of have a culture of unchecked unlawful behaviours. These include, deliberate breaches of employment contracts, on-mass engineering drawing non-compliance, bullying and negligence by all levels of management and being derelict in there duty of care owed to it's employees.

If those torts were not bad enough that is not the worst of the Origin Energy management modus operandi that I experienced. When I raised complaints through the internal complaint procedure I was initially fobbed off and then victimised. Further complaints were made, but everything was covered-up. No investigations occurred.

Since my depature from this company 18 months ago and through my own research and reaching out to other ex-employees I have discovered just how widespread this rotten culture is.

What I can confirm from my research is that approximately 14 claims for psychological injuries have been lodged over a recent 2 year period by Qld Origin Energy employees - only 2 were supported by Origin Energy.

There have also been several unfair dismissal claims that whistleblower Sally McDow has advised me of since the start of 2016. Most of these were either settled by conciliation or were dropped by the dismissed employee when confronted with the dirty tactics of Origin Energy legal representatives.

In addition to these alarming matters I personally know of 3 ex-employees who attempted suicide within the last 2 years. Each of these people claimed that their employment with Origin Energy was the major contributing factor.

Of course there is also the well-publicised tragic story of George Bender, another stakeholder in Origin Energy operations whose rights and health were of the lowest priority for this company. I have heard (second-hand) other reports of landowners complaining of the same negligence.

Yet, the spin that comes out of this company tells a different story. How is this so?

The only reasonable conclusion that can be drawn from this information is that Origin Energy lie. They consider people and the truth obstacles that need to be bypassed, or if necessary stream rolled in the name of power and profits.

While my submission is mostly with regard to internal machination of Origin Energy I appreciate that the Onshore Unconventional Gas Industry is comprised of several other companies and joint venture arrangements. I am not in a position to make comment about the other companies.

However, I would like to share my thoughts on the environmental impact of the Onshore Unconventional Gas industry as a whole. This is a bow that can easily be drawn to encapsulate an industry wide culture.

Through the reporting by Government senior staffer whistleblower Simone Marsh, various investigative journalism articles and Peter Garrett's memoirs, the mishandling of and unnecessary expedience that was applied by relevant government environment departments in granting approvals raises grave concerns about the birth of the Queensland CSG-LNG projects. The signing of a \$5b gas deal with China pre-dating these approvals belies belief.

Even if there was minimal risk of harm to flora, fauna and mankind from gas mining and operations (which is clearly not the case-there is catastrophic risk), as a matter of due diligence and good governance the companies involved must ensure the industry is having no negative effect; a low probability is not an acceptable level of risk when dealing with our future. Due diligence and complete risk assessments have to be performed before anything else. Even that is not enough. Only via continued monitoring by honest, responsible companies and independent agencies can good governance be said to exist.

Ask the landowners from Qld if they believe this basic right has been afforded them. I also take note of the re-emergence of Black Lung disease. Look how serious the ramifications can be by not adhering to due diligence and good governance.

The bottom line is that the corporations extolling the virtues of the Onshore Unconventional Gas industry are only interested in their own bottom line.

What they say and write can not be trusted. You must see through their tainted perspective and skewed priorities.

I implore the NT government to not repeat the mistakes of other greedy governments.

Do not allow this industry a foothold into your beautiful state.

Yours truthfully
Joseph Patrick Costelloe



Lake Woods

Location and Description

Lake Woods is a large ephemeral wetland located on the western edge of the Barkly Tableland and 220 km north of Tennant Creek. The Lake most frequently occupies an area of about 350 km², but during periods of major flooding (such as 1993 and 2001) it is broadly contiguous with the lower reaches of Newcastle Creek, and can reach 850 km² and, at times, nearer 1000 km², making it one of the largest temporary freshwater lakes in the Northern Territory and tropical Australia. The lake basin supports grass/sedge communities, including broad bands of lignum which comprise one of the largest areas of lignum swamp in the Northern Territory. The northern edge of the Lake and Newcastle Creek are fringed by river red gum and coolibah. The slopes of the Ashburton Range to the east are dominated by spinifex communities.

Tenure and Land Use

Lake Woods is located on pastoral leasehold land and encompasses two pastoral properties (Powell Creek and Newcastle Waters). The main land use within the Site is pastoral operations, but a fenced enclosure on the northern part of the lake is managed as the Longreach Waterhole Protected Area (approximately 7% of Site) by Parks and Wildlife Service NT in cooperation with the pastoral lease managers. The reserve is popular for conservation and recreation purposes.

Significance Rating

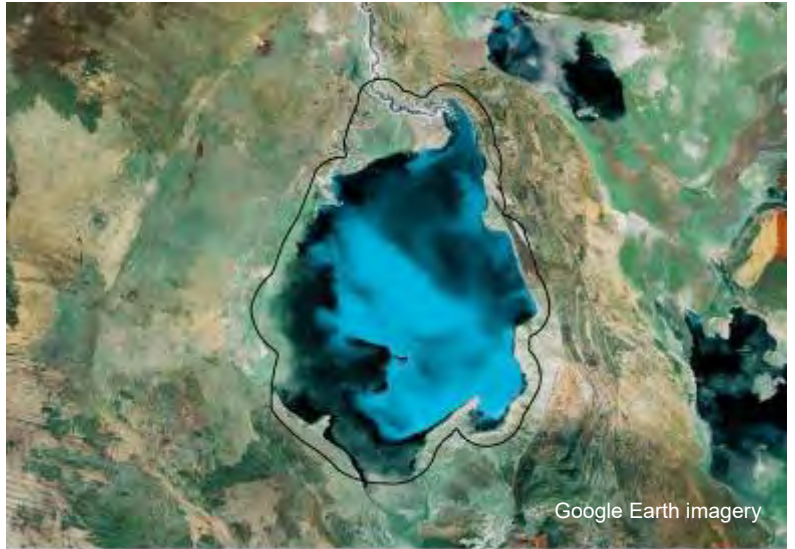
International Significance

Ecological Values

During periods of inundation, Lake Woods is a vast flooded area comprising diverse wetland habitat dominated by open water and with substantial areas of lignum shrubland and woodland at the lake margins. When conditions are suitable, the lake supports more than 100 000 waterbirds including internationally significant numbers of Plumed Whistling-Duck. The shrubland and wooded habitats provide breeding sites for several colonies of waterbird species including egrets, cormorants and spoonbills. Large numbers of shorebirds also use the lake for migration stopover, and the near permanent waterholes in Newcastle Creek are an important refuge for many species during the dry season.

Management Issues

Parkinsonia aculeata is widespread in the northern part of this lake and creek system and represents a major management issue. Cattle access to the Longreach Waterhole Reserve in the past caused erosion of creek banks, which is still apparent, and infestation by weeds has limited regeneration of native plant species in this area. Unrestricted recreational boating and visitor access could be disturbing significant waterbird breeding colonies.



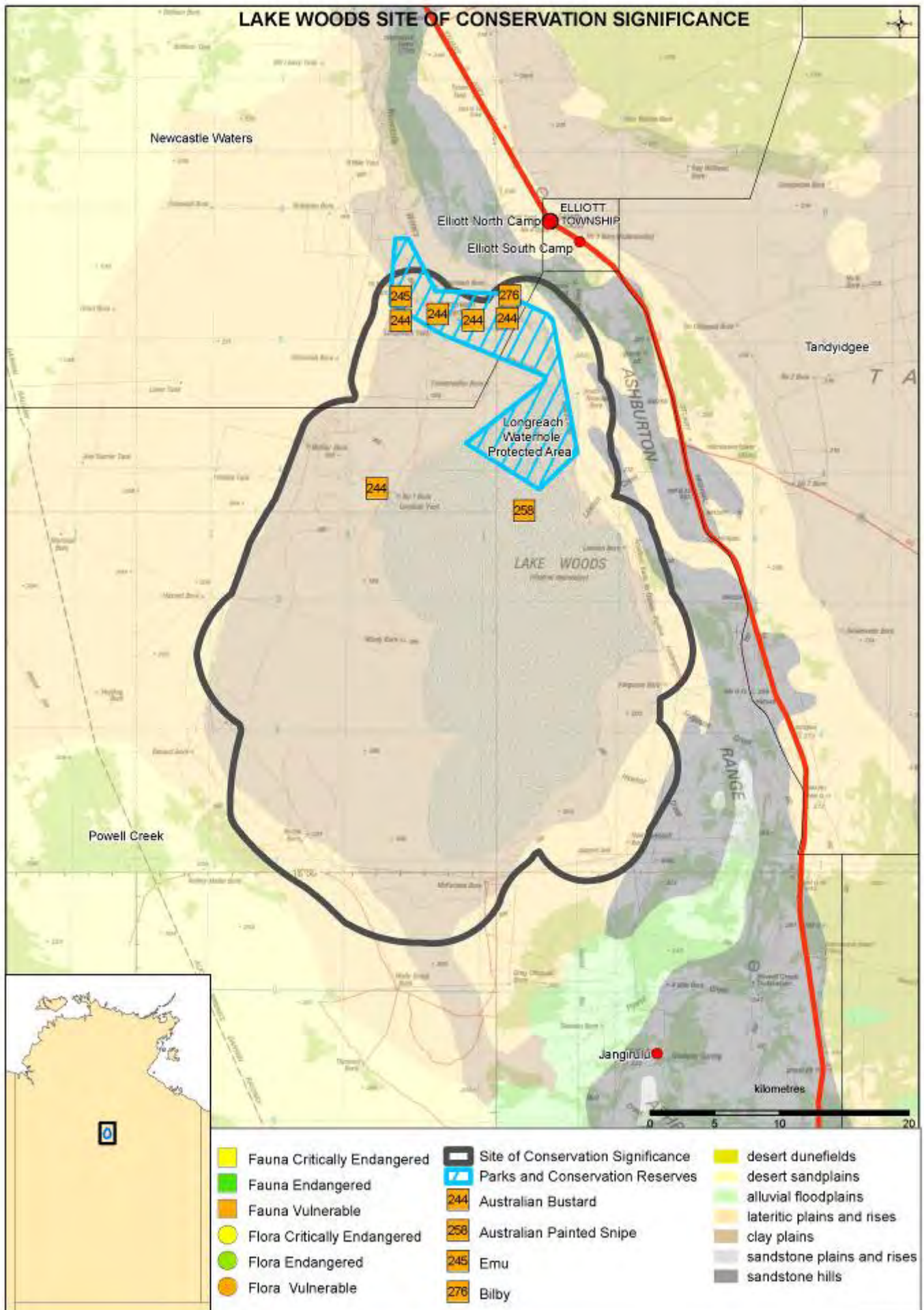
Condition

Apart from weed infestations, Lake Woods seems to be relatively resilient to grazing. Some bank erosion is apparent around the Longreach and South Newcastle Waterholes, and streamline erosion occurs in lighter-soil areas of the south-east of the site.

Current Conservation Initiatives

The Longreach Waterhole Protected Area was fenced in 1984 to exclude stock, but maintenance is difficult as the fence is effectively destroyed by each flood event. Surveys of waterbirds are conducted opportunistically by Wetlands International after major flood events.

Landholders muster the lakebed and remove cattle multiple times each dry season and have an on-going weed management program south of the protected area and in the catchment upstream of the reserve. This focuses on eradicating isolated *Parkinsonia* plants. The landholders, in conjunction with NRETAS, are developing a Conservation Management Plan for the site, using Ramsar guidelines.



LAKE WOODS - SITE OF CONSERVATION SIGNIFICANCE

LOCATION	SOCS Number	39 (NT Parks and Conservation Masterplan Map Number 48)
	Latitude/Longitude	17° 50' South, 133° 28' East (at centre)
	Bioregion	Mitchell Grass Downs (99%), Sturt Plateau (1%)
	Description	<p>Lake Woods is located immediately west of the Stuart Highway and 7 km south of the small township of Elliot. The site includes the lower reaches of Newcastle Creek, including two near-permanent waterholes (Longreach and South Newcastle), a delta of distributary channels where the Creek meets the lake, and the lake to the maximum high water mark.</p> <p>The Ashburton Range clearly delineates the east side of the site, but low relief on the west side of the lake means that this boundary is less well defined. The lake most frequently occupies an inner basin of about 350 km² but the boundary of this site has been delineated based on the maximum flooded area of the lake with a 2 km buffer, and encompasses an area of 1305 km².</p> <p>Lake Woods is primarily fed by Newcastle Creek from a large catchment to the north-east. Surface inflows are highly variable, although the creek does flow in most years. Large floods often cause at least partial inundation of the lake, and major floods which fill the lake to capacity have occurred at least three times in the past 15 years (1993, 2001 and 2006). Although the lake is shallow (2-3 m), water can persist for more than 12 months after major flood events.</p> <p>Other large wetlands on the Barkly Tableland including the Lake Sylvester system, Tarrabool Lake and Eva Downs Swamp are also recognised as sites of high conservation significance in the NT.</p>
THREATENED SPECIES	Significance Rating	Regional Significance
	Threatened plants and animals (Listings at National/NT level CR - Critically Endangered, EN - Endangered, VU - Vulnerable, NT - Near Threatened, LC - Least Concern, DD - Data Deficient)	<p>Four threatened species are reported from this site.</p> <p>Vertebrates</p> <ul style="list-style-type: none"> ▪ Australian Bustard <i>Ardeotis australis</i> (-/VU) ▪ Australian Painted Snipe <i>Rostratula australis</i> (VU/VU) ▪ Emu <i>Dromaius novaehollandiae</i> (-/VU) ▪ Greater Bilby (<i>Macrotis lagotis</i>) (VU/VU) (Fleming <i>et al.</i> 1983) <p>The Australian Painted Snipe has been recorded on a single occasion at Lake Woods (Jaensch 2003a), but the species is potentially more common given the extent of suitable habitat and difficulty of observation (R. Jaensch, Wetlands International, pers. comm.). There are very few, scattered records for this species in northern Australia. Bustard and Emu occur widely throughout the region, but are listed as threatened due to significant decline.</p> <p>Fleming <i>et al.</i> (1983) found signs of Bilby in sandy areas near Longreach Yards during a biological survey of the area, but the site contains little suitable habitat for this species, which occurs in the “desert country” to the west.</p>
ENDEMIC SPECIES	Significance Rating	Not Significant
	Notes	Two plant species recorded from this site are endemic to the NT.
WILDLIFE AGGREGATIONS	Significance Rating	International Significance
	Marine turtles	Not applicable
	Seabirds	No major aggregations recorded
	Waterbirds	<p>Total numbers of waterbirds: Maximum counts of waterbirds from aerial surveys of this lake during flood events include: 116 000 in 1993, 100 000+ in 2001, 70 000+ in 2002, and 50 000+ in 2006 (Jaensch and Bellchambers 1997; Wetlands International unpubl.), and real numbers are likely to be at least twice this number if the usual undercounting factor in aerial surveys is taken into account (Costelloe <i>et al.</i> 2004; Morton <i>et al.</i> 1990). The two near-permanent waterholes in this site also support large numbers of waterbirds during the dry season.</p> <p>Counts of individual species: Maximum counts of 27 000 Plumed Whistling-Ducks (Jaensch and Bellchambers 1997) are internationally significant (>1% global population; Dutson in prep.). High counts of 3000+ Great Egrets (Wetlands International unpublished data) are nationally significant (>1% Oceania population; Wetlands International 2006).</p> <p>Other species that occur in high numbers include: Australian Pelican (8000); Grey Teal (5000); Intermediate Egret (2000); and Glossy Ibis (3300) (Wetlands International unpublished data).</p> <p>The Freckled Duck is uncommon in the NT but is reported in small numbers (35) at this site (Jaensch 2003b).</p> <p>Breeding records: 23 waterbird species are reported breeding in this site (Jaensch and Bellchambers 1997) including colonies of several hundred to several thousand Straw-necked Ibis, Intermediate and Great Egret, Little Black Cormorant, Royal Spoonbill and Australasian Darter. Great Cormorants and Magpie Geese also breed at the site (Wetlands International unpubl.).</p> <p>Diversity of waterbirds: The vast size of this lake, the diversity of habitats, and availability of near-permanent water contribute to it being one of the most species-rich inland wetlands in the NT, with 65 waterbird species (Wetlands International unpublished data).</p>

LAKE WOODS - SITE OF CONSERVATION SIGNIFICANCE

	Shorebirds	11 shorebird species are recorded from this lake, including two species in substantial (but sub-threshold) numbers: Oriental Pratincole (6000+); and Little Curlew (700+) (Wetlands International unpubl.). A record of 26 Swinhoe's Snipe in 1993 is also notable because this species is an uncommon migrant which rarely travels this far inland (Jaensch 2003c).
	Other aggregations	Substantial numbers of Flock Bronzewing Pigeon are known to frequent the Barkly wetlands and there are historical records of large numbers at Lake Woods (Fleming et al. 1983).
WETLANDS	Significance Rating	International Significance
	Ramsar criteria met	Although no formal assessment has been conducted to date, Lake Woods is likely to meet at least five of the criteria for listing as a Wetland of International Importance under the Ramsar Convention, including criterion 1: rare or unique example of a wetland type; criterion 2: supports threatened species or communities; criterion 4: provides refuge or supports a critical life-cycle stage for important species; criterion 5: important wildlife aggregation site with >20,000 waterbirds; and criterion 6: regularly supports >1% of the individuals in a population.
	DIWA criteria met	Lake Woods is listed as a wetland of national significance in the Directory of Important Wetlands in Australia (DIWA: NT013 Lake Woods). The site meets criteria 1, 2, 3, 4, 5 and includes DIWA wetland types: B1, B6, B10, B13, B14.
	Notes	This site has been nominated as a national High Conservation Value Aquatic Ecosystem (the finalised list of HCVAE will replace the DIWA list), and is a priority HCVAE in the Caring for our Country Business Plan 2009-2010 (Commonwealth of Australia 2008). It is an outstanding example of a temporary freshwater lake and a large semi-permanent waterhole at the end of an inland-draining tropical creek system; one of the largest such lakes in the NT. The lake also includes the largest area of lignum swamp in the NT and one of the largest in tropical Australia (DIWA). Satellite imagery for this site indicates that the lake may be part of an even larger palaeo-lake basin indicative of wetter epochs in the geological past.
	Rivers	No information located
FLORA	Significance Rating	Regional Significance
	Notes	Restricted vegetation communities: The lignum shrubland and associated marsh present at Lake Woods is one of the most extensive occurrences in the NT (R. Jaensch, Wetlands International, pers. comm.). Restricted range species: The site contains a suite of plant and animal species characteristic of the blacksoil grasslands of subhumid north Australia. <i>Eucalyptus barklyensis</i> is a rarely-recorded tree almost entirely restricted to the Mitchell Grass Downs bioregion in the NT.
OTHER ENVIRONMENTAL VALUES		Lake Woods is proposed to be nominated by Birds Australia as an internationally-recognised <i>Important Bird Area</i> (G. Dutton in prep.). Lake Woods is identified as a site of significant refugia for biological diversity in arid and semi-arid Australia due to its importance as a breeding and migratory stop-over location for waterfowl in the sub-tropical inland of the NT (Morton et al. 1995). Lake Woods supports seven fish species and eight frog species are reported in the general region (Fleming et al. 1983). The rare Yellow Chat is abundant at Lake Woods and the lake is one of the few documented breeding sites on the Barkly Tableland for this species (Jaensch and Bellchambers 1997). Lake Woods is listed on the Register of the National Estate for its natural values (Australian Heritage Council 2007). Sub-humid wetlands such as Lake Woods are likely to become increasingly important in the coming decades if global climate change results in even minor rises in sea level, and saltwater inundation occurs on the vast floodplain wetlands of coastal northern Australia. At least 24 species recorded from this site are listed under international conventions or bilateral agreements protecting migratory animals.
MANAGEMENT ISSUES		Fire: Pastoral management generally seeks to suppress fire and in the period 1993-2004, 87% of the site was burnt in fewer than three years, and none was burnt in more than six years. Feral animals: The site is within the relatively intensively managed pastoral estate, and numbers of feral grazers are low. Feral cats are common in the region, and very numerous following irruptions of the native long-haired rat <i>Rattus villosissimus</i> . Weeds: In mid-2006 <i>Parkinsonia aculeata</i> (Weed of National Significance) was observed to be extensive in the northern part of the lake with dense thickets lining sections of Newcastle Creek down into the lake delta (R. Jaensch pers. obs. 2006). The current distribution of this weed in this site is unknown. Other: Cattle and horses have caused significant vegetation loss, trampling and soil erosion around the Longreach Waterhole in the past (Pitts 1994) and continued access to the broader lake area by livestock is likely to limit regeneration of tree and shrub species and cause soil compaction. The fence around the Longreach Waterhole Protected Area is damaged every time the lake floods, making maintenance difficult. Following extensive work by the landholders, at the start of the 08/09 wet season the fence was complete (M. Bolam, CPC, pers. comm.).

LAKE WOODS - SITE OF CONSERVATION SIGNIFICANCE

MANAGEMENT INFORMATION	NRM groups	Barkly Landcare and Conservation Association, Jeulalikari Landcare (Tennant Creek).
	Protected areas	Longreach Waterhole Protected Area (89 km ² / 7% of site).
	Current management plans	<p>Site-specific plans: The protected area was created under a management agreement between Newcastle Waters Station and the NT Parks and Wildlife Service in 1985.</p> <p>An Environmental Management System for Newcastle Waters Station, including the Lake Woods area, commenced in 2006 and is ongoing (M. Bolam, CPC, pers. comm.). In conjunction with NRETAS, the landholder is developing a Conservation Management Plan for the site, using Ramsar guidelines.</p> <p>Other management plans: Australian Weeds Strategy (NRMMC 2007); Threat Abatement Plan for Predation by Feral Cats (Environment Australia, 1999).</p>
	Monitoring programs and research projects	<p>Aerial and ground surveys of waterbirds are conducted opportunistically by Wetlands International after major flood events (R. Jaensch, Wetlands International, pers. comm.).</p> <p>Vegetation of the Longreach Waterhole conservation area was surveyed and mapped in 1990 (Pitts 1990) and vegetation communities have since been identified and monitoring points established (Pitts 1994).</p> <p>There are four Tier 1 rangeland monitoring points within this site (Karfs and Bastin 2001).</p> <p>Fire in the tropical savannas is mapped continuously under the North Australia Fire Information Project http://www.firenorth.org.au/nafi/app/init.jsp</p>
KEY REFERENCES	Management recommendations	<p>Conduct a comprehensive assessment of the management issues at the site and develop a formal management plan to address significant threats, including weed control and management of grazing pressure.</p> <p>Review the management agreement for the Longreach Waterhole protected area and investigate opportunities to include all significant areas of Lake Woods into a protected area.</p> <p>Review the management agreement for the Longreach Waterhole protected area in the light of a realistic assessment of NRETAS having the resources and will to manage the site as originally agreed, before consideration is given to adding further areas (M. Bolam, CPC, pers. comm.).</p> <p>In cooperation with landholders, determine the benefits of possible nomination as a wetland of international importance (Ramsar site) (NRETA 2005).</p> <p>Control priority weeds in the site in association with the Barkly Landcare and Conservation Association (NRETA 2005).</p> <p>In conjunction with the Northern Land Council, investigate the interest of the local Aboriginal community to undertake land management activities in the Longreach Waterhole reserve (NRETA 2005).</p> <p>Conduct detailed surveys and ongoing monitoring of waterbird populations, vegetation condition and weeds within the site.</p>
	Papers and reports	<p>DIWA (A Directory of Important Wetlands in Australia). <i>Australian Wetlands Database</i>. Department of Environment, Water, Heritage & the Arts, Canberra ACT (accessed July 2007).</p> <p>Fleming, M.R., K.A. Johnson, P.K. Latz and J.R. McKean. 1983. <i>A biological survey of Junction Stock Reserve and Newcastle Waters Pastoral Lease on the Barkly Tablelands</i>. Unpublished report. Conservation Commission of the Northern Territory: Alice Springs.</p> <p>Jaensch, R.P. (1994a). <i>An inventory of wetlands in the sub-humid tropics of the Northern Territory</i>. Report to the Australian Nature Conservation Agency. Conservation Commission of the Northern Territory, Darwin.</p> <p>Jaensch, R. and Bellchambers, K. 1997. <i>Waterbird conservation values of ephemeral wetlands of the Barkly Tableland, Northern Territory</i>. Unpublished report to Australian Heritage Commission and Parks and Wildlife Commission of the Northern Territory, 76 pp.</p> <p>Pitts B. (1990). <i>Longreach Waterhole Vegetation Survey and Mapping</i>. Internal Report, CCNT: Alice Springs, NT.</p> <p>Pitts B. (1994). <i>Vegetation Communities of Longreach Waterhole</i>. Internal Report, CCNT: Alice Springs, NT.</p>
	Contributors	Roger Jaensch, Wetlands International - Oceania, Brisbane Alaric Fisher, Biodiversity Conservation, NRETAS, Darwin



Lake Woods (Photo: Roger Jaensch)



Eva Downs Swamp (Photo: Roger Jaensch)

Appendix – Risks to Birdlife

[Birdlife International says](#): Lake Woods supports more than 20,000 and up to 116,000 waterbirds when fully inundated (Jaensch and Bellchambers 1997; Wetlands International, unpublished data provided by R. Jaensch).

Sixty-seven species of waterbird have been recorded, and 23 of these have bred, in the site (Jaensch and Bellchambers 1997; Australian Wetlands Database 2001).

Australasian Darters, Little Black Cormorants, Great Egrets, Intermediate Egrets, Straw-necked Ibis and Royal Spoonbills breed in colonies ranging in size from several hundred to several thousand birds (Jaensch and Bellchambers 1997; R. Jaensch pers. comm. 2007).

The site is the only known inland breeding location, and possibly the only breeding location in the Northern Territory, for Great Egret (R. Jaensch pers. comm. 2007).

Australian Pelicans (8000), Oriental Pratincoles (6000+) and Little Curlews (700+) have been recorded in substantial but sub-threshold numbers (DEWHA 2007; R. Jaensch pers. comm. 2007).

Grey Teal (5000), Great Egrets (3000), Intermediate Egrets (2000) and Glossy Ibis (3300) have been recorded in moderate numbers (DEWHA 2007). Small numbers of Freckled Duck (e.g. 35 birds in March 1994) occur and may breed in the IBA (Jaensch 2003b).

The nationally vulnerable Australian Painted Snipe has been recorded on a single occasion (Jaensch 2003a) but could be more common than the single record indicates, based on the extent of suitable habitat and the high potential for the species to be overlooked by observers (R. Jaensch pers. comm. 2007).

Yellow Chats are abundant and breed in Lignum shrubland (Jaensch and Bellchambers 1997; DEWHA 2007).

The globally near threatened Australian Bustard and biome-restricted Yellow-tinted Honeyeater are occasionally recorded in the area (Atlas of Australian Birds database).

MORE ON THE CHEMICALS USED:

Example one: BE-9 Biocide, Tributyl tetradecyl (TTPC)

CAS number 81741-28-8

Molecular formula C₂₆-H₅₆P.Cl

Origin plans to have 17,000 litres of this stimulation chemical at the storage area

Use Hydraulic Fracture Stimulation Fluid HYBRID Recipe

Hydraulic Fracture Stimulation Fluid HVFR Recipe

Hydraulic Fracture Stimulation Fluid SW Recipe

Once TTPC has adsorbed onto sediments, it will break down into two other chemicals, (tributyl-(5-hydroxy-pentyl) phosphonium chloride and tributyl- (7-hydroxy-heptyl) phosphonium chloride).

Human health toxicity summary: NO DATA

Repeat dose, carcinogenicity or reproductive data: NOT available

Rats exposed by inhalation – gasping, irregular respiration, red nasal discharge, anogenital straining, abdominal distension, 6/10 animals dead within 3 days, autopsy- red coloured lungs, distension stomach/intestines/ mottled liver.

High toxicity by the inhalation route.

NOTE

Tributyl tetradecyl phosphonium chloride is a new active ingredient for use in Canada and as of 28 February 2018, no incident reports in humans or domestic animals have been reported to the PMRA.

“study waiver rationales were provided by the applicant for toxicokinetic, reproductive toxicity, carcinogenicity, and chronic toxicity data.”

“The PMRA did not accept the applicant’s waiver rationale regarding toxicokinetic data, since from a hazard characterization perspective, such information may be valuable in interpreting toxic effects, or lack thereof, and may assist in the extrapolation of animal toxicity data to humans.”

The waiver rationale submitted in lieu of a reproductive toxicity study was not accepted.

Therefore, the database does not contain the standard required studies for assessing potential toxicity to infants and children.

http://publications.gc.ca/collections/collection_2018/sc-hc/h113-9/H113-9-2018-11-eng.pdf

FROM HALLIBURTON MSDS BE-9

Hazard Overview

May cause eye and skin burns. May cause respiratory irritation. May be harmful if swallowed. May be harmful if inhaled

Classification

Xi - Irritant.

N - Dangerous For The Environment.

Risk Phrases R22 Harmful if swallowed.

R36/38 Irritating to eyes and skin.

R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Example 2: DCA-11001 breaker activator

Diethanolamine

CAS 111-42-2

Molecular formula C₄H₁₁NO₂

Origin plans to store 5,000 litres at the stimulation chemical storage area.

Hydraulic Fracture Stimulation Fluid HVFR Recipe

Hydraulic Fracture Stimulation Fluid HYBRID Recipe

Hydraulic Fracture Stimulation Fluid SW Recipe

Chronic repeated dose exposure

Studies in rats, Signs of toxicity were observed across all dose groups, and included tremors, extreme weight loss, abnormal posture and a dose dependent increase in microcytic anaemia. Changes in kidney weights were associated with an increase in nephropathy and renal cell necrosis. Increase in liver weight was associated with a moderate increase in serum bile acid concentration (2008). Based on treatment-related effects reported with a LOAEL of 32 and 80 mg/kg bw/day in rat and mouse studies, respectively, the chemical is considered to cause serious damage to health from repeated oral exposure.

Study- dermal application -Ulceration, inflammation, hyperkeratosis, and acanthosis occurred at all administered doses (32 - 500 mg/kg bw/day). Other signs of toxicity included reductions in body weight gain, anaemia, renal function changes and liver weight increases. Demyelination in the brain, nephropathy and renal tubular necrosis were also observed.

Carcinogenicity

Limited studies are available

In rats, the main histopathological effects were noted in kidneys of female rats with nephropathy, renal tubular epithelial cell necrosis and/or mineralisation, which increased in incidence and/or severity in a dose-dependent manner.

In mice, the liver was clearly the most affected organ, and female mice were more sensitive than males. Exposure to diethanolamine for two years produced a marked neoplastic response in the liver characterised by significant increases in the incidences and multiplicity of hepatocellular adenomas and hepatocellular carcinoma.

Effects in the kidneys included increased organ weights and increased incidence of tubular epithelial cell necrosis. The incidences of renal tubule adenoma and renal tubule adenoma or carcinoma (combined) occurred with a positive trend in male mice, but renal tubule carcinoma did not follow the same pattern. Detailed evaluation of the renal neoplasms

indicated a treatment- and dose-related increase in the incidences of renal tubule adenoma and adenoma or carcinoma (combined). Diethanolamine is eliminated in urine as the parent compound.

Reproductive Toxicity / Developmental Toxicity/Teratogenicity

No reproductive toxicity studies are available for diethanolamine.

It is likely that testicular degeneration in a 90-day drinking water study is a direct toxic effect of diethanolamine.

The critical health effects for risk characterisation include systemic acute effects (acute toxicity by the oral route of exposure) and local effects (skin, eye and respiratory irritation). The chemical may also cause harmful effects following repeated exposure through oral and dermal routes.

Australian Hazard Classification

The chemical is classified as hazardous, with the following risk phrases for human health in the Hazardous Substances Information System (HSIS) (Safe Work Australia):

Xn; R22 (Acute toxicity)

Xi; R38/41 (Irritation)

Xn; R48/22 (Repeated dose toxicity)

It is reported that the fatal oral dose of the chemical is 20g in humans (HSDB).

Acute Toxicity

Inhalation May cause respiratory irritation.

Eye Contact Causes severe eye irritation which may damage tissue.

Skin Contact May cause skin irritation.

Ingestion Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity

Repeated overexposure may cause liver and kidney effects. Amines may form nitrosamines, a suspect carcinogen, if product is mixed with nitrates, nitrites, nitrogen oxides or other nitrosamines.

Incompatibility (Materials to Avoid)

Strong oxidizers. Violent, explosive reaction with sulfur trioxide, decaborane, silver perchlorate, triethenyl aluminum, and hydrogen in presence of nickel catalyst at temperatures above 200 C.

Hazardous Decomposition Products

Oxides of nitrogen. Carbon monoxide and carbon dioxide.

<https://www.santos.com/media/2884/dca-11001.pdf>

Example 3: DCA-23003

FRICITION REDUCER HALLIBURTON

Origin plans 18,000 litres for the stimulation chemical storage area

There is a severe lack of information on this product, which must be rectified before the NT Government could consider allowing it.

NO CAS

NO INFORMATION AVAILABLE

Example 4: 'STOPPIT' Halliburton trade name

1000kg drilling chemical storage

Substances Crystalline silica, quartz

CAS Number 14808-60-7

11.1. Information on Toxicological Effects

Acute Toxicity

Inhalation

Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects.

Eye Contact

May cause mechanical irritation to eye.

Skin Contact

May cause mechanical skin irritation.

Ingestion None known.

Chronic Effects/Carcinogenicity

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology

Program classifies respirable crystalline silica as Known to be a human carcinogen. Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2). There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

<https://www.msdsdigital.com/stoppittm-msds>

Example 5: DCA-32002

Alcohols, C6-C12, ethoxylated propoxylated

CAS 68937-66-6

Alcohols, C10-C16, ethoxylated propoxylated

CAS 69227-22-1

Origin plans 15,000L stimulation chemical storage area

Hydraulic Fracture Stimulation Fluid HYBRID Recipe

Hydraulic Fracture Stimulation Fluid HVFR Recipe

Hydraulic Fracture Stimulation Fluid SW Recipe

H302 - Harmful if swallowed

H315 - Causes skin irritation

H318 - Causes serious eye damage

H400 - Very toxic to aquatic life

H410 - Very toxic to aquatic life with long lasting effects

See: https://www.msdsdigital.com/sites/default/files/msds_record_database/DCA-32002_1.pdf

BARADEFoAM HP

Lost circulation material

Defoamer

500kg drilling chemical storage

Polyether polyol

No CAS

Proprietary

Hazardous Decomposition Products

Aldehydes. Ketones. Organic acid vapors. Hydrocarbons. Carbon monoxide and carbon dioxide.

<https://www.msdsdigital.com/bara-defoamr-hp-msds-2>

PAC L

Fluid loss additive
polyanionic cellulose polymer
2,300 kg drilling chemical storage area

Contains no hazardous substances
No CAS Proprietary

Special exposure hazards
Organic dust in the presence of an ignition source can be explosive in high concentrations.

Hazardous Decomposition Products
Carbon monoxide and carbon dioxide
<https://www.msdsdigital.com/pac-l-premium-msds>

BARACARB®

Bridging agent, sized ground marble
500kg drilling chemical storage

Substances	CAS number
Calcium carbonate	471-34-1
Crystalline silica, quartz	14808-60-7

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

Risk Phrases

R49 May cause cancer by inhalation.

R48/20 Harmful: danger of serious damage to health by prolonged exposure through inhalation.

HSNO Classification

6.4A Irritating to the eye

6.7A Known or presumed human carcinogens

6.9A Toxic to human target organs or systems

<https://www.msdsdigital.com/baracarbr-50-msds-3>

BAROFIBRE®

500kg drilling chemical storage

Substances

Contains no hazardous substances

CAS Proprietary

Other hazards

Dust can form an explosive mixture in air

<https://www.msdsdigital.com/barofibre-o-msds>

BaraBlend-657 lost circulation material

500kg drilling chemical storage

BaraBlend®-657 lost circulation material (LCM) is an engineered, composite solution to help remediate partial to severe lost circulation

Composition/information on Ingredients

CAS Number

Calcium carbonate 471-34-1

Limestone 1317-65-3

Glass, oxide 65997-17-3

Polymer Proprietary 1 - 5% Combustible Dust

Crystalline silica, quartz 14808-60-7 Carc. 1A (H350)

Hazard Statements

H350 - May cause cancer by inhalation

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer.

Crystalline silica has also been associated with scleroderma and kidney disease.

Carcinogen.

11.2 Symptoms related to the physical, chemical and toxicological characteristics

Acute Toxicity

Inhalation

Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages.

Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Chronic Effects/Carcinogenicity

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans).

Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres

(June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as Known to be a human carcinogen.

Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2). There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

<https://www.msdsdigital.com/barablendr-657-msds>

BREAKERS

DCA-13002

300kg stimulation chemical storage area

Hydraulic Fracture Stimulation Fluid HYBRID Recipe

Sodium persulfate

CAS 7775-27-1

MOLECULAR FORMULA Na₂O₈S₂

Substances of the persulfate category are not stable in the environment.

Hazardous Decomposition Products Oxides of sulfur. Oxygen. Sulfuric acid.

The persulfates are capable of inducing skin and respiratory sensitisation

Acute Toxicity

Inhalation May cause allergic respiratory reaction.

Eye Contact May cause eye irritation.
Skin Contact May cause an allergic skin reaction.
Ingestion Irritation of the mouth, throat, and stomach.
<https://www.msdsdigital.com/dca-13002-msds-1>

DCA-11001 breaker activator

5,000 L stimulation chemical storage area
Diethanolamine
CAS 111-42-2
Molecular formula C₄H₁₁NO₂

Hydraulic Fracture Stimulation Fluid HVFR Recipe
Hydraulic Fracture Stimulation Fluid HYBRID Recipe
Hydraulic Fracture Stimulation Fluid SW Recipe

Chronic repeated dose exposure

Studies in rats, Signs of toxicity were observed across all dose groups, and included tremors, extreme weight loss, abnormal posture and a dose dependent increase in microcytic anaemia. Changes in kidney weights were associated with an increase in nephropathy and renal cell necrosis. Increase in liver weight was associated with a moderate increase in serum bile acid concentration (2008). Based on treatment-related effects reported with a LOAEL of 32 and 80 mg/kg bw/day in rat and mouse studies, respectively, the chemical is considered to cause serious damage to health from repeated oral exposure.

Study- dermal application -Ulceration, inflammation, hyperkeratosis, and acanthosis occurred at all administered doses (32 - 500 mg/kg bw/day). Other signs of toxicity included reductions in body weight gain, anaemia, renal function changes and liver weight increases. Demyelination in the brain, nephropathy and renal tubular necrosis were also observed.

Carcinogenicity

Limited studies are available

In rats, the main histopathological effects were noted in kidneys of female rats with nephropathy, renal tubular epithelial cell necrosis and/or mineralisation, which increased in incidence and/or severity in a dose-dependent manner.

In mice, the liver was clearly the most affected organ, and female mice were more sensitive than males. Exposure to diethanolamine for two years produced a marked neoplastic response in the liver characterised by significant increases in the incidences and multiplicity of hepatocellular adenomas and hepatocellular carcinoma.

Effects in the kidneys included increased organ weights and increased incidence of tubular epithelial cell necrosis. The incidences of renal tubule adenoma and renal tubule adenoma or carcinoma (combined) occurred with a positive trend in male mice, but renal tubule carcinoma did not follow the same pattern. Detailed evaluation of the renal neoplasms indicated a treatment- and dose-related increase in the incidences of renal tubule adenoma and adenoma or carcinoma (combined). Diethanolamine is eliminated in urine as the parent compound.

Reproductive Toxicity / Developmental Toxicity/Teratogenicity

No reproductive toxicity studies are available for diethanolamine.

It is likely that testicular degeneration in a 90-day drinking water study is a direct toxic effect of diethanolamine.

The critical health effects for risk characterisation include systemic acute effects (acute toxicity by the oral route of exposure) and local effects (skin, eye and respiratory irritation). The chemical may also cause harmful effects following repeated exposure through oral and dermal routes.

Australian Hazard Classification

The chemical is classified as hazardous, with the following risk phrases for human health in the Hazardous Substances Information System (HSIS) (Safe Work Australia):

Xn; R22 (Acute toxicity)

Xi; R38/41 (Irritation)

Xn; R48/22 (Repeated dose toxicity)

It is reported that the fatal oral dose of the chemical is 20g in humans (HSDB).

Acute Toxicity

Inhalation May cause respiratory irritation.

Eye Contact Causes severe eye irritation which may damage tissue.

Skin Contact May cause skin irritation.

Ingestion Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity

Repeated overexposure may cause liver and kidney effects. Amines may form nitrosamines, a suspect carcinogen, if product is mixed with nitrates, nitrites, nitrogen oxides or other nitrosamines.

Incompatibility (Materials to Avoid)

Strong oxidizers. Violent, explosive reaction with sulfur trioxide, decaborane, silver perchlorate, triethenyl aluminum, and hydrogen in presence of nickel catalyst at temperatures above 200 C.

Hazardous Decomposition Products

Oxides of nitrogen. Carbon monoxide and carbon dioxide.

<https://www.santos.com/media/2884/dca-11001.pdf>

DCA-13003

10,000 L stimulation chemical storage area

Chlorous acid, sodium salt

CAS 7758-19-2

Molecular formula ClHO2.Na

Several rodent studies of 30 to 90 days' duration have reported haemotoxicity from repeated doses of sodium chlorite.

Sodium chlorite has high acute dermal toxicity

Sodium chlorite is a severe skin irritant.

10.5. Incompatible Materials

Prolonged contact with aluminum. Contact with metals. Organic matter. Contact with ammonia. All flammables, especially petroleum products, asphalt & other volatile flammables. Ammonium compounds. Strong acids.

Acute Toxicity

Inhalation

Harmful if inhaled. Causes severe respiratory irritation.

Eye Contact

Causes serious eye damage.

Skin Contact

Causes severe burns.

Ingestion

Harmful if absorbed through the skin. Causes burns of the mouth, throat and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/ Carcinogenicity

Prolonged or repeated exposure may cause damage to the thyroid gland. Prolonged or repeated exposure may cause adverse effects on the blood.

Hazard Statements

EUH032 - Contact with acids liberates very toxic gas

Full text of H-Statements referred to under sections 2 and 3

H272 - May intensify fire; oxidizer

H301 - Toxic if swallowed

H310 - Fatal in contact with skin

H312 - Harmful in contact with skin

H314 - Causes severe skin burns and eye damage

H318 - Causes serious eye damage

H330 - Fatal if inhaled

H332 - Harmful if inhaled

H335 - May cause respiratory irritation

H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

H400 - Very toxic to aquatic life

H412 - Harmful to aquatic life with long lasting effects

<https://www.msdsdigital.com/dca-13003-msds-0>

BIOCIDES:

BE-9 Biocide

17,000 L stimulation chemical storage area

Tributyl tetradecyl (TTPC)

CAS number 81741-28-8

Molecular formula C₂₆-H₅₆P.Cl

Use Hydraulic Fracture Stimulation Fluid HYBRID Recipe

Hydraulic Fracture Stimulation Fluid HVFR Recipe

Hydraulic Fracture Stimulation Fluid SW Recipe

TTPC is an antimicrobial biocide that is effective at preventing microbial slime from forming in oilfield sites such as fracturing fluids and water flooding operations.

Very soluble in water

Once TTPC has adsorbed onto sediments, it will break down into two other chemicals, (tributyl-(5-hydroxy-pentyl) phosphonium chloride and tributyl- (7-hydroxy-heptyl) phosphonium chloride).

Human health toxicity summary

NO DATA

No repeat dose, carcinogenicity or reproductive data available.

Rats exposed by inhalation – gasping, irregular respiration, red nasal discharge, anogenital straining, abdominal distension, 6/10 animals dead within 3 days, autopsy- red coloured lungs, distension stomach/intestines/ mottled liver.

High toxicity by the inhalation route.

NOTE

Tributyl tetradecyl phosphonium chloride is a new active ingredient for use in Canada and as of 28 February 2018, no incident reports in humans or domestic animals have been reported to the PMRA.

“study waiver rationales were provided by the applicant for toxicokinetic, reproductive toxicity, carcinogenicity, and chronic toxicity data.”

“The PMRA did not accept the applicant’s waiver rationale regarding toxicokinetic data, since from a hazard characterization perspective, such information may be valuable in interpreting toxic effects, or lack thereof, and may assist in the extrapolation of animal toxicity data to humans.”

The waiver rationale submitted in lieu of a reproductive toxicity study was not accepted. Therefore, the database does not contain the standard required studies for assessing potential toxicity to infants and children

http://publications.gc.ca/collections/collection_2018/sc-hc/h113-9/H113-9-2018-11-eng.pdf

FROM HALLIBURTON MSDS BE-9

Hazard Overview

May cause eye and skin burns. May cause respiratory irritation. May be harmful if swallowed. May be harmful if inhaled

Classification

Xi - Irritant.

N - Dangerous For The Environment.

Risk Phrases R22 Harmful if swallowed.

R36/38 Irritating to eyes and skin.

R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Hazardous Decomposition Products

Chlorine.

Phosphorus acids.

Carbon monoxide and carbon dioxide.

https://www.aplng.com.au/content/dam/aplng/compliance/msds/BE-9_SDS.pdf

WHMIS Hazard Class D1A Very Toxic Materials E Corrosive Material

Hazardous Decomposition products

Chlorine. Phosphorus acids. Carbon monoxide and carbon dioxide.

<https://www.msdsdigital.com/be-9-msds-0>

Aldacide G

500 L completion chemical storage area

336 L drilling chemical storage area

Glutaraldehyde

CAS 111-30-8

Molecular formula C₅H₈O₂

Use Hydraulic Fracture Stimulation Fluid HYBRID Recipe

Hydraulic Fracture Stimulation Fluid SW Recipe

Planned Drilling Muds

Mutagenicity /genotoxicity

Early in vitro tests were negative (Watts 1984), but some recent bacterial assays and tests in mammalian cells indicated that glutaraldehyde could be mutagenic in vitro

Carcinogenicity

The main finding of the study was an increased incidence of large granular lymphocytic leukaemia (LGLL) in the spleen and liver of male and female rats in all groups, including the control group. Treated females showed a significantly increased incidence of LGLL and analysis for dose-response trend for the severity of LLGL revealed an increased severity in females at the higher dosages (53% in spleen and 54% in liver versus respectively 20% and 23% in untreated females) while no such observation were made for the males.

From Nicnas

“Under the conditions of the study, glutaraldehyde in drinking water at 50 ppm and above produced a statistically significant increase in the incidence of LGLL (large granular cell lymphatic leukaemia) in female rats after 104 weeks.”

DOC]

Glutaraldehyde - Nicnas

https://www.nicnas.gov.au/__data/assets/word_doc/.../PEC3-glutaraldehyde.docx

From Shell msds

Occupational exposure to glutaraldehyde has resulted in occupational asthma, significant skin, respiratory system and eye irritation, as well as skin sensitisation in some cases (NICNAS, 1994 and ECHA, 2014). Glutaraldehyde is corrosive to the skin and is a respiratory sensitiser. Based on these hazards, glutaraldehyde has been ranked in the Human Health Toxicity Profile as Hazard Band 3 (1 = lowest, 4 = highest, refer Appendix B).The inhalation hazards associated with use of glutaraldehyde need to be managed in an occupational setting as it can cause asthma

Based on the PBT assessment, glutaraldehyde has been given an overall hazard score of 1.7, indicating that it poses a moderate hazard to the aquatic environment.

https://www.shell.com.au/about-us/projects-and-locations/qgc/about-onshore-natural-gas/hydraulic-fracturing-and-chemicals-used/_jcr_content/par/textimage.stream/1507093698404/b83f951fdc11879ad2bb3bdff203739be2410a77/ad-glutaraldehyde.pdf

Glyoxal (Ethanedial)

CAS number 107-22-2

Molecular formula C₂H₂O₂

NO VOLUME given in appendix A

Use PLANNED DRILLING MUDS

Mutagenicity/ Genotoxicity

Ethanedial was shown to be mutagenic in both bacterial and mammalian cells in vitro.

Unscheduled DNA synthesis was reported in one study in mice in vivo, but only within the pyloric sphincter and liver and not in more remote organs.

Ethanedial is a skin and eye irritant and skin sensitiser

Ethanedial is classified as hazardous for human health in the Hazardous Substances Information System (HSIS) with the following risk phrases (Safe Work Australia 2013):

- Muta. Cat. 3 (Mutagenic Substances, Category 3)
- R68 (Possible risk of irreversible effects)
- Xn; R20 (Harmful by inhalation)
- Xi; R36/38 (Irritating to eyes and skin)
- R43 (May cause sensitisation by skin contact)

If released to soil, glyoxal is expected to have very high mobility based upon an estimated K_{oc} of 1.

VISCOSIFIERS /SUSPENSION AGENTS

BARAZAN D OR BARAZAN D PLUS

4,150 kg drilling chemical storage

Xanthan gum polymer

Xanthan gum polymer with dispersant

NO CAS

Could not find msds on msdsdigital

Enviro-thin

500kg drilling chemical storage

Modified iron lignosulfate

Modified lignosulfonate

No CAS

Proprietary

Special Exposure Hazards Decomposition in fire may produce toxic gases.
Hazardous Decomposition Products Oxides of sulfur.
<https://www.msdsdigital.com/enviro-thintm-msds-3>

SAPP (not discussed in toxicity summary)
50kg drilling chemical storage

Abbreviation for sodium acid pyrophosphate, a sequestering agent used to treat cement contamination and a deflocculant for low-temperature water muds.
Sodium acid pyrophosphate
CAS 7758-16-9
Molecular formula $\text{Na}_2\text{H}_2\text{P}_2\text{O}_7$

Eye contact: An eye irritant.
Skin contact: Contact with skin may result in irritation.
Inhalation: Breathing in dust may result in respiratory irritation.
Chronic effects, carcinogenicity no information
<https://msds.orica.com/pdf/shess-en-cds-010-000000034340.pdf>

Acute Effects:

Health Hazards: Particulates may cause mechanical irritation to the eyes, nose, throat and lungs. Particulate inhalation may lead to pulmonary fibrosis, chronic bronchitis, emphysema and bronchial asthma. Dermatitis and asthma may result from short contact periods.
<http://www.redriversupply.us/usrfiles/msds/nov/NOV%20SAPP%20MSDS.pdf>

BDF 677
4,770KG drilling chemical storage
no information
NO CAS
No MSDS

BDF 988
3,390 drilling chemical storage
no information
no CAS
no MSDS

BDF 933 or BaraLube W-933
864kg drilling chemical storage

No information
No CAS
No MSDS

COULD FIND NO INFORMATION

BARABUF
500kg drilling chemical storage

BARABUF® pH buffer is used to provide alkalinity for all water based systems
magnesium oxide
CAS 1309-48-4

Hazard Overview

May cause metal fume fever with flu-like symptoms. May cause allergic skin and respiratory reaction.

Symptoms related to exposure

Inhalation

May cause mild respiratory irritation. May cause allergic respiratory reaction. May cause Metal Fume Fever (if heated) which is characterized by chills, fever, aching muscles, dryness and metal taste in mouth and throat, headaches, sneezing, nausea, and irritation of the nose and trachea.

Skin Contact

May cause an allergic skin reaction. May cause mild skin irritation.

Eye Contact

May cause mild eye irritation.

Ingestion

May cause abdominal pain, vomiting, nausea, and diarrhea.

Aggravated Medical Conditions

Allergic skin and/or respiratory reaction. Liver and kidney disorders.

<https://www.msdsdigital.com/barabuf-m-sds-4>

FE-2 Buffer
200kg stimulation chemical storage area
No CAS
No MSDS

Buffers which are listed in toxicology screen spread sheets

Sodium hydroxide
CAS 1310-73-2

Sodium diacetate
CAS 126-96-5

Acids

Hydrochloric acid

50,000 L stimulation chemical storage area

CAS 7647-01-0

Over view

The gas becomes the acid in aqueous systems and volatilization of the gas can occur from aqueous systems.

If released to water, hydrogen chloride dissociates readily in water to chloride and hydronium ions, decreasing the pH of the water. The solution in water is a strong acid, it reacts violently with bases and is corrosive. Reacts violently with oxidants forming toxic gas (chlorine).

Attacks many metals in the presence of water forming flammable/explosive gas (hydrogen).

DCA-16001

Clay stabiliser

43,000 kg stimulation chemical storage area

Contains no hazardous substances in concentrations above cut-off values according to the competent authority

<https://www.msdsdigital.com/dca-16001-msds-0>

N-DRIL-HT PLUS

Filtration control additive

500 kg drilling chemical storage

mixture, modified starch

no CAS

Contains no hazardous substances

Symptoms related to exposure

Inhalation

May cause allergic respiratory reaction.

Hazardous Decomposition Products

Carbon monoxide and carbon dioxide.

<https://www.msdsdigital.com/n-drilr-ht-plus-msds-3>

DEXTRID® LTE™

Filtration control additive

4,600kg drilling storage area

modified and bacterially stabilized starch product

mixture
no CAS

Contains no hazardous substances

Special Exposure Hazards

Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential. Decomposition in fire may produce toxic gases.

Hazardous Decomposition Products

Oxides of sulfur. Carbon monoxide and carbon dioxide.

Environmental Precautionary Measures

Prevent from entering sewers, waterways, or low areas

<https://www.msdsdigital.com/dextridr-lte-msds-2>

QUIK-FREE®

pipe-freeing agent

500kg drilling chemical storage

Substances

Contains no hazardous substances in concentrations above cut-off values according to the competent authority

No CAS

proprietary

10.6. Hazardous Decomposition Products

Oxides of sulfur. Acrolein. Carbon monoxide and carbon dioxide

<https://www.msdsdigital.com/quik-free-msds>

SALT

15,000 kg chemical completion storage area

96,000kg drilling chemical storage

Planned Drilling Muds

Hydraulic Fracture Stimulation Fluid HYBRID Recipe

Hydraulic Fracture Stimulation Fluid HVFR Recipe

Hydraulic Fracture Stimulation Fluid SW Recipe

Sodium Chloride

CAS 7647-14-5

WHAT IS THERE TO SAY -- 100,000 KG OF SALT POTENTIALLY IN A FRESHWATER SYSTEM ???

CAUSTIC SODA LIQUID

15,000 L stimulation chemical storage area

Caustic Soda

1,400 Drilling Chemical Storage

Hydraulic Fracture Stimulation Fluid HYBRID Recipe

Hydraulic Fracture Stimulation Fluid HVFR Recipe

Hydraulic Fracture Stimulation Fluid SW Recipe

Sodium hydroxide

Molecular formula Na-O-H

CAS 1310-73-2

Avoid contact of solid NaOH with water due to strong exothermic reaction, leather, wood, acids, organic halogen compounds or organic nitro compounds. Carbon monoxide gas can form upon contact with reducing sugars, food and beverage products in enclosed spaces

NaOH is a strong alkali, so it's dissolution in water may locally raise the pH of the affected environment. The dissolution reaction is also strongly exothermic.

Sodium hydroxide is a corrosive irritant to skin, eyes and mucous membranes.

Caustic dusts are irritating to the upper respiratory system. Prolonged exposure to high concentrations may cause discomfort and ulceration of nasal passages.

Workers exposed 2 to 15 minutes reported throat irritation and watery eyes. Obstructive airway disease has been reported following chronic occupational exposure to sodium hydroxide mist

Australian Hazard Classification

C: R35 (Corrosive, causes severe burns)

Aquatic Toxicity Guideline

no data found

Reactivity:

Reacts violently with acids. Reacts exothermically on dilution with water.

Possibility of hazardous reactions:

Reacts with ammonium salts, evolving ammonia gas. Reacts readily with various reducing sugars (i.e. fructose, galactose, maltose, dry whey solids) to produce carbon monoxide.

Hazard Statement(s):

H290 May be corrosive to metals.

H314 Causes severe skin burns and eye damage.
<https://msds.orica.com/pdf/shess-en-cds-010-000031006701.pdf>

Choline Chloride
Temporary clay stabilizer, direct substitute for potassium chloride

Hydraulic Fracture Stimulation Fluid HYBRID Recipe
Hydraulic Fracture Stimulation Fluid HVFR Recipe
Hydraulic Fracture Stimulation Fluid SW Recipe

CAS 67-48-1
Molecular formula C₅H₁₄NOCl

Combustible. Gives off irritating or toxic fumes (or gases) in a fire.
NICNAS

DRIL-N-SLIDE™
Lubricant
500kg drilling chemical storage

Contains no hazardous substances in concentrations above cut-off values according to the competent authority
CAS NA
10.6. Hazardous Decomposition Products Carbon monoxide and carbon dioxide.

<https://www.msdsdigital.com/dril-n-slidetm-msds-0>

BAROLIFT®
Sweeping agent
500 kg drilling chemical storage

Cellulose
CAS number 9004-34-6

Hazard Overview
May cause eye irritation. Airborne dust may be explosive.

Special Exposure Hazards
Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations.

Hazardous Decomposition Products
Carbon monoxide and carbon dioxide.

Aggravated Medical Conditions

Respiratory disorders.

Chronic Effects/Carcinogenicity

Prolonged or repeated exposure to cellulose-containing fibers can cause byssinosis (cotton dust fever).

<https://www.msdsdigital.com/baroliftr-e-msds>

Protect Country NT

Appendix G: Research & Consulted Sources

Submission:

Legal Challenges

<https://www.alicespringsnews.com.au/2019/10/15/fracking-foes-to-take-protest-to-origin-meeting/>
amjngee mungee

<https://www.abc.net.au/news/2019-06-23/billionaire-businessman-takes-on-origin-energy-supreme-court-nt/11237598> pastoralist

Whistleblower:

<https://www.smh.com.au/business/origin-energy-denies-cover-up-after-accusation-in-explosive-lawsuit-20170124-gtxhkx.html> whistleblower

<https://www.theguardian.com/environment/2017/jan/27/origin-energy-ignores-coal-seam-gas-well-leaks-whistleblower-says> whistleblower (main)

<https://www.complispace.com.au/blog/financial-services-updates/penalties-for-breaching-new-whistleblower-law/> Sally Dow

Other:

https://www.alec.org.au/key_points_from_the_final_fracking_report

<https://www.alicespringsnews.com.au/2019/10/15/fracking-foes-to-take-protest-to-origin-meeting/>

<https://www.protectcountrynt.org.au/resources>

<https://www.tai.org.au/content/massive-nt-fracking-emissions-will-cost-billions-offset-0>

<https://www.abc.net.au/news/2017-02-21/nt-government-may-have-breached-on-laws-on-mine-clean-up-funds/8290040> NTG misuse of mining tax to rehab land, \$1billion at current cost

Other Sources:

NT Government

<https://frackinginquiry.nt.gov.au>

The independent Scientific Inquiry into Hydraulic Fracturing of Onshore Unconventional Reservoirs in the Northern Territory

Fracking Inquiry - Submissions

<https://frackinginquiry.nt.gov.au/submission-library>

Fracking Inquiry – Action Items

<https://hydraulicfracturing.nt.gov.au/action-items>

Guide to Petroleum Environment Regulations

https://nt.gov.au/_data/assets/pdf_file/0005/295907/em-petroleum-environment-regulations.pdf

GBAP - Geological & Bioregional assessment program

<https://www.bioregionalassessments.gov.au/assessments/geological-and-bioregional-assessment-program/beetaloo-sub-basin/beetaloo-sub-basin-user-panel-communicues>

CSIRO

<https://publications.csiro.au/rpr/download?pid=csiro:EP1310385&dsid=DS2> (climate change, 2014)

<https://www.csiro.au/en/News/News-releases/2018/New-partnership-to-deliver-methane-emission-science-for-the-NT>

<https://littlesis.org/maps/4425-climate-denial-network-in-australia> who funds labour & liberal

Dont Frack the Territory:

<http://dontfracktheterritory.org/gas-industry-myths-exposed/>

<http://dontfracktheterritory.org/resources/fact-sheets-pamphlets/>

ECNT

[http://www.ecnt.org.au/response to climate impacts in the nt](http://www.ecnt.org.au/response%20to%20climate%20impacts%20in%20the%20nt)

[http://www.ecnt.org.au/frack free nt](http://www.ecnt.org.au/frack%20free%20nt)

<http://www.ecnt.org.au/submissions>

Lock the Gate Q&A

[https://d3n8a8pro7vnm.cloudfront.net/lockthegate/pages/6353/attachments/original/1571977993/Orig in Q A digital.pdf?1571977993](https://d3n8a8pro7vnm.cloudfront.net/lockthegate/pages/6353/attachments/original/1571977993/Orig%20in%20Q%20A%20digital.pdf?1571977993)

https://www.lockthegate.org.au/no_go_fracking_zones_fracture_territory_communities_in_two no go zone

Protect Country NT

[https://d3n8a8pro7vnm.cloudfront.net/lockthegate/pages/6352/attachments/original/1571977319/LTG NT ShaleGas 2019 A4 SML %281%29.pdf?1571977319](https://d3n8a8pro7vnm.cloudfront.net/lockthegate/pages/6352/attachments/original/1571977319/LTG%20NT%20ShaleGas%202019%20A4%20SML%20%281%29.pdf?1571977319) Climate Change Impact - Shale

Australia Institute

<https://www.tai.org.au/sites/default/files/NT%20Fracking%20open%20letter%20Feb%202018.pdf> open letter

<https://www.tai.org.au/sites/default/files/P637%20NT%20offset%20paper%20%5BWEB%5D.pdf>

the use of offsets does not justify fracking the NT. This research finds that even if offsets are used, they will be expensive and legally difficult to implement.

Guardian

<https://www.theguardian.com/environment/2019/oct/09/northern-australia-fossil-fuel-climate-goals-paris-agreement?fbclid=IwAR0WmMaim73fXvJqRKSB9CctwxGph5Sz2ehfNI-gNvUDkcwXz1fMYKjEaDi0>

<https://www.theguardian.com/australia-news/2017/dec/22/northern-territory-says-no-report-exists-from-investigation-into-huge-toxic-dump> Macarthur River Mine

<https://www.theguardian.com/australia-news/2015/nov/24/indigenous-landowners-want-protection-from-mining-i-dont-know-what-happens-if-the-water-gets-messed-up>

<https://www.theguardian.com/environment/2018/jun/25/new-nt-gasfields-would-put-paris-commitment-in-doubt>

<https://www.theguardian.com/australia-news/2016/jun/29/aboriginal-landowners-criticise-northern-land-council-over-drill-permit> criticisms of NLC

<https://www.abc.net.au/news/2018-01-27/scientists-question-nt-fracking-inquiry-environmental-findings/9345710?pfmredir=sm> use

<https://www.theguardian.com/environment/2018/jun/18/not-safe-not-wanted-is-the-end-of-nt-fracking-ban-a-taste-of-things-to-come>

SBS:

<https://www.sbs.com.au/news/what-is-fracking-and-why-is-it-dividing-australia>

black coal leads about one tonne of carbon emissions for every megawatt hour of electricity generated, while that figure is 0.7 tonnes for gas and less than 0.1 tonnes for renewables. "So gas still leads to at least seven times more carbon emissions than renewables," We're being misled

NITV - WILL COUNTRY EVER BE SAFE FROM NT GOVERNMENT

<https://www.sbs.com.au/nitv/article/2018/11/01/will-country-ever-be-safe-nt-government>

ABC

<https://www.abc.net.au/news/2018-10-16/indigenous-traditional-owners-origin-energy-fracking-consent/10379162>

<https://www.abc.net.au/news/2018-10-17/origin-energy-fracking-traditional-owners-indigenous-aboriginal/10387736> 2018

ABM

<https://www.sbs.com.au/nitv/article/2019/10/16/nt-traditional-owners-protest-against-fracking-origin-energys-agm> 2019

AGM

<https://www.abc.net.au/news/2019-09-18/northern-territory-film-uranium-protests-uneearthed-for-festival/11519914> Film: Dirt Cheap at NTL

<https://www.abc.net.au/news/2019-05-04/frances-creek-mining-mine-decision-nt-government-failures/11078994> Pine Creek - NTG lack of oversight

<https://www.abc.net.au/religion/why-mining-giants-are-backing-an-indigenous-voice-to-parliament/10815008> blood money mines & instit recognition

<https://www.abc.net.au/news/2019-08-13/remote-community-yuendumu-running-out-of-drinking-water/11405024> drinking water Yuendumu

<https://www.abc.net.au/news/2018-01-27/scientists-question-nt-fracking-inquiry-environmental-findings/9345710?pfmredir=sm> too optimistic

SMH

<https://www.smh.com.au/national/fractured-future-water-fears-as-drilling-for-gas-begins-in-the-nt-20191003-p52xfj.html>

GOOD ENVIRONMENTAL SUMMARY HERE

Facebook <https://www.facebook.com/events/darwin-supreme-court/stand-up-for-stations-ban-fracking/362207934668464/>

Klayton Utz

<https://www.claytonutz.com/knowledge/2019/april/nt-reform-of-impact-assessment-and-approval-system-takes-next-step-but-without-general-environmental-duty>

<https://www.claytonutz.com/knowledge/2019/august/the-nt-opens-the-door-to-onshore-gas-exploration-drilling-and-fracking>

APH: **Native Title Act 1993 Native title representative bodies Reports Northern Land Council 2011-12**

<https://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;query=Id:%22publications/taledpapers/69173%22>

CDU - developing the north (Tony Abbott as PM)

<https://www.cdu.edu.au/sites/default/files/the-northern-institute/docs/northern-australia-white-paper.pdf>

CDU Search - Charles Darwin University Gas Industry

CDU: [SEMINAR] RIEL Seminar Series: Outback water research by Prof. Jenny Davis, Friday 25 October 2019, 3:30-4:30pm, Yello 1.1.39

BOM NT: Climate Change:

<https://frackinginquiry.nt.gov.au/?a=452118>

Baseline surface water and ground water assessments p4

<https://frackinginquiry.nt.gov.au/?a=410599>

From: [Naomi Hogan](#)
To: [OriginPetroleum DENR](#)
Subject: Objection to Origin Energy B2 Pty Ltd Beetaloo Basin Velkerri drilling and hydraulic fracturing program (EP76)
Date: Friday, 1 November 2019 12:16:56 PM
Attachments: [Lock the Gate Sub on Origin Velkerri frack plan.pdf](#)

To DENR,

Please find a submission from Lock the Gate Alliance attached.

Thanks,
Naomi

--

Naomi Hogan

National Coordinator
Lock the Gate Alliance
0401 650 411
[@naomihoges](#)
naomi@lockthegate.org.au

Always was, always will be, Aboriginal land.

1 Nov 2019

Onshore Petroleum Assessment, Department of Environment and Natural Resources

Via email: originenergy.ep76@nt.gov.au

Dear Onshore Petroleum Assessment team,

RE: Objection to Origin Energy B2 Pty Ltd Beetaloo Basin Velkerri drilling and hydraulic fracturing program (EP76)

Lock the Gate objects to this Velkerri drilling and hydraulic fracturing program (EP76).

Key concerns that lead us to this objection include:

- Lack of consent and lack of acknowledgement of the concerns and objections of Traditional Owners for the region proposed to be fracked for this Velkerri well.
- The NT Government and Origin's failure to respect the concerns of host landholders and acknowledge that the risks associated with hydraulic fracturing activities were not explained in full as part of negotiations for land access.
- The failure of the NT Government to enact the recommendation 7.12 of the Pepper Inquiry to require all fracking waste fluids to be held in enclosed tanks.
- The flagrant disregard for the increased risks of operating during the wet season, with Origin attempting to undertake movements of thousands of litres of dangerous chemicals, thousands of truck movements, and waste movement and storage during a period of potential high rainfall and unpredictable weather.
- Limited attempts to undertake a scientific understanding of the position of this proposed well in relation to the Lake Woods catchment and the downstream dangers of operations during the higher risk wet season on the sensitive, remote and ecologically and culturally significant region.
- The failure of the chemical analysis to expose the harmful chemicals in the patented fracking fluids, and the failure to consider the risks of mixing these chemicals with one another, in a high-pressure high heat underground environment, and with other contaminants found in the shale layer.

- The failure of the risk assessments to consider in detail the drilling through the highly pressurized, deep and salty Moroak aquifer, and the long-term risks.
- Origin's activities to attempt to force access onto neighboring cattle stations for exploration works, before improved landholder negotiation rights are in place.
- The failure of the NT Government to enact any credible climate position that deals with the increased emissions from fracking gasfield activity in the Northern Territory.
- There are concerns about the waste transport to Qld, the lack of proper waste treatment and disposal options for unconventional gas waste, and risks to the headwaters of the Murray Darling Basin from current waste facilities mooted in Qld.
- The failure of the NT Government to properly consider and make meaningful improvements in light of the concerns raised with the chemicals and timing of Origin's Kyalla Drilling and Hydraulic Fracturing 2019 Program EP117 N2 proposal, demonstrating a lack of genuine interest in feedback from health professionals, Traditional Owners, scientists and concerned community members.

In light of the information gaps and concerns, we object to the plans outlined in this EMP.

Thank you for your consideration of this feedback.

Yours truly,

Naomi Hogan
Lock the Gate Alliance

From: [Ritsuko Maeda](#)
To: [OriginPetroleum DENR](#)
Subject: Origin EMP EP76 comment
Date: Friday, 1 November 2019 10:47:54 PM

Please provide a clear conceptual site model identifying all contaminants of concern and their potential human health and environmental impacts.

From: [Jessica Matteson](#)
To: [OriginPetroleum_DENR](#)
Subject: Objection to Origin Velkerri 76 S2 EMP
Date: Friday, 1 November 2019 10:29:55 AM

To whom it may concern,

I am emailing you to state my objection to Origin Velkerri 76 S2 EMP.

This submission to be lodged as an official objection on the following grounds:

- 1) The EMP authorises the use of open waste-water storage tanks in direct defiance of recommendation 7.12 from the Fracking Inquiry.
- 2) There is no information provided on how emissions, including fugitive emissions will be offset as required by recommendation 9.8 from the Fracking Inquiry.
- 3) Hydraulic stimulation should not be conducted over the wet season because of the high risk of flooding and extreme weather that will be impossible to accurately predict. This risk is simply too great and should operationalise the precautionary principle.
- 4) The uncertainty around baseline groundwater information, acknowledged by the Fracking Inquiry has not been addressed. No fracking should commence unless this information has been developed by comprehensive and long-term baseline groundwater studies.

Regards,

Jess Matteson
Alice Springs, 0870.

From: [Mid Merry](#)
To: [OriginPetroleum DENR](#)
Subject: Objection to Origin Velkerri 76 S2 EMP
Date: Friday, 1 November 2019 10:20:59 AM

This submission to be lodged as an official objection on the following grounds:

- 1) The EMP authorises the use of open waste-water storage tanks in direct defiance of recommendation 7.12 from the Fracking Inquiry.
- 2) There is no information provided on how emissions, including fugitive emissions will be offset as required by recommendation 9.8 from the Fracking Inquiry.
- 3) Hydraulic stimulation should not be conducted over the wet season because of the high risk of flooding and extreme weather that will be impossible to accurately predict. This risk is simply too great and should operationalise the precautionary principle.
- 4) The uncertainty around baseline groundwater information, acknowledged by the Fracking Inquiry has not been addressed. No fracking should commence unless this information has been developed by comprehensive and long-term baseline groundwater studies.

STOP FRACKING. DON'T FRACK. its not your land to destroy.

Mid Merry

From: noreply@denr.nt.gov.au
To: [OriginPetroleum_DENR](#)
Subject: DENR - Consultation Form - 749927
Date: Friday, 1 November 2019 1:10:51 PM

Contact details

First name: [REDACTED]
Surname: [REDACTED]
Email address: [REDACTED]
Country: Australia
Postcode: 0870
Phone number: [REDACTED]
Stakeholder type: Community

Feedback

Activity you are providing feedback on: Origin Energy B2 Pty Ltd Velkerri Drilling, Hydraulic Fracturing and Well Testing EP76 S2

Category type: Social and cultural, Flora and fauna, Water, Waste Management, Climate change, Human health, Chemicals, Regulation and compliance, Well integrity

If other, please specify::

Comments: Subject line: Objection to Origin Velkerri 76 S2 EMP This submission to be lodged as an official objection on the following grounds: 1) The EMP authorises the use of open waste-water storage tanks in direct defiance of recommendation 7.12 from the Fracking Inquiry. 2) There is no information provided on how emissions, including fugitive emissions will be offset as required by recommendation 9.8 from the Fracking Inquiry. 3) Hydraulic stimulation should not be conducted over the wet season because of the high risk of flooding and extreme weather that will be impossible to accurately predict. This risk is simply too great and should operationalise the precautionary principle. 4) The uncertainty around baseline groundwater information, acknowledged by the Fracking Inquiry has not been addressed. No fracking should commence unless this information has been developed by comprehensive and long-term baseline groundwater studies.

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Attachment 3: No file uploaded

Attachment 4: No file uploaded

Attachment: No file uploaded

5:

Privacy: Tick this box if you wish for your name and contact details to be treated as confidential. While the department will use their best endeavours to comply with your request, you are advised that your complete submission may be disclosed in accordance with the Information Act 2002 and if otherwise required by law.

From: [Jaclyn Nugent](#)
To: [OriginPetroleum DENR](#)
Subject: Objection to Origin Velkerri 76 S2 EMP
Date: Friday, 1 November 2019 6:15:58 PM

To whom it may concern,

This submission is to be lodged as an official objection on the following grounds:

- 1) The EMP authorises the use of open waste-water storage tanks in direct defiance of recommendation 7.12 from the Fracking Inquiry.
- 2) There is no information provided on how emissions, including fugitive emissions will be offset as required by recommendation 9.8 from the Fracking Inquiry.
- 3) Hydraulic stimulation should not be conducted over the wet season because of the high risk of flooding and extreme weather that will be impossible to accurately predict. This risk is simply too great and should operationalise the precautionary principle.
- 4) The uncertainty around baseline groundwater information, acknowledged by the Fracking Inquiry has not been addressed. No fracking should commence unless this information has been developed by comprehensive and long-term baseline groundwater studies.

Regards,

Jaclyn Pirrello

From: noreply@denr.nt.gov.au
To: [OriginPetroleum_DENR](#)
Subject: DENR - Consultation Form - 749934
Date: Friday, 1 November 2019 2:05:04 PM

Contact details

First name: [REDACTED]
Surname: [REDACTED]
Email address: [REDACTED]
Country: Australia
Postcode: 0870
Phone number:
Stakeholder type: Community

Feedback

Activity you are providing feedback on: Origin Energy B2 Pty Ltd Velkerri Drilling, Hydraulic Fracturing and Well Testing EP76 S2

Category type: Social and cultural, Flora and fauna, Water, Waste Management, Climate change, Human health

If other, please specify::

Comments: How can the NT Government have a Climate Action Plan and be moving ahead with fracking? On this point alone I vehemently object to this proposal. We simply cannot continue to rely upon extractive industries in the face of the climate crisis. We know this. Businesses, local governments and individuals are making changes to reduce their carbon footprints. Meanwhile, projections from the NT Government are that emissions will peak after 2030, rising from 16.5MT CO2e per annum to a projected 25MT CO2e per annum. This increase in emissions is due to the gas industry and will dwarf action from all other sectors. I urge the government to stop fracking, reduce reliance on the gas industry and to focus on low-carbon jobs, including those in the renewables sector. Further I strongly support Traditional Owners of this country in stating that fracking is risky, polluting, invasive, and unnecessary and should not go ahead in the NT. I urge the government to protect this country and to ban fracking in the NT.

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Attachment: No file uploaded

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Privacy: Tick this box if you wish for your name and contact details to be treated as confidential. While the department will use their best endeavours to comply with your request, you are advised that your complete submission may be disclosed in accordance with the Information Act 2002 and if otherwise required by law.

From: [Graeme Sawyer](#)
To: [OriginPetroleum_DENR](#)
Subject: see attached submission
Date: Friday, 1 November 2019 5:16:51 PM
Attachments: [PCA Origin Velkerri EMP.docx](#)
[ATT00001.htm](#)



Protect Country Alliance

Submission objecting

Origin Energy B2 Pty Ltd Beetaloo Basin Velkerri drilling and hydraulic fracturing program (EP76)

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Introduction

The Protect Country Alliance (PCA) brings together impacted landholders, communities, and civil society groups concerned about gas fracking proposals or projects in the Northern Territory. The Alliance is made up of delegates representing regional communities across the NT including; Elliott, Marlinja, Minyeri, Borroloola, Mataranka, Jilkminngan and Hermannsberg. The PCA also has member organisations based in all major population centres across the NT.

Based on ongoing relationships and conversations with landholders, Traditional owners, and groups across the NT, the PCA writes to object to the Origin EMP on the grounds that it does not sufficiently demonstrate best practice, nor has Origin practiced appropriate community consultation. There is no social licence for fracking processes within the NT.

Despite Origin's claims that all landholders and Traditional Owners consent to this project, the PCA works with many in the region, including Native Title Holders and Traditional Owners and pastoralists who strongly object and are extremely concerned about the risks to their livelihoods. This division and discrepancy should be acknowledged in the EMP. The current EMP presents unacceptable risk to the Territory's water, land and culture.

Risks

This EMP outlines a set of examples where the risks created by the proposal mean the project should be delayed to enable further information to be gathered to answer some key questions. This is in line with the Pepper inquiry recommendations:

In a number of cases, the Panel has recommended that a strategic regional environmental and baseline assessment (SREBA) (see Chapter 15) must be undertaken to provide the additional scientific knowledge and baseline information required before a final risk assessment can be made.

There are a number of concerns around corrosion, unrecognised pressure and salinity in the basin and uncertainty about the implications for well integrity. These issues should be better understood before proceeding. They have major implications for any risk assessment relating to the processes outlined in the EMP. Once this well is drilled it is impossible to undo the risks created.

This proposal involves the use of a range of substances and chemicals that have not been adequately evaluated. Further, there are high risks that these chemicals and other pollutants created during the fracking process will not stay in the deep aquifers where they are injected.

The Moroak Aquifer underlies the Beetaloo sub-basin and is above the upper, middle, and lower Velkerri layers where fracking companies hope there is enough gas for them to start production. See diagram Formation Layers at end of this document.

Data from wells such as Ronald 1 and Tanumbirini 1 show reason for great concern. The aquifer is at significant pressure (over 1500 psi) and very high salinity (118000 ppm from Ronald1). This raises a number of concerns about corrosion and movement of pollutants to other aquifers.

The NT Government, in a letter this September 2019, (File reference: LRM2017/0119-0002 M19-0291DENR) was unable to answer the simple questions as to what is the pressure and salinity in the Moroak Aquifer. This lack of knowledge is incredibly concerning with regard to this Origin request to frack both vertically and horizontally, with the well going through the Moroak aquifer. This is alarming, especially in light of the fact that the government has approved the drilling of holes through this aquifer and the high injection of a range of dangerous chemicals into the shale for fracking below this layer and along the vertical shaft. Clearly this current lack of knowledge means that a renewed risk assessment must now be conducted and the EMP should not be approved until a risk assessment of the Moroak is done.

The risks created by the Moroak aquifer have clear implications for reg 4(b) (which concerns the 'precautionary principle'), clearly there is a risk of inter aquifer pollution and this could turn the Gum ridge aquifer saline making it unsuitable for human and stock use. The regulated activity poses a threat of serious or irreversible environmental damage which warrants the application of the precautionary principle. Risks such as this are a key concern of pastoralists and Traditional Owners across the region.

The NT Government has a long history of inadequacies monitoring environmental projects, Montarra oil and other examples. Unless time is taken to evaluate these risks now there is likely to be another example from Fracking.

The waste water management plan is inadequate. Common biocides used in the industry are highly toxic to aquatic organisms and must not be released into the environment according to the Material Safety data sheet. Given the risks created by the pressure within these proposed drilling areas and the impacts of sulphide reducing bacteria the specific chemical compounds must be provided to enable an understanding of the risks of these chemicals to stygofauna and aquatic and terrestrial systems. The analysis in relation to these chemicals is insufficient to reduce any of the risk assessments.

The likelihood of corrosion and pressure causing saline water and fracking chemicals to move up the aquifer systems at some point in the future is very high. Clearly there are massive risks for negative impacts on future generations.

The scenario breaches reg 9(1)c as it could have devastating impacts on biodiversity and aquatic systems. For biocides to be released into the aquifers and river systems would be devastating.

Importantly, Origin's plans to undertake hydraulic fracturing activities are completely unacceptable as they do not give an adequate explanation of the waste management issues associated with such operations. The NT Fracking Inquiry report outlined on page 153, "However, there is still the very real possibility of overtopping of storage ponds during the wet season." And on page 156, "However, it is during the wet season that road transport accidents are most problematic, with any spilt contaminants potentially being washed overland to ecologically important temporary or permanent

waterbodies."

Origin should not be permitted to undertake these activities during the wet season as outlined in their EMP, due to compounding wet season risks. Keeping materials on site during the wet season is increasing risk and we do not accept that it is possible to mitigate the implications of this. Access by bird and amphibians to various water bodies is too risky.

Well Integrity

The EMP confirms the use of biocides which confirms corrosive bacteria are a concern. If this is being done to keep corrosive bacteria at bay then the point about corrosion of wells from the outside in becomes relevant.

Feedback from experts and research indicates this is potentially a massive problem. It means all wells are going to fail eventually and potentially in the near future and the contents, including these biocides and other chemicals will leak, and these breaches are likely to be 'close to surface', right in the beneficial aquifers.

The Oil and Gas Industry can only control sulphide reducing bacteria (SRB) when it is on the inside of a well with biocides. The outside of the well is in a natural control until a gas or oil well goes through the environment where they are (mainly damp soil with organic material present or other bacteria which can provide a food source/or aquifers). This gas or oil well, if cement coated, gives the SRB food and their numbers grow as the natural control (food) is no longer in short supply. As they "eat" the sulphates in the cement they exhaust Hydrogen Sulphate (rotten egg gas) which in the presence of water turns to acid, the whole cycle starts again.

How long a well's external surface will last before it is broken down enough to allow cross contamination of the aquifers, depends greatly upon the number of bacteria present, but this will eventually cause the connection between neighbouring aquifers to occur.

An example not from the Beetaloo but highlighting similar issues: The effect of

corrosive water on cementing and casing in the NT is provided by deep oil exploration wells (McDills and Dakota) drilled in the Perdika/Great Artesian Basin in the 1960s. (The Perdika Basin is one of the prospective unconventional shale gas areas of the NT). Now, some fifty years later, the steel casing has almost entirely corroded away, resulting in inter-aquifer contamination. This well required expensive rehabilitation work to stem artesian flow. This single bore cost the Territory and Commonwealth Governments \$500,000 to plug as the company responsible for the well was insolvent. This example highlights the issue of operator insolvency due to the boom and bust cycles of oil and gas development which complicates efforts to hold liable parties responsible and provide for timely environmental reclamation.

Corrosion is an issue in the CSG areas of QLD and confirms our fears that this is going to cause wells to fail eventually and injected chemicals and related material released from the fractured rock layers in the basin will leach eventually into waterways and beneficial aquifers. This includes the Roper and McArthur and other flows out of the catchments in the Beetaloo area.

Saltel Industries was approached in 2016 by one of Australia's leading natural gas producers, to tailor a solution for their unusual problem: in some of their CSG wells in Queensland, the 7in production casing must cope with severe and localized external corrosion, developing at shallow depth. These corrosion cases are suspected to be caused by bacteria growing under specific pressure and temperature environments. Microbiologically-influenced corrosion seems to be systemic in the region, and other operators might encounter similar issues in their CSG wells. There needs to be further study of this issue of bacterial corrosion in the SREBA before these wells are allowed to proceed.

The hypersaline nature of the deep aquifers and the high temperature further raises concerns about the integrity of the wells as these environments are highly corrosive, even for stainless alloys. Corrosion is an issue in QLD after 10 years and there is a major concern among stakeholders that integrity failure will connect the hypersaline

deep aquifers like the Moroak to the beneficial fresh water systems like the Gum Ridge aquifer. This poses a massive risk to the human and animal use of the region in the medium and long term and is clearly a breach of ESD principle for intergenerational equity.

Concerns related to fracking chemicals

The NT government needs to ensure that all chemicals used have been through health testing by the manufacturers before use.

There area range of chemicals in the proposed project and many of them have very high toxicity ratings with LC50 ratings at or near acute risk levels. There is no attempt to analyse how the combined toxicity of this cocktail of chemicals may interact to cause extreme toxicity reactions across a range of organisms.

This adds significantly to the risk factors associated with the eventual breakdown of the well and the failure of its structure potentially allowing leakage of these chemicals. The pressure in the deep Moroke aquifer further increases the likelihood of extreme negative outcomes. The threats to stygofauna and aquatic systems appear to be extreme in that the consequences are very high and the likelihood is also higher over time.

A large part of the problem here is that the risks appear to be heavily loaded against future generations, a clear breach of ESD principles which are supposedly the guiding principles of the NTG in this area.

Many of the chemicals that are being used present low/no danger as a stand alone product. However, in the fracking process, many chemicals get mixed together, including with unknown elements in the ground. This can result in toxic and harmful chemicals. More information is required as to how the proposed chemicals mix and what the products of this might be. Surfactants are a case in point. Many have low toxicity risk to humans but are very toxic at low concentrations to amphibians. The analysis of biodiversity impacts is inadequate.

Some of the fracking chemicals Origin plans to use are harmful to health both human and animal health and more study is required through the SREBA before they can be used. The list of substances Origin want to use contains chemicals that have known

health impacts. An independent review of the substances shows they are linked to: acute toxicity, respiratory irritation, tissue damage, burns, and cancer. Some are very toxic to aquatic life with long lasting effects.

The highest risk area for spills of the dangerous fracking chemicals is during transport. Yet Origin simply say that they will have road traffic controls in place and a spill response plan, so there's no further consideration needed. Road traffic controls in the Wet season are very different to what are required in the Dry. The risks are compounded to an unacceptable level, and the timeline for moving fracking chemicals both around and off the site should be prohibited during the Wet. Origin have also failed to do an overview of the specific transport routes and the sensitive environmental receptors that they may pass through with the fracking chemicals.

The EMP admits that the transportation of chemicals involves risks of:

“o Human and environmental receptor exposure to chemicals as a result of accidental release during transport from supplier warehouse to well lease or between well leases (i.e. truck rollover).

o Human and environmental receptors exposed to surface water bodies that received runoff from an accidental release during transportation.

o Human and environmental receptor exposure to chemicals as a result of accidental release during transport of surplus chemicals and wastes (i.e., flowback) from the well lease to a disposal/management facility.

o Human and environmental receptor exposure to chemicals as a result of accidental release of stored wastes and/or flow back.

o Human and environmental receptors exposed to surface water bodies that received runoff from an accidental release of stored wastes and/or flow back.”

Territorians and the landscape and waterways should not be burdened by these risks.

Open air wastewater tanks pose unacceptable risk to biodiversity

The Protect Country Alliance has strong concerns at Origin's plans to store wastewater fluid and toxic chemical flowback fluid in open air waste ponds. This practice directly contradicts recommendation 7.12 from the Fracking Inquiry and presents significant risk to biodiversity in the region.

First and foremost, the area concerned can only be described as data deficient in relation to biodiversity and environmental information. These inadequacies in knowledge fundamentally challenge the conclusions in the EMP. As an example, to just do a desktop audit of biodiversity about the area and then assume that there are no concerns does not reflect the data deficient basis of the systems used. This lack of information about the region's biodiversity extends across the land and water throughout the region and was highlighted in the Pepper Inquiry.

It is vitally important that work be done to provide guidance around these many issues as in situations where knowledge is uncertain the Precautionary Principle underlying our environmental legislation requires a very cautious approach.

If companies are wishing to exploit non-renewable resources in the area they have a responsibility to do the work required to ensure that environmental risks are 'acceptable'. Decisions based on such limited and flawed data are unacceptable and a range of on-ground work needs to be undertaken to improve the knowledge base upon which to evaluate decisions.

Open water storages should be not allowed in line with the Pepper inquiry recommendation 7.12 and others. To allow these pits will lead to dramatic and unacceptable changes in Biodiversity and massively increase risks that would not happen if the enclosed tanks were used.

It is unacceptable that Origin outlines the risks to birds from the open storage tanks (that were supposed to be banned):

"Water will be managed through the use of engineered treatment tanks that will

contain liquids but may have the potential for exposures to avian receptors.”

Origin admits that the below chemicals are harmful and could be accessed by birds:

- *Amine oxides, cocoalkyldimethyl (CAS number 61788-90-7)*
- *Chlorous acid, sodium salt (CAS number 7758-19-2)*
- *Glutaraldehyde (CAS number 111-30-8)*
- *Tributyl tetradecyl phosphonium chloride (CAS number 81741-28-8)*

This is unacceptable. Many species of honeyeaters and similar specie plunge bathe in water bodies in these areas. Polluted water should be separated from biodiversity as per Pep[per inquiry recommendations.

Amphibians

The fencing around freshwater storages and all other water needs to be frog proof, not just to have wildlife ladders installed. Native burrowing frogs are likely to try to access standing water. This highlights one of the risks relating to holding polluted water in open evaporation ponds in that it is likely to attract native species who cannot detect the pollutants. This include elements like surfactants which are not a human health issue but a massive issue for biodiversity, especially amphibians.

There are many unknowns about this region’s biodiversity but especially the frogs. There is a need to determine the range of the Water-holding frog *Litoria platycephala* and to determine whether the species in the Macarthur/ Beetaloo area is in fact a different species.

Cane toads *Rhinella marina* are a major threat to a number of animal species with population level declines documented (Doody 2004, 2006, 2009). Allowing open water storage pits will dramatically increase cane toad numbers in the region with broad biodiversity implications.

Doody (2009) concludes, “ We observed population–level declines in Australian predatory lizards caused by the arrival of an invasive species, *Bufo marinus*, at two sites along the Daly River. In contrast, there were no significant declines in populations of *Crocodylus johnstoni*. *Amphibolurus gilberti* populations increased substantially, presumably due to the losses in *Varanus panoptes*, a known predator of this species. These findings indicate that the invasion of *B. marinus* into this ecosystem caused a structural change in the lizard community. Changes in the abundance and community structure of these top predators may alter species–species interactions, in particular patterns of predation and competition, and the energy dynamics of the ecosystem. Recovery from low numbers, and possibly local extinction, may depend on the control of *Bufo marinus*, and/or the recolonization from individuals from the surrounding landscape.”

Further personal communication with the author indicates follow up surveys showed some species, like *V.panoptes* and *V.mitchelli* , are no longer present at the survey sites. Follow up work in the Kimberley’s reinforced the initial findings from the NT and indicated a broader range of varanid species were impacted.

Many areas of the NT were originally thought to be too dry for cane toads to colonise but this has been shown to be incorrect and the main reason that toads have been able to colonise large areas of Semi–arid and arid NT is because of the use of open water storage in the cattle industry. The creation of such spaces for water and waste–water storage for fracking will create a situation where cane toads will seek refuge and breed in the area. This would otherwise not be the case and the cane toad population would be massively increased if open water pits were introduced.

This is particularly destructive of varanid populations and other reptile species. By introducing standing water bodies into an area the cane toad population will not only increase but breeding of cane toads will occur at the sites. This introduces a size class of cane toads into the area that would not be occurring without the water pits and this causes dramatic declines and even local extinctions of smaller Varanid species and the

juvenile stages of the larger Varanid species such as *V.panoptes*, *V.gouldii* and *V.mertensii*.

Species that will be impacted negatively are likely to include:

Varanus acanthurus	Ridge-tailed Monitor
Varanus baritji	Black-spotted Ridge-tailed Monitor
Varanus mertensi	Merten's Water Monitor
Varanus mitchelli	Mitchell's Water Monitor
Varanus scalaris	Spotted Tree Monitor
Varanus tristis	Black-tailed Monitor
Tiliqua scincoides	Common Blue-Tongued Lizard
Varanus panoptes	Yellow Spotted Monitor
Varanus gouldii	Sand Monitor

There is also research indicating impacts on smaller lizard species due to large toad populations. In a two-year study in the Roper River region of the Northern Territory, Catling et al. (1999) found that high cane toad densities were associated with a significant reduction in the abundance of small lizards, possibly caused by reducing their invertebrate food supply. Like so many of these aspects of the local environment there is a deficiency of data that should be addressed before any such changes are

created in the local environment.

Plastic lined pits can be death traps for many species of native frogs that do not have toe pads. Plastic pits have been used as traps for some frog species. The risk includes many of the burrowing Frog fauna in the Beetaloo region and these species are likely to move to standing water bodies to breed. The pits should not be allowed, but if they are they need to be carefully designed. This elevated risk includes the period over the wet season where the pits may be emptied to avoid them overflowing. They will still collect water and become frog breeding sites, especially for burrowing frogs and any residues will cause problems E.G. Surfactants are highly toxic to native frog tadpoles at very low concentrations.

There are additional issues with the use of chemicals and this puts the waste-water elements of this plan in a particularly high risk category. Surfactants and many other chemicals are especially toxic for frogs and have implications for other species such as birds. Even if the pits are emptied there will be residues from waste water present and this will impact on wildlife.

Bird life

Anecdotal evidence from ongoing discussions with land holders and Traditional Owners in the proposed drilling area highlight the impact that a record breaking hot and dry season has had on local water and wildlife. Birds and other wildlife are relying on limited water. If Origin were to introduce bodies of open water in the area through open storage ponds– there would be wildlife accessing these ponds. This could poison wildlife and spread contamination. Many bird species will drink from available water pits and bathe in the shallows and some will plunge into the water to drink and to preen. Water with surfactants or toxic chemicals can cause issues and lead to deaths of birds.

The claim has been made that surfactants are “no more toxic than common household substances”, and are 'commonly found in everyday products, from toothpaste to laxatives to detergent to ice cream' (University of Colorado, 2014). However, surfactants can be deadly for birds and frogs. This complete lack of concern for biodiversity is unacceptable especially given the biodiversity crisis highlighted by the Paris Accord in 2019.

Most bird taxa have a gland at the base of the tail, the uropygial or preen gland. The oil it produces keeps the feathers flexible and assists the interlocking barbules to stay intact, thus forming a barrier that helps repel water and insulate the bird. In the case of waterbirds, preening oil helps them stay afloat, and without it birds may even drown.

Birds may also die because surfactants reduce the ability of feathers to act as insulation in cold weather, and have been used in the USA to control populations of pest species (Lustick, 1976). In semi-arid areas of the NT temperatures have been known to fall very low in winter, and in the driest months of the year, the time when birds are likely to be seeking water.

There are a range of other chemicals within the flow back and other waste water from Fracking and it is unacceptable to expose our biodiversity to the associated risks when there is a solution of enclosed storage as recommended.

There is also not enough detail in the EMP about how biodiversity, especially birdlife would be prevented from accessing the wastewater. There is also no mention of the pond covers being heat or extreme weather tested for Territory conditions.

Fracking wastewater is suggested to remain on site for over 12 months, including waste remaining on site during the unpredictable wet season months. This is unacceptable. The occasional requirement for a cover over the open ponds does not meet Recommendation 7.12.

Biocides are also very toxic to a range of wildlife and are especially dangerous in aquatic systems. The water systems like the Gum Ridge Aquifer are poorly studied in relation to troglofaunal and aquatic flows and yet very dangerous substances are being injected into these areas by these practices.

Transport risks and tourism impacts

Landholders and traditional owners in the NT are well aware of the increased traffic associated with mining activities. Pastoralists at Lucy Creek Station recall 50 road trains moving through their property on the first day of an experimental fracking well drilled by Petrofrontier in 2013. Just one well caused huge disruptions to their way of life and quality of roads in and out of the station.

Predicted vehicle movements per day is significant as it is. Local roads are used by pastoralists and local communities to access water bores and to access country for cultural reasons. Deterioration of roads and increased traffic will create safety issues. As Origin intends to drill more wells in the future this number of vehicle movements will be significantly multiplied.

The NT already experiences heavy traffic on the Stuart Highway during peak tourist seasons. Tourism operators and local business along the Stuart highway should be properly consulted as part of the approval process for Origin to begin drilling. Origin says they care about cumulative impacts, but have failed to talk to tourism operators about the risks of increased traffic on the Stuart Highway and Carpentaria Hwy, or to people living downstream from their fracking exploration activities.

The transport of equipment or heavy water tankers over the roads including the Carpentaria and Tablelands highways are of major concern as these roads deteriorate each year and are not capable of supporting lots of heavy loads, especially after rains. The risks to other road users and local amenity need to be considered.

In closing, we oppose this proposal for works by Origin and call on the NT Government to enact the precautionary principle to avoid the risks posed by exploratory fracking.

Further References

Doody J. S., Green B., Sims R. (2004). 'The Impact of Cane Toads on Native Frog-eating Predators in the Northern Territory'. A Progress Report submitted to CSIRO for Sustainable Ecosystems, Canberra 1 November 2004 Applied Ecology Research Group, University of Canberra, ACT 2601

Doody J. S., Green B., Sims R. and Rhind, D. I (2006) nitial impacts of invasive cane toads (Bufo marinus) on predatory lizards and crocodiles in Science of Cane Toad Invasion and Control. Proceedings of the Invasive Animals CRC/CSIRO/Qld NRM&W Cane Toad Workshop 5-6 June 2006, Brisbane

Mann, R.M., Bidwell, J.R. (2000) The acute toxicity of agricultural surfactants to the tadpoles of four Australian and two exotic frogs, Environmental Pollution 114 pp195-205

Formation Layers Beetaloo Sub-basin

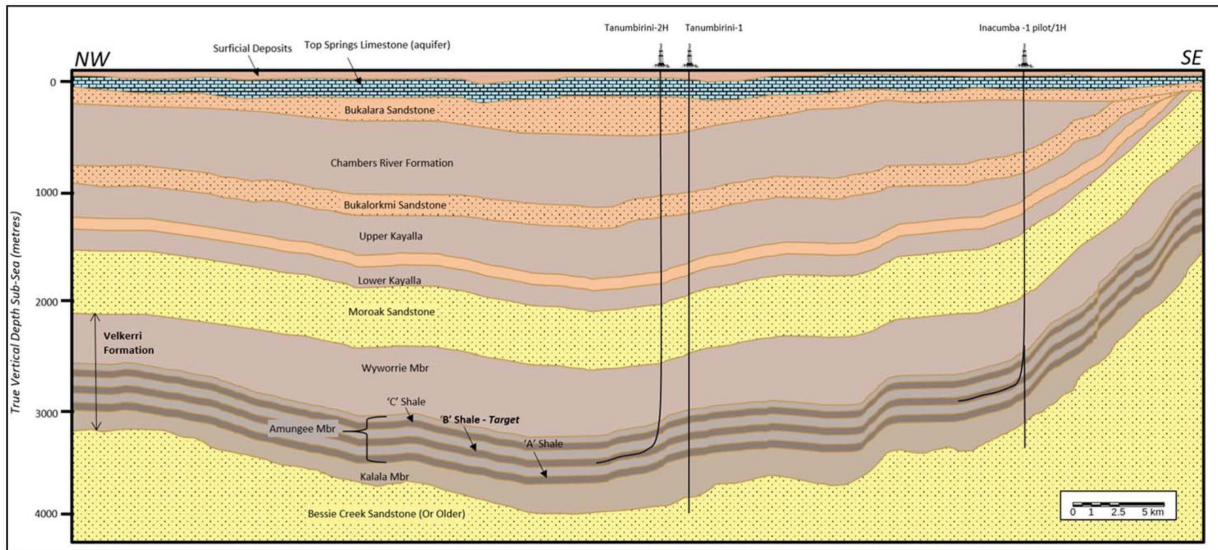


Figure 3-4 Illustrative section through the Beetaloo Sub-basin showing proposed target intervals of the Tanumbirini 2H and Inacumba 1/1H wells relative to the deepest aquifer

Yours truly,

Graeme Sawyer
 Protect Country Alliance
 Mobile 0411881378

From: [Protect NT](#)
To: [OriginPetroleum DENR](#)
Cc: [Minister Lawler](#); [Minister Kirby](#); [Chief Minister](#)
Subject: Protect NT Inc Submission - Origin Velkerri programme
Date: Friday, 1 November 2019 4:50:55 PM
Attachments: [Protect NT Inc Submission - Origin Velkerri programme.pdf](#)

Please find attached Protect NT Incorporated's submission for Origin Energy B2 Pty Ltd Beetaloo Basin Velkerri drilling and hydraulic fracturing program (EP76).

Kind Regards,

Pauline Cass

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Protect NT Inc.

Phone: 0438686144

Email: ProtectNT@gmail.com

Facebook: <https://www.facebook.com/groups/743562139323193/>

Origin Energy B2 Pty Ltd Beetaloo Basin Velkerri drilling and hydraulic fracturing program (EP76)

Submission from: Protect NT Incorporated

Dear Hon Minister for Environment and Natural Resources, Eva Lawler,

Protect NT Incorporated is a group with over 600 members, determined to protect our land, water, climate and lifestyles for future generations of Territorians. Onshore shale oil and gas hydraulic fracturing and its associated activities threatens everything we value about living in the Northern Territory. We are therefore vehemently opposed to Origin Energy B2 Pty Ltd Beetaloo Basin Velkerri drilling and hydraulic fracturing program (EP76).

In the past we have provided environmental reasoning and evidence as to why shale oil and gas activities must not proceed in the Northern Territory. These reasons include increased greenhouse gas emissions, water depletion, water, land and air contamination, earthquakes, health issues, and economic risks for existing industries. A 'Final list of issues'¹ is available in the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory's Final Report. These valid and justified concerns have consistently been ignored by the NT's decision makers. Rather than us repeating the scientific facts regarding the risks of shale oil and gas extraction again, this submission will provide an alternate yet equally valid reason why this EMP must not be accepted.

To accept this EMP is undemocratic. The decision to accept or reject this application is made by the Northern Territory Minister for Environment and Natural Resources. The Minister is not a scientist nor an environmentalist, this is an elected position not one based on experience or merit. The Minister for Environment and Natural Resources was elected to enact the will of Territorians in NT decision making and to achieve the best environmental outcomes and protections. We know that the majority of Territorians oppose fracking. This has been repeatedly demonstrated in newspaper and radio polls, in comments on social media, in protests and petitions, and was clearly stated by the NT Fracking Inquiry Panel in their 2018 Final Report. In other words, fracking has no social licence. Therefore, in order for the Minister to preform their duty as our representative and as a protector of our environment, this EMP application must be denied, as approval of this EMP could be seen as a dereliction of duties.

Yours Sincerely,

Pauline Cass
for Protect NT Incorporated

1 November 2019

¹ <https://frackinginquiry.nt.gov.au/inquiry-reports?a=494309>

From: noreply@denr.nt.gov.au
To: [OriginPetroleum_DENR](#)
Subject: DENR - Consultation Form - 749750
Date: Thursday, 31 October 2019 3:51:16 PM

Contact details

First name: [REDACTED]
Surname: [REDACTED]
Email address: [REDACTED]
Country: Australia
Postcode: 0870
Phone number:
Stakeholder type: Community

Feedback

Activity you are providing feedback on: Origin Energy B2 Pty Ltd Velkerri Drilling, Hydraulic Fracturing and Well Testing EP76 S2

Category type: Social and cultural, Flora and fauna, Water, Waste Management, Climate change, Human health

If other, please specify::

Comments: I have strong concerns on the use of unconventional fracking and the expansion of fossil fuel industry. Both present real risks to the Northern Territory, directly and indirectly. Despite following the Pepper Report recommendations, it is not possible to use this mining process without risks of leakage; methane into the atmosphere and chemicals into the subterranean environment. That subterranean environment is adjacent to limited and irreplaceable water supplies. As someone who depends on an aquifer to live and work in the NT, any risk to potable water is unacceptable. Residents of urban and remote towns across the NT are starting to feel the impacts of Climate Change, longer hotter summers are a threat to the livability of these places and any industry not decarbonising and moving away from fossil fuels are responsible. Your proposed project is a new venture, you don't have a workforce you need to transition, you don't have infrastructure to decommission, you haven't made a negative impact on the current and future generations. If your ambition is to help other countries transition from a carbon-based energy supply then invest in renewables, and don't provide fossil fuels as an option. Australia does not have carbon emission trading technology or systems in place to offset the potential emissions from the natural gas industry. Please take your corporate responsibility seriously and do not mine natural gas in the NT. Current and future generations are depending on companies like yours to make real and honest transitions away from fossil fuel dependency.

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Attachment 5: No file uploaded

Privacy: Tick this box if you wish for your name and contact details to be treated as confidential. While the department will use their best endeavours to comply with your request, you are advised that your complete submission may be disclosed in accordance with the Information Act 2002 and if otherwise required by law.

From: [Reesa Ryan](#)
To: [OriginPetroleum DENR](#)
Subject: Origin Energy B2 Pty Ltd Velkerri Drilling, Hydraulic Fracturing and Well Testing EP76 S2
Date: Friday, 1 November 2019 2:23:50 PM

Northern Territory Government,

I am lodging my objection to this proposal: “The EMP proposes a drilling, hydraulic fracture and well testing program on Exploration Permit 76, approximately 300km south-east of Katherine, in the Beetaloo Basin.”

All hydraulic fracturing is sub-economic. It is a ponzi scheme and we will end up with terrible destruction. Look at the US., Canada and Queensland. All are expensive to install and operate. All leak. All pipelines servicing fractured infrastructure leak. All destroy the water; the underground water from the drilling and fracturing, and the surface water from what they do with the water they pump up from deep underground and then leave on the surface in various ways.

Please don't do it. Don't destroy the water, the air, the land, the health of the people and of course the planet.

Reesa Ryan
NSW 2325

From: noreply@denr.nt.gov.au
To: [OriginPetroleum_DENR](#)
Subject: DENR - Consultation Form - 749895
Date: Friday, 1 November 2019 10:38:46 AM

Contact details

First name: [REDACTED]
Surname: [REDACTED]
Email address: [REDACTED]
Country: Australia
Postcode: 0870
Phone number: [REDACTED]
Stakeholder type: Community

Feedback

Activity you are providing feedback on: Origin Energy B2 Pty Ltd Velkerri Drilling, Hydraulic Fracturing and Well Testing EP76 S2

Category type: Social and cultural, Flora and fauna, Water, Waste Management, Climate change, Human health, Chemicals, Regulation and compliance, Well integrity

If other, please specify::

Comments: Objection to Origin Velkerri 76 S2 EMP Please lodge this submission as an official objection on the following grounds: As a long term NT resident, homeowner, mother, anthropologist and community sector worker I am deplore the government's green lighting of fracking for the NT. This is a disastrous decision and seems politically motivated in the first instance. Appallingly cynical to meet the CLP at the bottom of all concerns for the future of water, country, and community. I share these concerns with many others in the community; 1) The EMP authorises the use of open waste-water storage tanks in direct defiance of recommendation 7.12 from the Fracking Inquiry. 2) There is no information provided on how emissions, including fugitive emissions will be offset as required by recommendation 9.8 from the Fracking Inquiry. 3) Hydraulic stimulation should not be conducted over the wet season because of the high risk of flooding and extreme weather that will be impossible to accurately predict. This risk is simply too great and should operationalise the precautionary principle. 4) The uncertainty around baseline groundwater information, acknowledged by the Fracking Inquiry has not been addressed. No fracking should commence unless this information has been developed by comprehensive and long-term baseline groundwater studies. Sincerely Dr Lisa Stefanoff Alice Springs

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Privacy: Tick this box if you wish for your name and contact details to be treated as confidential. While the department will use their best endeavours to comply with your request, you are advised that your complete submission may be disclosed in accordance with the Information Act 2002 and if otherwise required by law.

From: [Thea Turnbull](#)
To: [OriginPetroleum DENR](#)
Date: Friday, 1 November 2019 8:36:05 PM

I object to Origin's plans to frack in the Beetaloo and the Origin Velkerri 76 S2 EMP.

This submission is being lodged as an official objection on the following grounds:

- 1) The EMP authorises the use of open waste-water storage tanks in direct defiance of recommendation 7.12 from the Fracking Inquiry.
- 2) There is no information provided on how emissions, including fugitive emissions will be offset as required by recommendation 9.8 from the Fracking Inquiry.
- 3) Hydraulic stimulation should not be conducted over the wet season because of the high risk of flooding and extreme weather that will be impossible to accurately predict. This risk is simply too great and should operationalise the precautionary principle.
- 4) The uncertainty around baseline groundwater information, acknowledged by the Fracking Inquiry has not been addressed. No fracking should commence unless this information has been developed by comprehensive and long-term baseline groundwater studies.

How dare you put your own financial profit before the lives of innocent people. These innocent people, include yourself and your children! Continuing fracking plans is murder. Read the science. I implore you to work for a safe climate and to protect the precious water you drink to survive. I know you are human like me.

Sincerely,

Thea Turnbull

From: noreply@denr.nt.gov.au
To: [OriginPetroleum_DENR](#)
Subject: DENR - Consultation Form - 749910
Date: Friday, 1 November 2019 11:43:52 AM

Contact details

First name: Catherine
Surname: Vero
Email address: cath@vero.net.au
Country: Australia
Postcode: 0870
Phone number: 0432722387
Stakeholder type: Community

Feedback

Activity you are providing feedback on: Origin Energy B2 Pty Ltd Velkerri Drilling, Hydraulic Fracturing and Well Testing EP76 S2

Category type: Social and cultural, Water, Waste Management, Climate change

If other, please specify::

Comments: The EMP does not list what the modeled GHG emissions are if the well is to go into full production. The link between these activities and the world's increasing emissions are direct. Given the climate emergency that we are in, it is unacceptable to be accessing a fossil fuel resource. For testing of these two wells, not even full production, GHG emissions are estimated to be "only" 111,823.2 t CO2 e. This is happening thousands of times each year world over contributing to catastrophic climate change and sea level rises across the world. It has to stop somewhere. How about we stop here and invest in something which will positively contribute to the world.

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Privacy:

From: [Renee](#)
To: [OriginPetroleum_DENR](#)
Subject: OBJECTION TO ORIGIN VELKERRI 76 S2 EMP
Date: Friday, 1 November 2019 10:48:22 AM
Attachments: [image002.wmz](#)
[image003.png](#)

This submission to be lodged as an official objection on the following grounds:

- 1) The EMP authorises the use of open waste-water storage tanks in direct defiance of recommendation 7.12 from the Fracking Inquiry.
- 2) There is no information provided on how emissions, including fugitive emissions will be offset as required by recommendation 9.8 from the Fracking Inquiry.
- 3) Hydraulic stimulation should not be conducted over the wet season because of the high risk of flooding and extreme weather that will be impossible to accurately predict. This risk is simply too great and should operationalise the precautionary principle.
- 4) The uncertainty around baseline groundwater information, acknowledged by the Fracking Inquiry has not been addressed. No fracking should commence unless this information has been developed by comprehensive and long-term baseline groundwater studies.

Kind regards,

Renée Vincent-Ogden
Mobile: 0429 675 620

Ogden Power - answers 4 energy

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company that it is addressed to.

From: [bryan wilkins](#)
To: [OriginPetroleum DENR](#)
Subject: Fracking beetaloo
Date: Wednesday, 30 October 2019 8:45:48 PM

To whom it may concern.

You lot need to stop now . You know it is risky yet you still want to go ahead with it. You should be chsrgeed with crimes against humanity . Stick with conventional gas extraction . I will no longer by any origin product . Shame on you all.

Regards Bryan Wilkins .non greeny but concerned grandparent