SUBMISSION re SANTOS ENVIRONMENTAL IMPACT STATEMENT - NARRABRI

Prepared by Leanne Brummell

30 Victoria Street

ST GEORGE QLD 4487

Contact details – leannebrummell@ourfishingshack.com

Mobile 0455344862

I have used the Powerpoint format for my submission to make it easier for you to identify which pieces of the EIS I am discussing.

I have copied and pasted the relevant bits with the link to where I found them and the page numbers.

My comments and the questions I wish you to consider are in bold coloured text.

I sincerely hope this saves you time and makes my concerns easily understandable. Please feel free to phone or email me anytime if there's anything you are not clear about.

Leanne Brummell
Ph 0455344862

I have read the entire EIS and must say I am disappointed that anyone thinks it contains enough information for such an important decision to be made. I have addressed my major concerns here. I am certain people with more technical knowledge than myself will address other issues.

I am making this submission as a concerned citizen. I don't have any pieces of paper saying I'm an expert on anything, however I have been involved in learning about the research process and environmental impact statements. I have helped university students to learn these things. I feel confident that my assertions can be taken as correct and be believed.

Much of what I've written is, to me, common sense. I feel this Environmental Impact Statement has been written only because it's a requirement of the approval process. Someone, or many someones, have written something to tick all the boxes that an Environmental Impact Statement must contain (I was around when they were invented and became a requirement). It's a heap of paragraphs put together to sound important. There's nothing about existing gasfields to support what they're saying.

I could not approve this project based on the information provided.

Leanne Brummell

https://majorprojects.affinitylive.com/public/44d80246c422429eb72b6489161765557/Chapter%2026%20Social%20and%20health.pdf

Pg 26-17

Water quality

Interconnection of groundwater sources

A groundwater impact assessment was undertaken that assessed the potential for the construction and operation of gas wells to impact groundwater (refer to Chapter 11 and Appendix F). The assessment concluded that the potential for interconnection of groundwater sources and subsequent flow would be low. All lines of evidence indicate that registered groundwater extraction bores in the project area target the Pilliga Sandstone or overlying aquifers, which are separated from the target groundwater units by numerous, relatively impermeable geological layers (refer to Chapter 11 and Appendix F).

The potential interconnection of groundwater sources would occur during drilling and completion of gas wells. Depressurisation of target groundwater units would have the potential to cause imperceptible quantities of groundwater to flow from relatively shallow groundwater aquifers (where water quality is relatively good) to the deep target groundwater units (where water quality is relatively poor). Degradation of groundwater quality in the relatively shallow groundwater aquifers would not be anticipated given this predicted direction of flow.

In addition to the geological barriers, gas wells would be drilled in accordance with the *Code of Practice for Coal Seam Gas: Well Integrity* (DTIRIS 2012), which sets a number of engineering requirements to establish zonal isolation, further preventing flow between groundwater units.

Overall, the risk impacts to human health due to groundwater flow between target groundwater units and shallow groundwater aquifers would be low.

So good water may be lost to poor water and you don't see this as a problem? How did you arrive at "imperceptible"?

What do you base this on? Where are studies of health in other gasfields? Qld/overseas?

http://www.resourcesandenergy.nsw.gov.au/__data/assets/pdf_file/0006/516174/Code-of-Practice-for-Coal-Seam-Gas-Well-Integrity.PDF

Pg v

The Government is developing requirements in relation to management of extracted water from CSG wells.

How can you approve this project when Govt hasn't even made up the rules yet?? I strongly believe these requirements must be made public and discussed first before any drilling goes ahead. I would expect that an in-depth longitudinal study of what happens in existing gasfields both in Australia, especially Qld, and overseas would be available. And a working model of any new technology would be constructed and trialled over a substantial period of time before requirements could be set by government. I think it would be risky to start drilling before this is done. If water is impacted it is irreversible. A mistake cannot be taken back or 'made good'. People cannot water their crops with money.

Loss of produced water

Impacts to human health as a result of loss of produced water (groundwater extracted from target coal seams) would be very unlikely due to:

- the chemical properties of the extracted groundwater
- the design and operational controls that would be in place to minimise the likelihood of spills or leaks (refer to Chapter 14 for mitigation and management controls)
- the chance of a leak or spill occurring in an area that provides a pathway to human contact
- the chance of a leak or spill being sufficiently large or long in duration prior to detection
- the dilution that would occur in the unlikely event of a leak or spill
- the type of contact that would occur in the very unlikely event of human contact.

A screening level review of data from existing operations in the project area (refer to Appendix T2), assessed produced water in its undiluted form against the recreational water guidelines. The recreational water guidelines are typically quantified as 10 times the Australian Drinking Water Guidelines to adjust for an incidental ingestion rate of 0.2 litres per day. The adoption of these guidelines is conservative as the guidelines assume that this incidental ingestion occurs every day for a lifetime, whereas in the very unlikely event of human exposure to produced water, the exposure would be an isolated occurrence. The screening level review found the produced water complied with the adopted guidelines for all parameters even before dilution occurs, excluding salinity and alkalinity (which are related). The guidelines for salinity and alkalinity are an aesthetic guideline that relates to palatability and maintenance of infrastructure like water pipelines, rather than health effects. For context, the salinity of produced water is above that normally found in fresh water but is not as high as the salinity of the ocean.

There is no way of knowing what the chemical properties of produced water will be until after the fact. Are you saying you could swim in it?

Pg 26-18

I would have liked to see some evidence of what actually happens when produced water is lost? I understand an area of the Pilliga has been unable to be rehabilitated even after 10 years! And you're not worried about salt. Salt can make cropping land unarable and drinking water for stock undrinkable. Money will not fix that so how do you 'make good'?

Leaks or spills of produced water are considered unlikely given design and operational level controls and monitoring, in accordance with relevant guidelines and standards, which would form part of the project. For example, produced water / brine ponds would be double-lined, with seepage collection pumps installed between liners and beneath the secondary liner. Water gathering lines would be designed and situated with consideration to their proximity to watercourses, where practicable. Produced water infrastructure would be tested prior to operations and leak detection / pressure monitoring systems would be in place to detect losses of produced water and trigger corrective action and remediation. Furthermore, produced water pressure at the well head and within underground water gathering lines is low. Leewood and Bibblewindi produced water and brine pond design would meet or exceed the requirements in the *Exploration Code of Practice: Produced Water Management, Storage and Transfer* (NSW Department of Industry, Skills and Regional Development 2015c).

The potential pathways for human contact with produced water include watercourses and groundwater resources. Water management infrastructure in proximity to a watercourse would be limited to the relatively small sections of water gathering lines at watercourse crossings. The likelihood of a substantial loss of produced water in these areas would be accordingly low, and would require flow to be occurring in the watercourse at the time of the loss to provide a pathway to human contact. Losses of produced water to a groundwater resource could occur in the event of a sustained loss from a pond or water gathering line. In these cases, it is unlikely that such a spill would occur and continue undetected given the management and monitoring practices that are put in place. If a leak is detected it would be isolated and repaired.

The produced water could be encountered either through recreational contact (such as swimming) or extraction for potable or domestic use. Both scenarios would require the produced water to enter a watercourse of groundwater resource. The likely distance between the point of loss and the point of potential human contact would mean that substantial dilution would occur prior to contact.

Overall, no human health impacts are expected due to the low likelihood of a loss of produced water occurring under the circumstances that would lead to human contact and the generally benign chemical characteristics of produced water, especially given the likely dilution that would occur prior to contact.

Once again, you can't know the chemical composition!!

Pg. 26-18-19

So you are saying that in a flood event when the water course is flowing, a leak or spill will lead to human contact with the water. So you are relying on luck this won't happen? I believe that if a holding pond fails, the water will go where it wants to find its own level and it is common sense that this water will seep into the soil and possibly contaminate both the soil and underground water.

National Water Quality Management Strategy

The *National Water Quality Management Strategy* is a joint national approach to improving water quality in Australian and New Zealand waterways. The strategy aims to protect water resources by improving water quality while supporting the businesses, industry, environment and communities that depend on water for their continued development.

A key output of the strategy is the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ 2000). The document identifies water quality guidelines targeted at the protection of specific environmental values, such as aquatic ecosystems and recreational water use. As described in the guidelines, once the relevant water quality guidelines and environmental values are identified for a given activity, these can be formalised between stakeholders as water quality objectives.

Using ANZECC/ARMCANZ (2000) terminology, Bohena Creek would not be classified as a 'highly disturbed system', particularly in the area immediately within the Pilliga State Forest. It does, however, receive runoff from land disturbed to varying degrees by agriculture. Indicative of this, pesticides have been detected in surface water samples collected from Bohena Creek, and exotic species are common (refer to Appendix G1). Under these circumstances and in accordance with ANZECC/ARMCANZ (2000), the level of protection that is considered appropriate for meeting the management goal of maintenance or improvement of ecological conditions is termed a 'slightly to moderately disturbed system'.

It is expected that water quality objectives for the project would be formalised in licence and approval conditions, particularly under the *Protection of the Environment Operations Act 1997* (refer to Section 7.3.2). Surface water and groundwater monitoring for the project would be undertaken with reference to those objectives.

https://majorprojects.affinitylive.com/public/e9a04178188c9fbfebb5ed4fdd55d576/Chapter%2007%20Produced%20water%20management.pdf pg 7-6

Chapter 7

Pesticides are evident in Bohenia Creek. I presume you aim to blame the farmers for its condition at the end of the day. I understand you intend to put produced water in this creek. I understand this creek is important to the natural biodiversity of the area. I think it's importance has been downplayed.

It is estimated that the project would extract around 1.5 gigalitres per year on average over 25 years, equalling about 0.7 per cent of the long-term annual extraction limit of around 205.6 gigalitres per year. This average extraction rate would total around 37.5 gigalitres over the life of the project. The proponent would seek a licence to extract this volume of water.

https://majorprojects.affinitylive.com/public/e9a04178188c9fbfebb5ed4fdd55d576/Chapter%2007%20Produced%20water%20management.pdf Pg. 7-8

There is no way of knowing the affect of this water extraction until it is too late. The experience in Qld is that water bores have dried up much faster than anticipated and water pressure levels have been impacted. Indeed some water bores have so much gas they can be lit on fire. There is no information in the submission of the Queensland experience for comparative purposes. It is common sense that water runs level (whether above or below ground). The truth is Santos does not have 100% certainty as to what will happen to groundwater pressures and levels when this large volume of water is extracted. Santos proposes to play Russian Roulette with the Australia's major water source and the water of future generations.

Produced water volumes are predicted to peak within years two to four of production at around 10 megalitres per day; therefore, estimated salt volumes are also expected to peak around that time. Forecasts indicate that the estimated salt quantities in produced water would be as follows:

- For the peak period in around years two to four - around 117 tonnes per day of which 115 tonnes per day would be extracted through the treatment process and disposed of off-site to a licensed landfill. This is the equivalent of around two and a half B-double truckloads of salt per day. The residual two tonnes of salt per day would be contained within the treated water used for beneficial reuse activities (refer to Table 7-3). Approximately 145 tonnes of salt product per day would be generated and transferred to a licensed landfill under a scenario where 12 megalitres per day of treated water is generated.
- The long-term average over the 25-year assessment period - around 48 tonnes per day of which around 47 tonnes per day would be extracted through the treatment process and disposed of off-site to a licensed landfill. This is the equivalent of just over one B-double truckload of salt per day. The residual one tonne of salt per day would be contained within the treated water used for beneficial use activities as shown in Table 7-3.

Even though cattle might enjoy lick blocks in drought time, salt is not the farmers friend. It has the potential to make soil and water unusable. This project is in an agricultural region.

Pg 7-23

What are the details of the licensed landfill? Or like in Qld are Santos just going to wait until they've got too much salt and then decide to try to find some way to dispose of it? The Waste Salt Disposal facility in Qld hasn't even been constructed yet and its placement at the head of a major River system is plain dumb. The submission does not specify clean salt and toxic salt amounts. Why isn't it telling us how much toxic salt and what it's composition and lifespan will be. Again I think this aspect needs to be planned and discussed before approval can be given to drill.

https://majorprojects.affinitylive.com/public/49843d7e67f5cabdf3677922dde9ce99/Chapter%2020%20Aboriginal%20heritage.pdf

Pg 20-4

Ch 20

A critical review of the data was undertaken to determine if there were duplicates in identified sites, inaccuracies in the data site location information, and / or errors in data sets. This information is captured in the project GIS database.

Buffers were then applied to Aboriginal cultural heritage sites as follows:

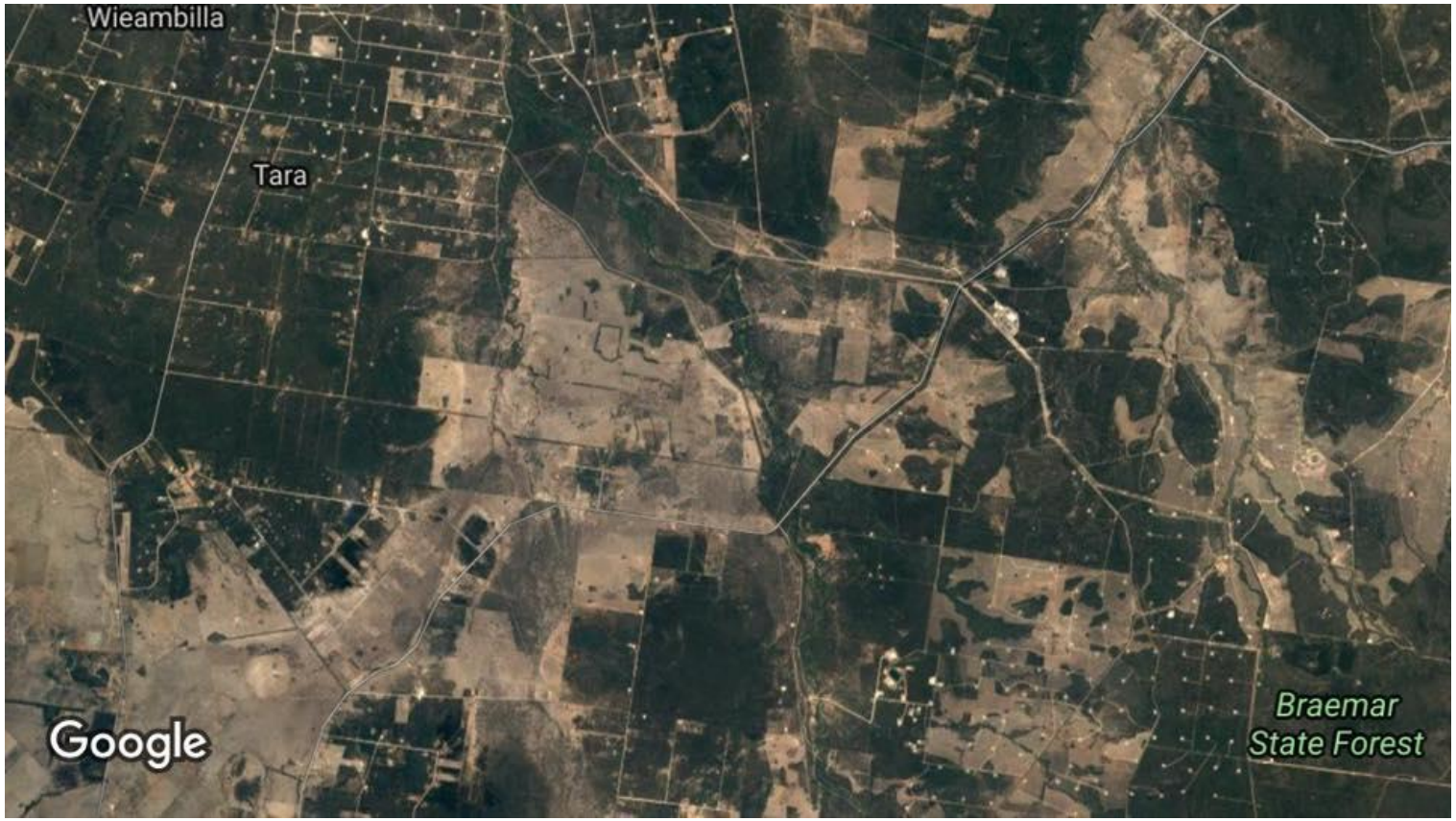
- AHIMS sites lacking contextual information – 100 metres from the site location registered in AHIMS
- all other sites – a graduated buffer based on the type of site and values adhering to it. The buffer applies either to the site location cited or to the boundary of the site where extent has been provided or generated. These are as follows:
  - 20 metres around isolated stone artefact / s
  - 40 metres around stone artefact scatters
  - 50 metres around places including scarred trees, resource places, rock shelters / caves, hearths and general historic places (such as camps)
  - 75 metres around grinding grooves
  - 100 meters around places including those associated with Aboriginal ceremony (such as stone arrangements and rings) and burials, as well as the considerably undefined places identified as being an ochre source and containing shell.

The custodian of the grinding grooves has gone so far as to make this secret business public to try and stop this project proceeding. Santos website full of glib "we discussed and have permission" – it's just plain wrong!!

This just leaves me speechless.. The lack of respect is unbelievable. Can you imagine a gas well 50m from the MCG? 75m from the town cenotaph? 20m from your church? Apart from the FACT that fugitive emissions will be occurring from many parts of this project and people visiting these sites will be breathing who knows what (cause the gas industry doesn't monitor, regulate, or tell anyone what's being spewed out into the atmosphere) I am abhorred that Santos expect the indigenous descendants of the area are going to traverse the Santos infrastructure to keep their culture alive. Offering money is like being offered beads and blankets. SHAMEFUL.

The project footprint would directly impact approximately one per cent of the project area (refer to Chapter 2). More than half of this footprint would consist of field infrastructure, such as drill pads, spread over the gas field (refer to Section 6.4). Impacts would most likely occur during the exploration and construction phases when physical works and ground disturbance activities occur in specified locations.

Pg 20-20



This is what 1% looks like in Qld (without ponds, compressor stations etc). Wonder why Santos haven't provided a mock up pic of their finished product? Because even though it might be 1% as you can see it's very invasive!! Zoom in on the pic and have a look.

The project would also be staged and field infrastructure would come into use and be retired at different stages of the project's life. Once the life of the well or other field infrastructure has expired, the area would be rehabilitated to its original use. Therefore, the area of disturbance at one time would be less than the total disturbance over the life of the project. Plant communities once associated with that area would be re-established by rehabilitation and subject to suitable corridors existing, wildlife would also return.

Pg 20-25

An incident that contaminated an area in the Pilliga ten years ago still hasn't been able to be rehabilitated. If this project is given the go ahead you must do so on the understanding that damage caused could possibly be forever. Are you going to put your name on the dotted line saying to future generations that I accept responsibility for whatever damage occurs now and into the future.

There is no evidence that wildlife will return, it's a statement of hope. In between Meandarra and Tara in Qld the trees look strange (like they're sick or something), I would presume from fugitive emissions since nothing the industry *self regulates* has been shown to be doing any harm to anyone or anything? I've driven through there just before dusk where you would expect to see lots of kangaroos and wallabies and not seen one – it's seriously like the evil forest in a fairytale cartoon.

http://www.resourcesandenergy.nsw.gov.au/__data/assets/pdf_file/0006/516174/Code-of-Practice-for-Coal-Seam-Gas-Well-Integrity.PDF Pg 23-24

4.9 Well abandonment

4.9.1 Principles

CSG well abandonment must ensure the environmentally sound and safe isolation of the well, protection of groundwater resources, isolation of the productive formations from other formations, and the proper removal of surface equipment.

Titleholders are responsible for the well until the department is satisfied that the titleholder can demonstrate that the well is safe and non-polluting.

The outcomes of well abandonment are to:

- maintain isolation of beneficial aquifers within the well from each other and hydrocarbon zones;
- maintain isolation of hydrocarbon zones within the well from each other, from aquifers, water bearing zones or from zones of different pressure;
- minimize risk to possible future coal mining
- isolate the surface casing or production casing from open hole;
- place a surface cement plug in the top of the casing; and recover/remove the wellhead.

The following matters should be considered when abandoning a well:

- The construction characteristics of the well
- integrity of the cement column
- geological formations encountered
- potential loss zones
- hydrogeological conditions i.e. location of beneficial aquifers and water bearing zones
- environmental risk
- regulatory requirements, title conditions and industry standards
- perforated and fracced zones.

The EIS does not mention monitoring abandoned wells!!

At the end of the day Santos fills the well with concrete and walks away with their money, end of responsibility. Concrete will not last forever, even if they use "twice as much of the really good stuff". In 50, 100, 200 years EVERY CAPPING *WILL* FAIL causing who knows what damage. RESPONSIBILITY WILL FALL ON THE LANDOWNER WHO CANNOT BE INSURED FOR SUCH INCIDENTS. The gas industry has taken a very short term view of its impacts. Not good enough when the Great Artesian Basin is at risk.

4.9.2 Mandatory requirements

a) A well must not be abandoned or suspended without prior departmental approval.

b) All CSG exploration wells must be plugged and abandoned and the department notified on the approved form within 3 months of the last drilling or testing activity, unless the well is converted to another approved purpose.

c) The titleholder must ensure that an abandoned well is sealed by filling the near-vertical section from total depth to top with cement or other sealing program as approved by the department. There is to be no open annulus to the surface.

d) Any well or drill hole that is to be abandoned shall be sealed and filled in such a manner to prevent leak of gas and/or water.

e) Cement shall be used as the primary sealing material. Cement testing should be carried out as per requirements set out in Section 4.3 - "Cementing" of this Code.

f) The titleholder must ensure that an abandoned well is sealed by filling from total depth to top with cement of at least 24 hour laboratory strength of at least 500 psi (3.5 MPa). In near-vertical open hole sections of the well, cement is to be placed in plugs of not more than 200 m lengths with a WOC period of 6 hours between placement. The first plug across the surface casing is to be tested to 500 psi (3.5 MPa) above the estimated or previously recorded LOP. Squeeze-cementing or other method is to be used to effectively seal off abandoned frac zones from the wellbore.

g) BOPs and/or wellhead must not be removed until the cement plug across the surface casing shoe or plug across the uppermost perforations has been physically tagged for correct location and pressure tested.

h) Wellheads must be removed, and casing must be cut greater than 1.5m below surface. A wellhead marker plate must be installed and must be placed and marked with details as per the department's requirements.

i) Complete and accurate records of the entire abandonment procedure must be kept, with these records submitted as part of the titleholder's legislative reporting requirements for the abandonment of CSG wells.

j) If a CSG well intended for abandonment is proposed for conversion to a water well, necessary approvals and licences must be obtained.

4.9.3 Good industry practice

Use integrated openhole volume calculated from caliper on wireline logs to calculate cement volumes where possible (this applies mostly to exploration wells which are to be plugged and abandoned). If no caliper data is available, 20-30% above theoretical volume or local knowledge should be used.

Pg 24-25

This is a future environmental disaster waiting to happen. EVERY SINGLE HOLE WILL ONE DAY DEVELOP CRACKS allowing water, gas, and whatever else might be underground to migrate to wherever it now naturally wants to go. THEY ARE MAKING CHANGES IN THE EARTH THAT WILL LAST FOREVER, NOT JUST UNTIL THE GAS RUNS OUT. Someone needs to be responsible for monitoring and fixing it forever. Qld already has hundreds of square kms of contaminated land (not that the industry publicises this) – don't let the arable lands of Narrabri be next. A 100 year future fund is not going to fix this. We can't grow food with money.

What about Health?

There is no data showing the possible adverse health impacts from this project. It just says none expected.

Worst case scenario what could happen? How can someone be expected to sign off on the project if they aren't aware of all the possibilities?

There are people in the Qld gasfields begging the Qld government to take their complaints seriously – NOSEBLEEDS, HEADACHES, METAL TASTE IN MOUTH, LEAD IN CHOOK EGGS, LACK OF SLEEP FROM NOISE, LIGHT POLLUTION FROM FLARING to name a few. The Qld government had someone compile information from reported visits to doctors. They say there's no problem based on statistics. They have not sent someone out to test all these people. The one doctor who has done so reports health impacts similar to those in American gasfields. It isn't profitable for an industry to be harming people's health, so lets not talk about it.

The Qld experience means that all persons anywhere near this project (and I mean like 100kms in every direction) need to have baseline health tests done. Baseline water tests are to be done I feel it is essential that baseline health be documented too.

Fugitive Emissions

These are emissions that can't be seen with the naked eye, and can only sometimes be smelled. So let's not worry about them. In Qld, these emissions aren't monitored, aren't regulated, no-one even tells anyone what they could possibly contain.

Can't see it? Let's put our heads in the sand and keep our eye on the dollars.

Fugitive emissions occur everywhere. At the well, at high rise and low rise outlets, pipeline vents, you get the idea.

I think it should be compulsory for these emissions to be monitored and tested.

To do less is to put the health of all persons living anywhere near the project at risk.

I sincerely thank you for taking the time to consider my concerns.

It would be appreciated if you could have a look at the Knitting Nannas Balonne Shire Facebook page where you will see many videos and stories from real people who “coexist” in the Qld gasfields. I am sure you wouldn’t wish their every day reality on anyone.

Leanne Brummell.