To the Panel Dr Tom Hatton ,Mr Philip Commander,Dr Fiona Haslam McKenzie,Dr Ben Clennell & Dr Jackie Wright.

My name is Tina Capurro

[redacted]

6th February 2018.

I'm a retired science teacher (38years in Uk) .I have now lived in the Swan Valley for the past 5 years . My husband owns a vineyard and we grow a variety of fruit & vegetables . As such we need to have a good supply of clean water and soil which is free of toxic substances .We are concerned that unconventional gas mining (including fracking) will have a detrimental effect on our livelihood & cause severe long lasting damage to the environment.

This Scientific Enquiry needs to look at ALL the Scientific Evidence that is available-of which there is an enormous amount! I'm not even sure why there is even the need for a Scientific Enquiry. However,I will try to highlight some of my concerns with the Scientific Evidence that supports these concerns I really hope the panel will take these on board and strongly recommend a TOTAL BAN of Fracking in W.A and follow the lead of many countries which have already done so e.g Scotland, Netherlands,Wales,Bulgaria,Romania,Czech Republic,Luxembourg,France ,US States of New York,Maryland,Florida ,Canadian Provinces of Nova Scotia ,Quebec etc

CONCERNS
1. CLIMATE CHANGE
This is widely considered the major global health threat of this century .
ref. 'Health and Climate Change Commission 2015.' The Lancet 388,no 10055. is a greenhouse gas considered to be 'more powerful' than carbon dioxide. .

The scientific community recognises that fossil fuels are a major contributor of green house gases deemed responsible for climate change.Countries are already suffering extremes of temperature,rainfall,droughts & flooding . The polar ice caps are melting at a much faster rate than even previous estimates ,many low lying countries are at risk of disappearing under rising sea levels . The Australian institute showed that methane emissions from unconventional gas have been severely underestimated.Ref The Australian Institute :Submission to Inquiry into Hydraulic Fracturing in NT April 2017.
The estimate used by Australian Government is 0.58tonnes of Methane leaked per kilotonneof methane produced, or 0.0058%, This estimate is based on a historic USA emissions factor designed for measuring conventional gas emissions & is no longer used in the USA.
USA methane emissions have risen 30% in the last decade.

Ref: Turner et al,2016, A large increase in US ,methane emissions over the past decade inferred from satellite data & surface observation,Geophysical Research Lettres ,Volume43,issue5,16 March ,p2218-2224

Sweden obtains 55% of its energy from renewables

Actual measurements by 16 peer reviewed projects ,using improved technology to take direct measurements from gas fields in the US ,have ranged from 2-17% of production Ref.Lafleur eat

all,2016, A review of current & future methane emissions from Australian unconventional oil and gas production,Melbourne University Melbourne institute Recorded Methane venting in Australia. An independent energy advisor,Tim Forcey,used an FLIR GF-320 infrared camera in the Queensland coal seam gas fields in 2017 to demonstrate substantial gas emissions from vents :
*continuous releases of methane from 'high point vents' on water-gathering pipelines *methane bubbling from the Condamine river & Wambo Creek.
Given the very large number of high point vents and other gas field equipment vents which are located throughout the Queensland CSG fields ,if the scale of venting detected by the FLIR camera was replicated it would represent a potentially vast unmeasured contribution to global warming!

2.WATER USE & POLLUTION
(In a state where there is limited available water .) A single shale gas frack uses 11.34million litres in the fracking fluids (wells are fracked on multiple occasions .) Some fluid returns to the surface as flow back.
There are numerous reports of water contamination by people living close to coal seam gas mines.
*Spills in NSW Pilliga Forest contaminating groundwater with uranium and arsenic *Gas bubbling in Condamine Qld.
*Numerous offences by Origin Energy ,Santos & Eastern Star Gas in NSW,NT and QLD for waste water spills,using unlined waste pits that then flooded,leaks from all parts of the operations ,discharging polluted water into a creek,polluting an aquifer with radioactive uranium & toxic heavy metals ,and killing vegetation and wildlife with untreated toxic coal seam gas wastewater.
On a personal note we are very concerned that our aquifer could be contaminated with toxic chemicals ,or the aquifer dries up (as so much water is needed in the fracking process) .This fertile land would not be able to be farmed .Food & clean water are more important than gas!Ref

a)NTN:Toxic Chemicals in the Exploration and Production of Gas from Unconventional sources. http://.karooplaces.com/wp- content/uploads/2011/06/coop shale gas report final 200111.pdf
b)Fracking: a serious concern for surface water as well as groundwater http://ec.europa.eu/environment/integration/research/news alert/PDFs/275na3.pdf

c)Llewellyn G.T.,Dorman,F,Westland,J.L.Yoxtheimer,D.,Grieve,P.Sowers,T.,Brantley,S.L"(2015), Evaluating a groundwater supply contamination incident attributed to Marcellus Shale gas development.Proceedings of the National Academies of Science ,112,6325-30.doi:101073/pans.1420279112/-/DCSupplemantal

d)DiGiulio,D.C.& Jackson ,R.B.(2016). Impact to underground sources of drinking water and domestic wells from production well stimulation and completion practices in the Pavilion,Wyoming,Field. Environmental Science & Technology,50(8). doi: 10.1021/aces.est.5b04970

3.HEALTH RISKS
The combination of chemicals (from fracking) and highly saline flowback is an environmental cause for concern .These resulting by-products can accumulate and persist indefinitely in the environment (I.e not biodegradable) can be taken up by plants & animals & hereby enter the foodchain.Remember DDT!

Ref Colborn et al ., 2011;Elliot et al ., 2017; Vidic teal 2014 Haswell QLD Univ Technology:.Submission to NT inquiry Aril 2017

Peer reviewed scientific literature to 2016 involving more than 700 studies on the impact of unconventional gas development show

84% of public health studies indicate risks to public health 69% of water studies show actual or potential water contamination 87% of air quality studies indicate elevated air pollution .

The list is endless ! What I've written is just a short taster. I've not mentioned evidence linking fracking with seismic activity .or serious threat to biodiversity fragmentation through direct clearing of bush land ,loss of native vegetation,fragmentation of important remnant vegetation ,spread of invasive species and increased fire risk.

https://www.shine.com.au/blog/coal-seam-gas-law/weeds-csv-insidious-legacy/
http://www.abc.net.au/news/2014-08-23/farmer-claims-csg-companies -spread-weeds-on-southern-qld-property/5661016

4. MISINFORMATION BY THE COAL & OIL INDUSTRIES

There are too many claims made by The Fracking industry which are self serving and conveniently selective with the truth.

a) 'Only a small amount of chemicals is used in fracking'.
While chemical additives make up only 0.5-2% of fracking fluid,it translates to very large ACTUAL amounts.
A typical 15 million litre fracturing operation would use 80 to 330 tons of chemicals!

b) 'the chemicals used can be found in household products '
While some chemicals can be found in home products ,combinations of these are still hazardous to health. For example the mixing of bleach with toilet cleaner ,both readily available household chemicals ,produces chlorine gas . A gas used in trench warfare during WW1.
Many fracking chemicals are known to be toxic & many have not been assessed for their long term impacts on the environment & human health .Fracking compounds used in Australia have been shown to include carcinogens ,neurotoxins, irritants /sensitisers,and endocrine disruptors.

Ref Toxic chemicals used in Australian fracking processes;National Toxics Network.April 2013
http://www.ntn.org.au/wp/wp-content/uploads/2013/04/UCgas report-April-2013.pdf

c)'there's no real risk of wells leaking,as well casings are thick and made of concrete and steel'
A detailed study in Pennsylvania found that more than 6% of gas wells leaked in the first year of operation and up to 75% of existing wells could have some form of integrity failure.

Ref Gas leaks & methane
https://www.theguardian.com/environment/2014/jun/20/fracking-wells-Pennsylvania-leaking-methane.

Ref. Well integrity
https://www.ncbi.nim.nih.gov/pic/articles/PMC4121783/
https://uk.news.yahoo.com/flawed-fracking-wells-taint-pennsylvanias-drinking-water-162146112.html

SUMMARY-
1. Climate change- the need to move away from fossil fuels to renewables .The need to stop unnecessary methane emissions.

2. Importance of conserving good clean water supply . Not polluting with dangerous toxic chemicals .

3. Conserving agricultural land for essential growing of food . Not polluting with chemicals that can get into the food chain.
The infrastructure of roadways ,pipes serving multiple well heads interferes with the mechanics of broad acre farming.This leads to gross inefficiency of food production.

4. Importance of conserving air quality. Stop the emission of pollutants into the atmosphere leading to an increase of health disorders eg asthma .

5. Public health

6. The right in a democratic society to say No & not be at the mercy of large conglomerates whose only interest is money .The need to look at the long term effects ,not short economic ones

7. Claims made by industry & governments have no credibility They maintain that unconventional gas extraction is both safe and 'clean' .However, many scientific studies now demonstrate this is far from the truth and that unconventional gas operations can have serious consequences for human & animal health

Ref Adgate ,Goldstein and McKenzie(2014) Potential public health hazards,exposure sand health effects from unconventional gas developments.Environmental and Technology 48: 8307-8320.
http://pubs.acs.org/doi/abs/10.1021/es404621d

CONCLUSION
The Government should BAN unconventional gas mining until the industry can convince the community that there are no risks or adverse effects .

The CSG Industry is under-insured and landholders are likely to bear a substantial risk as a result. Landholders may be liable for impacts arising from unconventional gas activities if they lead to personal injury,property damage,or contamination.Yet farmers have been refused insurance cover for risks and contamination associated with unconventional gas extraction.
The Government should demand that Companies carry Bonds that cover the liabilities of long term risks if the process is so SAFE? Eg James Hardies Asbestos mining debacle!

We need to think very carefully about the long lasting effects on future generations .This will depend on the decisions we make now . Must learn from past mistakes .

Tina Capurro