



**CSG Activities Review - NSW - Submission**  
Colin Duncan to: csg.review

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From: "Colin Duncan" <candwduncan@southernphone.com.au>  
To: <csg.review@chiefscientist.nsw.gov.au>

History: This message has been replied to and forwarded.

Professor Mary O'Kane  
NSW Chief Scientist and Engineer

Dear Professor O'Kane,

Thank you for the opportunity to submit this personal comment on the Review of CSG operations in NSW.

My observations are based on Practical Experience from my years living and working in the Oil & Gas Industry around the world. I was born and brought up in an oilfield. I also had experience at every level in the Oil & Gas Industry from working on the Oil Rigs through to Management as well as being called upon to gather evidence and provide expert opinion for a Royal Commission.

On the other hand I can also provide the contrasting perspectives of a Business owner who would profit greatly from CSG operations as well as that of a Rural Landholder that would be adversely affected by CSG operations.

The Issue of Compliance:

The Oil Industry, like any business is a profit based industry. Regulation and Compliance are always have the 'potential' to impact on a company's bottom line. How large an impact will depend not necessarily on the scope of the relevant regulations, but more so on the Enforcement of the regulations. The Unconventional Extraction of Gas from sources such as Shale, Tight Sand or Coal Seams, had been never been commercially viable until the industry was exempted from compliance to various regulatory acts by the United States Government.

I have found that even in some of the most heavily regulated operating areas of the world, the degree of enforcement reduces with remoteness of the operation and/or the financial gain through Taxes, Royalties and 'Commissions' to the Regulatory bodies.

The lack of Genuinely 'Independent' companies or organisations that could capably perform the enforcement aspect of the NSW regulations will have an impact on the level of compliance by the Gas Companies. In many cases where companies such as Metgasco, AGL and Santos, have been found to have been in breach of the regulations, the breaches have been reported by Members of the Public as opposed to the regulatory enforcement agency.

The Issue of Gaps of Knowledge to provide accurate Assessments of Risk from Unconventional Extraction Mining of Gas;

In 2011, Ross Dunn, the APPEA spokesperson, stated publicly that it was inevitable that the CSG Industry's activities would have an impact on aquifers. He wasn't saying anything new that the

industry wasn't aware of, he was merely stating a fact. This statement alone should be sufficient to transfer the Burden of Proof squarely onto any Gas Company wishing to conduct Gas Mining using any of the Unconventional Extraction Techniques.

Nowadays however, the current APPEA Spokesperson states unequivocally that there are No Risks from any of the Unconventional Extraction Techniques. It says so in their PR Blurb so this seems to be good enough for the NSW Government

Even I, as a mere layman, know that without a Baseline Study, any tests carried out where the results of which, suggest that harm may have been caused by an activity can only be a mere assumption. Therefore those people who claim that Unconventional Gas Mining poses risks to Human health, livestock, aquifers, etc. have, in the past, only been able to cite anecdotal evidence that this is the case.

On the other hand, due to the lack of the same Baseline Studies, the Unconventional Gas Industry's claims that there are no risks to all of the above are also unsubstantiated.

More disturbing is when Govt Ministers like Brad Hazzard come up to Lismore and proclaim that they have 'Done the Science'. As soon as he made that statement he lost all credibility in front of a well-informed audience, because until you, in your role as Chief Scientist, insist that baseline studies are conducted and made available to the General Public, for review, then there is no science on which to base any approval of Gas Mining using Unconventional Extraction Techniques.

The Unconventional Extraction Gas Industry as we know it today, despite its claims, is only a little over a decade old. Large scale operations such, as in the USA, and Queensland have only been operational within the last decade. Conventional Gas exploration and production has been around for much longer and the risks posed by that industry are well understood.

The technology used by the Unconventional Extraction Gas Companies is prehistoric compared to the Deep Sea Wells being drilled in the Gulf of Mexico.

Despite the Space Age Technology being used in the Gulf of Mexico, and all the fail safe precautions that were supposed to safeguard the operation from causing an oil spill, it still happened. Why? – The Human Factor, making a poor judgement call under pressure. The impact on the local Industries and the Environment was, and still is devastating.

The CSG Industry in NSW have none of the fail safe technology that would prevent aquifer contamination but then again they wouldn't know if they had caused a problem or not and, because of lack of baseline studies and real time well monitoring. nobody would be able to prove they did it anyway. Arrow Energy are drilling 7 wells per week and considering that most problems that result in aquifer contamination are due to casing failure from mistakes made during the drilling and completion of a well, this frenzied activity will undoubtedly leave a legacy for the future.

In Queensland the response from the industry and government alike has been that nearly all the reported problems have been natural occurrences. After the ABC's recent "4 Corners" the public are becoming more sceptical of this response.

A more disturbing development however is the recent Qld Govt report into Health Impacts from CSG mining activities in Tara. The summary of the report stated that there was no evidence of any connection between the CSG Mining activities and the health issues of the TARA Residents. As the Chief Scientist, with mountains of reports and an approaching deadline, you would be forgiven for

assuming that this report is the genuine article and take the summary at its face value.

Just imagine the Public outcry if the test results in this report proved conclusively a connection between CSG mining activities and the Health Impacts on the Residents of TARA. There would definitely be no CSG in NSW and the CSG operations and the Associated Income Revenue to the Government would have to stop until protections could be put in place.

So when is a scientific study not a scientific study? – When you start with a desired result and then modify your test parameters to make sure they give you the right answer . (see attached Critique)

Best Practice

During the APOLLO Space Programme the NASA Scientists used to pressure test their Space Capsules with pure Oxygen. This was considered 'BEST PRACTICE' until they incinerated 3 of their Astronauts during a pre-flight check.

Best Practice is properly defined as operating to achieved a desired outcome, as well as you can, within the parameters of the knowledge and experience available at the time. Without Baseline Studies we have little or no scientific knowledge at all, and the now documented and scientifically proven experience of an increasing number of communities both in Qld and the USA it would surely stand to reason that we shouldn't proceed until we at least have an inkling of what can go wrong and more importantly how to prevent it. APPEA will say that its different type of operation overseas but every well is different so that is not a valid argument.

The issue of 'Best Practice' at the moment is that, with all the mounting evidence emanating from Queensland and the USA, there should be NO CSG activities within 5 kilometres of ANY Residence and there should be No CSG related Activities carried out within 500meters of a Non CSG Mining Property Boundary. I would suggest that within a couple of years the flood of successful legal claims and settlements coming out of the USA will make Governments much more cautious about approving any Unconventional Extraction of Gas in its present form, anywhere near areas of Human Activity, Agricultural Land Use and in particular Water Catchments.

Once again, Thank you for this opportunity to make this submission. I don't envy your task. I'm afraid that this may be an exercise in futility because we already know what the Government has decided to do, irrespective of any input from us. As I write this, the NSW Government are funding CSG Industry experts to travel around the Rural Communities selling APPEA's message that Coal Seam Gas is Good because we have done the 'Science'. It will create Jobs – Boost the Local economy – and provide Cheap Energy.

The truth is the highly paid jobs will be taken by the FIFOs – the Locals will find it too expensive to live there and have to move away and the gas may be cheap in China but you will be paying top dollar for it here in NSW. Anyway most Rural Communities are supplied with LPG and there would be significant cost to them to have all their gas appliances changed over to CSG, if they could get it. And of course the biggest deception is that they are Not relying on the Science but in reality the Lack thereof.

Good Luck

Yours sincerely,

Colin Duncan  
Northern Rivers



Critique-of-CSG-Health-Study-april20131.pdf

## **NO CLEAN BILL OF HEALTH FOR CSG**

### **A Critique of the Queensland Department of Health's Report on the Health Impacts of CSG Activities on the Tara Community**

#### **Summary**

The Queensland Government's Health Report, *'Coal seam gas in the Tara region: Summary risk assessment of health complaints and environmental monitoring data, March 2013'*, [Health Report] and the reports on which it is based, do not provide a comprehensive investigation of the potential impacts of coal seam gas (CSG) activities on the residents of Tara. The Health Report should not be used by government or industry to claim *'a clean bill of health'* for the CSG industry in Tara, or any other CSG field for that matter.

The Health Report concludes overall that it was unable to determine whether any of the health effects reported by the community are linked to exposure to CSG activities. This is not an unsurprising finding and one that's very common in cases of chemical exposures and health impacts, especially when no baseline health data has been gathered.

The Health Report does however provide some evidence that might associate some of the residents' symptoms to exposures to airborne contaminants arising from CSG activities.

While industry's sampling on which the Health Report relies was very limited, both in scope and time, a wide range of volatile organic compounds (VOCs) were still detected in the air around residents' homes in Tara.

The Health Report concludes there was no evidence of contamination of concern, yet for many of the chemicals, the level of detection used by the laboratories was set above the level set for the protection of health used in the report.

However, benzene, a confirmed human carcinogen<sup>1</sup>, was detected at levels above the health criteria, yet these results were dismissed with the claim that 'benzene was not a compound that is found in CSG and therefore cannot be attributed to CSG activities'.

This statement contradicts the Queensland's Department of Environment and Heritage Protection website<sup>2</sup> which states that "BTEX compounds (benzene, toluene, ethylbenzene, xylene) are found naturally in crude oil, coal and gas deposits and therefore they can be naturally present at low concentrations in groundwater near these deposits".

<sup>1</sup> <http://monographs.iarc.fr/ENG/Monographs/vol100F/mono100F-24.pdf>

<sup>2</sup> <http://www.ehp.qld.gov.au/management/coal-seam-gas/btex-chemicals.html>

There was no assessment of aggregate or combined exposure, in particular for the children of Tara who are at greatest risk from exposures. Of the 11 families and 56 people reporting health symptoms, (headache, rashes, sore eyes, nausea, nosebleeds), only 15 were seen in person by the Government appointed doctor.

The detection of dangerous air toxics around resident's homes combined with the ongoing reporting of adverse health symptoms should be treated seriously and a scientifically valid investigation should be undertaken which ensures independence and is based on a rigorous monitoring program which is broad-spectrum, high-periodicity and long-term.

### **The QLD Health Report**

*"The investigation by itself is unable to determine whether any of the health effects reported by the community are linked to exposure to Coal Seam Gas activities." Page 5*

*"The most that can be drawn from the DDPHU report is that it provides some limited clinical evidence that might associate an unknown proportion of some of the residents' symptoms to transient exposures to airborne contaminants arising from CSG activities." Page 6*

The Health Report released by the Queensland government is not a comprehensive health study. The investigation of the residents' health complaints was limited to an analysis of reports of symptoms and a questionnaire with little clinical follow-up.

The Health Report's findings are based on information for 56 people from 11 families living in the region. However there was only direct participation by 15 people in person and two by telephone. Two other individuals who registered complaints with 13HEALTH were excluded from the analysis as they were not residents of the region.

A broad range of symptoms was reported. The predominant symptoms reported were headaches (34 people), sore, itchy eyes (18), nosebleeds (14) and skin rashes (11).

An investigation by the Darling Downs Public Health Unit<sup>3</sup> stresses that one of the main limitations of their investigation was the reliance on residents to report symptoms to either the government or their local health care provider (HCPs). They acknowledged the potential for under-reporting due to the lack of awareness of the government's reporting mechanism and/or the difficulties in accessing rural GPs at the time of the symptoms being experienced. Costs were also considered a factor. Based on previous experience, some residents were concerned about a negative reaction from health care providers if they reported that their symptoms were related to CSG. The report notes that there were often discrepancies between what was reported by the residents and what was reported by the local HCPs.

The Health Report acknowledges that few clinical examinations of the individuals reporting symptoms were undertaken by the government appointed doctor, who was also surprised at the relatively small number of people who came to see him;

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<sup>3</sup> The Darling Downs Public Health Unit Investigation into the health complaints relating to Coal Seam Gas Activity from residents residing within the Wieambilla Estates, Tara, Queensland July to November 2012

*'Whether this was due to a lack of widespread interest, or due to limited pre-publicity, as was suggested to me by some people I cannot determine. In any case, the small numbers make it difficult to generalise from my observations.'*

It should also be noted that the appointed Government doctor's association with the coal companies could also have been an influencing factor. Dr Adam is retained consultant by Anglo Coal and Curragh Qld Mining.

**Queensland Gas Company Environmental Health Assessment Report Tara Complaint Investigation Report, January 2013 Final  
REF: 0181432R01 (known as the ERM Report)**

Much of the environmental sampling and assessment on which the Health Report was based was undertaken on behalf of the Queensland Gas Company. The ERM report notes that twelve CSG wells are located between 0.6 km and 17 km from the residents' lots, and these are used for the extraction of CSG and water from the Walloon coal seam.

However, the ERM report claims there can be no linkages between CSG production and the residents' lots. The ERM report states there have been no surface releases of CSG production water to surface water despite evidence of CSG water being sprayed on roads as dust suppression with inevitable runoff in Queensland's heavy rains.

The ERM report states that the Queensland Government's gas monitoring study found no gas leaks and ambient air samples collected downwind from an operating well (Codie #6) showed no presence of coal seam gas components.

The ERM report does not consider the findings of research by the Southern Cross University (SCU),<sup>4</sup> which used atmospheric radon (<sup>222</sup>Rn) and carbon dioxide (CO<sub>2</sub>) concentrations to measure fugitive emissions in the CSG fields of the Tara region, Queensland.

The SCU study measured a 3 fold increase in maximum <sup>222</sup>Rn concentration inside the gas field compared to outside, suggesting enhanced diffuse soil gas exchange processes, helping gases to seep through the soil to be released to the atmosphere. The presence of these gases also suggests the release of other gaseous substances, such as VOCs.

### **ERM Water and soil sampling**

Notably, other than BTEX, the water testing of rainwater tanks and dams did not include the chemicals detected, or likely to be found in the air, and capable of deposition in water.

One rainwater tank tested exceeded the guideline concentration for aluminium, two exceeded the cadmium health guideline value and the zinc aesthetic guideline value. The source of this contamination was not identified but may be the result of contact with roofing or building materials.

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<sup>4</sup> Douglas R. Tait, Isaac Santos, Damien Troy Maher, Tyler Jarrod Cyronak, & Rachael Jane Davis  
Enrichment of radon and carbon dioxide in the open atmosphere of an Australian coal seam gas field  
*Environ. Sci. Technol.* <http://pubs.acs.org/doi/abs/10.1021/es304538g>

While there is no Australian guideline value for silica in recreational water, three dams had silica concentrations (250, 380 and 640 mg/L) well above the Australian Drinking Water Guideline value of 80 mg/L.<sup>5</sup>

In a related study carried out by the Queensland Department of Natural Resources and Mines, toluene and methane were detected in a resident's private water bore.<sup>6</sup>

The Health Report criticised the ERM report for summarising the results for dissolved metals, rather than total metals, the latter being more relevant to human health and generally more conservative. It also criticised the ERM report for not testing soil for arsenic, beryllium, cadmium, chromium (III), chromium (VI), cobalt, lead, inorganic mercury and nickel; i.e., metals that are of *'more relevance to public health considerations of soil contamination'*.

### **ERM Air sampling**

Only 13 air samples were collected in all. A single sample was collected at five properties with two samples at each of the remaining four properties.

While many volatile organic compounds were detected in the air, the ERM report concludes that apart from the benzene exceedance, there were no other exceedances of the air quality screening criteria.

Yet, in the case of 26 chemicals, the health criterion was set at a level below the detection level used by the laboratories. The ERM report notes that it cannot be categorically stated that concentrations in the samples were also below the relevant criteria value.

For example, US EPA Regional Screening Levels for 1,1,1,2-tetrachloromethane is 0.33 µg/m<sup>3</sup>, whilst the limit of detection used by the different labs varied between 8.3 µg/m<sup>3</sup> and 12 µg/m<sup>3</sup>, well above the health criteria.

In the case where benzene was clearly detected above health risk criteria, it was dismissed stating that 'benzene was not a compound that is found in CSG and therefore cannot be attributed to CSG activities' but rather from a local source such as smoking, etc.

This was a surprising comment when the website of the Queensland Government's Department of Environment and Heritage Protection states that:

*"BTEX compounds (benzene, toluene, ethylbenzene, xylene) are found naturally in crude oil, coal and gas deposits and therefore they can be naturally present at low concentrations in groundwater near these deposits".<sup>7</sup>*

In October 2010, benzene was found in monitoring bores at an Arrow Energy fracking operation in Queensland at 6 and 15 times the Australian Drinking Water Guidelines.

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<sup>5</sup> [http://www.nhmrc.gov.au/\\_files\\_nhmrc/publications/attachments/eh52\\_aust\\_drinking\\_water\\_guidelines\\_update\\_120710\\_0.pdf](http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/eh52_aust_drinking_water_guidelines_update_120710_0.pdf)

<sup>6</sup> Simtars Investigation of Kogan Water Bore (RN147705) -16 October 2012

<sup>7</sup> <http://www.ehp.qld.gov.au/management/coal-seam-gas/btex-chemicals.html>



Benzene is a confirmed human carcinogen. The dismissal of benzene exceedances is unexplainable when other BTEX chemicals such as toluene, a neurotoxin, were found in the air around a number of Tara homes and in the air above a resident's water bore. The level of toluene above the bore was measured at 0.33ppm but was dismissed as below levels of concern<sup>8</sup>, yet this is well above the 'Chronic Reference Exposure Limits' used for long term exposure by California, Massachusetts, Michigan states in the USA.<sup>9</sup>

The Health Study did acknowledge that the ERM air-monitoring program had important limitations. The total monitoring period was only nine days and the methodology resulted in limits of reporting for some chemicals that were substantially higher than the reference air quality criteria. They also noted the monitoring was not designed to identify short-term peaks or troughs in air concentrations.

The need for sampling over an extended period of time in order to assess the full range of air contaminants is clearly demonstrated in a recent published study on air pollution associated with unconventional gas activities.<sup>10</sup> This twelve month study detected 44 hazardous air pollutants at gas drilling sites including a wide range of air toxics, eg methane, methylene chloride, ethane, methanol, ethanol, acetone, and propane, formaldehyde, acetaldehyde, PAHs / naphthalene.

Most importantly, the authors noted a great deal of variability across sampling dates in the numbers and concentrations of chemicals detected. Notably, the highest percentage of detections occurred during the initial drilling phase, prior to hydraulic fracturing on the well pad.

### **Wieambilla Odour Investigation Results: July - December 2012**

The Queensland Government also facilitated some adhoc sampling for VOCs in air at the Wieambilla Estate in response to community concerns. They provided Summa canisters<sup>11</sup> with a 1-minute sampling period and passive diffusion samples to residents for use when appropriate. Despite the nature of this testing, many VOCs were again detected in the air. While, most were below relevant guidelines and the criteria used, the number and type of compounds was diverse.

Summa canister sampling found the following VOCs: hexane, propene, chloromethane, dichlorodifluoromethane, methylene chloride, ethanol, acetone, methyl ethyl ketone, acrolein, vinyl acetate.

Vinyl acetate exceeded the annual criteria in one case.

Passive samplers found the following VOCs: pentane, hexane, heptane, tetradecane, hexadecane, heptadecane, cyclohexane, 2-methylbutane, 3-methylpentane, 3-methylhexane, methylcyclohexane, tetrachloroethylene, 2-ethyl-1-hexanol, ethyl acetate, benzene, toluene, xylene, ethylbenzene, 1,2,4-trimethylbenzene, phenol, benzothiazole, naphthalene, alpha-pinene.

<sup>8</sup> Simtars Investigation of Kogan Water Bore (RN147705) -16 October 2012

<sup>9</sup> [http://oehha.ca.gov/air/chronic\\_rels/pdf/108883.pdf](http://oehha.ca.gov/air/chronic_rels/pdf/108883.pdf) ; Also see

<http://environment.gov.ab.ca/info/library/6659.pdf>

<sup>10</sup> Colborn T, Schultz K, Herrick L, and Kwiatkowski C. 2012 (in press). An exploratory study of air quality near natural gas operations. *Hum Ecol Risk Assess*

<sup>11</sup> A Summa canister is a stainless steel vessel which when the valve is opened allows the surrounding air to fill the canister and achieve a representative sample. The valve is then closed and the canister is sent to a laboratory for analysis

Benzene (0.6 ppb) exceeded their reference value and was also above the US EPA recommendations of 0.4ppb, which over a lifetime could cause a risk of one additional cancer case for every 100,000 exposed persons.<sup>12</sup> The benzene result was simply dismissed as an 'outlier'.

The US EPA note that VOCs can be toxic and some may cause cancer and other serious, irreversible health effects, such as neurological problems and birth defects.<sup>13</sup>

VOCs are key ingredients in forming smog and fine particle pollution (PM2.5), which are linked to asthma attacks and other serious health effects. Depending on a number of factors, (eg length, severity and timing of exposure, existing conditions) VOC exposure may result in eye, nose, and throat irritation; headaches, visual disorders, memory impairment, loss of coordination, nausea, damage to liver, kidney, and central nervous system.<sup>14</sup>

## **Conclusion**

The sampling of the Tara residents' homes was limited in time and scope. Some aspects were adhoc and incomplete. There was no systematic approach to the chemicals and analytes tested for or any consistency in the choice of sites tested. The sampling cannot be used to adequately assess environmental contamination or identify common pathways of exposure.

The health assessment of the residents and their symptoms is similarly cursory. Little clinical investigation was undertaken and the distribution of surveys was adhoc and did not ensure adequate coverage of affected residents

While relying on preliminary environmental sampling and repeating the unfounded statements that there were few exceedances for individual chemicals, there was no attempt to assess those cases where exceedances did occur, rather they were just dismissed.

There was no consideration or assessment of cumulative or aggregate impacts even when residences recorded a number of serious air contaminants and vulnerable children were at risk of exposure.

The Health Report and the documents on which it relies do not represent an acceptable investigation of the potential impacts of CSG activities on Tara residents and cannot be used by either government or industry to claim a clean bill of health.

The incomplete findings and detection of such a wide range of VOCs in air should prompt an immediate independent and comprehensive sampling program.

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<sup>12</sup> <http://www.anapolschwartz.com/practices/benzen>

<sup>13</sup> <http://www.epa.gov/airquality/oilandgas/pdfs/20120417presentation.pdf>

<sup>14</sup> <http://www.epa.gov/iaq/voc.html>

## **Specific Comments on the Tara testing results**

**John Polglase, Geochemist**  
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*'The current VOC test programme was inferior to the extent that conclusions cannot be drawn by any party. However, there are sufficient elevated and anomalous results to warrant a broad-spectrum, high-periodicity, long-term, monitoring programme.*

**John Polglase, Geochemist Divstrat Pty Ltd**

Toxicity is a non-beneficial accumulation in living organisms and systems that is typically dose and time based, such that it requires periodic monitoring over many months to years. The 'one-off' Volatile Organic Compound (VOC) test events at Tara were conducted by different laboratories using different test suites and methods, at different times and locations under different wind and temperature conditions. Some of the test suites did not target coal seam volatiles or other environment gases (eg. reduced and oxidised carbon, sulphur and nitrogen gases; hydrogen and oxygen; radon). Therefore the results do not adequately correlate on account of numerous 'data holes'. None of the laboratories conducted isotopic and radionuclide analyses that might assist with identifying origins.

Some important considerations that cannot be deduced from the current data sets are the ratios and aggregations of related chemical compounds, the combined effect of which may be non-beneficial. Indeed, some 'low-level' results have clearly been omitted. An added complication is the identity and impact of aerobic and anaerobic micro-organisms, which combine to produce breakdown chemical products over time and space, some of which products may be more toxic in volume or trace than their parent chemicals. In any case, the important topic of interim chemical reactivities and products between source and destination, does not appear to have been anticipated or considered. Indeed, only limited background or 'off-site' test data was supplied for comparative purposes.

In my view, the current VOC test programme was inferior to the extent that conclusions cannot be drawn by any party. However, there are sufficient elevated and anomalous results to warrant a broad-spectrum, high-periodicity, long-term, monitoring programme.

**Dr L Martin - Biochemist**  
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In reviewing Tara emissions data (20-01-13), I note detectable levels of monocyclic aromatic hydrocarbons (some known to be carcinogens) and detectable levels of phenols. Chronic exposure to phenols can result in abnormal reproductive function as a result of some phenols' weak oestrogenic (female sex-hormone) activity. Although the levels are dismissed as low, living organisms can be affected significantly by bioactive chemicals at levels well below those detectable by chemical

or physical methods, particularly if there is chronic exposure.<sup>15</sup> In such cases the biological responses of those exposed are the best evidence that a problem exists, not limited chemical tests - and the tests appear to be remarkably limited.

*There are certainly not enough data to carry out the simplest statistical analysis, or to draw any meaningful conclusion. The absence of chemically detectable levels is not proof that dangerous materials are not present at biologically active levels.*

Contact:

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<sup>15</sup> For example, chemicals used by the Australian UG industry have been found to be 'dangerous at concentrations near or below chemical detection limits by the State University of New York. These include glutaraldehyde, brominated biocides (DBNPA, DBAN), propargyl alcohol, 2-butoxyethanol (2-BE) and heavy naphtha. REF : Chemical and Biological Risk Assessment for Natural Gas Extraction in New York. Ronald E. Bishop, Ph.D., CHO, Chemistry & Biochemistry Department, State University of New York, College at Oneonta, Sustainable Otsego March 28, 2011.