

**TOWN AND COUNTRY PLANNING (APPEALS) (SCOTLAND) REGULATIONS 2013**

**APPEAL UNDER SECTION 47(2) OF THE TOWN AND COUNTRY PLANNING  
(SCOTLAND) ACT 1997 BY DART ENERGY (FORTH VALLEY) LTD CONCERNING  
COAL BED METHANE PRODUCTION, INCLUDING DRILLING, WELL SITE  
ESTABLISHMENT AT 14 LOCATIONS AND ASSOCIATED INFRASTRUCTURE AT  
LETHAM MOSS, FALKIRK, AND POWDRAKE ROAD, NEAR AIRTH, PLEAN**

**(REFERENCES PPA-240-2032 AND PPA-390-2029)**

**PRECOGNITION BY DR GERALYN MCCARRON**

**ON BEHALF OF**

**CONCERNED COMMUNITIES OF FALKIRK  
(AND SUPPORTERS)**

**1. Summary**

Across two continents the adverse health impacts reported by residents exposed to unconventional gas development are striking similar. Nosebleeds, sore eyes, nausea, metallic taste and difficulty breathing are common. Symptoms which could relate to neurotoxicity such as tingling, paraesthesia, numbness and headaches occurring in children are extremely concerning.

International studies have detailed the increased risks to babies of congenital heart defects, neural tube defects, and low birth weights. Repeated studies have documented the increased risks of cancer and non-cancerous ill health related to gas development.

Methane is promoted as “a cleaner burning fuel” but it is the wastes that are rejected and contaminate the local atmosphere, the soil or water during the process of extraction, cleaning and drying as well as those fugitive emissions which are inadvertently released which pose the health hazard for people living within a gas development. In Australia it is acknowledged by the gas companies that thousands of tons of volatile organic compounds, oxides of nitrogen, formaldehyde, carbon monoxide and particulate matter as well as heavy metals are pumped into the air shed shared with local residents. Millions of litres of hazardous fluids are extracted from the coal seams and brought to the surface. A wide range of toxic chemicals such as toluene, acetone, methyl ethyl ketone, cresol and phenol have been identified not only in the air people are breathing but in their body fluids.

It is very disturbing that Dart, in their waste management plan, have failed to acknowledge even the existence of some of these hazardous wastes associated with unconventional gas development and have therefore failed to submit detailed plans to deal with them. Dart has also failed to disclose the specific chemicals they plan to bring on site and in what quantities. They have failed to provide CAS numbers (unique chemical identifiers) or Manufacturing Safety Data Sheets. We are assured that a properly constructed well is key to protecting the aquifers and the populations’ drinking water but amongst Dart’s many omissions they have failed to define the composition of the cement which is key to this construction.

## **2. Introduction**

### Name, qualifications, professional memberships:

Dr Geralyn McCarron, MB BCH BAO FRACGP

Member: Australian Medical Association, Doctors for the Environment Australia, National Toxics Network.

### Relevant academic publications:

Symptomatology of a gas field 2013

Unconventional Natural Gas Development: Economic Salvation or Looming Public Health Disaster? Australian and New Zealand Journal of Public Health. (Accepted for publication February 2014.)

### Relevant practical experience:

General Practitioner

### Relevant personal history:

From Northern Ireland, living in Australia

### When and how you became involved with the case:

Since 2011 I have followed the controversy including recurring reports of ill health surrounding unconventional gas development in Australia.

## **3. Evidence**

### General outline:

Health and social impacts in Australia, level of industrialisation, specific causes for concern and international data.

### Specific points:

#### Health complaints in Queensland

In Queensland, Tara's rural residential estates are the most densely settled areas in Australia to have seen intensive coal bed methane (coal seam gas) development and pilot studies on underground coal gasification. Agriculture is the only pre-existing industry. Families in this rural community live on acreage blocks of 30 to 250 acres. Neighbouring Kogan/Montrose contains farms of several thousand acres. No health impact assessment was done before these major projects were permitted.

In February/March 2013 I conducted a health survey<sup>1</sup> of 38 families (113 people) from these areas.

The symptoms reported to me were outside the scope of what would be expected for a small rural community.

- 58% of residents surveyed reported their health had been adversely affected since gas development. A further 19% were uncertain.
- Symptoms were worse when odours came through. Some people could identify odours described as “rotten egg, sickly sweet, like pine tarsal, acetone, creosote, after burn from cigarette lighter.” Many people noted the association between their symptoms, wind direction, the location of waste evaporation ponds and road spraying of waste.
- A third of people over the age of six were reported to have spontaneous nose bleeds, (children particularly after playing outside).
- Common symptoms included skin irritation and eye irritation, cough, chest tightness, rashes, difficulty sleeping, joint pains, muscle pains and spasms, nausea and vomiting. Many reported a metallic taste which made them nauseous and unable to eat.
- Symptoms were reported which can sometimes be related to neurotoxicity (damage to the nervous system), including severe fatigue, weakness, headaches, numbness and paraesthesia (abnormal sensations such as pins and needles, burning or tingling), difficulty focusing and difficulty concentrating.
- Of concern was the high percentage of symptomatic children with paraesthesia being reported in approximately one third (15/48) of children to age 18 and headaches being reported in more than 70%.
- Children were noted to be constantly rubbing their fingers. Small children complained of “ants in their hand” and one infant reportedly screams and dips his fingers in water in the middle of the night.
- Parents of a number of young children reported twitching or unusual movements, and clumsiness or unsteadiness.

Whilst not definitive this study puts on the public record that living within the gas fields are many families who report symptoms that are in themselves very concerning, who believe that their health has been adversely impacted by the gas industry and who note associations between particular activities of the industry and exacerbation of their symptoms. It draws attention to the fact that the health impact of gas development is an issue which needs to be taken seriously and considered fully.

### Industrialisation

CSG is promoted in Australia as a “clean” energy alternative. That is not the reality for the residents of the gas fields. Very vulnerable people (people with asthma, young children, families with severely handicapped children, pregnant women, and the elderly) are forced to live inside an area of extreme industrialization, noise and pollution.

Noise is a significant issue - noise from the compressor stations, which can be heard from 10-15km away on still nights, 24/7 noise from drilling and fracking and intensive movement of heavy diesel trucks from 4.30 in the morning (including weekends)

It would be unthinkable to permit people to live within a Major Hazard Facility but a working gas field is just that: gas wells, high pressure gas pipelines, separation plants, processing plants, compressor stations, pumping stations, venting points, flares, gathering lines, and gigantic toxic evaporation ponds.

This industry video<sup>2</sup> <http://www.youtube.com/watch?v=1AeWYwBreEY> illustrates the extreme industrialisation.

### Chemicals of concern

Following media reporting of the residents' concerns the Queensland government undertook an investigation<sup>3</sup> based on minimal, mainly industry environmental sampling and very limited clinical investigation.

Despite the limitations of the study a wide range of gases and volatile chemicals were detected, many of which individually or in combination were capable of causing irritation to the eyes, skin, nasal mucosa, and respiratory tract along with systemic effects when absorbed. These included chlorinated hydrocarbons, benzene which is a recognised carcinogen and propylene and acrolein which are acute irritants as well as being associated with DNA alkylation. Phenols, some of which have been shown to have impacts on the endocrine system of living organisms were present as well as toluene which is a known neurotoxin, an irritant and a suspected reproductive toxin that can be absorbed by inhalation. Toluene is known to be associated with coal bed methane and was found repeatedly in air samples in the residential estates.

The metabolites of toluene have been found repeatedly in the urine of children and adults in the estates. Residents' urine have also tested positive for phenol, cresol as well as acetone, methyl ethyl ketone and the polycyclic aromatic hydrocarbon (PAH)(1-Hydroxypyrene).

The conundrum is that norms and safety standards exist for adults working 8 hours a day, 5 days a week with individual toxic chemicals but no safety standards apply for children or adults who live up to 24 hours a day, seven days a week with the same toxins.

The Material safety data sheet for phenol<sup>4</sup> discusses the potential chronic health effects:

*"The substance may be toxic to kidneys, liver, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs."*

The industry's self-reported figures to the National Pollution Inventory<sup>5</sup> give a glimpse of the extent of pollution. Just three of the gas processing plants within the Tara gas fields (Kenya, Talinga, and Windibri) admitted in one year (2011 to 2012) to pumping:

- 4690 tonnes oxides of nitrogen,
- 89 tonnes formaldehyde,

- 489 tonnes Volatile Organic Compounds,
- 1420 tonnes carbon monoxide
- 34.8 tonnes particulate matter

into the shared air over the Tara estates. These figures did not include air pollution from innumerable diesel trucks on the roads, drilling the wells, fracking them, flaring, venting, evaporation from the regional ponds, leaks, spills road spraying of process water, etc.

The World health organisation has classified outdoor air pollution and particulate matter in particular as carcinogenic to humans.<sup>6</sup>

Very little is known about what the effect mixtures of these toxic chemical have, how they interact with each other and how they interact within the human body.<sup>7</sup>

- If one compound in a mixture interferes with the metabolism or excretion of others, then the reference level for safety will be meaningless
- If compounds in the mixture are solvents they can compromise the blood brain barrier and other chemicals in the mix can cross the blood brain barrier causing neurotoxicity

In 2004 Dr Harold Zeiliger<sup>8</sup> noted that previously unexplained cancer clusters have common characteristics. They can be attributed to exposures to mixtures that contain one lipophilic and one hydrophilic chemical. Many of the chemicals of concern he identified were the ones also found in the airspace of the Tara residential estates.

In Queensland the MP for the region has already asked questions in Parliament about a possible link between gas development and a pancreatic cancer cluster in his constituency.<sup>9</sup>

Multiple unexplained animal deaths have been reported (18 cattle on one farm). There have been recurring reports of deaths of domestic fowl and native birds. Rainwater collected in the gasfields for domestic consumption is highly acidic with one sample tested by council having a pH of 4.66.

### Social impacts

Many residents want to get their families out to a place of safety. Many feel trapped. They have mortgages on properties which are unsaleable and have nowhere else to go. Many families are large. Whilst in theory discriminatory, in practice landlords are sometimes reluctant to rent to large families. Even if available, rent is likely to be prohibitive. The gas companies have to date refused to buy the residents out. The government has refused to relocate them. The companies have referred to community impacts as “collateral damage”<sup>10</sup>. Community is damaged and divided by confidentiality agreements imposed by the gas companies.

While gas field property is devalued and unsaleable some of the regional towns such as Chinchilla are booming bringing with it its own social problems. Property values and rents escalate to accommodate the influx of fly in/fly out, drive in/drive out workers. Huge temporary “man camps” are built to accommodate the transient workers. Locals on low fixed incomes are forced out of the housing markets with some families being forced to live in

tents in the show grounds.<sup>11</sup> Shops which depend upon family and farming business go bust to be replaced by gas company shop fronts and fast food outlets.<sup>12</sup>

There are multiple road traffic accidents and high volumes of oversized trucks on once quiet country roads. Road damage constantly being repaired causes traffic jams and frustration.

#### Australian Doctors concerned

Doctors for the Environment Australia<sup>13</sup> stated “*Human health relies on having clean safe drinking water and unpolluted air. Coal seam mining operations should not be allowed to endanger these basic health needs of Australians.*”

Australian Medical Association<sup>14</sup> President Dr Steve Hambleton (representing 28,000 doctors in Australia)

*“Despite the rapid expansion of CSG developments, the health impacts have not been adequately researched, and effective regulations that protect public health are not in place. There is a lack of information on the chemicals used and wastes produced, insufficient data on cumulative health impacts, and a lack of comprehensive environmental monitoring and health impact assessments... In circumstances where there is insufficient evidence to ensure safety, AMA recommends that the precautionary principle should apply. This is essential given the threat of serious and irreversible harms to human health”.*

#### International literature documenting health risks

- A health impact assessment by the Colorado School of Public health warned of the risk to neighbouring populations.<sup>15</sup>
- Colborn et al<sup>16</sup> reported that many chemicals used during the fracturing and drilling stages of gas operations may have long term health effects that are not immediately expressed. More than 75% of the chemicals could affect the skin, eyes, other sensory organs, and the respiratory and gastrointestinal systems. 40% to 50% could affect the brain/nervous system, immune and cardiovascular systems, and the kidneys; 37% could affect the endocrine system; 25% could cause cancer and mutations.
- Bamberger and Oswald<sup>16</sup> documented in six US states serious health effects on humans and companion animals, livestock, horses and wildlife including animal deaths, failure to breed and reduced growth.
- McKenzie et al<sup>18</sup> found that residents living less than half a mile from wells are at greater risk for health effects (both cancer and non-cancer) than residents living further away.
- Krzyzanowski<sup>19</sup> concluded Northeast British Columbia has experienced increased rate of cancer and other illness due to contaminants and stressors associated with unconventional gas.
- Steinzor et al<sup>20</sup> documented 25 most prevalent symptoms associated with exposure to gas development in Pennsylvania fatigue(62%) nasal irritation (61%),throat irritation (60%) sinus problems (58%) severe headaches 51%...and concluded: “*Contaminants that are associated with oil and gas*

*development are present in air and water in areas where residents are experiencing health symptoms consistent with such exposures.”*

- Colborn et al<sup>21</sup> reported that the number of non-methane hydrocarbons (NMHCs) and their concentrations were highest in the initial drilling phase. Many of the NMHCs had multiple health effects including 30 that affect the endocrine system.
- NIOSH<sup>22</sup>, the American Occupational Health and Safety organization highlighted the serious risks of cancer and chronic lung disease from silica used in fracking
- Food and Water Watch<sup>23</sup> documented sharp increases in heavy truck accidents, disorderly conduct arrests and diagnoses of sexually transmitted diseases in rural Pennsylvania since gas development.
- A second study<sup>24</sup> has recently confirmed Hill's<sup>25</sup> finding that babies born near gas development have lower birth weight and more health problems than babies not exposed.
- A report on the analysis of 124,843 births in Colorado<sup>26</sup> released in January 2014 found that in areas with the highest number of gas wells there was a 30% increase in the number of babies born with congenital heart defects compared to areas where there were no wells within a 10mile radius. Babies in the areas with the highest numbers of gas wells were two times more likely to have a neural tube defect (eg spina bifida) than those with no wells within a 10 mile radius.
- The World Health organization has unequivocally “classified outdoor air pollution as carcinogenic to humans.”<sup>6</sup> They specifically state that the adverse health effects of particulate matter are well documented; there is no evidence of a safe level of exposure or a threshold below which no adverse health effects occur.<sup>27</sup> Diesel exhaust is a known carcinogen.
- Raaschou<sup>28</sup> confirmed an unmistakable link between particulate matter air pollution and lung cancer even below existing EU air quality limits.

#### Association or Causation versus the Precautionary Principle

*"The precautionary principle asserts that the burden of proof for potentially harmful actions by industry or government rests on the assurance of safety and that when there are threats of serious damage, scientific uncertainty must be resolved in favor of prevention."<sup>29</sup>*

To date there has not been a single properly conducted health study which shows that it is safe for people to co-exist with unconventional gas exploration or development. The growing body of international evidence indicates the opposite.

#### **4. Conclusions**

In my opinion, with the level of evidence as it stands at present it would be unwise in the extreme for any authority to permit unconventional gas activity to commence in their region without the benefit of a full and comprehensive health impact assessment. If this industry cannot be shown to be safe the precautionary principle must apply.

1. CCoF 96: Symptomatology of a gas field: An independent health survey in the Tara rural residential estates and environs. G.McCarron, April 2013 CCoF 96
2. CCoF 248: Video. QGC/British Gas flyover of gasfields.  
<http://www.youtube.com/watch?v=1AeWYwBreEY>
3. CCoF 110: Queensland Government, Coal Seam Gas in the Tara Region. Summary risk assessment of health complaints and environmental monitoring data. March 2013  
<http://www.health.qld.gov.au/publications/csg/documents/report.pdf> CCoF 110
4. CCoF 192: MSDS Phenol. <http://www.sciencelab.com/msds.php?msdsId=9926463>
5. CCoF 111: National Pollution Inventory website.  
<http://www.npi.gov.au/npidata/action/load/individual-facility-detail/criteria/state/QLD/year/2012/jurisdiction-facility/Q012QGC002>
6. CCoF112: International Agency for Research on Cancer, press release no 221 17 Oct 2013 [http://www.iarc.fr/en/media-centre/iarcnews/pdf/pr221\\_E.pdf](http://www.iarc.fr/en/media-centre/iarcnews/pdf/pr221_E.pdf)
7. CCoF 294: Dr David Brown, fundamentals of toxicology.  
<http://www.youtube.com/watch?v=AhkswtBom4s>
8. CCoF113: Unexplained Cancer Clusters Common Threads (Archives of Environmental Health April 2004; 59,4; ProQuest Page 172)
9. CCoF 144: The Chronicle Newspaper article.  
<http://www.thechronicle.com.au/news/katter-mp-wants-probe-csg-links-cancer-cluster/2018180/>
10. CCoF 295: <http://www.youtube.com/watch?v=1IAoJfmRISq&feature=share>
11. CCoF 114: <http://www.sunshinecoastdaily.com.au/news/single-mother-and-her-two-children-left-out-cold/1985464/>
12. CCoF 115: <https://open.abc.net.au/projects/mining-life-45gy0yf/contributions/chinchilla-boom-town-11fn9if>
13. CCoF116: [http://dea.org.au/images/uploads/submissions/Review\\_of\\_CSG\\_in\\_NSW\\_-\\_Chief\\_Scientist\\_Submission\\_05-13.pdf](http://dea.org.au/images/uploads/submissions/Review_of_CSG_in_NSW_-_Chief_Scientist_Submission_05-13.pdf)
14. CCoF 117: <https://ama.com.au/media/ama-calls-coal-seam-gas-health-checks>
15. CCoF124: Human Health Risk Assessment for Battlement Mesa Health Impact Assessment, Mc Kenzie, Witter, Adgate (Colorado School of Public Health) Sept 2010
16. CCoF118: Colborn T, Kwiatkowski C, Schultz K, and Bachran M., Natural gas operations from a public health perspective. *Human and Ecological Risk Assessment* 2011; 17(5):1039-56.
17. CCoF 119: Bamberger, M. & Oswald, R.E., Impacts of Gas Drilling on Human and Animal Health. *New Solutions* 2012; 22(1): 51–77.
18. CCoF 84: McKenzie LM, Witter RZ, Newman LS et al, Human health risk assessment of air emissions from development of unconventional natural gas resources. *Science of the Total Environment* 2012; 424: 79-87.
19. CCoF 120: Krzyzanowski J., Environmental pathways of potential impacts to human health from oil and gas development in northeast British Columbia, Canada. *Environmental Reviews* 2012; 20(2): 122-134.
20. CCoF 121: Steinzor N, Subra W and Sumi L. Gas Patch Roulette, How Shale Gas Development Risks Public Health in Pennsylvania. Earthworks Oil & Gas Accountability Project, October 2012. [http://www.earthworksaction.org/library/detail/gas\\_patch\\_roulette\\_full\\_report#.UWBLDntwblU](http://www.earthworksaction.org/library/detail/gas_patch_roulette_full_report#.UWBLDntwblU)

21. CCoF 77: Colborn T, Schultz K, Herrick L, and Kwiatkowski C. An exploratory study of air quality near natural gas operations. *Human and Ecological Risk Assessment* 2012.
22. CCoF 122: [Worker Exposure to Crystalline Silica During Hydraulic Fracturing](http://blogs.cdc.gov/niosh-science-blog/2012/05/silica-fracking/)  
<http://blogs.cdc.gov/niosh-science-blog/2012/05/silica-fracking/>
23. CCoF 123:  
[http://documents.foodandwaterwatch.org/doc/Social\\_Costs\\_of\\_Fracking.pdf](http://documents.foodandwaterwatch.org/doc/Social_Costs_of_Fracking.pdf)
24. CCoF127: <http://www.bloomberg.com/news/2014-01-04/study-shows-fracking-is-bad-for-babies.html>
25. CCoF 128: <http://dyson.cornell.edu/research/researchpdf/wp/2012/Cornell-Dyson-wp1212.pdf>
26. CCoF191: McKenzie L, Guo R et al, Birth Outcomes and Maternal Residential Proximity to Natural Gas Development in Rural Colorado. *Environmental Health Perspectives* 2014
27. CCoF125: Review of evidence on health impacts of air pollution REVIHAAP project, WHO 2013
28. CCoF 126: Air pollution and lung cancer incidence in 17 European cohorts: prospective analyses from the European Study of Cohorts for Air Pollution Effects (ESCAPE) Ole Raaschou-Nielsen <http://press.thelancet.com/lungcancer.pdf>
29. CCoF145: Goldstein, The Precautionary Principle Also Applies to Public Health Actions <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1446778/>