

**Submission
No 615**

INQUIRY INTO COAL SEAM GAS

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The Director
General Purpose Standing Committee No. 5
Parliament House
Macquarie St
Sydney NSW 2000

Dear Hon Robert Brown MLC

Submission to INQUIRY INTO COAL SEAM GAS by the above GPSC (#5)

Brief Summary

I object to Coal Seam Gas (CSG) development in NSW based on a number of non-exhaustive grounds, as outlined below. These concerns pertain to the impacts of CSG operations on groundwater and surfacewater environments, and the lack of scientific baseline data, knowledge and certainty relating to cumulative impacts of CSG operations on NSW alluvial and groundwater systems, including groundwater fauna. There is little understood about the full environmental services that groundwater ecosystems provide to surficial systems. I therefore object to CSG development proceeding NSW, unless full impacts can be evaluated, detected, managed for and rehabilitated, and at least the issues outlined in my submission are addressed.

There are a number of terrestrial and social impact concerns, which also form the basis of my objection.

I am further of the view that the legislative framework, surrounding CSG development, fails the environment and the community, and is in dire need of review to ensure cross-referencing and adequate elevation and incorporation of the principles of Ecologically Sustainable Development, before it can be considered an appropriate legislative framework for responsible decision making.

The issues covered in this submission include discussion about/concern over:

- Groundwater and surface water relationships
- Groundwater ecology
- Water extraction (overextraction)
- Acceptable ecological thresholds
- Requirement for scientific study of water environments for baseline data
- Climate Change and aquatic system stress
- Cumulative impacts
- Fugitive methane
- Remediation
- Salinity impacts on food and agriculture
- Inadequacy of current legislative framework for assessing and managing CSG development

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I write as a resident personally addressing the above Inquiry, with issues for investigation or consideration against the Terms of Reference, as follows. The environmental and health impact of CSG activities including the:

1 Effect on ground and surface water systems

As a resident of the Manning Valley NSW, I hold grave concerns for the environment in terms of potential impacts arising from Coal Seam Gas (CSG) production. With many valleys of this region, laying within close proximity to one another, many river systems of the Manning Valley possess high interconnectivity. Gravel, geomorphic in-stream features, such as those featuring highly in many Manning valley river systems, create an effective exchange system for groundwater and surface water flows (hyporheic exchange). This surface and groundwater exchange provides vital ecological functions to river health¹ - such as nutrient and biogeochemical cycling, as well as habitat and filtration. As such, any disturbance to how groundwater is able to move through aquifers, may potentially have large impacts upon river systems, and thus surface water availability and quality to the environment and community in the long-term. These effects may become particularly evident in times of low-flow.

1.1 Groundwater extraction

CSG production is likely to extract vast volumes of groundwater, leading to a permanent depletion and deterioration of the functions and capacity of groundwater systems. This is an unacceptable situation for NSW. It has been stated that NSW east coast's rivers, feature the highest variability of flow in Australia, if not in the world. The National Water Commission indicates projections that the Australian CSG industry could extract approximately 56% of the current yearly volume taken from the Great Artesian Basin, every year for the next 25 years². I am of the view that mega groundwater extraction, such as this, can create cataclysmic and outstanding pressures on the environment, and the NSW community, through depletion of scarce freshwater resources. Regional freshwater feasibility studies based on the projected water extractions of this industry must therefore be carried out before consideration is given to lifting the moratorium on CSG development.

¹ Hancock PJ (n.d) *Human Impacts on the Stream-Groundwater Exchange Zone*
http://www.pebblescience.org/pdfs/Stream_Groundwater_Exchange_Zone.pdf (DOI: 10.1007/s00267-001-0064-5)

² Australian Water Commission (2010) *Position Statement Coal Seam Gas and Water*
http://www.nwc.gov.au/resources/documents/Coal_Seam_Gas.pdf

Furthermore, hydraulic fracturing has the potential to create unforeseen geological and hydrogeologic damage to aquifers, unnaturally linking underground groundwater systems, connecting and freely draining basins, and interrupting or increasing underground gradients and flows, which could lead to severe and extreme groundwater impacts.³

1.2 Groundwater fauna and ecology

Very little is known of the multi-dimensional landscape in which Coal Seam Gas production operates. Complex environments exist in subsurface groundwater ecosystems that are little understood, and the National Water Commission - in recently conducting an overview of the biodiversity in Subsurface dependant groundwater ecosystems (SGDE) - identified extensive gaps in knowledge about the distribution, composition and biodiversity values of Australian groundwater fauna.⁴ CSG production threatens to potentially destroy the habitat and conditions in which these fauna live. Therefore, in the face of material scientific uncertainty, in relation to subsurface dependant groundwater ecosystems, consideration should not be given to approvals for CSG exploration, assessment or production. Unknown adverse impacts to our environment must be avoided at all cost. On this subject, the National Water Commission has stated:⁵

"The interconnections between surface and subsurface ecosystems demonstrate that the water needs of SGDEs must be considered in truly holistic water planning; and ecosystem functions of SGDEs must be maintained if only to meet desired environmental outcomes for some surface waters."

Discompacting groundwater systems, by reducing pressures in aquifers, through structural damage, may potentially permanently disrupt the groundwater environment. Large scale de-pressurisation of coal seams and aquifers will not only affect flows and volumes of groundwater, but will also impact the sensitive environment of SGDEs, and their close interconnections with surface groundwater dependent

³ Australian Water Commission (2010) *Position Statement Coal Seam Gas and Water*
http://www.nwc.gov.au/resources/documents/Coal_Seam_Gas.pdf

⁴ Tomlinson, M and Boulton, A (2008) *Subsurface Groundwater Dependent Ecosystems: a review of their biodiversity, ecological processes and ecosystem services*. University of New England Waterlines, Occasional Paper No 8, October 2008

⁵ Tomlinson, M and Boulton, A (2008) *Subsurface Groundwater Dependent Ecosystems: a review of their biodiversity, ecological processes and ecosystem services*. University of New England Waterlines, Occasional Paper No 8, October 2008

ecosystems and other ecosystems⁶, through potentially affecting flux and flow regimes, water quality and aquifer pressure. Given that the ultimate impacts on other ecosystems of damage to SGDE's are largely unknown, proposals for CSG should not proceed.

1.3 *Wastewater release*

Any proposal to release wastewater from CSG production to rivers and streams will have the potential to geomorphically, ecologically and hydrologically alter river behaviour and characteristics to the detriment of important river and water quality values to the point where many of the benefits of these systems may be sacrificed. The Manning Valley comprises of unregulated systems, which have evolved and adapted to historical and current regimes. Introducing 'pulsed' or large-scale release of wastewater can disturb and potentially irreversibly alter these systems, should geomorphic or other biophysical thresholds be breached.

1.4 *Aquatic system fragility and resilience*

I object to CSG development in NSW until at least a complete understanding of the fragility and resilience thresholds of the river systems likely affected (both upstream and downstream) are completely measured and understood, with a good appreciation of the current trajectory of geomorphic recovery of those streams. This needs to be done so that effective scientific baseline data can be used in projecting real impacts of CSG production activities.

1.5 *Cumulative environmental threats*

The risks of environmental damage by Coal Seam Gas are extremely high, as well as hard to realistically monitor, enforce and manage. The impacts of Climate Change on river systems, are not yet quantified, however, Climate Change will put our aquatic systems and water supply under increasing pressure. I therefore personally find, the addition of further large-scale threats, such as by allowing Coal Seam Gas production in NSW - without understanding thresholds to permanent and irreversible change to our aquatic systems – entirely unacceptable.

⁶ Tomlinson, M and Boulton, A (2008) *Subsurface Groundwater Dependent Ecosystems: a review of their biodiversity, ecological processes and ecosystem services*. University of New England Waterlines, Occasional Paper No 8, October 2008

1.6 Restricting limit of damage

Whilst CSG companies have argued that hydraulic fracturing is restricted to the target seam, it is not clear how this will be measured, monitored and enforced by the NSW Government. I therefore hold concerns that aquifer interference by CSG, may have little yet scientifically understood impacts on river ecology, hydrology and geomorphology, and that these impacts may be catastrophic to the future of our rivers (water quantity and quality) in terms of the recharge capacity provided by groundwater systems. I therefore object to current and future proposals for Coal Seam Gas production until full certainty of knowledge about the relationships of surface and groundwater system monitoring, evaluation, as well as National and State and Regional Guidelines are secured for the determination of environmentally (feasibility study) sustainable levels of water extraction (including groundwater), with clear and measurable environmental outcomes.

1.7 Cumulative impacts

One of the greatest risks in CSG production is for combined effects of CSG operations over a wide temporal scale. Currently, there is no sufficiently strong mechanism being sought from CSG companies, or proposed for how wide-scale cumulative impacts of Coal Seam Gas extraction will be measured, nor on what constitutes sustainable thresholds as to cumulative impacts of numerous approved or neighbouring CSG operations. As mentioned earlier, there is a vast interconnectivity involved with groundwater systems, which can be opened up, or changed, from hydraulic fracturing. I am of the view, that until an effective way of understanding and appreciating cumulative and progressively increasing impacts on our natural environment, from CSG activity, can be articulated and identified, a proposal for assessment and production should not be issued for CSG mining. I recommend that thorough baseline studies be done to form a solid set of cumulative impacts data and environmental thresholds for sustainability.

2 Effects related to hydraulic fracturing

2.1 Fugitive methane

I object to CSG production in NSW on a further basis of concern regarding fugitive and 'freed' methane, including large uncontrolled gas releases caused by mishandling or over extension or failure of equipment. The nature of fracturing bedrock and aquifers to release gas and water, leaves potential for a

vast network of fissures and cleats which may not be rehabilitated or monitored, causing potential avenues for methane movement and escape to surface waters, wetlands and springs, as well as through well heads as alternative avenues for fugitive methane. Thousands of overseas (and tens of cases in QLD – 24/58 leaking/breaches of LEL standards) of 'well' failure are documented, demonstrating that CSG-methane production is neither a clean or green energy to extract, hold or transport. In this regard, CSG wells and cracks in coal seams (allowing fugitive gases) have the potential to negatively affect our community and the environment for a long time after the Gas exploration and production companies have left their leases. This industry threatens to leave an insufferable legacy to our environment, future generations and current day communities – which are unacceptable.

3. *Nature and effectiveness of remediation required under the Act*

Provisions for remediation of CSG operations under the *Petroleum (onshore) Act 1991* (NSW) (hereafter, *Petroleum Act*) are meager, and do not provide appropriate or realistic measures for addressing physical and by-product damage induced by CSG mining operations, such as permanent damage to coal seams, and alteration of subsurface geology and hydrology. The objects of the *Petroleum Act* are essentially to direct and regulate the processing of mining administration, and are scant in detail about the situations where rehabilitation is required, for the operating environments of CSG production. A review of sections 74 and 75 of the Act are required to bring about better security for management of long-term changes to the environment caused by CSG operations. The requirements for detailed testing and monitoring, as well as guidelines for adaptive management, post-operation are fundamentally missing from the *Petroleum Act*.

It seems there is a there is a degree of discretion created under the *Petroleum Act* as to rehabilitation of the impacts and alterations in the landscape brought about by CSG related activities.

4. *Food security and agricultural activity*

Drilling through potable water aquifers into deeper aquifers has the potential to draw up contaminants (naturally occurring), thus potentially polluting important shallow aquifers used by primary producers for agricultural production. Clean water is a fundamental limiting factor to quality agriculture in NSW. The

pollution of ground and surface water by either salt storage; wastewater dumping and cross contamination of aquifers.

4.1 Salinity

Large volumes of Salt are extracted as a waste product of CSG mining, which is often contaminated and cannot be feasibly (economically) transported off site. Potential for leaching to the environment from banded overburden will leave farmers with a large and destructive 'salt in the landscape' issue. I object to CSG assessment and production based on the risk which this by-product poses to agriculture and the environment.

5. ***The interaction of the Act with other legislation and regulations, including the Land Acquisition (Just Terms Compensation) Act 1991***

5.1 *Broad consideration of current legislation.*

The *Petroleum Act* is heavily geared towards the administration of Titles, with a lack of detail on requirements for comprehensive environmental assessment and concurrence with other agencies. Section 74 of the *Petroleum Act* pays little definition to the obligations of the Minister about consideration of the environment. Part 4 contains scant direction for the requirement of consideration of advice or consultation with other agencies on Titles. It would seem that, from cursory appraisal that the objectives of the *Water Management Act 2000* (NSW) and Regulations, these Acts are essentially subordinate to the purposes of the *Petroleum Act*, through this lack of representation of information and referral to other essential legislation. This Act is currently not well-gearred towards appreciating and assessing the full extent of impacts of CSG extraction, which are yet to be understood with clear science, in terms of impacts on the unique Australian hydrological landscape.

The distinct lack of cross-referral between the *Petroleum Act* and the *Water Management Act* is but one reason I object to allowing consideration of CSG Titles. The *Water Management Act* is a solid platform for registering water extraction and managing impacts on water resources, yet the environmental considerations provided in the *Water Management Act* are not nested or reflected in the *Petroleum Act*.

An ESD focused framework, representing various relevant acts such as the: *Protection of the Environment and Operations Act*; *Threatened Species Act*; *Water Management Act*; *National Parks & Wildlife Act*, is required, but is not effected by the current legislative framework surrounding Coal Seam Gas extraction in NSW. I recommend a full review of the interchange between these acts to ensure that Ecologically Sustainable Development is not just merely 'encouraged' or 'considered' but is central to decisions relating to Title considerations under the relevant instruments relating to CSG.

Further to these matters, the *Petroleum Act* does not express the Precautionary Principle. The Precautionary Principle creates avenues for balanced decisions to be made in terms of Ecologically Sustainable Development. 'Triple bottom line reporting' is a fundamental business direction for governments to consider for staying viable. Ignoring Ecologically Sustainable Development can create decisions, which inadvertently bias the interests of one group over another, or one form of economic development over others.

The *Petroleum Act* nor the *Mining, Petroleum Production and Extractive Industries SEPP 2007* (NSW), do not well outline where consideration is to be given to alternative forms of economic development or supply. This assessment should be made as part of an overall consideration for any mining or extractive operation in NSW. A broader scope for assessing social, environmental, cultural, and economic impacts from CSG related activities must be explored, with scientifically and socially acceptable guidelines nested in associated Regulations.

5.2 *Mining, Petroleum Production and Extractive Industries SEPP 2007*

The *Mining, Petroleum Production and Extractive Industries SEPP 2007* contains provisions for significant impacts on land in the vicinity of CSG developments; land use trends; and incompatibility in land uses – for evaluating and comparing preferred land use options. However, the standards and tests which are to be applied to effectively evaluate these temporal, economic and social relationships are not well-established in the current legislation; and therefore the existing provisions enable a degree of subjectivity, bias and discretion potentially favouring dominating uses/industries to occupy otherwise beneficial resources to the community or other Industries. I propose that precise tests and standards are set out for the assessment of these factors, and that these evaluations are conducted by independent

auditors and experts. I also recommend that the SEPP is further expanded in scope to reference the fundamentals required of Rehabilitation of groundwater resources and coal seam damage associated with CSG development and activities.

I object to development of CSG in NSW on the above grounds.

Yours faithfully

Tina N Clemens