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Committee Secretary
Senate Select Committee on Unconventional Gas Mining
PO Box 6100
Parliament House
Canberra
ACT 2600

14 March 2016

Dear Sir/Madam,

Re: Submission from the Centre for Coal Seam Gas, The University of Queensland

Thank you for the invitation to provide a submission to the Australian Senate Select Committee Inquiry on "Unconventional Gas Mining".

The Centre for Coal Seam Gas (the Centre) at The University of Queensland (UQ) conducts and coordinates studies on technical and social challenges associated with the development of the coal seam gas (CSG) industry in Queensland. It was founded in December 2011 and is funded by The University of Queensland (20%) and the four main CSG industry proponents in Queensland (80%). The Centre is not a group of researchers dedicated *solely* to CSG research. Rather it supports projects by researchers employed across around 18 different schools and centres at UQ. This submission therefore does not therefore claim to speak on behalf of, or represent the views of, the many individual researchers undertaking these projects. The conduct of all the Centre supported research is subject to the University's research integrity and ethics policies and procedures (www.uq.edu.au/ppf).

CSG Research supported by the Centre

The current inquiry is far broader than the scope of the research program supported by the Centre (social performance, water, geosciences and petroleum engineering). An overview of the research program is provided on the [Centre website](#). The challenge for researchers now is to complete the necessary independent peer reviews, to translate the research and help others learn from these insights.

At the time of this submission, the majority of the research supported by the Centre is still pre-publication and pre- (or is undergoing) independent peer review. While this process delays

release of findings, it is essential for ensuring credible robust research outcomes. Research briefings can be arranged if required.

We have also developed an [Onshore Gas Research Directory](#) to provide a tool to help search the summaries (and contact information) for more than 400 research projects and government reports, primarily from Australia. This source may assist the Inquiry to locate relevant scientific information. A large number of publications are being added this year and will continue to be generated over the coming years.

Previous Inquiries and Reviews

This inquiry follows similar inquiries and scientific reviews within Australia and overseas. These seem to have considered essentially the same body of scientific evidence and materials. The leading scientific reviews have generally concluded that the environmental risks of unconventional gas development can be managed given suitable, robust regulation. Responses to the scientific material have varied. Some inquiries have resulted in moratoria on gas development, others have made recommendations that have not been adopted, and other jurisdictions have elected to develop their gas resources.

Other international bodies have also suggested key principles for the regulation of unconventional gas (e.g. *International Risk Governance Council, 2013*; and, *International Energy Agency, World Energy Outlook, Special Report, 2012*). Closer to home, the COAG, Standing Council on Energy and Resources have developed, in 2013, a *National Harmonised Regulatory Framework* outlining 18 “leading practices” for regulation of CSG.

Given this very large volume of previous work, we will not repeat the science input nor findings from inquiries in any detail as many will have been referenced in other submissions to this inquiry and the inquiry will no doubt have reviewed and collated their findings to be incorporated later.

Lessons learned in Queensland

With respect to the search for legislative and regulatory *adequacy*, lessons have been and are being learned from the developments in Queensland. While not in any way assuming that everybody’s concerns and issues are fixed, or are fixable to their satisfaction, or that no further concerns will arise, there have been several regulatory innovations that could be translated

more broadly for different contexts in Australia, whether for onshore gas development or for other forms of large industrial or resource development.

Robust monitoring and compliance strategies are critical in establishing community trust in both the industry and regulator. Key initiatives in Queensland include the establishment of new regulatory entities:

- The Queensland GasFields Commission (statutory authority) was established to facilitate improved relationships between the CSG industry and agricultural landholders and regional communities. The Commission is an important conduit for scientific and technical advice, for example through its 'Technical Communications' which cover a range of issues from groundwater systems to well integrity.
www.gasfieldscommissionqld.org.au/gasfields/about-us/publications.html).
- The Office of Groundwater Impact Assessment (OGIA), in the Queensland Department of Natural Resources and Mines, has responsibility for assessing the cumulative groundwater impacts of the CSG industry, assigning responsibility for actions in areas of overlapping tenure, and developing springs management and groundwater monitoring strategies across the cumulative management area. Particularly important is this organisation's, evidence based, in-built update and revision process. That includes production of an annual report with major review every three years to make use of new data as it emerges, to incorporate insights from improved models, and to make public its technical assessments;
- The Coal Seam Gas Compliance Unit (Qld Department of Natural Resources and Mines) to provide a primary point of contact for landholder and community complaints regarding the industry and also regional management of a structured compliance program in relation to both CSG well integrity and safety, and groundwater management.

In addition to these new entities, the development and improvement of key open and transparent regulatory 'Codes' also has an important part to play. Chief amongst these are the Queensland Department of Natural Resources and Mines Codes of Practice for "... *coal seam gas well head emissions detection and reporting*" (2011); for, "... *constructing and abandoning coal seam gas wells and associated bores in Queensland*" (2013) and the "*Land Access Code*" (2010).

For further consideration

There are a number of key actions that might assist in governing the sector, such as:

- **Research**—In Queensland, while activity in the region rose steadily from 2007/8, the CSG development decisions were finally taken in late 2010 and early 2011. Independent initiatives resulted in the establishment of two main part-industry funded research providers (this Centre and GISERA) in mid- to late- 2011. Both involved substantial industry funding support. Today, in addition to extensive research overseas, there exists a large body of local, onshore gas research completed and underway across Australian research institutions. A major challenge for researchers and research institutions is to collate and synthesise this in a way which is accessible for wider audiences.
 - **Establish baselines & pre-existing trends**—Ensure that a comprehensive range of pre-development data and trend line data is gathered before commencement of large field developments in relation to issues perceived to be important. For example, 10-20 year trends in groundwater levels and groundwater chemistry can represent a touchstone in assessing effects of extraction of groundwater associated with unconventional gas development and pre-existing uses for agriculture. Such trends are also needed to monitor and assess effects on biodiversity, environmental and public health, and socio-economic conditions. For example, researchers at UQ have found that there are often important, under-used, pre-existing records from resource exploration (oil, gas and mining), which contain data that can help to establish trends and baselines that could be highly relevant to water quality, emissions, and natural occurrences of hydrocarbons (e.g., [see Surat and Bowen basins hydrocarbons research](#)). Researchers at CSIRO/GISERA have been undertaking direct measurements of fugitive methane emissions to ground truth factors used in calculating GHG impacts, as well aiming to study naturally occurring background fluxes in the region (e.g., see <http://www.gisera.org.au/research/ghg.html>). Methods developed in these studies will be applicable in other areas.
 - **Track social and economic effects**—Research has shown that stakeholder perceptions of change, whether industry, regulator or community and whether positive or negative, are invariably an incomplete indicator of on-the-ground, up-to-date effects. UQ research to date indicates, for example, that chief among the cumulative impacts are a significant increase in migration into, out of, and within towns near CSG development with implications for town character and opportunities for growth. Importantly, the scale,
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speed, and nature of development was accompanied by a marked difference for some local residents between expectations and effects of CSG development. That underlines the salience of clear, consistent, and sustained communication and engagement efforts. The pattern of effects, town-by-town reflects unique aspects of each town, the areas of focus of the industry (in some ways dictated by where the gas resource is), and the nature of the region as a social and economic system. UQ's research has focused on establishing impact metrics that are accepted by the communities as important and credible, relevant to industry and government stakeholders, and lend themselves to objective measurements ([Cumulative socioeconomic indicators research](#)). This information is used to foster a shared understanding across sectors (community, government, industry) on how changes in one parameter (*e.g.*, employment) can affect another (*e.g.*, income levels) in a given town and region, and also highlights how changes are experienced differently in various towns across the region. Likewise researchers in GISERA/CSIRO have added much understanding to this sphere (<http://www.gisera.org.au/research/impacts.html>). Again, there are significant challenges in synthesizing and disseminating this growing body of knowledge to wider groups.

- ***Track environmental, especially groundwater impacts***—Ensure that cumulative environmental, and especially ground water, impacts are forecast, monitored, and reported. This sort of assessment has been achieved in Queensland through OGIA's modelling, monitoring, and updating work (which is supported closely by a range of geosciences and groundwater research here at UQ, and other institutions). These efforts are also supported by DNRM's [CSG Net](#), which involves landholders in conducting monitoring, a form of citizen science that enables a local check on the validity of results from government and industry monitoring and modelling. Regular review of modelling estimates is essential, for example, research currently underway by UQ researchers is indicating that actual water and salt production figures may be significantly lower than pre-production forecasts made by industry, the regulator and third parties.
 - ***Data repositories and portals***—Establish high quality data management infrastructure and systems that can hold historical, baseline, production, and monitoring data and facilitate the interrogation of this data. It is important that government facilitates sharing of data as well as providing access to researchers. Techniques have been
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developed that are ready to transfer to other geographical areas and additional forms of content. These techniques include [UQ's Water Chemistry Atlas for the CSG fields](#). The Water Chemistry Atlas employs 3-D visualization technology to enable exploring and interrogating groundwater data with the help of a regional geological model to clarify which specific aquifers are being accessed by the water bores.

- **Transparent reporting**—Provide transparent reporting of activities, monitoring, compliance, and enforcement data to public stakeholders. For example, the Queensland government's [CSG Globe](#) is an online mapping tool that facilitates a public view of industry data on the location and depth of CSG wells. It is essential that data repositories and associated reporting tools developed by government and research institutions are maintained in the long-term to facilitate identification of trends and any investigations that may be required.

In the research space, it is fair to say, that we all wish that we had started these investigations earlier. It may be that other States can build on work in train here. In many cases for such investigations, community members can be actively involved in problem identification and solutions development.

Sincerely,



Professor Andrew Garnett

Director
University of Queensland
Centre for Coal Seam Gas
