

**Submission into the management of the
Murray Darling Basin from the perspective of
Coal Seam Gas (CSG) extraction**

With respect to the economic, social and environmental impacts of mining coal seam gas on:

- The sustainability of water aquifers and future water licensing arrangements;*
- the property rights and values of landholders;*
- the sustainability of prime agricultural land and Australia's food task;*
- the social and economic benefits or otherwise for regional towns and the effective management of relationships between mining and other interests; and*
- other related matters including health impacts.*

19 JULY 2011

By Anne Bridle

19 July 2011

Senate Standing Committees on Rural Affairs and Transport
PO Box 6100
Parliament House
Canberra ACT 2600

Dear Sir/Madam,

As a mother and as a representative of Talbingo Pastoral Company, I welcome the opportunity to provide input into the management of the Murray Darling Basin from the perspective of Coal Seam Gas (CSG) extraction.

I make this submission as someone who is actively involved in understanding the developing CSG industry in Queensland and its interface with agriculture and rural and regional communities. In doing so, I bring forward my experiences and my knowledge of CSG development with specific reference to Queensland and the governance systems that apply. I paint a picture across the landscape of my concerns and issues and relay the groundwater knowledge that I have learnt from independent groundwater hydrologists. Where possible I align this picture to the terms of references of the inquiry into the management of the Murray Darling Basin (MDB) from the perspective of CSG extraction. I trust that where I bring forward issues then provide a context for these issues, the committee will have the capacity and foresight to apply the implications to the scale.

However, I seriously worry that the implications of CSG development is an issue far beyond the scope and capacity of this inquiry to deal with. I only hope that I have clearly articulated my concerns and coupled with the concerns of others, this will encourage and enable higher level attention and consideration of the industry.

Lastly, I am grateful for the opportunity to provide my views and I thank-you in advance for your considered attention to the issues I raise herein.

Yours faithfully,

Anne Bridle

Background

I am a mum, a wife and a partner in an integrated agricultural enterprise which I dearly love. My family and I, operate Talbingo Pastoral Company which includes a fully integrated agricultural operation involving a Santa Gertrudis cattle stud, cattle breeding, backgrounding, fattening and feedlotting, grain growing and a commercial transport business. Our integrated business is contingent on all aspects of our business chain. At Talbingo, south of Dalby our 30,000 acre property comprises approximately 15,000 acres of cultivatable area and we grow grain, fodder and silage for our cattle as well as directly marketing those products. Our feedlot is currently built to 1250 head SCU (standard cattle unit) capacity and it is licensed to operate at 5,000 head SCU once our planned infrastructure expansion is built. Our land holding also includes 70,000 acres of cattle backgrounding country at Dirranbandi as part of our long term plan to build cattle capacity supplied into our expanded feedlot. At our Dirranbandi holding, we are totally reliant on bore water from the Gubbermunda aquifer for domestic household supply and the watering of an extensive cattle herd. Here, we have implemented and fully embraced the GABSCI bore capping and piping scheme.

Notwithstanding the size of our operations, we depend on our feedlot and its viability is directly dependent upon a bore license issued to us under the *Water Act 2000* allowing us to access the Kumbarilla Bed aquifer for stock intensive purposes. Cattle drinking water in the paddock is provided by 4 stock and domestic water bores and a number of overland flow dams. Over the last 10 years a number of our dams have gone dry due to dry weather at Talbingo. During this time we have, like others in the district, relied heavily on our bores to water stock. Water for our home and that of our employees is provided by water bores. Talbingo, is situated on the headwaters of the Moonie River, but has no access or rather water entitlement from this resource.

Our feedlot built in 2006 provides a contingency plan for drier times and a vertically integrated adjunct to our existing grain and beef production business. In 2008 and 2010, Talbingo Feedlot was a finalist in the national ALFA Feedlot of the Year Competition (<3,000 head capacity). We are licensed to expand our feedlot to 5,000 head capacity which would enable us to turn-off up to 15,000 head of cattle per year. Our feedlot has over 3,000 tonnes in grain storage capacity. Feedlot milling capacity

is already built to 5,000 head feedlot. The feedlot is registered to feed EU, EU High Quality Grain Fed Beef, and Non scheme cattle. Following consistently strong cattle performance figures through our feedlot for our own cattle, we have recently accepted custom feeding into our feedlot regime and it is custom feeder demand for pen space in our feedlot that will drive our next stage feedlot expansion to 2,700 SCU over the next 3 months.

Currently we employ 7 people full time at Talbingo and 2 people full time at Dirranbandi as well as up to 15-20 subcontractor staff throughout the year. We provide accommodation for our permanent staff and families and these families send their children to the local schools as well as shop locally. Our business purchases goods and services from local businesses in Dalby, Tara, St George and Bollon and we hold major key accounts with business houses in Dalby, St George and Meandarra.

Escalating coal seam gas exploration and production across the Surat Basin has become a concern to our business and its viability due to the possibility of loss of agricultural land and of our bore water supplies being unduly affected. As a result of these concerns I am actively engaged in understanding the developing coal seam gas industry and its interface with the agricultural industry and rural and regional communities. My capacity in this area comprises being:

- a committee (and founding) member of the Basin Sustainability Alliance (BSA)
- a committee member of the Australian LotFeeders (ALFA) CSG subcommittee
- a committee member of FutureFood Queensland
- a landholder representative of the of the Surat Basin Sustainable Resource Communities Local Leadership Group
- a member of the Surat Basin Future Directions Steering Committee
- a member of the Dalby CSG Engagement Group
- a member of the Qld Rural Womens Working Group
- a member of the AgForce Mining (CSG) Taskforce

As a landholder and as a member of these various committees I have, over time, questioned the interface between agriculture, food security, mining and jobs and economic growth particularly in the context of escalating coal seam gas development in Queensland and the implications to long term rural liveability and sustainability. I have compared the different government policy and processes applying to different industry development. Specifically, I have asked how the CSG industry will have the capacity to make-good long-term damage to the Great Artesian Basin water resource and from where our future food and water needs will come. Whilst I admit and celebrate that the various groups I am involved with (particularly Basin Sustainability Alliance) have collectively affected change in legislation and government regulations, these concessions are only as good as the capacity they translate to make a difference in 30 to 50 years' time.

The impost forced upon our community generally to keep abreast of CSG development is staggering and a significant change to how we used to operate. I now regularly research various legislations and acts of parliament, read company environmental impact statements, environmental authorities and environmental management plans. I have accessed databases for water resource allocations and entitlements and analysed reliance on this resource by various industry sectors. Each new piece of information fits together as part of a larger ever-changing puzzle that often brings with it more questions than answers. Yet within a heartbeat it all changes and there is a new management plan in place. There is no matrix or document control register available to square off between CSG company environmental authority conditions and the 1500 State and Federal conditions on the LNG projects. The public is not aware if the financially complicit regulator is doing its job after a poor record in the past, nor is it aware of the most up-to-date material on CSG development. At times I have used my local State parliament minister to raise questions in parliament just to get the information on the public record. I have made submissions to various federal government departments despite no submissions being called for. And where possible, I have carbon copied my submissions to various community and industry groups so as to encourage discussion and a commitment to address issues and concerns.

In February 2010, I was told by a legal representative in the Queensland government that “yes Anne, you are right, CSG is unsustainable in terms of its unrestricted water take but it is allowed under the P & G Act and you need to walk away- there is nothing you can do about it”. That advice is something I have not and cannot heed- it is against what I believe in and against the vision I uphold for my children’s future. Together with my fellow BSA colleagues, I have isolated loopholes in legislation and regulations pertaining to CSG development and sought to have them addressed by government. It is a long and arduous process and whilst landholders are now somewhat engaged in discussing these types of issues with government, the CSG companies and their representatives, have long enjoyed such access and input into the legislation, conditioning and regulation under which they operate. CSG industry development in Queensland is still largely facilitated on a reactive basis: to make good damage rather than preventing it happening in the first place; or to pay for damage along the way when it occurs. Such a framework is very enabling of an industry development that is characterised by a significant lag period between cause and effect and has the potential to have impacts on groundwater which last hundreds of years.

I have witnessed the fracturing of rural and regional communities, as people at all levels of community, some with reservations over the social and environmental governance of the CSG industry and some with financial and commercial industry co-option, are pitted against each other. I have at times felt intimidated by high level CSG Company representatives and local industry subcontractors.

I have extensive networks at many levels of community, industry and government in Queensland as well as across NSW. The ability/capacity to access new information, to research and share information through both email and the internet has been and continues to be a very powerful tool to reach people.

Introduction and overview of observed governance of the CSG industry

The Queensland government has openly accepted a new aggressive “player” to vie for land and water resources across the state and within the Murray Darling Basin (MDB). The community is still deliberating its presence as the national ‘lock the gate campaign’ indicates as do the strong community protests that spring up at each new

development hot spot. Whilst other states of Australia are a little further behind in their acceptance and facilitation of this new player, they are quickly catching up. Money talks. The new aggressive player is the Coal Seam Gas (CSG) industry.

Although the CSG industry has been operating for over 15 years in Queensland to meet domestic gas supply, it has recently been elevated to being a major industrialised and *aggressive* player through the concurrent government acceptance of the exporting of Liquefied Natural Gas (LNG) through Gladstone in Queensland and Newcastle in NSW and the taking over by multi-nationals of the small local prospectors. To meet LNG export demand the CSG industry must draw on many more gas reserves than ever considered for a domestic gas venture and draw from across a very wide landscape. To do so means accessing and sterilising more land from agricultural production (the time-frames are still not known), extracting significant amounts of groundwater year in, year out for 30 to 50 years, interfering with both surface and groundwater systems, disrupting the exclusive rights to land held by landowners and displacing the social fabric and capital of rural communities. And doing so within a legislative framework that was only ever intended for a domestic gas supply industry, NEVER for the scale of an export LNG industry.

For many of us residing in rural and regional Queensland, operating in this space is difficult. It is not a game and unfortunately it is not a choice as we have no capacity to “opt out” of the impacts that will ultimately come our way or accrue over time and space and perhaps regardless of our geographical proximity to a CSG gasfield. The uncertainty of our lives and businesses is problematic and while we are living it, the aggressive new player is playing for “keeps” and has the referee on his side.

At this stage the prospect and reality of CSG development on their land weighs heavily on the minds of landholders. Sometimes it generates paralysis but never excitement. Mostly it brings concern and uncertainty for landholders and their future, their family’s future and the future of what they have tried to manage, their natural resources.

CSG development in Queensland offers state royalties, jobs and economic growth and federal taxes to cash starved state and federal governments in dire need of assistance. The Queensland government has facilitated and enabled the escalation of CSG

development to LNG capacity through its approvals processes and lack of monitoring and accountability to date and all this in the context of the greater good CSG brings to the nation. Gaps in research and legislative frameworks have been known and for some time have been ignored. In hindsight, this ignorance appears intentional. Moreover, public discussion of CSG development and its potential impacts has become highly politicised. The Queensland government, operating in a 3 year election timeframe, is far devoid of long term natural resource sustainability concerns nor is it considerate of the implications for future food production capacity.

When someone did the sums on the royalties to be amassed by an export LNG industry in Queensland they forgot to calculate the other side of the ledger – specifically, the long-term costs to the environment; the loss of diversity and ecological, social and agricultural values for long term sustainability. There was certainly never any consideration to calculating how these ‘figures’ in unison with NSW’s CSG footprint may amass for the MDB.

And why do the sums at all? It appears that there is a “not on my watch” mentality in government facilitated by the time lag between cause and effect from CSG development and its impacts. So long as the impact can be stalled/not seen until a later date (preferably outside a 3 year election period) there is no need to put a cost on the level of damage that has been considered and ultimately accepted. And there is no point to bring forward the hidden externalities until they materialise and present a problem later on. So in this cosy system and process, the CSG companies submit Environmental Impact Statements (EIS) , revised EIS, Environmental Management Plans, revised EMPS, Noise Constraints Plans, Water Management Plans, Salt and Brine Management plans, Roads and Tracks Management Plans, Pipeline Plans ...the list goes on... and these go forward to approval stage without full community knowledge of the potential impacts.

No one individual can keep up with the documents or get across the sheer size of the plans proposed. It is a difficult and lonely process to traverse. But most of all it is the governance process of this industry, the complicitary nature of its development, the fracturing of communities and the path that has been ultimately accepted by government for rural and regional Queensland that is debilitating and soul destroying

to witness and bear. Especially as the ability, capacity and will of communities to participate, get informed and be involved in the decision process is systematically eroded. In the context of this submission, where I refer to “complicit”/“complicitary”, I refer to the obtaining of benefit/s which may compromise the adoption of a balanced view of all the considerations.

At what point do the State and Federal governments clearly communicate to the people of Australia the impacts they have ultimately accepted by allowing an export LNG industry? And at what point do we collectively choose to stand up together, community by community, when the policy and processes in place seriously challenge and jeopardise long term natural resource and social legacies and the food producing capacity we collectively leave our children and future grandchildren?

Adaptive Management Regime

Without answers to the many environmental, social and long term sustainability questions around this industry the Queensland Government has adopted an Adaptive Management Regime (AMR) to manage this industry as it rapidly unravels from various CSG companies across the countryside. When a proactive response to this industry development is so vitally needed and strongly called for by communities we see paralysis in the face of uncertainty paired with a business-as-usual approach to aid and benefit from industry growth. As in the past, uncertainty provides an excuse for both the State and Federal governments to continue as before and to use industry experience as the “research”.

For our vital groundwaters facing impact from CSG development, and the ecological, human, health and future generational reliance on those waters, there can be little to no comfort in the AMR that is currently proposed* by the Queensland government. Scientific researchers have acknowledged publicly that “you can model groundwater impacts until the cows come home, but the real test in time will be the “suck-it-and-see” approach- quite simply it is a matter of putting stress on the system and seeing what happens (Professor Steven Raine, USQ 2011). Communities justifiably have a right to be concerned because the reality could be irreversible damage. Further the current environmental regulatory apparatus is paralysed by uncertainty in that the government cannot adapt unless there is proof of damage, yet proof is/or potentially

will be unattainable or take considerable time and then the impact will be potentially too significant to claw back from.

*In theory, for AMR to work, all realms of possibilities/impacts must be considered, time must not be restricted and the goals can change. Yet the AMR proposed by the State government places boundaries and limits on the impact possibilities. It also externalises many factors.” Science loves order, simplicity, and manipulation of a single variable against a background of consistency. The tools of science do not work well when everything is changing at once so the systems suffer from a constricted one impact at a time vision” (Steingrabber, S. 2010). The government’s proposed AMR framework appears only open to certain impacts in a confined framework during a specified period. Further, the goal remains the same, a world class export LNG industry at all costs. From the very start, AMR is flawed and its capacity to respond to impact is compromised.

In October of 2010, the federal government had a golden opportunity to assess and define the capacity of the governing mechanisms for an export LNG industry. Rather than seek peer reviews of the concerns and potential impacts of the industry or adopt the precautionary principle for the development, the federal government gave conditional approval to the QCLNG and Santos projects. In early 2011, the federal approval of the APLNG Project was also granted. The documents that were considered in the approvals process for the QCLNG and Santos Projects were tabled in the Senate after these approvals were granted. These documents revealed that both QGC and Santos were active participants in the drafting of the federal conditions that would eventually apply to them. In particular, one proponent was deciding the terms they would operate under as they threatened that unless afforded this opportunity, the multinational company they represented would find it difficult to recommend final investment, which would ensure the project would be discontinued. Surely our environment, our communities, our natural resources and our future generations deserve better governance. It remains to be seen what environmental, social or intergenerational value was traded off in October last year to secure these projects and how these trade-offs will manifest themselves in years to come.

Lack of capacity to respond to CSG industry development

The pace of CSG industry development in Queensland is far outstripping various environmental, social, governmental and political capacities to respond. The environmental capacity response to CSG development is over stretched due to the sheer volume, scale and constant extraction of groundwater from a system that is accustomed to responding to slower rates of extraction and recharge and pressure and quality changes. The social fabric of communities is changing rapidly with the introduction of new people, new dynamics of what community is, change in community social capital and significant stresses on both soft and hard social infrastructure.

The lack of governmental capacity to respond to CSG development has been acknowledged by the Queensland Government in the past (Andrew, Brier, LNG Enforcement Unit, DERM 2010) but still they continue to play catch up with an industry they are financially complicit in allowing to rapidly evolve. The Queensland Government is failing to realise they have only just caught up with the first stage of development and the context has changed again and they are still playing catch up. The sheer pace is far out stripping the capacity of communities and even companies, through issues with sub-contractors, to manage this development thoughtfully. And if this really is a once in a generation opportunity to develop these resources on behalf of this generation and further generations (as stated in Queensland Government publicity statements), then the failure of government to not manage it thoughtfully is a matter of national importance. It is well recognized that economic systems move much quicker than environmental and social systems and it is often this disconnect that shears the system. We need time as indicated by the number of organisations across Australia that have called for a moratorium on CSG development, such as: the Queensland Country Women's Association; Agforce Queensland; National Farmers Federation; NSW Farmers Association; Queensland Conservation Council and Basin Sustainability Alliance to name a few.

Politically, the three year election cycle has seen both industry and government spin doctors elevate the “jobs, jobs, jobs” mantra together with economic growth and promise mostly for the south-east corner of Queensland- the largest voting base in the state.

Overseas experience

Natural gas including CSG extraction has been occurring for 30-40 more years in other countries around the world. But Queensland appears to have been reluctant to learn from the experiences and impacts of these developments. These impacts include, but are not limited to, loss of groundwater in aquifers, contaminated groundwater supplies, loss of agricultural land, health affects to people, pets, stock and wildlife and displacement of community.

The Queensland government has down played overseas experiences saying that the Queensland CSG industry is so much more regulated than other countries and our rock mechanics and aquifers are so different. I'd like to believe this. Yet many things remain the same. The technologies used in Canada and the US to extract the gas are very similar. Our aquifers often sit directly above or below the target coal seam just like they do in the United States. These aquifers are often impacted by or connected to strata formations above and below - either directly via fractures and fissures, or indirectly by differential rock and fluid stresses and pressures. Likewise, both here and overseas, extracting huge amounts of groundwater changes the mass, stress and chemical balances of this complex rock-fluid-gas system, so that it takes time for both the hydrodynamics and chemical composition of the water to achieve new equilibriums. Further, hydraulic fraccing of the coal seams in Queensland is carried out by the very same companies that hydraulically frac coal seams overseas (Hallibuton, BJ Services, Slumberger to name a few, as referenced in CSG Company EIS and as evidenced on CSG well sites.). The practise of hydraulic fraccing overseas carried out by these companies is currently being scrutinised due to concerns over significant impacts to groundwater.

In some areas in Queensland, it is expected that the head pressure change in groundwater aquifers from CSG extraction will be far greater than ever experienced in other countries in the world to date. This is because of the greater depth of the coals in Australia at which the CSG is extracted. This is new uncharted territory for Queensland. Coal seam gas extraction has not been done before on such close well density and wide scale, the science is unknown and it brings significant uncertainty for our groundwater systems. Will this greater pressure change mean we will

experience far greater groundwater impacts than in other countries just from dewatering? and then what happens when fracking is added into the mix?

And lastly and most tellingly, the regulators both here and overseas are bound in a governance system that puts short-term economic gains from this industry in a hierarchy far above the environment and long term natural resource impact legacies it leaves. At what point does evidence of harm overseas from CSG development become definitive evidence for Australia to consider, and to acknowledge that harm could very likely happen here?

CSG as an energy resource

In doing business, the CSG industry produces 3 major products namely gas, groundwater and salt, yet it is just the gas component that is widely acknowledged and its benefits touted. CSG development has been facilitated on the perception that it is a clean and green energy source. Greenhouse Gas Emissions (GHG) and the full carbon footprint of infrastructure development to extract and move the gas to port are not considered rather it appears these considerations are blinded by the lieu of the demand for and economic stimulus from export LNG .

It is acknowledged that new systems are needed to produce our energy, yet just as critically, if not greater, is our need to produce our food in less ecologically damaging ways. The problem with CSG development is that it will contribute heavily to wide scale ecological damage to our food production systems through the displacement of land, greater industrialisation of air, water and soil, clearing of vegetation, and introduction of huge salt loads.

Salt

As of 30 June 2011, there are still no answers to how the millions and millions of tonnes of salt brought to surface will be dealt with across the Surat, Bowen and Galilee resource basins which house the rivers and tributaries that form the headwaters of the MDB. The CSG industry is going to mobilise a lot of salt and it is going to have to go somewhere. There is talk of encapsulating the salt and burying it somewhere in the Basins. There is talk that in a couple of years some new industry is going to materialise and take the lot, value-adding it, by turning it into beneficial

products such as soda ash or glass. Yet as a community we wait knowing that if it were some other industry looking for development approval it would not be granted without giving consideration to its impact on other industries and other regions and certainly not without a plan for its waste disposal.

It remains to be seen how the Queensland Government is going to uphold their MDB end of valley salt targets and manage the risk imposed by saline water being introduced into the surface system and the risk imposed by contaminating interconnected aquifers. How is the Queensland Government and CSG industry going to adequately recompense the seemingly inevitable risk realities of local, state, and Murray Darling Communities?

Water - the sustainability of water aquifers and future water licencing capacity.

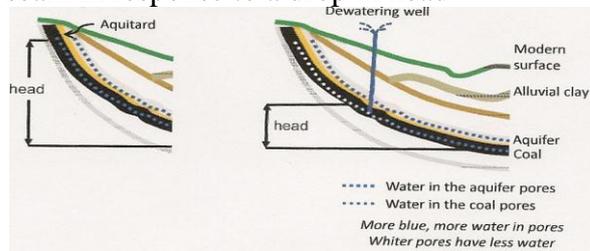
Ground water is the lifeblood of businesses and towns in rural and regional Queensland and predicted climate change towards lower rainfall and higher temperatures (Allen Consulting Group, 2005) will exacerbate this reliance. The Surat Basin is one of three major depressions which comprise the Great Artesian Basin (Department of Natural Resources and Water, 2006) and the Walloon Coal Measures, from which coal seam gas is extracted, are part of this system (Hellmuth, 2008; Great Artesian Basin Resource Operations Plan, 2007). The Springbok and Hutton aquifers lie above and below the coal seam and, in the Eastern part of the basin, the Condamine alluvium aquifer, though not part of the Great Artesian Basin, lies directly above the coal seam or the Springbok aquifer and is the highest allocated groundwater source in the State (Hellmuth, 2008). Escalation of coal seam gas extraction in the Great Artesian Basin by its very nature of unregulated and unlimited dewatering threatens the sustainability of this system over time.

Coal seam methane is held on cleats in underground coal seams and the current extraction method used by Coal Seam Gas companies is to de-pressure the coal seam, by dewatering, to allow the gas to be released from the cleats in the coal. The coal seams are not discreet systems separate from aquifers above or below them, and while there are confining layers between different stratigraphic layers, these confining layers are not watertight and water can migrate between the layers (Figure 1). The dewatering of the coal seams may establish connectivity through the disruption of the

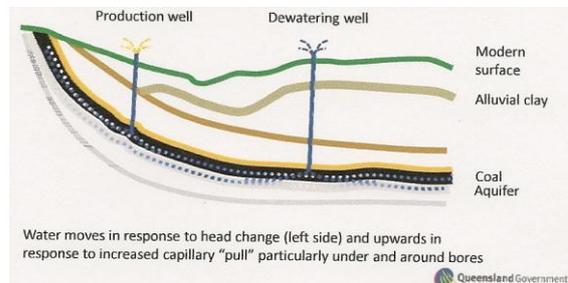
hydraulic conditions that maintain the dynamic flow equilibrium in the aquifers (Hellmuth, 2008). Settling of the individual sedimentary formations in the Surat Basin of the Great Artesian Basin has resulted in numerous faults, folds and fractures in the water containing porous sandstone (Hillier and Foster, 2002). If dewatering of a system changes the level of the heads significantly, water will migrate laterally and from aquifers above and below (Figure 1.) and in areas where there is fracturing or faulting the risk of this process will be exacerbated (Hellmuth, 2008).

Figure 1 – Risks A- D

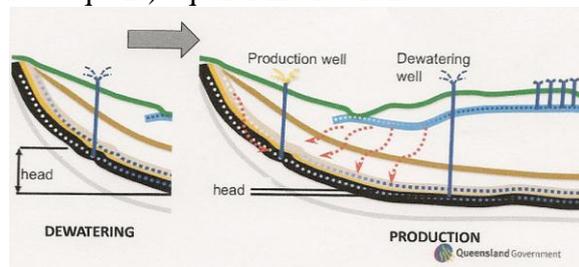
Risk A - Risk A: water movement through the aquitard from aquifer into the coal seam in response to a drop in head



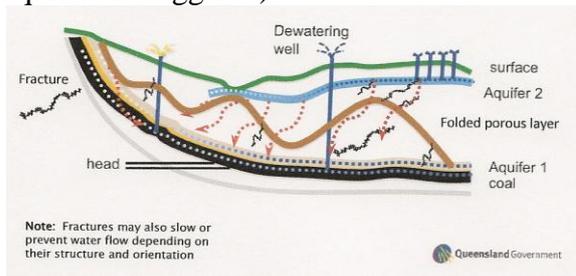
Risk B - Water movement from aquifer below coal into coal responding to dewatering



Risk C - Gas production and dewatering reduce head and trigger possible second (and subsequent) aquifer interactions



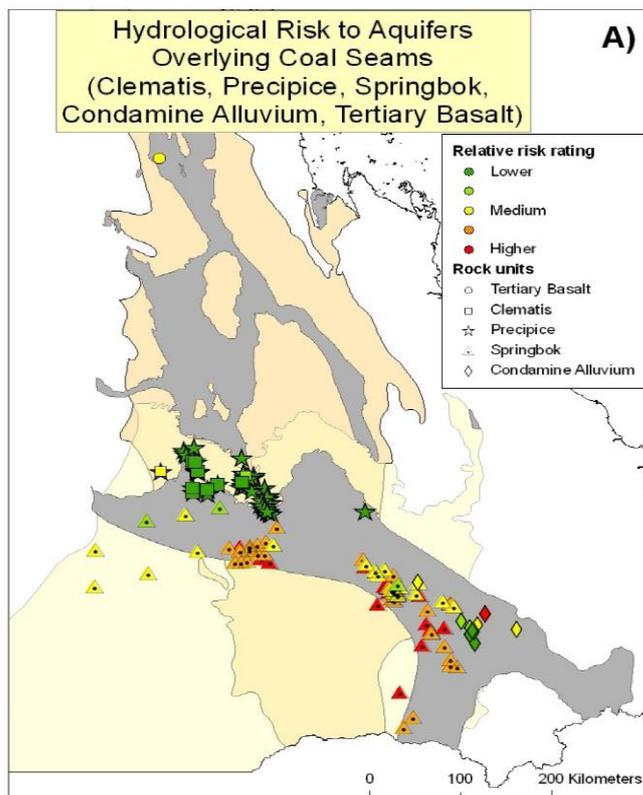
Risk D - Fracturing and folding increase the chance that water movement from distant aquifers is triggered).



Source: Department of Employment, Economic Development and Innovation, 2010

The hypothesised risks to the overlying (Figure 2 A) and underlying aquifers (Figure 2 B) in the Surat Basin indicate that the highest risks are to the Condamine alluvium aquifer, the Springbok aquifer and the Hutton aquifer, the latter is an aquifer of the Great Artesian Basin (Hellmuth, 2008).

Figure 2A



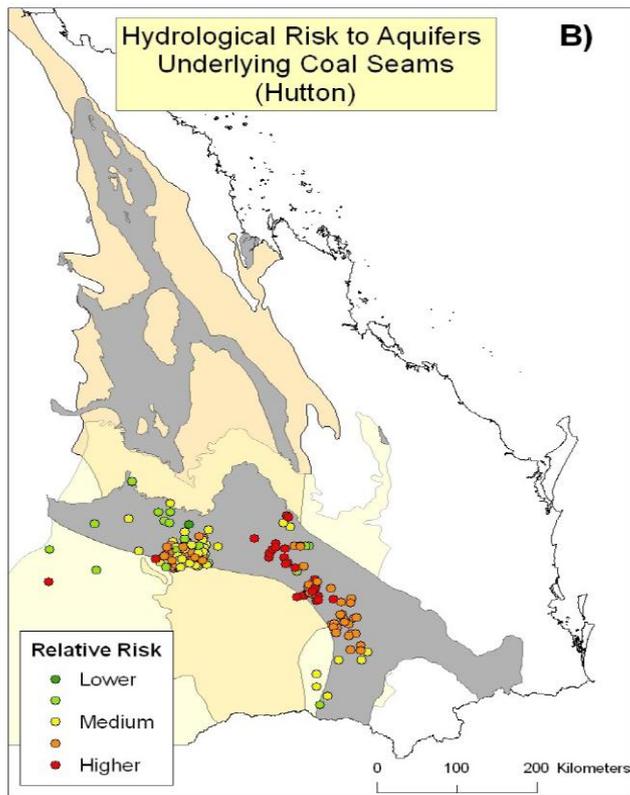


Figure 2 – Relative risk to aquifers A) overlaying coal seams and B) underlying coal seams in the Bowen and Surat Basins. **Source: Hellmuth, 2008**

In Queensland, under the Water Act, 2000 Section 19, all rights to the use, flow and control of water are vested in the State. Under the Queensland Petroleum and Gas (Production and Safety) Act (2004) Section 185, CSG companies have the right to take *unlimited volume* of water during extraction. Modelling by the Department of Employment, Economic Development and Innovation in November, 2009 estimates a mid-range of 196,000 ML of associated water per annum will be released by Coal Seam Gas extraction, which is between 120-350,000ML per annum of water removed from the aquifers over the next 20-40 years (DEEDI, 2010).

The intent of s185 giving tenure holders unlimited groundwater take was done so with a domestic gas supply industry in mind. The intent of s185 when written in 2004, did not apply to the scale and density of an export LNG industry. In the absence of changing this original intent in the Petroleum and Gas (Production and Safety) Act 2004, the Queensland government must have overriding authority through the EP Act to overrule s185.

The EPA effectively requires DERM to be clear in its conditioning and to take charge of the matter otherwise a literal interpretation of s185 would mean unrestricted rights regardless of impacts and that was clearly not intended and nor is EPA/DERM restricted thereby. The department bears a heavy onus to protect groundwater and must discharge that onus in clear terms through its conditioning. Currently the conditioning of groundwater in CSG company Environmental Authorities with respect to this issue is too vague.

It is hoped that this will be rectified in future and that environmental authorities will not be constrained by s185. Rather, that DERM will condition appropriately to ameliorate the impacts from s185. This means that if unreasonable impacts on groundwater are expected from CSG extraction, the department will use its power under the EP Act to restrict/limit the right of CSG companies to take unlimited water in the process of CSG development.

The fate of associated CSG water or groundwater extracted in the process of getting the gas is many and ever-changing, depending on the latest whim or directive from the government “watered down” by the resultant CSG industry lobbying power. These comprise a number of options such as reinjection after treatment through a reverse osmosis plant, virtual reinjection (substitution against existing water entitlements), beneficial use and discharge to river and creek systems. In explaining my concerns about groundwater I have looked at these where possible in the context of the concern/issue and then followed by current gaps in regulatory framework and the implications these gaps bring.

I strongly commend the work that that the Condamine Alliance and QMDB are currently doing through a joint project to recognise and map local and regional environmental values of water as a resource (both surface and ground water) on a sub catchment and catchment basis and with community input and future use considered. This work is compelling and the first such research of its type at a local level. To map and recognise the environmental values of water on a local basis is to eventually protect those values. Yet CSG industry input and conversations are seriously lacking from this space. And in the meantime it makes you wonder when CSG companies

have been submitting their Environmental Impact Statements (EIS) and Environmental Management Plans (EMP), what local environmental value did they assign the water resource on a local basis if this work had not been done before?

The production of water in the extraction of coal seam gas is not “new” water. Rather it is groundwater from the Great Artesian Basin (GAB). One of the difficulties in reconciling an export LNG industry is that you simply cannot take the projected 350,000ML per year in, year out, over 20-30 years from the GAB and expect things to be as they were before. Groundwater impact will occur as the coal seams are rapidly dewatered over a wide scale area. Pressure head levels will change and so to the chemical composition of groundwater as water moves and rebalances within a wider system. Many factors will play a significant part in the impact: time, space, CSG well density, aquifer proximity to the coal seam, geological faults and fissures, aquifer attributes, confining layers, aquifer connectivity etc.

Whilst Nature is ultimately very forgiving, the extent of physical and chemical imbalances and impacts are highly variable (eg. variable flow rates; recharge rates vary with the seasons and droughts; different fluid provenances and country rock chemical interactions etc.). The time for any 'repair' and the re-establishment of new geochemical and hydrodynamic equilibriums varies tremendously. However, it can be said that the greater the degradation of groundwater quality and/or quantity, the longer the restorative process, whether that process is anthropogenic or natural. Despite nature being very forgiving, it has been shown when enough stress is applied; collapses are often rapid and catastrophic

The GAB Resource Operations Plan (2007) (GABROP) provides: “enhanced certainty and security for water users and the natural environment”... “to ensure that the Great Artesian Basin is sustainably managed for the benefit of future generations”

Yet missing from consideration in the GABROP are the mining and petroleum and gas industries who are major players (water takers) in this system.

When the Petroleum and Gas (Production and Safety) Act (2004) was enacted its intent was to incorporate a domestic gas supply industry only. Clause s185 giving

tenure holders the unrestricted take of water in the process of extracting gas was never intended for an export scale industry of in excess of 40,000 CSG wells drawing over 350,000ML per year for 30-50 years.

The GABROP of 2007 did not envisage that an export LNG industry could jeopardise water entitlements from GAB aquifers including the Walloon Coal Measures (WCM) from which over 10,000ML of water entitlements is licenced. The Queensland government in its acceptance of an export LNG industry has said that the WCM may no longer be able to supply water because of CSG development (DERM 2011). The department has effectively “*written off*” the WCM as a water resource. Yet to this day, no one can say from government or industry where 10,000 ML of licenced entitled water from the WCM will come from to make-good the water to licenced users for perpetuity. Nor for that matter, to make-good the water entitlement licences from any other aquifer that will be affected. The annual licenced water entitlement for the GAB system in Queensland is just 101,675ML to provide a context to compare to CSG industry take (DERM 2010). This figure does not include the estimated annual stock and domestic water take from the GAB system of 350,000ML (DERM 2010).

In 2007 the then Department of Natural Resources and Water (now DERM) sought expressions of interest in 7,200ML of General Reserve Hutton aquifer water. The intent of this process was to release for licenced entitlement extra GAB Hutton aquifer water to a maximum of 7,200ML. The EOI process was oversubscribed to the tune of 29,000ML yet the release did not go ahead. How then, is it now permissible to accept an annual CSG industry water take of 350,000ML from the WCM with connectivity implications of such take to other aquifers? And without at least prescribing robust and calculated separation distances of CSG well locations to existing water bores/ and aquifers?

For so long the CSG industry and Queensland government denied aquifer interconnectivity to keep the spotlight from shining on the implications this would have for groundwater aquifers and water users generally. Knowledge of the conductivity of strata formations and the degree to which the underlying rock mechanics allow water to be transmitted is critical. Yet this all changes as new wells

are drilled and come into production. Strata formation conductivity and transmissivity vary with area and formation and across time.

Seismic reflection data used in the CSG industry to infer strata formation properties, is subjective and does not provide detail. It can only pick out the major faults and fissures in geological strata. It is unable to determine the location of geological flaws, fissures, faults, joints and planes of weaknesses, load and relaxation cracks - all which may be groundwater (with methane) highways and superhighways. They also may become highways through mass load changes as water at depth is removed rapidly from the system. Groundwater (with methane) may not be constrained to a particular stratum or horizon (eg. seepage, springs, hidden faults etc).

It is first concerning that the location of many of these potential water and gas pathways *cannot* be determined. The other more pressing factor is that the transmissivity *cannot* be established ex ante and therefore the impact is not considered until post ante. This is not precautionary principle best practice. Also, three dimensional structural geology and groundwater systems are locally diverse. It remains to be seen how CSG companies have been able to adequately map the three dimensional structural geology and groundwater system for a local area given the limitations of seismic reflection data. Geological strata formations simply do not line up as simple horizontal stacks atop each other as the colourful industry pictures depict. And the pretty arrows indicating the directional flow of water within the overall system cannot be relied upon.

In their modelling of the potential impacts on groundwater from their activities, CSG companies hold parameters such as changes in pressure and rock mechanics, static over time and space. This is a limitation of the modelling and brings in another source of error in impact predictions. Whilst I am aware of the State government's involvement of the Queensland Water Commission (QWC) to predict groundwater impact, I have reservations regarding the capacity of the QWC to do so. Specifically I have real concerns about the lack of field validated data provided to the QWC on which it intends to base its predictions for its model. In light of this, I welcome further research into this area such as that proposed recently by USQ for which RDA funding is sought. This proposed work directly addresses validating data and calibrating

groundwater parameters that the modelling will rely on.(USQ Program proposal, March 2011).

CSG development threatens high security groundwater supplies and seriously threatens current and future licencing capacity. For many landholders, business and communities in rural Queensland, groundwater is their only secure water supply. 22 of 23 towns in the Western Downs Shire are reliant on groundwater (Western Downs Regional Council 2010). A large number of towns across Queensland are reliant on GAB water. Threats to this resource could potentially affect tourism in rural and regional areas. Further, through interconnectivity CSG development threatens the alluvial and surface waters of the MDB.

Concerns are now growing in rural areas about the long term impacts of coal seam gas extraction. Businesses and rural communities are questioning the long term security of their water supply and business operations. This uncertainty coupled with a lack of confidence in State government legislation to protect the Great Artesian Basin water resource long term is crippling agricultural business development and investment. Many businesses are in limbo and unable to make long term financial and business decisions until they know the potential impact on their land and water resources.

Burden of Proof

Another issue of concern regarding the impact of CSG development on ground water relates to the capacity and burden of proof of bore impact as a result of CSG activities. What is required to prove that a bore impact has been caused by CSG extraction? I understand from the Queensland government that it will include knowledge of:

- water extraction of bores in the area over time
- CSG company extraction of CSG associated water
- Actual change in water levels in the past and since the impact
- bore logs showing geological strata formation that was there versus what is there now
- transmissivity (inadequacies of seismic survey reflection data)

- modelling where geology provides the constant and water variables/water volumes extracted provide variables to calculate depth/cone of depression of extraction.

Yet it is unlikely that all this information will be available in an investigation into an impacted bore. So how confident can bore owners be, that if an impact occurs as a result of CSG extraction, it can be proven? Without proof, impacted water users are left literally high and dry. These factors, the onus of burden of proof, and the significant financial imbalance between CSG company and bore owner and the capacity of a bore owner to seek independent hydrological services are critical considerations for current and future water licencing capacity.

The Queensland government professes to have everything under control regarding groundwater concerns, claiming that the CSG companies and Government are monitoring the impact of CSG extraction on groundwater. However, when issuing its licencing and environmental authorities for CSG companies to operate, the Queensland Government does not require CSG companies to construct any water monitoring bores to measure both the quality and quantity of water in:

- (i) the target coal seam;
- (ii) the overlying aquifer
- (iii) the underlying aquifer

in order to have certainty that environmental harm to groundwater systems does not occur and should it do so, that it will be picked up. (refer to individual Environmental Authorities for CSG companies operating in Queensland)

CSG companies have a responsibility to provide water quantity data to the Queensland Water Commission (QWC), yet the QWC has no jurisdiction over the licencing and approvals process. Where directed to provide monitoring bores, CSG companies are able to do so legally under the Petroleum and Gas Act (Production and Safety) 2004 which does not require the monitoring of water quality.

This is a failure of the government's environmental services department to appropriately condition the monitoring of the quality and quantity in groundwater systems. And as it stands, it will in the future, make a mockery of any investigation

into suspected CSG activity induced bore water impacts. Landholders and communities will ultimately bear the cost from lack of proof of impact on groundwater systems.

“Make-Good clause”

The Queensland government acknowledges there will be water impact from CSG. If it can be proved those impacts were caused by CSG and involved a drawdown in bore level and/or a quality change, the CSG company must “make-good” that water supply to the bore holder. But what mechanism addresses and responds to secondary impacts to interconnected water of the MDB? The water cycle is not renewable. *It is constrained* and unless I am wrong, the 26 years of water reform in Australia to date has been trying to establish this and realign management practices within this framework.

The state government has suggested a number of ways a CSG Company could make-good the primary water loss; these include:

- replacement or relocation of pumps or bores;
- deepening of bores;
- bore remediation and repair;
- providing a replacement bore;
- arranging an alternative water supply; and
- providing suitable compensation for the impact.

However, whilst a stock and domestic bore (due to right of way access) can be lengthened to any aquifer, a water entitlement bore cannot. Suppose a water entitlement bore is affected - it can be only be drilled deeper to the extent of the aquifer for which the bore holder has a licence. A recent search across the GAB water bore entitlement database for Queensland reveals that **NO** CSG Company has been actively buying multiple entitlement licences in the various aquifers to divvy out to potentially affected bore users (Database of Great Artesian Basin Licenced Water Entitlements for Queensland 2010).

Whilst CSG companies have access to treated CSG water for provision to affected boreholders, there exists a major concern in any longterm reliance on the provision of this water to offset damage to water bores. CSG companies are predicting from their modelling that major impacts to groundwater will be felt between 2050-2060, yet, by then, production of CSG associated water will have tapered off to nearly nothing from these wells. It is expected that CSG wells will produce water in their first 10-20 years yet thereafter there will be little to no produced water. This issue has intergenerational significance.

Under the GAB ROP there are no new water entitlements available for any aquifer system in Queensland. Further, due to various surface water resource operation/management plans, CSG companies do not have access to volumes of surface water to divvy out either. Whilst they may have heaps of CSG associated water at their ready it comes with conditions and will only last for 2-30 years; yet the greatest impacts from CSG extraction to groundwater aquifers are not expected to materialise until 2050-2060 (Professor Steven Raine from CSG companies groundwater modelling).

“Make-Good” application to the water bore not the aquifer

Of concern also is that the make-good clause applies to the water bore not the aquifer. And make-good only applies to a water drawdown or to a water quality change as a result of a water drawdown. Suppose CSG activity caused a change in water quality and there was no water drawdown, the make-good provision would not apply. Recourse for the bore holder would be to pursue a civil claim through the EP Act querying the clause on environmental harm causation.

When you look at this from a bigger picture it becomes obvious that the enabling mechanism to causing harm (s185 of the Petroleum and Gas (Production and Safety) Act 2004) has no offsetting mechanism to restrict/stop water take should environmental harm occur on a significant scale. Protection is afforded the individual water bore and not the aquifer and therein lies a major problem. We simply do not have umpteen untapped aquifers sitting idly below us to access, should cumulative, one by one, water bore damage eventually extend to a whole aquifer.

Capacity to “make-good” groundwater supplies

The average licensed water entitlement business/ landholder in Queensland looking at the big picture can see no avenue for a CSG company to make-good water *for perpetuity* should CSG activities significantly impact his/her bore.

To cover off on this mechanism, the CSG industry is now heavily lobbying the State government to amend the GABROP which comes up for review in 2012. It is my understanding the intent is to get the government to recognise that reinjecting treated CSG water into another aquifer will augment (add to) the water supply in the receiving aquifer. For the augmentation the CSG industry is hoping to receive a “credit” - with the credit entitling them to offset a new licence in the receiving aquifer. Whilst a credit is unlikely to be a 1:1 offset, this concept has serious connotations for long term sustainability of an already stressed groundwater system.

Most notably, no “new” water will have materialised in this process. The water would have just merely moved from one aquifer to another and in the process some will be lost as brine and the water quality will have changed. The water is a finite amount. If reinjection is used as a tool to mitigate or ward off resultant long term changes in head pressure levels, any licence written against that water (or a percentage of that water) will comprise this capacity to mitigate. A credit offset is also conceptually in breach of federal government conditioning of the 3 LNG projects approved to date. Lastly, it is beyond belief that the GAB system, so severely stressed in 2007 as to require a resource operations plan and the GAB Sustainability Initiative for long term survival, has suddenly turned around to be a system capable of new licenced entitlements.

Given that the Queensland government is complicit in enabling the CSG industry to receive economic gain, *will* it now act against the overarching sustainability principles of the GABROP and amend it, to provide CSG companies with their desperately needed make-good mechanism by allowing a reinjection credit offset?

An ever-changing playing field

One of the problematic areas of governance within this space is that state and federal governments are not sure where they are at as they manipulate and alter the rules to fit (facilitate and enable) the newcomer on the block. These changes often run contrary

to other plans or regulations providing long term sustainability to rural landscapes, environments, communities and our natural resources. The community is equally struggling to keep up with and make sense of inconsistent messages from government and the complicitary nature of CSG developments. They are left wondering who is governing who, and under what values and goals?

Reinjection

The Queensland government now recognises reinjection as the first priority option for CSG associated water. A recent caveat was added, that it is the first priority option so long as it is feasible. Virtual reinjection (or substitution against existing water entitlements) fits this priority option. The relevance here to the MDB is that when the draft MDB Plan was handed down last year many irrigators viewed treated CSG water in a different light than before - 'a get it while you can' approach to offset their potential MDB cut. Yet again no new water materialised in this space. How will the Queensland government ensure through its Beneficial Use Authority (BUA) process that the MDB plan is adopted? If the MDB plan proposes allocation cuts, how will the Queensland government ensure those cuts are transitioned and people are moved off the use of that water? How is it that a new industry can have right of way over groundwater at a cost to existing industries, already being stripped of their entitlements through regional resource operational plans?

In the Central Condamine Alluvium situated within the Surat Basin the licensed entitlement is 92,000ML. However to meet long term sustainability of the Central Condamine Alluvium (CCA) it is recommended that the level of extraction be reduced to 40,000ML per year. For long term sustainability, local irrigators within the CCA have accepted that their entitlements will now be 42.7% of their original entitlement. At the same time, the Coal Seam Gas industry has been given the right of way under State legislation to unlimited take of underground water during the gas extraction process (Petroleum and Gas [Production and Safety] Act, 2004). There is known connectivity between the WCM and Condamine Alluvium and the Condamine Alluvium is already a stressed groundwater system.

There are many issues with reinjection. Specifically, it is yet to be **proven safe on a wide scale**. In some areas it is thought that reinjection may not be possible. Therefore,

on a local basis reinjection will not provide a mitigating tool in some areas.

Reinjection of treated water involves forcing water under pressure into the receiving aquifer. How safe are the mechanisms to do this to groundwater supplies? If reinjection is to occur in a dewatered aquifer, the aquifer will never be able to take the volume of water that was extracted in the first place, due to a number of factors:

- as an aquifer is dewatered it compresses, reducing the space available to take the water
- fractures and fissures may close
- some consolidation of the aquifer may occur or subsidence occurs.

Further, mass extraction of water over time, reinjection and hydraulic fracturing practices have been shown to cause geological instability and seismic events in other countries. These operations have left town water supplies redundant in other countries. Resultant geological instability and seismic events from these operations have caused major changes in groundwater and surface landscapes.

Reinjection is still in trial stage in Queensland. Reinjecting CSG associated water involves treating it through a Reverse Osmosis Plant, removing oxygen from the water, adding biocides to kill bacteria growth then adding chemicals to break down the added chemicals. The proponents will have to prove that what they intend adding to the reinjection water will not contaminate or cause chemical change in the receiving water. Also, proponents still need to identify aquifers that are capable of receiving water such as, that have:

- capacity (suitable head space)
- suitable permeability (sufficient pore space)
- compatible water quality and rock mechanics

It is expected that proponents will be able to reinject greater volumes of water at depth than what they could otherwise reinject into shallower aquifers. That is, it is expected that the deeper aquifers will have greater capacity to receive the water. Yet even if reinjection could be proven safe, the feasibility of reinjecting to deeper aquifers (to mitigate long-term groundwater impacts from extraction) may limit the practise.

Beneficial Use Authorities (BUA) for treated CSG associated water

CSG companies are applying for and receiving State government approval to discharge excess treated CSG water in river systems and creeks and in some instances to on-sell this treated water for “new” uses. Also, landholders are being told by CSG companies if they “toe the line” with land access “they will get a crack at” (access to) treated CSG water otherwise it’ll be offered to someone else. This pressure or co-option for land access is conflicting for landholders weighing up the long term sustainability of their business and short-term opportunities.

The practice of Hydraulic Fracking

I hold grave concerns for the practice of hydraulic fracking as a method to aid CSG extraction in Australia. My concerns are many, from looking overseas where countries are banning the practice because of its impacts, most notably on groundwater and health, to my personal experience with a hydraulic frac job in the Surat Basin that interconnected aquifers, and the facts that arose from the investigation behind that incident, including regulatory gaps still to be addressed. Whilst I briefly summarise the frac incident below I acknowledge that I have withheld detail due to the size, sensitive nature of the documents involved and the time restrictions in making this submission.

The incident I refer to occurred on the property neighbouring mine. In July 2010, I wrote to the then Environment Minister Stephen Robertson alerting him to a hydraulic fracking incident near our farm that had the potential to contaminate groundwater supplies and pose major risks to food safety and trade. The questions I asked of Minister Robertson exposed serious gaps in the regulatory framework around CSG development in Queensland and forced a commitment to change the laws governing well stimulation techniques such as hydraulic fracking. These gaps in legislation exist in the context of an industry embarking on an expansion of upwards of 40,000 CSG wells across Queensland over the next 20-30 years.

In June 2009, (13 months before my letter) When fracking a CSG well, the CSG company involved caused the Springbok Sandstone Aquifer to interconnect with the Walloon Coal Measures. The company had prior documented knowledge that the Springbok Sandstone Aquifer is erosional at its base and this company also confirmed

they were aware before they drilled the well that “interconnection of the coal measure and the aquifer existed naturally at this location”.

The particular CSG company was aware of the dangers but went ahead anyway- in fact they set the collar to the fracture stimulation in the Springbok Sandstone Aquifer itself which ensured fracture stimulation of that formation too. This saw chemicals (some which are not fit for discharge into waterways) intentionally pumped into the Springbok Sandstone Aquifer and migration pathways for water opened up. To me, it is beyond belief that a company would intentionally frac within an aquifer, but I have been assured this was a *commercial* and professional company decision - that CSG had concentrated in the top of the coal seam and fracing the aquifer above enabled this gas to be targeted for extraction.

I note from the Petroleum and Gas (Production and Safety) Act 2004, *Stimulation* means “*a technique used to increase the permeability of a natural underground reservoir, including for example, hydraulic fracturing, cavitation, fracture acidizing, and the use of proppant treatments*”.

From Schedule 4 of this same Act, the Coal Seam Gas Potential Hazard Guide lists the potential impact of hazard from the stimulation of coal seam as “*structural integrity of coal seam and strata immediately above and below the coal seam (roof and floor) adversely affected*”. In light of this section within the Act I suggest that the CSG company may have knowingly accepted too much risk of damage in their decision to place a frac ECP within the Springbok Aquifer when the P&G Act (2004) clearly states that stimulation of the coal seam can adversely affect the structural integrity of the coal seam immediately above and below.

Which CSG company was involved in this incident is not the key issue- of much greater concern is that there was so little appreciation of the dangers they were creating and a regime in place that required no assessment beforehand. The CSG Company told no-one of what they had done. As a result of this investigation into this incident the interconnectivity was finally sealed in March 2011, some 21 months after it was caused.

Despite taking my concerns to the highest level of our State government, I am led to believe that the details of this incident were not passed onto the Federal Water Group that advises Minister Tony Burke. This was at the time the Minister was considering this particular company and another company's export projects for approval as part of his role as Federal Minister for the Environment. If this were the case and the information was not disclosed, in giving his conditional approval for now three CSG projects to proceed, Minister Burke would not have had access to crucial information that highlighted the risks involved in the industry. Nor would the federal government have been aware of the risks these companies are prepared to take.

The fracking and interconnectivity incidents show a blatant disregard for the critical importance of the GAB water resource, and the lack of a regulatory framework to protect it. More than 15 years after the CSG industry began interacting with the Great Artesian Basin, the Queensland Government shows little to no comprehensive baseline and groundwater monitoring. Monitoring and reporting of underground water impact by Coal Seam Gas Companies required under the Petroleum and Gas (Production and Safety) Act 2004, had not been met by any CSG company up until June, 2009 (Response to Question on Notice 641, Queensland Parliament, 18th June, 2009). I am led to believe that no reports have since been received due to the transferring of monitoring and modelling oversight to the Queensland Water Commission. Landholders and communities regard such information as critical because you simply cannot manage what you don't measure. Independent hydrologists have warned it will take years before the impacts of CSG extraction on groundwater reserves become apparent (Matrix Report 2007; Hellmuth, 2008). CSG companies themselves acknowledge that these impacts could last hundreds of years (CSG Company Environmental Impact Statements). Will these companies and governments be around then to deal with the fallout?

In December 2010, the National Water Commission (NWC) issued a Position Statement on CSG and Water. In part the NWC states:

“Extracting large volumes of low-quality water will impact on connected surface and groundwater systems, some of which may already be fully or over allocated, including the Great Artesian Basin and Murray-Darling Basin. Impacts on other water users and the

environment may occur due to the dramatic depressurisation of the coal seam, including:

- changes in pressures of adjacent aquifers with consequential changes in water availability;*
- reductions in surface water flows in connected systems; and*
- land subsidence over large areas, affecting surface water systems, ecosystems, irrigation and grazing lands.*

The production of large volumes of treated waste water, if released to surface water systems, could alter natural flow patterns and have significant impacts on water quality, and river and wetland health.

The practice of hydraulic fracturing to increase gas output has the potential to induce connection and cross-contamination between aquifers, with impacts on groundwater quality.

The NWC is concerned that CSG development represents a substantial risk to sustainable water management given the combination of material uncertainty about water impacts, the significance of potential impacts, and the long time period over which they may emerge and continue to have effect”.

Last year, Queenslanders watched as a BTEX chemical scare in groundwater from Underground Coal Gasification (UCG) activities near Kingaroy forced a number of properties into quarantine. For a period of time landholders with cattle exposed to this water were unable to sell their cattle. The issue of groundwater contamination is real and not limited to UCG. The implications of activities affecting groundwater for health, the environment, food safety and domestic and international trade are also very real. It is not just about well stimulation and fracking- it's about drilling muds, and opening up migration pathways from depressurising the underground system for gas and other compounds naturally found in the coal seams. Given the possibility that the chemicals used by the CSG industry in drilling muds and well stimulation fluids could

enter water supplies over time, it's not unrealistic to demand that only chemicals deemed safe to enter the food chain are used.

The reality demonstrated by the fracking incident highlighted earlier is that the government and the public do not know what these companies are doing under the ground. There is no assessment of company plans against company daily drill logs nor against a set of susceptible criteria to causing neither aquifer damage nor recognised stand-off distances to water aquifers. There is no independent on-site inspectorate and the regulatory framework is more about dealing with impacts, rather than preventing impacts from happening in the first place. There is also little way of knowing what is actually being done under the ground ...we cannot view the underground system like looking through perspex at an ant farm, yet there exists a very strong commercial interest to get the gas out.

The BP disaster in the Gulf of Mexico - caused by fracking – shows what can happen in a worst case scenario, with a government that simply did not understand the risks involved and therefore did not have the oversight and procedures in place to foresee and handle the disaster.

I believe that the social licences of CSG companies to operate in Queensland and Australia are being seriously questioned by some landholders, local rural communities and the wider public. Major investment companies are asking if the risks associated with this industry development have been appropriately considered/modelled, risks such as access to land surface, water impacts, the long-term capacity to make-good water damage, and the potential for litigation and changes to government regulations along the way (JP Morgan Report 2010).

In Queensland, the CSG industry acknowledges that 40% of the 40,000 CSG wells (to be drilled in the next 20 years) will be fraced to enhance CSG extraction from low permeability coals. However, CSG companies are now publicly saying that even high flow (high permeability) wells will be fraced from the outset and that as gas production from existing unfraced CSG wells tapers off and declines, they too will be fraced to enhance production. In light of this, perhaps the industry projected

figure of 40% of CSG to be fraced will be much higher? And what work has been done to understand the quicker extraction of water from high permeability coals? Whilst CSG companies may propose an overall low percentage of wells to be fraced, this may be a totally different story for a regional area. For example of the 2,000 CSG wells that QGC propose to drill in its Jordan Project area (144,818 hectares), 1,700 of these will be fraced. This equates to a greater than 85% frac rate. A high density of fraced CSG wells poses greater risk to water bores and aquifers on a local and regional basis.

A CSG company fracing a CSG well may frac it multiple times (for example 9 times in the one frac job, 75km south-west of Dalby in 2010). I understand that water bores with proximity to fraced CSG wells are at greater risk of groundwater impact than water bores near CSG wells that are not fraced. Specifically, the risk is greater for water bores with entitlement to underlying aquifers and water bores that transverse (go through) the coal measures (DERM 2011). It is worth noting that water bores that have entitlement in overlying aquifers may transverse the coal measures if they are reclaimed oil bore. Yet nowhere does any Queensland government regulation specify a separation distance from a CSG well to a water bore regardless of whether the CSG well will ever be fraced and regardless of the aquifer tapped or whether the water bore transverses the coal seam.

This brings me to the next issue of differing well construction standards between CSG wells and groundwater bores in Queensland. The construction of groundwater bores must meet strict standards – spacers every 12 m to ensure the bore casing stays centre of the hole so that a concrete bond can be achieved around the casing, 24 hour cure time on concrete etc. These standards exist to protect the groundwater resource. If similar standards do not exist for CSG well construction, yet CSG wells go through water aquifers, does this mean that the construction integrity of CSG wells do not protect the groundwater resource?

Property rights and values of landholders;

There is another layer of immorality that has surfaced in the CSG industry in Queensland. That is, the alarming way in which landholders are forced into land access through a churn- in, churn-out sausage machine type process from the new

land access law. Whether by negotiation, mediation or referral to the land court, access will happen and in tighter time frames (Queensland Government Land Access Code, 2010). CSG companies may have bought into gas field developments in Queensland with government rules giving them rights to extract the gas from the ground, but these companies are downplaying the existence of dual tenure over that land, giving landholders the right to utilise the surface of their land. A clause within the Petroleum and Gas (Production and Safety) Act 2004 (s804) giving jurisdiction to protect landholders from CSG activity “unreasonably interfering” with their operations, has not been tested in the courts. Lack of precedence regarding this clause is causing great uncertainty to landholders.

CSG development and its impacts on water supplies happen regardless of prime agricultural land. That is, groundwater does not know the boundaries of prime agricultural land. Restricting development on prime agricultural land will not stave off the water impacts for that land, or the implications for food producing capacity. Further the Strategic Cropping Land (SCL) Policy proposed by the Queensland Government does not protect such land from CSG development such as gas wells, compressor stations and pipelines as this infrastructure is expected to have a life of less than 50 years and therefore by definition “*will not permanently alienate the land*”.

The small pockets of land meeting the proposed SCL criteria in Queensland are located mostly on the flood Plains. Climate change expectations are that Australia will experience greater climate extremes including more flood events such as experienced in Queensland earlier this year, which decimated agricultural production from flood prone (flood plain) areas. If meeting Australia’s future food task is truly important, then Australia’s food producing capacity be maximised by giving strategic consideration to diverse geographical areas of supply instead of putting all our eggs in one basket?

Scale

Approximately 3,000 CSG wells have been drilled in Queensland to date, with ownership split relatively evenly among the major companies and with a sprinkling of smaller operators. QGC have drilled 900 wells in 15 odd years of which 37 have been

fraced. It now intends to drill 500 to 900 wells **each year** moving into new areas for the next 10 years to take them to 6000 wells. That is, QGC will drill what they have drilled 15 years in one year, each year for the next 10 years. Of the wells QGC will drill, over 2,400 (of the 6000) will be fraced (QGC Environmental Management Plans for the Ruby and Jordan Project areas). How does fracing 37 wells in 15 years give this company the expertise to frac 2400 new wells on a wide scale basis in a much shorter period of time? Especially when QGC and other companies use subcontractors that have operated in the United States where there have been serious issues with fracing. The other major CSG companies are proposing significant ramp-ups as well, on similar scales. We have not seen anything yet in the terms of what is going to come in land access pressure. Our people, communities and environment (specifically groundwater) are not ready for this. No one appears to have considered the emotional and mental health of our communities unprepared for this type of impact.

Many mitigation or offset mechanisms will not necessarily lessen, reduce or resolve the impact in the local region as it occurs (eg remnant vegetation offsets etc) and this will lead to further ecological damage on a local basis and a greater disconnect for local communities.

Land impacts - Well pad and infrastructure footprint on land

CSG companies propose broad gasfield development conceptual plans for blanket areas. The 4 major CSG companies in Queensland are QGC, Santos, Origin and Arrow. QGC propose placing a CSG well every 750m down to a minimum of 400m if required. Origin also propose 750m well grid spacing, Santos are a little wider with their grid spacings out to 1000m. Arrow Energy is undecided on its well spacings but suggests it too could equate to one CSG well every 750 m. Generally the well pad size is expected to be 1 hectare in size. Access tracks (roads) and gathering lines need to be constructed to each well site. The Federal Government conditioning of QGC's and Santos's LNP projects require roads to be 6m in width. Other infrastructure associated with gasfields includes compressor stations, ponds, screw compressors and power lines to name a few. Helmuth (2010, pp. 3) says this is expected to directly impact on 10 000 square kilometres of Queensland's rural and regional landscapes. Yet little is done to disclose these other impacts or multiples thereof.

Little consideration has been given to a broad brush tenure by gasfields. The patterned spider web images from the United States of mass gasfield developments are starting to emerge here (*goto Google Earth and search for: Grassdale, Dalby Queensland*). Many existing businesses will not be able to co-exist with these plans either now or into the future when circumstances and markets drive different agendas. Land access is going to get tough from both sides - the landholder and the proponent.

To provide this committee with an understanding of what a conceptual gasfield plan may equate to an area of land (ie. number of gas wells, hectares taken out by roads and wells) I direct you to a CSG Well Calculator that I developed on behalf of Basin Sustainability Alliance earlier this year for Queensland. This calculator can be applied to other states if the conceptual well plan is known for the particular CSG Company. To access this tool, please go to www.basinsustainabilityalliance.org then choose the link to the *CSG Well Calculator*.

However, it is difficult to ascertain from a conceptual gasfield plan how other associated infrastructure will be sited such as, compressor stations, ponds, screw compressors, frac ponds, pipeline pressure outlet vents and power lines to name a few.

In our business at Talbingo, we have adopted various techniques and practises within our operation which may not be compatible with many aspects of gas field development. These techniques and practises include but are not limited to GPS tracking devices, control traffic and zero till farming practises, self-steer tractors, remote sensor weed detection systems, intensive cattle production, low stress stock handling and production systems and managed fire burns as a pasture management tool. Equally important is the siting of various water bores for water supply for stock and domestic purpose and, as mentioned earlier, our stock intensive water entitlement licence for water supply to our feedlot. Additionally, our business has been held up as a showcase vertically integrated agricultural business in easy access to Brisbane. We often host overseas food commodity buyers at Talbingo to see a sizeable clean green safe food production enterprise. The aesthetic value of healthy pastures, healthy water supply, healthy crops, healthy livestock, a healthy atmosphere and the absence of

industrialisation contributes significantly to the priceless comparative advantage we hold.

CSG well sites are deemed a work site. We use aerial spraying services in our cropping enterprises. I understand that CSG wells emit gas from the well head and are often intentionally flared. I also understand that some agricultural chemicals plus AvGas as a fuel in aviation are flammable substances. Further, those agricultural chemicals would not be permitted to drift/be sprayed on a work site.

So where will all these issues and concerns leave landholders such as ourselves in future, should a CSG company site multiples of CSG wells in our cultivation systems in line with their conceptual gas field plans? Potentially, we will lose efficiencies in our cropping production system and restrict our ability to adopt new farming techniques and practises into the future. Whilst there is some thought that all this impact can be compensated for- what it represents on a cumulative scale is a loss of agricultural productivity and efficiency across time and on large scale.

Further, CSG companies are actively buying up land across their tenements in Queensland to site large infrastructure that otherwise may not have been accepted by landholders. It would be an interesting exercise for this committee to ascertain the extent of CSG company ownership, the category of land purchased, development plans proposed on the land and the net effect to food producing capacity previously enabled by the land. It is my understanding that local councils were at one stage seeking to quantify the extend of CSG company ownership of land, but were unable to obtain this information.

Multiple CSG Wells, One Well Pad

A number of CSG companies also propose to place multiple CSG wells in the one well pad. Whilst landholders may welcome the notion of a greater spaced out grid, I am led to believe that these companies will not necessarily change their grid footprint. Rather the tight grid pattern will still exist, more wells will go in, the water will be drawn down quicker and the gas extracted quicker. My concern is that if this practice is adopted, it will hasten groundwater and other impacts. What impact does the quicker de-watering of the Walloon Coal Measures have on the MDB system?

The debate that is continually overlooked in the rush for CSG development is “are the water resources at risk, or are they not?” If they are at risk, there needs to be a serious and robust debate about how much risk we in Australia are prepared to accept.

In –Fill Practices

There is past evidence of CSG companies negotiating a 750 m grid pattern and later coming back to “in-fill” CSG wells in between. Recently a CSG company conceded that its gas field development parameters are set by the market. Currently the market demands this level of development but if the market condition changes and it is favourable to go for more gas then back filling cannot be ruled out. I worry that landholders cannot necessarily stop the in-fill practice yet they are not being fully appraised of the CSG field development plans across their land, and so cannot appropriately assess the full impacts of CSG operations on their land.

Well stimulation terminology and the use of commercial-in-confidence defence

Please note I have consciously used the term “well stimulation” above to refer to all methods of stimulating gas production from a petroleum and gas well, which may include the technique known as hydraulically fracturing.

I am aware that CSG companies have various means of well stimulation techniques not limited to hydraulic fracturing. However, CSG companies have been reluctant to disclose the nature of all these “operations” as they are classed as “commercial-in-confidence” techniques. Therefore, it would not be possible for the government to regulate other well stimulation techniques if they do not know what these techniques entail or the risks they pose. The potential impact to the MDB system would also go unaddressed.

CSG companies have a tendency to hide behind clauses such as “unable to disclose commercial –in-confidence material” and in their defence state that it may compromise their company’s time delivery, efficiency or other comparative advantage over a competitor.

Chemicals used in drilling and well stimulation and the mobilisation of naturally occurring chemical compounds

It is critical that any chemicals used in drilling and CSG well stimulation activities do not migrate to the bores of groundwater users. It is critical also that natural occurring chemicals and compounds in coal seams and strata formations are not mobilised to water aquifers tapped by water bores. Many homes use bore water, the livestock we eventually eat as steak, chicken, lamb and pork from supermarkets more often than not drink it, and the plants we grow for grain and vegetables soak up bore water through their roots and foliage systems under irrigation.

In homes across rural Queensland bore water use can be for drinking purposes, for domestic activities such as bathing, showering, brushing teeth, cooking food, washing etc. This water use scenario is also common in towns providing bore water to homes.

It is worth noting that research has shown that some chemicals do not need to be drunk to be absorbed into a person's system. Some chemicals have the capacity to bio accumulate, and some are absorbed as greater toxic load to the body by simply being heated and washed over the body rather than through drinking. Further it has been shown that the development age of a person is a factor in the manifesting of a chemical load. Our children and young adults are most vulnerable. It remains to be seen what risks are posed by the CSG industry in terms of introduced chemicals and naturally mobilised chemicals. The implications also to our food chain cannot be underestimated. The integrity of groundwater systems for their intended use *must be safe and protected on a proactive basis*.

Defining Sustainability (Professor Geoff Slaughter, USQ 2011)

One of the best known definitions of Sustainability or Sustainable Development is from the Brundtland report Our Common Future:

"Development, which meets the needs of the present without compromising the ability of future generations to meet their own needs".

World Commission on Environment and Development (1990), Our Common Future [Brundtland Report], Australian Edition, Oxford University Press, Melbourne.

The paradox of sustainable growth was summed up by Herman Daly as:

“When the economy grows it does not grow into the void, displacing nothing and incurring no opportunity costs. Rather it grows into the finite, non-growing ecosystem and incurs the opportunity cost of displaced natural capital and ecological services. Beyond some point growth in production and population will begin to increase social and environmental costs faster than it increases production benefits, thereby ushering in an era of uneconomic growth—growth that on balance makes us poorer rather than richer, that increases “illth” faster than wealth, and that is likely to be ecologically unsustainable. There is evidence that the US has already reached such a point”. Herman Daly (Former Senior Economist in the Environment Department of the World Bank)

I suggest that sometime in the future we will face Daly’s paradox of sustainable growth from CSG development.

CONCLUSION

Within this submission I have painted a picture of the facts around CSG development, the volume of water extracted and the impacts of such development. I have brought forward my knowledge of CSG development and the current governance framework applying, particularly in Queensland, contextualised across a wide geographical area.

If anything could be achieved through this inquiry into the management of the Murray Darling Basin from the perspective of Coal Seam Gas (CSG) extraction, it is strongly hoped that it will be a greater awareness of the significant issues that continue to go unaddressed right across Queensland and Australia, not just within the MDB system. I highlight some of my key concerns as:

- Inconsistency in the rules governing water resources in Queensland and Australia for different water users
- The lack of a mechanism to stop or restrict CSG development if something goes wrong or is predicted to go wrong

- Lack of capacity to make good water supplies to licenced users and rural communities. That is, from where is the water going to come longer term as aquifers are affected?
- The imbalance in power between the industry and everyday people regulated by a State government urgently wanting of economic stimulus from CSG.

In light of these points I urge this committee to :

- seek greater scope and powers to address the impact of CSG development beyond just the implications to the MDB
- give due diligence to the findings and recommendations of independent hydrologists such as: Federal Water Group, Geosciences Australia, National Water Commission.
- immediately recognise that the processes, skills and understanding are not up to date and a suspension on any further activity is the only way to catch up
- strongly seek federal consideration to elevating sub alluvial and aquifers of the Great Artesian Basin to assets of significance under the EPBC Act for the perseverance of agricultural production capacity and human health and existence values. Further that CSG development be listed as a threat to those assets. The implication of this elevation and listing would need to be applied to projects already approved.
- give greater scrutiny to the safety to groundwater supplies of the practise of hydraulic fraccing used in CSG extraction
- ensure greater enshrinement and action around the use of the precautionary principle as a governing condition to CSG development until we have greater knowledge. That not enough data is no longer an excuse to proceed, even with caution. So that there is engaged deliberative debate about the industry and its impacts on water and land resources, and where we consider whether we are prepared to accept them today and for future generations. There are governments around the world right now that are finding out that it is illegal practice not to adopt the precautionary principle - the US government is being sued over fraccing and a US class action has been filed against BHP Billiton, Chesapeake and others because of groundwater and land impacts from geological instability caused by fraccing.

Most importantly, I hope that once this committee has knowledge of the inconsistencies and systemic problems in CSG development governance and the many implications that manifest from it, that there can be no denying that there are serious issues with this industry. Further, that as a result of the knowledge this committee will be obligated to act and if necessary seek higher powers and scope to do so. The genie cannot go back in the bottle. Something must be done.

Lastly, I sincerely thank-you for shining a bright light on this industry development and what it means to all of us.

“Sunlight is the best disinfectant” (Louis Brandeis 1856-1941)

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