Coal seam gas production – friend or foe of Queensland’s water resources?

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The emerging coal seam gas (CSG) industry in Australia is promoted as providing unparalleled opportunities for Australia’s economic and regional development, as well as delivering numerous employment opportunities. However, the CSG industry is also strongly opposed by some people, who cite possible risks to the environment and water resources and health impacts as grounds for prohibiting CSG extraction. This article considers whether, in the context of CSG production in Queensland, the 2010 amendments to the Water Act 2000 (Qld) are sufficient to ensure water resources are used and regulated in such a way that protects both the short and long-term quality and availability of Queensland’s water resources. The Queensland regulatory regime is considered against the National Water Commission’s 2010 position statement on CSG.

The National Water Commission has stated:

[The] CSG industry offers substantial economic and other benefits to Australia. At the same time, if not adequately managed and regulated, it risks having significant, long-term and adverse impacts on adjacent surface and groundwater systems.¹

Achieving balance between maximising economic benefit from coal seam gas (CSG) and managing the risks to water systems and the wider environment as a result of CSG is a key issue in Queensland.² In addition to water and environmental concerns, the economic benefits that may be derived from a CSG industry in Queensland must be balanced against the interests of other industries such as agriculture, and community needs such as ensuring potable water supply.

A defining point for this delicate balancing act was the Bligh Government’s Blueprint for Queensland’s LNG Industry paper (Blueprint Paper), which was tabled in Parliament in September 2009.³ At the time of tabling, Premier Bligh spoke of achieving the right balance. Bligh explained that the government’s aim is to “grab… with both hands” the economic and job creation opportunities that a CSG/liquefied natural gas (LNG) industry can offer Queensland, but recognised that the expansion of the CSG/LNG industry has to be done carefully and must properly consider environmental and community concerns.⁴

This is the platform on which the recent amendments to the Water Act 2000 (Qld), Petroleum and Gas (Production and Safety) Act 2004 (Qld) (PG Act), Water Supply (Safety and Reliability) Act 2008 (Qld) and the Environmental Protection Act 1994 (Qld) (EP Act) were introduced.

This article begins with a brief outline of the benefits that may be derived from a CSG industry and the possible risks associated with it. Recent legislative changes are then reviewed and it is considered whether the current regulative regime is sufficient to ensure that water resources are used

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²In this article, both the terms “coal seam gas” (CSG) and “liquefied natural gas” (LNG) will be used depending on the context. While this article is focused on CSG extraction and production – that is, activities that occur before the CSG is cooled and condensed into liquid, or LNG – much of the information and available resources refer more generally to LNG.


⁴Queensland, Debates, Legislative Assembly, 17 September 2009, pp 2395-2397 (Anna Bligh, Premier and Minister for the Arts).
and regulated in such a way that protects both the short and long-term quality and availability of Queensland’s water resources. It is not intended that this article attempt to identify what will amount to an adequate level of “quality” or determine an appropriate level of “availability”, as these issues are better dealt with from a scientific and policy perspective. The benchmark against which the Queensland regulative regime is measured is the principles for managing CSG and water as provided by the National Water Commission (NWC) in its 2010 position statement. This article considers whether the Queensland regulatory regime implements the principles set out by the NWC, and the mechanisms by which this is done.

**WHAT ARE THE BENEFITS OF CSG? THE ROLE OF CSG INDUSTRY IN QUEENSLAND**

**Economy and jobs**

Each year the resources industry injects billions of dollars into Queensland’s economy, supports tens of thousands of jobs and is critical for the State’s current and future economic growth. For example, in the 2008/2009 financial year, Queensland produced over 190 million tonnes of coal, valued at an estimated $41.5 billion. The value of Queensland’s petroleum production in the 2008/2009 financial year was approximately $1.353 billion, despite the State’s many highly-prospective areas remaining relatively unexplored.

Still largely in its infancy, the CSG industry is being billed as a “once in a generation opportunity for a generation of employment”. It is estimated that the industry could offer as many as 18,000 direct and indirect jobs.

A local LNG industry exporting at 28 million tonnes a year could add more than $3 billion… to gross state product and offer [Queensland] around $850 million a year in royalties.

It is clear that a CSG industry would contribute to overall economic and employment growth in Queensland. Additionally, the emerging CSG industry is contributing to population growth in regional towns, new and additional infrastructure in towns, improved medical facilities, and increased training and career opportunities.

**CSG as a source of clean energy – therefore good for the environment?**

By 2010, about 70% of Queensland’s gas market will be supplied from coal seam gas.

When combined with other low or non-emissions fuels [natural gas] can contribute enormously to reducing the growth in Australia’s greenhouse gas emissions.

LNG is widely recognised as a clean and safe form of energy that can provide substantial...
environmental gains. For example, greenhouse gas emissions from gas-fired power stations can be up to 70% less than coal-fired power stations. Additionally, LNG can be readily supplied to overseas markets.

WHAT’S THE BIG DEAL? THE IMPORTANCE OF WATER RESOURCES IN QUEENSLAND

Of key concern to landholders and conservation groups is the impact that CSG production may have on groundwater resources, particularly as much of the area currently under development for CSG overlays the Great Artesian Basin. For example, because CSG wells often pass through a number of overlying aquifers to access targeted gas seams, there are concerns there may be an increase in inter-aquifer exchanges and adjacent groundwater resources may become contaminated by CSG water. There are also concerns relating to the chemicals used in fracking fluids and possible contamination to groundwater by these fluids.

Concerns regarding the impacts of CSG exploration and production has seen some groups call for a moratorium on mining and resource development until the full ramifications of CSG production on the agricultural production system and the environment are known; others call for a complete ban on “CSG procedures” within the Great Artesian Basin.

The Queensland government has recognised that the extraction of CSG to support an LNG industry may have impacts on Queensland’s groundwater resources. This has also been acknowledged by the Australian Petroleum Production and Exploration Association (APPEA), the peak national body representing Australia’s upstream oil and gas exploration and production industry. APPEA director Ross Dunn has reportedly stated: “[CSG] Drilling will, to varying degrees, impact on adjoining aquifers… the extent of the impact and whether the impact can be managed is the question.”

There are approximately 2,700 artesian bores and 15,000 sub-artesian bores in Queensland, which access the Great Artesian Basin and provide water for stock, domestic, urban, industrial and agricultural use. It is evident that in Queensland there is significant reliance on the Great Artesian Basin. It is apparent that any activity that may jeopardise this important source of water is a legitimate concern and one that legislation should attempt to manage. While not discussed in this article, it should therefore be noted that CSG extraction is only one activity that may jeopardise the quantity and quality of water in the Great Artesian Basin. For example, over-allocation of water for irrigation, unlicensed bores and current extraction for use in “traditional” resource extraction also have the potential to significantly impact the water quantity and quality in the Great Artesian Basin and should also be managed through legislation.

ADAPTIVE AND PRECAUTIONARY MANAGEMENT APPROACH

The competing arguments for and against a CSG industry are recognised by the NWC, which advises the Council of Australian Governments and the federal government on national water issues and the progress of the National Water Initiative (NWI).

While the NWC acknowledges that the CSG industry offers substantial economic and other benefits to Australia, it is concerned that CSG development represents a substantial risk to sustainable water management, and notes that this concern is amplified by the long-term nature of CSG production and the uncertainty regarding the impact it will have on water resources.\textsuperscript{22} Some of the potential risks to water resources identified by the NWC include:

- low-quality CSG water impacting connected surface and groundwater systems;
- impacts such as changes in pressure of adjacent aquifers and reduction in surface waterflows on other water users and the environment as a result of depressurisation of the coal seam; and
- fraccing, which has the potential to induce connection and cross-contamination between aquifers.\textsuperscript{23}

The NWC’s 2010 Position Statement on CSG and Water promotes an “adaptive and precautionary management approach” to allow for progressive improvements in the understanding of impacts that CSG development has on water resources, including cumulative effects, and to support timely implementation of “make good” arrangements.\textsuperscript{24} In addition to the adaptive and precautionary management approach, the NWC proposes 10 other principles (derived from the NWI) that it recommends State and Territory governments implement to manage the cumulative impacts of CSG water. These are known as the NWI Principles and are set out in full in the Annexure to this article. They include:

- licensing the withdrawal of water that is undertaken as part of CSG extraction;
- transparent project approval processes;
- baseline assessments of water systems to provide a benchmark for assessing cumulative impacts;
- pursing options to minimise cumulative impacts of extraction as a priority;
- making any discharge of CSG water to surface waters subject to conditions to ensure that environmental values and water quality objectives are protected;
- identifying clear accountabilities for any potential short or long-term cumulative impacts; and
- the full cost of environmental, social and economic water impacts are to be borne by CSG companies.

When comparing Queensland’s CSG water legislative regime to the NWI Principles, it must be kept in mind that the Principles were released in December 2010, which is subsequent to the Queensland reforms discussed in this article.

**CSG WATER REGULATORY REGIME – DOES IT MEET THE NWI PRINCIPLES?**

In 2010 extensive amendments were made to the regulatory regime that applies to CSG extraction and CSG water. These amendments have primarily been introduced by the Water and Other Legislation Amendment Act 2010 (Qld) and the South-East Queensland Water (Distribution and Retail Restructuring) and Other Legislation Amendment Act 2010 (Qld) (Restructure Act). This section considers whether the NWI Principles are provided for in the Queensland regulatory regime.

**Baseline assessments – NWI Principle 3**

NWI Principle 3 provides that adequate monitoring, including baseline assessment of surface and groundwater systems, should be undertaken to provide a benchmark for assessing cumulative impacts on other water users and water-dependent ecosystems.

This principle is met by amendments to the Water Act introduced in December 2010. In particular, the purpose of the amendments to Ch 3 of the Water Act was to establish a regime to provide for the management of impacts on underground water caused by the exercise of underground water rights by petroleum tenure holders.\textsuperscript{25}

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\textsuperscript{22} Australian Government, n 1.
\textsuperscript{23} Australian Government, n 1.
\textsuperscript{24} Australian Government, n 1.
\textsuperscript{25} Water Act 2000 (Qld), s 316.
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The purpose of Ch 3 is achieved by a number of mechanisms. Relevant to NWI Principle 3, petroleum tenure holders are required to monitor and assess the impact of the exercise of underground water rights on water bores.26 A petroleum tenure holder is required to undertake baseline assessments of all water bores in the tenement area to determine, inter alia, water quality and water level. A baseline assessment plan must also be prepared.27 The information collected from baseline assessments will then be used to establish benchmark data regarding each water bore prior to any impact of the petroleum tenure holder exercising its underground water rights.28 Certain industry standards are to be followed when undertaking the assessments and the person conducting the assessment must meet a certain level of skill, experience and expertise.29 Further, all baseline assessments must be completed, or certified, by an independent third party.30

The Water Act now requires a petroleum tenure holder to give the Department of Environment and Resource Management (DERM) an underground water impact report. The key elements of the report include: a comprehensive water monitoring program; projections of potential future water level impacts; and a spring impact management strategy.31 The report must also include details regarding the quantity of water taken or produced by a CSG proponent and an estimate of this figure for the following three years, and identify and describe each aquifer that is likely to be affected.32 The explanatory memorandum for the Water and Other Legislation Amendment Bill 2010 (Qld) explains that the purpose of this underground water impact report is to:

- ensure that the impacts of giving a petroleum tenure holder rights to extract unlimited volume of underground water as part of a petroleum and gas extraction are managed appropriately such that bore owners are not seriously disadvantaged and natural spring ecosystems are not at severe risk.33

Underground water impact reports are subject to approval by the DERM.34

The monitoring and reporting obligations under Ch 3 are also relevant to NWI Principles 8 and 9, which relate to accountability for the impacts, and associated costs, of CSG extraction.

Potential options to minimise impacts – NWI Principle 5

NWI Principle 5 promotes pursing options to minimise the cumulative impacts of CSG extraction on water balance. To achieve this objective, Principle 5 suggests: aquifer reinjection where water quality impacts are acceptable; groundwater trading; and substituting CSG for other water use. Principle 5 seems to indicate a support for “beneficial use” of CSG water; that is, changing the status of CSG water from a waste to a resource that can be used for a beneficial purpose.35 “Beneficial use” is a concept included in the Queensland regime.

Chapter 5A of the EP Act provides for petroleum activities to be issued with environmental authorities (Ch 5A activities). Chapter 5A activities are further categorised as either level 1 or level 2 activities. CSG activities are classified either as level 1 or level 2, based on the risk of environmental impacts.

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26 Water Act 2000 (Qld), Ch 3, Pt 3.
27 Water Act 2000 (Qld), s 397.
32 Water Act 2000 (Qld), s 376.
33 Water Act 2000 (Qld), s 376.
harm.\textsuperscript{36} The assessment process for level 1 CSG activities are more comprehensive than level 2 activities. Relevantly, each of the major CSG projects is applying for a level 1, Ch 5A environmental authority (Relevant EA).\textsuperscript{37}

As part of an application for a Relevant EA, an applicant must submit an environmental management plan that complies with s 310D of the EP Act. Section 310D was inserted by the Restructure Act. Each environmental management plan must include how the CSG proponent proposes to manage CSG water, including the use, treatment, storage or disposal of the matter.\textsuperscript{38} An environmental management plan must also include the measurable criteria (management criteria) against which the CSG proponent will monitor and assess the effectiveness of the management of water, including: criteria for quantity and quality of water used, treated, stored or disposed of; protection of environmental values; and the disposal of waste (eg salt generated from the management of water).\textsuperscript{39} An application for a Relevant EA is subject to public submissions and the application must be decided by the DERM against a range of criteria.\textsuperscript{40}

The amendments to the EP Act were accompanied by a number of guidelines. Of particular relevance when considering whether the Queensland legislation satisfies NWI Principle 5 is the Coal Seam Gas Water Management Policy. The amendments introduced by the Restructure Act phases out the use of large evaporation dams. Preferred and non-preferred management options for CSG water have been introduced and are set out in the guide “Preparing an Environmental Management Plan for Coal Seam Gas Activities”. The examples given in NWI Principle 5 reflect the preferred management options for beneficial use set out in the Queensland policies, in particular:

- Injecting CSG water, treated CSG water or brine into a natural underground reservoir or aquifer where the injection is unlikely to have a detrimental impact on certain environmental values and water quality objectives.
- Reusing CSG water without first substantially changing its composition. The potential uses of this water will depend on the composition of the water; however, examples include livestock watering, domestic users, aquaculture, mining and extractive industry uses, and industrial uses.
- Treating CSG water (eg by desalination or chemical treatments) to remove or reduce contaminants to make the water suitable for a desired end use. Treated CSG water may be used as potable water for human or animal consumption, or irrigation water for agricultural purposes.
- Supplying water of a suitable quality to a water supply dam (determined by the responsible entity for the water supply dam).\textsuperscript{41}

The non-preferred options include disposal via evaporation dams, disposal via injection where a detrimental impact is likely, and disposal to surface waters. The government expects that only in very rare circumstances will the use of evaporation dams be warranted.\textsuperscript{42}

Annual returns, which are required to be submitted pursuant to s 316(3)(a) of the EP Act, must include an evaluation of the effectiveness of the management of CSG water under the management criteria specified in the environmental management plan.\textsuperscript{43} The annual return must, inter alia, state whether the CSG water has been effectively managed. If the water has not been effectively managed,
the CSG proponent must specify the action that will be taken to ensure that water will be effectively managed against the criteria in the future.\textsuperscript{44} The Queensland government espouses that this process “implements an adaptive environmental management regime for CSG water”.\textsuperscript{45}

It can be seen that the Queensland regulative regime promotes beneficial use as the preferred option for managing CSG water and, on face value, the regime therefore complies with NWI Principle 5. Further, as the Queensland regime was in place before the NWI Principles, it may even be the case that NWI Principle 5 is based on Queensland’s regime. However, the government’s claim that the process outlined above implements an adaptive environmental management regime is questionable. Can the regime properly be promoted as an adaptive regime if the CSG proponents, who have a vested interest in disposing of CSG water with minimal cost and interference to CSG production, are also charged with the task of monitoring their own compliance and effectiveness? A solution to this may be imposing a requirement that annual returns must be completed by an independent third party.

Discharge of CSG water to surface waters – NWI Principle 6

NWI Principle 6 provides that, if discharges to surface waters are unavoidable, discharges should be conditioned so that environmental values and water quality objectives, including water quality to meet public health objectives, are protected.

As noted above, the disposal of CSG water directly to surface waters is a non-preferred water management option. If a CSG proponent seeks to dispose of CSG water to surface waters, certain information must be provided in the environmental management plan, including how the discharge regime is going to ensure protection of the environmental values and compliance with the water quality objectives for the environment proposed to receive the discharge.\textsuperscript{46} The environmental values and applicable water quality objectives that apply will depend on the surface water area or river proposed to be affected by CSG water discharges; examples of the environmental values to be protected may include the life, health and well-being of people, the diversity of ecological processes, and land-use capability.\textsuperscript{47}

The purpose of an environmental management plan is to propose environmental protection commitments to assist the DERM in deciding the conditions of the Relevant EA.\textsuperscript{48} The proposed environmental commitments are to be based on the water management hierarchy and principles outlined in the Environmental Protection (Waste Management) Policy 2000.\textsuperscript{49} Relevantly, waste disposal is the last and least preferred option in the hierarchy of waste management practices.\textsuperscript{50} In deciding whether to grant or refuse an application for a Relevant EA or an environmental management program, the DERM must have regard to the application of the waste management hierarchy.\textsuperscript{51} If the DERM grants the Relevant EA, s 310O of the EP Act allows the DERM to impose conditions that it considers are necessary or desirable.

By designating surface discharge as a non-preferred water management option and requiring the DERM to have regard to the waste management hierarchy, the Queensland regime discourages CSG proponents from seeking to dispose of CSG water to surface waters. This, together with the ability for the DERM to impose conditions on a Relevant EA, satisfies the objectives of NWI Principle 6.

\textsuperscript{44} Environmental Protection Act 1994 (Qld), s 316A(3); Queensland Government, n 35, p 5.
\textsuperscript{45} Queensland Government, n 35, p 5.
\textsuperscript{46} Queensland Government, n 41, p 22.
\textsuperscript{47} Environmental Protection (Water) Policy 2009 (Qld), s 11; Queensland Government, n 41, p 15.
\textsuperscript{48} Environmental Protection Act 1994 (Qld), s 310D(1).
\textsuperscript{49} Queensland Government, n 41, p 16.
\textsuperscript{50} Environmental Protection (Waste Management) Policy 2000 (Qld), s 10.
\textsuperscript{51} Environmental Protection (Waste Management) Policy 2000 (Qld), ss 14, 15.
Transparent approvals process – NWI Principles 2 and 7

NWI Principle 2 requires that project approvals are transparent, including clear and public articulation of predicted environmental, social and economic risks along with conditions implemented to manage these risks.

An application for a Relevant EA is open for public inspection and the applicant must publish a notice about the application in a newspaper. As discussed above, an application for a Relevant EA is subject to public submissions. Any properly-made submission must be considered by the DERM in deciding whether to grant or refuse the application for a Relevant EA. While the application process for a Relevant EA is a transparent procedure that allows for public submissions, it is not required to cover social and economic risks and, therefore, does not meet the criteria set out in NWI Principle 2. However, the DERM may require an applicant for a Relevant EA to prepare an environmental impact statement (EIS). Alternatively, if a project is declared as a significant project under the State Development and Public Works Organisation Act 1971 (Qld), an EIS may also be required.

The requirement of preparing an EIS is significant, as the purpose of an EIS is to assess the potential adverse and beneficial environmental, economic and social impacts of a project.

The Department of Employment, Economic Development and Innovation states:

A strength of the significant project declaration process… is that it provides a consistent and transparent process of environmental assessment for the proponent, the community and government. Importantly it provides the opportunity for community and stakeholder views to be incorporated into the assessment and approvals process.

If an EIS is required for a CSG project, this would bring the approval process for the project within the requirements of NWI Principle 2. Relevantly, each of the major CSG projects has been declared a significant project and therefore will be required to prepare an EIS.

The EIS process is also relevant to NWI Principle 7, which provides that jurisdictions should undertake water and land-use change planning and management processes in an integrated way to ensure the implications of projects are addressed prior to final development approval. The generic terms of reference for an EIS require that, for example, a project proponent assesses the potential for the project’s construction and operation to change existing and potential land-uses of the project site and adjacent areas, and the proposed land-use options after the project ends. Additionally, an EIS will likely be required to discuss the project’s consistency with existing land-uses or long-term policy framework for the area.

Clear accountabilities to be identified and full costs to be borne by CSG companies – NWI Principles 8 and 9

NWI Principle 8 espouses that clear accountabilities should be identified for any short or long-term cumulative impacts from CSG processes, clarifying which organisations are responsible for managing and rectifying, or compensating, for any impacts. NWI Principle 9 recommends that the full costs,
including externalities, of any environmental, social and economic water impacts and their management should be borne by the CSG companies.

In addition to imposing obligation on individual petroleum tenure holders through the underground water impact report (discussed above), the Water Act provides for cumulative management for areas that the DERM considers may be affected by the underground water rights of two or more petroleum tenement holders.\(^6^1\) This declaration allows the NWC to have oversight over the cumulative management of the impacts of the relevant petroleum tenement holders.\(^6^2\)

In relation to long-term impacts, the Water Act makes it clear that the underground water obligations of a petroleum tenure holder continue to apply despite the end of the tenure.\(^6^3\) Further, a petroleum tenure holder is required to provide financial security – the amount of which can be increased at anytime.\(^6^4\)

The Water Act imposes “make good obligations” on petroleum tenure holders within areas of aquifers where the water level is predicted to decline because of the taking of water by the petroleum tenure holder.\(^6^5\) The obligations are imposed to ensure that owners of water bores that are impaired, or that are likely to be impaired, by the extraction of underground water by a petroleum tenure holder maintain access to a reasonable supply of water for the authorised use and purpose of their water bore.\(^6^6\) For example, supply may be maintained by enhancing an existing bore, constructing a new bore or providing a supply of an equivalent amount of water of a suitable quality. Alternatively, if agreed by the water bore owner, they can be compensated by the petroleum tenure holder of any loss of reasonable supply experienced because of the tenure holder’s water extraction.\(^6^7\)

It is apparent that CSG proponents will bear the cost in relation to maintaining supply from bores and have a range of obligations in relation to costs associated with environmental impacts, as discussed above. Petroleum tenure holders are also required to fund the NWC’s functions in relation to groundwater management via a levy.\(^6^8\) However, NWI Principle 9 also recommended that CSG proponents bear the cost of “social impacts”. The NWI position statement provides that the social impacts include disrupting current land-use practices and the local environment through infrastructure construction and access.\(^6^9\) To help manage these effects, the government released the Sustainable Resource Communities Policy and strengthened the social impact assessment component within the EIS process.\(^7^0\)

**Precautionary and adaptive approach – NWI Principle 10**

The overarching theme of the NWC’s 2010 Position Statement on CSG and Water is the promotion of an adaptive and precautionary management approach. NWI Principle 10 restates this objective and notes that it is essential to enable improved management in response to evolving understanding of current uncertainties.

In the Blueprint Paper, the government committed to introducing an adaptive environmental approval regime that requires new environmental authorities to be subject to appropriate conditions and that enables existing environmental authorities to be altered should significant unintended

\(^{61}\) Water Act 2000 (Qld), s 365.

\(^{62}\) Explanatory Memoranda, Water and Other Legislation Amendment Bill 2010 (Qld), p 110.

\(^{63}\) Water Act 2000 (Qld), s 439.

\(^{64}\) Petroleum and Gas (Production and Safety) Act 2004 (Qld), ss 488, 489.

\(^{65}\) Water Act 2000 (Qld), ss 387, 409, 376(b)(iv).

\(^{66}\) Explanatory Memoranda, Water and Other Legislation Amendment Bill 2010 (Qld), p 133.

\(^{67}\) Water Act 2000 (Qld), s 421.

\(^{68}\) Water Act 2000 (Qld), ss 360FA-360FC.

\(^{69}\) Australian Government, n 1.

environmental outcomes occur.\textsuperscript{71} The government has stated that it has honored this commitment with legislative amendments to the EP Act, which allows for an adaptive environmental approach to be adopted when managing the impacts of disposing of CSG water; the government also refers to the amendments to the \textit{Water Act} in further supporting an adaptive approach.\textsuperscript{72}

The government is correct in stating that the DERM has the power to amend a Relevant EA to protect the environment from unintended impacts and that such an amendment may be triggered in information submitted by a CSG proponent within an annual evaluation.\textsuperscript{73} However, it remains to be seen at what point of non-compliance or what level of environmental detriment will trigger the DERM to take action.

It may be the case that amending a Relevant EA in a way that substantially affects economic or social benefits that are derived from CSG will become a political hot potato that the government is unwilling to deal with. In such a case it is feasible that the environment will lose out to economic and political considerations.

Another scenario that has already arisen is a situation where a CSG proponent (QGC) has sought to have its Relevant EA broadened to allow discharges of treated CSG into surface waters; in particular, the Weaambilla Creek near Condamine.\textsuperscript{74} The DERM’s website reports that the environmental authority was granted.\textsuperscript{75} It is questionable whether the DERM will refuse other such applications given the significant investment CSG proponents make in the Queensland CSG industry.

**NWI Principles 1, 4 and 11**

The foregoing sections evaluated Queensland’s CSG water regulatory regime against the NWI Principles recommended by the NWC for managing the cumulative impacts of CSG water. Principles 2, 3 and 10 to 16 were discussed in detail, concluding that those principles, at least in part, are met by the Queensland regulatory regime. However, NWI Principles 1, 4 and 11 are not currently dealt with in the Queensland regime.

NWI Principle 1 recommends that the interception of water by CSG extraction should be licensed to ensure it is integrated into water-sharing processes from the inception of those processes. As noted above, a petroleum tenure holder is able to extract an unlimited volume of underground water as part of gas extraction.\textsuperscript{76} There are multiple benefits that may result if the right to take an unlimited volume of water under the PG Act is converted to a licence to take a stipulated amount under the \textit{Water Act}. For example, water produced from CSG operations (and other petroleum activities) may be viewed as a valuable resource rather than a waste byproduct and oil and gas proponents would be required to comply with the sustainability criteria of the \textit{Water Act}.\textsuperscript{77} While environmental benefits would likely result from licensing water extracted as a result of oil and gas operations, it may be difficult to accurately estimate the volume of water that will be extracted. Further, it may also be difficult or dangerous for operations to be reduced or suspended if a licensee exceeds their licensed volume. In this respect, further investigations into the viability of licensing water extraction for oil and gas operations under the \textit{Water Act} are required.

NWI Principle 4 recommends that jurisdictions should work to achieve consistent approaches to managing the cumulative impacts of CSG extraction. A consistent national approach to managing CSG

\textsuperscript{71} Queensland Government, n 3, p 4.


\textsuperscript{73} Queensland Government, n 72.

\textsuperscript{74} “Gas Company Defends Disposal Plans”, \textit{Courier Mail} (22 April 2011).


\textsuperscript{76} \textit{Petroleum and Gas (Production and Safety) Act 2004} (Qld), s 185(3).

extraction impacts does not exist under the various State regimes. It is outside the scope of this article to consider the various regimes that apply to CSG extraction and how those regimes might be amended in order to cumulatively manage the issue.

NWI Principle 11 states that water produced as a by-product of CSG extraction that is made fit for purpose for use by other industries or the environment, should be included in NWI-compliant water planning and management processes. As part of meeting the NWI requirements, Queensland implemented a system involving water resource plans “to advance the sustainable management of water.” Importantly, under the Water Act, “water” means water in a watercourse, lake or spring, underground water, overland flow water, and water that has been collected in a dam; it does not include by-products such as CSG water. CSG water will be “waste” under the EP Act, unless the CSG proponent has obtained a water licence under the Water Act that allows beneficial use of the CSG water. It may be the case that CSG water, through beneficial use, ends up, for example, in a dam, in which case it will come within the definition of “water” under the Water Act and would come within the scope of the water resource plans system. However, without further investigation, it is unclear whether CSG water generally will be included in the Queensland water planning and management process.

While the Queensland regulatory regime does not satisfy all 11 NWI Principles, it has undergone significant reform to address the key issues identified by landholders, the community and conservation groups. Further, the government has committed to ensuring any outstanding issues regarding the potential impacts CSG extraction may have on groundwater are addressed.

CONCLUSION
Any resource extraction will necessarily have some level of impact on the environment, whether to vegetation, wildlife, water or other natural resources. Two of Queensland’s largest industries – coal and petroleum – can and do have significant impacts on the environment. However, these industries also inject billions of dollars annually into Queensland’s economy and support rural and regional communities.

The regulatory framework seeks to implement a regime that “strikes the right balance” between Queensland’s economic needs, the needs of other industries, community needs and the wider environmental needs. By way of comparison to the 11 NWI Principles proposed by the NWC for the management of CSG and water, it can be seen that Queensland’s regime incorporates a number of the principles. The Queensland regulatory regime for CSG extraction is robust and attempts to be sufficiently flexible so that advancements in extractive practices and scientific knowledge can be readily reflected in CSG processes. While Queensland has some way to go in order to meet all 11 NWI Principles, the current regulatory regime is, in the author’s opinion, close to striking the right balance between the various considerations.

It has been stated that managing environmental impacts caused by CSG extraction through an adaptive management approach “essentially focuses on waiting for impacts to occur before changing damaging practices and learning from mistakes.” In essence, this is exactly what an adaptive management approach will do; however, the alternative to a robust and flexible regime that can adapt over time is a complete ban on CSG extraction until the science is certain that CSG can be accessed and used in such a way as to guarantee no harm will occur to groundwater – a proposition that may never be realised.

Presented with these two options, if Queensland desires to reap the benefits of a CSG industry now, the only option is to proceed with extraction under a robust, flexible and adaptive regime. There is no doubt that further amendments could be made to the regulatory regime that strengthen the environmental protection objectives. In this regard, it should be noted that further amendments to the

78 Water Act 2000 (Qld), s 38(1).
79 Queensland, Debates, Legislative Assembly, 26 October 2010, pp 3799-3801 (Stephen Robertson, Minister for Natural Resources, Mines and Energy and Minister for Trade).
80 Queensland Conservation Council, n 16, p 2.
Water Act were passed in late 2011.\textsuperscript{81} Provided the government stands by its commitment to adapt the regime as required and address outstanding issues, the current regulatory regime is the preferred option moving forward.

**ANNEXURE – PRINCIPLES PROPOSED BY NATIONAL WATER COMMISSION**

1. The interception of water by CSG extraction should be licensed to ensure it is integrated into water sharing processes from their inception.
2. Project approvals should be transparent, including clear and public articulation of predicted environmental, social and economic risks along with conditions implemented to manage the risks.
3. Adequate monitoring, including baseline assessment of surface and groundwater systems, should be undertaken to provide a benchmark for assessing cumulative impacts on other water users and water-dependent ecosystems.
4. Jurisdictions should work to achieve consistent approaches to managing the cumulative impacts of CSG extraction. Such arrangements should consider and account for the water impacts of CSG activities in water budgets and manage those impacts under regulatory arrangements that are part of, or consistent with, statutory water plans and the National Water Initiative.
5. Potential options to minimise the cumulative impacts of extraction on the water balance should be pursued as a first priority. These options include aquifer reinjection, where water quality impacts are acceptable, and groundwater trading or direct substitution for other water use.
6. If discharges to surface waters are unavoidable, discharges should be conditioned so that environmental values and water quality objectives, including water quality to meet public health objectives, are protected. In such circumstances discharges to ephemeral streams should be pulsed to avoid flows in naturally dry periods.
7. Jurisdictions should undertake water and land-use change planning and management processes in an integrated way to ensure that water planning implications of projects are addressed prior to final development approval.
8. Clear accountabilities should be identified for any short- or long-term cumulative impacts from CSG processes, clarifying which organisations are responsible for managing and rectifying or compensating for any impacts.
9. The full costs, including externalities, of any environmental, social and economic water impacts and their management should be borne by the CSG companies. This includes, if not already in place, mechanisms such as bonds and sureties that deal with uncertainty and the timeframes associated with potential impacts. Given that these timeframes may extend for 100 or more years, current systems need to be re-evaluated.
10. A precautionary and adaptive approach to managing and planning for CSG activities is essential to enable improved management in response to evolving understanding of current uncertainties. This includes impacts such as long-term reductions in adjacent aquifer pressures and levels, and impacts on environmental assets that are not adequately protected by current “make good” mechanisms.
11. Water produced as a by-product of CSG extraction, that is made fit for purpose for use by other industries or the environment, should be included in NWI-compliant water planning and management processes. This will enable CSG producers to manage this resource in accordance with the principles of the National Water Initiative.\textsuperscript{82}

\textsuperscript{81} Water and Other Legislation Amendment Act 2011 (Qld).
\textsuperscript{82} Australian Government, n 1.