

# **COAL SEAM GAS PUBLIC HEARING**

**Narrabri: 29 March, 2016**

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CHIEF SCIENTISTS

REPORT. *NSW.*



**Chief Scientist  
& Engineer**

## **Final Report of the Independent Review of Coal Seam Gas Activities in NSW**

September 2014



[www.chiefscientist.nsw.gov.au/coal-seam-gas-review](http://www.chiefscientist.nsw.gov.au/coal-seam-gas-review)



## Chief Scientist & Engineer

The Hon Michael Baird MP  
Premier  
Minister for Infrastructure  
Minister for Western Sydney  
Parliament House  
SYDNEY NSW 2000

Dear Premier,


### **Final Report – Independent Review of Coal Seam Gas Activities in NSW**

In February 2013 your predecessor wrote requesting I undertake an independent review of coal seam gas activities in NSW. I now submit the final report of that Review.

This report presents the Review's findings and recommendations. Detailed support for the outcomes of the Review is provided in the accompanying reports and information papers released as part of the Review.

In presenting this final report I wish again to acknowledge the assistance of many people – the experts who advised the Review; those who took the time to write submissions or talk to my team; colleagues from government departments in NSW and other jurisdictions; colleagues in industry, research organisations, learned academies and professional associations; and the CSG review team itself which worked hard to make sense of a complex and contentious issue.

Yours sincerely,

  
Digitally signed  
by Mary O'Kane  
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**Mary O'Kane**  
**Chief Scientist & Engineer**  
30 September 2014



## EXECUTIVE SUMMARY

This report is the final and overarching report of the independent review of coal seam gas activities in NSW (the Review) undertaken by the Chief Scientist and Engineer. It presents the main findings and recommendations of the Review along with a summary of Government decisions regarding CSG over the time of the Review and a description of the Review process.

The Review was commissioned on 21 February 2013 by the former Premier, in a climate of community unease about CSG extraction.

The initial report of the Review was released in July 2013. In June 2014 the Review released reports on related matters referred to it by Government (cumulative impacts of activities in the Sydney Water Catchment, and placement of monitoring equipment for NSW water resources). At that time it also released a report on whether adequate financial mechanisms are in place to deal with possible environmental impacts from CSG and related operations.

With the release of this final report, the Review is also releasing reports on regulatory compliance and managing risk.

In preparing these reports, the Review drew on information from a large number of experts from around the world in a range of fields. It also consulted extensively with community groups, industry and government agencies.

Having considered all the information from these sources and noting the rapid evolution of technological developments applicable to CSG from a wide range of disciplines, the Review concluded that the technical challenges and risks posed by the CSG industry can in general be managed through:

- careful designation of areas appropriate in geological and land-use terms for CSG extraction
- high standards of engineering and professionalism in CSG companies
- creation of a State Whole-of-Environment Data Repository so that data from CSG industry operations can be interrogated as needed and in the context of the wider environment
- comprehensive monitoring of CSG operations with ongoing automatic scrutiny of the resulting data
- a well-trained and certified workforce, and
- application of new technological developments as they become available.

All of this needs to take place within a clear, revised, legislative framework which is supported by an effective and transparent reporting and compliance regime and by drawing on appropriate expert advice.

Of course, as the technologies involved are applied in new regions where the detailed hydrogeology is not yet fully characterised, there could be unexpected events, learnings, or even accidents. This is common for new applications in the extractive industries and underlines the need for Government and industry to approach these issues with eyes wide open, a full appreciation of the risks, complete transparency, rigorous compliance, and a commitment to addressing any problems promptly with rapid emergency response and effective remediation. It also highlights the need to record and capitalise on the data and knowledge gained from CSG extraction activities in new regions and to take advantage of new technology developments which, if harnessed appropriately, can make CSG production increasingly safer and more efficient over time.

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# 1 ABOUT THE REVIEW

## 1.1 THE REVIEW AND ITS REPORTS

The independent review of coal seam gas activities in NSW (the Review) undertaken by the Chief Scientist & Engineer began in late February 2013. The Terms of Reference for the Review are at Appendix 1. This report is the final and overarching report of the Review.

Over the past 19 months, the Review has examined the coal seam gas (CSG) industry, the potential environmental, human health and social impacts of CSG extraction, and the legislative and regulatory framework within which CSG operations occur in NSW.

The Initial Report of the Review (CSE Initial Report) was released in July 2013. It provided an overview of the issues and made five recommendations. Since then, the Review has released and is releasing reports on major topics identified through the Review, including:

- insurance and related financial coverage to manage environmental impacts (CSE Insurance)
- compliance systems and processes (CSE Compliance)
- risks to human and environmental health (CSE Risks).

The Review has also provided advice on other related matters requested by Ministers, specifically:

- the placement of monitoring equipment for water resources (CSE Monitoring)
- measuring cumulative impacts of activities which impact ground and surface water in the Sydney Water Catchment (CSE Catchment).

A full list of all the reports released by the Review is given at Appendix 2. All are available on the Chief Scientist & Engineer's website (<http://www.chiefscientist.nsw.gov.au/coal-seam-gas-review>).

In addition, the Review team is releasing information papers on fracture stimulation, abandoned wells and on managing the physical interface between the CSG industry and other activities. As well, more than 20 background information papers by experts were commissioned on a range of topics, with more than one paper for more controversial topics. These background papers are also available on the website.

## 1.2 PROCESS OF THE REVIEW

Overall the process of the Review was developed in the knowledge that the issues to be examined were contentious, complex, technical and wide ranging. For this reason it was clear that the Review needed to canvass many different opinions and experts covering a range of perspectives and fields, but it had to do this in a way that maintained a level of independence and avoidance (or awareness) of organisations' conflicts of interests.

The Chief Scientist & Engineer established a team within the Office of the Chief Scientist & Engineer (the Review team) to support and facilitate the Review work. The size of the task required the team to grow from the small team already in place in the Office. The fact that the Review team included individuals with a diverse range of academic and professional backgrounds, including computer engineering, chemical engineering, mechanical engineering, petroleum engineering, hydrogeology, medicine, agriculture, chemistry, environmental science, high-tech equipment compliance systems, public policy and communication, brought a range of perspectives to the issues involved. While the Review team members were not CSG experts, their range of experience meant the Review was able



to formulate detailed technical queries and undertake informed analysis and interpretation of relevant issues and information, drawing on experts advising the Review as necessary.

Throughout the Review the team has pursued the philosophy of operating as transparently as possible, publishing all submissions received apart from those marked 'confidential' on the website of the Chief Scientist & Engineer, talking to the media on request and publishing commissioned papers on the website. Those working on the Review, either in the team or as commissioned experts, were asked to declare all real and possible conflicts of interest with a register established and decisions about how to handle conflicts being determined on a case-by-case basis with decisions formally recorded.

The range and complexity of the issues meant that a great many individuals and organisations needed to be canvassed, ranging from independent impartial experts, to key players in the CSG landscape; from those deeply supportive, to others fighting to prevent the industry's further development.

To address the terms of reference and understand the complexities of the issues, the Review team conducted substantial literature searches (CSE Initial Report §1.4.1) and read widely in the peer-reviewed literature as well as the 'grey literature' reports from organisations, industry and associations. During the course of the Review, a range of material was developed and released by other Australian bodies including the Commonwealth (particularly through the IESC processes), the Queensland Government, CSIRO and other organisations. This was taken into account by the Review.

Consultation was undertaken widely with independent academic experts, government agencies, natural gas industry and service companies, industry bodies, wider industry, community activist groups and the broader community to understand the key issues from a range of perspectives. These consultations were done through public submissions, background technical information papers, formal meetings, visits, workshops, interviews and information requests.

Technical assistance and expertise was drawn particularly from universities, publicly funded research organisations, the learned academies and technical consulting firms. Such assistance included commissioned papers, occasional advice on formulating issues, assistance with identifying experts, peer review of the Review reports, and participation in meetings.

A series of background technical information papers was commissioned on a range of issues related to the CSG industry. Independent experts, who had minimal or no actual, potential or perceived conflicts of interest, were engaged to write the papers. The rationale, process and development for the papers is discussed in the Initial Report §1.4.2. More than 20 background papers have been developed and are available on the website (<http://www.chiefscientist.nsw.gov.au/coal-seam-gas-review/csg-background-papers>).

The Review inspected CSG exploration and related water-management activities at Narrabri and Gloucester and inspected CSG production and related activities at Camden. It also inspected the Apex Energy CSG exploration site in the Sydney Catchment.

A call for public submissions to the Review was made to enable the Review to understand the issues and concerns from various perspectives (CSE Initial Report §1.4.5). Submissions were welcomed throughout the entire Review and provided considerable insight into specific issues. A total of 266 submissions was received. The submissions are available on the website (<http://www.chiefscientist.nsw.gov.au/coal-seam-gas-review/public-submissions>).



Consultations involving community members and local councils were held across the State in Camden, Campbelltown, Gloucester, Sydney Catchment, Taree, Gunnedah, Narrabri (including the Pilliga) and the Liverpool Plains.

The team also consulted with government agencies in NSW, across Australia, and overseas.

Consultations with NSW Government agencies formed an important part of the Review, and were used to provide information on the current regulatory system, how the system has operated previously, and what reforms have been put in place more recently. The Review had many face-to-face meetings and teleconferences over the period with agencies, and also surveyed relevant agencies to identify data holdings and systems. The Review sought formal advice on specific issues as required. The Review team also worked closely with the Land and Water Commissioner, drawing on his ongoing consultations across the State on CSG.

The team met with relevant officers from Queensland, Western Australian and South Australian agencies to understand the processes and issues being dealt with in those states. Discussions were held with various Commonwealth Government agencies and agencies from overseas including from Canada, New Zealand, USA and UK. The government agencies associated with resource and environmental management in these other jurisdictions were consulted through meetings, phone discussions and email, with some of these agencies also assisting the Review by providing peer review of report sections, in particular as they related to their jurisdictions.

Various stakeholders from the CSG industry, including companies providing services to the CSG industry, community groups, industry bodies and associations, including from the wider business sector, were invited to meetings with the Review team to discuss key issues and concerns – including those raised in submissions. The Review team met many of these organisations multiple times, including meeting with peak bodies and key stakeholders in the final few weeks of the Review to ensure that the team kept abreast of any new issues that may have arisen.

The Review also ran several workshops aimed at resolving some of the more difficult issues. To understand the complexities associated with cumulative impacts in the Sydney Water Catchment, the Review held two workshops where it brought together top-level experts in relevant fields (see CSE Catchment §1.3.3). To inform the work on CSG risks, four workshops were held. These were a novel way of bringing together stakeholders (many expert) from industry, research organisations, government and the community so participants could hear, debate, consider and, in some cases, resolve opposing viewpoints. Attendees at these workshops were selected for their knowledge, expertise and interest in the issues related to CSG and related activities. Government officials, researchers, and representatives from extractive industries, peak bodies, learned academies and community groups took part, providing a diverse range of backgrounds, expertise and views. Further to this a series of targeted meetings was held with expert practitioners from individual government agencies, research organisations and industry to delve further into specific issues in particular the risks and technical controls available to manage CSG (see CSE Risks §1.2.1).

By far the most complex and time-consuming task the Review undertook was the Compliance Study and its investigation of the processes and systems for ensuring compliance with legislative instruments, regulations and conditions applying to CSG extraction in NSW. The approach to reviewing compliance activity was informed by consultation, public submissions, well inspections, site visits and extensive interaction with the various agencies responsible for compliance with the legislation and regulations pertaining to CSG extraction (see CSE Compliance §1.2), but was challenged by difficulties

in obtaining data to demonstrate compliance, and indeed it ended up being the rate-limiting step for the Review.

### **1.3 HOW THIS REPORT IS STRUCTURED**

This final report provides the overall findings and recommendations of the Review. The individual reports, listed at Appendix 2, provide the detail, evidence and rationale behind various findings and recommendations.

The main findings of the Review are in Chapter 3 and its recommendations are in Chapter 4. As much has happened in Government regarding CSG over the course of the Review, these developments are summarised in Chapter 2 to provide contemporary context for the findings and recommendations.

## 2 DEVELOPMENTS IN GOVERNMENT AND RELATED ENTITIES SINCE THE REVIEW STARTED

During the course of the Review, a number of regulatory, administrative and process changes have been brought in by NSW Government as well as Commonwealth and local entities to address issues related to CSG.

Legislative reform has included a range of amendments to the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (SEPP), which brought about initiatives such as the Gateway Process, Strategic Agricultural Land mapping, residential CSG exclusion zones and their 2km buffers, as well as Critical Industry Clusters in the Upper Hunter, and clarified the State Significant Development criteria for CSG exploration wells. Further changes to the SEPP were also introduced to stipulate criteria to protect water resources, habitat and amenity; to ensure that decisions around approvals balance economic (resource) and environment issues; and to require the consent authority to consider biodiversity mitigation and offsets.

The *Protection of the Environment Operations Act 1997* and the *Protection of the Environment Operations (General) Regulation 2009* were amended, positioning the Environment Protection Authority (EPA) to be the lead regulator for environmental and human health impacts of CSG; and introducing a risks-based approach to environmental licensing.

Soon to be completed are a review of the *Petroleum (Onshore) Act 1991* and the introduction of a new title instrument that aims to ensure that activity approvals and conditions travel with the petroleum title. The Codes of Practice for Fracture Stimulation Activities and Well Integrity are also being reviewed, while Codes for Safety Management Systems and Emergency Response are being developed.

During the period of the Review, the Commonwealth Government has also introduced legislative changes that impact NSW CSG industry, in particular the introduction of the 'water trigger' under the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999*, requiring the CSG-related proposals that are likely to impact significant water resources to be referred to the Commonwealth. Later amendments devolved the Environmental Impact Assessment authority from the Commonwealth to NSW, with the Commonwealth accrediting the NSW processes.

Several changes have also been made to the administrative arrangements in NSW Government agencies for dealing with CSG. These have included the establishment of the Office of Coal Seam Gas in NSW Trade & Investment; the establishment of the position of Land and Water Commissioner; and a review followed by a restructure of the Division of Resources and Energy (DRE) in NSW Trade & Investment, following the appointment of a new Deputy Secretary. Furthermore, the responsibility for collecting minerals royalties (including for petroleum) has been transferred from DRE in NSW Trade & Investment to the Office of State Revenue in the Treasury and Finance cluster of NSW Government, effective from July 2014.

Efforts have also been made to streamline and coordinate processes across regulators, including through a Memorandum of Understanding (MOU) and the establishment of a cross-agency working group on CSG. In addition, several agencies have taken steps to improve regulatory capability and capacity through recruiting staff, purchasing additional

instrumentation and developing materials to improve officers' knowledge of the CSG industry.

On exploration licence issues, the NSW Government has:

- put a hold on CSG exploration and extraction in the Sydney Water Catchment Special Areas
- put a 6 month freeze on new petroleum exploration licence applications, which was extended by a further 12 months to September 2015
- undertaken to audit existing petroleum exploration licences
- designated the Santos Narrabri Gas Project and AGL's Gloucester Gas Project as Strategic Energy Projects
- signed an MOU with Santos to streamline the assessment process for the Narrabri Gas Project
- renewed AGL's Gloucester petroleum exploration licence and granted an activity approval to fracture stimulate four wells.

Initiatives that relate to land access have been introduced by Government and other entities, such as a review of the process for arbitrating land access arrangements for exploration commissioned by NSW Government followed by the announcement in August 2014 that all recommendations of that review were endorsed and will be implemented progressively. A voluntary Code of Practice for Land Access was developed by DRE. An MOU was executed by NSW Farmers, Cotton Australia, NSW Irrigators Council, AGL, and Santos agreeing common principles of access to private agricultural landholders' property.

Other broader initiatives that affect CSG extraction include:

- an Energy Security Summit that examined emerging issues of gas supply for NSW
- the release of the Water Monitoring Framework developed by the NSW Office of Water, which includes a Groundwater Baseline Project commissioned by the Land and Water Commissioner
- an announcement by the Minister for Natural Resources, Lands and Water of a scheme to credit the return of groundwater to the water sources from which it was extracted
- development by the NSW Office of Water of Guidelines to assist proponents to develop Groundwater Monitoring and Modelling Plans
- release of a framework by the NSW Office of Water that describes the assessment criteria for the Aquifer Interference Policy to aid the development of a project proposal or Environmental Impact Statement.

Other developments, not directly related to CSG, that could impact the industry include:

- the release in October 2013 of the Independent Commission Against Corruption's report *Reducing the opportunities and incentives for corruption in the state's management of coal resources*, that makes a range of relevant recommendations on managing the coal mining industry in NSW
- a number of agency amalgamations and restructures including the formation of Bulk Water NSW from the Sydney Catchment Authority and State Water, and the creation of the new Department of Planning and Environment.



### 3 FINDINGS

This chapter presents the high-level findings of the Review. The evidence and reasoning supporting these findings is provided in the various detailed reports of the Review, listed at Appendix 2.

#### **Stakeholders have significant concerns**

- Land is a key issue and one that strikes an emotional chord due to the strong affinity Australians have with their land and its central role in the livelihood of rural communities. There is a perceived lack of support for rights of landowners in terms of access to their land. Lack of consultation, inadequate compensation, property value decreases, and potential legacy issues are also cited as major issues by landowners as are the negative impacts on amenity and a lack of adequate benefits for their neighbours and their communities.
- Water is another key issue. Primary producers and others fear that CSG developments will negatively impact prime agricultural land by depleting aquifers and contaminating groundwater reserves. They argue that it could result in reduced food production.
- Other major concerns, especially from community groups, are short- and long-term negative environmental impacts (and who will pay to remediate land); managing produced water and associated by-products such as salts; possible impacts on human and animal health; the distributed nature of the industry (giving rise to concerns including malfunctioning unattended wells and heavy traffic on minor roads); and the cost to the taxpayer of regulating the industry.
- Certain processes such as fracture stimulation ('fracking') and, to a lesser extent, horizontal drilling, are of particular concern in the context of CSG although the use of these techniques in other industries (underground water access in the case of fracture stimulation and infrastructure provision in the case of horizontal drilling) is more accepted.
- There is concern about lack of adequate and respectful consultation. Stakeholders cited the failure of industry proponents and government agencies at all levels to engage, provide information, communicate and address community concerns before proceeding with development. On the issue of consultation and adequate information provision, the Review notes that getting the balance right between overall benefit to society and impact on individuals is a recurrent challenge for governments especially for issues as divisive as CSG. While the Review found that consultation and information provision could be significantly improved, it is clear that there are many in the community whose level of concern is such that they are likely to remain opposed to CSG production in NSW under any conditions.
- A large number of those who expressed their opposition to CSG to the Review also made it clear that they were not opposed to CSG *per se* but were opposed to CSG production in heavily populated areas and in areas of intensive agricultural production.
- Local councils, especially rural councils, are concerned that they are not receiving adequate funds to cover rapid infrastructure upgrades (such as upgrades to local roads and other amenities) necessary to deal with the CSG industry coming to a rural locality.
- The CSG industry is concerned that it is being adversely affected financially by what it perceives to be an uncertain, often changing, and increasingly tough regulatory regime in NSW.
- There is a perception in some parts of the community that CSG extraction is potentially more damaging and dangerous than other extractive industries. This perception was heightened following the release of the American movie *Gasland* in 2010. The Review examined this issue in detail and concluded that while the CSG industry has several

aspects that need careful attention, as do almost all industries, it is not significantly more likely to be more damaging or dangerous than other extractive industries.

- Many perceive the CSG industry to be a new industry that is being fast-tracked without adequate attention to significant concerns. CSG production has been happening at significant levels in North America (where coal seam gas is generally referred to as coal bed methane) for two decades and in NSW for 13 years (at Camden by Sydney Gas, later AGL). CSG from NSW sources currently accounts for 5% of the NSW gas supply. In the 1990s the Government introduced measures such as a five-year royalty holiday (followed by a five-year incremental sliding scale of royalties from 6% up to 10%) to encourage the petroleum industry. This benefit was removed at the end of 2012. Some of the companies that began exploring during this time were responsible for incidents that led to increased concerns about the industry generally.
- Complex and opaque legislation and complex regulatory processes. This concern was raised repeatedly by community, the CSG industry and government agencies. It can lead to considerable administrative burden for those needing to comply, those assessing compliance and those trying to understand the legislative and regulatory regime from the community for the purpose of investigating concerns. This complexity can also lead to gaps, overlaps, contradictions and wasted time in inefficient oversight. The Review agrees that the legislation and regulatory processes need to be addressed.
- Inconsistent legislation. Many industry and community groups have alerted the Review to varying legislative and regulatory regimes for things similar to those relating to CSG extraction. Legislation and regulation covering the construction of wells and production of gas from coal seams as part of coal mining activities is less stringent than that for CSG production. Similarly a 2km buffer zone approach has been introduced for CSG extraction, but no such zone is in place for conventional gas or other types of unconventional gas extraction.

#### **Lack of trust**

- CSG companies are viewed as untrustworthy by some members of the community in both urban and rural areas. This lack of trust seems to stem particularly from some CSG exploration companies: being perceived to be in violation of land access regulations; being perceived by some to bully vulnerable landholders; not managing sub-contractors appropriately; engaging in questionable environmental practices; and not reporting accidents to the regulator quickly enough.
- Despite the limited extent of CSG development across NSW, Government is perceived by some as favouring the CSG industry for allowing it to proceed in areas where there has been considerable community opposition. Government is also perceived by some as not managing regulatory compliance effectively and not supporting compliance activities with sufficient penalties where CSG companies have infringed regulations.
- Government and industry information about CSG is perceived by some as lacking independence and, accordingly, is not trusted.
- Among groups trying to understand CSG impacts there is concern about lack of access to raw data, and especially baseline data associated with a locality, before CSG exploration and production commences. While the Government open data access provisions of recent years go some way to addressing this concern, the fact that most companies are not releasing this data in raw form (and are not required by Government to release it) leads to increased suspicion.
- There is considerable social tension and animosity between some neighbours in some local communities where CSG operations are proceeding or proposed. On the one hand there are those who are concerned about potential negative impacts of CSG extraction and see those who want its introduction as 'selling out' to CSG companies. On the other hand, landowners and community members who are in favour of CSG often feel that the debate has been 'hijacked' by environmental activists who are 'using' the community for their own ends.

### **There can be benefits to individuals, industry and communities**

- Industry, particularly the manufacturing industry, believes having increased amounts of locally produced gas helps deal with concerns about rising gas prices and possible future shortages. This is a particular issue for several companies that have long-term gas purchase contracts expiring. As well as raising concerns about price, several industry and government figures have also expressed concern about potential gas shortages, in the light of the high-value contracts for the export of gas from the new LNG plants at Gladstone. The impending increase in export capacity is anticipated to lead to greater demand for CSG production and to cause Australian east coast gas prices to rise to meet the export price.
- With effective consultation addressing stakeholder concerns and appropriate levels of compensation, CSG development can provide new revenue streams for landholders and their communities. With appropriate support arrangements in place, landholders can make money from CSG production on their land. While local councils have to ensure their communities can cope with the industry influx, industry activity can bring benefits to communities, especially to rural communities, in terms of increased employment, rents and servicing opportunities.

### **CSG extraction and related technologies are mature and Australia is well equipped to manage their application**

- Unconventional gas production is now a major industry especially in North America where, on balance, it is generally highly valued because of the energy security it provides. On the back of this, there is now considerable investment and experience in the development and refinement of technologies to maximise production while minimising adverse impacts. In Australia related technologies have now been extensively deployed successfully for some years (including at Camden in NSW). The independent petroleum engineering, geological and geophysical experts advising the Review consider that such technologies (including fracture stimulation and horizontal drilling technologies), with appropriate safeguards, are suitable for use in many parts of the sedimentary basins in NSW, noting that drilling in any new location is, to an extent, a learning-by-doing activity as there will always be local geological attributes specific to an individual resource development. These activities can and should be guided by companies investing in geophysics and other characterisation techniques to inform the best drilling and extraction approaches to take.
- There is a long history of working in the subsurface in Australia for the extraction of resources such as minerals, coal, gas, oil, water and, to a lesser extent, geothermal heat. This has led to a good understanding by Australian governments of what is needed to regulate subsurface activities for the purposes of safety, health, minimising environmental impact and protecting high-priority resources such as water. As a consequence Australia has built up high-quality expertise and knowledge of subsurface activities. In the public sector it has government agencies such as Geoscience Australia and State resources departments; research-intensive Earth Science and Mining Engineering departments in universities; publicly funded research agencies such as CSIRO and ANSTO; various collaborative research centres; and relevant national collaborative research infrastructure. In the private sector Australian resources companies have reputations as leading in the applications of world best practice. With Australia heavily invested in resources development, most of the global resources industry service companies have a major presence here. Australia also has a well-educated workforce.
- Australia has a strong track record in water technology innovation and management. Water is a key issue for Australia so we have developed significant capabilities in water management. This includes water treatment, operations and infrastructure for water and fluids management, management of byproducts such as salts, waste disposal,



remediation and rehabilitation. These activities are backed by considerable research and science expertise especially in government agencies, universities, CSIRO, the Bureau of Meteorology and various Cooperative Research Centres. This means that Australia is in a good position to rise to the challenge of managing the various water issues associated with CSG production.

#### **There are things we need to know more about**

- While Australia has a long history of working in the subsurface, there is still considerable uncertainty associated with the development of any new resource province. Currently CSG activities tend to be considered mainly at a site-specific level. A better understanding of the industry impacts at scale and over time is needed. To enable better planning decisions and better management of cumulative impacts, it will be necessary that industry collects and provides to Government significantly more data than at present including data from a wider range of sources. With a diverse range of resources, including coal, CSG and underground water, hosted in our sedimentary basins, there is a need to understand better how the different resources and their development regimes interact. More detailed knowledge of the structure and composition (especially regarding hydrogeology) of the sedimentary basins is needed to enhance productivity for the CSG industry through more precise resource characterisation and better subsurface and surface environmental management.
- There is a need to understand better the nature of risk of pollution or other potential short- or long-term environmental damage from CSG and related operations, and the capacity and cost of mitigation and/or remediation and whether there are adequate financial mechanisms in place to deal with these issues. This requires an investigation of insurance and environmental risk coverage, security deposits, and the possibility of establishing an environmental rehabilitation fund. Doing this is essential to ensure that the costs and impacts from this industry are not a burden for the community.
- Legacy issues, including better understanding of inappropriately abandoned wells, need attention.

#### **Risks can be managed**

- Management of potential risks associated with CSG, as with other industries, requires effective controls; high levels of industry professionalism; systems to predict, assess, monitor and act on risks at appropriate threshold conditions; legislation; regulation; research; and commitment to rapid remediation, continuous improvement and specialist training. The Review studied the risks associated with the CSG industry in depth and concludes that – provided drilling is allowed only in areas where the geology and hydrogeology can be characterised adequately, and provided that appropriate engineering and scientific solutions are in place to manage the storage, transport, reuse or disposal of produced water and salts – the risks associated with CSG exploration and production can be managed. That said, current risk management needs improvement to reach best practice.
- In particularly sensitive areas, such as in and near drinking water catchments, risk management needs to be of a high order with particularly stringent requirements on companies operating there in terms of management, data provision, insurance cover, and incident-response times.

#### **New knowledge and technologies are becoming available but need to be harnessed to make CSG extraction safer and more productive**

- Rapid advances in knowledge and technologies in a wide range of fields (especially in information and communication technologies; numerical modelling; geology, geophysics and petroleum engineering; and new materials) are occurring and can be harnessed to improve CSG production efficiency and to minimise adverse impacts. Some of the most notable recent developments include:



- data technologies especially in the area of big data, data analytics and data fusion. These technologies use very large amounts of data from diverse sources to enable better understanding of complex earth systems with an improved grasp of the uncertainties in modelling for purposes such as characterising CSG resources and predicting groundwater impacts. For these powerful technologies to be effective, significantly more data from a wider range of sources need to be collected
- visualisation technologies that allow for detailed inspection of data. These include using 3D and movie techniques which are often particularly useful in allowing experts from a wide range of disciplines to inspect and analyse large amounts of complex data easily and quickly. They are also used for training and testing responses to hazardous situations
- sensor and monitoring technologies – both in-line and remote monitoring technologies – are becoming very cheap and are increasingly integrated with onboard signal processing and communications technologies. This means that the very large amounts of surveillance data they produce can be preprocessed locally then rapidly sent to a central data repository
- artificial intelligence techniques that allow for intelligent, real-time interrogation of monitoring data with alerts when anomalies are detected
- developments in petroleum engineering that allow for better matching of combinations of appropriate technologies for particular geological situations
- developments in new materials.
- In order to speed the beneficial uptake of new technology developments for an industry as contentious as CSG, the Review concludes that Government needs access to such expertise on a permanent basis, such as by creation of a standing committee comprising top experts from relevant disciplines, to advise it when to act on new technology developments as they become available.

#### **There are no guarantees**

- All industries have risks and, like any other, it is inevitable that the CSG industry will have some unintended consequences, including as the result of accidents, human error, and natural disasters. Industry, Government and the community need to work together to plan adequately to mitigate such risks, and be prepared to respond to problems if they occur.

## 4 RECOMMENDATIONS

The final recommendations of the Review are presented below, grouped according to themes. Some of the recommendations have been modified, simplified or combined, compared with the form in which they were first presented in previously released reports of the Review; however their intent has not changed.

### **Intent, communication, transparency and fairness**

#### **Recommendation 1**

That Government make clear its intent to establish a world-class regime for extraction of CSG. This could be articulated in a clear public statement that covers:

- the rationale/need for CSG extraction
- a clear signal to industry that high performance is mandatory, compliance will be rigorously enforced and transgressions punished
- a fair system for managing land access and compensation
- a mechanism for developing a clear, easy-to-navigate legislative and regulatory framework that evolves over time to incorporate new technology developments
- mechanisms for working closely and continuously with the community, industry, and research organisations on this issue.

#### **Recommendation 2**

That Government ensure clear and open communication on CSG matters is maintained at all times. This includes:

- simplicity and clarity in legislative and regulatory requirements
- ensuring openness about CSG processes in line with an open access approach; publishing all relevant approval requirements, decisions and responses, and compliance and enforcement outcomes on appropriate government websites and making CSG data from companies, Government and research organisations available through a centralised Government data repository
- measurable outcomes to track performance against commitments to reform.

#### **Recommendation 3**

That Government investigate as a priority a range of practical measures for implementation (or extension of current measures) to allow affected communities to have strengthened protections and benefits including fair and appropriate:

- land access arrangements, including land valuation and compensation for landholders
- compensation for other local residents impacted (above threshold levels) by extraction activities
- funding (derived from the fees and levies paid by CSG companies) for local councils to enable them to fund, in a transparent manner, infrastructure and repairs required as a consequence of the CSG industry.

#### **Recommendation 4**

That the full cost to Government of the regulation and support of the CSG industry be covered by the fees, levies, royalties and taxes paid by industry, and an annual statement be made by Government on this matter as part of the Budget process.

### **Legislative and regulatory reform and appropriate financial arrangements**

#### **Recommendation 5**

That Government use its planning powers and capability to designate those areas of the State in which CSG activity is permitted to occur, drawing on appropriate external expertise as necessary.

### **Recommendation 6**

That Government move to a single Act for all onshore subsurface resources (excluding water) in the State, constructed to allow for updating as technology advances. This will require a review of all major Acts applying to the resources sector.

### **Recommendation 7**

That Government separate the process for allocation of rights to exploit subsurface resources (excluding water) from the regulation of the activities required to give effect to that exploitation (i.e. exploration and production activities); and that it establish a single independent regulator. The regulator will require high levels of scientific and engineering expertise, including geological and geotechnical ability, environmental and water knowledge and information, and ICT capability including data, monitoring and modelling expertise; and will be required to consult – and publish details of its consultations – with other arms of Government and external agencies, as necessary. The regulator will also require appropriate compliance monitoring and enforcement capability.

### **Recommendation 8**

That Government move towards a target and outcome-focused regulatory system, with three key elements:

- regularly reviewed environmental impact and safety targets optimised to encourage uptake of new technologies and innovation
- appropriate and proportionate penalties for non-compliance
- automatic monitoring processes that can provide data (sent to and held in the openly accessible Whole-of-Environment Data Repository) which will help detect cumulative impacts at project, regional and sedimentary basin scales which can be used to inform the targets and the planning process.

### **Recommendation 9**

That Government consider a robust and comprehensive policy of appropriate insurance and environmental risk coverage of the CSG industry to ensure financial protection short and long term. Government should examine the potential adoption of a three-layered policy of security deposits, enhanced insurance coverage, and an environmental rehabilitation fund.

### **Managing risk by harnessing data and expertise**

#### **Recommendation 10**

That Government commission the design and establishment of a Whole-of-Environment Data Repository for all State environment data including all data collected according to legislative and regulatory requirements associated with water management, gas extraction, mining, manufacturing, and chemical processing activities. This repository, as a minimum, would have the characteristics that it:

- is accessible by all under open data provisions
- has excellent curatorial and search systems
- houses long-term data sets collected as part of compliance activities
- can accept citizen data input
- can be searched in real time
- is spatially enabled
- is able to hold data in many diverse formats including text, graphics, sound, photographs, video, satellite, mapping, electronic monitoring data, etc., with appropriate metadata
- is the repository of all research results pertaining to environmental matters in NSW along with full details of the related experimental design and any resulting scientific publications and comments
- is the repository of historical resources data with appropriate metadata

Various legislative amendments or other incentives will be needed to direct all environment data to the Repository.

### **Recommendation 11**

That Government develop a centralised Risk Management and Prediction Tool for extractive industries in NSW. This would include a risk register, a database of event histories, and an archive of Trigger Action Response Plans. The tool would be updated annually based on Government and company reporting and would include information on risk management and control approaches and draw on data from the Whole-of-Environment Data Repository for the State. The risk tool would be reviewed and commented on by relevant expert and regulatory bodies. The risk tool would be used to assist with:

- assessing new proposals
- assessing compliance
- improving prediction capability for consequences of incidents in risk assessments
- improving prediction capability of risk likelihoods
- informing project design amendments to decrease risk levels (such as undertaken in the Dam Safety Committee)
- informing the calculation of cumulative impacts
- flagging issues or risks that require a higher level of regulatory protection such as inclusion in legislation.

### **Recommendation 12**

That Government establish a standing expert advisory body on CSG (possibly extended to all the extractive industries). This body should comprise experts from relevant disciplines, particularly ICT and the earth and environmental sciences and engineering, but drawing as needed on expertise from the biological sciences, medicine and the social sciences. The prime functions of this expert body would be to advise Government:

- on the overall impact of CSG in NSW through a published Annual Statement which would draw on a detailed analysis of the data held in the Whole-of-Environment Data Repository to assess impacts, particularly cumulative impacts, at project, regional and sedimentary basin scales
- on processes for characterising and modelling the sedimentary basins of NSW
- on updating and refining the Risk Management and Prediction Tool
- on the implications of CSG impacts in NSW for planning where CSG activity is permitted to occur in the State
- on new science and technology developments relevant to managing CSG and when and whether these developments are sufficiently mature to be incorporated into its legislative and regulatory system
- on specific research that needs to be commissioned regarding CSG matters
- on how best to work with research and public sector bodies across Australia and internationally and with the private sector on joint research and harmonised approaches to data collection, modelling and scale issues such as subsidence
- on whether or not other unconventional gas extraction (shale gas, tight gas) industries should be allowed to proceed in NSW and, if so, under what conditions.

### **Recommendation 13**

That Government establish a formal mechanism consisting of five parallel but interacting steps. The five steps are given below.

- Companies or organisations seeking to mine, extract CSG or irrigate as part of their initial and ongoing approvals processes should, in concert with the regulator, identify impacts to water resources, their pathways, their consequence and their likelihood, as well as the baseline conditions and their risk trigger thresholds before activities start. These analyses and systems should be incorporated in project management plans to meet regulator-agreed targets. Appropriate monitoring and characterisation



systems would be developed as part of these project management plans and then installed. The monitors would measure baseline conditions and detect changes to these, as well as providing data on impacts and triggered risk thresholds.

- Data from the monitors should be deposited (either automatically or in as close to real time as possible) in the State Whole-of-Environment Data Repository by all the extractive industries. Increasingly automated tools to interrogate data in the Repository should be developed, and these used to search data for discontinuities and compliance alerts.
- As a separate process, the expert advisory body would examine on a frequent basis all data relevant to a region or a sedimentary basin. This data would come from a range of sources (the companies' monitoring data along with triangulation/cross-validation data such as that from satellites, reports from local councils, seismic data, subsidence maps, information from cores, etc.). The expert body would use this data review to check for any factors signalling problems in that region and, if any are found, recommend to Government the appropriate action to be taken with regard to the relevant parties.
- In a parallel process, the Government should commission, construct and maintain a variety of models of each region and in particular one that seeks to address cumulative impacts. These models should feed into the land use planning process and the activity approvals processes, and should assist in target setting for new projects.
- Government, working with other appropriate Australian governments, should commission formal scientific characterisation of sedimentary basins starting with the East Coast basins, and concentrating initially on integration of groundwater with the geological, geophysical and hydrological context. Viewing these integrated systems in models and in interpretation could be described as a 'Glass Earth' approach to understanding the dynamics of activities and impacts in the basins.

## **Training and certification**

### **Recommendation 14**

That Government ensure that all CSG industry personnel, including subcontractors working in operational roles, be subject to ongoing mandatory training and certification requirements. Similarly, public sector staff working in compliance, inspections and audits should be given suitable training and, where appropriate, accreditation.

## **Legacy and consistency matters**

### **Recommendation 15**

That Government develop a plan to manage legacy matters associated with CSG. This would need to cover abandoned wells, past incomplete compliance checking, and the collection of data that was not yet supplied as required under licences and regulations. There will also need to be a formal mechanism to transition existing projects to any new regulatory system.

### **Recommendation 16**

That Government consider whether there needs to be alignment of legislation and regulation governing extraction of methane as part of coal mining and the application of buffer zones for gas production other than CSG with the relevant legislation and regulation provisions governing CSG production.

## APPENDICES

### APPENDIX 1 TERMS OF REFERENCE

#### Review of coal seam gas activities in NSW

At the request of the NSW Government, the NSW Chief Scientist & Engineer will conduct a review of coal seam gas (CSG) related activities in NSW, with a focus on the impacts of these activities on human health and the environment.

The Chief Scientist & Engineer is to:

1. undertake a comprehensive study of industry compliance involving site visits and well inspections. The Chief Scientist's work will be informed by compliance audits undertaken by regulatory officers, such as the Environment Protection Authority and other government agencies
2. identify and assess any gaps in the identification and management of risk arising from coal seam gas exploration, assessment and production, particularly as they relate to human health, the environment and water catchments
3. identify best practice in relation to the management of CSG or similar unconventional gas projects in close proximity to residential properties and urban areas and consider appropriate ways to manage the interface between residences and CSG activity
4. explain how the characteristics of the NSW coal seam gas industry compare with the industry nationally and internationally
5. inspect and monitor current drilling activities including water extraction, hydraulic fracturing and aquifer protection techniques
6. produce a series of information papers on specific elements of CSG operation and impact, to inform policy development and to assist with public understanding. Topics should include:
  - operational processes
  - NSW geology
  - water management
  - horizontal drilling
  - hydraulic fracturing (fracking)
  - fugitive emissions
  - health impacts
  - wells and bores
  - subsidence.

The NSW Chief Scientist & Engineer will provide an initial report to the Premier and the Minister for Resources and Energy on her findings and observations by July 2013.



## APPENDIX 2 REPORTS AND BACKGROUND PAPERS WRITTEN AND/OR COMMISSIONED BY THE NSW CHIEF SCIENTIST & ENGINEER DURING THE INDEPENDENT REVIEW OF COAL SEAM GAS ACTIVITIES IN NSW

### Reports written by the NSW Chief Scientist & Engineer for the Independent Review of Coal Seam Gas Activities in NSW

Available at <http://www.chiefscientist.nsw.gov.au/reports>

- Initial Report on the Independent Review of Coal Seam Gas Activities in NSW
- Environmental risk & responsibility and insurance arrangements for the NSW CSG industry
- On measuring the cumulative impacts of activities which impact ground and surface water in the Sydney Water Catchment
- Placement of monitoring equipment for water resources in NSW
- Study of regulatory compliance systems and processes for coal seam gas
- Managing environmental and human health risks from coal seam gas activities
- Final Report of the Independent Review of Coal Seam Gas Activities in NSW

### Information papers written by the NSW Chief Scientist & Engineer for the Independent Review of Coal Seam Gas Activities in NSW

- Information paper: On managing the interface between coal seam gas activities and other land uses (Setbacks)
- Information paper: Fracture stimulation activities
- Information paper: Abandoned wells

### Reports commissioned by the NSW Chief Scientist & Engineer for the Independent Review of Coal Seam Gas Activities in NSW

Available at <http://www.chiefscientist.nsw.gov.au/coal-seam-gas-review/csg-background-papers>

	Topic	Expert name and organisation	Title of paper
1	Baseline human health	Dr Pavla Vaneckova & Assoc Professor Hilary Bambrick: University of Western Sydney – Centre for Health Research	Approaches to baseline studies of human health in relation to industries with potential environmental impact
2	CSG processes	Professor Peter Cook: PJC International, National Centre for Groundwater Research and Training, Flinders University	Life Cycle of Coal Seam Gas Projects: Technologies and Potential Impacts
3	Community concerns	Dr Melanie Taylor, Ms Natalie Sandy & Professor Beverley Raphael: University of Western Sydney - School of Medicine, Disaster Response and Resilience Research Group	Background paper on community concerns in relation to coal seam gas
4	Data management	Dr Ian Gibson, Intersect Australia	NSW Coal Seam Gas: Data Background Paper
5	Gas dispersion modelling	Professor Peter Rayner & Dr Steven Utembe: University of Melbourne - School of Earth Sciences	Modelling the Airborne Dispersion of Pollutants from Coal Seam Gas Extraction
6	Geology	Dr Craig O'Neill and Dr Cara Danis: Macquarie University - Department of Earth and Planetary Science	The Geology of NSW: The geological characteristics and history of NSW with a focus on coal seam gas (CSG) resources
7	Geology	Professor Colin Ward and Assoc. Professor Bryce Kelly: University of New South Wales - School of Biological, Earth and Environmental Sciences	Background Paper on New South Wales Geology: With a focus on basins containing coal seam gas resources
8	Groundwater	Mr Doug Anderson, Ms Priom Rahman, Ms Erica Davey, Mr Brett Miller, Dr William Glamore: University of New South Wales - Water Research Library	Background Paper on Groundwater Resources in Relation to Coal Seam Gas Production
9	Horizontal drilling	Professor John Carter: Advanced Geomechanics	Background Paper on Horizontal Drilling
10	Legislation and regulation	Ms Sue Graebner, Independent consultant	Legislative framework for CSG exploration and production. Released as appendix to CSE report, "Study of



			regulatory compliance systems and processes for coal seam gas"
11	Methane	Dr Linda Stalker: CSIRO	Methane origins and behaviour
12	Produced water	Assoc Professor Damian Gore and Dr Peter Davies: Macquarie University - Department of Environment & Geography	Macquarie University Background paper on produced water and solids in relation to coal seam gas production
13	Produced water	Dr Stuart Khan and Ms Geena Kordek	Coal Seam Gas: Produced Water and Solids,
14	Risk, insurance & management	Mr Bernard Evans: Hicksons Lawyers	Paper 1 - Insurance and Environmental Securities; Attachment: Environmental risks arising from CSG operations
15	Risk, insurance & management	Mr Tony Abbott: Piper Alderman	Insurance and Environmental Securities; Attachment: Risk Model Evaluation
16	Sedimentary basins	Assoc Professor Tim Rawling & Professor Mike Sandiford: University of Melbourne - Melbourne Energy Institute	Multi basin usage/cumulative impact,
17	Seismicity	Professor Mike Sandiford and Mr Gary Gibson: The University of Melbourne - Melbourne Energy Institute	Seismicity and Induced Earthquakes
18	Seismicity	Dr Barry Drummond: Independent consultant, formerly with Geoscience Australia	Background Paper on Seismicity
19	Subsidence causes	Dr Jubert A Pineda and Professor Daichao Sheng: The University of Newcastle - ARC Centre of Excellence for Geotechnical Science and Engineering	Subsidence: An overview of causes, risks and future developments for Coal Seam Gas production
20	Subsidence monitoring	Dr Simon McClusky and Dr Paul Tregoning: The Australian National University - School of Earth Sciences	Background paper on subsidence monitoring and measurement with a focus on coal seam gas (CSG) activities
21	Subsidence monitoring	Cooperative Research Centre for Spatial Information	Subsidence monitoring in relation to coal seam gas production
22	Water treatment	Emeritus Professor Chris Fell: Fell Consulting Pty Ltd	Water treatment and coal seam gas

**Other reports written by or commissioned by the NSW Chief Scientist & Engineer prior to the Independent Review of Coal Seam Gas Activities in NSW**

- Hydraulic fracturing for coal seam gas (CSG) stimulation in NSW, by Dr Rob Jeffrey: CSIRO
- CSE draft letter on the likelihood of hydraulic fracturing



# STRATEGIC LANDS

September 2012

## Fact Sheet

### The Gateway process

The Gateway is an independent, scientific and upfront assessment of how a mining or coal seam gas (CSG) production proposal will impact the agricultural values of the land on which it is proposed.

#### THE GATEWAY APPLIES ON THE MOST IMPORTANT AGRICULTURAL LAND

- The Strategic Regional Land Use Plans for the State's Upper Hunter and New England North West regions identify and map over two million hectares of land as "Strategic Agricultural Land".
- These areas of highly valuable agricultural land are identified due to either:
  - their inherent qualities such as soil type, land capability or water access (known as biophysical Strategic Agricultural Land), or
  - because they form part of a critical industry cluster such as wine making or horse breeding in the Upper Hunter.
- Biophysical Strategic Agricultural land may also be identified through the site-specific verification processes that will apply both within and outside of the Upper Hunter and New England North West regions.
- Strategic agricultural land is then given additional protection from State significant mining and CSG proposals through the "Gateway" process.

#### ASSESSMENT BEFORE A DEVELOPMENT APPLICATION CAN BE LODGED

- The Gateway will consider proposals at a very early stage before they can lodge a development application (DA).
- The Gateway provides a stringent and focused scientific assessment of the impacts of mining and CSG production proposals on Strategic Agricultural Land and its associated water resources. This will include a comprehensive assessment of potential aquifer impacts from the Minister for Primary Industries and the Commonwealth Independent Expert Scientific Committee.
- To pass the Gateway unconditionally, a proposal must demonstrate that it meets the Gateway criteria relating to agricultural and water impacts.
- If a proposal can't demonstrate that it meets these criteria, it will be subject to stringent requirements, included as conditions of a Gateway Certificate, that must be addressed at the development application stage.



# Strategic Regional Land Use Policy



- Such conditions could include, for example, the requirement for additional environmental studies or physical amendments to the project to avoid or minimise impacts.
- Any conditions of a Gateway Certificate will be specifically considered by the Planning Assessment Commission (PAC) in its determination of the development application. Terms of Reference will be provided to the PAC for each project to ensure that this is done.
- Cost benefit analysis will not form part of the Gateway consideration. The assessment at this stage will relate only to impacts on agricultural land and water. A triple bottom line cost benefit analysis may be provided by the applicant at the development application stage.

## INDEPENDENT GATEWAY PANEL

- The Gateway assessment will be undertaken by an independent panel of experts in fields such as agricultural science, water, and mining against explicit, objective criteria. No panel members have been appointed to date.
- Expert advice on aquifer impacts will be obtained from the Minister for Primary Industries and the Commonwealth Independent Expert Scientific Committee to assist in the assessment, which must be taken into account by the Gateway Panel.

## ASSESSMENT AT THE DEVELOPMENT APPLICATION STAGE

- State significant mining and CSG production proposals on Strategic Agricultural Land must pass through the Gateway process and obtain a Gateway Certificate before they can proceed to the development application stage.
- Projects will be subject to a full merit assessment process, including public exhibition, at the development application stage. Expert advice on aquifer impacts will also be obtained from the NSW Office of Water at this stage.
- Projects for which conditional Gateway Certificates have been issued will be required to clearly demonstrate that they have addressed the matters stipulated in the conditions.
- The applicant may choose to provide a triple bottom line cost benefit analysis at the DA stage to compare and contrast potential economic, social and other benefits of a proposal against its possible impacts. Any cost benefit analysis submitted at this point will be independently peer reviewed.
- Determinations of development applications will be made by the independent Planning Assessment Commission.

# Strategic Regional Land Use Policy



## **GATEWAY PROCESS TO BE GIVEN EFFECT IN PLANNING LAW**

- Full details of the Gateway process and criteria will be included in a forthcoming amendment to the State Environmental Planning Policy that deals with mining (known as the Mining SEPP).
- This SEPP amendment will be exhibited for public comment shortly.



# Strategic Regional Land Use Policy



# Foreword from NSW Premier Barry O'Farrell



The NSW Government committed to develop a Strategic Regional Land Use Policy to address one of the State's ongoing challenges – to provide greater protection for valuable agricultural land and better balance competing land uses.

For the first time in our history, the NSW Government is identifying and protecting strategic agricultural land, protecting valuable water resources and providing greater certainty for companies wanting to invest in mining and coal seam gas projects in regional NSW.

This policy is the result of an extensive consultation process, during which the views of farmers, miners and the wider community were heard and have informed its development and final form.

The policy has 27 new measures that work together to identify, map and protect the State's most valuable agricultural land and critical water resources.

It provides certainty around processes and allows for greater input from local communities, landholders and scientific experts into the assessment of exploration, mining and coal seam gas production proposals.

This policy also provides the platform to resolve conflicts over competing land use. Farmers and miners now know where they stand.

This document provides an overview of the initiatives contained in the Strategic Regional Land Use Policy and provides a guide for appropriate future land use in regional NSW.

Advice on where to find more information and detailed policy documents can be found on the back of this brochure.

**Barry O'Farrell**  
**Premier**

Strategic Regional Land Use Policy

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[www.planning.nsw.gov.au](http://www.planning.nsw.gov.au)

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# About the Strategic Regional Land Use Policy

The Strategic Regional Land Use Policy Package sets out a range of initiatives to better balance growth in the mining and coal seam gas (CSG) industries with the need to protect important agricultural land and water resources.

## Exploration activities

- There is a greater emphasis on the upfront protection of agricultural land and water through strong new requirements at the initial exploration stage and the bolstering of measures already in place. New initiatives include:
  - The creation of a Land and Water Commissioner position with an unfettered oversight and community advisory role with respect to exploration across the State.
  - The requirement for a specific assessment of agricultural impacts at the exploration stage through the preparation of an Agricultural Impact Statement.

## Strategic Regional Land Use Plans and Mapping of Strategic Agricultural Land

- The NSW Government is mapping Strategic Agricultural Land across the entire State to ensure that important land and water resources in areas impacted by mining and CSG activity are properly protected.
- This mapping will then be incorporated into either a new Strategic Regional Land Use Plan or via the reviews of existing Regional Strategies, some of which are already underway. See table for a regional breakdown and status of mapping.
- The mapped land will be a trigger for the Gateway process – an upfront, scientific assessment of the impacts of State significant mining and CSG proposals on Strategic Agricultural Land. This assessment will be undertaken by an independent, expert panel.
- If the panel considers that a proposal does not meet the Gateway criteria relating to agricultural and water impacts, it will issue a certificate with conditions tailored to address the proposal's likely impacts. These proposals then proceed to the development application stage where they must

fully address the matters stipulated in the conditions of the Gateway Certificate, including amending the proposal if necessary.

- Mapping has been completed and Strategic Regional Land Use Plans released for the Upper Hunter and New England North West regions – regions which are experiencing the most rapid growth in the mining and CSG industries and which have some of the State's most valuable agricultural land. In these two regions alone, more than two million hectares of Strategic Agricultural Land has been mapped – a significant increase from the amount of mapped land in the draft plans released in March 2012.

### Status of Strategic Agricultural Land Mapping

#### Strategic Regional Land Use Plans

Complete:	Upper Hunter New England North West
Commenced:	Central West Southern Highlands
To be commenced in 2013:	Western Murrumbidgee Alpine

#### Other Regions

Regional Strategies – to be reviewed and updated over the next two years:	Far North Coast Mid North Coast Lower Hunter Central Coast Illawarra South Coast Sydney-Canberra Corridor Murray
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## Aquifer Interference Policy

- The Aquifer Interference Policy has been introduced statewide to protect the State's crucial water resources through the assessment of potential impacts associated with mining and CSG activities.
- The policy outlines how the volumes of water taken as part of an aquifer interference activity will be licenced and accounted for.
- For the first time, the policy sets out minimal impact considerations against which the NSW Office of Water will assess the potential impacts of all proposals. This process will ensure minimal impacts on our State's groundwater systems.

# Introduction

With the mining industry continuing to grow in regional areas of the State and CSG beginning to emerge as a new energy resource in NSW, it is crucial the proper framework is in place for the protection of our valuable agricultural land.

The Strategic Regional Land Use Policy is the NSW Government's response to this challenge. It puts in place a number of measures to balance the often competing needs of these industries and, crucially, to ensure our most important agricultural and water resources are protected.

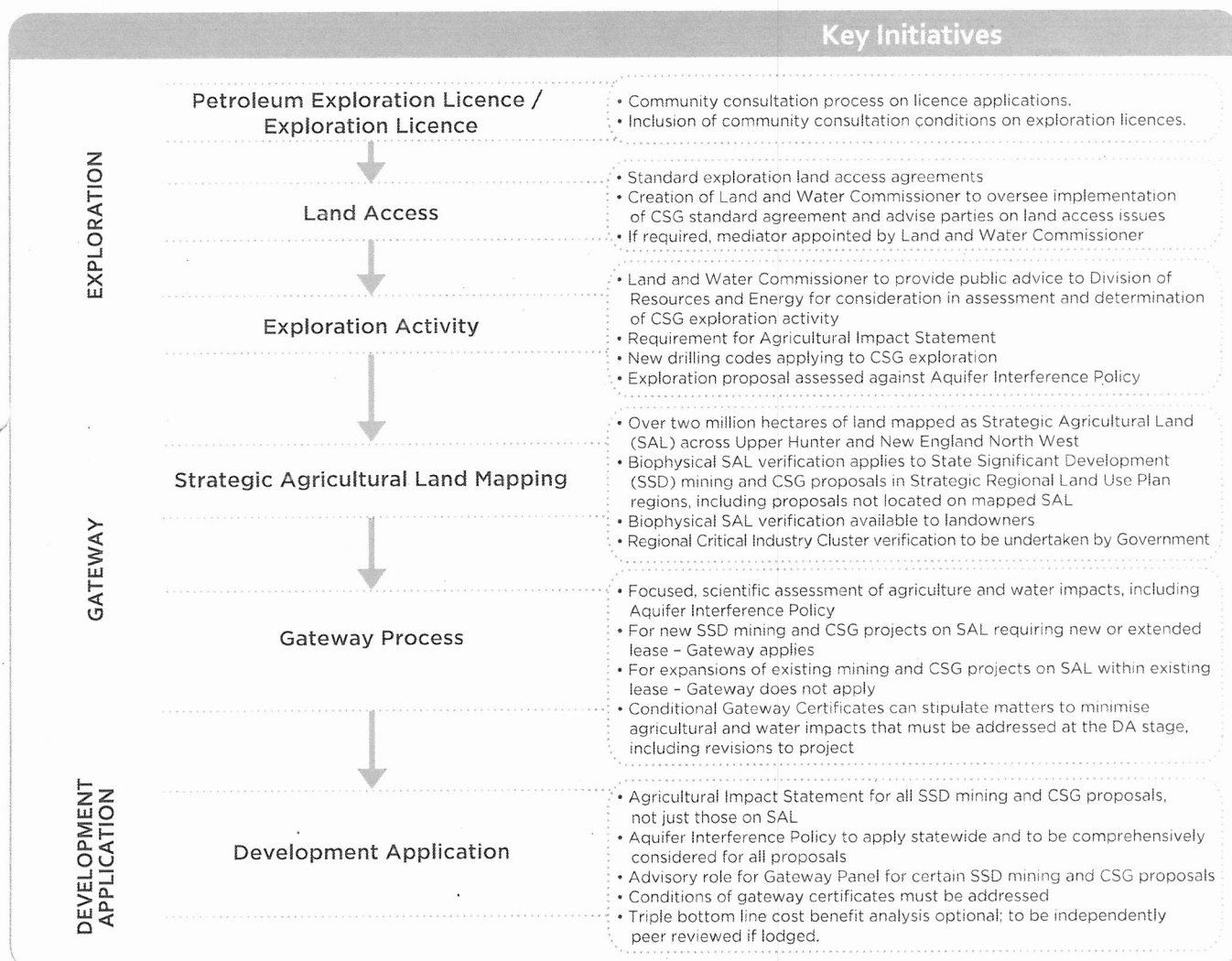
The policy package consists of:

- A comprehensive suite of initiatives to better regulate exploration activities;
- Creation of a Land and Water Commissioner;

- Strategic Regional Land Use Plans, with the Upper Hunter and New England North West regions the first to be prepared;
- A statewide Aquifer Interference Policy;
- The requirement for an Agricultural Impact Statement at the exploration and development application stages; and
- Two new Codes of Practice for the CSG industry.

For the first time in NSW history, this package identifies, maps and protects the State's most valuable agricultural land and its critical water resources from the potential impacts of mining and CSG.

Importantly, these protective measures cover the entire process from land access and exploration through to planning application and finally extraction – as shown in the flowchart below.





## Comprehensive consultation process

In the development of the Policy, the NSW Government undertook a robust consultation process, involving a wide range of industry stakeholders, local councils and communities.

A Stakeholder Reference Group consisting of 10 industry and stakeholder bodies was established from the outset to discuss the detailed policy proposals and advise the Government on their implementation.

Draft policy documents were then exhibited for public comment from 8 March to 14 May 2012. Almost 1,600 submissions were received on the two draft Strategic Regional Land Use Plans alone, with a further 500 received on the draft Aquifer Interference Policy and more than 100 on the draft Code of Practice for CSG Exploration.

Around 1,000 people attended 11 public forums and information sessions held across the two regions where Ministers and senior staff from government agencies outlined the policy and answered questions from the community.

A number of online discussion forums were also hosted where interested members of the public could provide feedback.

Key issues raised in consultation were:

- regulation of mining activities and CSG exploration
- the “Gateway” process
- agricultural land mapping
- the proposed “exceptional circumstances” provision
- aquifer impacts
- the natural environment



# Initiatives To Better Manage Exploration

If not regulated appropriately, exploration activities undertaken by the mining and CSG industries may have the potential to impact important agricultural land and water resources.

While consideration of these impacts has traditionally been left until an application is made to extract the resource, the NSW Government has shifted the emphasis to protection upfront by introducing a number of strong new requirements at the initial exploration stage and bolstering existing measures.

## New initiatives

The position of Land and Water Commissioner has been created. The Commissioner will have an unfettered oversight and community advisory role with respect to exploration across the State. The Commissioner has the ability to review any exploration approval and advise government and the community whether the assessment process has occurred in accordance with the regulatory and legislative framework.

The Commissioner will oversee the implementation of a standard land access agreement for exploration activity. This agreement is currently being negotiated between key stakeholders including the NSW Farmers' Association and the Australian Petroleum Production and Exploration Association.

The Commissioner will also collate and publish remuneration information on land access agreements to assist parties in negotiating future agreements, and will be able to appoint a mediator if requested.

The introduction of this new position will provide added transparency to the negotiations between landholders and miners on important matters such as land access and remuneration, and allow these negotiations to happen fairly and in good faith.

For the first time in the State's history, a project's potential agricultural impacts must be specifically addressed by the applicant at exploration stage through the preparation of an Agricultural Impact Statement.

This new requirement will allow the Government to carefully assess potential agricultural impacts at the earliest stages of a mining or CSG production proposal and ensure that even preliminary exploration activities do not adversely impact our valuable agricultural and water resources.

To strengthen community and stakeholder confidence in the new processes, 40 new compliance and community liaison personnel will be employed, with most located in regional NSW.

## Existing and strengthened initiatives

Other initiatives in relation to exploration activities include:

- The introduction of a public comment process on licence applications
- The inclusion of community consultation conditions on exploration licences and the release of community consultation guidelines
- The release of updated, improved environmental assessment guidelines for exploration activities
- The publication of approvals for exploration activity on the Division of Resources and Energy (DRE) website
- The introduction of an industry levy to fund enhanced regulatory and communication capabilities within DRE
- The introduction of an Aquifer Interference Policy which requires any exploration activities taking more than three megalitres per year to hold a water access licence
- A review of security bonds and penalties, which is currently underway

A number of other important initiatives relating specifically to the exploration and extraction of CSG have also been introduced by the NSW Government, including:

- A ban on the use of BTEX chemicals in drilling and hydraulic fracturing
- A ban on the use of evaporation ponds for the disposal of extracted water associated with petroleum production
- Two Codes of Practice for the CSG industry covering well integrity and fracture stimulation, following an independent review led by the Chief Scientist & Engineer
- Multi-agency assessment of applications for exploration activities
- Removal of the five year royalty holiday for CSG producers
- Draft Code of Practice for CSG explorers



# Strategic Agricultural Land Mapping

Strategic Agricultural Land is highly productive land that has unique natural resource characteristics (such as soil quality and reliable water access) or socio-economic value (such as high productivity, infrastructure availability and access to markets). There are two categories of Strategic Agricultural Land:

- Biophysical Strategic Agricultural Land – based on the inherent qualities of the land; and
- Critical industry clusters – based on the land's importance to a highly significant and clustered industry such as wine making and horse breeding.

Over 2 million hectares of Strategic Agricultural Land has been mapped across the Upper Hunter and New England North West regions. The mapped land will be a trigger for the Gateway process - an independent, scientific and upfront assessment of the impacts of State significant mining and CSG proposals on Strategic Agricultural Land.

A number of important changes have been made to the initial two Strategic Agricultural Land maps in response to issues raised during consultation.

## Biophysical Strategic Agricultural Land

The amount of biophysical Strategic Agricultural Land in currently mapped areas has significantly increased, as shown in the table below and the two maps over the page.

Region	Draft Maps		Final Maps	
New England North West	955 910 ha	9.6 % of region	1 525 462 ha	15.3 % of region
Upper Hunter	199 436 ha	8.2 % of region	211 060 ha	8.8 % of region

## New England North West

In response to concerns raised during consultation about the extent of land mapped as biophysical Strategic Agricultural Land, an extensive review was undertaken to determine whether the biophysical Strategic Agricultural Land criteria appropriately reflected all areas with an inherent high agricultural value.

As a result of this review, the criteria for biophysical Strategic Agricultural Land have been revised by adding land with moderate soil fertility which also meets the standards for Land and Soil Capability Classes I and II. This now captures areas with a high agricultural value but slightly lower soil fertility, such as important cotton producing areas around Gunnedah, Moree and Narrabri. As a result, the amount of biophysical Strategic Agricultural Land in the region has increased by 463,000 hectares.

The biophysical Strategic Agricultural Land maps are partially derived from land and soil capability data sets compiled by the Office of Environment and Heritage. At the time of the release of the draft Strategic Regional Land Use Plans for public exhibition, the Office of Environment and Heritage had completed a review of these data sets for the Upper Hunter but not the New England North West.

The Office of Environment and Heritage has since completed its review of New England North West data sets which have been used to remap biophysical Strategic Agricultural Land in the New England North West region, resulting in an additional 106,000 hectares of biophysical Strategic Agricultural Land.

In total, the area of biophysical Strategic Agricultural Land in the New England North West region has increased by 569,000 hectares to more than 1.5 million hectares or over 15 per cent of the region.

## Upper Hunter

The underlying rainfall data sets for the biophysical Strategic Agricultural Land have been updated using Bureau of Meteorology data. This has resulted in an additional 11,000 hectares of biophysical Strategic Agricultural Land in the Upper Hunter region, including an area to the west of Merriwa that was not shown as Strategic Agricultural Land in the draft maps.

In total, the area of biophysical Strategic Agricultural Land in the Upper Hunter region has increased by 11,600 hectares to more than 211,000 hectares or almost 9 per cent of the region.

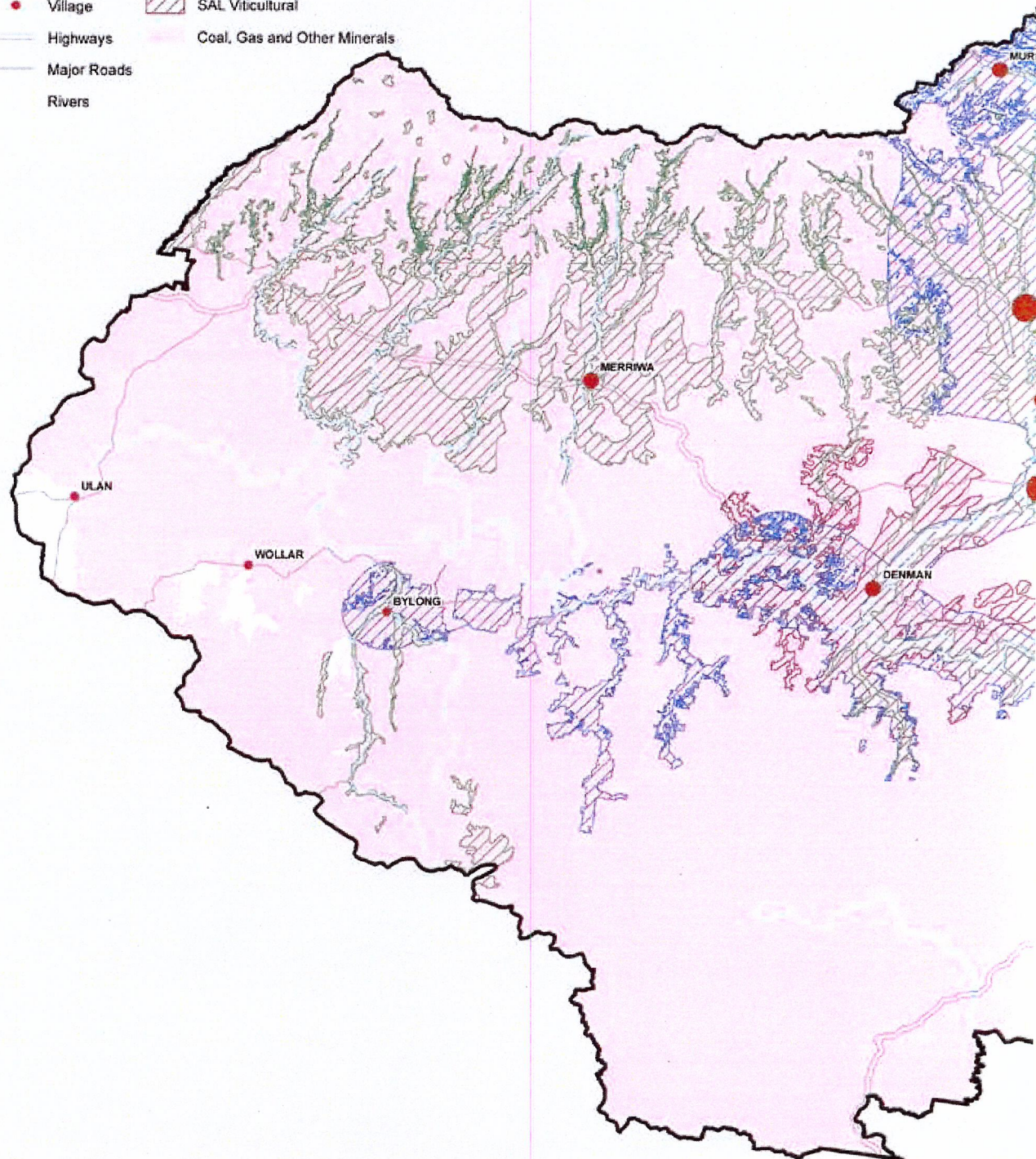




# Strategic Agricultural Land (SAL)

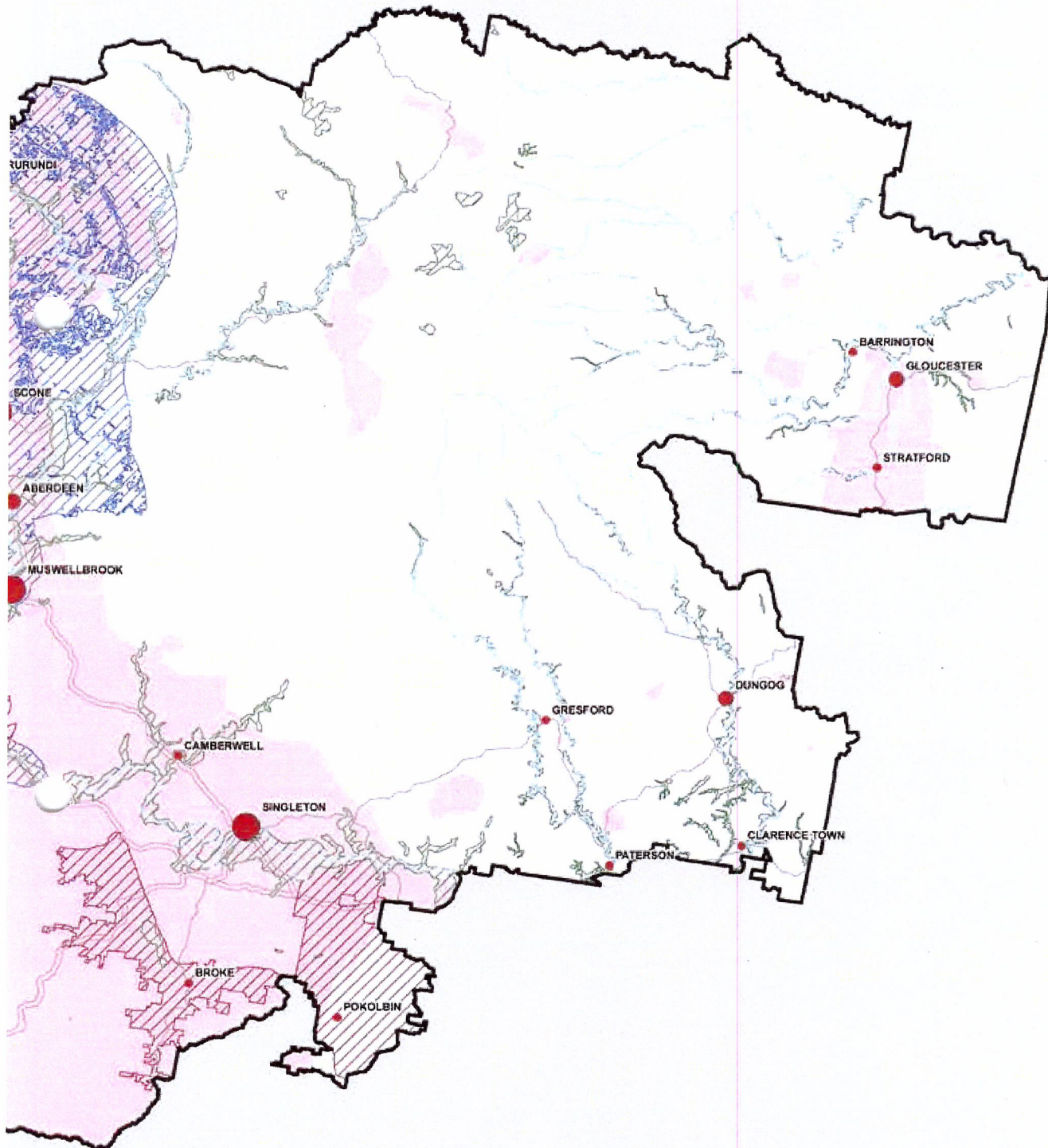
## Legend

- |               |                                |
|---------------|--------------------------------|
| ● Major Town  | Biophysical SAL                |
| ● Town        | SAL Equine                     |
| ● Village     | SAL Viticultural               |
| — Highways    | — Coal, Gas and Other Minerals |
| — Major Roads |                                |
| — Rivers      |                                |





## - Upper Hunter












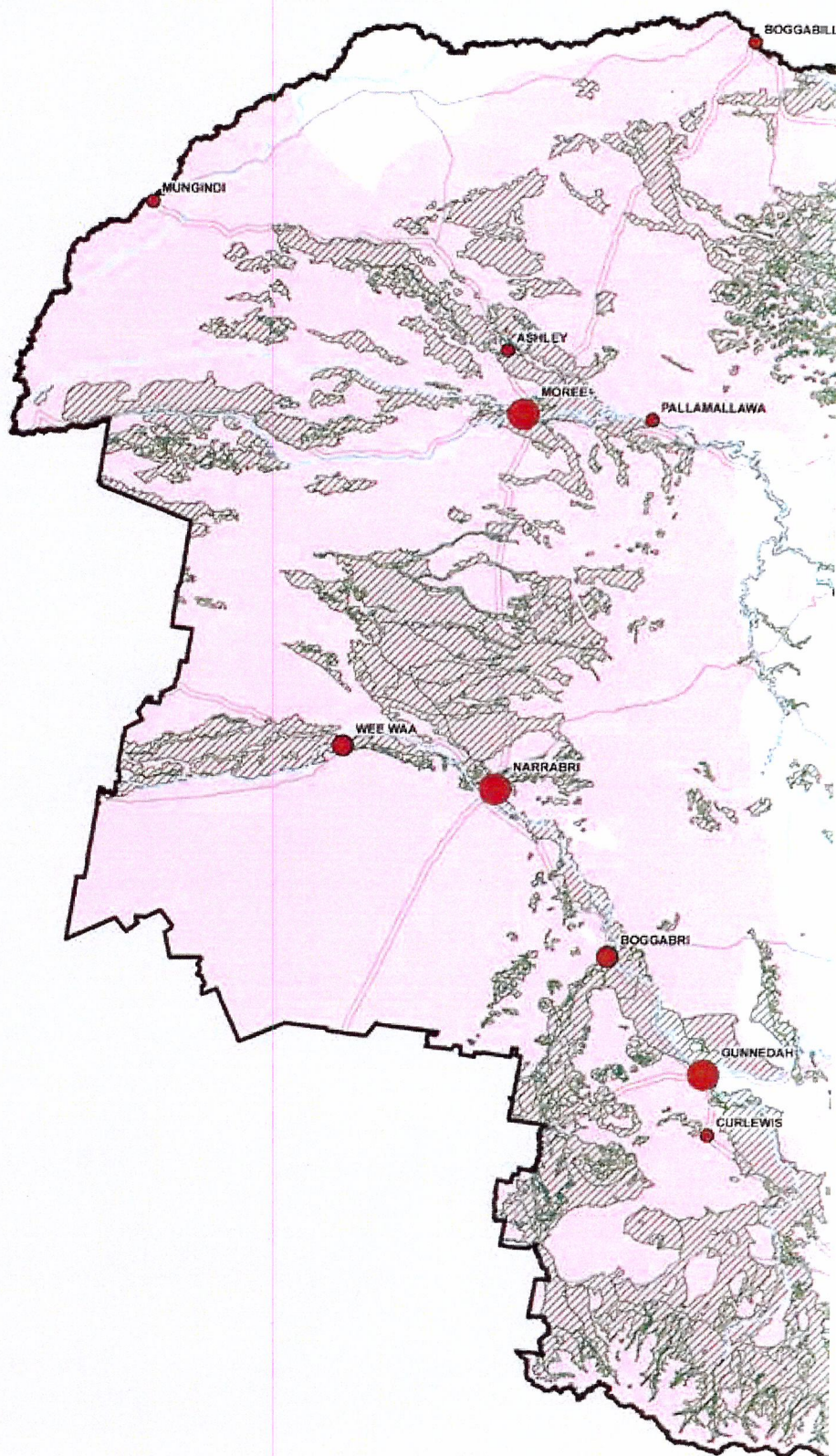




# Strategic Agricultural Land (SAL) -

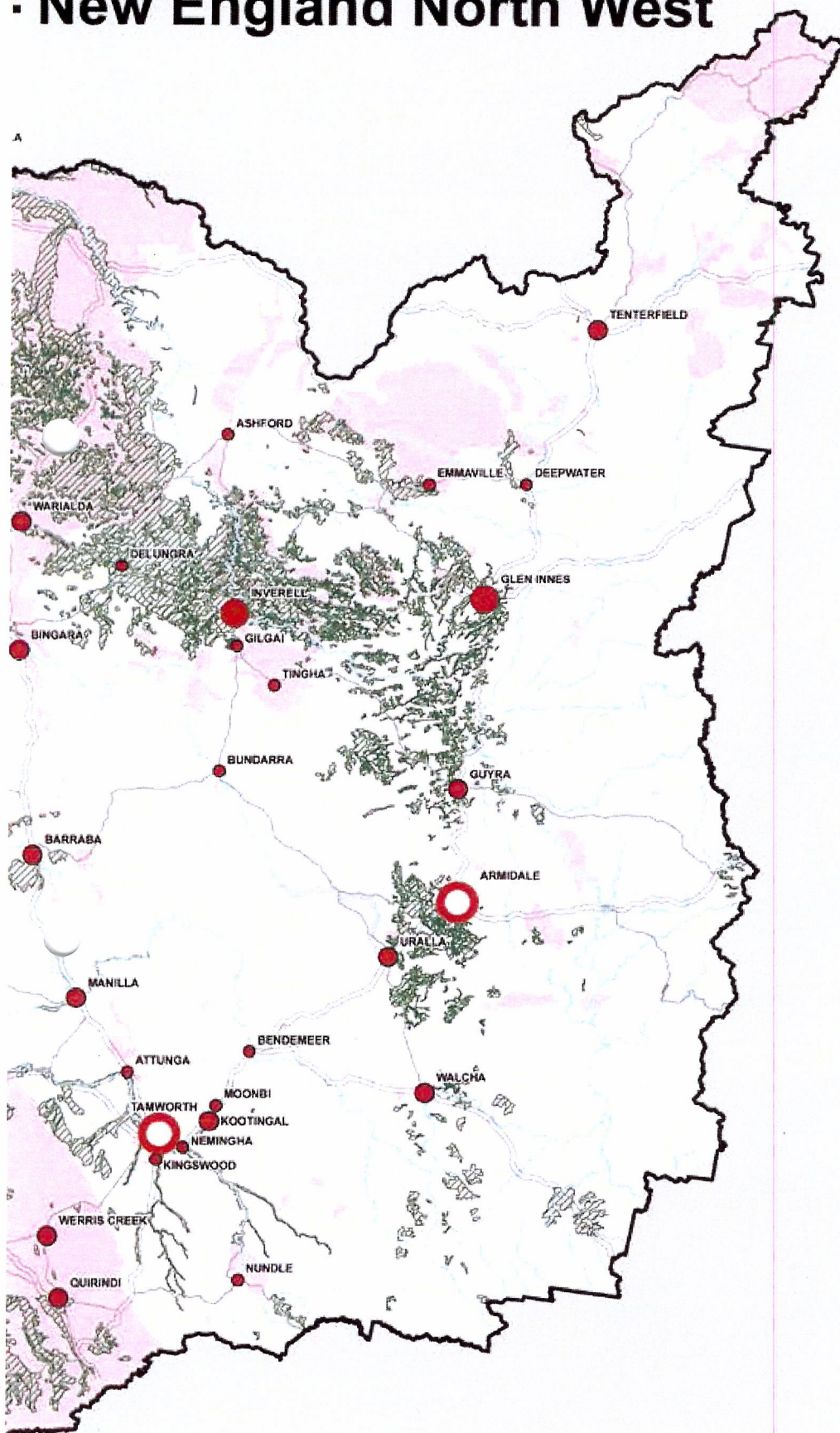
## Legend

-  Major Regional Centre
-  Major Town
-  Town
-  Village
-  Highways
-  Major Roads
-  Rivers
-  Biophysical SAL
-  Coal, Gas and Other Minerals





# - New England North West



## Critical Industry Clusters

The areas of the equine and viticulture Critical Industry Clusters in the Upper Hunter have been amended to include additional areas associated with these industries. These changes can be seen in the table below:

Critical Industry Cluster	Draft Maps		Final Maps	
Viticulture	53 292 ha	2.2 % of region	107 135 ha	4.4 % of region
Equine	183 452 ha	7.6 % of region	233 286 ha	9.7 % of region

In response to submissions from the wine industry and local government, the viticulture Critical Industry Cluster now includes important grape growing areas around Denman. This has more than doubled the size of the viticulture Critical Industry Cluster to over 107,000 ha or 4.4 per cent of the region.

Based on submissions from the thoroughbred industry, the criteria for the equine Critical Industry Cluster were also amended to include land up to 18 degrees in slope. This has increased the size of the Critical Industry Cluster to over 233,000 hectares, or 9.7 per cent of the region.

In total, the amount of land identified as a Critical Industry Cluster has increased by more than 103,000 hectares to more than 340,000 hectares.

## Strategic Agricultural Land verification processes

Due to the regional scale of the mapping and the objective nature by which Strategic Agricultural Land is identified, it is important that appropriate processes are in place to provide for site-specific verification that particular sites do meet the Strategic Agricultural Land criteria.

The verification process for biophysical Strategic Agricultural Land now requires that State significant mining or CSG proposals within the Strategic Regional Land Use Plan regions that are not located on mapped Strategic Agricultural Land must verify whether the land they are on meets the criteria for biophysical Strategic Agricultural Land. If it does, then the proposal will be required to go through the Gateway process. Landowners, including those in areas outside the Upper Hunter and New England North West regions, will also be able to apply for verification of whether their land meets the criteria for biophysical Strategic Agricultural Land. If the land is identified as biophysical Strategic Agricultural Land, the Gateway process will apply to subsequent State significant mining CSG proposals on that land.

Over the coming months, the Government will also be undertaking a regional-scale verification process for the mapped Critical Industry Clusters in the Upper Hunter. This exercise will involve field work and extensive consultation with landowners and industry groups to develop a database of existing equine and viticulture land uses and revised Critical Industry Cluster maps. This is to ensure that the areas mapped as Critical Industry Clusters meet the relevant classification criteria.

Once the database and revised maps are finalised, they will be included in the Upper Hunter Strategic Regional Land Use Plan and the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2009 (known as the Mining SEPP).

In the interim, the current Critical Industry Cluster maps will be included in the Upper Hunter Strategic Regional Land Use Plan and the Mining SEPP as a trigger for the Gateway process.

## Buffer zones

The draft Strategic Regional Land Use Plans proposed that State significant mining and CSG projects on land within two kilometres of mapped Strategic Agricultural Land would also be required to pass through the Gateway process.

Many submissions raised a number of issues regarding the proposed buffer zones, including that their purpose was unclear and that they added to the complexity and scope of the Strategic Agricultural Land mapping and Gateway process.

Following a review of these issues, buffer zones around mapped Strategic Agricultural Land areas have been replaced by the following:

- The requirement for State significant mining and CSG projects that are not located on biophysical Strategic Agricultural Land to verify whether or not the land they are on meets the criteria for biophysical Strategic Agricultural Land.
- The requirement for all State significant mining and CSG projects with a potential impact on agricultural land or resources (not just those located on mapped Strategic Agricultural Land) to lodge an Agricultural Impact Statement with their development application. This requirement will ensure that proposals located in proximity to any mapped Strategic Agricultural Land are subject to a heightened assessment of potential impacts on Strategic Agricultural Land.
- Statewide application of the Aquifer Interference Policy – which means that all proposals, including those located in proximity to mapped Strategic Agricultural Land, will still be fully and comprehensively assessed against the provisions of that policy.

# The Gateway

The Gateway is an independent, scientific and upfront assessment of the impacts of State significant mining and CSG proposals on Strategic Agricultural Land that will be undertaken before a proposal can proceed to the lodgement of a development application (DA). The Gateway assessment will be undertaken by a panel of independent experts who must issue a Gateway Certificate in order for a proposal to proceed to the DA stage.

Following public exhibition, significant refinements have been made to improve the operation of the Gateway process and to focus it on those mining and CSG proposals with the highest level of potential impact on strategic agricultural land and its associated water resources.

## Issues considered by the Gateway

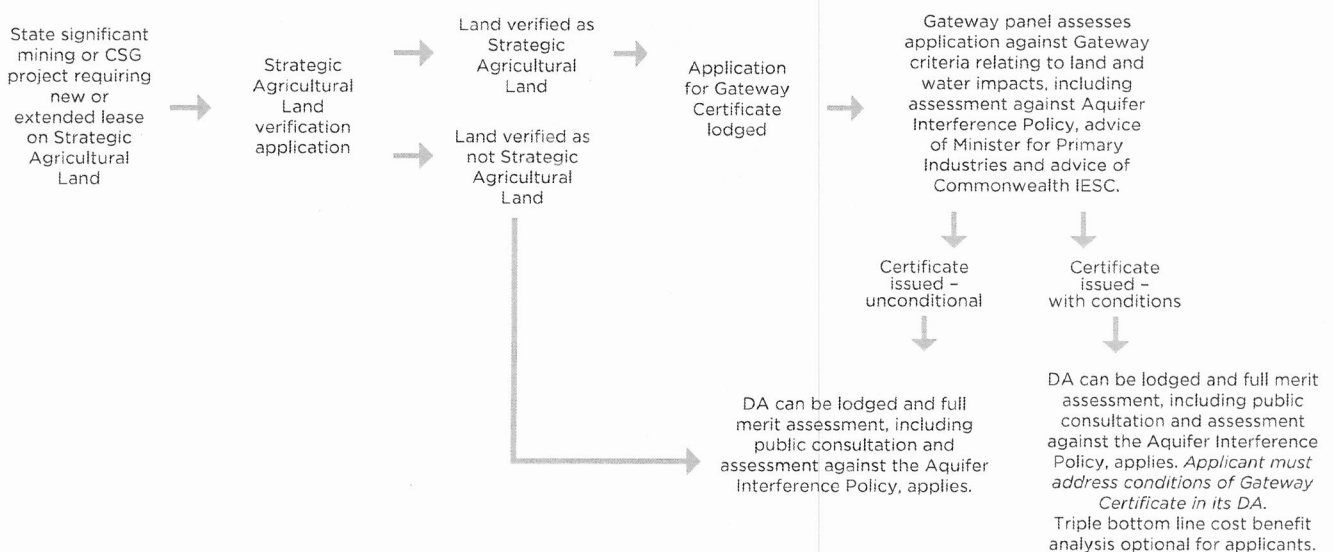
The Gateway process has been revised to focus only on the scientific assessment of land and water impacts of projects located on Strategic Agricultural Land. This will include an assessment of potential aquifer impacts based on the advice of the Minister for Primary Industries and the Commonwealth Independent Expert Scientific Committee.

Other matters, such as the socio-economic impacts and benefits of the proposal, will not be considered at the Gateway stage but will be considered at subsequent stages during the assessment and determination of the DA.

Upon completion of its assessment, the Gateway Panel will have the option of either:

1. Issuing an unconditional Gateway Certificate if the panel determines that the proposal meets the criteria relating to agricultural and water impacts. The proposal can then proceed to the DA stage for a full merit assessment and public consultation process; or
2. Issuing a conditional Gateway Certificate if the panel determines that the proposal does not meet the criteria relating to agricultural and/or water impacts. The conditions of the Gateway Certificate would be tailored to address the panel's issues in relation to the potential impacts of the proposal on agricultural land and water. Conditions could include, for example, the requirement for additional environmental studies or physical amendments to the project to avoid or minimise impacts. Proposals issued with a conditional Gateway Certificate will be able to proceed to the DA stage for a full merit assessment but, importantly, will be required to fully address the matters stipulated in the conditions of the Gateway Certificate. For example, a proposal may need to be substantially revised to avoid or minimise impacts on Strategic Agricultural Land. Any conditions of a Gateway Certificate, as well as a cost benefit analysis if prepared by an applicant, will be specifically considered by the Planning Assessment Commission in its determination of the DA.

See the flowchart below for how the Gateway will work.





**Importantly, the ‘exceptional circumstances’ provision that would have allowed certain mining or CSG production projects to bypass the Gateway process has been removed.**

### Projects to which the Gateway applies

As well as revisions to the way it operates, changes have also been made to the types of projects to which the Gateway applies. The Gateway process applies to State significant mining and CSG proposals on Strategic Agricultural Land that extend beyond an existing mining or petroleum production lease area or where a new lease is required.

New greenfield projects and brownfield projects involving expansion beyond their lease area are the projects likely to have the most significant impact on Strategic Agricultural Land.

The diagram below entitled “Application of the Gateway” demonstrates how this will work.

### Transitional arrangements

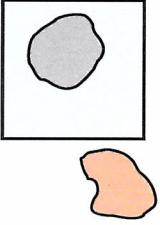
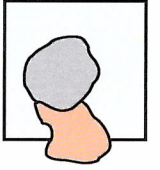
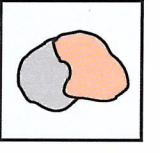



Due to their advanced stage in the development assessment process, projects for which Director-General’s Requirements have been issued will not be required to obtain a Gateway Certificate. However, such projects will still be subject to a comprehensive assessment of potential agricultural impacts at the DA stage through:

- Referral to the independent Gateway Panel for advice
- The requirement for an Agricultural Impact Statement
- Assessment against the Aquifer Interference Policy
- Referral to the Commonwealth Independent Expert Scientific Committee for advice, where the project will impact on highly productive groundwater as defined in the Aquifer Interference Policy

Applicants will have the option of submitting a triple bottom line cost benefit analysis with their DA. This would be used for a detailed consideration of the economic, social and other benefits of the proposal against its possible impacts through the merit assessment process and, ultimately, in the determination of the independent Planning Assessment Commission. If a cost benefit analysis is prepared by the proponent, it will be independently peer reviewed.

Full details of the Gateway process and criteria will be included in an amendment to the Mining State Environmental Planning Policy (SEPP) that will be exhibited for public comment.

Expressions of interest will be sought for Gateway Panel members.

Application of the Gateway		
<p><b>Gateway will apply to:</b></p> <p><b>Greenfield mines</b></p> <p>New stand alone mines or GSG projects or project extensions beyond existing lease area</p> <p>(advisory only at DA stage if DGRs already issued)</p>		
<p><b>Gateway will apply to:</b></p> <p><b>Brownfield mine expansion beyond lease area</b></p> <p>Expansions of an existing mine or CSG project partially within and partially outside of the existing lease area</p> <p>(advisory only at DA stage if DGRs already issued)</p>		
<p><b>Gateway will NOT apply to:</b></p> <p><b>Brownfield mine expansion within lease area</b></p> <p>Expansions of an existing mine or CSG project within existing lease area (with such proposals still subject to the usual environmental assessment process under the Planning Act, including the requirement for an Agricultural Impact Statement and comprehensive assessment against the provisions of the Aquifer Interference Policy).</p>		
<p><b>Key:</b></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  Existing Project         </div> <div style="text-align: center;">  Project Extension or New Project         </div> <div style="text-align: center;">  Existing Lease Area         </div> </div>		



# Aquifer Interference Policy

Agricultural land requires a reliable source of water to support viable cropping and livestock activities. As a result, the protection of agricultural land must incorporate measures to not just manage impacts on the land itself but its water sources, both above ground and below.

The Aquifer Interference Policy is the NSW Government's approach to protecting these crucial water resources, particularly from potential impacts associated with mining and CSG activities.

The Aquifer Interference Policy will be applied statewide to clarify water licence and assessment requirements for aquifer interference activities.

The Aquifer Interference Policy has two main purposes. Firstly, it outlines how the volumes of water taken as part of an aquifer interference activity will be licenced and accounted for.

Secondly, the Aquifer Interference Policy sets out the assessment considerations to ensure that impacts on groundwater systems are minimised. For the first time, the policy sets out minimal impact considerations against which the NSW Office of Water will assess the potential impacts of proposals.

## The minimal impact considerations

The minimal impact considerations include thresholds for impacting water table and water pressure levels as well as water quality changes in different types of groundwater systems, including alluvial aquifers that are highly connected to surface water. The productivity of groundwater systems has also been taken into account as part of the considerations.

The considerations include numeric thresholds for water table, water pressure and water quality impacts, which vary according to the type of groundwater asset and its associated water source.

There are two levels of minimal impact considerations. If the predicted impacts are less than the Level 1 minimal impact considerations, these impacts will be considered as acceptable.

Where an activity's predicted impacts are greater than the Level 1 minimal impact considerations, the proposal will be subject to additional requirements that must be assessed through the DA process. These requirements will depend on the level of predicted impacts and range from additional monitoring, mitigation and remediation to additional studies to further assess the predicted impacts.

## Role of the Aquifer Interference Policy for State significant mining and CSG projects

The Minister for Primary Industries will provide advice on aquifer impacts during the assessment of a State significant mining or coal seam gas proposal. This advice will be provided at the Gateway and DA stages, and made public before any Gateway Certificate is issued or DA determined.

The Minister's advice will be based on an assessment by the NSW Office of Water of the project against the minimal impact considerations in the Aquifer Interference Policy. This assessment will determine the potential impacts of the project and whether further avoidance, prevention, mitigation measures or additional studies should be required.

This approach will ensure that potential aquifer impacts are fully considered up front in the planning assessment process and given significant weight in deciding whether a mining or CSG proposal should be allowed to proceed.



# Implementation And Next Steps

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The Gateway process will be implemented by an amendment to the Mining SEPP. This amendment will outline matters such as the projects to which the Gateway will apply, the role and functions of the Gateway Panel, and the matters to be considered through the Gateway process.

A draft amendment to the Mining SEPP to give statutory effect to the Gateway process will be exhibited for public comment.

A draft guideline on the triple bottom line cost benefit analysis methodology will also be publicly exhibited.

## More Information

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Further information about the Strategic Regional Land Use Policy, including the Strategic Regional Land Use Plans, the Aquifer Interference Policy, the Codes of Practice, fact sheets and frequently asked questions, can be found on this website:

[www.nsw.gov.au/strategicregionallanduse](http://www.nsw.gov.au/strategicregionallanduse)



September 2012

## Fact Sheet

### The Gateway process

The Gateway is an independent, scientific and upfront assessment of how a mining or coal seam gas (CSG) production proposal will impact the agricultural values of the land on which it is proposed.

#### THE GATEWAY APPLIES ON THE MOST IMPORTANT AGRICULTURAL LAND

- The Strategic Regional Land Use Plans for the State's Upper Hunter and New England North West regions identify and map over two million hectares of land as "Strategic Agricultural Land".
- These areas of highly valuable agricultural land are identified due to either:
  - their inherent qualities such as soil type, land capability or water access (known as biophysical Strategic Agricultural Land), or
  - because they form part of a critical industry cluster such as wine making or horse breeding in the Upper Hunter.
- Biophysical Strategic Agricultural land may also be identified through the site-specific verification processes that will apply both within and outside of the Upper Hunter and New England North West regions.
- Strategic agricultural land is then given additional protection from State significant mining and CSG proposals through the "Gateway" process.

#### ASSESSMENT BEFORE A DEVELOPMENT APPLICATION CAN BE LODGED

- The Gateway will consider proposals at a very early stage before they can lodge a development application (DA).
- The Gateway provides a stringent and focused scientific assessment of the impacts of mining and CSG production proposals on Strategic Agricultural Land and its associated water resources. This will include a comprehensive assessment of potential aquifer impacts from the Minister for Primary Industries and the Commonwealth Independent Expert Scientific Committee.
- To pass the Gateway unconditionally, a proposal must demonstrate that it meets the Gateway criteria relating to agricultural and water impacts.
- If a proposal can't demonstrate that it meets these criteria, it will be subject to stringent requirements, included as conditions of a Gateway Certificate, that must be addressed at the development application stage.



- Such conditions could include, for example, the requirement for additional environmental studies or physical amendments to the project to avoid or minimise impacts.
- Any conditions of a Gateway Certificate will be specifically considered by the Planning Assessment Commission (PAC) in its determination of the development application. Terms of Reference will be provided to the PAC for each project to ensure that this is done.
- Cost benefit analysis will not form part of the Gateway consideration. The assessment at this stage will relate only to impacts on agricultural land and water. A triple bottom line cost benefit analysis may be provided by the applicant at the development application stage.

## INDEPENDENT GATEWAY PANEL

- The Gateway assessment will be undertaken by an independent panel of experts in fields such as agricultural science, water, and mining against explicit, objective criteria. No panel members have been appointed to date.
- Expert advice on aquifer impacts will be obtained from the Minister for Primary Industries and the Commonwealth Independent Expert Scientific Committee to assist in the assessment, which must be taken into account by the Gateway Panel.

## ASSESSMENT AT THE DEVELOPMENT APPLICATION STAGE

- State significant mining and CSG production proposals on Strategic Agricultural Land must pass through the Gateway process and obtain a Gateway Certificate before they can proceed to the development application stage.
- Projects will be subject to a full merit assessment process, including public exhibition, at the development application stage. Expert advice on aquifer impacts will also be obtained from the NSW Office of Water at this stage.
- Projects for which conditional Gateway Certificates have been issued will be required to clearly demonstrate that they have addressed the matters stipulated in the conditions.
- The applicant may choose to provide a triple bottom line cost benefit analysis at the DA stage to compare and contrast potential economic, social and other benefits of a proposal against its possible impacts. Any cost benefit analysis submitted at this point will be independently peer reviewed.
- Determinations of development applications will be made by the independent Planning Assessment Commission.

# Strategic Regional Land Use Policy

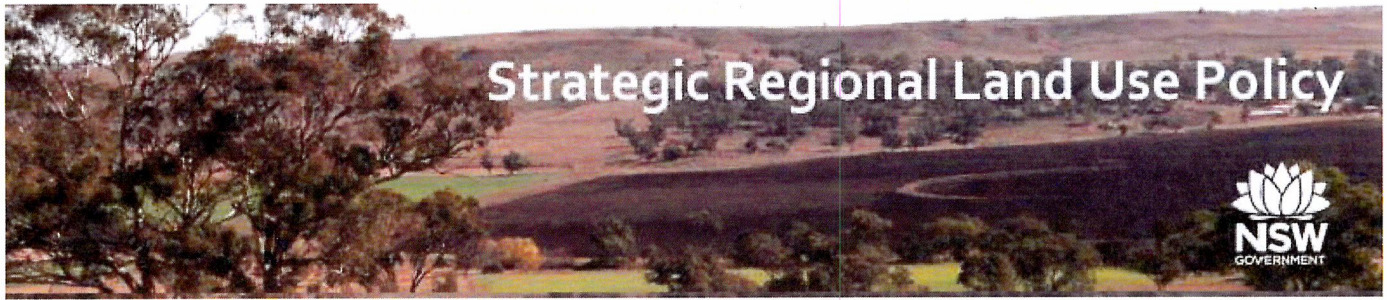


## **GATEWAY PROCESS TO BE GIVEN EFFECT IN PLANNING LAW**

- Full details of the Gateway process and criteria will be included in a forthcoming amendment to the State Environmental Planning Policy that deals with mining (known as the Mining SEPP).
- This SEPP amendment will be exhibited for public comment shortly.



# LAND AND WATER COMISSION



May 2015

## Fact Sheet

### Land and Water Commissioner

The NSW Government has appointed a Land and Water Commissioner to provide independent advice to landholders, resource companies, the community and government on mining and coal seam gas activities in the state.

The Commissioner listens to community issues, facilitating greater consultation between government, community and industry.

The Commissioner is a key source of information and guidance to assist landholders and communities to better understand the way that mining and gas activities are approved and regulated in NSW, and to give them a say in how things are done.

The Commissioner is responsible for overseeing the finalisation of standardised land access agreements which are being developed in conjunction with key agricultural sector and mineral / petroleum industry representatives.

#### **ROLE AND RESPONSIBILITIES**

The Commissioner provides advice on:

- Exploration activities and mineral, petroleum and coal seam gas exploration development throughout the state
- Strategic Regional Land Use Policy
- Regulatory approval and assessment processes
- Compliance and enforcement matters
- Landowner rights, access agreements and compensation
- Rights and responsibilities of exploration companies

The Commissioner supports Government by:

- Responding to concerns raised in relation to current / future exploration and development activities across the state
- Generating independent advice on the impacts of current policy settings

#### **RESOURCES**

The Commissioner has access to the resources of all NSW Government agencies, including the NSW Chief Scientist and Engineer, as well as other relevant bodies to seek advice on matters raised with the Commissioner.

#### **ACCOUNTABILITY AND REPORTING MECHANISMS**

The Land and Water Commissioner reports directly to the Secretary, NSW Trade & Investment.

# LAND AND ACCESS AGREEMENTS





**Anthony Roberts**  
Minister for Industry, Resources and Energy

## **MEDIA RELEASE**

Thursday, 10 September 2015

### **TWO NEW SIGNATORIES TO THE AGREED PRINCIPLES OF LAND ACCESS**

Minister for Industry, Resources and Energy, Anthony Roberts, today welcomed the Country Women's Association of NSW (CWA of NSW) and Dairy Connect as signatories to the *Agreed Principles of Land Access*, a landmark agreement on land access for gas operations in NSW.

The *Agreed Principles of Land Access* was first signed in March 2014 by gas companies Santos and AGL, and landholder representatives NSW Farmers, Cotton Australia and the NSW Irrigators Council.

Mr Roberts said the principles specifically cover access to private agricultural landholder's property for gas exploration and production drilling operations.

"These principles are based on the values of respect, integrity and trust and ensure landholders can deal with these companies with confidence," Mr Roberts said.

"This commitment shows these professional and capable companies can responsibly develop natural gas resources in NSW whilst recognising the importance of respecting, communicating and working with communities."

All signatories have agreed to the following principles:

- Any Landholder must be allowed to freely express their views on the type of drilling operations that should or should not take place on their land without criticism, pressure, harassment or intimidation. Any Landholder is at liberty to say "yes" or "no" to the conduct of operations on their land;
- Gas companies confirm that they will respect the Landholder's wishes and not enter onto a Landholder's property to conduct drilling operations where that Landholder has clearly expressed the view that operations on their property would be unwelcome; and
- The parties will uphold the Landholder's decision to allow access for drilling operations and do not support attempts by third party groups to interfere with any agreed operations. The parties condemn bullying, harassment and intimidation in relation to agreed drilling operations.



President of CWA of NSW, Tanya Cameron, said: "While the CWA is not taking sides on the issue, we believe landholders should have a voice and the right to make the decisions that suit their families and businesses.

"We believe signing this agreement, along with the other industry organisations, helps to protect this right and takes a lead role in ensuring landholders remain a part of the decision making process. The Agreed Principles of Land Access agreement is a step in the right direction."

President of the Dairy Connect Farmers' Group, Graham Forbes, said: "Dairy Connect applauds the Country Women's Association of NSW and other fellow signatories for the unity and weight given to a farmer's right to choose what activities do or do not take place on their land.

"This agreement also protects the farmer from being a target of harassment from the gas companies as well as third party opponents. It's good to see the agricultural and mining industries working together and showing respect to the individual farmer."

\*Attached is a copy of the *Agreed Principles of Land Access*.

\*Photo 1 caption left to right: Mike Logan, CEO, Dairy Connect/ Minister Roberts/ Tanya Cameron, President, CWA of NSW.

\*Photo 2 caption left to right (standing): Minister Roberts/ Mark McKenzie, CEO, NSW Irrigators Council/ Peter Mitchley, General Manager Energy NSW, Santos/ Michael Johnsen, Member for Upper Hunter.  
(seated): Andy Vesey, Managing Director & CEO, AGL/ Tanya Cameron, President, CWA of NSW/ Mike Logan, CEO, Dairy Connect.





# Agreed Principles of Land Access

## Introduction

These principles have been agreed between landholders and gas companies based on values of respect, integrity and trust.

They have been facilitated between representatives of agricultural landholders and gas companies.

## Application

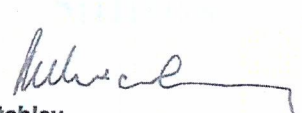
The principles agreed in this document relate to coal seam gas projects in New South Wales and specifically cover access to private agricultural landholder's property (**Landholders**) for coal seam gas drilling operations for exploration and production purposes (**Operations**).

## Principles

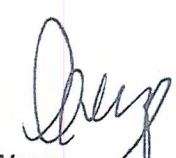
All parties to this document have agreed the following principles:

1. Any Landholder must be allowed to freely express their views on the type of Operations that should or should not take place on their land without criticism, pressure, harassment or intimidation. A Landholder is at liberty to say "yes" or "no" to the conduct of Operations on their land;
2. Gas companies confirm that they will respect the Landholder's wishes and not enter onto a Landholder's property to conduct Operations where that Landholder has clearly expressed the view that Operations on their property would be unwelcome; and
3. The Parties will uphold the Landholder's decision to allow access for Operations and do not support attempts by third party groups to interfere with any agreed Operations. The Parties condemn bullying, harassment and intimidation by third party groups and individuals in relation to the agreed operations.


On this day, Friday the 28<sup>th</sup> of March 2014, we the undersigned parties hereby agree to abide by the principles in this document.



**Peter Mitchley**  
General Manager - Energy New South Wales  
Santos Ltd.



**Andy Vesey**  
Managing Director & Chief Executive Officer  
AGL Energy Ltd.  
10 September 2015



**Tanya Cameron**  
President  
Country Women's Association (NSW)  
10 September 2015



**Mike Logan**  
Chief Executive Officer  
Dairy Connect  
10 September 2015



**Matt Brand**  
Chief Executive Officer  
NSW Farmers Association



**Leah Ross**  
obo Lyndon Mulligan  
Chairman  
Cotton Australia Ltd.



**Stefanie Schulte**  
obo Richard Stott  
Chairman  
NSW Irrigators Council



# **AQUIFER INTERFERENCE POLICY**



**Department of  
Primary Industries**  
Office of Water

## **NSW Aquifer Interference Policy**

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NSW Government policy for the licensing and assessment of  
aquifer interference activities

**Publisher**

NSW Department of Primary Industries, a division of NSW Department of Trade and Investment, Regional Infrastructure and Services.

**NSW Aquifer Interference Policy: NSW Government policy for the licensing and assessment of aquifer interference activities**

First published: September 2012

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**Disclaimer**

The information contained in this publication is based on knowledge and understanding at the time of writing (July 2012). However, because of advances in knowledge, users are reminded of the need to ensure that information on which they rely is up to date and to check the currency of the information with the appropriate officer of the Department of Primary Industries or the user's independent advisor.

Publication number: 11445



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# 1. Introduction

## 1.1 Purpose of this Policy

The purpose of this Aquifer Interference Policy ("this Policy") is to explain the role and requirements of the Minister administering the *Water Management Act 2000* ("the Minister") in the water licensing and assessment processes for aquifer interference activities under the *Water Management Act 2000* and other relevant legislative frameworks.

This Policy:

1. clarifies the requirements for obtaining water licences for aquifer interference activities under NSW water legislation; and
2. establishes and objectively defines considerations in assessing and providing advice on whether more than minimal impacts might occur to a key water-dependent asset.

Importantly, this Policy will assist proponents of aquifer interference activities in preparing the necessary information and studies to be used by the Minister in the assessment of project proposals that have some level of aquifer interference.

Furthermore, this Policy will form the basis of the assessment and subsequent advice provided by the Minister (or the NSW Office of Water) at the various stages of an assessment under the *Environmental Planning and Assessment Act 1979*.

## 1.2 What is an aquifer?

Under the *Water Management Act 2000* an aquifer is a geological structure or formation, or an artificial landfill, that is permeated with water or is capable of being permeated with water. More generally, the term 'aquifer' is commonly understood to mean a groundwater system that is sufficiently permeable to allow water to move within it, and which can yield productive volumes of groundwater. Groundwater is all water that occurs beneath the ground surface in the saturated zone. A groundwater system is any type of saturated geological formation that can yield anywhere from low to high volumes of water. For the purposes of this Policy the term aquifer has the same meaning as groundwater system and includes low yielding and saline systems.

## 1.3 What is aquifer interference?

The *Water Management Act 2000* defines an aquifer interference activity as that which involves any of the following:

- the penetration of an aquifer,
- the interference with water in an aquifer,
- the obstruction of the flow of water in an aquifer,

- the taking of water from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations, and
- the disposal of water taken from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations.

Examples of aquifer interference activities include mining, coal seam gas extraction, injection of water, and commercial, industrial, agricultural and residential activities that intercept the water table or interfere with aquifers. The *Water Management (General) Regulation 2011* states that an aquifer interference activity also includes the extraction of sand and the extraction of road base material.

Aquifer interference activities may take water from the water source in which they exist as well as connected groundwater and surface water sources. Even where there is no take of water, aquifer interference activities can still affect the functioning of aquifers which can impact water users and dependent ecosystems.

Appropriate disposal of water extracted as a result of activities such as coal seam gas extraction also needs to be considered in order to manage impacts on aquifers and river systems as well as to reflect the economic value of that water. Any disposal options will need to also consider any relevant water or land pollution issues as well as waste disposal, as required by the *Protection of the Environment Operations Act 1997*.

This Policy applies to all aquifer interference activities but has been developed in particular to address the following high risk activities:

- **mining activities** such as open cut voids, underground mine workings and the disposal of water taken from an aquifer including water taken as part of coal seam gas extraction;
- other **extractive industries**, such as sand and gravel extraction, as defined in the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*;
- **coal seam gas activities**, including those related to both exploration and production
- other large projects which require **dewatering** such as for the construction and maintenance of associated works, such as buildings, roads and other civil works;
- **injection works** used to transmit water into an aquifer; and
- activities with the potential to contaminate groundwater or result in unacceptable loss of storage or structural damage to an aquifer.

The use of chemicals in the process of hydraulic fracturing (also known as “fracking”), will be regulated under the *Petroleum (Onshore) Act 1991* and the *Environmental Planning and Assessment Act 1979*.



## 1.4 What this Policy covers

Aquifer interference activities may or may not **take** water from the water source in which they occur. They may take water from connected groundwater and surface water sources.

Water is taken when it is specifically required to be used as part of an activity, for example the washing or processing of ore. Water is also taken incidentally where the take is required to allow the effective and safe operation of the activity, for example dewatering to allow mining or coal seam gas extraction. In all cases, the activity is taking water from a water source. Many of these water sources are at or near full commitment and have extraction limits set by water sharing plans. If there is unaccounted take, less water is available for the environment and other users that have a legal right to access water in the aquifer or connected water sources.

To comply with extraction limits set by water sharing plans it is important that the volumetric take of water by aquifer interference activities is appropriately licensed and accounted for. Section 2 of this Policy covers water licensing requirements under the *Water Act 1912* or *Water Management Act 2000*.

Mining and coal seam gas development proposals on strategic agricultural land will need to be assessed by a gateway panel before they can proceed to development application lodgement. Part of this assessment requires consideration of the impacts of the proposal on aquifers against the Aquifer Interference Policy. Further information on the gateway process can be found at <http://www.planning.nsw.gov.au/>

Nothing in this Policy exempts an activity from any requirement to obtain an Environmental Protection Licence under the *Protection of the Environment Operations Act 1997* in relation to waste disposal and preventing and minimising pollution of water or land.

## 2. Licensing the water taken through aquifer interference

The water management framework for NSW and the National Water Initiative are underpinned by objectives and principles aimed at the sustainable management of water sources. Water sharing plans set extraction limits and rules for water access, available water determinations, account management and trading in order to protect water sources and their dependent ecosystems, whilst recognising the social and economic benefits of the sustainable and efficient use of water.

All water taken by aquifer interference activities, regardless of its quality, needs to be accounted for within these extraction limits. This is to protect environmental water and the lawful taking of water from groundwater and surface water sources by other users. The processes for obtaining licences under the *Water Management Act 2000*, the licence type and the entitlement volumes are all relevant for ensuring that the aquifer interference activity has adequate water in its water account to cover the take of water by that activity.

A water licence is required under the *Water Management Act 2000* (unless an exemption applies or water is being taken under a basic landholder right) where any act by a person carrying out an aquifer interference activity causes:

- the removal of water from a water source; or
- the movement of water from one part of an aquifer to another part of an aquifer; or
- the movement of water from one water source to another water source, such as:
  - from an aquifer to an adjacent aquifer; or
  - from an aquifer to a river/lake; or
  - from a river/lake to an aquifer.

A water licence is required whether water is taken for consumptive use or whether it is taken incidentally by the aquifer interference activity. For example, dewatering of groundwater during building construction and groundwater filling and evaporating from a void post-activity requires a water licence (unless an exemption applies) even where that water is not being used consumptively as part of the activity's operation.

The volume of water taken from a water source(s) as a result of an activity needs to be predicted prior to project approval and then measured and reported in annual returns or environmental management reports. This may require additional detailed monitoring and more frequent reporting, prepared by the licence holder and submitted to the Minister who would then assess the robustness and reliability of the predictions with respect to being fit-for-purpose. These volumetric reporting requirements are important as they allow the Minister to:

- verify predictions made in proposals, including assessments as to the likely take of groundwater from the aquifer in which the activity exists or any other connected aquifers or surface water sources and enable appropriate water licences to be held;

- ensure water taken is consistent with the amount of water available in the licensee's water allocation account, to protect environmental water and the security of other authorised water users; and
- assess whether the total extraction exceeds the limit established for a water source by a water sharing plan (ie in water sources now covered by the *Water Management Act 2000*).

A water licence gives its holder a share of the pool of water available for extraction. The water access licence must hold sufficient share component and water allocation to account for the take of water from the relevant water source at all times.

Where the water sharing plan provides for unassigned water in a water source, the Minister may declare that the right to apply for an aquifer access licence in that water source can be acquired by auction, tender or other means. This is done through a controlled allocation order made under section 65 of the *Water Management Act 2000*. There is no unassigned water in the aquifers that are highly connected to surface water sources in NSW.

The *Water Management Act 2000* includes the concept of ensuring "no more than minimal harm" for both the granting of water access licences and the granting of approvals (see Section 3). Water access licences are not to be granted unless the Minister is satisfied that adequate arrangements are in force to ensure that no more than minimal harm will be done to any water source as a consequence of water being taken under the licence.

Where a water access licence has been applied for by a method consistent with a controlled allocation process then adequate arrangements are in force to ensure that no more than minimal harm will occur. This is because the controlled allocation process allows for the allocation of a proportion of the unassigned water within the relevant water source using a conservative approach. Furthermore, unassigned water can only occur where total water requirements within a water source are less than the long-term average annual extraction limit specified in the relevant water sharing plan.

Where the water is to be taken from a water source that has no unassigned water or insufficient unassigned water to account for any inflows to the activity (either surface or groundwater) then water entitlements will need to be purchased from an existing licensed user.

In this situation, a licence application for a zero share licence may be required and the issue of this licence will not cause more than minimal harm to occur. This is because, it cannot be used to take water until either water allocations or entitlements are also purchased via an approved access licence dealing.

Any access licence dealing requiring the Minister's consent will need to consider the requirements of section 71Y of the *Water Management Act 2000*, including the water management principles. These principles require water sources to be protected and social and economic benefits to be maximised. Therefore, consideration of whether to approve an access licence dealing should find the optimum balance of these requirements. To the extent that these matters have already been identified and considered under the EP&A Act assessment, then that process and its outcomes should be taken into account.



Aquifer interference activities may induce flow from adjacent groundwater sources or flow from connected surface water sources to compensate for the water taken from the aquifer in which the activity is occurring or to fill the void created in the aquifer. Flows induced from other water sources also constitute take of water. In all cases, separate access licences are required to account for the take from all individual water sources.

For example, alluvial aquifers generally overlie deeper hard rock aquifers. In NSW, these vertically layered aquifers may be managed as separate water sources. Where an aquifer interference activity is taking water from a groundwater source, and this take is causing the movement of water into the groundwater source from an adjacent, overlying or underlying groundwater source, separate aquifer access licences are required for the groundwater source and for any adjacent, overlying or underlying groundwater sources.

An access licence with a share component which specifies a surface water source is required to account for the take of water where the activity is taking water from a connected surface water source. For example, where an aquifer interference activity is taking water from a groundwater source, and this take is causing the movement of water from a connected regulated or unregulated river water source into the groundwater source, then an access licence in the regulated or unregulated river water source is required to account for the take of water from that water source and another access licence in the groundwater source is required for the remainder of the take.

In addition, where an aquifer interference activity is incidentally taking water from a river it must be returned to that river when river flows are at levels below which water users are not permitted to pump.

Penalties are defined in the *Water Management Act 2000* for illegal take of water, examples of which include:

- unlicensed or unauthorised take of water (s. 60A);
- contravention of the terms and conditions of an access licence (s. 60B);
- taking water for which there is no or insufficient water allocation (s. 60C); and
- taking water otherwise than by means of a nominated water supply work (s. 60D).

In order to comply with section 60D of the *Water Management Act 2000*, State significant development projects which do not have an approval under the *Water Management Act 2000* will need to nominate on their water access licence the water supply work that is causing water to be taken. For example, where an open cut or underground coal mine is taking water indirectly from a connected river and thus is having the effect of diverting water flowing to or from a water source, then the mine workings will need to be the nominated water supply work.

In these instances, some conditions may be imposed on the water access licence which relate to the taking of water as a result of the works that have been approved in the development consent. This might include appropriate monitoring networks and measurement strategies to ensure the take of water from all affected water sources can be accurately quantified and reported.

Compliance action and penalties may apply under the *Water Management Act 2000* in the event that there is insufficient water allocation to account for the take of water during an activity's life. Such a situation can be rectified through adjustments to held entitlements, purchasing water allocations on the temporary water market or through remediation action to reduce the actual take of water

Examples of situations that may result in an increased take of water include:

- causing or enhancing hydraulic connection between aquifers or between a groundwater source and a surface water source that is not accounted for;
- interception of groundwater that can not be accounted for;

## 2.1 Proponents' responsibilities for holding licences

It is the proponent's responsibility to ensure that the necessary licences are held with sufficient share component and water allocation to account for all water taken from a groundwater or surface water source as a result of an aquifer interference activity, both for the life of the activity and after the activity has ceased.

In determining the type and the number of water licences required, either through the water trading market or by licence application, the following will need to be considered:

- which water source(s) will the activity take water from;
- a prediction of the total amount of water that will be taken from each connected groundwater or surface water source on an annual basis as a result of the activity and after closure of the activity, as described in section 3.2.3. In some instances where the take of water might have potentially significant impacts on water sources or their dependent ecosystems or other authorised water users, then the predictions should be based on complex groundwater modelling conducted in accordance with the Australian Groundwater Modelling Guidelines, as described in section 3.2.3;
- how and in what proportions this take will be assigned to the affected aquifers and connected surface water sources, even if take predictions are not based on groundwater modelling;
- how any relevant licence exemptions might relate to the water to be taken by the activity;
- the characteristics of the water requirements such as whether it is taken at a fixed rate or varying in time, i.e. is it ongoing, constant, unavoidable - which, in the case of regulated rivers, means that high security water may be required to account for the water requirements - or is it climatically/time varying or controllable in some way - which, in the case of regulated rivers, implies general security water is likely to be adequate to account for the water taken;
- whether there are sufficient water entitlements and water allocations that are able to be obtained to cover the characteristics of the water requirements. Consideration must also be given to the water sharing plan rules by which water is credited to water accounts on an annual basis and by which those accounts may be managed

(eg, carryover rules for unused water allocations) to provide the flexibility required to ensure there is sufficient water in accounts to cover the take of water;

- how this water will be obtained - by what mechanism and what licence category, consistent with any trading rules specified in either the Minister's access licence dealing principles and/or relevant water sharing plans. Consideration will also need to be given to the possibility and effect of low water allocations in regulated river systems. For example, if high security entitlements have been purchased to cover the ongoing take of water from a regulated river water source, then there may be years of low water allocations due to low water availability. This may result in insufficient water allocation being credited to the high security licence account. One way to cover this shortfall would be to enter the temporary water trading market and purchase water allocations credited to other licences. The costs and ability to undertake this sort of trade (ie, the market depth) during these low allocation times will need to be understood;
- the effect that activation of existing entitlement may have on future available water determinations for the proposed licence category and entitlement volume;
- actions required both during operation and post-closure to minimise the risk of inflows to a mine void as a result of flooding, since these are very difficult to account for volumetrically. Therefore, set-back distances from rivers should be no less than that required to ensure structural integrity of the river bank during flooding events. Levee banks or landforms should also be constructed at the appropriate time to prevent at least a 1 in 100 year flood from entering the site either during or after operation. In some instances, where the implications of such inflows are significant, levee bank levels may be required to be higher; and
- a strategy for accounting for any water taken beyond the life of the operation of the project, such as continuing to hold the appropriate amount of licence entitlement to cover the ongoing volumetric impact or surrendering a component of licence entitlement at the end of the project. Where a licence or part of a licence has been surrendered to the Minister, a security deposit or condition of consent under the EP&A Act may account for or require the upfront payment of fees and subsequently the licence may be retained for the period of ongoing take of water or cancelled.

Where uncertainty in the predicted inflows may have a significant impact on the environment or other authorised water users, the applicant will also need to specifically report on the following:

- any potential for causing or enhancing hydraulic connection between aquifers or between groundwater and surface water sources, and quantification of this risk in the volumetric inflow estimates;
- quantification of any other uncertainties in the groundwater or surface water impact modelling conducted for the activity; and
- strategies in place for monitoring actual and reassessing any predicted take of water and how any changes in these requirements will be accounted for, including analysis of water market depth and/or in-situ mitigation and remediation options.



## 2.2 Dealing with perpetual inflow volumes

Many large aquifer interference activities continue to take water from groundwater or connected surface waters well after the activity has ceased, eg open cut mining. The post-closure continued take of water until an aquifer system reaches equilibrium may extend from months to centuries after cessation, depending on the scale of the activity, recharge relationships and aquifer characteristics. Where there is ongoing take of water, the licence holder must retain a water licence for the period until the system returns to equilibrium or surrender it to the Minister. Accordingly, the trading of water that has been acquired to account for inflows during the life of the activity will be limited so that aquifer access licences and associated water accounts properly cater for the ongoing take of water after an aquifer interference activity has ceased. Given the likelihood of a less active mine management regime post-closure, surrendering of licence entitlements, that adequately cover any likely future low available water determination periods is preferable.

The Minister will approve outward dealings (sales) involving water licences which are currently used to account for the take of water by an aquifer interference activity only if satisfied that a hydrogeological study demonstrates that the volume of water to be traded out is no longer being nor will be taken. Such dealings might be initiated in the event that pre-operation predictions were found to over-estimate inflows and therefore there is excess water held, or post-closure where the ongoing inflows are less than those accounted for by the held licences during the life of the mine.

## 2.3 Licensing outside water sharing plan areas

In water sources where water sharing plans do not yet apply, an aquifer interference activity that is taking groundwater is required to hold a water licence under Part 5 of the *Water Act 1912*. Where an aquifer interference activity is also taking surface water a water licence is required under Part 2 of the *Water Act 1912*. For example, where an aquifer interference activity is taking groundwater, and this is causing water to move from a connected surface water source into the groundwater source, a Part 2 water licence is required to account for the amount of water taken from the surface water source and a Part 5 water licence is required for the water taken from the groundwater source.

Until water sharing plans apply across the whole State, it is possible for the *Water Act 1912* to apply in a groundwater source and the *Water Management Act 2000* to apply in a connected surface water source or vice versa. Where this occurs and the aquifer interference activity is effectively taking water from both water sources then licences will be required under each Act.

The requirements for proponents detailed in sections 2.1 and 2.2 of this Policy also apply to applicants for a *Water Act 1912* licence. An application for a licence made under the *Water Act 1912* will be assessed on the same considerations as an application for an access licence made under the *Water Management Act 2000*.

### 3. Assessment process for aquifer interference activities

Some aquifer interference activities can have significant impacts on water sources such as aquifers and rivers, their dependent ecosystems and other water users. These impacts can continue for decades or even centuries after the cessation of the activity. Therefore, a comprehensive assessment framework is required for large scale aquifer interference activities.

#### 3.1 *Environmental Planning and Assessment Act 1979*

Part 4, Division 4.1 and Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) provides a streamlined approval process for the assessment and determination of State significant development and State significant infrastructure respectively.

The Minister for Planning and Infrastructure has delegated his decision-making authority for all State significant development and State significant infrastructure applications lodged by private developers to the Planning Assessment Commission (or to senior officers of the Department of Planning and Infrastructure if there are fewer than 25 objections by members of the public and the local council has not objected). The Planning and Assessment Commission will also determine all applications where a reportable political donation has been made. The Minister will continue to determine applications lodged by Government agencies.

An additional process – a gateway process - will apply to State significant development applications for mining or coal seam gas extraction on strategic agricultural land as defined in a relevant Strategic Regional Land Use Plan. The gateway process will involve a panel which is intended to provide a tailored mechanism to assess the potential impacts of these proposals on strategic agricultural land and resources. The panel will deliver greater rigor to the scientific assessment process.

An independent panel of experts will be established to undertake the gateway assessment. Proposals assessed to satisfy specified criteria relating to its agricultural and aquifer impacts can be certified to proceed to the development application stage. Other proposals that the panel considers do not fully satisfy these criteria will be issued with conditional certificates, outlining matters that must be addressed at the development application stage in order to better address potential agricultural and/or aquifer impacts. Such matters could include, for example, the requirement for additional studies or physical amendments to the project.

Under the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* the Minister for Primary Industries will be required to provide advice to the gateway panel, which will be made public, on aquifer impacts either:

- (a) at the gateway stage (for example, relevant State significant mining and coal seam gas proposals on Strategic Agricultural Land); and
- (b) during the assessment of the relevant development application.

This advice will be based on the considerations specified in section 3.2 of this Policy.

Under the Environmental Planning and Assessment Regulation, the Director-General of the Department of Planning and Infrastructure must consult relevant public authorities when preparing the environmental assessment requirements for State significant development. The Department of Planning and Infrastructure will consult with the NSW Office of Water when preparing these requirements for any State significant development. NSW Office of Water's advice to the Department of Planning and Infrastructure will be based on the requirements of this Policy and will be made publicly available. Therefore the *Environmental Planning and Assessment Act 1979* works with the *Water Management Act 2000* to deliver the appropriate water management outcomes for State significant development, State significant infrastructure and other projects.

### 3.2 Framework for assessing the impacts of aquifer interference activities on water resources

The assessment of aquifer interference activities seeking approval under the EP&A Act will be made on a case by case basis for each particular project in accordance with this Policy.

The NSW Office of Water's assessment of impacts on water sources and water dependent ecosystems and subsequent advice and proposed conditions of approval as input to the planning process for a project is based on an "account for, mitigate, avoid/ prevent, and remediate" approach. In practice this means the assessment and subsequent advice will be based on the proponents':

1. (a) ability to demonstrate that they have the ability to obtain the necessary licences in order to **account for the take of water** from any relevant water source. The requirements for this are detailed in Section 2 of this Policy. Where there is concern that the necessary licence entitlements cannot easily be obtained, the proposal should **include mitigation or avoidance strategies** in order to reduce the take of water to a point where it can be accounted for; or  
(b) ability to demonstrate that the proposal has been designed in such a way as to **prevent the take of water** where applicants are unable to meet the requirements specified in point 1 above; and
2. ability to demonstrate that adequate arrangements will be in place to **ensure that the minimal impact considerations specified in Table 1 and section 3.2.2 can be met**; and
3. proposed **remedial actions for impacts greater than those that were predicted as part of the relevant approval**. The requirement for remedial actions may occur where modelled predictions were inaccurate or where planned mitigation, prevention or avoidance strategies have failed. The assessment will include:
  - (a) consideration of the potential types and risks of unforeseen impacts that may occur during the operational phase or post-closure of the aquifer interference activity; and
  - (b) whether the proposed mitigation, prevention or avoidance strategies will minimise these risks; and



- (c) whether the proposed remedial actions are adequate, should the proposed risk minimisation strategies in (b) fail; and
- (d) advice on what further mitigation, prevention, avoidance or remedial actions may be required; and
- (e) appropriate conditions that maintain any mitigation, prevention, avoidance or remediation actions until they are no longer required to keep the impacts at or below the predicted levels.

By accounting for the take of water, existing water shares between the environment and all other water users are maintained. By avoiding the take of water other water related impacts on water sources and their dependent ecosystems and on other water users may also be avoided. By avoiding the take of water, the proponent can also reduce the cost of purchasing entitlement in fully committed water sources and associated ongoing water charges and also minimise the costs of any mitigation or prevention strategies.

Before the Minister provides advice to either the gateway process, the Planning Assessment Commission or the Minister for Planning the NSW Office of Water will undertake an assessment of the project's ability to achieve points 1 to 3 above.

The NSW Office of Water's assessment will determine the potential level of impact relative to the considerations in Table 1 and will identify where further mitigation, prevention or avoidance measures would be necessary to meet the Level 1 minimal impact considerations or, under the Level 2 minimal impact considerations, what further studies are necessary to assess whether the project will not prevent the long-term viability of a relevant dependent ecosystem or significant site. The assessment includes determining the rigour of impact predictions and the suitability of proposed mitigation, prevention or avoidance strategies.

As part of the assessment process, there may be no suitable or practical mitigation or prevention options and therefore the proponent may be asked to avoid impacts by modifying the proposed activity.

### **3.2.1 Aquifer impact assessment**

The *Water Management Act 2000* includes the concept of ensuring "no more than minimal harm" for both the granting of water access licences (see Section 2) and the granting of approvals. Aquifer interference approvals are not to be granted unless the Minister is satisfied that adequate arrangements are in force to ensure that no more than minimal harm will be done to any water source, or its dependent ecosystems, as a consequence of its being interfered with in the course of the activities to which the approval relates.

While aquifer interference approvals are not required to be granted, the minimal harm test under the *Water Management Act 2000* is not activated for the assessment of impacts. Therefore, this Policy establishes and objectively defines minimal impact considerations as they relate to water-dependent assets and these considerations will be used as the basis for providing advice to either the gateway process, the Planning Assessment Commission or the Minister for Planning.

The minimal impact considerations have been developed for impacts on groundwater sources, connected water sources, and their dependent ecosystems, culturally significant sites and water users.

Before the Minister provides advice to either the gateway process, the Planning Assessment Commission or the Minister for Planning, the NSW Office of Water will assess the potential impacts of the aquifer interference activity against the minimal impact considerations specified in Table 1, as well as any specific rules in a relevant water sharing plan, based on the information provided in the proponent's Environmental Assessment.

There are two levels of minimal impact considerations specified in Table 1. If the predicted impacts are less than the Level 1 minimal impact considerations, then these impacts will be considered as acceptable.

Where an activity's predicted impacts are greater than the Level 1 minimal impact considerations specified in Table 1, but these predicted impacts exceed the Level 1 thresholds by no more than the accuracy of an otherwise robust model, then the project will be considered as having impacts that are within the range of acceptability, with extra monitoring and potential mitigation or remediation required during operation, should the project be approved. In such instances, the Minister's advice will include a request that appropriate conditions be imposed to ensure the impacts of the activity are acceptable. This may include for example, adaptive management conditions requiring the proponent to monitor the actual impacts of the proposal and take action to mitigate or remediate the impacts that exceed the Level 1 thresholds.

Where the predicted impacts are greater than the Level 1 minimal impact considerations by more than the accuracy of an otherwise robust model, then the assessment will involve additional studies to fully assess these predicted impacts. If this assessment shows that the predicted impacts do not prevent the long-term viability of the relevant water-dependent asset, as defined in Table 1, then the impacts will be considered to be acceptable.

### **Groundwater source categories**

Groundwater sources have been divided into "highly productive" and "less productive". Highly productive groundwater is defined in this Policy as a groundwater source that is declared in the Regulations and will be based on the following criteria:

- a) has total dissolved solids of less than 1,500 mg/L, and
- b) contains water supply works that can yield water at a rate greater than 5 L/sec.

Highly productive groundwater sources are further grouped into the following categories:

- 1. Alluvial;
- 2. Coastal sands;
- 3. Porous rock;
  - a) Great Artesian Basin - Eastern Recharge and Southern Recharge;
  - b) Great Artesian Basin – Surat, Warrego and Central;
  - c) other porous rock; and
- 4. Fractured rock.

The Great Artesian Basin groundwater sources were categorised separately because of the Basin's unique hydrogeology and management requirements.

The categories of less productive groundwater sources are:

1. Alluvial;
2. Porous rock;
3. Fractured rock.

### **Minimal impact considerations**

For each of the highly productive and less productive groundwater sources thresholds for key minimal impact considerations have been developed. These thresholds deal with water table and groundwater pressure drawdown as well as groundwater and surface water quality changes.

This Policy will adopt an adaptive management approach to the minimal impact considerations which means they will be regularly reviewed and updated, if required, based on scientific information and experience during implementation.



Table 1 – Minimal Impact Considerations<sup>(1)</sup> for Aquifer Interference Activities

Highly Productive Groundwater Sources			
	Water Table	Water Pressure	Water Quality
<b>1. Alluvial Water Sources</b> These considerations apply to all highly productive alluvial groundwater sources except those listed at item 1.1	1. Less than or equal to a 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" <sup>(2)</sup> variations, 40m from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan; or A maximum of a 2m decline cumulatively at any water supply work.	1. A cumulative pressure head decline of not more than 40% of the "post-water sharing plan" <sup>(2)</sup> pressure head above the base of the water source to a maximum of a 2m decline, at any water supply work.  2. If the predicted pressure head decline is greater than requirement 1. above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.	1. (a) Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity; and  (b) No increase of more than 1% per activity in long-term average salinity in a highly connected surface water source at the nearest point to the activity.  Redesign of a highly connected <sup>(3)</sup> surface water source that is defined as a "reliable water supply" <sup>(4)</sup> is not an appropriate mitigation measure to meet considerations 1.(a) and 1.(b) above.
	2. If more than 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan then appropriate studies <sup>(5)</sup> will need to demonstrate to the Minister's satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or significant site.  If more than 2m decline cumulatively at any water supply work then make good provisions should apply.	1. A cumulative pressure head decline of not more than 40% of the "post-water sharing plan" pressure head above the top of the relevant aquifer <sup>(7)</sup> to a maximum of a 3m decline, at any water supply work.  2. If the predicted pressure head decline is greater than requirement 1. above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works, unless make good provisions apply, unless make good provisions apply.	(c) No mining activity to be below the natural ground surface within 200m laterally from the top of high bank or 100m vertically beneath (or the three dimensional extent of the alluvial water source - whichever is the lesser distance) of a highly connected surface water source that is defined as a "reliable water supply".  (d) Not more than 10% cumulatively of the three
<b>1.1 Lower Murrumbidgee Deep Groundwater source</b>			

Highly Productive Groundwater Sources			
	Water Table	Water Pressure	Water Quality
			<p>dimensional extent of the alluvial material in this water source to be excavated by mining activities beyond 200m laterally from the top of high bank and 100m vertically beneath a highly connected surface water source that is defined as a "reliable water supply".</p> <p>2. If condition 1.(a) is not met then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works.</p> <p>If condition 1.(b) or 1.(d) are not met then appropriate studies are required to demonstrate to the Minister's satisfaction that the River Condition Index category of the highly connected surface water source will not be reduced at the nearest point to the activity.</p> <p>If condition 1.(c) or (d) are not met, then appropriate studies are required to demonstrate to the Minister's satisfaction that:</p> <ul style="list-style-type: none"> <li>- there will be negligible river bank or high wall instability risks;</li> <li>- during the activity's operation and post-closure, levee banks</li> </ul>

Highly Productive Groundwater Sources			
	Water Table	Water Pressure	Water Quality
			<p>and landform design should prevent the Probable Maximum Flood from entering the activity's site; and</p> <ul style="list-style-type: none"> <li>low-permeability barriers between the site and the highly connected surface water source will be appropriately designed, installed and maintained to ensure their long-term effectiveness at minimising interaction between saline groundwater and the highly connected surface water supply;</li> </ul>
<b>2. Coastal sands water sources</b>	<ol style="list-style-type: none"> <li>Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any:               <ul style="list-style-type: none"> <li>(a) high priority groundwater dependent ecosystem; or</li> <li>(b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan.</li> </ul> <p>A maximum of a 2m decline cumulatively at any water supply work.</p> </li> <li>If more than 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any:               <ul style="list-style-type: none"> <li>(a) high priority groundwater dependent ecosystem; or</li> <li>(b) high priority culturally significant site;</li> </ul> </li> </ol>	<ol style="list-style-type: none"> <li>A cumulative pressure head decline of not more than a 2m decline, at any water supply work.</li> <li>If the predicted pressure head decline is greater than requirement 1. above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.</li> </ol>	<ol style="list-style-type: none"> <li>Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity.</li> <li>If condition 1 is not met then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works.</li> </ol>



Highly Productive Groundwater Sources			
	Water Table	Water Pressure	Water Quality
	<p>listed in the schedule of the relevant water sharing plan then appropriate studies (including the hydrogeology, ecological condition and cultural function) will need to demonstrate to the Minister's satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or significant site.</p> <p>If more than 2m decline cumulatively at any water supply work then make good provisions should apply.</p>		
<b>3. Porous Rock Water Sources</b>	<p>1. Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any</p> <p>(a) high priority groundwater dependent ecosystem, or</p> <p>(b) high priority culturally significant site, listed in the schedule of the relevant water sharing plan.</p> <p>A maximum of a 2m decline cumulatively at any water supply work.</p>	<p>1. A cumulative pressure head decline of not more than a 2m decline, at any water supply work.</p> <p>2. If the predicted pressure head decline is greater than requirement 1. above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.</p>	<p>1. Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity.</p> <p>2. If condition 1 is not met then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works.</p>
<b>3.1. Great Artesian Basin</b>  <b>Eastern Recharge Groundwater Source</b>  <b>and</b>  <b>Southern Recharge Groundwater Source</b>	<p>2. If more than 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any:</p> <p>(a) high priority groundwater dependent ecosystem; or</p> <p>(b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan then appropriate studies (including the hydrogeology, ecological condition and cultural function) will need to demonstrate to the Minister's</p>	<p>1. (a) Less than 0.2m cumulative variation in the groundwater pressure, allowing for typical climatic "post-water sharing plan" variations, 40m from any:</p> <p>(i) high priority groundwater dependent ecosystem; or</p> <p>(ii) high priority culturally significant site; listed in the schedule of the relevant water sharing plan.</p> <p>(b) A cumulative pressure level decline of not more than 15m, allowing for typical climatic "post-water sharing plan" variations.</p>	

Highly Productive Groundwater Sources			
	Water Table	Water Pressure	Water Quality
	<p>satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or culturally significant site.</p> <p>If more than 2m decline cumulatively at any water supply work then make good provisions should apply.</p>	<p>(c) The cumulative pressure level decline of no more than 10% of the 2008 pressure level above ground surface at the NSW State border, as agreed between NSW and Qld.</p> <p>2. If the predicted pressure head decline is greater than requirement 1.(a), above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the dependent ecosystem or culturally significant site.</p> <p>Pressure level decline should not</p> <p>(a) cause any flowing bore to cease to flow,</p> <p>(b) be any more than 1m, allowing for typical "post-water sharing plan" variations, at any flowing water supply work unless make good provisions apply, or</p> <p>(c) be any more than 2m, allowing for typical "post-water sharing plan" variations, at any non flowing water supply work unless make good provisions apply.</p>	
3.2 Great Artesian Basin Surat Groundwater Source and Warrego Groundwater Source and Central Groundwater Source	Not applicable	<p>1. (a) Less than 0.2m cumulative variation in the groundwater pressure, allowing for typical climatic "post-water sharing plan" variations, 40m from any:</p> <p>(i) high priority groundwater dependent ecosystem; or</p> <p>(ii) high priority culturally significant site; listed in the schedule of the relevant water sharing plan.</p> <p>(b) A cumulative pressure level decline of not</p>	

Highly Productive Groundwater Sources			
	Water Table	Water Pressure	Water Quality
		<p>more than 30m, allowing for typical climatic "post-water sharing plan" variations.</p> <p>(c) The cumulative pressure level decline of no more than 10% of the 2008 pressure level above ground surface at the NSW State border, as agreed between NSW and Qld.</p> <p>2. If the predicted pressure head decline is greater than requirement 1.(a) above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the dependent ecosystem or culturally significant site.</p> <p>Pressure level decline should not</p> <p>(a) cause any flowing bore to cease to flow,</p> <p>(b) be any more than 1m, allowing for typical "post-water sharing plan" variations, at any flowing water supply work unless make good provisions apply, or</p> <p>(c) be any more than 2m, allowing for typical "post-water sharing plan" variations, at any non flowing water supply work unless make good provisions apply.</p>	
<b>4. Fractured Rock Water Sources</b>	<p>1. Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any:</p> <p>(a) high priority groundwater dependent ecosystem; or</p> <p>(b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan.</p> <p>A maximum of a 2m decline cumulatively at any</p>	<p>1. A cumulative pressure head decline of not more than a 2m decline, at any water supply work.</p> <p>2. If the predicted pressure head decline is greater than requirement 1.(a) above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.</p>	<p>1. Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity.</p> <p>2. If condition 1 is not met then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of</p>



Highly Productive Groundwater Sources			
	Water Table	Water Pressure	Water Quality
	<p>water supply work.</p> <p>2. If more than 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any:</p> <p>(a) high priority groundwater dependent ecosystem; or</p> <p>(b) high priority culturally significant site;</p> <p>listed in the schedule of the relevant water sharing plan then appropriate studies<sup>(6)</sup> will need to demonstrate to the Minister's satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or significant site.</p> <p>If more than 2m decline cumulatively at any water supply work then make good provisions should apply.</p>		<p>the dependent ecosystem, significant site or affected water supply works.</p>

## NOTES:

- (1) All predicted volumes and aquifer impacts are to be determined using data and modelling as described in section 3.2.3;
- (2) "post-water sharing plan" – refers to the period after the commencement of the first water sharing plan in the water source, including the highest pressure head (allowing for typical climatic variations) within the first year after commencement of the first water sharing plan;
- (3) "Highly connected" surface water sources are identified in the Regulations and will be based on those determined during the water sharing planning process;
- (4) "Reliable water supply" is as defined in the SRLUP;
- (5) "Appropriate studies" on the potential impacts of water table changes greater than 10% are to include an identification of the extent and location of the asset, the predicted range of water table changes at the asset due to the activity, the groundwater interaction processes that affect the asset, the reliance of the asset on groundwater, the condition and resilience of the asset in relation to water table changes and the long-term state of the asset due to these changes;
- (6) Consideration of modelling accuracy is described in Section 3.2.1
- (7) "relevant aquifer" in relation to alluvial water sources is defined in the relevant WSP and relates to that part of the aquifer that can be utilised for productive purposes;
- (8) All cumulative impacts are to be based on the combined impacts of all "post-water sharing plan" activities within the water source.

Less Productive Groundwater Sources			
	Water Table	Water Pressure	Water Quality
<b>1. Alluvial Water Sources</b>	<p>1. Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan"<sup>(2)</sup> variations, 40m from any:</p> <p>(a) high priority groundwater dependent ecosystem; or</p> <p>(b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan; or</p> <p>A maximum of a 2m decline cumulatively at any water supply work unless make good provisions should apply.</p>	<p>1. A cumulative pressure head decline of not more than 40% of the "post-water sharing plan"<sup>(2)</sup> pressure head above the base of the water source to a maximum of a 2m decline, at any water supply work.</p> <p>2. If the predicted pressure head decline is greater than requirement 1. above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.</p>	<p>1. (a) Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity; and</p> <p>(b) No increase of more than 1% per activity in long-term average salinity in a highly connected surface water source at the nearest point to the activity.</p> <p>Redesign of a highly connected<sup>(3)</sup> surface water source that is defined as a "reliable water supply"<sup>(4)</sup> is not an appropriate mitigation measure to meet considerations 1.(a) and 1.(b) above.</p> <p>(c) No mining activity to be below the natural ground surface within 200m laterally from the top of high bank or 100m vertically beneath (or the three dimensional extent of the alluvial material - whichever is the lesser distance) of a highly connected surface water source that is defined as a "reliable water supply".</p>
	<p>2. If more than 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any:</p> <p>(a) high priority groundwater dependent ecosystem; or</p> <p>(b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan then appropriate studies<sup>(5)</sup> will need to demonstrate to the Minister's satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or significant site.</p> <p>If more than 2m decline cumulatively at any water supply work then make good provisions should apply.</p>		<p>2. If condition 1.(a) is not met then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works.</p> <p>If condition 1.(b) is not met then appropriate studies are required to demonstrate to the Minister's satisfaction that the River Condition Index category of the highly connected surface water source will not be reduced at the nearest point to the activity.</p>

Less Productive Groundwater Sources			
	Water Table	Water Pressure	Water Quality
			<p>If condition 1.(c) is not met, then appropriate studies are required to demonstrate to the Minister's satisfaction that:</p> <ul style="list-style-type: none"> <li>- there will be negligible river bank or high wall instability risks;</li> <li>- during the activity's operation and post-closure, levee banks and landform design should prevent the Probable Maximum Flood from entering the activity's site; and</li> <li>- low-permeability barriers between the site and the highly connected surface water source will be appropriately designed, installed and maintained to ensure their long-term effectiveness at minimising interaction between saline groundwater and the highly connected surface water supply;</li> </ul>
<b>2. Porous and Fractured Rock Water Sources</b>	<ol style="list-style-type: none"> <li>Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m from any:               <ol style="list-style-type: none"> <li>high priority groundwater dependent ecosystem; or</li> <li>high priority culturally significant site; listed in the schedule of the relevant water sharing plan.</li> </ol> <p>A maximum of a 2m decline cumulatively at any water supply work.</p> </li> <li>If more than 10% cumulative variation in the water table, allowing for typical climatic "post-</li> </ol>	<ol style="list-style-type: none"> <li>A cumulative pressure head decline of not more than a 2m decline, at any water supply work.</li> <li>If the predicted pressure head decline is greater than requirement 1. above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.</li> </ol>	<ol style="list-style-type: none"> <li>Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity.</li> <li>If condition 1 is not met then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works.</li> </ol>



Less Productive Groundwater Sources		
	Water Table	Water Pressure
	Water Quality	
	<p>water sharing plan" variations, 40m from any:</p> <p>(a) high priority groundwater dependent ecosystem; or</p> <p>(b) high priority culturally significant site;</p> <p>listed in the schedule of the relevant water sharing plan if appropriate studies demonstrate to the Minister's satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or significant site.</p> <p>If more than a 2m decline cumulatively at any water supply work then make good provisions should apply.</p>	

## NOTES:

- (1) All predicted volumes and aquifer impacts are to be determined using data and modelling as described in section 3.2.3;
- (2) "post-water sharing plan" – refers to the period after the commencement of the first water sharing plan in the water source, including the highest pressure head (allowing for typical climatic variations) within the first year after commencement of the first water sharing plan;
- (3) "Highly connected" surface water sources are identified in the Regulations;
- (4) "Reliable water supply" is as defined in the SRLUP;
- (5) "Appropriate studies" on the potential impacts of water table changes greater than 10% are to include an identification of the extent and location of the asset, the predicted range of water table changes at the asset due to the activity, the groundwater interaction processes that affect the asset, the reliance of the asset on groundwater, the condition and resilience of the asset in relation to water table changes and the long-term state of the asset due to these changes;
- (6) Consideration of modelling accuracy is described in Section 3.2.1.
- (7) All cumulative impacts are to be based on the combined impacts of all "post-water sharing plan" activities within the water source.

### 3.2.2 Additional considerations

In addition to the considerations specified in section 3.2.1 any advice provided to a gateway panel, the Planning and Assessment Commission or the Minister for Planning on a State significant development or State significant infrastructure will also consider the potential for:

- acidity issues to arise, for example exposure of acid sulphate soils;
- waterlogging or water table rise to occur, which could potentially affect land use, groundwater dependent ecosystems and other aquifer interference activities. Specific limits will be determined on a case-by-case basis, depending on the sensitivity of the surrounding land and groundwater dependent ecosystems to waterlogging and other aquifer interference activities to water intrusion.

In the case of petroleum exploration and production (including coal seam gas) activities the Minister will also consider and provide advice on:

- whether the design, construction and operation of a bore is likely to modify the existing hydraulic connection between aquifers. The Minister's advice will consider whether bore construction is likely to cause or enhance hydraulic connection between aquifers, based on a consideration of whether the *"Code of Practice for Coal Seam Gas Well Integrity"* will be complied with;
- whether hydraulic fracturing activities is likely to modify the existing hydraulic connection between aquifers. The Minister's advice will consider whether hydraulic fracturing activities are likely to cause or enhance hydraulic connection between aquifers, based on a consideration of whether the *"Code of Practice for Coal Seam Gas Fracture Stimulation"* will be complied with; and
- the method for disposal of extracted water. In the case of petroleum production (including coal seam gas) activities, the method for the disposal of extracted water should not involve the use of evaporation ponds, as defined the *Petroleum (Onshore) Regulation 2007*.

This issue will be primarily dealt with via a prohibition of evaporation ponds under the *Petroleum (Onshore) Regulation 2007*, with the alternate method of disposal stipulated as conditions on the development consent under the EP&A Act. Alternate disposal options might include reinjection to an aquifer, discharge to a river, on-selling to a nearby industry, agricultural development or potable water supply. Any adopted option will require treatment of discharges to an appropriate water quality standard such that they would have minimal impact on any proposed receiving waters and not affect their beneficial use category (if applicable). Alternate disposal options will therefore need to consider any relevant water or land pollution issues and waste disposal, including those that may be required by the *Protection of the Environment Operations Act 1997*.

### 3.2.3 What is required from proponents?

A risk management approach to assessing the potential impacts of aquifer interference activities will be adopted, where the level of detail required to be provided by the proponent is proportional to a combination of the likelihood of impacts occurring on water sources, users and dependent ecosystems and the potential consequences of these impacts.

In addition to the volumetric water licensing considerations specified in section 2, the proponent of an activity that may result in aquifer interference will need to provide the following to enable the assessment of the activity against the minimal impact considerations in Table 1 and the additional considerations in section 3.2.2:

- establishment of baseline groundwater conditions including groundwater depth, quality and flow based on sampling of all existing bores in the area potentially affected by the activity, any existing monitoring bores and any new monitoring bores that may be required under an authorisation issued under the *Mining Act 1992* or the *Petroleum (Onshore) Act 1991*; and
- a strategy for complying with any water access rules applying to relevant categories of water access licences, as specified in relevant water sharing plans. For example, returning water of an acceptable quality to the affected water source during periods when flows are at levels below which water users are not permitted to pump;
- details of potential water level, quality or pressure drawdown impacts on nearby water users who are exercising their right to take water under a basic landholder right. Consideration will need to be given to any relevant distance restriction requirements that may be specified in any relevant water sharing plan or any remediation measures to address these impacts;
- details of potential water level, quality or pressure drawdown impacts on nearby licensed water users in connected groundwater and surface water sources;
- details of potential water level, quality or pressure drawdown impacts on groundwater dependent ecosystems;
- details of potential for increased saline or contaminated water inflows to aquifers and highly connected river systems;
- details of the potential to cause or enhance hydraulic connection between aquifers;
- details of the potential for river bank instability, or high wall instability or failure to occur;
- details of the method for disposing of extracted water (in the case of coal seam gas activities);

If a project is approved, then the conditions of approval should include the following:

- details of an effective and independently assessed (by the Minister) groundwater/surface water level/pressure, flow and quality monitoring program through all phases of the activity;
- details of appropriate water measurement devices, regimes or methods such as water meters or other water measurement methods to measure actual take resulting from the activity;
- details of appropriate reporting procedures including timely notification systems for reporting the results of monitoring and metering programs against the licensing and approval requirements specified by this Policy; and



- details of contingency plans or remedial measures to be employed where it is found that take by or impacts from the activity are outside of the licensing and approval requirements specified by this Policy.

Proponents of any project that may be defined as an aquifer interference activity under the *Water Management Act 2000* will also be required to provide estimates of all quantities of water that are likely to be taken from any water source during and following cessation of the activity and all predicted impacts associated with the activity, based on the following minimum requirements:

- if the Gateway process applies, estimated based on a simple modelling platform that is:
  - developed using the available baseline data that has been collected at an appropriate frequency and scale; and
  - determined to be fit-for-purpose to the satisfaction of the Minister; and
- if a development consent under Part 4, Division 4.1 of the EP&A Act applies or for any mining or CSG production activity not subject to the Gateway, estimated based on complex modelling platform that is:
  - calibrated and validated (where practical) to the available baseline data that has been collected at an appropriate frequency and scale and over a sufficient period of time to incorporate typical temporal variations. In instances where an activity has a high likelihood of causing more than minimal harm to a “*reliable water supply*”, at least 2 years of baseline data is required; and
  - consistent with the Australian Groundwater Modelling Guidelines; and
  - independently reviewed and determined to be robust and reliable, and deemed fit-for-purpose to the satisfaction of the Minister; and
- in all other processes, estimated based on a desk-top analysis that is:
  - developed using the available baseline data that has been collected at an appropriate frequency and scale; and
  - determined to be fit-for-purpose to the satisfaction of the Minister.
- if a development consent under Part 4, Division 4.1 or Part 5.1 of the EP&A Act has been granted or for any approved mining or CSG production activity that was not subject to the Gateway, the NSW Office of Water will recommend that a condition of approval require that the maximum of the predicted annual water quantities are to be licensed from the commencement of the activity regardless of when water will actually commence to be taken. This is required to eliminate any risk of there being insufficient market depth from which to obtain the necessary water entitlements at any point in time in the future. The proponent should therefore demonstrate during the planning assessment process that these licences can be acquired if development consent is granted;

Proponents of aquifer interference activities should contact the NSW Office of Water to obtain relevant information and assistance.

### 3.3 Defined minimal impact aquifer interference activities

There are a number of activities that are considered as having a minimal impact on water-dependent assets, these include:

- grey water re-use on gardens;
- sampling and coring using hand held equipment;
- trenching and costeaning;
- access tracks;
- building and work pads;
- shallow pit toilets;
- monitoring bores and wells that are:
  - required by an order, or approved voluntary management proposal, under Part 3 of the Contaminated Land Management Act 1997, or
  - required by a development consent under Part 4 or an approval under Part 5.1, of the Environmental Planning and Assessment Act 1979, or required or undertaken as a result of an environmental assessment under Part 5 of that Act, or
  - required by a condition of an environment protection licence under the Protection of the Environment Operations Act 1997; or
  - required under the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008; or
  - constructed and operated by the Ministerial Corporation; and

constructed and decommissioned in accordance with standards equivalent to the Minimum Construction Requirements for Water Bores in Australia and that all bore construction, geology - location, driller and company details, depth, drilling method, diameter, geology, water bearing zones, water entry design, backfilling, casing/liner info, gravel pack, disinfection, development details, pump test details, water levels, and water quality information be recorded and provided on request from the NSW Office of Water.

- leachate ponds and sumps if constructed, operated and abandoned in accordance with appropriate standards and guidelines as determined by the Minister;
- septic tanks, associated trenches and pit toilets if constructed, operated and abandoned in accordance with the "Environment and Health Protection Guidelines: On-Site Sewage Management for Single Households" (January 1998 – prepared

jointly by NSW EPA; NSW Health; Dept of Local Govt; DLWC; and Dept of Urban Affairs and Planning) as may be updated from time to time;

- sewage holding ponds if lined with an impervious layer and otherwise constructed, operated and decommissioned in accordance with the requirements of the NSW State Groundwater Quality Protection Policy;
- construction and on-going use of waste liquid/effluent storage and irrigation reuse schemes providing these are carried out in accordance with their planning and other approvals;
- construction and on going use of tailings and ash dams if lined with an impervious layer providing these are carried out in accordance with their planning and other approvals; and
- construction and on-going use of aquaculture ponds if lined with an impervious layer providing these are carried out in accordance with their planning and other approvals.
- Core holes, stratigraphic (chip) holes, geo-environmental and geotechnical bores, works or activities (the latter as listed in AS 1726) intersecting the water table if they are decommissioned in such a way as to restore aquifer isolation to that which existed prior to the construction of the bore, work or activity and that the decommissioning is conducted within a period of 28 days following completion of the bore, work or activity;
- caverns, tunnels, cuttings, trenches and pipelines (intersecting the water table) if a water access licence is not required;
- underground storage tanks if constructed, maintained and monitored to appropriate standards and guidelines as determined by the Minister, which would be required to be lined with an impervious layer to ensure there is no ongoing take of water; and
- construction and on-going use of maturation and holding or storage ponds if lined with an impervious layer, subject to the requirements of section 3.2.2 in relation to water extracted as part of petroleum production (including coal seam gas) activities.

The impacts of an exploration activity on surface and ground water will be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979*.

In order to assess environmental impacts of an exploration activity under the *Mining Act 1992* or the *Petroleum (Onshore) Act 1991*, the Division of Resources and Energy of the Department of Trade, Investment, Regional Infrastructure and Service (DTIRIS) may require the applicant to prepare a Review of Environmental Factors (REF).

An REF is a document that provides a description of the proposed activity, an overview of the likely environmental impacts of the exploration activity, including impacts on surface and ground water, and proposed mitigation measures. Further information on REFs is contained in the Environmental Impact Assessment Guidelines published by the Division of Resources and Energy of DTIRIS.



## 4. Security deposits and penalties

A security deposit is a bank guarantee or sum of money held by the Government to cover the costs of remediation works for unforeseen impacts or ongoing post-closure activities. The effect of security deposits is to assign the risk of unforeseen and ongoing impacts to the proponent of the aquifer interference activity and not other water users or the environment.

In providing advice to the Minister for Planning or the Planning Assessment Commission, the Minister may recommend that a security deposit be held relating to the potential water issues.

The actual amount calculated to be deposited will reflect the level of risk to the aquifer or its dependent ecosystems from the proposed activity. This amount will be determined on a case by case basis.

It is important that proponents perform all of their obligations under their water licences and relevant approvals. A security deposit or appropriate insurance policy may be required as a condition of a planning approval to provide for the cost of performing the proponent's obligations in the event that they fail to perform those obligations.

Independent of security deposit requirements, surrendering of water access licences is a 'make good' provision which may account for ongoing post-closure take of water, provided water management costs and the net present value of any charges associated with this ongoing take of water and the surrendered licences are met.

There are tier 1 and 2 offences in the *Water Management Act 2000* - for example, under s.60A for taking water without an access licence, under s.60B for contravening any term or condition of a licence, and under s.60C for not holding sufficient water allocations (volume).

## 5. Glossary

A number of the terms used in this Policy are defined in the *Water Act 1912* or *Water Management Act 2000*. Additional terms used in this Policy are defined below.

**Aquifer interference activity** – is defined in the dictionary of the *Water Management Act 2000*.

**Coal seam gas** – The gas, usually methane, contained within coal beds or shale strata.

**Costeaning** – is the digging of a trench or pit cut across the conjectured line of outcrop of a seam or ore body to expose the full width.

**Dewatering** – Removal of water from an aquifer as part of the construction phase of a development or part of ongoing mining activities to maintain access, serviceability and/or safe operating conditions.

**Evaporation pond** – as defined in the *Petroleum (Onshore) Regulation 2007*.

**Highwall** – The unexcavated face of exposed overburden and coal or ore in an opencast mine or the face or bank of the uphill side of a contour strip-mine excavation.

**Hydraulic connection** - A path or conduit allowing fluids to be connected. The degree to which a groundwater system can respond hydraulically to changes in hydraulic head.

**Hydraulic fracturing** – Also known as ‘fracking’, is the process of initiating and propagating fractures in rocks by injecting a fluid (typically water), proppant (typically sand) and chemicals under high pressure.

**Incidental water** – Water that is taken by an aquifer interference activity that is incidental to the activity; including water that is encountered within and extracted from mine workings, tunnels, basements or other aquifer interference structures that must be dewatered to maintain access, serviceability and/or safe operating conditions. This water is not actually required to be used as part of the process of carrying out that activity,

# **NSW GROUNDWATER INFORMATION AND POLICY**





Australian Government  
Bureau of Meteorology

# National Groundwater Information System

Access to groundwater information, including the location of bores and bore logs, is essential to support informed decision-making about vital groundwater resources. The National Groundwater Information System is a spatial database which provides this information to water stakeholders.

## What is the system?

The National Groundwater Information System is a spatial database from which a range of groundwater information will be able to be accessed and visualised.

## How does it work?

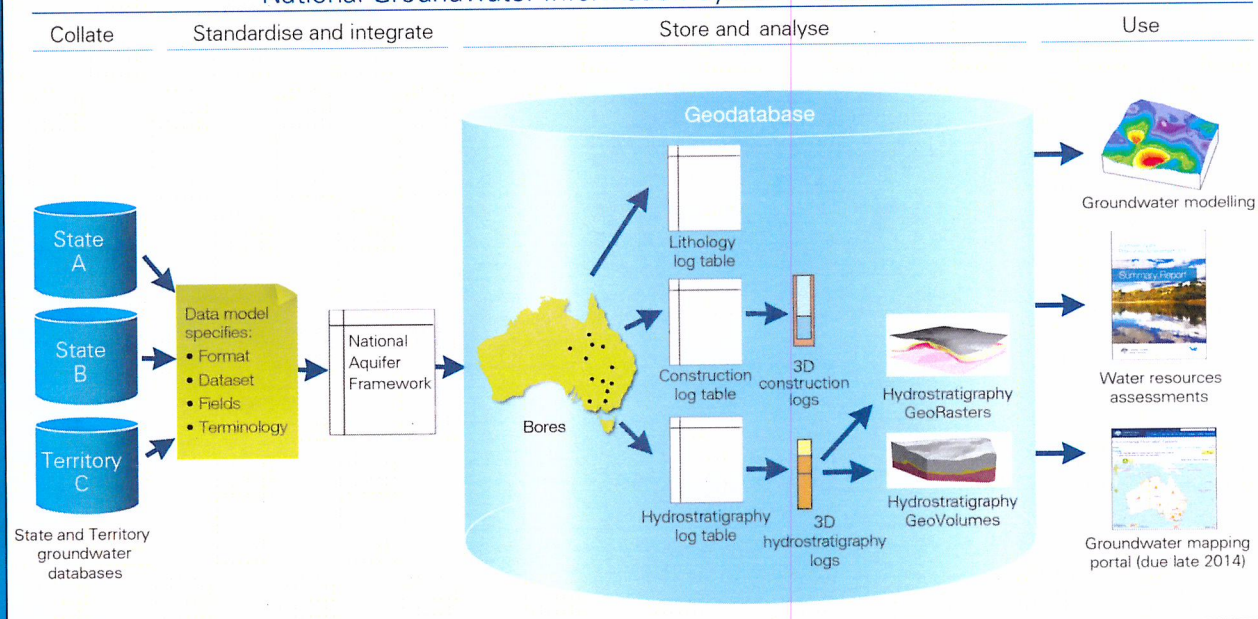
The system collates groundwater information from States and Territories and makes it nationally consistent. It will be available through a central, web mapping portal in late 2014.

## Why is the system important?

Policy makers need access to information that is nationally consistent as groundwater systems often span jurisdictional boundaries.

The system will ensure that nationally consistent data is freely available online so that better informed decisions can be made around how we manage vital groundwater resources. In many parts of Australia there is increasing pressure on groundwater resources from activities including agriculture, mining, urban and commercial developments.

## National Groundwater Information System – data work flows



## What information is housed in the system?

The system contains the location of more than 800 000 bore sites around the country.

It also houses detailed information about each bore, such as its purpose (i.e.: monitoring, irrigation and commercial water use) as well as lithology, construction and hydrostratigraphy logs. 2D and 3D aquifer geometry is also available for some areas.

## Why is the Bureau involved?

Under the *Water Act 2007*, the Bureau of Meteorology is responsible for compiling and delivering comprehensive water information across Australia. The system builds on the Bureau's commitment to increasing access to groundwater information to inform our understanding of how important groundwater resources should be managed.



Water Information  
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### Who can use the system?

The system is designed for use by a wide variety of water stakeholders including lead water agencies, catchment management authorities, consultants, academics, educational institutions, farmers and private industry.

It has already been widely used by State and federal governments for a range of purposes, including:

- interjurisdictional groundwater resource assessments;
- water accounting;
- water balance assessments;
- the creation of 3D geovolumes for analysing a range of information including groundwater availability, modelling and annual extraction volumes;
- the analysis of fresh water lenses and changes in aquifer thickness;
- the creation of datasets for groundwater resource appraisals; and
- conceptual and 3D groundwater models for a range of purposes including the analysis of groundwater and surface water interaction and groundwater resource assessments.

### How does the system ensure that groundwater information is nationally consistent?

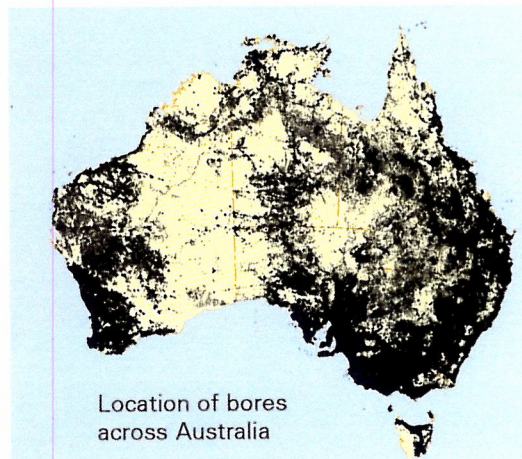
Each State and Territory uses their own terminology to describe sediments and rocks with similar hydraulic characteristics (hydrogeologic units) and these differences cause many difficulties, especially for groundwater basins that span multiple jurisdictions.

The Bureau ensures that information submitted by State and Territory lead water agencies is nationally consistent by standardising terminology using the National Aquifer Framework before uploading it into the system.

### What is the National Aquifer Framework?

The National Aquifer Framework is the first nationally agreed system for naming and grouping hydrogeological units in Australia.

The framework aggregates State-level information to ensure that the hydrogeological unit information is nationally consistent. This allows groundwater information to be consistently analysed at all levels.



### Who provides the information?

Information contained in the system is provided by the lead water agency in each State and Territory. Water Corporation also provides information for Western Australia.

### A collaborative approach

The system is jointly funded by the Bureau and the National Water Commission.

The system's data model was developed with input and direction from a technical reference group and steering committee.

Contributing partners included the lead water agencies of each State and Territory, the Australian National University, Geoscience Australia, the Murray-Darling Basin Authority and the National Water Commission.

### When will the system be updated?

New information will be uploaded into the system on an annual basis each December following the delivery of updated data by lead water agencies.

### When will the system become available?

The system is available in ESRI File Geodatabase format by emailing [groundwater@bom.gov.au](mailto:groundwater@bom.gov.au)

The web mapping portal is scheduled for release in late 2014.

### For more information

For more information please visit our website at [www.bom.gov.au/water/groundwater/ngis](http://www.bom.gov.au/water/groundwater/ngis) or contact: [groundwater@bom.gov.au](mailto:groundwater@bom.gov.au) Subscribe to our newsletters and product alerts to receive regular climate and water updates.



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Groundwater data in the

## Gunnedah Basin

More than 700 groundwater monitoring sites and 1,300 Government monitoring bores are gathering vital data in the Gunnedah Basin in northern NSW. Baseline groundwater data is robust and dates back to 1903 in the Great Artesian Basin, and the late 1960s for the main alluvial systems.

Most of the monitoring bores are in the Upper and Lower Namoi and the Lower Gwydir valleys, where high yield, good quality water and the large volume of water rights are allocated across the systems. The NSW Government is installing further groundwater monitoring sites in the sedimentary basin where coal seam gas exploration is underway.

The project maps the geology of the Gunnedah Basin and its groundwater sources. It examines existing groundwater entitlements and uses. It shows the groundwater monitoring networks and highlights water level behaviour over time in key groundwater sources.

### Water and coal seam gas in the Gunnedah Basin

The coal within the porous rocks of the sedimentary (mineral or organic matter deposited by water, air or ice) Gunnedah Basin was deposited 250–300 million years ago.

Santos holds petroleum exploration licences in the Gunnedah Basin. There are also a number of coal mining exploration leases in the area and several operating coal mines.

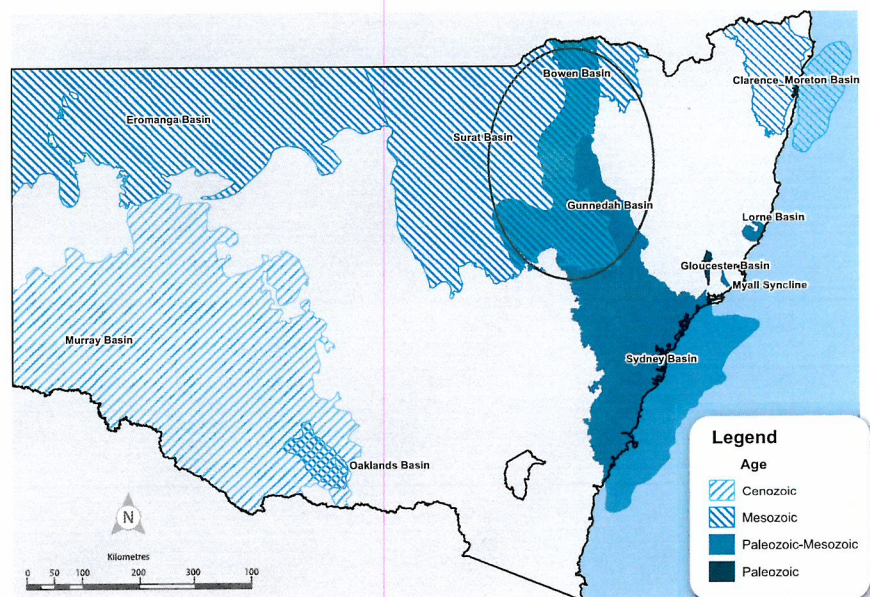
NSW Office of Water undertakes regular monitoring of water sources to assess the impact of agriculture, industry, mining and coal seam gas in the area. To safeguard the environment and community, there is limited and controlled use of groundwater in NSW under the *NSW Water Act 1912* and *Water Management Act 2000*.

Irrigation is the predominant purpose for groundwater use. Most of the current entitlements to take water are in alluvial water sources – predominantly the Upper and Lower Namoi and Gwydir.

The Santos project in Narrabri is estimated to use two gigalitres (GL)/yr (800 Olympic swimming pools) of groundwater from the Gunnedah Oxley Basin porous rock water source. This represents 1.8 per cent of the sustainable extraction limit of the porous rock water source.

Santos is exploring for coal seams in the deep porous rocks between 700 and 1000 metres below the ground, and not the alluvial (shallow high yield fresh water) systems that are important for stock, irrigation, domestic and town use.

Hydraulic fracturing of the coal seams is not being proposed by Santos in the Gunnedah Basin.





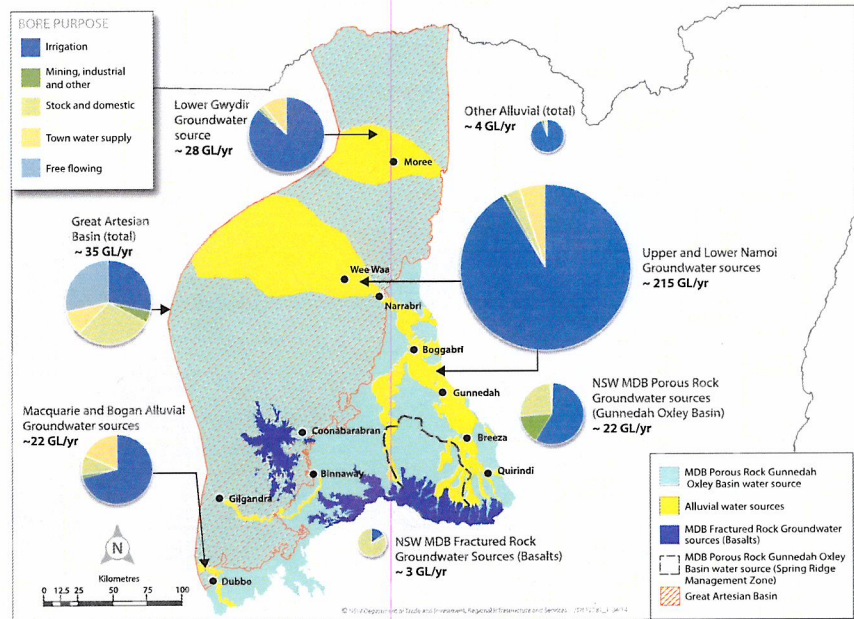
## Groundwater data in the Gunnedah Basin

### NSW Aquifer Interference Policy

The NSW Aquifer Interference Policy protects our aquifers and groundwater while balancing the needs of the community, farmers, industry and the environment.

Three key elements of the policy include:

- All water taken must be properly accounted for.
- The activity must address minimal impact considerations on water table, water pressure and water quality.
- Planning for measures in the event that the actual impacts are greater than predicted, including making sure that there is sufficient monitoring in place.

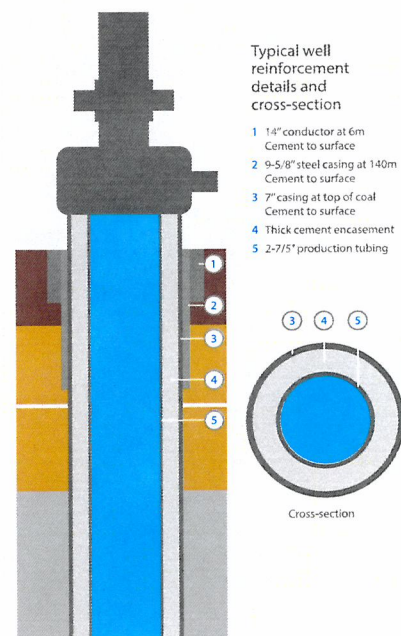


*Gunnedah Basin: Distribution and purpose of groundwater rights*

### Well integrity in the Gunnedah Basin

The NSW Government protects the quality of the community's water in a range of ways, including:

- The *Code of Practice for Coal Seam Gas Well Integrity* – guidelines that ensure the strength of wells and the protection of underground water from contamination. The Code also specifies technical requirements for the design, construction, production, maintenance, closure and rehabilitation of coal seam gas wells in NSW. The requirements include that a well is triple-cased in cement and steel.
- The Office of Coal Seam Gas well inspectors undertake announced and unannounced inspections throughout the drilling and construction process. Once constructed, wells are subject to ongoing testing and integrity reporting as well as incident reporting.
- More stringent requirements for drilling and construction of gas bores than for water bores.
- Further information on the hydraulic fracturing process is available on the CSIRO website – [www.csiro.au](http://www.csiro.au)



### More information about water and coal seam gas

More information about water in the Gunnedah Basin and coal seam gas can be found at [www.water.nsw.gov.au](http://www.water.nsw.gov.au)





## WATER AND COAL SEAM GAS | FACT SHEET 6

# Monitoring groundwater levels

April 2013

One concern associated with the extraction of coal seam gas is that groundwater levels may drop and that current supply will be affected.

The NSW Office of Water has an extensive groundwater database with data from around 135,000 water supply and monitoring bores across NSW. This includes data from private bores drilled from the late 1800s through to the present day. The database includes information on the depth of each bore, the rock types that have been drilled, the depth of aquifers intersected by the bore, the depth to water in the completed bore and the estimated bore yield. The bore's casing details are also supplied.

This information is available to the public at the NSW Office of Water website and provides an insight into the groundwater conditions in an area.

The monitoring bore sites are mainly located in areas where significant volumes of groundwater are extracted, such as from shallow alluvial aquifers where groundwater is primarily used for irrigation, as well as in areas where there may be other groundwater management issues, such as highly saline watertables.

The deep sedimentary basins in which coal and coal seam gas resources are located are not generally areas where groundwater has typically been monitored by the NSW Office of Water. There is limited monitoring data available for these groundwater sources. This is changing, and three deep monitoring sites are to be drilled in 2013, two in the Hunter Valley and one in the Liverpool Plains areas. Each site will consist of a nest of bores monitoring the groundwater at varying depths. Further sites are also proposed on the Far North Coast.

## How do I see what the groundwater in my area is doing?

Most of the Office of Water's bores are manually monitored on a 6 or 12 weekly basis. Approximately 1,200 bores have data loggers installed that provide continuous groundwater level monitoring.

While all groundwater data held by the NSW Office of Water is publicly available, not all of it can yet be directly accessed through the website.

The water level data from 360 of the groundwater monitoring sites can be accessed by following the prompts to *Real Time Data* from [www.water.nsw.gov.au](http://www.water.nsw.gov.au)

Other groundwater data can be obtained by requesting a copy of Pinneena GW, a DVD containing a copy of the complete groundwater archive or by emailing a request for data extraction from specific datasets to [waterinfo@water.nsw.gov.au](mailto:waterinfo@water.nsw.gov.au). There will be a fee charged to meet the costs for supply of the Pinneena Groundwater DVD and there may be a fee charged for the data extraction, depending on the request, for approximately \$100-\$195.

The Office of Water is expanding the real time data base to include sites in areas where coal seam gas will be extracted.

This will mean that information on groundwater levels in both the alluvial and sedimentary aquifers will be available via the Office of Water website.



## How do I access this information

1. Log onto [www.water.nsw.gov.au](http://www.water.nsw.gov.au) and select **Groundwater** from the dropdown menu under **Water management**.

The screenshot shows the NSW Department of Primary Industries Office of Water website. The 'Water management' dropdown menu is open, and 'Groundwater' is highlighted. The 'Real-time data' link is also visible in the top navigation bar.

2. Then from this groundwater landing page select **Real time data**.

The screenshot shows the 'Groundwater access and use' page on the NSW Department of Primary Industries Office of Water website. The 'Real time data' link is highlighted in the left sidebar.



3. Select a river basin by clicking on **Groundwater** and choosing a river basin from the drop down menu, or use the Google map on the page to navigate to the location of your choice by selecting the green marker.

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4. Then select a bore site. This example shows **Kanoona Lane** bore site in the **Hunter River Basin**.

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## How do I interpret the results for Kanoona Lane

The basic information is located in the middle of the page, along with a Google map to help locate the bore.

For this site, the **latest instantaneous values** are saying that the groundwater is 9.743 metres below the measuring point (MP), that is the surface of the ground.

This measurement was taken on 8:51am on 04 April 2013 and the trend indicates this groundwater is rising, as show by the arrow.

If you want more information, you can click on the graphical image and see the levels in groundwater over the past month.

## More information

[www.water.nsw.gov.au](http://www.water.nsw.gov.au)

[www.resources.nsw.gov.au](http://www.resources.nsw.gov.au)

[www.environment.nsw.gov.au](http://www.environment.nsw.gov.au)

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Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (April 2013). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of the Department of Primary Industries or the user's independent adviser.

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