



Desert Channels Queensland

Position Paper - Coal Seam Gas

November 2020

Desert Channels Queensland Inc (DCQ) is a community-based organisation working with landholders on the sustainable management of their land and water resources. Our goal is to have thriving communities with productive industries supported by a healthy environment.

DCQ position papers are for general information only. They are not intended to be, and should not be, relied on as a substitute for specialist advice. While every effort is taken to ensure the information is accurate, **DCQ** makes no representations and gives no warranties that this information is correct, current, complete, reliable or suitable for any purpose. We disclaim all responsibility and liability for any direct or indirect loss, damage, cost or expense whatsoever in the use of, or reliance upon, this information.

Coal Seam Gas

The issue

Coal Seam Gas or CSG is a controversial topic due to perceived risks associated with the unconventional extractive methods undertaken and the rapidly changing nature of the industry. The potential for CSG in the DCQ region is currently only within the Cooper and Galilee Basins, shown below in Figure 1. Other parts of the region are not likely to hold potential for CSG activities (Lewis et al. 2018).

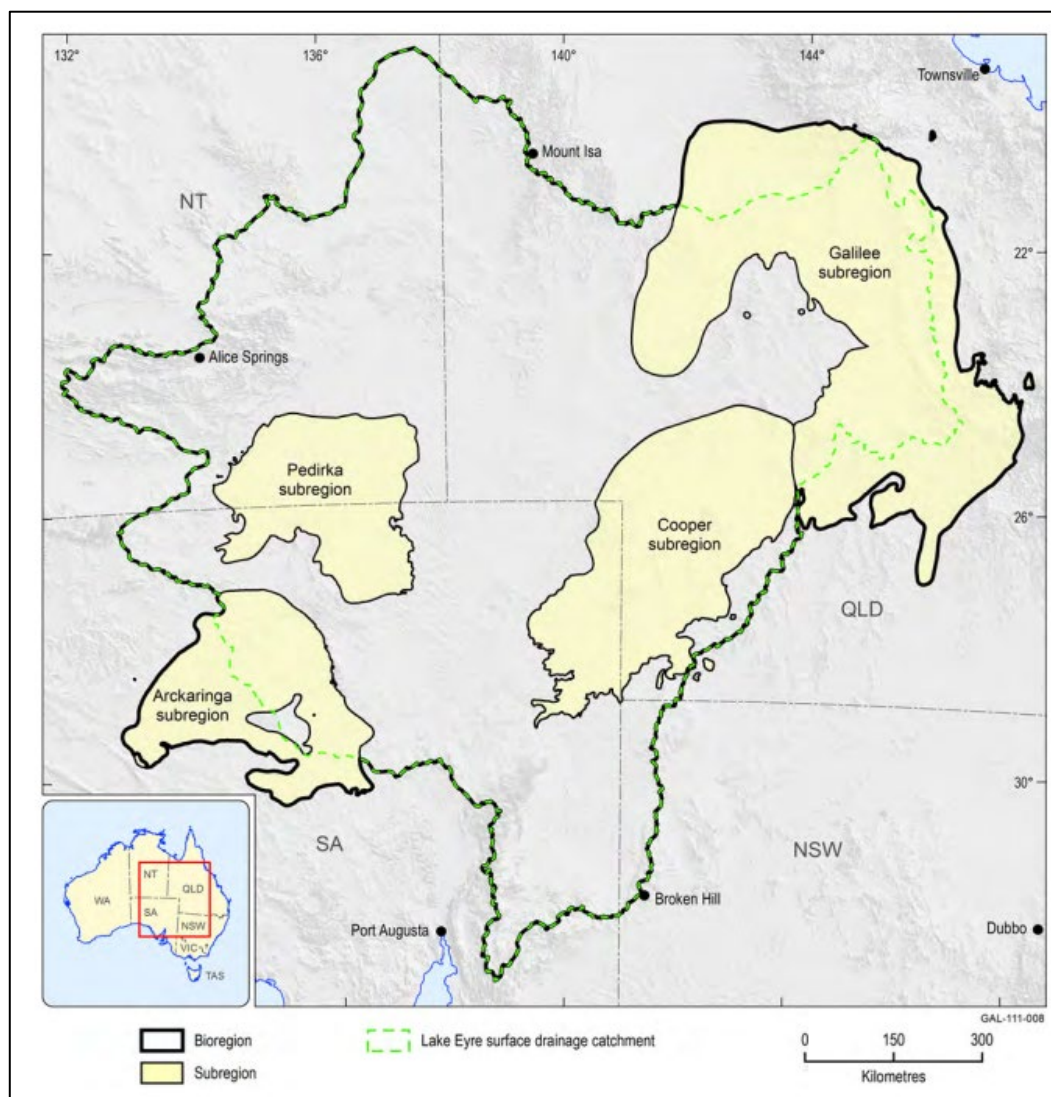


Figure 1 – Cooper and Galilee Basins in relation to the Lake Eyre Basin Boundary and the Desert Channels Queensland region. Other potential gas extraction basins include the Pedirka and Arckaringa region in the Northern Territory and South Australia. (Evans et al. 2014)

CSG is part of onshore gas extraction, which can be classified in two categories – conventional and unconventional. CSG is classified as an unconventional gas activity, along with shale gas, tight gas and deep coal gas. Conventional gas is often extracted from a single well that taps reservoirs mainly

in porous sandstone. Unconventional gas however requires innovative extraction methods often in more complicated geological settings.

Within the different types of unconventional gas, a key difference with CSG from the others is that during extraction, de-watering the aquifer is potentially required affecting the pressure of the surrounding aquifers. Other broad risks associated with CSG include clearing numerous pads for the wells, the use of hydraulic fracturing chemicals and disposal of waste materials. It is important to note that not all CSG extraction will require hydraulic fracturing (Lewis et al. 2018).

A detailed summary of the difference between the different type of gas activities are listed in Table 1. Figure 2 provides examples of conventional and unconventional gas activities as part of a geological profile.

Table 1 – Summary of Conventional and Unconventional Gas Activities

Type of Gas Activity	Geology of the resource	Examples	Activities that may trigger impacts	Extent within the DCQ region
Conventional	Conventional gas reservoirs largely consist of porous sandstone formations capped by impermeable rock, with the gas stored at high pressure. When tapped, conventional gas flows to the production well under high pressure. Most of Australia’s conventional gas reserves are offshore.	Natural Gas	Single extraction infrastructure linked to roads, offstream storages and production plants	Occurs within south west corner within the Cooper and Eromanga Basin.
Unconventional	Non-conventional gas reservoirs are found in complex geological systems and can be difficult to produce. Requires innovative methods for extraction.	Coal Seam Gas – Mainly methane extracted from coal seams from 300 -1000m deep.	<ul style="list-style-type: none"> • Large number of collection wells and pads • Potential for hydraulic fracturing requiring treatment and disposal of waste water • Can lead to lowering of aquifer water pressure • Fugitive emissions 	<p>Not economic in the Cooper and Eromanga Basin</p> <p>Currently in exploratory phase in the Galilee Basin with three current projects</p>
		Tight gas – in rock formations with extremely low permeability, making it difficult to flow.	<ul style="list-style-type: none"> • Requires hydraulic fracturing • No dewatering required 	No extraction to date. Potential in the Cooper and Eromanga Basin
		Shale Oil – mainly methane trapped at shale rock layers at depths greater than 1500m.	<ul style="list-style-type: none"> • Requires hydraulic fracturing • No dewatering required 	No extraction to date. Potential in the Cooper and Eromanga Basin
		Deep Coal Gas - gas in coal beds at depths usually below 2000 m. Held within the organic porosity and fracture system of the coal seam.	<ul style="list-style-type: none"> • Requires hydraulic fracturing • No dewatering required 	No extraction to date. Potential in the Cooper and Eromanga Basin

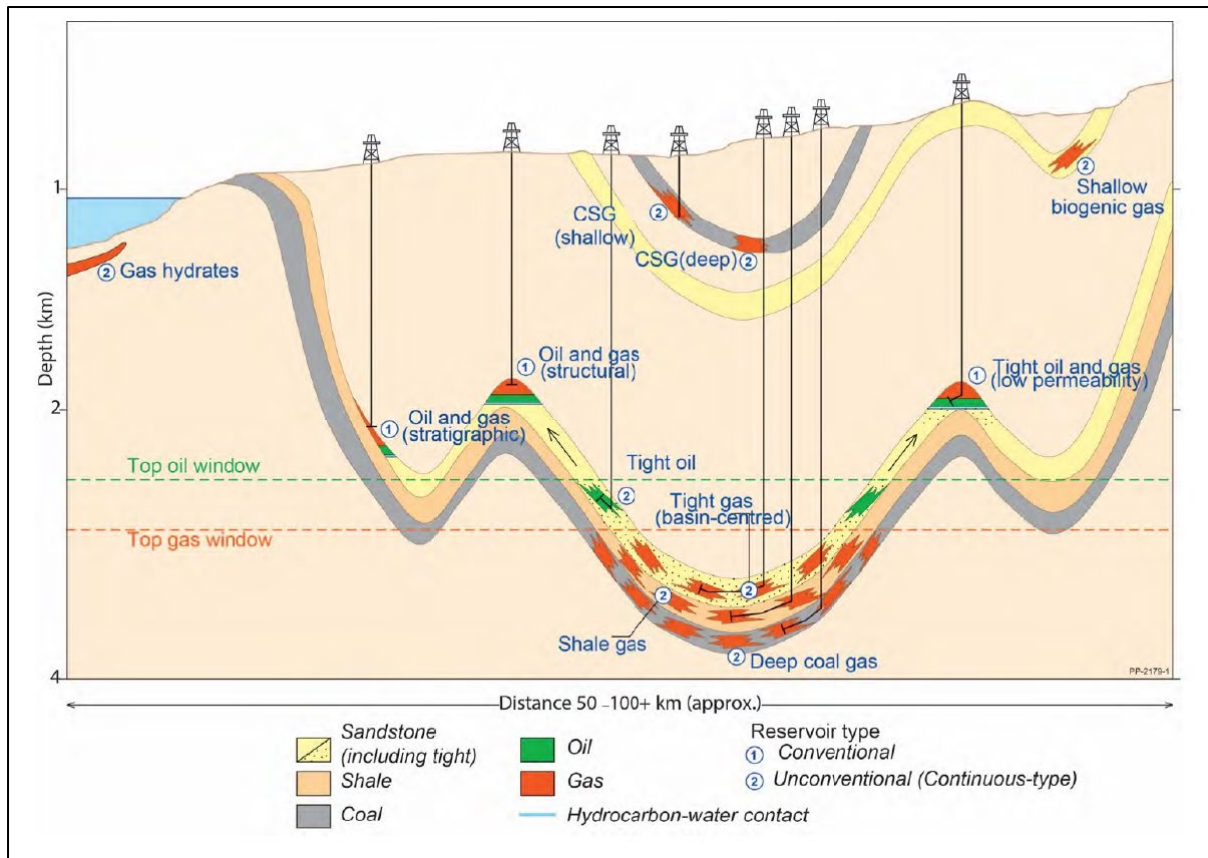


Figure 2 – Geological profile highlighting the differences between conventional and unconventional gas (Holland et al. 2020).

Current Gas Extraction within the Lake Eyre Basin

Conventional gas extraction within the Cooper and Eromanga Basins currently form Australia’s most developed onshore gas reservoir. It is a nationally significant provider of gas to the East Coast Gas Market. Exploration tenements are widespread throughout the Cooper basin, however production tenements are found only in the southern part of the basin. This gas extraction has been occurring for over 50 years within the basin.

There is no current conventional gas extraction in the Galilee Basin.

In relation to CSG potential in the Cooper Basin, Smith (2016) finds no production occurring in the Cooper basin since December 2012. Smith (2016) however notes potential projects in South Australia’s Cooper Basin.

Within the Galilee Basin, three CSG projects have occurred or are proposed in the Ilfracombe-Aramac region that extract from the upper Permian coal measures (Lewis et al. 2018). The gas content in these measures vary considerably with higher gas content occurring at depths of 900 to 1200m. The gas content declines rapidly at depths less than 700m (Lewis et al. 2018).

There are no records of other unconventional gas activities (tight, shale, deep coal gas) in the Cooper or Galilee basin (Holland et al. 2020).

Potential for CSG Activities within the Lake Eyre Basin

Within the Cooper Basin, it was found as part of the Bioregional Assessment that CSG is unlikely to occur within the Basin, other than for a potential site in South Australia (Smith et al. 2016). Overall, it was found that any coal resource development in that area is highly unlikely (Smith et al. 2016).

In relation to the Galilee Basin, the ability to conduct commercial scale production of CSG is currently uncertain (Lewis et al. 2018). Any future development would likely occur within the central eastern zone that contains elevated gas content at depths of 900 to 1200m. This includes the area that extends from the current Glenaras Gas project north of Ilfracombe towards the north-east, past Aramac and towards Lake Galilee (Lewis et al. 2018). See below for a location of the current or proposed CSG sites within the Galilee Basin.

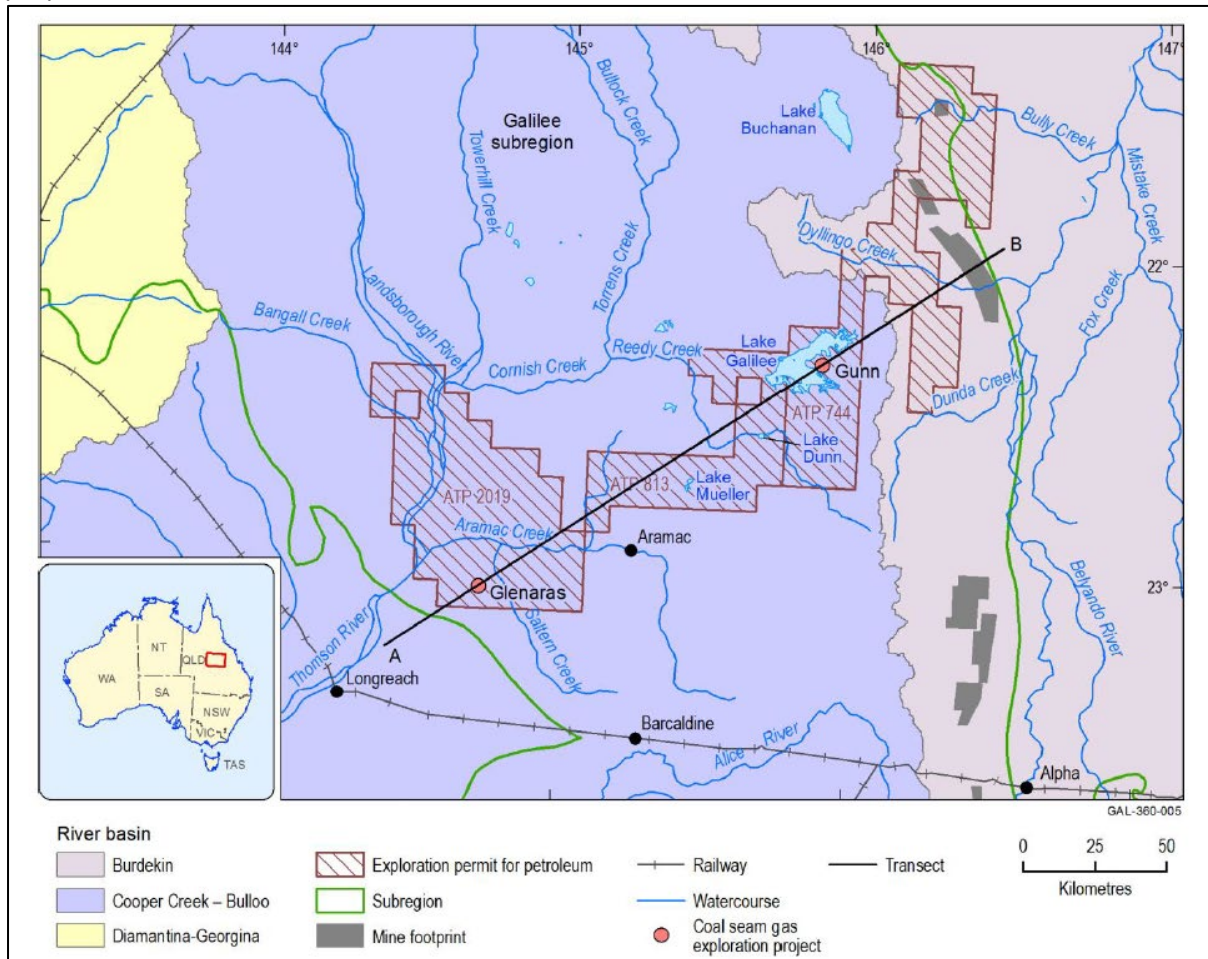


Figure 3 – Current gas tenements within the Galilee Basin that highlight potential for CSG extraction. The purple zone includes the Cooper Creek-Bulloo catchment. ATP2019 relates to Glenaras Project, ATP813 relates to Blue Energy and ATP744 relates to Gunns Project. Sourced from Lewis et al. (2018).

Potential Hazards or Impacts of CSG Activities

Hazards or impacts from CSG activities and associated gas activities are listed in a number of reports, both at a direct impact, but also consequences at the wider landscape. Below is a summary of the hazards identified.

The most detailed study of CSG for areas within the DCQ region is the Bioregional Assessment study on the Galilee Basin (Lewis et al. 2018). In this study, it focussed on the coal mines on the eastern edge of the basin, however it did consider current CSG proposals as well. The study on CSG however

only identified qualitative impacts. It was not possible to quantitatively evaluate the potential hydrological impacts of any CSG project (Lewis et al. 2018). It was also based on the three current projects in the region ranging from the Glenaras project in the west, Blue Energy in the central and to Gunns in the east (See figure 3). These are all at different stages and so direct knowledge of the proposals was not always known limiting the study. The key hydrological impacts from the CSG activities are specifically detailed in Evans et al. (2018) and are summarised as:

- Groundwater pumping enabling CSG extraction;
- Unplanned groundwater changes in non-target aquifers;
- Failure of well integrity; and
- Hydraulic fracturing.

In relation to aquifer impacts, the potential for aquifer drawdown of around 20- 25m within the upper Permian coal measures exists for some of the proposals (Evans et al. 2018). Due to the dewatering of aquifers, a water management plan would be required to manage the potentially very large volumes of water in areas that are not used to coping with such volumes. Water quality will potentially require treatment (reverse osmosis), and any products such as brine will require management (Evans et al. 2018).

The impact on the Clematis Group Aquifer, which is the main water supply for many pastoral bores in the Barcaldine area, could involve a drawdown of 0.2m from the Gunns CSG project. The Glenaras Gas Project was not modelled, but it was speculated that if depressurisation due to production occurred, there may be some potential for drawdown in overlying aquifers such as the Hutton Sandstone (Lewis et al. 2018). There was no specific information available from the Blue Energy proposal on local aquifers.

The hazards to landscape features from the proposed CSG activities were also summarised by each proposal. The study by Lewis et al. (2018) noted that it would require more detailed modelling to quantify the impact on these landscape features. Figure 4 below provides context to the different CSG tenement and the landscape values including springs and other groundwater dependent ecosystems.

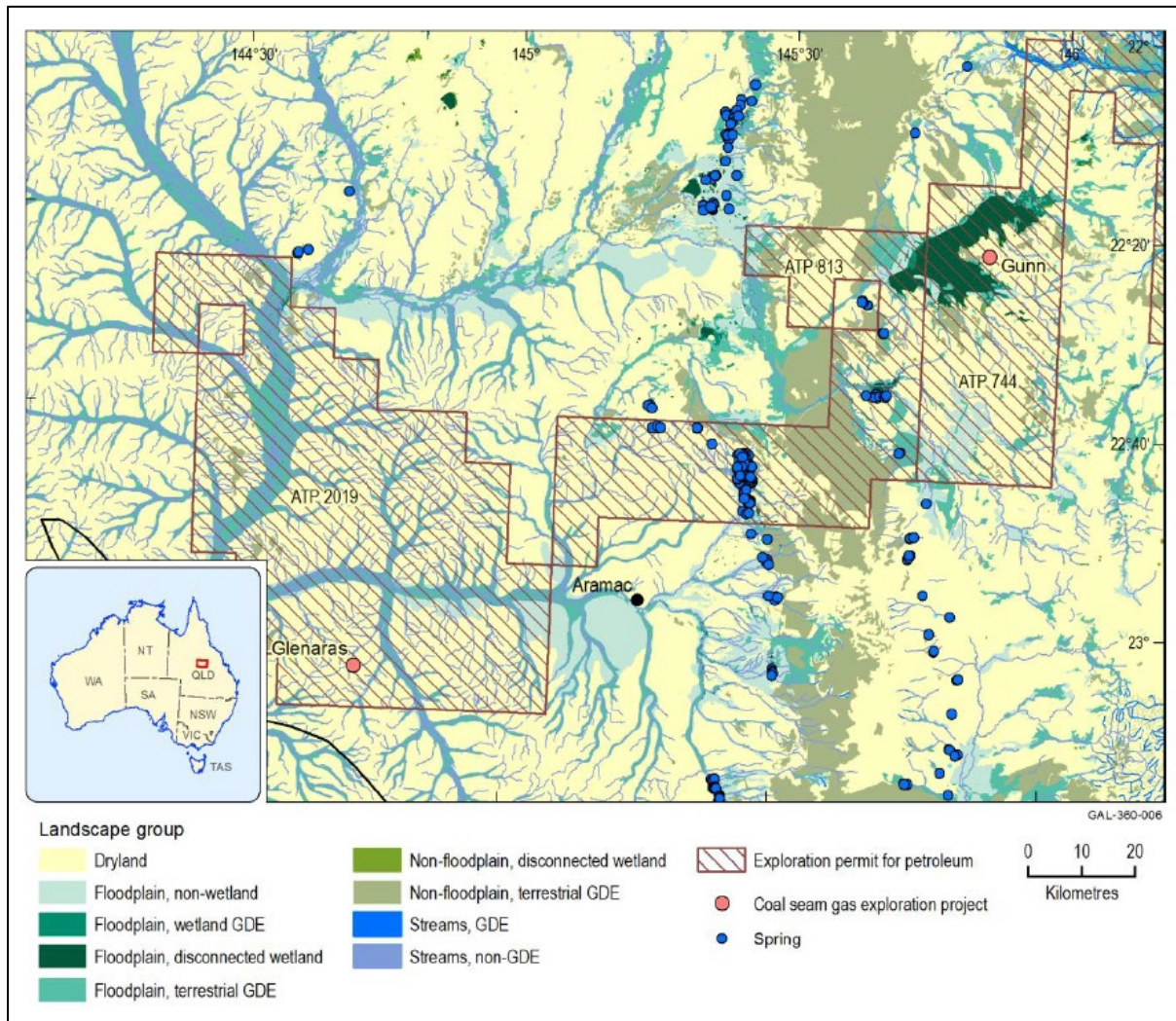


Figure 4 – Landscape values within the vicinity of CSG exploration tenements in the Galilee Basin. ATP2019 relates to Glenaras Project, ATP813 relates to Blue Energy and ATP744 relates to Gunns Project. Sourced from Lewis et al. (2018). GDE stands for ‘Groundwater Dependent Ecosystem’.

On the western Glenaras project, no major landscape features were identified as a potential issue for CSG activities. The area contains mainly dryland landscape features.

In ATP813, or the Blue Energy’s CSG tenement, there are a number of terrestrial groundwater dependent ecosystems in the vicinity, along with a number of springs, both recharge and artesian discharge. Included in this is the Barcardine Supergroup of artesian springs, which contain a number of endemic species and are listed as a *Threatened Ecological Community* under the Commonwealth’s *Environment and Protection Biodiversity Conservation Act 1999*. These are also listed on the Register of the National Estate and in a *Directory of Important Wetlands* (Lewis et al. 2018).

The Gunn’s CSG project, on the eastern boundary poses changes to the hydrological regime to Lake Galilee, which is listed as a *Directory of Important Wetlands* and part of the Register of the National Estate (Lewis et al. 2018). CSG in this area could lead to changes to water flow volumes, timing, quality and could be cumulative given that the lake is part of a closed basin (Lewis et al. 2018). This could lead to impacts on the ecological, sociocultural and Indigenous values of the lake (Lewis et al. 2018).

Overall Lewis et al. (2018) noted that based on current information, there is potential impacts on aquifer drawdown and groundwater dependent ecosystems, but more detailed modelling is required to quantify the impacts.

In a separate broad study by Marshall et al. (2013), it identified hazards posed to riverine aquatic ecosystems in Lake Eyre Basin from future petroleum and gas mining activities. In particular Marshall et al. (2013) notes that CSG can create grids of disturbance across the landscape, with multiple well pads ranging between 10 000 m² to 24 000 m². Between each well pad are tracks, creating a web of disturbance across the landscape, leading to a cumulative large area of disturbance. In addition to disturbance created, Marshall et al. (2013) summarise hazards to aquatic ecosystems in table 2.

Table 2 – Identified hazards to aquatic ecosystems from petroleum and gas activities in the Lake Eyre Basin (Marshall et al. 2013).

Hazard	Description
Sedimentation of waterholes	Disturbance from activities can lead to increased rates and quantities of sediment deposition in waterholes.
Fragmentation of the floodplain	Infrastructure on floodplains can isolate portions from the flooding or interfere with natural patterns of movement of biota, energy and nutrients between floodplains and the river.
Addition of waste water changing flow regime	CSG has the potential to generate large volumes of waste water that can be disposed into waterways and alter their flow regimes. This could alter the dryland river systems such as Cooper Creek and alter the biota dependent on certain flow regimes.
Altered turbidity of water (from treated waste water)	Treated waste water may have low turbidity and alter the biota present who require higher turbidity water.
Altered ionic composition and Electrical Conductivity (EC) of water (from treated waste water)	Treated waste water may have altered chemical composition that can alter aquatic ecosystems in the area.
Water extraction from waterholes	Disruption to the hydrological processes occur if waterhole pumping takes place for CSG activities.
Addition of contaminants to water	Water quality would be diminished with any contaminants introduced from CSG activities.
Introduction or dispersal of weed and pest species to aquatic, riparian and floodplain habitats	Greater human activity in areas for CSG may act as weed vectors, acting as an ongoing threat for the Lake Eyre Basin.

In an unconventional gas study by Holland et al. (2020) that focused on the impacts of shale, tight and deep coal gas development, there were over 200 hazards identified in the life cycle of production. In particular, Holland et al. (2020), noted that hydraulic fracturing and the chemicals used are considered a hazard by the community. Out of 116 chemicals used between 2011 and 2016 for shale, tight, and deep coal gas operations, about 33% were ‘low concern’ and pose minimal risk to aquatic ecosystems. A further 33 were potentially high concern and 41 were of potential concern (Holland et al. 2020). Holland et al (2020) further states that following a review of inquiries into onshore gas industry operations, the likelihood of issues associated with hydraulic fracture is low. This however will be further analysed in the stage 3 report that is due in 2021 (Holland et al. 2020). Although this study did not explicitly focus on CSG operations, similar hazards in the life cycle would be expected for CSG operations.

In a three-year CSIRO led study on CSG operations and hydraulic fracturing in the Surat Basin, it was found that:

- Hydraulic fracturing operations had little to no impacts on air quality;
 - Hydraulic fracturing chemicals were not detected in water samples taken from nearby groundwater bores, soil samples or water samples from a nearby creek;
 - Water produced from the wells immediately after fracturing containing elevated concentrations of salts, ammonia, organic carbon, some metals and organic compounds, with concentrations reducing to pre-fractured state within 40 days;
 - Current water treatment operations are effective at maintaining water quality;
 - Biocides and some geogenic chemicals used in fracturing were completely degraded in soil samples within 2-3 days; and
 - Soil microbial activity was reduced by the addition of hydraulic fracturing fluids.
- (GISERA 2020)

Overall, the hazards from CSG can vary dramatically, and all require a contextual analysis based on:

- Methods required for extraction (hydraulic fracturing may or may not be required, dewatering may or may not be required).
- The hydrogeology of the area and the impacts on surrounding groundwater uses from any aquifer dewatering (pastoral bores);
- Landscape values that could be impacted from CSG operations (pad clearing, groundwater dependent ecosystems (springs), weed risk threats);
- Treatment of waste water and impacts on landscape values.

An example is that the Glenaras Project identified by Lewis et al. (2018) had minimal hazards identified, but Gunns however had the potential to impact Lake Galilee due to potential impacts on changes to hydrology. Similarly, although little information is available on Blue Energy projects, it has the potential to impact threatened artesian springs.

Community Views of Gas Activities.

Aspects of gas activities, particularly coal seam gas has been and continues to be a concern to sections for the community, as identified in the 2013 It was found that the community has significant concerns about the impacts from coal seam gas operations and the influence on natural resources, in particular, influences on water quality and quantity (Western Rivers Advisory Panel 2013).

A local community group, the Western Rivers Alliance advocates for the protection of rivers, floodplains and associated surface and underground waters of the Channel Country region. This includes that watercourses, floodplains and wetlands are protected from unconventional gas development. This group prepared a report in 2016 titled 'Channel Country at the Crossroads - The Risks of Unconventional Gas Mining for Land, Water and Life' (available here <https://apo.org.au/node/67729>). This report contains a summary of the Lake Eyre Basin and the risks of unconventional gas mining. It concludes with a number of recommendations, including:

- Comprehensive, independent and expert risk assessment of the likely impacts of an unconventional gas industry on the Channel Country, its natural resources, communities and economy.
- An expert review of legislation and policy to identify gaps in the existing framework and recommend amendments to ensure protection of land, water, ecosystem processes and human and animal health.

Agforce on their 'Mining and Resources' policy page states 'That a moratorium be called for in particular locations where insufficient science exists to prove that CSG development will not have

impacts on the environment’. There is no explicit mention of which areas do not contain sufficient science (Agforce 2020).

CSG in the Lake Eyre Basin is also a regular topic in local media, highlighting the community interest in the industry. Some examples of stories published include

- **May 2013** – CSG Fears Aired for Lake Eyre Basin (Available here: <https://www.abc.net.au/news/2013-05-16/csg-fears-aired-for-lake-eyre-basin/4693784>)
- **July 2013** – Oil and Gas Companies have begun exploring across the inland Queensland Lake Eyre Basin (Available here: <https://www.theaustralian.com.au/national-affairs/oil-and-gas-companies-have-begun-exploring-across-the-inland-queensland-lake-eyre-basin/news-story/be209bd3ce57a71d8323cb9e785e020b>)
- **September 2016** – Future of one of the world’s last great desert river systems in Central Australia under threat: new report (Available here: <https://www.abc.net.au/radionational/programs/breakfast/desert-river-system-under-threat/7867032>)
- **October 2019** – Fracking fears grow for rivers in Queensland’s channel country. (Available here: <https://www.theguardian.com/australia-news/2019/oct/10/fracking-fears-grow-for-rivers-in-queenslands-channel-country>)
- **May 2020** – Lobby groups speak out on blocked Lake Eyre Basin Fracking report. (Available here: <https://www.northweststar.com.au/story/6742737/lobby-groups-speak-out-on-blocked-lake-eyre-basin-fracking-report/>)

It is noted that regional communities receive \$1.4 billion in direct economic contributions from the gas industry in 2016/2017 (Gasfield Commission Queensland 2017). Further surveys would be required to quantify the views of the community in relation to CSG for economic activity.

Regulation Guiding Gas Activities Within Queensland

The most recent study on legislation and regulations guiding gas activities is by Holland et al. (2020), who summarised regulations in relation to shale, tight and deep coal gas resources for the Cooper Basin. In summary there are five pieces of Commonwealth legislation and one intergovernmental agreement that applies to gas activities. These are summarised below in Table 3 and 4.

Table 3 – Commonwealth Legislation and Intergovernmental Agreements regulating gas activities.

Legislation	Summary
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	Protects and manages nationally and internationally important flora, fauna, ecological communities, wetlands (e.g. Ramsar) and heritage places. It is the overarching legislation for strategic assessments and considers water resources as a Matter of National Environmental Significance, in relation to coal seam gas (CSG) and large coal mining development.
<i>Lake Eyre Basin Intergovernmental Agreement Act 2001</i>	Provides for integrated management of surface water, groundwater and natural resources within the Agreement Area.
<i>Native Title Act 1993</i>	Recognises and protects native title and the requirements for Indigenous Land Use Agreements.
<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i>	Preserves and protects places, areas and objects of particular significance to Aboriginals, where ‘Aboriginal’ means a member of the Aboriginal race of Australia and includes a descendant of the Indigenous inhabitants of the Torres Strait Islands.
<i>Industrial Chemicals (Notification and Assessment) Act 1989</i>	Notification and assessment of the use of industrial chemicals within Australia.
<i>Water Act 2007</i>	Manages the water within the Murray–Darling Basin and provides for the collection, collation, analysis and dissemination of information about

	Australia’s water resources; and the use and management of water in Australia – includes water access rights, water delivery rights or irrigation rights.
--	---

Sourced from Holland et al. (2020).

Within Queensland, CSG activities are subject to the same regulatory environment that governs the exploration and development of coal, oil and gas resources in Queensland. A summary table provided by Holland et al. (2020) is included below. This includes six primary pieces of legislation and a number of other additional policies relevant to the development of resources in Queensland.

Table 4 – Queensland Government Legislation regulating gas activities.

	Legislation	Summary
Queensland Primary Legislation	<i>Petroleum Act 1923</i>	Regulates certain petroleum and natural gas activities. The <i>Petroleum and Gas (Production and Safety) Act 2004</i> supersedes this act, but an amended version of the <i>Petroleum Act 1923</i> was retained so that the rights of existing permit holders were not lost.
	<i>Petroleum and Gas (Production and Safety) Act 2004</i>	Regulates petroleum and gas exploration tenure, safety, production and pipelines.
	<i>Environmental Protection Act 1994 (EP Act)</i>	Regulates activities to avoid, minimise or mitigate impacts on the environment.
	<i>Water Act 2000</i>	Regulates the sustainable management of Queensland’s water resources, water supply and the impacts on groundwater caused by the extraction of groundwater by the resources sector.
	<i>Water Supply (Safety and Reliability) Act 2008</i>	Regulates interactions and direct impacts associated with drinking water supply.
	<i>Gasfields Commission Act 2013</i>	Established the Gasfields Commission – an independent statutory body with powers to review legislation and regulation; obtain and disseminate factual information; advise on coexistence issues; convene parties to resolve issues; and make recommendations to government and industry.
Queensland Supporting Legislation	<i>Aboriginal Cultural Heritage Act 2003</i>	Regulates activities to protect Queensland’s Indigenous cultural heritage values.
	<i>Biosecurity Act 2014</i>	Manages and contains weeds and pest animals
	<i>Environmental Offsets Act 2014</i>	Regulates the requirements and management of environmental offsets in response to activities that cause a significant residual impact on prescribed environmental matters.
	<i>Fisheries Act 1994</i>	Regulates the use of waterway barriers that may impact on fish movement along a waterway.
	<i>Forestry Act 1959</i>	Regulates activities involving the clearing of forest products and access to quarry material on state land.
	<i>Heritage Act (1992)</i>	Provides for the protection of Queensland’s Cultural Heritage.
	<i>Mineral and Energy Resources (Common Provisions) Act 2014</i>	Regulates land access for mineral and energy resource authority holders. Commenced on 27 September 2016.
	<i>Nature Conservation Act 1992</i>	Regulates the protection of flora and fauna as well and enables offset conditions to be imposed on certain authorities.

<i>Planning Act 2014</i>	Establishes integrated land use planning and development to achieve ecological sustainability. Provides standards and requirements for bore construction, especially artesian bores.
<i>Public Health Act 2005 (PH Act)</i>	Protects and promotes the health of the Queensland public. Allows for public health orders to be issued that require the removal or reduction of the risk to public health from a public health risk or to prevent that risk from recurring. It also allows for investigating health complaints.
<i>Queensland Heritage Act 1992</i>	Regulates activities to protect Queensland's heritage places.
<i>Regional Planning Interests Act 2014 (RPI Act)</i>	Identifies and protects areas of Queensland that are of regional interest and resolves potential land use conflicts. Protects living areas in regional communities, high-quality agricultural areas from dislocation, strategic cropping land, and regionally important environmental areas.
<i>State Development and Public Works Organisation Act 1971</i>	Provides ability for Queensland's Coordinator-General to declare a project a 'coordinated project'. Coordinated projects require an environmental impact statement and a higher level of public input.
<i>Transport Operations (Road Use Management) Act 1995</i>	Regulates the transportation of dangerous goods by road, manages road use impacts and issues directions on road use, including payment of compensation.
<i>Waste Reduction and Recycling Act 2011</i>	Promotes waste avoidance and reduction, reduce consumption of natural resources, minimise the impact of waste generation and ensure shared responsibility between government, business and the community.
<i>Work Health and Safety Act 2011</i>	Provides a framework to protect the health, safety and welfare of all workers at work. It also protects the health and safety of all other people who might be affected by the work.

Sourced from Holland et al. (2020).

Proposed Legislative Amendments Relevant to the Lake Eyre Basin

Consultation about amendments to the *Regional Interests Act 2014* (RPI) was made available in December 2019 specifically about the Channel Country. The Channel Country is currently listed as an area of regional interest or 'Strategic Environmental Area' (SEA) in the RPI. Within that area, it is also classified as a 'Designated Precinct' (DP) which limits unacceptable land uses. Strategic Environment Areas are connected to environmental attributes that assist in defining the SEA.

To undertake certain developments in a SEA or DP, a Regional Interests Development Approval (RIDA) is required. When applying for a RIDA, the assessment considerations require that the 'Required Outcome' is met. To achieve the required outcome, the applicant must demonstrate how the prescribed solution is met. The amendment includes a new provision that makes an unacceptable land use within a designated precinct to include 'high impact petroleum and gas activities'.

High impact petroleum and gas activities definition:

- *infrastructure for processing or storing petroleum or by-products, including gas compression*
- *low hazard dams and all regulated dams*
- *borrow pits*
- *permanent campsites / workforce accommodation*
- *waste disposal*
- *other supporting infrastructure for the project (for example sewage treatment plants).*

It is important to note that even with the amended definition, applications for high impact petroleum or gas within a designated precinct could still be approved if the application meets prescribed solution 1 in the assessment criteria.

DCQ made public submission to this legislation in January 2020 including support for the proposed amendment to the definition of 'High impact petroleum and gas activities'. These amendments are currently being planned to hold a second round of consultation and a potential regulatory impact statement.

Evidence

1. There is low to nil chance of CSG activities occurring in the Cooper Basin (Smith et al. 2016).
2. There is potential for CSG activities in the central Eastern part of the Galilee basin, evidenced by three current projects of Glenaras, Blue Energy and Gunns (Lewis et al. 2018). The commercial potential of CSG is however uncertain (Lewis et al. 2018).
3. A number of studies identify a broad range of hazards from CSG ranging from aquifer dewatering, to higher risk of weed infestations (Holland et al. 2020; Lewis et al. 2018; Marshall et al. 2013). Some of these hazards can be managed, evidenced by GISERA (2020) on aquifer impacts on the Surat Basin.
4. There is limited modelling that quantifies the impacts of CSG on Lake Eyre Basin from the current proposed activities in the Galilee Basin (Glenaras, Blue Energy and Gunns). More detailed modelling is required to quantify the impacts (Lewis et al. 2018). Potential however exists for drawdown in aquifers that supply pastoral bores, and disruption to groundwater dependent ecosystems (artesian springs) (Lewis et al. 2018).
5. Research is being undertaken to further improve knowledge of CSG and how to mitigate the effects. Some examples of research include:
 - a. The Geological and Bioregional Assessment (CSIRO led) is undertaking the Stage 3 report of tight gas, shale gas and deep coal gas for the Cooper Basin. Such findings will help understand the risk of unconventional gas in the region. More information is available here: <https://www.bioregionalassessments.gov.au/geological-and-bioregional-assessment-program>
 - b. University of Queensland Centre for Natural Gas is undertaking research in the Great Artesian Basin to identify knowledge to inform management of the water resource. More information is available here: <https://natural-gas.centre.uq.edu.au/project/great-artesian-basins-new-body-knowledge>
 - c. The CSIRO led GISERA (Gas Industry Social and Environmental Research Alliance) is a collaboration between CSIRO, Commonwealth and state governments and industry to undertake independent research. More information is available here: <https://gisera.csiro.au/>
6. Some reports on the gas production within the Lake Eyre Basin commissioned from the State Government have not been released. In a leak to the Guardian reported on 29 April 2020, it was found that an independent scientific panel commissioned by the Queensland Government recommended a ban on fracking within the Lake Eyre Basin. It recommended excluding all gas wells from the floodplains and that unconventional petroleum and gas production be designated as an 'unacceptable use' in the area. Details of the article can be found here: <https://www.theguardian.com/australia-news/2020/apr/29/scientific-advice-recommending-ban-on-fracking-in-lake-eyre-basin-kept-secret-and-ignored>.
7. Sections of the community do not support CSG activities with a number of groups and consultation records highlighting community concern. Gas within Queensland however is a major employer and contributor to economic activity.

8. A range of legislation exists within Queensland to regulate gas production activities. Proposed amendments to the Regional Planning Interests Act were released in late 2019, which provide more restrictions on CSG activities in the Lake Eyre Basin. However, with proposed amendments, there is the ability to still undertake CSG activities in all areas, subject to the development ensuring the application meets the required outcomes. These proposed amendments are subject to a second round of consultation and a potential Regulatory Impact Statement.

Position statements

- DCQ supports CSG extraction in the region subject to best practices that ensures any extraction does not cause irreversible damage to natural resources, including water, soil, biota and ecosystems.
- DCQ recognises that impacts on CSG extraction can only be understood based on the context of the project, including the relevant hydrogeology, landscape features, extraction methods and mitigation strategies. Detailed studies and modelling are required for each proposal.
- DCQ supports undertaking further research into CSG activities in the region to further understand the impacts from CSG and how any impacts can be managed.
- DCQ supports more community-based communication products explaining the potential for unconventional gas activities in the region and the innovations within the industry.
- DCQ supports regular review of legislation relevant to CSG extraction to ensure it is contemporary with current industry standards.
- DCQ would like to see a greater percentage of royalties from CSG being brought back to local and adjacent communities.
- Under current extraction methodologies DCQ does not support having gas/oil extraction infrastructure on the floodplains (SEA)

DCQ recommends

- Ongoing research into CSG activities within the Galilee & Cooper Basins basin to quantify the impacts from the current and future CSG projects in the region.
- The Queensland Government develop region specific information sheets on gas production and particularly in regards to fracking and potential effects on the aquifers in the Qld portion of Lake Eyre Basin, including keeping up to date with research and regularly updating fact sheets
- Regular legislative reviews to ensure that any CSG activities are regulated in accordance with best practice science.
- Governments release of all reports into CSG in the region to promote transparency within the region.

DCQ will

- Provide comment on future legislation and policy that regulate CSG;
- Provide support where appropriate to research activities undertaken in the region on CSG activities;
- Provide support where appropriate on education programs about CSG activities in the region based on best available science.

references

Agforce (2020) *Mining and Resources*. [online] Available at:

<https://agforceqld.org.au/index.php?tgtPage=policies&page_id=335> [Accessed 14 June 2020].

Evans, T., Tan, K.P., Magee, J., Karim, F., Sparrow, A., Lewis, S., Marshall, S., Kellett, J. and Galinec, V. (2014) *Context statement for the Galilee subregion. Product 1.1 from the Lake Eyre Basin Bioregional Assessment*. Department of the Environment, Bureau of Meteorology, CSIRO and Geoscience Australia, Australia.

Evans, T., Brandon, C., Lewis, S., Pavey, C., Holland, K., Beringen, H., Schmidt, R.K., Post, D.A and Henderson, B.L. (2018) *Assessing impacts of coal resource development on water resources in the Galilee subregion: key findings. Product 5: Outcome synthesis from the Lake Eyre Basin Bioregional Assessment*. Department of the Environment and Energy, Bureau of Meteorology, CSIRO and Geoscience Australia, Australia.

Lewis, S., Evans, T., Pavey, C., Holland, K.L., Henderson, B.L., Kilgour, P., Dehelean, A., Karim, F., Viney, N.R., Post, D.A., Schmidt, R.K., Sudholz, C., Brandon, C., Zhang, Y.Q., Lymburner, L., Dunn, B., Mount, R., Gonzalez, D., Peeters, L.J.M., O' Grady, A., Dunne, R., Ickowicz, A., Hosack, G., Hayes, K.R., Dambacher, J. and Barry, S. (2018) *Impact and risk analysis for the Galilee subregion. Product 3-4 for the Galilee subregion from the Lake Eyre Basin Bioregional Assessment*. Department of the Environment and Energy, Bureau of Meteorology, CSIRO and Geoscience Australia, Australia.

Gasfield Commission Queensland (2017) *Gasfields Commission Queensland*. [online] Available at: <<https://gasfieldscommissionqld.org.au/>> [Accessed 14 June 2020].

GISERA (2020). *Air, water and soil impacts of hydraulic fracturing, Phase 2*. [online] Available at: <<https://gisera.csiro.au/project/air-water-and-soil-impacts-of-hydraulic-fracturing-phase-2/>> [Accessed 10 June 2020].

Holland, K.L., Brandon, C., Crosbie, R.S., Davies, P., Evans, T., Golding, L., Gonzalez, D., Gunning, M.E., Hall, L.S., Henderson, B., Kasperczyk, D., Kear, J., Kirby, J., Lech, M.E., Macfarlane, C., Martinez, J., Marvanek, S., Merrin, L.E., Murray, J., O'Grady, A., Owens, R., Pavey, C., Post, D., Rachakonda, P., Raiber, M., Sander, R., Stewart, S., Sundaram, B., Tetreault-Campbell, S., Williams, M., Zhang, Y. and Zheng, H. (2020) *Geological and environmental baseline assessment for the Cooper GBA region. Geological and Bioregional Assessment Program: Stage 2*. Department of the Environment and Energy, Bureau of Meteorology, CSIRO and Geoscience Australia, Australia.

Marshall, J.C., Clifford, S. and Choy, S. (2013). *Hazards posed to riverine aquatic ecosystems in Lake Eyre Basin from future petroleum and gas mining activities*. Department of Science, Information Technology, Innovation and the Arts. Queensland Government, Brisbane

Smith, M., Pavey, C., Ford, J., Sparrow, A., Karim, F. and Radke, B. (2016) *Conceptual modelling for the Cooper subregion. Product 2.3 for the Cooper subregion from the Lake Eyre Basin Bioregional Assessment*. Department of the Environment and Energy, Bureau of Meteorology, CSIRO and Geoscience Australia, Australia.

Western Rivers Advisory Panel (WRAP) 2013, *Western Rivers Advisory Panel Report To the Honourable Andrew Cripps MP Minister for Natural Resources and Mines*. [online] Available at: <http://www.dnrm.qld.gov.au/__data/assets/pdf_file/0015/82500/wrap-report.pdf> [Accessed 23 May 2015].