

The Senate

---

Environment and Communications  
References Committee

---

Adequacy of the regulatory framework  
governing water use by the extractive industry

October 2018

© Commonwealth of Australia 2018

ISBN 978-1-76010-855-7

***Committee contact details***

PO Box 6100  
Parliament House  
Canberra ACT 2600

*Tel:* 02 6277 3526

*Fax:* 02 6277 5818

*E-mail:* [ec.sen@aph.gov.au](mailto:ec.sen@aph.gov.au)

*Internet:* [www.aph.gov.au/senate\\_ec](http://www.aph.gov.au/senate_ec)

This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Australia License.



The details of this licence are available on the Creative Commons website:

<http://creativecommons.org/licenses/by-nc-nd/3.0/au/>

Printed by the Senate Printing Unit, Parliament House, Canberra.

# Committee membership

## **Committee members**

Senator Janet Rice, Chair	AG, Victoria
Senator Jonathon Duniam, Deputy Chair	LP, Tasmania
Senator Anthony Chisolm	ALP, Queensland
Senator the Hon Kristina Keneally	ALP, New South Wales
Senator Steve Martin	NATS, Tasmania
Senator Anne Urquhart	ALP, Tasmania

## ***Former members***

Senator Sam Dastyari, to 25 January 2018	ALP, New South Wales
Senator the Hon Don Farrell, from 5 February 2018 to 15 February 2018	ALP, South Australia
Senator Linda Reynolds CSC, to 27 June 2018	LP, Western Australia
Senator Peter Whish-Wilson, Chair to 4 September 2017	ALP, Tasmania

## **Committee secretariat**

Ms Bonnie Allan, Committee Secretary, from 10 January 2018
Ms Christine McDonald, Committee Secretary
Mr CJ Sautelle, Principal Research Officer
Dr Ros Hewett, Acting Senior Research Officer
Ms Kate Morris, Administrative Officer, from 30 April 2018
Ms Margaret Jones, Administrative Officer



# Table of contents

<b>Committee membership .....</b>	<b>iii</b>
<b>Abbreviations .....</b>	<b>vii</b>
<b>List of recommendations .....</b>	<b>ix</b>
<b>Chapter 1: Introduction .....</b>	<b>1</b>
Acknowledgements .....	2
Structure of this report.....	2
Key terms used in this report.....	2
Recent related inquiries .....	3
<b>Chapter 2: Background.....</b>	<b>7</b>
Australia's underground water systems .....	7
Australia's water users .....	11
Methods of water use by the extractive industry.....	18
Conclusion .....	24
<b>Chapter 3: Regulatory framework for use of underground water .....</b>	<b>25</b>
Commonwealth and cross-jurisdictional regulatory arrangements .....	25
State and territory regulatory arrangements .....	33
Issues and gaps identified in current Commonwealth regulatory systems.....	36
Conclusion.....	50
<b>Chapter 4: Impacts of water extraction.....</b>	<b>51</b>
Background.....	51
Environmental impacts .....	53
Economic impacts .....	65
Social impacts.....	66
Cultural impacts for Aboriginal communities.....	68
Beneficial impacts .....	69

Conclusion .....	70
<b>Chapter 5: Committee view .....</b>	<b>71</b>
Amendments to the EPBC Act .....	71
Bilateral agreements .....	72
Compliance with current Commonwealth conditions .....	72
The National Water Account .....	73
Baseline modelling .....	74
Bioregional assessments .....	75
Lack of research impacting regulatory decisions .....	75
The National Water Initiative .....	76
Abandoned mines .....	77
<b>Australian Greens' additional comments .....</b>	<b>79</b>
<b>Coalition Senators' dissenting report.....</b>	<b>83</b>
<b>Appendix 1: Submissions, tabled documents and answers to questions on notice.....</b>	<b>85</b>
<b>Appendix 2: Public hearings and witnesses.....</b>	<b>87</b>

# Abbreviations

AMD	Acid and metalliferous drainage
APPEA	Australian Petroleum Production and Exploration Association
AWRIS	Australian Water Resource Information System
COAG	Council of Australian Governments
EIS	Environmental impact statements
EPBC	Environment Protection and Biodiversity Conservation Act 1999
GDEs	Groundwater-dependent ecosystems
GLs	Gigalitres
IESC	Commonwealth Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development
LCA	Law Council of Australia
MNES	Matters of national environmental significance
NWI	National Water Initiative
PFW	Produced formation water





# List of recommendations

## Recommendation 1

**5.8** The Committee recommends that the Commonwealth Government amend the *Environment Protection and Biodiversity Act 1999* to include all forms of unconventional gas under the provisions of the water trigger.

## Recommendation 2

**5.10** The Committee recommends that the role of the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development be expanded to provide scientific advice to regulatory decision-makers on the impacts of unconventional gas activities on Australia's water resources.

## Recommendation 3

**5.12** The Committee recommends that the Commonwealth Government does not commit to any bilateral approval agreements with states and/or territories.

## Recommendation 4

**5.16** The Committee recommends that the Commonwealth Government appropriately resource the Department of the Environment and Energy to undertake compliance and monitoring activities of extractive projects which have been approved under the *Environment Protection and Biodiversity Act 1999*.

## Recommendation 5

**5.18** The Committee recommends that the Department of the Environment and Energy require, as a condition of approvals for all extractive projects affecting water resources, that proponents publicly release real-time data or, where this is not available, the most up-to-date monitoring data available on water levels and water quality.

## Recommendation 6

**5.20** The Committee recommends that the Commonwealth Government work with state and territory governments through the Meeting of Environment Ministers or another forum, as appropriate, to ensure that extractive industries are accurately reporting surface and rainfall water take.

## Recommendation 7

**5.22** The Committee recommends that the Commonwealth Government expand the National Water Account so that it is able to comprehensively incorporate data on underground water systems.

## Recommendation 8

**5.25** The Committee recommends that the Department of the Environment and Energy require proponents of projects addressed under the water trigger to clearly report on the nature and extent of uncertainty existing in their baseline

modelling on potential impacts. Further, approvals should not be granted where there is a high risk of negative environmental outcomes and modelling data provided by proponents fails to provide confidence that these risks have been appropriately taken into account.

#### **Recommendation 9**

**5.26** The Committee recommends that the Commonwealth Government, through the Council of Australian Governments and the National Water Initiative as appropriate, encourage state and territory governments to require extractive industry projects to clearly report on the nature and extent of uncertainty existing in their baseline modelling on potential impacts.

#### **Recommendation 10**

**5.28** The Committee recommends that the Commonwealth Government prioritise Bioregional Assessments to ensure that the information they provide can be used for upcoming proposals for extractive industry projects.

#### **Recommendation 11**

**5.30** The Committee recommends that the Commonwealth Government provide the Bioregional Assessment Program with additional resources to equip the program to improve its data collection and research functions.

#### **Recommendation 12**

**5.32** The Committee recommends that the Commonwealth Government identify current research gaps affecting regulatory decisions on the impacts of extractive projects on underground water ecosystems, and provide funding for further research into this areas as appropriate.

#### **Recommendation 13**

**5.34** The Committee recommends that the Department of the Environment and Energy ensure reporting requirements for proposed projects requiring approval under the water trigger include information on the potential impacts to the organisms living in groundwater ecosystems.

#### **Recommendation 14**

**5.37** The Committee recommends that the Commonwealth Government, through the Council of Australian Governments and the National Water Initiative, encourage states and territories to adopt consistent regulatory approaches that promote the fair, equitable and sustainable allocation of water resources.

#### **Recommendation 15**

**5.39** The Committee recommends that the Commonwealth Government accept the Productivity Commission's recommendation in its National Water Reform report that the National Water Initiative be renewed by 2020.

#### **Recommendation 16**

**5.40** The Committee recommends that the Commonwealth Government accept the Productivity Commission's recommendation in its National Water Reform report that state and territory water entitlement and planning frameworks explicitly incorporate extractive industries.

#### **Recommendation 17**

**5.43** The Committee recommends that the Commonwealth Government accept the Productivity Commission's recommendation in its National Water Reform report that all governments undertake further work to incorporate clear, measurable and well-informed Indigenous cultural objectives in water plans, with tangible actions, monitoring and reporting arrangements to ensure that these objectives are implemented effectively.

#### **Recommendation 18**

**5.44** The Committee recommends that the Commonwealth Government accept the Productivity Commission's recommendation in its National Water Reform report that an Indigenous working group be established to provide advice on the development of provisions related to the incorporation of Indigenous cultural objectives for the renewed National Water Initiative.

#### **Recommendation 19**

**5.46** The Committee recommends that the renewed National Water Initiative include measures to encourage harmonisation of terminology used in regulatory frameworks governing water use across the various jurisdictions.

#### **Recommendation 20**

**5.47** The Committee recommends that the renewed National Water Initiative include measures to take into account the cumulative impacts of extractive industry activities on water resources.



# Chapter 1

## Introduction

1.1 On 18 October 2017, the Senate referred the following matters to the Environment and Communications References Committee for inquiry and report by 27 March 2018:

The adequacy of the regulatory framework governing water use by the extractive industry, with particular reference to:

- a. the social, economic and environmental impacts of extractive projects' take and use of water;
- b. existing safeguards in place to prevent the damage, contamination or draining of Australia's aquifers and water systems;
- c. any gaps in the regulatory framework which may lead to adverse social, economic or environmental outcomes, as a result of the take and use of water by extractive projects;
- d. any difference in the regulatory regime surrounding the extractive industry's water use, and that of other industries;
- e. the effectiveness of the 'water trigger' under the *Environment Protection and Biodiversity Conservation Act 1999*, and the value in expanding the 'trigger' to include other projects, such as shale and tight gas; and
- f. any other related matters.<sup>1</sup>

1.2 On 13 February 2018, the Senate granted the Committee an extension of time to report until 27 June 2018.<sup>2</sup> On 25 June 2018, the Senate granted the Committee a further extension until 21 August 2018.<sup>3</sup> On 20 August 2018, the Senate granted the Committee a further extension of time until 19 September 2018.<sup>4</sup> On 17 September 2018, the Committee was granted another extension of time to report until 17 October 2018.<sup>5</sup>

1.3 In accordance with its usual practice, the Committee advertised the inquiry on its website and wrote to relevant individuals and organisations inviting submissions by 15 December 2017. The Committee received 32 submissions, which are listed at Appendix 1, and held three public hearings, in Brisbane on 1 May 2018, Sydney on

---

1 *Journals of the Senate*, No. 66, 18 October 2017, p. 2111.

2 *Journals of the Senate*, No. 85, 13 February 2018, p. 2690.

3 *Journals of the Senate*, No. 102, 25 June 2018, p. 3271.

4 *Journals of the Senate*, No. 110, 20 August 2018, p. 3534.

5 *Journals of the Senate*, No. 118, 17 September 2018, p. 3766.

2 May 2018 and Canberra on 10 September 2018. Submissions and the transcripts of evidence are available on the committee's website at [www.aph.gov.au/senate\\_ec](http://www.aph.gov.au/senate_ec).

## Acknowledgements

1.4 The Committee expresses its thanks to the organisations and witnesses who provided evidence to the inquiry.

## Structure of this report

1.5 This report concentrates on the water sources commonly used by extractive industries in the process of extracting resources lying beneath the surface—that is, underground water sources. The report examines the environmental, social and economic impacts of water extracted in this process, and the current regulatory frameworks governing water use.

1.6 The report is divided into five chapters:

- Chapter 1: Introduction (this chapter), which gives an overview of the inquiry and previous related inquiries;
- Chapter 2: Background, which provides a synopsis of Australia's underground water systems, water users and the different methods of water extraction;
- Chapter 3: Regulatory systems governing water use, which examines federal legislation and bodies responsible for oversight of water use; the National Water Initiative; differences between state and territory regulatory frameworks and requirements; and current issues and gaps in regulatory frameworks;
- Chapter 4: Impacts of extraction on Australia's water resources, which outlines the major environmental, economic and social impacts of water extraction, including beneficial impacts; and
- Chapter 5: Committee view, which also includes the Committee's recommendations.

## Key terms used in this report

1.7 The following key terms are used in this report:

- *Extractive industry*: the mining, mineral processing, and oil and gas industries;<sup>6</sup>
- *Aquifer*: a geological formation (or group of geological formations) that is able to receive, store and transmit significant amounts of water;<sup>7</sup>

---

6 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 10; Department of Agriculture and Water Resources, *Submission 30*, p. 1.

7 Bureau of Meteorology, *Australian water information dictionary: Aquifer*, <http://www.bom.gov.au/water/awid/initial-a.shtml> (accessed 23 May 2018).

- *Artesian basin*: a geological structural feature (or combination of features) in which water is contained under pressure, including confined aquifers;<sup>8</sup>
- *Groundwater*: water lying below the earth's surface contained in aquifers;<sup>9</sup>
- *Groundwater-dependent ecosystems (GDEs)*: ecosystems that rely on groundwater, such as rivers, springs, wetlands, forests, caves and aquifers;<sup>10</sup>
- *Stygofauna*: fauna that live in groundwater;<sup>11</sup> and
- *Unconventional gas*: natural gas located in complex geological systems, such as coal seam gas (natural gas located within coal seams), shale gas (located in shale rock formations) and tight gas (located within low permeability sandstone rock).<sup>12</sup>

## Recent related inquiries

1.8 A number of inquiries have examined, or are examining, matters related to water use by the extractive industry. These include, among others:

- Federal Parliamentary inquiries;
- inquiries commissioned by the Commonwealth Government into the regulatory frameworks governing water use; and
- inquiries commissioned by state governments into particular forms of mining and their impacts, including on water resources.

### *Federal Parliamentary inquiries*

1.9 During the 44<sup>th</sup> Parliament the Senate Select Committee on Unconventional Gas Mining examined the adequacy of Australia's legislative, regulatory and policy framework for unconventional gas mining. The select committee's interim report, tabled in May 2016, examined water use and impacts caused by unconventional gas mining.<sup>13</sup> On 8 May 2016, the Governor-General issued a proclamation dissolving the House of Representatives and the Senate from 9.00am on 9 May 2016 for a general election. As a result of the dissolution of the Senate, the Select Committee ceased to exist. The Select Committee was not reinstated in the 45<sup>th</sup> Parliament.

---

8 Bureau of Meteorology, *Australian water information dictionary: Artesian basin*, <http://www.bom.gov.au/water/awid/initial-a.shtml> (accessed 23 May 2018).

9 Murray-Darling Basin Authority, *Discover groundwater*, <https://www.mdba.gov.au/discover-basin/water/discover-groundwater> (accessed 23 May 2018).

10 Bureau of Meteorology, *Groundwater dependent ecosystems atlas*, <http://www.bom.gov.au/water/groundwater/gde/> (accessed 23 May 2018).

11 Geoscience Australia, *Submission 2*, p. 3.

12 CSIRO, *What is unconventional gas?*, <https://www.csiro.au/en/Research/Energy/Hydraulic-fracturing/What-is-unconventional-gas> (accessed 7 June 2018).

13 Select Committee on Unconventional Gas Mining, *Interim report*, May 2016, pp. 64–68.

1.10 The Senate Environment and Communications References Committee (this Committee) is currently conducting an inquiry into the rehabilitation of mining and resources projects as it relates to Commonwealth responsibilities, including the environmental impacts on water from abandoned mines. The Committee is due to report by 28 November 2018.

1.11 The Senate Select Committee on Red Tape held an inquiry into environmental assessment and approvals, with its interim report tabled in October 2017. The inquiry examined the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), including its inclusion of 'a water resource, in relation to coal seam gas development and large coal mining development' (also known as the water trigger—see Chapter 3) as a matter of national environmental significance that requires applications for relevant projects to be approved by the Minister for the Environment.<sup>14</sup> The Red Tape Committee recommended that the water trigger be removed from the EPBC Act because of regulatory duplication between state environmental approvals processes and the Commonwealth.<sup>15</sup> A dissenting report by Labor senators disagreed with a number of the report's recommendations. Labor senators emphasised that the water trigger was 'carefully considered', and suggested that a statutory review of the EPBC Act scheduled to be undertaken in 2019 could consider ways to reduce regulatory burden.<sup>16</sup>

#### *Commonwealth Government inquiries*

1.12 On 19 December 2017, the Productivity Commission released a report into national water reform, focusing on the progress of the National Water Initiative (NWI) intergovernmental agreement between the Commonwealth, state and territory governments, including state and territory initiatives to meet the NWI's objectives. The review also examined possible future reform priorities and ways in which the NWI could be improved.<sup>17</sup> The Productivity Commission recommended that state and territory governments 'ensure that water entitlement and planning arrangements explicitly incorporate extractive industries' and that entitlements for extractive industries be 'issued under the same framework that applies to other consumptive users'. It also recommended governments commit to a renewed National Water Initiative through the Council of Australian Governments by 2020.<sup>18</sup>

---

14 Senate Select Committee on Red Tape, *Effect of red tape on environmental assessment and approvals: Interim report*, October 2017, p. 9.

15 Senate Select Committee on Red Tape, *Effect of red tape on environmental assessment and approvals: Interim report*, October 2017, p. 12, Recommendation 2.

16 Senate Select Committee on Red Tape, *Effect of red tape on environmental assessment and approvals: Interim report*, October 2017, Dissenting Report by Labor Senators, p. 35.

17 Productivity Commission, *National Water Reform*, Report no. 87, December 2017, Canberra, p. 3.

18 Productivity Commission, *National Water Reform*, Report no. 87, December 2017, Canberra, p. 28, Recommendation 3.1 and p. 43, Recommendation 10.1.



1.13 The Department of the Environment and Energy commissioned an independent review of the water trigger, as required under the EPBC Act, to examine the extent to which the water trigger legislation has achieved its objectives. The inquiry's report was published in April 2017. The review found that 'the water trigger is an appropriate measure to address the regulatory gap' that it was established to fill.<sup>19</sup> It also found that the conditions of approval applied to proposals related to the water trigger had increased transparency and public confidence in the regulatory system, but the effectiveness of the water trigger legislation was not yet clear because of its relatively recent establishment.<sup>20</sup>

#### *State government inquiries into particular forms of mining*

1.14 The Northern Territory Government commissioned an independent Scientific Inquiry into Hydraulic Fracturing of Onshore Unconventional Reservoirs in the Northern Territory, with a final report presented in March 2018. The inquiry looked at the environmental, social and economic risks and impacts of hydraulic fracturing, and devoted an entire chapter to water in its final report.<sup>21</sup> The Northern Territory Government in its response to the report supported, among others, the inquiry's recommendations that the Australian Government amend the EPBC Act for the water trigger to include onshore shale gas development; that the use of all surface water for onshore gas activity in the Northern Territory be prohibited prior to the grant of any further exploration approvals; and that reinjection of wastewater into aquifers be prohibited in the absence of full scientific investigations determining that associated risks can be mitigated.<sup>22</sup>

1.15 In September 2017, the Western Australian Government announced the establishment of an independent scientific panel inquiry into the environmental impacts of hydraulic fracturing. The inquiry is due to present its final report later in 2018.<sup>23</sup>

1.16 The New South Wales Government commissioned an independent review of coal seam gas activities in New South Wales, with the Chief Scientist and Engineer's

---

19 Commonwealth of Australia, *Independent Review of the Water Trigger Legislation*, April 2017, p. 6.

20 Commonwealth of Australia, *Independent Review of the Water Trigger Legislation*, April 2017, p. 7.

21 Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, *Final Report*, April 2018, p. 10, Chapter 7.

22 Northern Territory Government, *Government Responses to Recommendations from the Final Report on Hydraulic Fracturing in the Northern Territory*, pp. 5, 7, [https://hydraulicfracturing.nt.gov.au/\\_data/assets/pdf\\_file/0005/497426/Government-responses-to-Recommendations.pdf](https://hydraulicfracturing.nt.gov.au/_data/assets/pdf_file/0005/497426/Government-responses-to-Recommendations.pdf) (accessed 24 May 2018).

23 Independent Scientific Panel Inquiry into Hydraulic Fracture Stimulation in Western Australia 2017, *Progress of the Scientific Inquiry*, <https://frackinginquiry.wa.gov.au/progress-scientific-inquiry> (accessed 24 May 2018).

report handed down in September 2014. The most frequently raised issue to the inquiry was that of potential risks to groundwater.<sup>24</sup> The inquiry recommended the creation of a risk management and prediction tool for extractive industries, and a plan to manage legacy matters associated with coal seam gas mining.<sup>25</sup>

1.17 Other related inquiries include:

- Senate Select Committee on the Murray-Darling Basin Plan, which tabled its report in March 2016; and
- Senate Rural and Regional Affairs and Transport References Committee inquiry into the integrity of the water market in the Murray-Darling Basin, due to report in November 2018.

---

24 NSW Chief Scientist and Engineer, *Independent review of coal seam gas activities in NSW: Managing environmental and human health risks from CSG activities*, September 2014, p. 1.

25 NSW Chief Scientist and Engineer, *Independent review of coal seam gas activities in NSW: Managing environmental and human health risks from CSG activities*, September 2014, p. vi.

# Chapter 2

## Background

2.1 This chapter provides a synopsis of Australia's underground water systems, including the Great Artesian Basin and the Murray-Darling Basin. It outlines Australia's major water users by industry, including a breakdown of water used by the mining industry by state/territory, and concludes with a discussion of the different methods of water extraction by various extractive industries.

### Australia's underground water systems

2.2 Water is one of Australia's most precious resources.<sup>1</sup> Water shortages have the potential to constrain the future economic growth of Australia, given that Australia has the lowest average rainfall of any continent and is the driest continent with permanent inhabitants.<sup>2</sup> Predictions from the Bureau of Meteorology and CSIRO suggest that rainfall may increase in the future but will be confined largely to intense rainfall events. This could impact the recharge rates of underground water sources because more rainwater will be lost to evaporation.<sup>3</sup>

2.3 Groundwater lies in the sandstone layers trapped between impervious rocks or clays sitting beneath the surface. Artesian water can be drawn to the surface through bores because of the considerable pressure under which it is placed in artesian basins.<sup>4</sup> Most of the water in the artesian basins stretching across Australia is millions of years old and, in some cases, too salty for human consumption, though it can still be used for sheep and cattle and to water crops.<sup>5</sup> Some of these ancient sources of water are not regularly replenished by rainfall.<sup>6</sup>

2.4 The aquifers stretching across the country are located at different levels and may overlay other aquifers (see Figure 2.1). Australia's largest underground water systems include the:

- Great Artesian Basin (in Queensland, the Northern Territory, South Australia and New South Wales);

---

1 Australian Petroleum Production and Exploration Association Ltd, *Submission 22*, p. 2.

2 Lin Crase, 'An Introduction to Australian Water Policy', in Lin Crase (ed.), *Water Policy in Australia: The Impact of Change and Uncertainty*, RFF Press, Washington, DC, 2008, p. 2; Conservation Council of South Australia, *Submission 10*, p. 3.

3 Conservation Council of Western Australia, *Submission 27*, pp. 15, 27.

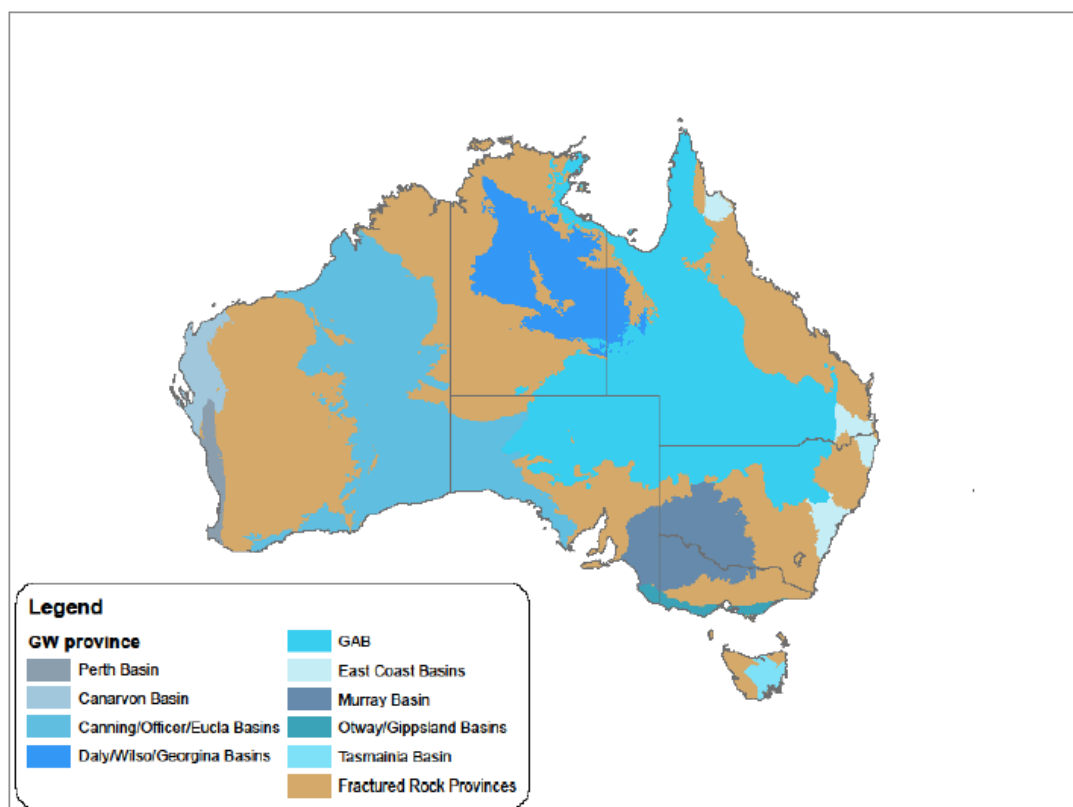
4 Great Artesian Basin Coordinating Committee, *Fact sheet 5: Pressure and heat in the Great Artesian Basin*, July 2016, p. 1, <http://www.gabcc.gov.au/sitecollectionimages/resources/78283c5b-16ab-44be-bcb7-972bd9e1196d/files/pressure-and-heat-gab-factsheet.pdf> (accessed 22 May 2018).

5 Rachel Dixon, *Water in Australia*, Redback Publishing, Frenchs Forest, 2018, p. 20.

6 Ms Georgina Woods, Policy Coordinator, Lock the Gate Alliance, *Committee Hansard*, 2 May 2018, p. 31.

- Canning Basin (in Western Australia);
- Daly-Wiso-Georgina Basin (in the Northern Territory and Queensland); and
- Murray Basin (in Victoria, South Australia and New South Wales).<sup>7</sup>

**Figure 2.1: Groundwater provinces across Australia<sup>8</sup>**



Source: Australian Bureau of Meteorology

2.5 The Conservation Council of South Australia argued in its submission that many water systems are currently 'under significant pressures from water use and consumption'.<sup>9</sup> Because of their significance for human consumption and agriculture, recent programs for two systems, the Great Artesian Basin and the Murray-Darling Basin (which includes the Murray Basin), have attempted to address reduced water supply through government intervention.

7 Buru Energy Limited, *Submission 14*, p. 1; Michael Pelusey and Jane Pelusey, *Natural Water*, Macmillan Library, South Yarra, Vic., 2006, p. 16.

8 Bureau of Meteorology, *Australian aquifer boundary grouping and alignment with National Aquifer Framework*, p. 2, <http://www.bom.gov.au/water/groundwater/insight/documents/AquiferBoundariesMethod.pdf> (accessed 23 May 2018).

9 Conservation Council of South Australia, *Submission 10*, p. 1.

## Great Artesian Basin

2.6 The Great Artesian Basin is a multi-layered system of aquifers that covers around a fifth of Australia.<sup>10</sup> It is 'one of Australia's most essential water supplies' and contains 65 million gigalitres of water.<sup>11</sup> The Great Artesian Basin is the major, in some instances the only, reliable source of water for 180,000 people spread across 120 towns, communities and pastoral enterprises in the arid areas of Queensland, the Northern Territory, South Australia and New South Wales (see Figure 2.2).<sup>12</sup>

**Figure 2.2: Map of the Great Artesian Basin**<sup>13</sup>



Source: Department of Agriculture and Water Resources

- 
- 10 Murray-Darling Basin Commission, *Murray-Darling Basin groundwater: A resource for the future*, p. 12, [https://www.mdba.gov.au/sites/default/files/archived/mdbc-GW-reports/2173\\_GW\\_a\\_resource\\_for\\_the\\_future.pdf](https://www.mdba.gov.au/sites/default/files/archived/mdbc-GW-reports/2173_GW_a_resource_for_the_future.pdf) (accessed 23 May 2018).
- 11 Rachel Dixon, *Water in Australia*, Redback Publishing, Frenchs Forest, 2018, p. 20; Australian Farmers for Climate Action, *Submission 6*, p. 5; Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 32.
- 12 Nature Conservation Council of NSW, *Submission 7*, p. 2; Department of Agriculture and Water Resources, *Submission 30*, p. 5.
- 13 Department of Agriculture and Water Resources, *Great Artesian Basin*, <http://www.agriculture.gov.au/water/national/great-artesian-basin/> (accessed 6 August 2018).

2.7 Declining pressure and reduced flows led in the twentieth century to almost half of the artesian springs from the Great Artesian Basin drying up, and many bores stopped flowing altogether.<sup>14</sup> Since the 1970s and 1980s, governments have engaged in and encouraged rehabilitation work on bores and bore drains, leading to the Great Artesian Basin Sustainability Initiative (2000–2017) between the Australian, New South Wales, South Australian and Queensland governments. In recent years, there has been significant pressure recovery in a number of areas due to these initiatives, with an estimated annual water savings of more than 250,000 ML per year.<sup>15</sup>

### ***Murray-Darling Basin***

2.8 The Murray-Darling Basin is a drainage area consisting of thousands of interconnected creeks and rivers flowing above a complex system of groundwater and aquifers, including the Murray Basin.<sup>16</sup> The northern part of the Murray-Darling Basin overlies the southern part of the Great Artesian Basin.<sup>17</sup>

2.9 Although the area covers only 14 per cent of Australia, it includes more than 40 per cent of Australia's farms and is Australia's most important agricultural region (see Figure 2.3).<sup>18</sup> Most groundwater used in the area is taken from shallow aquifers.<sup>19</sup> Because of the extent of water extraction in the region, the Murray-Darling Basin has been subject to coordinated initiatives since 2012 by the Australian, South Australian,

---

14 Great Artesian Basin Coordinating Committee, *Fact sheet 5: Pressure and heat in the Great Artesian Basin*, July 2016, p. 1, <http://www.gabcc.gov.au/sitecollectionimages/resources/78283c5b-16ab-44be-bcb7-972bd9e1196d/files/pressure-and-heat-gab-factsheet.pdf> (accessed 22 May 2018).

15 Great Artesian Basin Coordinating Committee, *Fact sheet 5: Pressure and heat in the Great Artesian Basin*, July 2016, p. 1, <http://www.gabcc.gov.au/sitecollectionimages/resources/78283c5b-16ab-44be-bcb7-972bd9e1196d/files/pressure-and-heat-gab-factsheet.pdf> (accessed 22 May 2018); Department of Agriculture and Water Resources, *Great Artesian Basin Sustainability Initiative*, <http://www.agriculture.gov.au/water/national/great-artesian-basin/great-artesian-basin-sustainability-initiative> (accessed 23 May 2018); Department of Agriculture and Water Resources, *Submission 30*, p. 6.

16 Murray-Darling Basin Authority, *Discover the Basin*, <https://www.mdba.gov.au/discover-basin> (accessed 23 May 2018); J.E. Lau, D.P. Commander and G. Jacobson, *Hydrogeology of Australia*, Bulletin 227, Australian Government Publishing Service, Canberra, 1987, p. 3; Property Rights Australia Incorporated, *Submission 21*, p. 10.

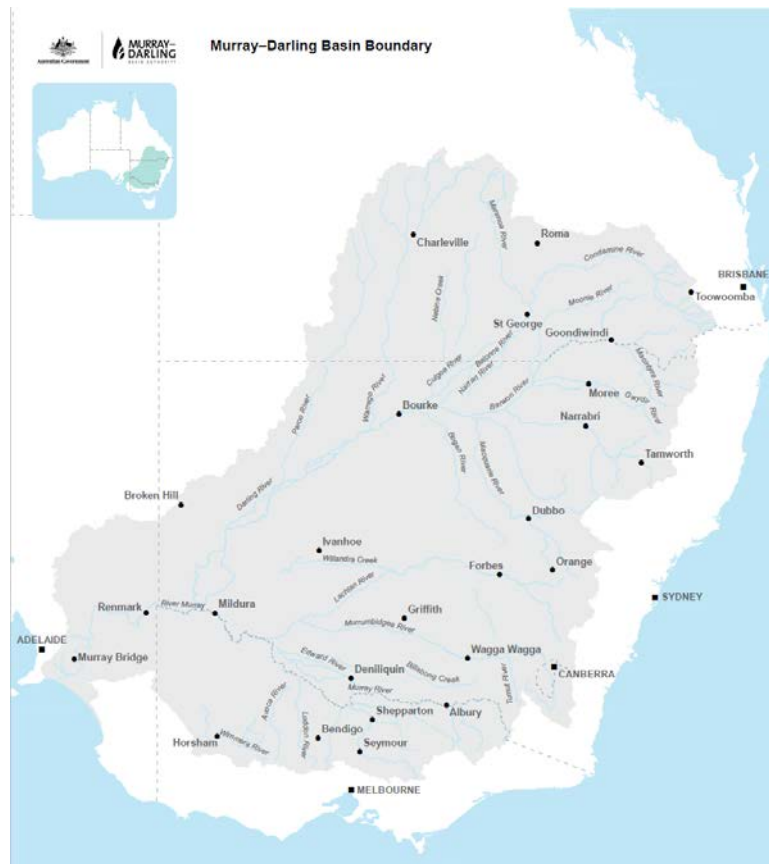
17 Murray-Darling Basin Authority, *Geology*, <https://www.mdba.gov.au/discover-basin/landscape/geology> (accessed 23 May 2018).

18 Murray-Darling Basin A, *Murray-Darling Basin groundwater: A resource for the future*, p. 4, [https://www.mdba.gov.au/sites/default/files/archived/mdbc-GW-reports/2173\\_GW\\_a\\_resource\\_for\\_the\\_future.pdf](https://www.mdba.gov.au/sites/default/files/archived/mdbc-GW-reports/2173_GW_a_resource_for_the_future.pdf) (accessed 23 May 2018); Discover Murray, *The Murray-Darling Basin*, <http://www.murrayriver.com.au/about-the-murray/murray-darling-basin/> (accessed 23 May 2018).

19 Murray-Darling Basin Authority, *Discover groundwater*, <https://www.mdba.gov.au/discover-basin/water/discover-groundwater> (accessed 23 May 2018).

Victorian, New South Wales, Queensland and Australian Capital Territory governments to reduce water use through the Murray-Darling Basin Plan.<sup>20</sup>

**Figure 2.3: Map of the Murray-Darling Basin<sup>21</sup>**



Source: Murray-Darling Basin Authority

## Australia's water users

2.10 Water is used for human, animal and plant consumption, and plays an important role in Aboriginal cosmologies tied to the land. Native flora and fauna throughout Australia are dependent on access to regular water, with some groundwater-dependent ecosystems such as rivers, wetlands and springs dependent entirely on groundwater that has been discharged to the surface. Groundwater ecosystems existing below the surface also rely on subterranean water, and may include stygofauna and microbial communities.

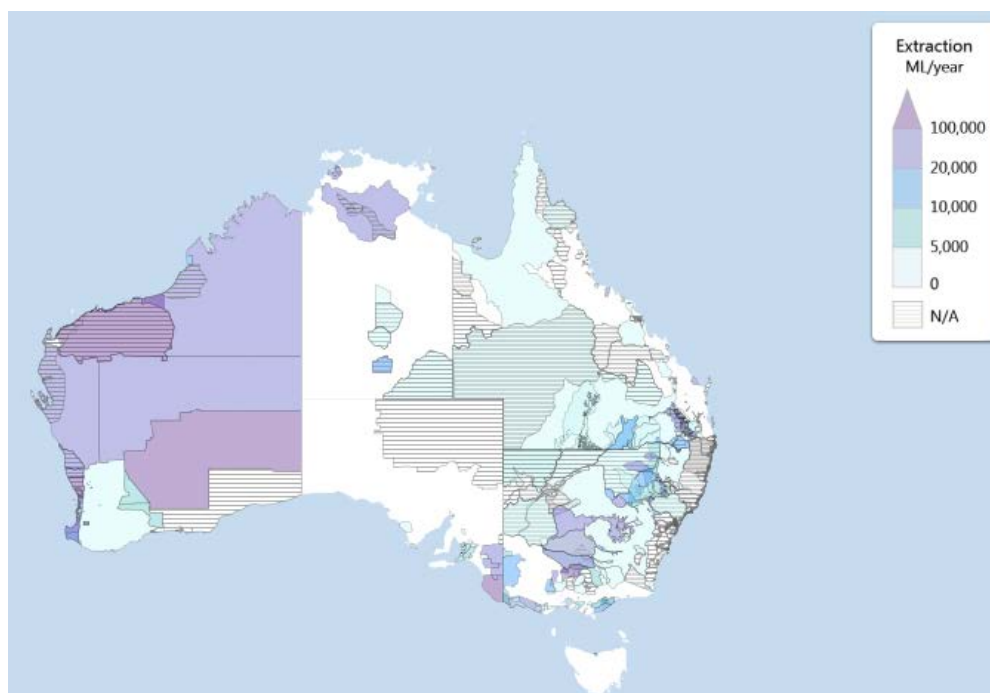
20 Murray-Darling Basin Authority, *What's in the Basin Plan?*, <https://www.mdba.gov.au/basin-plan/whats-basin-plan> (accessed 23 May 2018).

21 Murray-Darling Basin Authority, *Murray-Darling Basin boundary*, <https://www.mdba.gov.au/sites/default/files/cartographicmapping/MDB-boundary-map-2017.pdf> (accessed 23 May 2018).

### *Human and agricultural consumption*

2.11 Groundwater comprises around 17 per cent of Australia's accessible water resources. About 30 per cent of Australia's total water use is taken from groundwater, with some regions more reliant on groundwater than others (see Figure 2.4).<sup>22</sup>

**Figure 2.4: Total Australian groundwater extraction, 2016–17<sup>23</sup>**



Source: Australian Bureau of Meteorology

2.12 Across many regional, remote and arid areas of Australia, groundwater is the main or only source of water for human consumption, stock use and irrigation because of low or unreliable annual rainfall averages. Groundwater is essential for the survival of communities in these areas, including remote Aboriginal communities.<sup>24</sup> For example, 90 per cent of the Northern Territory's consumptive water supplies are drawn from groundwater, with the towns of Alice Springs and Tennant Creek relying completely on groundwater.<sup>25</sup>

22 Murray-Darling Basin Authority, *Discover groundwater*, <https://www.mdba.gov.au/discover-basin/water/discover-groundwater> (accessed 23 May 2018); Mr Tom Crothers, Consultant, Property Rights Australia, *Committee Hansard*, 1 May 2018, p. 36.

23 Bureau of Meteorology, *Australian Groundwater Insight: Groundwater management – extraction (2016–17)*, <http://www.bom.gov.au/water/groundwater/> (accessed 13 June 2018).

24 Conservation Council of Western Australia, *Submission 27*, p. 2.

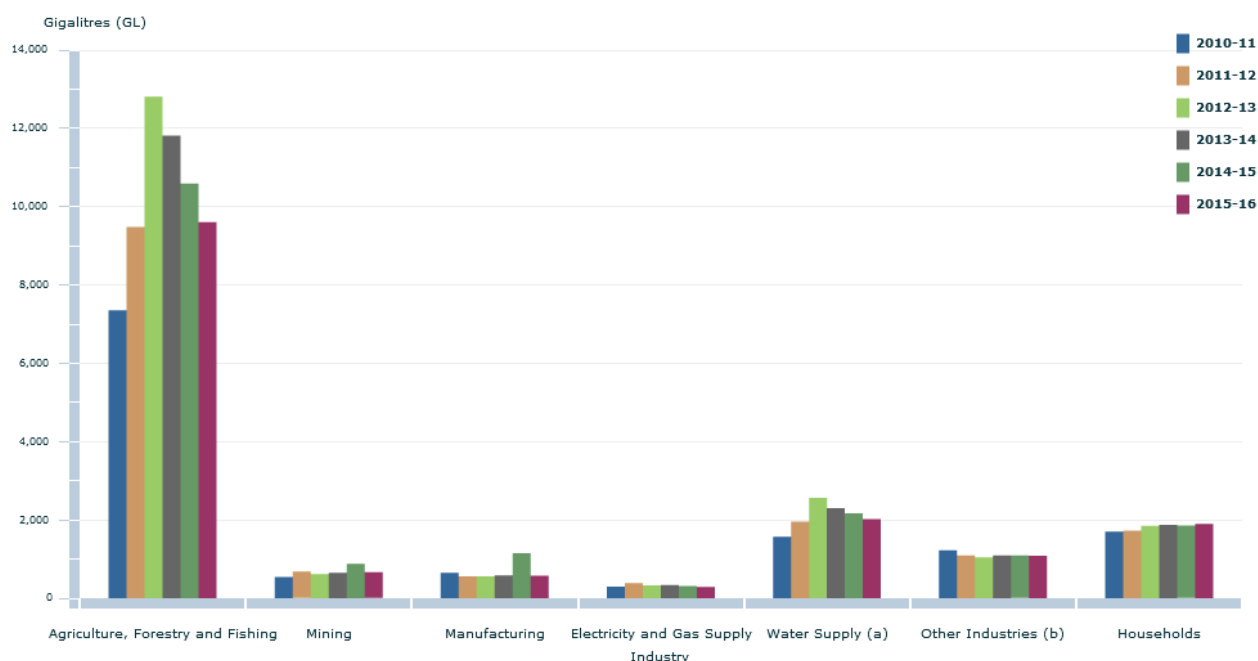
25 Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, *Final Report*, April 2018, p. 108; Lock the Gate Alliance, *Submission 28*, p. 8. Miss Helen Bender also noted that 'Groundwater is the only secure water available for feedlot development' for the areas in Queensland dependent upon the Great Artesian Basin (*Submission 29*, p. 11). See also Mr Lee McNicholl, Chairman, Basin Sustainability Alliance, *Committee Hansard*, 1 May 2018, p. 2.



2.13 In 2015–16, approximately 76,544 GL of water was extracted around Australia. The Australian Bureau of Statistics reported that total water consumption by households and industry was 16,132 GL, a decrease of 7.2 per cent compared to 2014–15, largely because of reductions in agricultural consumption in New South Wales and Victoria.<sup>26</sup>

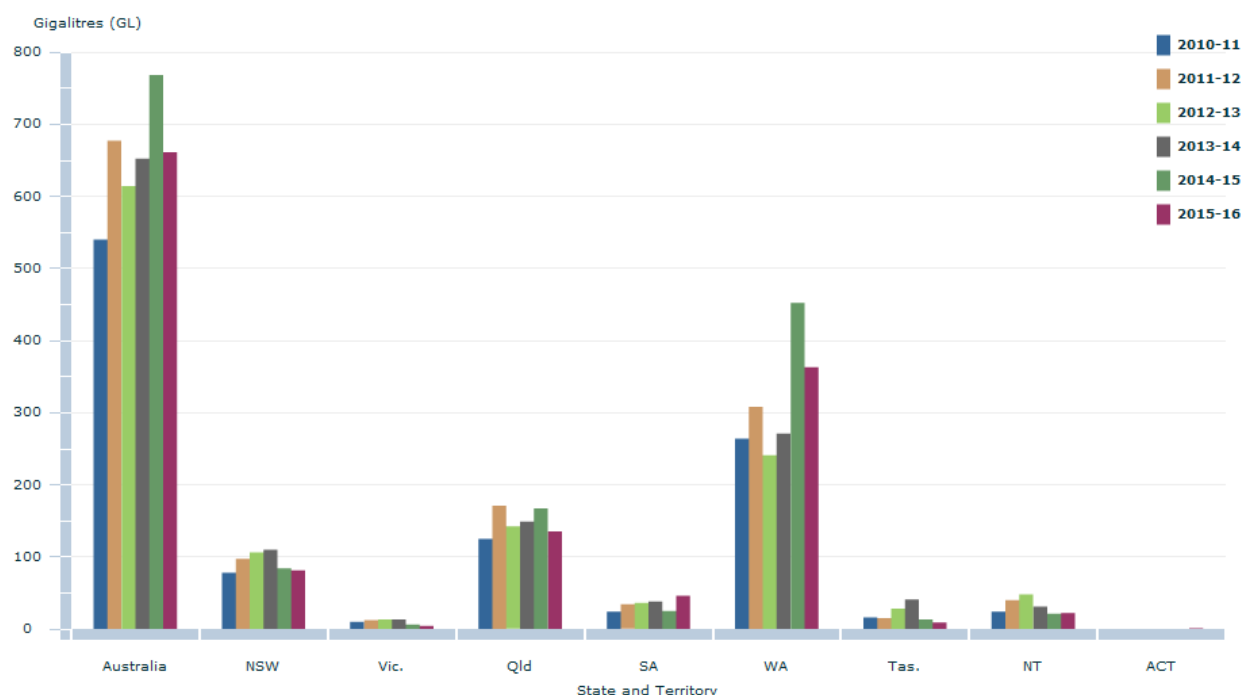
2.14 Most water (58.5 per cent) is used by the agricultural industry, with household use accounting for 11.8 per cent and mining accounting for 4.1 per cent of Australia's total water consumption. Agriculture is the primary user of water in all states and territories except the Australian Capital Territory, where water consumption is dominated by households (see Figure 2.5 and Figure 2.6).<sup>27</sup>

**Figure 2.5: Australia's total water consumption by industry, 2015–16<sup>28</sup>**



Source: Australian Bureau of Statistics

- 26 Australian Bureau of Statistics, *4610.0 – Water Account, Australia, 2015–16*, 23 November 2017, <http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4610.0Main%20Features22015-16?opendocument&tabname=Summary&prodno=4610.0&issue=2015-16&num=&view=> (accessed 23 May 2018).
- 27 Australian Bureau of Statistics, *4610.0 – Water Account, Australia, 2015–16*, 23 November 2017, <http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4610.0Main%20Features22015-16?opendocument&tabname=Summary&prodno=4610.0&issue=2015-16&num=&view=> (accessed 23 May 2018).
- 28 Australian Bureau of Statistics, *4610.0 – Water Account, Australia, 2015–16*, 23 November 2017, <http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4610.0Main%20Features22015-16?opendocument&tabname=Summary&prodno=4610.0&issue=2015-16&num=&view=> (accessed 22 May 2018).

**Figure 2.6: Water use by the mining industry by state/territory, 2015–16<sup>29</sup>**

Source: Australian Bureau of Statistics

2.15 The Australian Petroleum Production and Exploration Association (APPEA) emphasised that the oil and gas industry is a relatively small user of water compared with other industries. Dr Malcolm Roberts, APPEA's Chief Executive Officer, asserted that agriculture 'uses more water in Australia in a single day than the industry uses in an entire year. Manufacturing uses 22 times more water than the gas industry'.<sup>30</sup>

2.16 The Minerals Council of Australia argued that 'it is important to note the minerals industry often uses water not suitable for other industrial purposes, including saline and hypersaline water'.<sup>31</sup> The International Association of Hydrogeologists emphasised the mining industry's relative value for money proportional to its total water use.<sup>32</sup> This was echoed by APPEA, who contended that the oil and gas industry's water consumption represented 'exceptionally high economic value-add' compared with other industries.<sup>33</sup>

29 Australian Bureau of Statistics, *4610.0 – Water Account, Australia, 2015–16*, 23 November 2017, <http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4610.0Main%20Features22015-16?opendocument&tabname=Summary&prodno=4610.0&issue=2015-16&num=&view=> (accessed 22 May 2018).

30 Dr Malcolm Roberts, Chief Executive Officer, Australian Petroleum Production and Exploration Association, *Committee Hansard*, 2 May 2018, p. 15.

31 Minerals Council of Australia, *Submission 13*, p. 1.

32 International Association of Hydrogeologists, *Submission 9*, p. 3.

33 Australian Petroleum Production and Exploration Association Ltd, *Submission 22*, p. 10.

2.17 However, the Committee also heard from other submitters and witnesses that figures of water use did not necessarily equate to decreased impacts in comparison with other industries. Ms Georgina Woods from Lock the Gate Alliance suggested that estimates of overall water usage by the mining industry did not give an adequate picture of intensive use in small areas:

In the Hunter region, for example, the mining industry owns more than half of the high-security water licences in the regulated river and is a big groundwater user, particularly in the porous-rock aquifers. The Great Artesian Basin is another example of a water resource that has a significant and growing water use by the mining industry.<sup>34</sup>

2.18 Ms Joanne Rea, the Chair of Property Rights Australia, argued that agricultural use of water 'is necessarily estimated, always overstated and has more to do with the capacity of bores than actual usage'. She contended that although agriculture may use a significant amount of water, its impacts are spread across 'a wide area so that local impacts are minimal or manageable'.<sup>35</sup> The issue of impacts is further discussed in Chapter 4.

2.19 The Committee was told that competition for water resources between different industries may intensify in the future because of anticipated impacts on rainfall from climate change. The Nature Conservation Council of NSW argued in its submission that the:

Conflict between extractive industry's use of water resources and other users is likely to become more acute as the effects of climate change are felt in Southern Australia, with less water available for all users and for the environment.<sup>36</sup>

### ***Importance of water in Aboriginal cosmologies***

2.20 Many remote Aboriginal communities depend entirely on springs sourced from groundwater.<sup>37</sup> However, water, for some traditional owner groups, is important not just as a resource but also because of the cultural and spiritual meanings attached to particular waterways, natural catchment areas and the land.<sup>38</sup> In some instances, sacred sites for traditional owners extend beneath the surface of the earth and may include underground water.<sup>39</sup>

---

34 Ms Georgina Woods, Policy Coordinator, Lock the Gate Alliance, *Committee Hansard*, 2 May 2018, p. 30.

35 Ms Joanne Rea, Chair, Property Rights Australia, *Committee Hansard*, 1 May 2018, p. 31.

36 Nature Conservation Council of NSW, *Submission 7*, p. 1.

37 Ms Revel Pointon, Lawyer, Environmental Defenders Office Queensland, *Committee Hansard*, 1 May 2018, p. 28.

38 Law Council of Australia, *Submission 8*, p. 7; Miss Helen Bishop, *Submission 29*, p. 1.

39 Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, *Final Report*, April 2018, p. 25.

2.21 Miss Helen Bishop, in a submission prepared on behalf of the traditional owners of the area where the Rum Jungle abandoned uranium mine is located, stated that:

Several significant and sacred sites are located in the area which holds significant relevance to Koongurrukun and Warai people in bestowing and maintaining Mookununggunuk [epistemology] that maintains the knowledge of life for the area...

The importance of best practice rehabilitation and successful implementation of the rehabilitation plan are paramount to the maintenance of Mookununggunuk, in particular the sacred sites identified within the rehabilitation areas. These sites hold significant cultural values directly connected to underground water.<sup>40</sup>

2.22 The importance of water to Aboriginal identity was raised during the Northern Territory Government's *Scientific Inquiry into Hydraulic Fracturing in the Northern Territory*. The final report noted the centrality of water to Aboriginal identity:

Water is an essential part of traditional Aboriginal culture, both in terms of access for survival for groups living in remote areas, and also in terms of its spiritual link to Aboriginal sacred sites and religious customs.<sup>41</sup>

2.23 The Aboriginal Fracking Forum stated that:

We are concerned about the damage to our water, our country, our dreaming and our songlines. This damage would be irreversible...Drilling in one area has a bigger impact than just that place. It will damage neighbouring language groups on country and the entire water system...People and country are one and the same, any damage to our country impacts us, our identity and who we are.<sup>42</sup>

2.24 The issue of how regulatory frameworks address water rights for Traditional Owners is addressed in Chapter 3, while impacts specific to Traditional Owners are outlined in Chapter 4.

### ***Groundwater-dependent ecosystems***

2.25 Groundwater-dependent ecosystems rely on groundwater for some or all of their water requirements, whether directly or indirectly. These may include surface water ecosystems such as wetlands and rivers that rely on the surface expression of groundwater; terrestrial fauna and flora; terrestrial ecosystems dependent on

---

40 Miss Helen Bender, *Submission 29*, p. 3.

41 Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, *Final Report*, April 2018, p. 102.

42 Statement from the Aboriginal Fracking Forum, 19 November 2017, *Ban Fracking, Protect Country*, provided by Seed Indigenous Youth Climate Network, Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, *Final Report*, April 2018, p. 268.

subsurface groundwater; and subterranean ecosystems, such as aquifer and cave ecosystems.<sup>43</sup>

2.26 Some flora and fauna species that rely on artesian springs are listed as endangered species and communities, notably in areas lying above the Great Artesian Basin.<sup>44</sup> Several submitters argued that there is very little knowledge about local flora and fauna and how groundwater might interact with these species in some areas, including very remote regions where relatively little research has been conducted.<sup>45</sup>

2.27 The Committee heard evidence from an expert in groundwater ecosystems, Associate Professor Grant Hose, outlining the importance of water for ecosystems that live entirely underground, and how the organisms, stygofauna and microbes that live in aquifers contribute to the composition and quality of the aquifers' water. Professor Hose commented:

The biodiversity and the ecological functions, the importance of what lives in aquifers, is all too frequently overlooked. It does have immense value, just as we can go out on the street and quantify what a tree does; we can understand what that tree does and how important that tree is to the global environment...[O]rganisms in groundwater...have a similar function in making the environment better...Their capacity to do that is important, because it provides us with clean drinking water. It also supports the movement of water through aquifers. What lives in aquifers is important to the quality and the availability of water that's in there.<sup>46</sup>

2.28 Groundwater ecosystems, or ecosystems living entirely in water systems below ground, contribute to water quality by breaking down pollutants, purifying groundwater so that it is fit for consumption, and contributing to the storage and flow of water through aquifers. Stygofauna—the invertebrates that live in groundwater—are especially diverse in Australia. Few are listed as threatened species or members of threatened ecological communities, despite their rarity, because of the relatively recent recognition of their significance and difficulties associated with developing stygofauna taxonomy.<sup>47</sup> The Western Australian Government recognises the global significance of stygofauna; the Queensland Government has released guidelines for

---

43 Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, *Final Report*, April 2018, p. 113; Geoscience Australia, *Groundwater dependent ecosystems*, <http://www.ga.gov.au/scientific-topics/water/groundwater/understanding-groundwater-resources/groundwater-dependant-ecosystems> (accessed 24 May 2018).

44 Geoscience Australia, *Submission 2*, p. 3; Lock the Gate Alliance, *Submission 28*, p. 6.

45 Conservation Council of Western Australia, *Submission 27*, p. 21 (see Response from Vimy Resources, p. 6 for a counterargument to this claim); The Colong Foundation for Wilderness Ltd, *Submission 16*, p. 6.

46 Associate Professor Grant Hose, Department of Biological Sciences, Macquarie University, *Committee Hansard*, 2 May 2018, p. 36.

47 Associate Professor Grant Hose, *Submission 5*, pp. 2–3.

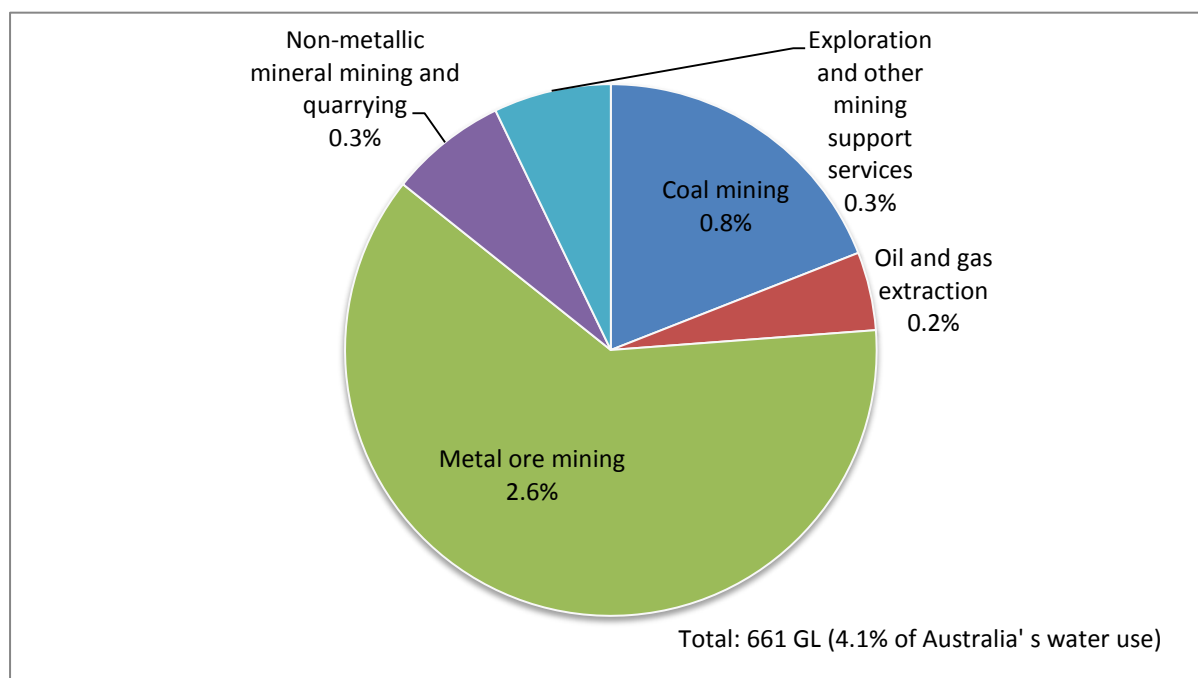
the assessment of stygofauna; and the New South Wales Government has risk assessment guidelines for groundwater-dependent ecosystems.<sup>48</sup>

### Methods of water use by the extractive industry

2.29 The amount of water extracted and methods of extraction employed by the extraction industry depend on the type of material being extracted, as well as local geography and geology.

2.30 As noted above, the mining industry as a whole was responsible for 4.1 per cent of Australia's total water consumption in 2015–16. Metal ore mining accounts for more than half of the mining industry's total water use (2.6 per cent of Australia's total water consumption), followed by coal mining (Figure 2.7).

**Figure 2.7: Water use by mining sectors as a proportion of total water use, 2015–16<sup>49</sup>**



Source: Australian Bureau of Statistics

2.31 Water use in the mining industry may differ in a number of aspects from water use in the oil and gas industry, as outlined below.

### Water use by the mining industry

2.32 The mining industry utilises water in various ways before, during and after mining operations. The New South Wales Minerals Council outlined types of water

48 Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, *Final Report*, April 2018, p. 115.

49 Australian Bureau of Statistics, *Water Account, Australia, 2015–16*, 23 November 2017, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4610.02015-16?OpenDocument> (accessed 23 May 2018).

take by mining companies that require water licenses, including: water that is extracted, is dewatered, is required for processing or washing, is required for dust suppression or water that flows into a void post-mining.<sup>50</sup>

2.33 The Queensland Department of Environment and Heritage Protection set out a definition of 'mine-affected water' that includes the following:

- groundwater from a mine's dewatering activities;
- mine pit water, tailings dam water, processing plant water;
- rainfall runoff which has been in contact with areas disturbed by mining activities (excluding rehabilitated areas); and
- groundwater which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated.<sup>51</sup>

*Dewatering of mines operating below the water table*

2.34 For mines operating at depths below the natural water table, water is extracted in a process called dewatering to allow mining to occur safely.<sup>52</sup> This water is removed via dewatering wells adjacent to the mine void. The Minerals Council of Australia noted in its submission that water extracted in this way may be used for operational purposes (such as minerals processing), and may either be managed onsite, or discharged where an operation has a license that allows this.<sup>53</sup>

2.35 Mining below the water table can result in final pit voids being left in the landscape after mining activities have ceased, with pit lakes forming once dewatering is no longer occurring. Geoscience Australia stated that this process can result in permanent changes to the local water table due to evaporative loss from pit lakes, as shown in Figure 2.8.

---

50 New South Wales Minerals Council, *Submission 15*, p. 5.

51 Queensland Department of Environment and Heritage Protection, *Guideline: Application of Operational Policy requirements to obtain enhanced environmental authority conditions for Fitzroy Basin Mines*, February 2014, p. 4, <https://www.ehp.qld.gov.au/assets/documents/regulation/rs-gl-apply-fitzroy-ea-conditions.pdf> (accessed 7 June 2018).

52 Minerals Council of Australia, *Submission 13*, p. 27.

53 Minerals Council of Australia, *Submission 13*, p. 27.

**Figure 2.8: Schematic diagram showing impacts of dewatering and final pit voids<sup>54</sup>**

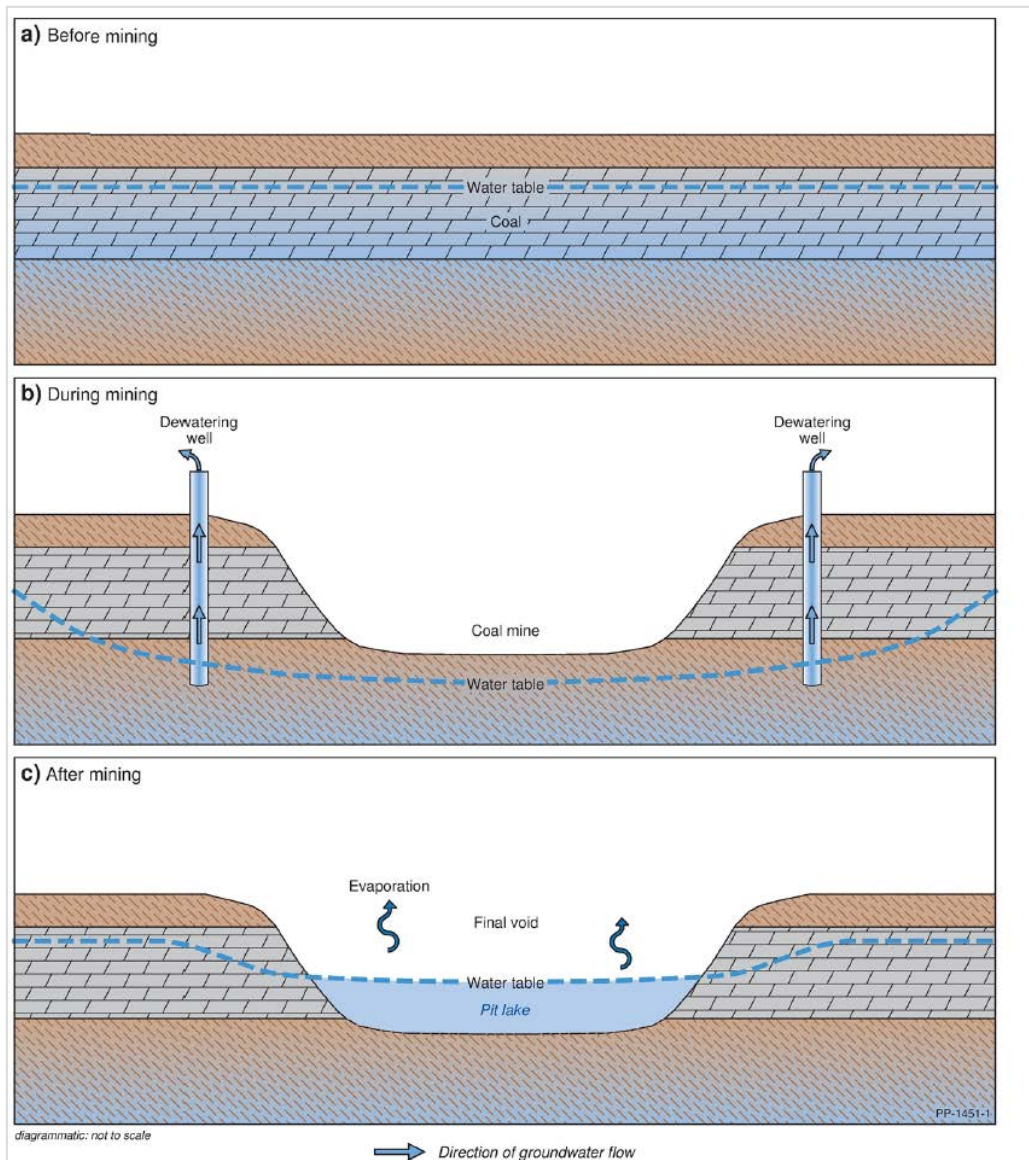


Figure 2 Schematic diagram of (a) an unmined, unconfined Coal seam; (b) the same system after dewatering during open-cut mining - the water table has been lowered around the mine so that groundwater does not discharge into the mine void; and (c) the same system after the mine has closed - dewatering has ceased and the water table rises again, however the final void becomes a groundwater 'sink' permanently lowering the water table in a zone around the void.

Source: Geoscience Australia

### Management of mine-affected and process water

2.36 In many cases, mine-affected water requires active management and cannot simply be released into the surrounding environment. This includes water used in minerals processing procedures (often referred to as process water), for example to



---

wash and prepare coal extracted in coal mining operations.<sup>55</sup> Processing uranium from its raw form into usable end product also involves significant water use.<sup>56</sup>

2.37 Management of mine-affected water is dealt with in various ways by the mining industry, depending on the type of water and the level of impact or contamination. The Minerals Council of Australia pointed to several examples of mines in Australia implementing specific measures to deal with mine-affected and process water, including:

- construction of a reverse osmosis water treatment plant at a coal mine in Queensland's Fitzroy Basin, to reduce the amount of mine-affected water held onsite to allow water treated in the plant to be used for other parts of the mining operations; and
- construction of a brine concentrator at the Ranger Uranium mine, which allows process water from the mine's tailings storage facility to be treated and discharged.<sup>57</sup>

#### *Accounting for water use by the minerals industry*

2.38 The Minerals Council of Australia discussed how the mining industry describes and accounts for its water use across the industry. It drew the Committee's attention to the Minerals Council of Australia Water Accounting Framework which, it stated, 'is widely considered international best practice in accounting'. It explained the purpose of the Water Accounting Framework as follows:

The framework enables water flows to be accounted for and quantified by source and destination through an input-output model. Standard definitions for both water 'source' and 'destination' categories create uniformity between companies and hence across the sector in how water quality, quantity and purpose is described. Agreed categories also describe the 'level of treatment effort' required to achieve a standard of water quality fit for human consumption. While indicative only and not reflective of end uses, this process supports benchmarking and continuous improvement.<sup>58</sup>

#### *Water use by the oil and gas industry*

2.39 The oil and gas industry in Australia incorporates the extraction of various petroleum products, including petroleum liquids (crude oil, condensate and liquid petroleum gas) as well as natural gas products.

2.40 Conventional gas extraction involves the drilling of wells to extract natural gas located in permeable material beneath impermeable rock. The gas is generally located in relatively large reservoirs and can be extracted via vertically drilled wells. Unconventional natural gas is located in less permeable rock or spread more diffusely

---

55 Lock the Gate Alliance, *Submission 28*, p. 2.

56 Conservation Council of Western Australia, *Submission 27*, p. 4.

57 Minerals Council of Australia, *Submission 13*, pp. 11–12.

58 Minerals Council of Australia, *Submission 13*, p. 10.

throughout a deposit. Forms of 'unconventional' gas include coal seam gas (natural gas located within coal seams), shale gas (located in shale rock formations) and tight gas (located within low permeability sandstone rock). Extraction of unconventional gas requires additional extractive processes.

2.41 APPEA's overview of how water is used in extractive oil and gas projects is summarised below. It noted that water use varies in each stage of the project life (exploration, development and production) and is different for different project types.<sup>59</sup>

*Water used in well drilling*

2.42 Water is a component of the drilling muds used for well drilling, with the amount of water used depending on how many times the mud is reused in different wells and the lifetime production of each well. APPEA stated that in Australia, 'the general rule of thumb for onshore wells is approximately 1 ML per well for drilling'.<sup>60</sup>

*Water found in oil and gas reserves brought to the surface during extractive processes*

2.43 Oil and gas extraction also involves bringing to the surface water that is present alongside the targeted resource. This water is called produced formation water (PFW) or, in coal seam gas operations, associated water.<sup>61</sup> APPEA noted that PFW is made up of various components and 'may include petroleum hydrocarbons, suspended solids, dissolved oxygen and salts'. It noted further that the volume and properties of PFW vary from location to location and over the productive life of a reservoir.<sup>62</sup>

2.44 APPEA explained how associated water is extracted in coal seam gas operations:

[Coal seam gas] is absorbed into the coal matrix and is held in place by the pressure of formation water. To extract the gas, a well is drilled into the coal seam and formation water from the coal cleats and fractures is pumped and withdrawn. The removal of water in the coal seam reduces the pressure, enabling the CSG (coal seam gas) to be released (desorbed) from the coal micropores and cleats, and allowing the gas and 'produced water' to be carried to the surface.<sup>63</sup>

---

59 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 11.

60 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 13.

61 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 13.

62 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 13.

63 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 30.

2.45 APPEA commented further that the volume of associated water and the amount of gas produced depend on the particular geological and hydrogeological features of a location:

No two wells or coal seams behave identically and associated water production can vary from a few thousand to hundreds of thousands of litres a day, depending on the underground water pressures and geology. A well will deliver most of its water at the start of the pumping phase. As the water is pumped from the coal formation, the pressure is released from the seam, and the gas begins to flow.

Associated water production and gas production are inversely proportional. As water rates decline, gas production increases...

Coals with lower permeability do not require as much water to be pumped to reduce the pressure on the coal. This is why some operations –for example in NSW and Queensland's Bowen Basin – produce lower volumes of water. Areas with higher permeability generally produce higher volumes of water. Different CSG operations produce differing amounts of water.<sup>64</sup>

2.46 APPEA noted that associated water extracted during coal seam gas operations can be treated and used in a range of different ways once brought to the surface, including:

- industrial reuse (for example, using associated water as cooling water for industrial projects which would otherwise have taken water from local streams or groundwater);
- agricultural reuse (for example, crop irrigation), reducing the need to extract water from local aquifers;
- injection of associated water back into local aquifers, increasing the volume of water stored in these aquifers; and
- river discharge—blending associated water with seasonal non-permanent streams.<sup>65</sup>

*Water used in hydraulic fracturing (fracking)*

2.47 Water is a major component of hydraulic fracturing (or fracking). Hydraulic fracturing involves pumping fluid at high pressure down a wellbore to initiate and encourage cracks in low permeability rock to recover gas and oil. This fluid contains water, sand or other solids and chemicals.<sup>66</sup>

---

64 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, pp. 30 and 31.

65 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 34.

66 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 13; BBC News, 'What is fracking and why is it controversial?', *BBC News*, 16 December 2015, <https://www.bbc.com/news/uk-14432401> (accessed 7 June 2018).

### *Moratoria and bans on particular forms of gas extraction*

2.48 Queensland and New South Wales are the only states in Australia where coal seam gas extraction is currently being undertaken, while other unconventional gas extraction involving fracking processes occurs in northeast South Australia.<sup>67</sup>

2.49 Victoria, Tasmania and Western Australia have moratoriums in place on hydraulic fracturing activities, while the Northern Territory Government has recently announced a decision to lift a moratorium on fracking previously in place.<sup>68</sup> The South Australian Government has proposed a ten-year moratorium on fracking activities in the Limestone Coast area of the state's southeast.<sup>69</sup>

### **Conclusion**

2.50 This chapter has outlined the background to Australia's underground water systems, major water users and how extractive industries take and use water. The following chapter outlines the regulatory frameworks governing water use.

---

67 Australian Government Department of the Environment and Energy, 'Coal and coal seam gas – Regulation', <http://www.environment.gov.au/water/coal-and-coal-seam-gas/regulation> (accessed 25 May 2018); Government of South Australia, 'Petroleum: Frequently asked questions', [http://petroleum.statedevelopment.sa.gov.au/frequently\\_asked\\_questions](http://petroleum.statedevelopment.sa.gov.au/frequently_asked_questions) (accessed 25 May 2018).

68 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, pp. 23–24; The Hon Michael Gunner, Chief Minister of the Northern Territory, *Media Release*, 'Fracking moratorium lifted – Strict laws to be in place before exploration or production can occur', 17 April 2018.

69 Nick Harmsen, *ABC News Online*, 'Fracking ban in SA's south-east may not need legislation, Steven Marshall says', 12 April 2018, <http://www.abc.net.au/news/2018-04-12/decade-long-fracking-ban-may-not-need-law-change/9642876>.

# Chapter 3

## Regulatory framework for use of underground water

3.1 This chapter provides an overview of regulatory arrangements governing water use by the extractive industry at the state and territory and Commonwealth levels. The chapter focuses on Commonwealth responsibilities and regulatory frameworks.

3.2 Since the 1990s, Commonwealth and state and territory governments have implemented significant reforms in water management in response to increased awareness of the impacts of water use on the environment.<sup>1</sup>

3.3 At the Commonwealth level, the Australian Constitution provides that the Commonwealth shall not 'abridge the right of a State or of the residents therein to the reasonable use of the waters of rivers for conservation or irrigation'.<sup>2</sup> It does not refer explicitly to underground water sources.

3.4 State and territory governments are primarily responsible for managing water resources.<sup>3</sup> Regulation to manage potential impacts from extractive industry activities is applied at both a Commonwealth and state and territory level, with different approaches evident between jurisdictions.<sup>4</sup>

3.5 However, under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), applications for coal seam gas or large coal mining developments that have, will have, or are likely to have a significant impact on a water resource must be approved by the Commonwealth Minister for the Environment and Energy (the Minister). This is known as the water trigger.

### Commonwealth and cross-jurisdictional regulatory arrangements

3.6 Commonwealth regulatory measures governing water use are the responsibility of the Department of Agriculture and Water Resources and the Department of the Environment and Energy.<sup>5</sup> Regulatory activities are, in the first instance, determined by the provisions of the EPBC Act. Several bodies and programs are responsible for collating and providing data and expert information on water resources and impacts of extractive industry activities, as outlined below.

---

1 Department of Agriculture and Water Resources, *Submission 30*, p. 2.

2 *Commonwealth of Australia Constitution Act*, section 100; Ms Joanne Rea, Chair, Property Rights Australia, *Committee Hansard*, 1 May 2018, p. 30.

3 Productivity Commission, *National Water Reform*, Report no. 87, December 2017, Canberra, p. v.

4 Geoscience Australia, *Submission 2*, p. ii.

5 Department of Agriculture and Water Resources, *Submission 30*, p. 1.

3.7 The Commonwealth Government also works with state and territory governments through the National Water Initiative and several regional plans to regulate water use.

***Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)***

3.8 The EPBC Act is the Commonwealth Government's central piece of environmental legislation and is the legal framework under which nationally and internationally important flora, fauna, ecological communities and heritage sites are managed. The EPBC Act defines these as matters of national environmental significance (MNES).<sup>6</sup>

3.9 Under the EPBC Act, actions that have, will have or are likely to have an impact on matters of national environmental significance must be assessed by the Minister. The EPBC Act does not apply to actions that are not likely to impact matters of national environmental significance. These are the responsibility of the states and territories.<sup>7</sup>

3.10 Actions that must be assessed under the EPBC Act can be assessed by accredited state and territory processes, and under assessment bilateral agreements between the Commonwealth and some state and territory governments (Western Australia, Queensland, New South Wales, South Australia and the Australian Capital Territory).<sup>8</sup> In this instance, the Department of Environment and Energy explained:

The role of the Environment Minister is then to approve the action based upon the assessment undertaken and apply approval conditions not otherwise applied by the state or territory, as needed, to provide adequate protection for MNES.<sup>9</sup>

3.11 Geoscience Australia submitted that because the relevant state and territory governments and the Commonwealth Government make their own decisions on project approval and develop their own approval conditions to meet differing requirements, '[t]his may result in two approval decisions and two sets of conditions'.<sup>10</sup>

3.12 The Commonwealth Government is also committed to implementing approval bilateral agreements. Under these approval bilateral agreements, jurisdictions would assess the likely impacts of a project and make a decision that takes into account both state matters and matters of national environmental significance. Approval bilateral agreements would require only one decision.<sup>11</sup> As of December 2017, no approval

---

6 Department of the Environment and Energy, *Submission 1*, p. 1.

7 Department of the Environment and Energy, *Submission 1*, p. 1.

8 Geoscience Australia, *Submission 2*, p. 12.

9 Department of the Environment and Energy, *Submission 1*, pp. 1–2.

10 Geoscience Australia, *Submission 2*, p. 12.

11 Department of the Environment and Energy, *One-Stop Shop for environmental approvals*, <http://www.environment.gov.au/epbc/one-stop-shop> (accessed 31 May 2018).

---

bilateral agreements were in place, although there were proposals to implement these.<sup>12</sup>

3.13 Issues raised in evidence about assessment bilateral agreements and the proposed approval bilateral agreements are discussed further in paragraphs 3.65–3.67.

*The water trigger*

3.14 Since 2013, applications for coal seam gas or large coal mining developments that have, will have, or are likely to have a significant impact on a water resource must be approved by the Minister. As outlined above, this is known as the water trigger.<sup>13</sup>

3.15 Under the EPBC Act, the Minister must take into account the precautionary principle when assessing projects with the potential to significantly impact a water resource. Guidelines released by the Department of the Environment and Energy on the water trigger state that 'if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation'.<sup>14</sup> The guidelines also state that proponents should take into account in their applications:

- the value of a water resource;
- potential changes to water quantity and/or quality;
- potential changes to water quality;
- potential changes to hydrological or hydrogeological connections (such as recharge rates, aquifer pressure and interactions between different water sources); and
- cumulative impacts of a project in tandem with existing and future developments at the local, aquifer/catchment and regional levels.<sup>15</sup>

3.16 The environmental assessment process may take several years for large and complex projects.<sup>16</sup> Approvals for projects may be contingent on the proponent meeting performance conditions, usually related to environmental and water performance requirements.<sup>17</sup> Throughout the duration of the projects, proponents may

---

12 Geoscience Australia, *Submission 2*, p. 12.

13 Department of the Environment and Energy, *Submission 1*, pp. 1–2.

14 Department of the Environment, *Significant impact guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources*, December 2013, p. 14, <http://www.environment.gov.au/system/files/resources/d078caf3-3923-4416-a743-0988ac3f1ee1/files/sig-water-resources.pdf> (accessed 31 May 2018).

15 Department of the Environment, *Significant impact guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources*, December 2013, pp. 16–20, <http://www.environment.gov.au/system/files/resources/d078caf3-3923-4416-a743-0988ac3f1ee1/files/sig-water-resources.pdf> (accessed 31 May 2018).

16 Minerals Council of Australia, *Submission 13*, pp. 1, 14.

17 Minerals Council of Australia, *Submission 13*, p. 16.

be required to consider impacts through ongoing water monitoring and management plans.<sup>18</sup>

3.17 As outlined in Chapter 1, the water trigger legislation was reviewed in 2017, with the review concluding that the water trigger is an appropriate measure to respond to risks associated with coal seam gas and large coal mining projects.<sup>19</sup>

3.18 Currently, the water trigger does not include shale and tight gas projects, although these must still be referred for assessment if they are likely to significantly impact other matters of national environmental significance listed under the EPBC Act. However, the Department of the Environment and Energy's post-implementation review of the water trigger concluded that 'the coverage of tight and shale gas may need to be considered as the investment in these processes moves from exploration to production'.<sup>20</sup>

3.19 The enactment of the water trigger has meant that a nationally consistent approach has been applied to the regulation of coal mining and coal seam gas projects impacting on water resources.<sup>21</sup> Geoscience Australia, the Department of Agriculture and Water Resources and the Independent Review of the Water Trigger Legislation agreed that approval conditions attached to projects assessed under the water trigger address the gaps between state and territory jurisdictions and Commonwealth requirements.<sup>22</sup>

3.20 When making a decision on matters referred under the water trigger, the Minister may take into account the state and territory government's assessment of the potential impacts of the project and any approval conditions attached to the project, as well as scientific advice provided by the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal and Mining Development (IESC).

*The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC)*

3.21 If a development related to the water trigger has been referred to the Minister, the Minister must seek the advice of the IESC in his or her deliberations. The IESC is

---

18 Dr Stuart Minchin, Chief, Environmental Geoscience Division, Geoscience Australia, *Committee Hansard*, 2 May 2018, p. 40.

19 Department of the Environment and Energy, *Submission 1*, p. 3.

20 Department of the Environment and Energy, *Implementation of the Water Trigger under the Environment Protection and Biodiversity Conservation Amendment Act 2013: Post Implementation Review*, December 2016, p. 21; Department of the Environment and Energy, *Submission 1*, p. 3.

21 Geoscience Australia, *Submission 2*, p. 9.

22 Geoscience Australia, *Submission 2*, p. 16; Department of Agriculture and Water Resources, *Submission 30*, p. 4; Commonwealth of Australia, *Independent Review of the Water Trigger Legislation*, April 2017, p. 6.



responsible for providing scientific advice to the Minister on the potential impacts of coal seam gas and large coal mining on water resources.<sup>23</sup>

3.22 Approval conditions attached to projects in response to the IESC's advice have included, for example, requirements for additional baseline data, additional monitoring of water levels and water quality, improvements to modelling, assessments of aquifer connectivity, limits on the type and extent of actions such as hydraulic fracturing, and management of the final void at large coal mines.<sup>24</sup>

3.23 A number of witnesses and submitters to the inquiry praised the work of the IESC in regulating impacts of coal mining and coal seam gas activities.<sup>25</sup> For example, Ms Joanne Rea from Property Rights Australia told the Committee that:

The Independent Expert Scientific Committee do an excellent job and they are transparent. The problems they find with applications, their requests for more information and their recommendations are often things that should have been picked up before a proposal got to them...<sup>26</sup>

3.24 The University of Queensland's Centre for Coal Seam Gas noted that the level of expert advice provided by the IESC 'is not readily available through state and territory assessment processes unless the regulator formally engages experts to contribute to the assessment'.<sup>27</sup> South Australia, Queensland, Victoria, New South Wales and the Northern Territory have in place agreed protocols to seek advice from the IESC when making their own assessments of large coal mining developments.<sup>28</sup>

#### *Environmental impact statements*

3.25 Proponents of significant extractive industry projects that are likely to impact the environment must provide environmental impact statements (EISs) in their applications for approval. Often, EISs use modelling to anticipate possible impacts on water sources. Geoscience Australia acknowledged that 'there is always a degree of uncertainty in the model predictions' because of their reliance on sparse data and information.<sup>29</sup>

---

23 Department of the Environment and Energy, *Submission 1*, p. 1; Geoscience Australia, *Submission 2*, p. 7; Department of Agriculture and Water Resources, *Submission 30*, p. 4.

24 Department of the Environment and Energy, *Submission 1*, p. 2.

25 Associate Professor Grant Hose, Department of Biological Sciences, Macquarie University, *Committee Hansard*, 2 May 2018, p. 36; Mr Tom Crothers, Consultant, Property Rights Australia, *Committee Hansard*, 1 May 2018, p. 34; Nature Conservation Council of NSW, *Submission 7*, p. 5; Dr Megan Kessler, Scientific Director, Environmental Defenders Office New South Wales, *Committee Hansard*, 2 May 2018, p. 28.

26 Ms Joanne Rea, Chair, Property Rights Australia, *Committee Hansard*, 1 May 2018, p. 31.

27 University of Queensland, Centre for Coal Seam Gas, *Submission 18*, p. 2.

28 Minerals Council of Australia, *Submission 13*, p. 25.

29 Geoscience Australia, *Submission 2*, p. 12.

### ***Bioregional Assessment Program***

3.26 The Commonwealth Government's Bioregional Assessment Program consists of independent scientific experts who, in consultation with government agencies, authorities and industry groups, analyse the potential impacts of coal seam gas and large coal mining developments on water and water-dependent assets.<sup>30</sup> The assessments provide a risk analysis on areas where potential impacts could occur in South Australia, Victoria, Queensland and New South Wales, and are intended to inform Commonwealth and state government decisions in the regulation of coal seam gas and coal mining operations. The IESC is able to draw on bioregional assessments in the advice it gives to the Commonwealth Government under the EPBC Act.<sup>31</sup>

3.27 Dr Stuart Minchin from Geoscience Australia explained that the program is 'an attempt by the Commonwealth to get some baseline information' against which to measure cumulative impacts, and 'to look at broadscale issues around the likelihood' of problems arising with a particular development'.<sup>32</sup> He argued that the program is 'a very significant and, I daresay, world-leading kind of approach in pulling together all of that knowledge in a given region'.<sup>33</sup>

3.28 The Department of the Environment and Energy stated that the Australian Government has provided \$94 million of funding to deliver the Bioregional Assessment Program, along with an additional \$30.4 million to extend the program to examine the potential environmental impacts of shale and tight gas projects and appropriate mitigation and management approaches.<sup>34</sup> Mr Bruce Edwards from the Department of the Environment and Energy stated that the first full bioregional assessments were released in July 2017, with the final bioregional assessments due to be published later in 2018.<sup>35</sup> Mr James Tregurtha, also from the Department, explained that program funding had been allocated 'towards areas of greatest need in terms of where development is actually happening or proposed to happen'.<sup>36</sup>

---

30 Department of the Environment and Energy, *Submission 1*, p. 2; Bioregional Assessments Program, *About the program*, 1 May 2018, <http://www.bioregionalassessments.gov.au/about> (accessed 30 May 2018).

31 Bioregional Assessments Program, *About the program*, 1 May 2018, <http://www.bioregionalassessments.gov.au/about> (accessed 30 May 2018).

32 Dr Stuart Minchin, Chief, Environmental Geoscience Division, Geoscience Australia, *Committee Hansard*, 2 May 2018, p. 43.

33 Dr Stuart Minchin, Chief, Environmental Geoscience Division, Geoscience Australia, *Committee Hansard*, 2 May 2018, p. 44.

34 Department of the Environment and Energy, *Submission 1*, p. 2.

35 Mr Bruce Edwards, Assistant Secretary, Policy and Reform Branch, Environment Standards Division, Department of the Environment and Energy, *Committee Hansard*, 2 May 2018, p. 50. Mr James Tregurtha, Acting First Assistant Secretary, Environment Standards Division, Department of the Environment and Energy, stated that 'there is another phase for the unconventional gas' assessments (p. 50).

36 Mr James Tregurtha, Acting First Assistant Secretary, Environment Standards Division, Department of the Environment and Energy, *Committee Hansard*, 2 May 2018, p. 50.

---

### ***The Australian Water Resource Information System and the National Water Account***

3.29 The Bureau of Meteorology is responsible for compiling, interpreting and providing comprehensive information about major water resources in Australia through the National Water Account.<sup>37</sup> Through the Australian Water Resource Information System (AWRIS), it also receives and interprets data about groundwater levels, water quality in rivers and aquifers, and water use and restrictions.<sup>38</sup>

3.30 Mr Christopher Biesaga from the Department of Agriculture and Water Resources noted that the National Water Account focuses on water resources that have 'high public interest'. He commented that he was only aware of one groundwater system that is included in the National Water Account.<sup>39</sup> Given its narrow focus on groundwater, the Department of Agriculture and Water Resources suggested that the National Water Account could be expanded:

With increased national interest in the management of the aquifers such as the Great Artesian Basin and the impact of water use by the extractive industry, the department notes that an opportunity exists for the establishment of a new Water Account to increase transparency and provide accessible information for both water resource managers and the public.<sup>40</sup>

3.31 It noted that this expanded role would be contingent on appropriate funding being made available, 'including from users of the resource'.<sup>41</sup>

#### ***Cross-jurisdictional initiatives***

3.32 The Commonwealth and state and territory governments are involved in a number of cross-jurisdictional initiatives related to regulation of water use by the extractive industry. These include:

- National Water Initiative;
- cooperative efforts to manage the Great Artesian Basin; and
- Murray-Darling Basin Plan.

---

37 Department of Agriculture and Water Resources, *Submission 30*, p. 7; Bureau of Meteorology, *Information sheet 3: Australian Water Resources Information System (AWRIS)*, [http://www.bom.gov.au/water/about/publications/document/InfoSheet\\_3.pdf](http://www.bom.gov.au/water/about/publications/document/InfoSheet_3.pdf) (accessed 4 June 2018); Bureau of Meteorology, *National Water Account*, <http://www.bom.gov.au/water/nwa/about.shtml> (accessed 4 June 2018).

38 Bureau of Meteorology, *Australian Water Resources Information System (AWRIS)*, <http://www.bom.gov.au/water/about/wip/awris.shtml> (accessed 4 June 2018).

39 Mr Christopher Biesaga, Director, Great Artesian Basin Section and Lake Eyre Basin Section, Department of Agriculture and Water Resources, *Committee Hansard*, 2 May 2018, p. 49.

40 Department of Agriculture and Water Resources, *Submission 30*, pp. 7–8.

41 Department of Agriculture and Water Resources, *Submission 30*, p. 8.

---

*The National Water Initiative*

3.33 The National Water Initiative (NWI) is a national commitment by the Commonwealth, state and territory governments for cohesive water management, planning, pricing and trade.<sup>42</sup> Jurisdictions have indicated that they will provide outcomes and actions for a number of key elements of the NWI, including water access entitlements and planning frameworks; water markets and trading; integrated management of water for environmental outcomes; and water resource accounting.<sup>43</sup>

3.34 Because the NWI is a joint commitment between governments, it has no compliance or enforcement arrangements attached to it unless additional agreements are in place, as is the case for the Murray-Darling Basin.<sup>44</sup>

3.35 In some instances, the NWI does not clearly address water use by extractive industries. Clause 34 of the NWI intergovernmental agreement acknowledged a number of issues in the application of its principles to the minerals and petroleum sectors, and allowed for additional policies and measures to be developed beyond the agreement for this sector:

The Parties agree that there may be special circumstances facing the minerals and petroleum sectors that will need to be addressed by policies and measures beyond the scope of this Agreement. In this context, the Parties note that specific project proposals will be assessed according to environmental, economic and social considerations, and that factors specific to resource development projects, such as isolation, relatively short project duration, water quality issues, and obligations to remediate and offset impacts, may require specific management arrangements outside the scope of this Agreement.<sup>45</sup>

3.36 The Productivity Commission has also stated that the 'NWI is ambiguous in how it applies to extractive industries'.<sup>46</sup>

3.37 The Department of Agriculture and Water Resources noted in its submission that 'national commitments made under the NWI have not been equally implemented across the nation'.<sup>47</sup> It argued that 'full implementation of the NWI is important for

---

42 Department of Agriculture and Water Resources, *Submission 30*, p. 2.

43 Productivity Commission, *National Water Reform*, Report no. 87, December 2017, Canberra, p. 7.

44 Department of Agriculture and Water Resources, *Submission 30*, p. 3.

45 *Intergovernmental Agreement on a National Water Initiative between the Commonwealth of Australia and the Governments of New South Wales, Victoria, Queensland, South Australia, the Australian Capital Territory and the Northern Territory*, 25 June 2004, para 34, pp. 6–7, <http://www.agriculture.gov.au/SiteCollectionDocuments/water/Intergovernmental-Agreement-on-a-national-water-initiative.pdf> (accessed 31 May 2018); Department of Agriculture and Water Resources, *Submission 30*, p. 3.

46 Productivity Commission, *National Water Reform*, Report no. 87, December 2017, Canberra, p. 17.

47 Department of Agriculture and Water Resources, *Submission 30*, p. 2.

---

water to reach to its highest value and for all water users to be confident in water planning and management'.<sup>48</sup>

3.38 The Productivity Commission recommended that 'a renewed NWI be negotiated through COAG [the Council of Australian Governments]'. It further proposed that this revised NWI should incorporate policy reform so that 'extractive industries and alternative water sources' are included in water entitlement frameworks.<sup>49</sup>

#### *Great Artesian Basin and Murray-Darling Basin*

3.39 As outlined in Chapter 2, the Commonwealth Government has been involved in cross-jurisdictional efforts with state and territory governments to manage water in the Great Artesian Basin and the Murray-Darling Basin. The Murray-Darling Basin Plan, in place since November 2012, sets limits for the amount of surface and groundwater that can be extracted by all industries operating in the Murray-Darling Basin, while the Commonwealth Government is currently in the process of drafting a new Great Artesian Basin strategic management plan.<sup>50</sup>

### **State and territory regulatory arrangements**

3.40 Environmental impacts beyond matters of national environmental significance, such as air and water quality, and environmental matters of state and local significance are the responsibility of states and territories.<sup>51</sup> State and territory governments also manage access rights to water resources and regulate mining activities.<sup>52</sup>

3.41 The Law Council of Australia (LCA) explained that state and territory water resources legislation focuses on management of the resource and taking of water. Impacts caused by the extraction, use and disposal of water by the extractive industry, the LCA stated, are more directly addressed in state and territory planning and development and environmental protection laws, as well as by Commonwealth oversight through the EPBC Act.<sup>53</sup>

3.42 Figure 3.1 gives a broad overview of state and territory regulatory arrangements governing water use by extractive industries.

---

48 Department of Agriculture and Water Resources, *Submission 30*, p. 8.

49 Productivity Commission, *National Water Reform*, Report no. 87, December 2017, Canberra, pp. 25, 43.

50 Geoscience Australia, *Submission 2*, p. 7; Mr Paul Morris, First Assistant Secretary, Water Division, Department of Agriculture and Water Resources, *Committee Hansard*, 2 May 2018, p. 48.

51 Department of the Environment and Energy, *Submission 1*, p. 1.

52 Department of Agriculture and Water Resources, *Submission 30*, p. 1.

53 Law Council of Australia, *Submission 8*, p. 4.

**Figure 3.1: State and territory approaches to regulation of water use by extractive industries<sup>54</sup>**

NSW	Under section 60I of the <i>Water Management Act 2000</i> (NSW), mining activities require a licence for any water taken as part of those activities.
Victoria	Under the <i>Water Act 1989</i> (Vic), extractive industries are required to obtain a take and use licence to secure water access, either from the market or via a new entitlement in areas where unallocated water exists.
Qld	Limited statutory water rights apply to incidental water take or ‘associated water’ for petroleum, gas and mining production. These rights operate outside the state’s water access entitlement and planning framework. These rights are conditional on underground water obligations, which include preparation of an underground water impact report and the requirement to enter ‘make good’ agreements with landholders. Water access entitlements are required for non-incidental take or ‘non-associated water’ use. Water rights for some mining companies are specified in special agreement Acts.
WA	Western Australia’s water licensing framework applies to water taken by extractive industries, with further guidance in government guidelines. State agreements for major projects may override some legislation like the <i>Rights in Water and Irrigation Act 1914</i> (WA).
SA	Mining and petroleum operations require a water licence where they take water from a prescribed water resource (many mines are outside of prescribed resource areas). In areas outside of prescribed areas, the <i>Natural Resources Management (NRM) Act 2004</i> (SA) allows for control of water take through regional NRM policies, which normally do not directly control volume. Licences are not required for water used to drill petroleum and gas wells for exploration purposes; instead these activities are authorised by the Minister for Sustainability, Environment and Conservation.
Tasmania	Mines are required to have a licence under the <i>Water Management Act 1999</i> (Tas) to take water from a watercourse or lake but groundwater does not require a licence unless specified under a water management plan or a Groundwater Area.
Northern Territory	Mining and petroleum operations are exempt from water licence and permit provisions under the <i>Water Act 1992</i> (NT). Currently, a memorandum of understanding seeks to clarify the relationship between agencies with the aim of ensuring water resource use for mining does not impinge on existing allocations for other users and vice versa. Proposed amendments to the Water Act will require all new and increased water use by mining and petroleum activities to be subject to the same water licensing requirements as other water users from 2018 onwards.

<sup>54</sup> Geoscience Australia, *Submission 2*, p. 11.

3.43 Most states and territories have more than 80 per cent of their water use managed under water plans. Arrangements governing water plans ensure water resources are shared between consumptive users and the environment. All jurisdictions have in place water metering, accounting and compliance systems, and all, except Western Australia and the Northern Territory, have legislation for statutory-based water entitlement and planning arrangements.<sup>55</sup> Some jurisdictions have alternative water rights arrangements for extractive industries outside water entitlements and planning frameworks.<sup>56</sup> In general, monitoring activities are the remit of individual state jurisdictions, not the Commonwealth.<sup>57</sup>

3.44 Some evidence received by the Committee concerned gaps in state and territory regulatory arrangements.<sup>58</sup> For example, a number of submitters and witnesses drew the Committee's attention to inconsistencies in the regulatory requirements for the extractive industry in Queensland as compared to other industries. It was stated that the extractive industry is permitted to take an unlimited amount of water without a licence or paying for the water if it is extracted in the course of their regular operations as 'associated water'.<sup>59</sup>

3.45 The Committee was given conflicting information about this issue, with one submitter reporting that associated water is not included in estimates of total water use across the state, and a witness stating that even though an unlimited take of associated water is permitted, it still must be reported and monitored.<sup>60</sup> Dr Malcolm Roberts, the Chief Executive Officer of the Australian Petroleum Production and Exploration Association, argued that Queensland's system involved a comprehensive network of monitoring bores to observe any impacts on water sources.<sup>61</sup>

---

55 Productivity Commission, *National Water Reform*, Report no. 87, December 2017, Canberra, pp. 8, 11.

56 Productivity Commission, *National Water Reform*, Report no. 87, December 2017, Canberra, pp. 17, 82–83.

57 Dr Stuart Minchin, Chief, Environmental Geoscience Division, Geoscience Australia, *Committee Hansard*, 2 May 2018, p. 40.

58 Environmental Defenders' Offices of Australia, *Submission 4*, p. 15.

59 Environmental Defenders' Offices of Australia, *Submission 4*, p. 17; Basin Sustainability Alliance, *Submission 20*, p. 2; Lock the Gate Alliance, *Submission 28*, pp. 4–5, 6; Miss Helen Bender, *Submission 29*, p. 2; Mr Maxwell Winders, Director, Wambo Cattle Company Pty Ltd, *Committee Hansard*, 1 May 2018, p. 3; Ms Joanne Rea, Chair, Property Rights Australia, *Committee Hansard*, 1 May 2018, p. 31; Mr Tom Crothers, Consultant, Property Rights Australia, *Committee Hansard*, 1 May 2018, p. 36; Ms Revel Pointon, Lawyer, Environmental Defenders Office Queensland, *Committee Hansard*, 2 May 2018, p. 25.

60 Environmental Defenders' Offices of Australia, *Submission 4*, p. 17; Professor Jonathan Fulcher, Private Capacity, *Committee Hansard*, 1 May 2018, p. 16. Mr Tom Crothers, Consultant, Property Rights Australia, stated that associated water began to be measured from late 2016 (*Committee Hansard*, 1 May 2018, p. 37).

61 Dr Malcolm Roberts, Chief Executive Officer, Australian Petroleum Production and Exploration Association, *Committee Hansard*, 2 May 2018, p. 17.

3.46 The Committee also heard concerns that much of the responsibility for the monitoring and baseline testing included in make-good agreements in Queensland is placed on land-owners. Ms Verity Morgan Schmidt, the Chief Executive Officer of Farmers for Climate Action, told the Committee:

They are trying to navigate this process and understand what a good make-good agreement needs to look like at the same time as they are grappling with drought, feeding stock and the realities of running a large farm business...The onus for the responsibility for delivering and pursuing that is being pushed back onto the graziers themselves, which seems to be quite disadvantageous.<sup>62</sup>

3.47 One witness expressed his worry that make-good agreements only apply to land-owners directly affected by extractive industry activities, while in the long-term other land-owners living in a connected water system may also be negatively affected by reduced water supply.<sup>63</sup>

3.48 The Department of Agriculture and Water Resources emphasised the importance of all states and territories implementing comprehensive water planning frameworks, arguing that the existence of statutory water rights outside water planning frameworks 'reduces transparency, limits the capacity of water planning to sustainably and transparently manage all water use and potentially compromises access to water for other users and the environment'.<sup>64</sup>

3.49 A bioregional assessment from the Federal Government released in June 2018 noted that existing coal mines could affect groundwater drawdown in an area of 4307 square kilometres, and there was at least a five per cent risk that additional coal resource development could lead to changes in groundwater for 3213 square kilometres of the region.<sup>65</sup>

### **Issues and gaps identified in current Commonwealth regulatory systems**

3.50 Evidence provided to the inquiry outlined a number of issues related to Commonwealth regulation of water. These included broad criticisms of the regulatory systems in place, as well as concerns about specific issues.

3.51 The Committee received a range of views concerning regulatory approaches to extractive industries compared with other water users. For example, the International Association of Hydrogeologists argued that other industries were not required to measure and report on groundwater levels and quality to the extent

---

62 Ms Verity Morgan-Schmidt, Chief Executive Officer, Farmers for Climate Action, *Proof Committee Hansard*, 10 September 2018, p. 3.

63 Mr Angus Emmott, Private capacity, *Proof Committee Hansard*, 10 September 2018, p. 4.

64 Department of Agriculture and Water Resources, *Submission 30*, p. 3.

65 Bioregional Assessments Program, *Coal resource development and water resources in the Hunter subregion*, <https://www.bioregionalassessments.gov.au/factsheets/coal-resource-development-and-water-resources-hunter-subregion> (accessed 26 July 2018).



required of the extractive industry.<sup>66</sup> The Association described Commonwealth regulation as a 'duplication' of state frameworks and suggested that the regulatory frameworks governing extractive industry water use, from Commonwealth to state to local requirements, were 'among the most stringent in the world'.<sup>67</sup>

3.52 Nevertheless, the International Association of Hydrogeologist's Australian President told the Committee that because of discrepancies between jurisdictions in the level of rigour required of extractive industry proposals, 'it is important to have a Commonwealth-level regulatory framework that addresses certain large, high-risk projects'.<sup>68</sup>

3.53 Ms Revel Pointon, a lawyer from the Environmental Defenders Office Queensland, argued that 'the extractive industries are often exempt from a lot of the requirements that are being provided to other water users, including the agricultural industry', as did Mr Mark McKenzie, the Chief Executive Officer of the New South Wales Irrigators Council.<sup>69</sup>

3.54 Some submitters were of the opinion that existing regulatory frameworks were inadequate.<sup>70</sup> For example, Property Rights Australia argued that regulation focused on managing impacts and compensating land owners for damage, rather than prevention of damage, contamination or draining of Australia's aquifer and water systems.<sup>71</sup> The Environmental Defenders' Offices of Australia contended that current requirements failed to protect the interests of current and future water users.<sup>72</sup> The Conservation Council of Western Australia expressed concern that Commonwealth conditions applied to projects were inconsistent with state conditions or former conditions applied to similar projects, and were not always applied or enforced.<sup>73</sup>

3.55 Specific problems identified in evidence include:

---

66 International Association of Hydrogeologists, *Submission 9*, pp. 2, 5. See also Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, pp. 2, 21; Dr Malcolm Roberts, *Committee Hansard*, 2 May 2018, p. 15.

67 International Association of Hydrogeologists, *Submission 9*, pp. 3, 4; Dr Lange Jorstad, President, Australian Chapter, International Association of Hydrogeologists, *Committee Hansard*, 2 May 2018, p. 4. See also Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 3; Dr Gavin Lind, Director, Workforce and Health, Safety, Environment and Communities, Minerals Council of Australia, *Committee Hansard*, 1 May 2018, p. 25.

68 Dr Lange Jorstad, President, Australian Chapter, International Association of Hydrogeologists, *Committee Hansard*, 2 May 2018, p. 6.

69 Ms Revel Pointon, Lawyer, Environmental Defenders Office Queensland, *Committee Hansard*, 42 May 2018, p. 24; Mr Mark McKenzie, Chief Executive Officer, New South Wales Irrigators Council, *Committee Hansard*, 2 May 2018, p. 9.

70 Conservation Council of Western Australia, *Submission 27*, p. 1.

71 Property Rights Australia Incorporated, *Submission 21*, p. 2.

72 Environmental Defenders' Offices of Australia, *Submission 4*, p. 2; The Colong Foundation for Wilderness Ltd, *Submission 16*, p. 1.

73 Conservation Council of Western Australia, *Submission 27*, p. 4.

- limitations of the water trigger;
- insufficient recognition of cumulative impacts and limited bioregional assessments;
- bilateral agreements with states and territories;
- approvals given despite uncertainty in modelling;
- lack of research on environmental impacts in general;
- limited recognition of the value of groundwater ecosystems;
- insufficient compliance and enforcement of compliance;
- limited economic value given to the environment;
- limitations of the National Water Initiative;
- lack of consultation with Traditional Owners; and
- limited regulation of the impacts of abandoned mines.

### ***Limitations of the water trigger***

3.56 This inquiry's terms of reference directed the Committee to examine the value of expanding the water trigger to include other projects, such as shale and tight gas. Some submitters were not in favour of expanding the water trigger<sup>74</sup>, while others considered that the existing water trigger framework was unnecessary because it duplicated current arrangements.<sup>75</sup>

3.57 For example, the International Association of Hydrogeologists argued that a water trigger 'should apply to all groundwater users and not single out coal mining and the onshore gas industry' without a scientific basis for doing this.<sup>76</sup>

3.58 While Geoscience Australia acknowledged that 'there is no scientific reason to regulate potential impacts to water resources differently', it proposed that the water trigger should employ a consistent approach to all industries that use water on the basis of their potential impacts on water resources. This was also echoed by the University of Queensland's Centre for Coal Seam Gas, which noted that other 'sectors

---

74 Buru Energy Limited, *Submission 14*, p. 5; Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 3. The Northern Territory Government (*Submission 3*, p. 4) argued that it 'would need to be convinced of the efficacy' of expanding the water trigger.

75 Minerals Council of Australia, *Submission 13*, pp. 2, 30–31; New South Wales Minerals Council, *Submission 15*, p. 7; Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 3.

76 International Association of Hydrogeologists, *Submission 9*, p. 5

which extract large volumes of water e.g., large-scale irrigation developments are also not referred to the IESC for review'.<sup>77</sup>

3.59 However, many submitters and witnesses to the inquiry proposed expanding the water trigger to include all unconventional gas projects, including shale and tight gas.<sup>78</sup> For example, the Environmental Defenders' Offices of Australia proposed that the water trigger be expanded to include exploration and projects for all forms of unconventional gas and all large mines excavating below the water table.<sup>79</sup> It further argued that the water trigger in its current form 'does not require the Minister to refuse a development likely to have a significant impact on water resources' or 'to act consistently with the advice of the IESC'.<sup>80</sup> The National Farmers' Federation proposed amending the EPBC Act to require the Minister to take the IESC's advice into account when providing approvals.<sup>81</sup>

3.60 Mr Bruce Edwards from the Department of the Environment and Energy noted that if shale and tight gas 'were added under the water trigger then obviously it would depend on shale development going forward, and that hasn't been the case yet'.<sup>82</sup> However, as outlined in paragraph 3.18, the Department of the Environment and Energy's post-implementation review of the water trigger concluded that consideration could be given to expanding the water trigger once these activities move from exploration to production.<sup>83</sup>

---

77 Geoscience Australia, *Submission 2*, p. 16; University of Queensland Centre for Coal Seam Gas, *Submission 18*, p. 3. See also Professor Andrew Garnett, Director, Centre for Coal Seam Gas, University of Queensland, *Committee Hansard*, 1 May 2018, p. 20.

78 Ms Revel Pointon, Lawyer, Environmental Defenders Office Queensland, *Committee Hansard*, 2 May 2018, p. 24; Ms Georgina Woods, Policy Coordinator, Lock the Gate Alliance, *Committee Hansard*, 2 May 2018, p. 30; Nature Conservation Council of NSW, *Submission 7*, p. 5; Conservation Council of South Australia, *Submission 10*, p. 5; Ms Gillian Pechey, *Submission 12*, p. 1; Basin Sustainability Alliance, *Submission 20*, pp. 4, 24; Property Rights Australia Incorporated, *Submission 21*, p. 15; Lock the Gate Alliance, *Submission 28*, p. 2; Miss Helen Bender, *Submission 29*, p. 13.

79 Environmental Defenders' Offices of Australia, *Submission 4*, p. 4.

80 Environmental Defenders' Offices of Australia, *Submission 4*, p. 20; Ms Revel Pointon, Lawyer, Environmental Defenders Office Queensland, *Committee Hansard*, 2 May 2018, p. 24. See also Associate Professor Grant Hose, Department of Biological Sciences, Macquarie University, *Committee Hansard*, 2 May 2018, p. 39.

81 National Farmers' Federation, *Submission 17*, p. 10.

82 Mr Bruce Edwards, Assistant Secretary, Policy and Reform Branch, Environment Standards Division, Department of the Environment and Energy, *Committee Hansard*, 2 May 2018, p. 52.

83 Department of the Environment and Energy, *Implementation of the Water Trigger under the Environment Protection and Biodiversity Conservation Amendment Act 2013: Post Implementation Review*, December 2016, p. 21; Department of the Environment and Energy, *Submission 1*, p. 3.

### *Cumulative impacts and bioregional assessments*

3.61 Several submitters to the inquiry were of the opinion that current regulatory frameworks do not sufficiently take into account the cumulative impact of extractive industry activities on water sources.<sup>84</sup>

3.62 The Minerals Council of Australia submitted that in recent years, cumulative environmental impact assessments increasingly have been required in environmental impact assessments at both state/territory and Commonwealth levels. It stated that there had been little best practice guidance available to industry on how to prepare this information.<sup>85</sup>

3.63 Geoscience Australia noted that establishing scientific baselines to assess cumulative impacts is fraught with difficulties:

In areas of cumulative surface water and groundwater use, establishing scientific baselines to assess, manage and regulate any potential impacts to these resources is highly challenging. This is especially relevant where these cumulative impacts develop over time, such as the gradual growth of a number of extractive industry projects in a region.<sup>86</sup>

3.64 Geoscience Australia recommended that '[f]urther assessment of the effectiveness of the current regulation of cumulative impacts is needed to provide evidence to inform the regulatory approach to managing potential impacts to water resources'.<sup>87</sup>

3.65 A number of submitters emphasised the importance of bioregional assessments to understanding long-term impacts in a region. For example, the LCA argued that bioregional assessments 'allow regulators to impose clear conditions that are effective and enforceable, and provide more information and transparency upfront in the approval process' to strengthen public confidence in the regulatory system.<sup>88</sup>

3.66 The Committee also heard concerns that many bioregional assessments remain incomplete.<sup>89</sup> Lock the Gate Alliance submitted that despite this, projects

---

84 See, for example, Nature Conservation Council of NSW, *Submission 7*, p. 3; Conservation Council of South Australia, *Submission 10*, p. 5; NSW Irrigators' Council, *Submission 11*, p. 9; Mr Tony Windsor MP and Mr John Clements, *Submission 23*, p. 7; Miss Helen Bender, *Submission 29*, p. 13.

85 Minerals Council of Australia, *Submission 13*, p. 2.

86 Geoscience Australia, *Submission 2*, p. 13.

87 Geoscience Australia, *Submission 2*, p. 13.

88 Law Council of Australia, *Submission 8*, p. 6; Australian Farmers for Climate Action, *Submission 6*, p. 6.

89 Ms Revel Pointon, Lawyer, Environmental Defenders Office Queensland, *Committee Hansard*, 2 May 2018, p. 28.

continue to be approved.<sup>90</sup> The Environmental Defenders' Offices of Australia submitted that bioregional assessments 'should be completed as a matter of priority'.<sup>91</sup>

### ***Bilateral agreements***

3.67 Some submitters and witnesses questioned how effective bilateral agreements are in the hands of states and territories.<sup>92</sup> One submission suggested that the effect of bilateral agreements has meant that states 'provide, vet and control much of the information'.<sup>93</sup> The Nature Conservation Council of NSW argued that '[d]irect Commonwealth involvement is required to ensure that an appropriate level of scientific rigour is maintained in the face of economic pressures'.<sup>94</sup> Similarly, the New South Wales Irrigators' Council called for assessments of projects that fall under the water trigger to 'remain within the remit of the Federal Government and not be delegated to the State authorities'.<sup>95</sup>

3.68 However, the Australian Petroleum Production and Exploration Association argued that the EPBC Act was originally intended 'to encourage Bilateral Agreements, not remove them'.<sup>96</sup>

3.69 The Independent Review of the Water Trigger Legislation recommended that if governments wish to pursue bilateral approval agreements, an independent review should be conducted to analyse state regulatory systems, practice and policy and to recommend any necessary changes to each state systems so that these would be in line with the requirements of the water trigger.<sup>97</sup>

### ***Approvals given despite uncertainty in modelling***

3.70 A number of submitters expressed concern that the modelling used by extractive industries in their applications for approval was poor, limited or incomplete.<sup>98</sup> For example, Dr Lange Jorstad from the International Association of Hydrogeologists noted that one area where he consistently heard 'there is a failing is in

---

90 Lock the Gate Alliance, *Submission 28*, p. 2.

91 Environmental Defenders' Offices of Australia, *Submission 4*, p. 19.

92 Lock the Gate Alliance, *Submission 28*, p. 2; Ms Georgina Woods, Policy Coordinator, Lock the Gate Alliance, *Committee Hansard*, 2 May 2018, p. 31.

93 Mr Tony Windsor MP and Mr John Clements, *Submission 23*, p. 8.

94 Nature Conservation Council of NSW, *Submission 7*, p. 5.

95 NSW Irrigators' Council, *Submission 11*, p. 5.

96 Australian Petroleum Production and Exploration Association Ltd, (APPEA), *Submission 22*, p. 28.

97 Commonwealth of Australia, *Independent Review of the Water Trigger Legislation*, April 2017, p. 10.

98 Environmental Defenders' Offices of Australia, *Submission 4*, p. 5; Environmental Defenders' Offices of Australia, *Submission 4*, p. 9; Conservation Council of Western Australia, *Submission 27*, p. 9; Miss Helen Bender, Private capacity, *Committee Hansard*, 1 May 2018, p. 5. See also Caroon Coal Action Group Inc, *Submission 26*, p. 2.

the predictive assessment, through computer modelling, of impacts' expected from a particular project.<sup>99</sup>

3.71 Some evidence also questioned the reliability of modelling used by extractive industries and governments. Mr Maxwell Winders, a landholder living in Queensland, contended that detailed groundwater impact modelling that he commissioned his associated environmental engineering company and a consultant to undertake on his property indicated 'considerably more impairment' to a local aquifer than did modelling provided by the Office of Groundwater Impact Assessment. The Queensland Government established this industry-funded body to provide 'evidence-based independent scientific assessment of cumulative groundwater impacts from resource operations'.<sup>100</sup>

3.72 The Environmental Defenders' Offices of Australia proposed that in the absence of comprehensive data, 'mining and unconventional gas developments should not be assessed under the EPBC Act'.<sup>101</sup> It drew the Committee's attention to the example of the proposed Adani Carmichael coal mine in Central Queensland. Dr Jorstad took a similar view, telling the Committee that:

There were concerns that the operation of the mine would diminish or completely destroy the supply to those springs. There is a fairly strongly held opinion, after the decision was made on that project, that there still was not a good enough understanding of where the water supplying those springs was coming from. This was perhaps the most fundamental thing that should have been resolved prior to an approval on that project...

There were some fairly fundamental aspects of that computer model that one of the independent reviewers felt were insufficient as the basis for impact prediction. There was too much uncertainty, and the uncertainty was not quantified in any useful way. Essentially it was given a very light treatment.<sup>102</sup>

3.73 The LCA argued that for adaptive management conditions to be effective in preventing impacts on the environment, 'there still must be a sufficient baseline of

---

99 Dr Lange Jorstad, President, Australian Chapter, International Association of Hydrogeologists, *Committee Hansard*, 2 May 2018, p. 3.

100 Queensland Government, *Office of Groundwater Impact Assessment*, <https://www.business.qld.gov.au/industries/mining-energy-water/resources/environment-water/ogia> (accessed 23 July 2018); Mr Maxwell Winders, *Submission 25*, pp. 6–8; Mr Maxwell Winders, Director, Wambo Cattle Company Pty Ltd, *Committee Hansard*, 1 May 2018, p. 1.

101 Environmental Defenders' Offices of Australia, *Submission 4*, p. 20.

102 Dr Lange Jorstad, President, Australian Chapter, International Association of Hydrogeologists, *Committee Hansard*, 2 May 2018, p. 3; Environmental Defenders' Offices of Australia, *Submission 4*, p. 7; Ms Revel Pointon, Lawyer, Environmental Defenders Office Queensland, *Committee Hansard*, 2 May 2018, p. 28.

knowledge and understanding of the particular water resource'.<sup>103</sup> It submitted that in the absence of research, ideally no extractive project should be approved, noting that it may not be possible or realistic to defer extraction until appropriate baseline data is available. It suggested that in this instance, 'regulators and courts must fall back on fundamental principles, such as the precautionary principle, to make decisions about proposed projects'.<sup>104</sup>

3.74 The LCA noted that regulators at both the state and Commonwealth levels apply the precautionary principle in practice by setting conditions based on adaptive management approaches for projects in which there is scientific uncertainty. These conditions may require the proponent to carry out further research to close knowledge gaps, apply conservative management strategies, periodically evaluate monitoring results against existing models, and adjust models and management strategies as knowledge gaps are closed.<sup>105</sup> Dr Stuart Minchin, Geoscience Australia, was of the opinion that such measures may be 'entirely appropriate, because it can take years' to obtain baseline data.<sup>106</sup>

3.75 Dr Minchin asserted that because of a lack of clarity surrounding uncertainties present in particular forms of modelling, 'regulators are having to make decisions at times without really understanding the level of uncertainty associated with those models'.<sup>107</sup> Geoscience Australia recommended that regulators require proponents to clearly report uncertainty in their model predictions of potential impacts to groundwater.<sup>108</sup>

### ***Lack of research***

3.76 A number of submitters drew the Committee's attention to the lack of research surrounding impacts caused by water extraction and the interaction of different water resources more broadly.<sup>109</sup> Dr Lange Jorstad, the President of the Australian Chapter of the International Association of Hydrogeologists, acknowledged that research and

---

103 Law Council of Australia, *Submission 8*, p. 6; Ms Robyn Glindemann, Deputy Chair, Australian Environment and Planning Law Group, Legal Practice Section, Law Council of Australia, *Committee Hansard*, 1 May 2018, p. 39.

104 Law Council of Australia, *Submission 8*, p. 5. See also Mr Mark McKenzie, Chief Executive Officer, New South Wales Irrigators Council, *Committee Hansard*, 2 May 2018, p. 14.

105 Law Council of Australia, *Submission 8*, p. 6.

106 Dr Stuart Minchin, Chief, Environmental Geoscience Division, Geoscience Australia, *Committee Hansard*, 2 May 2018, p. 41.

107 Dr Stuart Minchin, Chief, Environmental Geoscience Division, Geoscience Australia, *Committee Hansard*, 2 May 2018, p. 41.

108 Geoscience Australia, *Submission 2*, p. 13.

109 Australian Farmers for Climate Action, *Submission 6*, p. 6; Conservation Council of South Australia, *Submission 10*, p. 3; National Farmers' Federation, *Submission 17*, pp. 3–6; Ms Robyn Glindemann, Deputy Chair, Australian Environment and Planning Law Group, Legal Practice Section, Law Council of Australia, *Committee Hansard*, 1 May 2018, p. 38; Associate Professor Grant Hose, Department of Biological Sciences, Macquarie University, *Committee Hansard*, 2 May 2018, pp. 36–37.

understanding of site-specific characteristics is often limited for large projects. Dr Jorstad described the information as 'basically a set of pinholes in a very large mass of land. We make a lot of inferences about what is between those data points and how they interact with each other'.<sup>110</sup>

3.77 Ms Robyn Glindemann from the LCA contended that:

...the focus needs to continue to be on developing our scientific understanding of our water resources. The lack of scientific knowledge around the interaction between surface and subsurface resources has infiltrated and is infiltrating the decision-making process, both at a regulator level and at a court level, and it is not satisfactory.<sup>111</sup>

3.78 The Australian Petroleum Production and Exploration Association expressed its support for the Commonwealth Government continuing 'to develop and implement its research program on the water-related impacts of coal seam gas development' to ensure that decisions involving projects that could impact water sources 'are based on the best available science'.<sup>112</sup>

#### ***Limited recognition of groundwater ecosystems***

3.79 Associate Professor Grant Hose drew the Committee's attention to the limited number of studies on groundwater ecosystems, arguing that the 'consequence of this knowledge gap is that regulatory decisions are based on a paucity of robust scientific evidence'. Because few stygofauna species are listed for protection, he commented, 'there is no mandate for environmental assessments related to extractive industries to consider groundwater biota as they might do for rare and threatened flora and fauna'. To address this regulatory gap, Associate Professor Hose recommended that groundwater ecosystems be given 'the same regulatory consideration and recognition as surface freshwater, marine and terrestrial ecosystems'. He also called for further research into the impacts of extractive activities on the organisms living in groundwater, and suggested that until such research has provided greater clarity, 'regulatory guidance should recommend the highest level of protection for groundwater ecosystems'.<sup>113</sup>

---

110 Dr Lange Jorstad, President, Australian Chapter, International Association of Hydrogeologists, *Committee Hansard*, 2 May 2018, pp. 2–3.

111 Ms Robyn Glindemann, Deputy Chair, Australian Environment and Planning Law Group, Legal Practice Section, Law Council of Australia, *Committee Hansard*, 1 May 2018, p. 38.

112 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 26.

113 Associate Professor Grant Hose, *Submission 5*, pp. 1, 2–3.



## *Compliance*

3.80 Several submitters and witnesses to the inquiry highlighted concerns about compliance and monitoring regimes and limited enforcement activities on the part of regulators.<sup>114</sup>

3.81 Geoscience Australia argued that because groundwater impacts may take years or decades to become apparent, 'the regulatory system must ensure ongoing monitoring of water resources occurs'.<sup>115</sup>

3.82 Geoscience Australia noted that the Department of the Environment and Energy often approves projects with conditions that require projects with incomplete baseline data to include completed baseline data in their Water Monitoring and Management Plans, which they are later required to provide to the Minister. The result, it suggested, is that regulatory responsibility is shifted 'from the approvals process to the compliance process'.<sup>116</sup> Given the reliance on the compliance process, Geoscience Australia proposed an independent compliance review to assess the effectiveness of conditions placed on coal and coal seam gas projects to date, 'and the effectiveness of associated monitoring and compliance'.<sup>117</sup>

3.83 The Committee heard concern about the level of transparency involved in reporting of water levels by extractive industries.<sup>118</sup> Mr Peter Wills, a cattle farmer from New South Wales, expressed concerns about real-time data from monitoring bores not being made available to his community, stating that 'by the time you get information, it could be six months old... There should be no reason to keep it hidden, surely'.<sup>119</sup>

3.84 Mr Bruce Currie, a beef cattle producer from Queensland, proposed that all commitments made in environmental impact statements:

must have government and landowner 24/7 accessible electronic monitoring, with harsh penalties if the monitoring fails and limits are breached prior to the mine commencing. Queensland and the federal government state the number of conditions imposed on mines, but neither

---

114 Environmental Defenders' Offices of Australia, *Submission 4*, p. 15; NSW Irrigators' Council, *Submission 11*, p. 3; Property Rights Australia Incorporated, *Submission 21*, p. 15; Mr Tom Crothers, Consultant, Property Rights Australia, *Committee Hansard*, 1 May 2018, pp. 35, 37; Dr Lange Jorstad, President, Australian Chapter, International Association of Hydrogeologists, *Committee Hansard*, 2 May 2018, p. 5; Mr Angus Emmott, Private capacity, *Proof Committee Hansard*, 10 September 2018, p. 3.

115 Geoscience Australia, *Submission 2*, p. 7.

116 Geoscience Australia, *Submission 2*, p. 13.

117 Geoscience Australia, *Submission 2*, p. 13.

118 See, for example, Ms Verity Morgan-Schmidt, Chief Executive Officer, Farmers for Climate Action, *Proof Committee Hansard*, 10 September 2018, p. 3.

119 Mr Peter Wills, *Proof Committee Hansard*, 10 September 2018, p. 18.

level of government is enforcing compliance...Conditions are nothing if there is not thorough monitoring, strict adherence and harsh penalties.<sup>120</sup>

3.85 Lock the Gate Alliance alleged that it had found evidence of several mining operators in New South Wales taking surface water and rainwater, with subsequent depleted flow and recharge for water systems. Ms Georgina Woods, Lock the Gate's New South Wales Coordinator, told the Committee:

In Maules Creek...the large coalmine next to that community is capturing a huge amount of surface water...without having the requisite water licences, which we believe is contrary to and unlawful under the Water Management Act. Our review of mining activities in the Hunter region has indicated there may be a similar pattern occurring there where there are huge volumes of water...So it's quite a significant volume of water that the industry is capturing in rainfall run-off, and obviously that's going to reduce the availability of water in the system and have an environmental effect in terms of periods of no flow.<sup>121</sup>

3.86 The NSW Minerals Council disputed this evidence, stating that Lock the Gate had 'incorrectly claimed that NSW mining operations are exceeding their licenced allocations for surface water'.<sup>122</sup> It argued that an exemption under the *Water Management (General) Regulation 2018* (NSW) allows for landholders to capture surface water runoff without the need for a water access licence:

The Excluded Work Exemption is available for mining operations (and other landholders) to capture surface water runoff from disturbed areas without the need for a [water access licence] in circumstances where surface water drains from disturbed areas into "dirty water" mine and sediment dams located on a minor stream that are "*solely for the capture, containment and recirculation of drainage and/or effluent ... to prevent the contamination of a water source*".

In this regard, mining companies are often required to operate such dams, as part of their "dirty water" management systems, under their planning approval, environment protection licences and their associated water management plans approved by relevant regulators.

The use of runoff from mining areas also helps to minimise the amount of water mining operations need to extract from local waterways and Regulated river systems such as the Hunter[.]<sup>123</sup>

3.87 A number of submitters and witnesses recommended that governments ensure that sufficient resourcing is in place for ongoing compliance activities.<sup>124</sup> The NSW

---

120 Mr Bruce Currie, Private capacity, *Proof Committee Hansard*, 10 September 2018, p. 7.

121 Ms Georgina Woods, NSW Coordinator, Lock the Gate Alliance, *Proof Committee Hansard*, 10 September 2018, pp. 13–14.

122 *Correspondence from the New South Wales Minerals Council – response to certain evidence given during a public hearing on 10 September 2018*, p. 1.

123 *Correspondence from the New South Wales Minerals Council – response to certain evidence given during a public hearing on 10 September 2018*, p. 2.

---

Irrigators' Council was of the opinion that 'sufficient qualified personnel in respective Government Departments is an ongoing concern for the water industry'.<sup>125</sup>

3.88 Dr Minchin from Geoscience Australia suggested that proponents be required to make ongoing monitoring data publicly available for transparency, and for this data to be made as clear as possible.<sup>126</sup>

3.89 The Productivity Commission in its report on national water reform recommended that 'Australian, State and Territory Governments should improve monitoring, evaluation, auditing and reporting' to make better use of environmental water, demonstrate the benefit of allocating water to the environment, build public trust in its management and keep managers accountable.<sup>127</sup>

#### ***Limited economic value given to the environment***

3.90 Ms Sarah Asokendaran, a doctoral candidate at the University of Queensland, suggested that traditionally, environmental assessments and environmental impact statements do not adequately assess 'the intrinsic value of the environment, as some ecosystem goods and services are not traditionally reflected in markets (e.g. climate change, flood protection)'. She highlighted that the incorporation of Natural Capital Accounting as an economic tool to measure the value of the environment would 'strengthen decision making for development'.<sup>128</sup>

#### ***Limitations of the National Water Initiative***

3.91 A number of submitters and witnesses were of the opinion that differences in the regulatory frameworks between states and territories were problematic, and had not yet been addressed in the NWI negotiations.<sup>129</sup>

3.92 The LCA was concerned about the 'failure to address the extractive sector within the NWI negotiations, and the ongoing failure to deal with the industry in the years since'. As a result, states and territories have developed or maintained their own

---

124 Environmental Defenders' Offices of Australia, *Submission 4*, p. 15; National Farmers' Federation, *Submission 17*, pp. 10–11; Ms Robyn Glindemann, Deputy Chair, Australian Environment and Planning Law Group, Legal Practice Section, Law Council of Australia, *Committee Hansard*, 1 May 2018, p. 39.

125 NSW Irrigators' Council, *Submission 11*, p. 7. See also National Farmers' Federation, *Submission 17*, p. 11.

126 Dr Stuart Minchin, Chief, Environmental Geoscience Division, Geoscience Australia, *Committee Hansard*, 2 May 2018, p. 43.

127 Productivity Commission, *National Water Reform*, Report no. 87, December 2017, Canberra, p. 33.

128 Ms Sarah Asokendaran, *Submission 19*, pp. 4–5. See also Ms Sarah Asokendaran, Private capacity, *Committee Hansard*, 1 May 2018, p. 15.

129 See Lock the Gate Alliance, *Submission 28*, p. 1; Australian Farmers for Climate Action, *Submission 6*, p. 3; Ms Robyn Glindemann, Deputy Chair, Australian Environment and Planning Law Group, Legal Practice Section, Law Council of Australia, *Committee Hansard*, 1 May 2018, p. 38. See also Department of Agriculture and Water Resources, *Submission 30*, p. 3.

arrangements to regulate the take and use of water by the extractive sector.<sup>130</sup> The Department of Agriculture and Water Resources observed that 'it is reasonable to expect' that state and territory governments will implement 'comprehensive water planning frameworks'.<sup>131</sup>

3.93 The LCA also noted that the NWI does not clearly consider cumulative impacts, and argued that even if the interaction of groundwater and surface water resources may be poorly understood, 'sustainable water management practices are more likely to be achieved where all water use is subject to the same assessment and governance framework'.<sup>132</sup>

3.94 Areas raised with the Committee which submitters and witnesses proposed needed reform for consistency across jurisdictions included the ways in which jurisdictions issue water plans and manage areas and water sources, and the use of differing terminologies.<sup>133</sup>

### ***Lack of consultation with Traditional Owners***

3.95 The Committee received evidence recommending that Traditional Owners of land affected by water extraction be included in decision-making to a much greater extent than is presently the case.<sup>134</sup> Lock the Gate Alliance argued that states and territories had not consistently met the agreements in the NWI for water planning that incorporates recognition of Indigenous water needs.<sup>135</sup> The LCA also considered that 'the current frameworks for recognition of Indigenous cultural flows under the *Water Act 2007* (Cth) and most State water rights systems remain inadequate'.<sup>136</sup>

3.96 Ms Helen Bishop, who provided a submission on behalf of the Traditional Owner Rum Jungle Liaison Committee, questioned what regulatory measures the Commonwealth would employ to ensure that Traditional Owners were given the right to be actively involved in decisions affecting them:

Water is vested in Governments through laws and legislation that restricts any Traditional Owner guarantees to protect their natural heritage and cultural enjoyment. What systems, checks and balances will the Commonwealth put in place that protects Traditional Owners' rights and freedoms, cultural practices and social observations with regard to water, its management, use and the effects of extraction, contamination and the

---

130 Law Council of Australia, *Submission 8*, p. 3.

131 Department of Agriculture and Water Resources, *Submission 30*, p. 3.

132 Law Council of Australia, *Submission 8*, p. 7.

133 National Farmers' Federation, *Submission 17*, p. 2; Ms Sarah Asokendaran, *Submission 19*, pp. 8–11; Ms Sarah Asokendaran, Private capacity, *Committee Hansard*, 1 May 2018, p. 14.

134 Ms Robyn Glindemann, Deputy Chair, Australian Environment and Planning Law Group, Legal Practice Section, Law Council of Australia, *Committee Hansard*, 1 May 2018, p. 38.

135 Lock the Gate Alliance, *Submission 28*, p. 1.

136 Law Council of Australia, *Submission 8*, p. 4.

---

effectiveness of the 'water trigger' under the *Environment Protection and Biodiversity Conservation Act 1999*?<sup>137</sup>

3.97 Ms Bishop further argued that it is 'inappropriate, culturally ignorant and disrespectful that future decisions are made without consultation that ultimately impact upon Traditional Owners' responsibilities, accountabilities and cultural authority'.<sup>138</sup>

3.98 The Australian Petroleum Production and Exploration Association noted that a social impact assessment for gas development in the Northern Territory in 2018 'identified significant opportunities for the enhancement of social values, such as collaboration between the community and industry...and indigenous participation'.<sup>139</sup>

3.99 The Productivity Commission's report into National Water Reform recommended that all governments undertake further work to incorporate 'clear, measureable and well-informed Indigenous cultural objectives in water plans, tangible actions...and monitoring and reporting arrangements' to oversee these objectives.<sup>140</sup> In its recommendation for a renewed NWI, it proposed that 'an Indigenous working group be established to provide advice on the development of relevant provisions'.<sup>141</sup>

### ***Rehabilitation, mine closure and abandoned mines***

3.100 Both the NSW Minerals Council and the Minerals Council of Australia outlined that state regulatory systems include requirements for the management of mine rehabilitation, including industry plans for rehabilitation, and government oversight of rehabilitation activities.<sup>142</sup>

3.101 However, the Committee heard that a major regulatory gap in current frameworks governing water use as well as mine rehabilitation is the failure of these to take into account the long-term water impacts of abandoned mines.<sup>143</sup> Ms Corinne Unger argued that current measures in which states are expected to take responsibility for mining legacies were 'ad hoc and uncoordinated'. She further asserted that some abandoned mine programs did not appropriately address water impacts, and proposed

---

137 Ms Helen Bishop, *Submission 31*, p. 2.

138 Ms Helen Bishop, *Submission 31*, p. 5.

139 Australian Petroleum Production and Exploration Association Ltd, *Submission 22*, pp. 7–8.

140 Productivity Commission, *National Water Reform*, Report no. 87, December 2017, Canberra, pp. 18, 29.

141 Productivity Commission, *National Water Reform*, Report no. 87, December 2017, Canberra, p. 26.

142 New South Wales Minerals Council, *Submission 15*, p. 5; Minerals Council of Australia, *Submission 13*, pp. 20–24.

143 Ms Corinne Unger, *Submission 24*, p. 2; Ms Corinne Unger, Private capacity, *Committee Hansard*, 1 May 2018, p. 8.

that the EPBC Act be amended to incorporate measures that would address the impacts on water from abandoned mines.<sup>144</sup>

3.102 Geoscience Australia suggested that approval conditions for mine rehabilitation and closure be 'included at the approval stage of project development so industry can plan for closure, and so that regulators are able to implement closure requirements'.<sup>145</sup>

## **Conclusion**

3.103 This chapter has focused on the regulatory frameworks governing water use by the extractive industry that in large part are intended to prevent or mitigate negative environmental impacts arising from extractive activities. The following chapter outlines what these potential impacts could be, as well as some of the economic and social impacts of water use by the extractive industry.

---

144 Ms Corinne Unger, *Submission 24*, pp. 3, 4, 6; Ms Corinne Unger, Private capacity, *Committee Hansard*, 1 May 2018, pp. 11, 12.

145 Geoscience Australia, *Submission 2*, p. 14; Dr Stuart Minchin, Chief, Environmental Geoscience Division, Geoscience Australia, *Committee Hansard*, 2 May 2018, p. 40.

# Chapter 4

## Impacts of water extraction

4.1 This chapter examines some of the impacts of water extraction, including environmental, economic, cultural and social impacts. The benefits that arise from activities associated with the extractive industry are also considered.

4.2 The Committee acknowledges that the impacts of water extraction are not limited to water taken by the extractive industry.<sup>1</sup> However, given the terms of reference of this inquiry, this chapter focuses on impacts arising from extractive activities.

### Background

4.3 The Minerals Council of Australia noted that proponents of proposed extractive industry projects must draw on detailed scientific analyses in their proposals, including data collection, analysis of potential impacts and water models that integrate local and regional data. As outlined in Chapter 3, regulators may also draw on independent specialist and technical advice when making decisions.<sup>2</sup>

4.4 Because much of the research on impacts by extractive industry activities is fragmented or still emerging, understanding of some types of impacts remains limited. The Law Council of Australia (LCA) stated that knowledge of how underground water extraction impacts on surface water resources and dependant vegetation and ecosystems 'remains patchy'.<sup>3</sup> This sentiment was echoed by Ms Revel Pointon from the Environmental Defenders Office Queensland:

...one of the biggest risks is that we don't know a lot of the impacts that we are having, especially on our groundwater basins, due to the insufficient understanding of how they interact with each other and the impact of the resource industries on them.<sup>4</sup>

4.5 Evidence provided to this inquiry indicated that the type and extent of impacts depend on local geography and conditions, the nature of the extractive activity and the methods that it employs.<sup>5</sup> Central to whether these impacts take place is how well a company manages and monitors the specific risks that arise from their operations. For example, Buru Energy Limited noted that '[i]n petroleum well activities, the integrity

---

1 Dr Stuart Minchin, Chief, Environmental Geoscience Division, Geoscience Australia, *Committee Hansard*, 2 May 2018, p. 42. See also International Association of Hydrogeologists, *Submission 9*, pp. 3–4.

2 Minerals Council of Australia, *Submission 13*, p. 1.

3 Law Council of Australia, *Submission 8*, p. 4.

4 Ms Revel Pointon, Lawyer, Environmental Defenders Office Queensland, *Committee Hansard*, 2 May 2018, p. 24.

5 Geoscience Australia, *Submission 2*, p. 4; Dr Lange Jorstad, President, Australian Chapter, International Association of Hydrogeologists, *Committee Hansard*, 2 May 2018, p. 3.

of the well is a key control for managing potential impacts to aquifers'.<sup>6</sup> Methods of managing well integrity to avoid or remediate negative impacts may include proper well design and construction, monitoring and appropriate decommissioning of the well at the end of its active life. One specific risk that uranium mining companies must manage, which may not be relevant in other types of extractive industries, is radioactive discharge into water.<sup>7</sup>

4.6 The Australian Petroleum Production and Exploration Association argued that because government agencies closely monitor potential impacts on water resources and industry itself imposes risk management measures and safeguards, the possibility of negative impacts on water resources occurring are minimised.<sup>8</sup> Buru Energy highlighted its post-operational monitoring of groundwater at its petroleum well sites, occurring on a 6 monthly basis, with results of the monitoring published on its website. It contended that the 'demonstrated lack of groundwater contamination...restricts the potential for negative social, economic or environmental impacts'.<sup>9</sup>

4.7 The inquiry received evidence emphasising that many of the impacts of extractive activities are long-term. Australian Farmers for Climate Action submitted that extractive industries have 'positive and negative impacts on rural and regional Australia, with short term economic gain often being negatively outweighed by long term negative environmental and social impacts'.<sup>10</sup> The Environmental Defenders' Offices of Australia argued that many impacts arising from the extractive industry's use of underground water are irreversible, and some groundwater bores and springs may never function again. Where recovery is possible, it may take hundreds or even thousands of years.<sup>11</sup>

4.8 The International Association of Hydrogeologists, while acknowledging that timeframes for the full restoration of some resources may take decades, contended that 'mitigation measures are designed to support or compensate for the affected values of the groundwater resource until the values are eventually restored'.<sup>12</sup>

4.9 The Committee heard that one of the major challenges for regulators making decisions about the impacts of proposed projects is the time needed for impacts on groundwater to become apparent, including, sometimes, after mines have closed.<sup>13</sup>

---

6 Buru Energy Limited, *Submission 14*, p. 3.

7 Geoscience Australia, *Submission 2*, p. 2.

8 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, pp. 2, 3.

9 Buru Energy Limited, *Submission 14*, p. 3

10 Australian Farmers for Climate Action, *Submission 6*, p. 2. See also Mr Mark McKenzie, Chief Executive Officer, New South Wales Irrigators Council, *Committee Hansard*, 2 May 2018, p. 9.

11 Environmental Defenders' Offices of Australia, *Submission 4*, p. 5.

12 International Association of Hydrogeologists, *Submission 9*, p. 4.

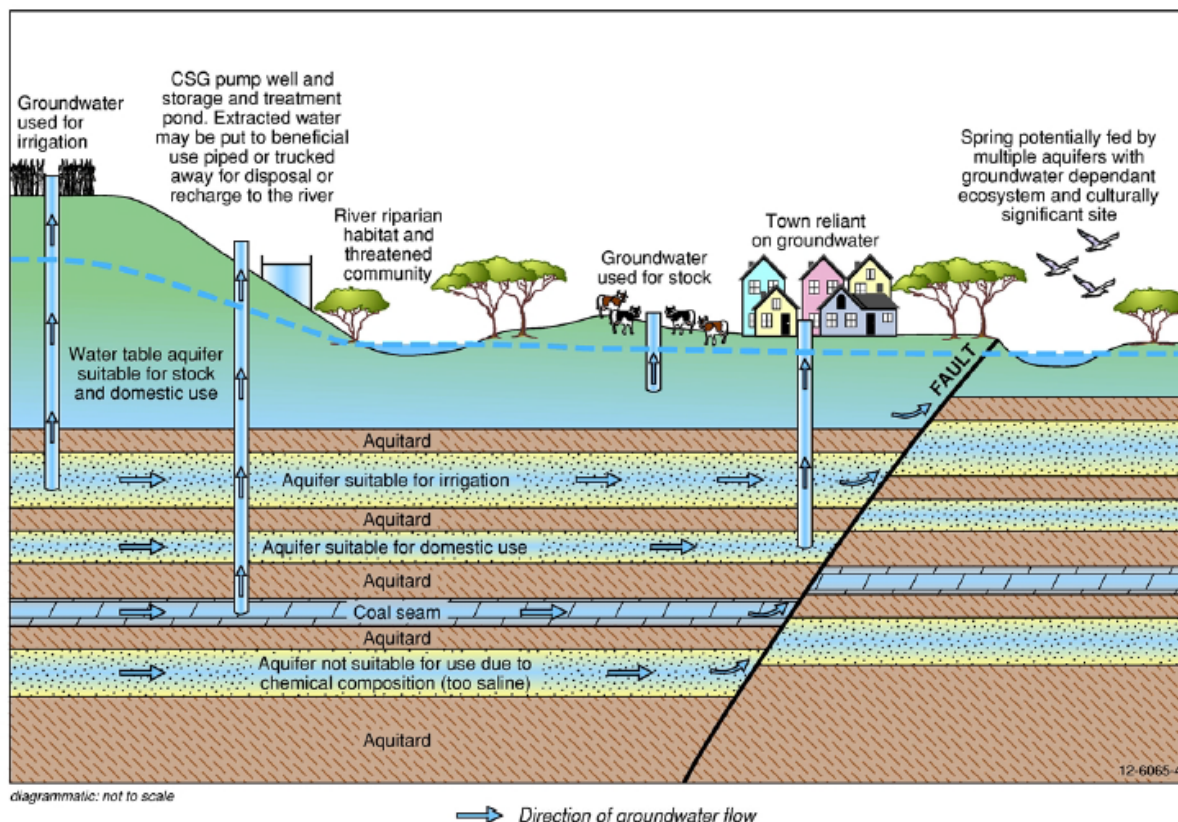
13 Geoscience Australia, *Submission 2*, p. 7.



Even after mine rehabilitation is complete, water may continue to leak through evaporation from final voids or from aquifers that have had their structure permanently changed. This issue is outlined further in Chapter 3.<sup>14</sup>

4.10 It should be remembered that there may be several water users in a particular area, including extractive industries, and these different methods of extracting water may interact with each other (see Figure 4.1).

**Figure 4.1: Schematic hydrogeological diagram showing how several land uses may interact with groundwater resources<sup>15</sup>**



Source: Geoscience Australia

## Environmental impacts

4.11 The scale and extent of environmental impacts depend on local conditions and geography. For example, the Northern Territory Government's inquiry into hydraulic fracturing noted that 'impacts on arid zone groundwater systems are likely to be greater and occur for longer, because these systems are recharged far more slowly, if at all'.<sup>16</sup>

14 Environmental Defenders' Offices of Australia, *Submission 4*, p. 9.

15 Geoscience Australia, *Submission 2*, p. 5.

16 Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, *Final Report*, April 2018, p. 108.

4.12 Groundwater and surface water are often interconnected and interdependent, with impacts on one part of a water resource regularly extending to others. Recent recognition of this interconnectivity has increasingly led to management of different water resources 'as different parts of a single water system'.<sup>17</sup>

4.13 In broad terms, major environmental impacts on groundwater that may arise from large extractive industry projects include:

- groundwater depressurisation and pressurisation;
- decreased water quantity for other users;
- changes to geographical structures;
- groundwater contamination;
- loss of habitat for groundwater-dependent ecosystems;
- changes in water quality;
- potential seismic activity arising from aquifer reinjection;
- specific impacts arising from hydraulic fracturing;
- legacy water impacts from abandoned mines; and
- cumulative impacts to water sources.<sup>18</sup>

#### ***Groundwater pressurisation and depressurisation***

4.14 As outlined in Chapter 2, some extractive industries inject water or other fluids into groundwater, whether to remove minerals from the ground or for waste disposal. This injection may increase or decrease groundwater pressure and can lead to negative consequences, such as introducing poor quality groundwater into other formations or changing the flow paths between aquifers, resulting in new connections, pressure changes and the mixing of different groundwater chemistries.<sup>19</sup>

4.15 Lock the Gate Alliance contended that the impacts arising from loss of pressure and drawdown of Great Artesian Basin aquifers through coal seam gas extraction would be long term.<sup>20</sup>

4.16 Dr Lange Jorstad from the International Association of Hydrogeologists acknowledged that impacts arising from extractive processes:

...can either dewater or depressurise a groundwater resource. Some of those groundwater resources take a very, very long time to recover and during that time the access to that groundwater is diminished for everyone else and

---

17 Geoscience Australia, *Submission 2*, p. 2.

18 Geoscience Australia, *Submission 2*, pp. 2–3; NSW Irrigators' Council, *Submission 11*, p. 5.

19 Geoscience Australia, *Submission 2*, p. 6.

20 Lock the Gate Alliance, *Submission 28*, p. 5.

---

every other ecological groundwater-dependent system to regain that access.<sup>21</sup>

### *Decreased water quantity*

4.17 The Committee heard that water extraction can lead to decreased water quality. The University of Queensland's Centre for Coal Seam Gas submitted that water extraction by resource tenure holders may 'lower water levels in adjacent areas to where the activities are being undertaken', leading to decreased water quantity in water bores and springs in surrounding areas.<sup>22</sup> The Centre's submission outlined ways in which resource tenure holders must remediate potential impacts to water quantity in Queensland, including monitoring, entering into make-good agreements with bore owners and preparing underground water impact reports.<sup>23</sup>

4.18 The Basin Sustainability Alliance argued that water extraction by the coal seam gas industry in the Surat Basin had led to the depressurisation of two aquifers 'to the extent that the agricultural sector is not permitted to construct any new bores into these two aquifers for intensive animal production or irrigation uses'.<sup>24</sup>

4.19 The Northern Territory Government's inquiry into hydraulic fracturing stated in its final report that 'excessive water extraction can potentially cause perennial rivers to become intermittent or temporary'.<sup>25</sup> Lock the Gate Alliance expressed concern that the Adani Carmichael project in Queensland would 'fundamentally change' the Carmichael River:

The river will lose 25 percent of its catchment area, lose groundwater discharge into the river, and the proportion time the river experiences zero flow will increase. At least 65 springs will be affected and the Carmichael River will experience 1–4 metres of drawdown. The combined effect of drawdown and lost baseflow of 1,000ML will increase zero flow periods of the river by 30–60%. Impacts on the river are predicted to extend 10km upstream and 25km downstream of the mine.<sup>26</sup>

4.20 Ms Elizabeth Laird, a member of the Maules Creek community in New South Wales, argued that Maules Creek had experienced a serious decline in bore water levels over the 10 months prior to September 2018, with 'bores that have held for 60 years' running dry. Ms Laird suggested that this may have been a result of local mining drawdown of underground water resources. She further expressed her concerns that bore failure could impact bushfire fighting efforts:

---

21 Dr Lange Jorstad, President, Australian Chapter, International Association of Hydrogeologists, *Committee Hansard*, 2 May 2018, p. 4.

22 University of Queensland, Centre for Coal Seam Gas, *Submission 18*, p. 5.

23 University of Queensland, Centre for Coal Seam Gas, *Submission 18*, p. 9 (p. 5 of legal overview included in submission).

24 Basin Sustainability Alliance, *Submission 20*, p. 9.

25 Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, *Final Report*, April 2018, p. 163.

26 Lock the Gate Alliance, *Submission 28*, p. 7.

We are facing catastrophic fire and continuing intense drought conditions. We are deeply concerned that bore failure could mean that water may not be reliably available to put out fires when we need it.<sup>27</sup>

4.21 Mr Peter Willis, a cattle farmer from New South Wales, expressed frustration that some of his neighbours had 'no water in their bores or a lack of pumpable water at a decent rate' while a neighbouring coal mine had dug further evaporation ponds and used sprayers so that water extracted during the coal mining process would evaporate. He emphasised that despite rainfall, 'There are bores that haven't stayed or recovered... [W]ater has just been draining out of these bores which normally never had a problem'.<sup>28</sup>

### ***Changes to geographical structures***

4.22 Many open-cut mines result in a final void. Where this lies below the water table, the void may become a permanent groundwater sink or 'pit lake', with groundwater continually flowing into the void and the water lost to evaporation after the closure of the mine.<sup>29</sup>

4.23 Geoscience Australia noted that coal seam gas mining may lead to a permanent change to the structure of an aquifer because of the removal of coal seams.<sup>30</sup> It further stated that reductions in aquifer pressure and volume of water can lead to cavities and voids that subsequently collapse and lead to changes in the topography of the land surface. These changes to land subsidence, in turn, can affect water flow paths, environmental flows and cause increased erosion.<sup>31</sup>

### ***Groundwater contamination***

4.24 Various activities associated with the extractive industry can lead to the release of contaminated groundwater. These include:

- the accidental release of naturally low quality groundwater;
- the accidental release of remnant brine or salts left over from treated groundwater;
- the accidental release of hydraulic fracturing fluid;
- leaching of contaminants from ores and waste rock, which can be made worse by acid mine drainage; and

---

27 Ms Elizabeth Laird, Private capacity, *Proof Committee Hansard*, 10 September 2018, p. 12.

28 Mr Peter Willis, Private capacity, *Proof Committee Hansard*, 10 September 2018, p. 17.

29 Geoscience Australia, *Submission 2*, p. 14; Australian Farmers for Climate Action, *Submission 6*, p. 4.

30 Geoscience Australia, *Submission 2*, p. 14. See also Mr Tony Windsor MP and Mr John Clements, *Submission 23*, p. 2.

31 Geoscience Australia, *Submission 2*, p. 3. See also Ms Georgina Woods, Policy Coordinator, Lock the Gate Alliance, *Committee Hansard*, 2 May 2018, pp. 30, 32; Environmental Defenders' Offices of Australia, *Submission 4*, p. 8.

- 
- leaks along well casings between aquifers or between underground water and the surface.<sup>32</sup>

4.25 The New South Wales Minerals Council referred to the 'adequacy of existing water laws and policies' in New South Wales in reducing the risk of contamination.<sup>33</sup> The Australian Petroleum Production and Exploration Association submitted that the risk of contamination because of well integrity or the spread of subsurface chemicals is very low:

...the latest research by the CSIRO confirms that subsurface risks as a result of well integrity or hydraulic fracture stimulation is considered to be low, and that the risks to people or groundwater dependent terrestrial ecosystems from subsurface chemicals are considered to be very low. While a surface spill of chemical additives could affect water resources, this risk is well understood and is managed effectively by many industries...<sup>34</sup>

4.26 The Association further contended that the use of chemical additives in wells 'is controlled, strictly regulated and managed to minimise environmental risk'.<sup>35</sup>

4.27 Buru Energy stated that environmental impacts on water as a result of its activities in the Canning Basin had been negligible, with a 'demonstrated lack of groundwater contamination'.<sup>36</sup>

4.28 However, the Committee heard that contamination has occurred. The Conservation Council of South Australia stated that between 2001 and 2010, 120 leaking aquifer wells were identified in the south-east region of South Australia alone that required rehabilitation costing \$5.5 million. The Council referred to a report by the Australian Council of Learned Academies on the shale gas industry which argued that even with a potential well failure rate of 0.5 per cent, as suggested by a number of studies, the number of wells in large shale gas fields could lead to a significant number of failed wells within an area.<sup>37</sup>

---

32 Geoscience Australia, *Submission 2*, pp. 5–6. See also Basin Sustainability Alliance, *Submission 20*, pp. 15–16. For a specific example of contamination of surface water, specifically Sydney's drinking water catchments, see the Colong Foundation for Wilderness Ltd, *Submission 16*.

33 New South Wales Minerals Council, *Submission 15*, p. 5.

34 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 2.

35 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 14. See page 15 for a detailed list of ways in which risks of petroleum activities damaging water quality and quantity are mitigated and reduced.

36 Buru Energy Limited, *Submission 14*, p. 3.

37 Conservation Council of South Australia, *Submission 10*, p. 2; P. Cook, V. Beck, D. Brereton, R. Clark, B. Fisher, S. Kentish, J. Toomey and J. Williams, *Engineering energy: Unconventional gas production*, report for the Australian Council of Learned Academies, 2013, p. 128.

4.29 Ms Corinne Unger, a doctoral candidate at the University of Queensland, gave evidence that in parts of Queensland, groundwater contamination from abandoned mines was especially apparent, with cattle in Queensland drinking acid mine drainage. She argued that '[t]here is a whole section on Mount Oxide in North Queensland. There is bright blue water. Landholders are vulnerable to...the acid mine drainage flowing through their property'.<sup>38</sup>

***Loss of habitat for groundwater-dependent ecosystems***

4.30 Because of the interconnections between underground and surface water systems, reductions in aquifer water levels can lead to decreased flow of groundwater to surface groundwater-dependent ecosystems, such as wetlands, rivers and springs. Some of these may host endangered or threatened species or communities, particularly in areas dependent on the Great Artesian Basin.<sup>39</sup>

4.31 The Conservation Council of Western Australia was of the opinion that the long-term impacts of water use at the Mulga Rocks uranium deposit in the Goldfields region of Western Australia would significantly impact the ecosystems dependent on local water sources:

...the taking water from a pristine environment that will take hundreds or thousands of years to recover is not sustainable – in fact it dramatically impacts on that water source and any future potential use of that water resource and the surrounding environment which is constantly competing for the small amount of water that exists.<sup>40</sup>

4.32 Within aquifers themselves, lower water tables or lower groundwater pressure may lead to a loss of habitat and changed environmental conditions for the organisms living in this environment.<sup>41</sup> Associate Professor Grant Hose argued that greater consideration should be given to impacts arising from water extraction on the organisms living in an aquifer:

Any anthropogenic change to the conditions in an aquifer is likely to have an impact on what lives there and its ability to provide those functions. They are fundamentally important, and they need to be considered in assessments of any development that's going to influence aquifers.<sup>42</sup>

---

38 Ms Corinne Unger, Private capacity, *Committee Hansard*, 1 May 2018, pp. 10–11.

39 Geoscience Australia, *Submission 2*, p. 2; Lock the Gate Alliance, *Submission 28*, p. 6.

40 Conservation Council of Western Australia, *Submission 27*, p. 21. In its response to the Conservation Council of Western Australia's submission, Vimy Resources, the company managing the Mulga Rocks uranium project, argued that its consultants had found that once water extraction had ceased, groundwater levels would gradually recover, and 'that there were no groundwater-dependent ecosystems that could be impacted as a result of the extraction'. See Response from Vimy Resources, *Submission 27*, pp. 4–5.

41 Associate Professor Grant Hose, *Submission 5*, p. 2.

42 Associate Professor Grant Hose, Department of Biological Sciences, Macquarie University, *Committee Hansard*, 2 May 2018, p. 36; Associate Professor Grant Hose, *Submission 5*, p. 2.

4.33 Associate Professor Hose explained that some of the organisms living in an aquifer play a key role in maintaining groundwater quality and distribution.<sup>43</sup>

#### ***Changes in water quality***

4.34 As outlined above, changes to the groundwater pressure in an aquifer can alter water flow directions from adjacent formations as water flows towards the area that has been depressurised. As a result, the groundwater chemistry of water sources that were previously subject to different flows may change through mixing and degradation of groundwater quality.<sup>44</sup> For example, the Conservation Council of South Australia highlighted that one impact of water extraction during coal seam gas developments is potential mixing of saline and freshwater aquifers.<sup>45</sup>

4.35 Associate Professor Grant Hose recommended that greater emphasis be placed on impacts to water quality in regulatory decisions, given that changes to groundwater microbial communities affect their capacity to remove pollutants and contaminants to make water drinkable:

A lot of discussion is had around the volumes of water and the amount that's extracted. What I don't see enough of in these discussions is changes to the water quality. The pure act of removing water from an aquifer can change the direction of flow. It can change how water moves. That can change the water chemistry. It can change pH. It can change dissolved oxygen or the amount of carbon in that water, and that changes the ecosystem.<sup>46</sup>

4.36 He further outlined that water removal from aquifers 'changes what lives there and it changes their capacity to provide ecosystem services and beneficial services that we rely on'.<sup>47</sup>

#### ***Aquifer reinjection and potential seismic activity***

4.37 The Committee heard concerns about the impacts of reinjection of water previously extracted from aquifers. Associate Professor Grant Hose questioned the impact water reinjection has on the ecosystems living within aquifers, and called for 'further regulation and consideration and...the knowledge to underpin the decisions made around whether or not' reinjection should happen.<sup>48</sup>

4.38 Lock the Gate Alliance expressed reservations about the reinjection of water extracted during gas mining, stating that '[c]onsiderable research from the United

43 Associate Professor Grant Hose, *Submission 5*, p. 2.

44 Geoscience Australia, *Submission 2*, p. 3.

45 Conservation Council of South Australia, *Submission 10*, p. 2.

46 Associate Professor Grant Hose, Department of Biological Sciences, Macquarie University, *Committee Hansard*, 2 May 2018, p. 36.

47 Associate Professor Grant Hose, Department of Biological Sciences, Macquarie University, *Committee Hansard*, 2 May 2018, p. 36.

48 Associate Professor Grant Hose, Department of Biological Sciences, Macquarie University, *Committee Hansard*, 2 May 2018, p. 37.

States, where it is widespread, has linked this practice with dramatic increases in earthquakes and other seismic activity'.<sup>49</sup>

4.39 Similarly, the Conservation Council of Western Australia highlighted international concerns about the impacts of reinjection:

Re-injection schemes around the world are a challenging feat of engineering, and they are notorious for suffering problems with clogging (of the injection bores and/or aquifer), loss of efficiency and even structural/ geological instability (e.g. re-injecting waste-water near faults seems to set them off).<sup>50</sup>

4.40 The Northern Territory Government's independent inquiry into hydraulic fracturing concluded that '[t]here is a direct correlation reported between deep well injection and felt seismic activity'. Because of this, the inquiry recommended that all reinjection of wastewater into aquifers be prohibited until research has established that seismic activity would likely not occur.<sup>51</sup>

4.41 The issue of potential seismic activity arising specifically from the hydraulic fracturing process is outlined further below.

#### ***Specific impacts from hydraulic fracturing***

4.42 The inquiry received evidence about the specific impacts associated with hydraulic fracturing (also known as fracking). The Australian Petroleum Production and Exploration Association argued that hydraulic fracturing has occurred without incident in various regions around Australia:

Numerous Australian and international reviews have found that the risks associated with hydraulic fracturing can be managed effectively with a robust regulatory regime.

In Queensland, around 6 per cent of all wells have been hydraulically fractured, without incident. In the Cooper Basin in South Australia, some 40 wells have been hydraulically fractured over the last 2 years. Hydraulic fracturing in the Cooper Basin has occurred for many decades without incident. In Western Australia, hydraulic fracturing has been used extensively to assist with the recovery of oil and gas from conventional resources – an estimated 800 wells have been hydraulically fractured since 1958, without incident.<sup>52</sup>

---

49 Lock the Gate Alliance, *Submission 28*, p. 9; Ms Georgina Woods, Policy Coordinator, Lock the Gate Alliance, *Committee Hansard*, 2 May 2018, p. 32.

50 Conservation Council of Western Australia, *Submission 27*, p. 22. In its response to the Conservation Council of Western Australia's submission, Vimy Resources emphasised that its proposed reinjecting of aquifers carried minimal risk because the 'fault lines in the local area are not located anywhere near the reinjection borefield and have not been active for more than 100 million years'. See Response from Vimy Resources, *Submission 27*, p. 8.

51 Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, *Final Report*, April 2018, p. 141.

52 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 13.



4.43 The Australian Petroleum Production and Exploration Association stated that most hydraulic fracturing fluids are 90–98 per cent water and sand, with additives making up a small proportion of fluids. The few additives that could harm the environment or be dangerous for human health, it contended:

...would need to be discharged in large quantities, over a long period, to reach concentration levels which could affect the much larger volumes of water present in aquifers...A recent report by the CSIRO found that chemicals remaining underground after hydraulic fracturing are unlikely to reach people or groundwater dependent terrestrial ecosystems in concentrations that would cause concern.<sup>53</sup>

4.44 The Northern Territory inquiry into hydraulic fracturing noted that although available evidence indicates hydraulic fracturing can cause low-level seismic activity, 'the magnitude of this activity is likely to be very small, with minimal or no damage to surface infrastructure'.<sup>54</sup>

4.45 However, the Northern Territory inquiry also outlined that shale gas operations produce significant amounts of wastewater, which may lead to contamination of surface and groundwater.<sup>55</sup> The inquiry identified eight specific pathways through which hydraulically fractured shale gas could contaminate ground or surface water (see Figure 4.2).<sup>56</sup>

4.46 The Basin Sustainability Alliance expressed concern that the quality of the water extracted through fracking 'is very toxic and presents a significant risk to surface and groundwater resources if it is not appropriately constrained and managed'.<sup>57</sup>

---

53 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 16.

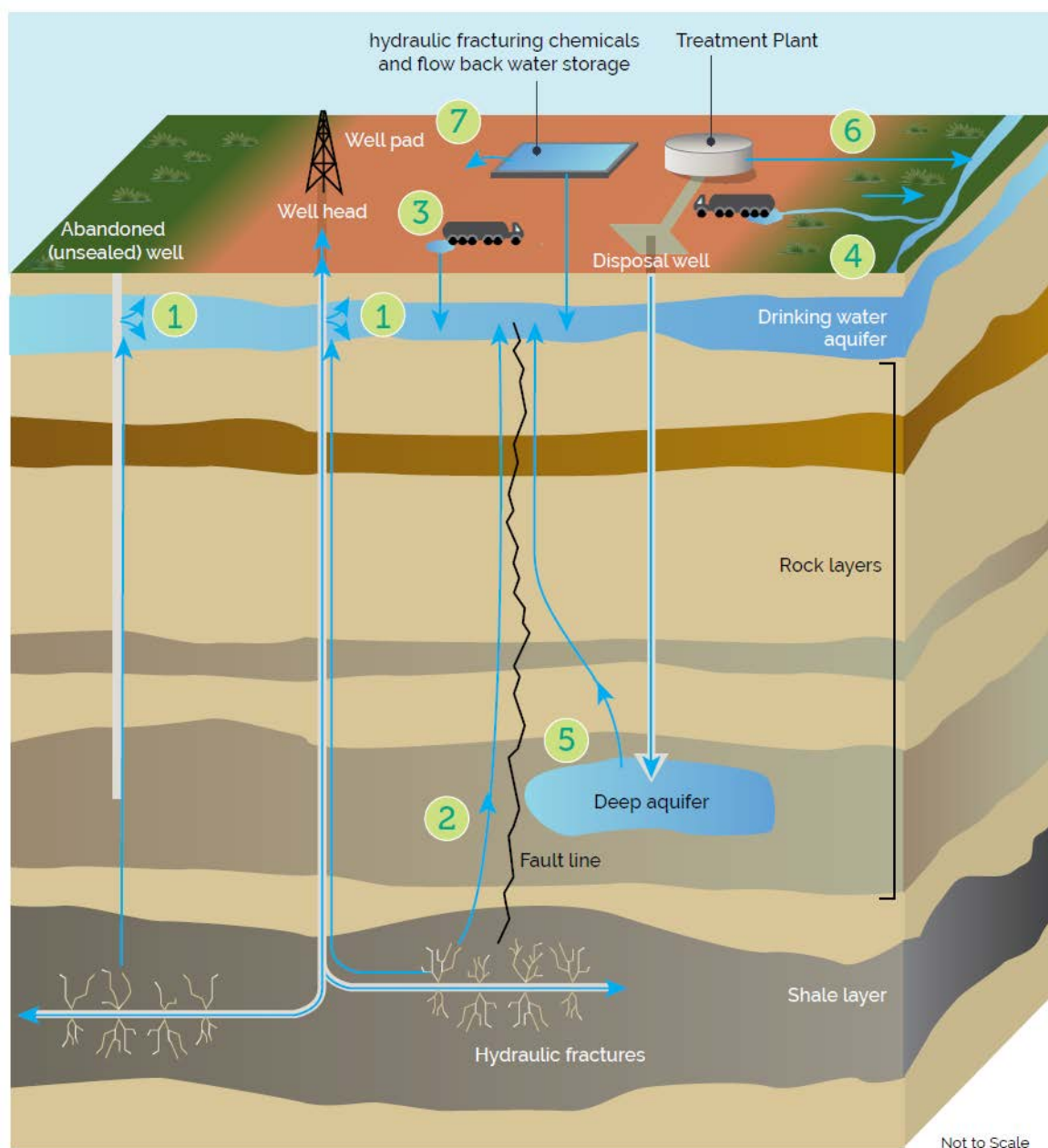
54 Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, *Final Report*, April 2018, p. 139.

55 Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, *Final Report*, April 2018, p. 141.

56 Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, *Final Report*, April 2018, p. 144.

57 Basin Sustainability Alliance, *Submission 20*, p. 16. See also Miss Helen Bender, Private capacity, *Committee Hansard*, 1 May 2018, pp. 4–5; Mr Tom Crothers, Consultant, Property Rights Australia, *Committee Hansard*, 1 May 2018, p. 36; Environmental Defenders' Offices of Australia, *Submission 4*, pp. 18–19; Conservation Council of South Australia, *Submission 10*, pp. 2–3; Miss Helen Bender, *Submission 29*, pp. 13–14.

**Figure 4.2: Potential water contamination pathways from a shale gas site<sup>58</sup>**



- Path 1 - leakage of either hydraulic fracturing fluid, flowback or produced water, or methane from operating or abandoned wells;  
 Path 2 - contamination of shallow groundwater via fractures induced by the hydraulic fracturing process;  
 Path 3 - surface spills of chemicals, hydraulic fracturing fluid, flowback water or produced water at the well site or other handling facility within the well pad;  
 Path 4 - surface spills of chemicals, hydraulic fracturing fluid, flowback water or produced water within the well pad that is washed off-site into a waterbody;  
 Path 5 - reinjection of untreated wastewater to deep aquifers, with possible seismic activity and fault reactivation;  
 Path 6 - direct discharge of treated or untreated wastewaters to surface waters or drainage lines;  
 Path 7 - overtopping or failure of wastewater storage ponds;  
 Path 8 - spills during transport of chemicals or wastewater from either road transports or pipelines (not shown).

Source: *Scientific Inquiry into Hydraulic Fracturing in the Northern Territory*

58 Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, *Final Report*, April 2018, p. 145.

---

### *Legacy water impacts from abandoned mines*

4.47 A further issue when considering the water impacts of mining operations is that of ongoing environmental impacts from historical mines that have been abandoned. In some cases these mines operated prior to modern environmental standards being in place, and continue to impact their surrounding environment.

4.48 A primary issue in relation to many of these sites is that of acid and metalliferous drainage (AMD), whereby the weathering of reactive sulphide rock exposed by mining activities results in acidic or otherwise toxic water runoff. This problem can significantly affect local ecosystems, with prominent examples in Australia including the Mt Lyell mine in Tasmania, where AMD from historical waste rock dumps is still causing significant contamination to the Queen and King River systems; and the Rum Jungle mine in the Northern Territory where copper and other heavy metals and acids have polluted the surrounding environment.<sup>59</sup>

4.49 In addition to AMD, other water-related impacts of closed and abandoned mines can include:

- unknown long term groundwater interactions between mine features and their surrounding environment;
- changes to groundwater quality as a result of saline pit lakes forming in mine voids; and
- decreased surface water quality as a result of mixing with contaminated drainage from mine features.<sup>60</sup>

4.50 The Committee was told that abandoned mines may continue to impact water sources after their closure. Ms Corinne Unger stated that 'it is evident from research that water impacts are a significant closure legacy' for mines.<sup>61</sup> Ms Unger added that a major environmental impact from early mine closure is acid and metalliferous drainage from remaining resources that have not been depleted as planned.<sup>62</sup>

4.51 Ms Unger argued that '[w]ater impacts from abandoned mines do harm aquifers and water systems, but these impacts are largely undocumented, unquantified and unregulated' (see Chapter 3 for further discussion of this regulatory gap).<sup>63</sup> Ms Unger referred to a report from the New South Wales Auditor General in 2012

---

59 See: EPA Tasmania, 'Mt Lyell Acid Drainage Remediation', <http://epa.tas.gov.au/epa/water/remediation-programs/mt-lyell-acid-drainage-remediation> (accessed 30 May 2018); Rum Jungle Traditional Owner Liaison Committee, *Submission 31*, p. 4.

60 Ms Corinne Unger, Private capacity, *Committee Hansard*, 1 May 2018, pp. 9-10.

61 Ms Corinne Unger, *Submission 24*, p. 1.

62 Ms Corinne Unger, *Submission 24*, p. 6, citing Laurence, 2006; Ms Corinne Unger, Private capacity, *Committee Hansard*, 1 May 2018, p. 9.

63 Ms Corinne Unger, *Submission 24*, p. 2.

which suggested that '[d]erelict mines may represent the State's largest category of contamination liability'.<sup>64</sup>

4.52 Geoscience Australia recommended that consideration be given to 'how long-term water use by extractive industry projects approved under Commonwealth legislation will be monitored and managed after the active mining phase', given that groundwater impacts may take years or decades to become apparent.<sup>65</sup>

### *Cumulative impacts*

4.53 Cumulative impacts are the combined, incremental and successive impacts of one or more activities.<sup>66</sup> Geoscience Australia noted that the cumulative impact of developments in areas where there are several extractive industry projects 'on water resources can be greater and more regional in extent than single developments'.<sup>67</sup>

4.54 A number of submitters expressed concerns about the extent of knowledge about cumulative impacts across regions. For example, the Nature Conservation Council of NSW suggested that the cumulative impacts of long-term groundwater use by mining and coal seam gas projects has not been assessed adequately.<sup>68</sup> The Environmental Defenders' Offices of Australia argued that significant uncertainty remains 'as to how many groundwater basins interconnect and therefore the impacts that mining and gas projects will have on our groundwater systems'.<sup>69</sup>

4.55 Dr Gavin Lind, the Director of Workforce and Health, Safety, Environment and Communities at the Minerals Council of Australia drew the committee's attention to the Minerals Council's cumulative environmental impact assessment industry guide. He stated that cumulative impact 'is a consideration that we as an industry strongly believe you can measure and you should measure'.<sup>70</sup>

4.56 However, Dr Lange Jorstad from the International Association of Hydrogeologists acknowledged some of the difficulties inherent in assessing cumulative impacts:

One of the key things that is not often well captured is the cumulative effect of multiple extractive projects within a small geographical area...Often when, say, a consultant is engaged by a mining company to assess the impact of a specific project, they may not have access to the information for

---

64 Ms Corinne Unger, *Submission 24*, p. 4, citing New South Wales Audit Office, 2012.

65 Geoscience Australia, *Submission 2*, p. 7. See also Dr Stuart Minchin, Chief, Environmental Geoscience Division, Geoscience Australia, *Committee Hansard*, 2 May 2018, p. 40.

66 Geoscience Australia, *Submission 2*, p. 6, citing Franks et al, 2010.

67 Geoscience Australia, *Submission 2*, p. 7.

68 Nature Conservation Council of NSW, *Submission 7*, p. 3.

69 Environmental Defenders' Offices of Australia, *Submission 4*, p. 6.

70 Dr Gavin Lind, Director, Workforce and Health, Safety, Environment and Communities, Minerals Council of Australia, *Committee Hansard*, p. 27.

the next mine operated by someone else, with a different consultant providing that service, and you tend to get maybe a bit of guesswork...<sup>71</sup>

4.57 The result, Dr Jorstad stated, was an analysis that covered individual contributions to impacts in a region, but did not necessarily take into account the total, cumulative impact of all projects operating within an area.<sup>72</sup>

### **Economic impacts**

4.58 The Committee heard that environmental impacts may have an economic impact in turn. Reductions in the level of groundwater, along with depressurisation, may mean that other water users, such as farmers, drill new, deeper wells at increased cost because of the depth required, or purchase alternative water sources for stock, such as carted water.<sup>73</sup>

4.59 Australian Farmers for Climate Action submitted that across Australia, 'farmers are coming under increasing pressure from competing land uses, including the mineral and extractive industries'.<sup>74</sup> The New South Wales Irrigators' Council outlined that specific impacts from extractive industries on agricultural production include increased competition for land, labour and water resources:

The increased demand from mining and energy resource extractive industries has increased overhead costs for irrigated agricultural producers – further exacerbating the overall financial constraints that irrigators in NSW are experiencing...[I]rrigated agricultural producers are price takers in domestic and international markets and are unable to adjust their output prices to accommodate the increased costs to enable them to retain acceptable enterprise gross margins.<sup>75</sup>

4.60 The Nature Conservation Council of NSW stated that in the Murray-Darling Basin, mining companies often purchase high security licences from the New South Wales Government. As a consequence, local farmers who rely on general security licenses have less access to water in dry years because other users have purchased water rights.<sup>76</sup>

4.61 Ms Verity Morgan-Schmidt, the Chief Executive Officer of Farmers for Climate Action, outlined the combined impacts of changing climate conditions and competition for water resources:

---

71 Dr Lange Jorstad, President, Australian Chapter, International Association of Hydrogeologists, *Committee Hansard*, 2 May 2018, pp. 4, 5.

72 Dr Lange Jorstad, President, Australian Chapter, International Association of Hydrogeologists, *Committee Hansard*, 2 May 2018, pp. 4, 5.

73 Geoscience Australia, *Submission 2*, p. 3. See also Conservation Council of South Australia, *Submission 10*, p. 3.

74 Australian Farmers for Climate Action, *Submission 6*, p. 2.

75 NSW Irrigators' Council, *Submission 11*, p. 3.

76 Nature Conservation Council of NSW, *Submission 7*, p. 2. See also National Farmers' Federation, *Submission 17*, p. 8.

There is a feeling of rural Australia being under siege, to be honest. It feels like there are lots pockets occurring right across the country where incompatible land use is being prioritised over the interests of sustainable industries such as Australian agriculture. What we know is that farmers' reliability of production is already threatened and challenged by the impacts of a changing climate. What we are finding is that these incompatible land uses...are also contributing to those risk factors that farmers are finding and they are making life increasingly difficult for them.<sup>77</sup>

4.62 Mr Peter Wills noted the impact of declining water resources on farmers, pastoralists and graziers, stating that if farmers are no longer able to 'irrigate crops, they have to make business decisions. If they can no longer run cattle or a diminished amount of cattle...immediately they have to deal with that situation'.<sup>78</sup>

4.63 Ms Joanne Rea from Property Rights Australia told the Committee that the expansion of Queensland's statutory underground water rights for coal seam gas combined with restrictions on water rights for agricultural use was '[d]riving people out of business by denying access to a valuable resource'.<sup>79</sup>

4.64 Ms Jody Brown, whose family own a sheep and cattle station in Queensland, noted the importance of reliable groundwater access to the value of pastoral land:

Grazing land in arid and drought-prone areas is much easier to sell if it has reliable access to groundwater. Therefore, if we had been forced to sell due to the Great Artesian Basin water being compromised, it's likely our land would have sold for a much lower value than it was previously worth...Money on its own cannot sustain life out here and there's no replacement for water.<sup>80</sup>

4.65 Mr Maxwell Winders emphasised that lowering of water levels in bores and gasification because of water extraction during coal seam gas mining 'is a matter of concern to individual lot-feeders and to the beef industry as a whole'. Mr Winders submitted that the Queensland regulatory 'make good' system had 'little effect in retarding the loss of the identifiable socio-economic benefits of feedlot beef production'.<sup>81</sup>

## **Social impacts**

4.66 Some evidence provided to the inquiry outlined the social consequences arising from water use by the extractive industry, including impacts on rural communities. Property Rights Australia argued that in the Murray-Darling Basin, 'the exodus from towns shows the effects of insufficient available water on a community'. Further, the water restrictions imposed as part of the Murray-Darling Basin Plan had

---

77 Ms Verity Morgan-Schmidt, Chief Executive Officer, Farmers for Climate Action, *Proof Committee Hansard*, 10 September 2018, p. 1.

78 Mr Peter Wills, *Proof Committee Hansard*, 10 September 2018, p. 18.

79 Ms Joanne Rea, Chair, Property Rights Australia, *Committee Hansard*, 1 May 2018, p. 31.

80 Ms Jody Brown, Private capacity, *Proof Committee Hansard*, 10 September 2018, p. 8.

81 Mr Maxwell Winders, *Submission 25*, p. 3.

---

'caused businesses to fail and walk away with no compensation and agriculture to become a memory in some communities'.<sup>82</sup>

4.67 Mr Angus Emmott, a beef cattle producer from Queensland, was of the opinion that new coal and coal seam gas mines should not be approved where best science indicated a probability or even a high possibility of negative impacts. He suggested that:

Feeding our people over the long term is a lot more important than digging a bit of coal to make some short-term money...I'm not against mining at all. As a society, we're going to have to keep mining, but we have to use the best science and make sure we don't destroy our food-producing system in doing it... If we damage the integrity of our groundwater systems and undermine the long-term sustainability of regional Australia and our water systems, then we really undermine the future of Australia. The idea of doing that for potentially short-lived economic gain that really doesn't bring lasting benefits to the regions is deeply concerning.<sup>83</sup>

4.68 The New South Wales Irrigators' Council also submitted that a major observable impact resulting from mining impacts is 'the depopulation of small rural communities' because of ongoing loss of agricultural productivity.<sup>84</sup>

4.69 Lock the Gate Alliance submitted that the New Acland coal mine had negatively impacted the town of Acland in Queensland which, as of 2016, had one remaining resident who had refused to sell his properties to New Hope Coal company.<sup>85</sup> Lock the Gate Alliance went on to comment:

The New Acland coal mine has already decimated the former agricultural village of Acland. It has caused extensive hardship, damaged community members' physical and mental health, as well as their livelihoods and eroded the once-thriving and cohesive rural community.<sup>86</sup>

4.70 Lock the Gate Alliance stated that stage three of the New Acland project was the only mining project to have a Queensland Land Court decision that the mine should not proceed. The Alliance argued that this decision 'was largely a result of the considerable consequences the mine would have on groundwater aquifers used by

---

82 Property Rights Australia Incorporated, *Submission 21*, p. 4.

83 Mr Angus Emmott, Private capacity, *Proof Committee Hansard*, 10 September 2018, p. 5.

84 NSW Irrigators' Council, *Submission 11*, p. 3.

85 Elly Bradfield, 'Acland "ghosts" returning to breathe life into the coal mining town for census night', *ABC News*, 9 August 2016, <http://www.abc.net.au/news/2016-08-09/acland-ghosts-return-to-queensland-town-for-census-night/7704250> (accessed 29 May 2018).

86 Lock the Gate Alliance, *Submission 28*, p. 7.

surrounding farmers'.<sup>87</sup> In May 2018, the Queensland Supreme Court rejected the Land Court's decision and referred the matter back to the Land Court.<sup>88</sup>

4.71 Dr Gavin Lind from the Minerals Council of Australia emphasised that the minerals industry is focused on 'the distributional fairness and procedural fairness of communities in their acceptance' of minerals operations and on 'building trust together with the community'.<sup>89</sup>

### **Cultural impacts for Aboriginal communities**

4.72 The LCA argued the release of gigalitres of water into the environment can have cultural or spiritual repercussions for traditional owners of the land.<sup>90</sup> The Council submitted that the National Water Initiative (NWI) does not adequately take into account impacts of water use on Aboriginal societies:

The ongoing failure to incorporate the extractive industry into the NWI framework – particularly in relation to resource planning and management – also means that the impact of the industry's use of water is not being systematically addressed in the context of the impact on Aboriginal peoples' connection to, and responsibility for, their land...[T]he current frameworks for recognition of Indigenous cultural flows under the *Water Act 2007* (Cth) and most State water rights systems remain inadequate. Aboriginal people often have the right to 'consultation', but generally no substantive rights or cultural entitlements. Cultural flows will not be appropriately recognised until water rights in Australia recognise substantive rights arising by virtue of Aboriginal custom.<sup>91</sup>

4.73 The LCA suggested that several models may provide a solution to this issue, such as the recent creation of a formal Indigenous Council to advise on water use of the Yarra River in Victoria, and the ongoing National Cultural Flows Research Project.<sup>92</sup> This project aims to achieve water entitlements, or cultural flows, within Australia's water planning and management systems 'that are legally and beneficially

---

87 Lock the Gate Alliance, *Submission 28*, p. 7.

88 Kirrin McKechnie, 'New Acland coal mine expansion back on the table after Land Court decision rejected', *ABC News*, 2 May 2018, <http://www.abc.net.au/news/2018-05-02/new-acland-coal-mine-expansion-back-on-the-table/9718230> (accessed 29 May 2018).

89 Dr Gavin Lind, Director, Workforce and Health, Safety, Environment and Communities, Minerals Council of Australia, *Committee Hansard*, p. 28.

90 Law Council of Australia, *Submission 8*, p. 7; See also Ms Corinne Unger, *Submission 24*, p. 2; Lock the Gate Alliance, *Submission 28*, pp. 5–6; Ms Helen Bishop, *Submission 31*; Ms Revel Pointon, Lawyer, Environmental Defenders Office Queensland, *Committee Hansard*, 2 May 2018, p. 28.

91 Law Council of Australia, *Submission 8*, p. 4.

92 Law Council of Australia, *Submission 8*, p. 4.



owned by Indigenous Nations...to improve the spiritual, cultural, environmental, social and economic conditions of those Indigenous Nations'.<sup>93</sup>

### **Beneficial impacts**

4.74 Despite the negative impacts outlined above, some witnesses and submitters focused on the beneficial impacts of water extraction. The International Association of Hydrogeologists argued that there are substantial positive benefits arising from extractive projects in general. These include, for example, groundwater resources being developed by mining companies in rural areas 'that would otherwise not be developed due to the cost and technical difficulty of accessing them'. Other positive impacts that the Association noted included increased employment in local communities, direct spending and royalties.<sup>94</sup>

4.75 The Minerals Council of Australia stated that some water extracted from underground sources may be treated and provided for townships or agricultural purposes. This water, it argued, along with water infrastructure provided and maintained by extractive industries, may be offered to other users 'to their substantial benefit in terms of cost, accessibility and reliability'.<sup>95</sup> The Australian Petroleum Production and Exploration Association also noted that the additional water supply in some regions was particularly beneficial for agricultural communities in times of drought.<sup>96</sup>

4.76 Ms Robyn Glindemann from the LCA gave an example in evidence of a RioTinto irrigation project in Western Australia in which 'water was transported from dewatering bores and fed through an irrigation system to grow hay for stock', although she noted that a major issue for the project was the cost of transporting the hay to areas where it could be used.<sup>97</sup>

4.77 The Australian Petroleum Production and Exploration Association emphasised that '[r]egional communities benefit the most from the onshore gas industry, with new jobs and infrastructure creating stronger, diversified regional economies'. The Association highlighted that in some regions, the resources sector is the biggest contributor to gross regional product, with low unemployment, higher

---

93 National Cultural Flows Research Project, *About the project*, [http://culturalflows.com.au/~culturalflowscom/index.php?option=com\\_content&view=article&id=16&Itemid=125](http://culturalflows.com.au/~culturalflowscom/index.php?option=com_content&view=article&id=16&Itemid=125) (accessed 28 May 2018).

94 International Association of Hydrogeologists, *Submission 9*, p. 4; See also Dr Malcolm Roberts, Chief Executive Officer, Australian Petroleum Production and Exploration Association, *Committee Hansard*, 2 May 2018, pp. 19, 20–21.

95 Minerals Council of Australia, *Submission 13*, pp. 27, 28. See also Dr Malcolm Roberts, Chief Executive Officer, Australian Petroleum Production and Exploration Association Ltd, *Committee Hansard*, 2 May 2018, pp. 15, 16, 21.

96 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 7.

97 Ms Robyn Glindemann, Deputy Chair, Australian Environment and Planning Law Group, Legal Practice Section, Law Council of Australia, *Committee Hansard*, 1 May 2018, p. 40.

family incomes and a reversal of population decline being features of regions that host the resources sector.<sup>98</sup>

### **Conclusion**

4.78 This chapter has examined the major environmental, economic, social and cultural impacts of water extraction, as well as beneficial impacts arising from extractive activities. The following chapter outlines the Committee's view and recommendations arising from the inquiry.

---

98 Australian Petroleum Production and Exploration Association Ltd (APPEA), *Submission 22*, p. 34.

# Chapter 5

## Committee view

5.1 Australia's underground water systems are a precious and finite resource. As the driest inhabited continent, and with climate change expected to affect future rainfall patterns, Australia needs access to underground water supplies more than ever, particularly because of the reliance of rural, regional and remote communities on these resources.

5.2 The Committee acknowledges the substantial economic benefit that extractive projects may provide to certain sectors of the community and some regional and rural communities. However, these benefits should not be prioritised at the expense of other industries or the environment in terms of long-term impacts on resources and ecosystems which will need decades and centuries to recover from extractive activities.

5.3 The Committee considers that current regulatory processes do not sufficiently take into account the intrinsic value of the environment as a valuable resource in its own right. The loss of groundwater-dependent and groundwater ecosystems, particularly those that are threatened and endangered or not yet identified, would be an irrevocable tragedy. Figures estimating total water use of particular industries do not accurately represent the long-term impacts of changes to topography, aquifer structures or groundwater quality that arise from extractive industry activities.

5.4 The Committee commends the Commonwealth, state and territory governments for improvements made to water management initiatives in the Murray-Darling Basin and the Great Artesian Basin. However, there remains considerable room for improvement in terms of fair and equitable water allocation so that short-term economic gain does not outweigh the long-term water needs of agricultural users, rural, regional and remote communities and ecosystems. The needs of one industry should not be prioritised over the needs of other water users.

5.5 The Committee also considers that there are specific areas for improvement in the Commonwealth regulatory framework governing water use by extractive industries. These are outlined below.

### **Amendments to the EPBC Act**

5.6 The Committee recommends that the Commonwealth Government expand the water trigger in the *Environment Protection and Biodiversity Act 1999* (EPBC Act) to include all forms of unconventional gas activity. The Committee was told repeatedly by multiple submitters and witnesses that the water trigger should be expanded to include shale and tight gas. There is no scientific reason to treat these forms of gas extraction as different from coal seam gas activity in terms of impacts on water resources, particularly because unconventional gas extraction involves large amounts of water.

5.7 The Committee was not persuaded by arguments from a small number of submitters that the Commonwealth requirements imposed on industry for projects

impacting water resources were duplicative of state and territory requirements or unnecessary. If anything, evidence presented to this inquiry demonstrated the importance of Commonwealth oversight of activities that have the potential to affect a resource that is as important to the future of the Australian economy as water.

### **Recommendation 1**

**5.8 The Committee recommends that the Commonwealth Government amend the *Environment Protection and Biodiversity Act 1999* to include all forms of unconventional gas under the provisions of the water trigger.**

5.9 Further, the Committee considers that the investigatory role of the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) be extended so that it is able to provide advice on unconventional gas activities and how these may impact water resources. The Committee commends the IESC for its detailed and high quality work provided to date to inform regulatory decisions at both the state and Commonwealth levels.

### **Recommendation 2**

**5.10 The Committee recommends that the role of the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development be expanded to provide scientific advice to regulatory decision-makers on the impacts of unconventional gas activities on Australia's water resources.**

### **Bilateral agreements**

5.11 Evidence provided to the inquiry emphasised the importance of ongoing Commonwealth involvement in regulatory decisions governing water use by the extractive industry. The Committee heard concerns that proposed bilateral approval agreements would remove the Commonwealth from regulatory decisions, and give states the power to make decisions that would take into account both state matters and matters of national environmental significance. The Committee does not consider that approval bilateral agreements should proceed, given evidence suggesting that states may have made regulatory decisions on the basis of insufficient modelling and research or even, in some instances, in spite of evidence from experts and government water bodies suggesting projects should not proceed.

### **Recommendation 3**

**5.12 The Committee recommends that the Commonwealth Government does not commit to any bilateral approval agreements with states and/or territories.**

### **Compliance with current Commonwealth conditions**

5.13 The Committee heard from a range of witnesses and submitters outlining the environmental impacts of extractive activities that, despite regulatory requirements intended to mitigate their impacts, had negatively impacted other water users. Further, because of limited baseline data, projects are often required to provide the Minister for the Environment and Energy with completed data after the project has been approved. As a result, the Committee was told, regulatory oversight is shifted from the approvals process to the compliance process.

5.14 The Committee is concerned that there have been instances where compliance is poor, and ongoing monitoring and reporting are limited in terms of certain types of negative impacts, particularly groundwater depressurisation and water quality. Monitoring compliance is essential given the reliance of regulatory decision-makers on data that is not provided until a project is underway.

5.15 The Committee considers that the Commonwealth Government should provide the Department of the Environment and Energy with funding to undertake compliance and monitoring activities of projects which it has approved.

#### **Recommendation 4**

**5.16 The Committee recommends that the Commonwealth Government appropriately resource the Department of the Environment and Energy to undertake compliance and monitoring activities of extractive projects which have been approved under the *Environment Protection and Biodiversity Act 1999*.**

5.17 In addition, the Committee sees no reason why mining companies should withhold up-to-date monitoring data from communities, particularly in the interests of transparency. These figures should be released to alleviate community concerns about bore water levels and water quality, and will do a great deal to ensure community confidence that industry is complying with approval conditions and licensing requirements. This should be a requirement in all Commonwealth approvals.

#### **Recommendation 5**

**5.18 The Committee recommends that the Department of the Environment and Energy require, as a condition of approvals for all extractive projects affecting water resources, that proponents publicly release real-time data or, where this is not available, the most up-to-date monitoring data available on water levels and water quality.**

5.19 The Committee is concerned about evidence regarding surface water and rainfall take by extractive industry projects, particularly because this may impact water flows into connected water systems and lead to decreased water levels in rivers and other bodies of water. The Committee is of the opinion that the Commonwealth Government should work with states and territories to ensure that accurate reporting of surface and rainfall take by extractive industries occurs.

#### **Recommendation 6**

**5.20 The Committee recommends that the Commonwealth Government work with state and territory governments through the Meeting of Environment Ministers or another forum, as appropriate, to ensure that extractive industries are accurately reporting surface and rainfall water take.**

#### **The National Water Account**

5.21 The Committee heard that the National Water Account only covers one groundwater system, despite many regional, rural and remote communities across Australia relying partly or entirely on underground water. The Committee proposes that, given the importance of underground water for human and animal consumption, the National Water Account be expanded and provided with additional resources to

more adequately capture Australia's underground water resources. The Commonwealth Government could consider, if appropriate, partial cost-recovery measures from users of water resources.

### **Recommendation 7**

**5.22 The Committee recommends that the Commonwealth Government expand the National Water Account so that it is able to comprehensively incorporate data on underground water systems.**

### **Baseline modelling**

5.23 A number of submitters and witnesses to the inquiry raised the issue of approvals for the proposed Adani Carmichael coal mine in Queensland. In particular, the Committee heard that even after a decision was made about the project, concerns remained among experts that too much uncertainty existed about the information included on groundwater sources in the project's baseline modelling for a decision to be made.

5.24 The Committee was told that this instance of uncertainty in baseline modelling was not isolated but appears to be relatively widespread across different proposals. This is because it may take years to close the knowledge gaps used to inform baseline models. Without proponents being required to outline the extent and nature of the uncertainty in their modelling, the onus has been placed on regulators to make decisions based on limited and incomplete models. The Committee recommends that the Department of the Environment and Energy require proponents to clearly report uncertainty in their model predictions of potential impacts to groundwater, and the Commonwealth Government encourage states and territories introduce the same requirement through the Council of Australian Governments and/or the National Water Initiative. Further, the Committee is of the view that in the event of high uncertainty in modelling data combined with significant risks that a project could lead to negative environmental outcomes, approvals should not be granted until better modelling provides more certainty.

### **Recommendation 8**

**5.25 The Committee recommends that the Department of the Environment and Energy require proponents of projects addressed under the water trigger to clearly report on the nature and extent of uncertainty existing in their baseline modelling on potential impacts. Further, approvals should not be granted where there is a high risk of negative environmental outcomes and modelling data provided by proponents fails to provide confidence that these risks have been appropriately taken into account.**

### **Recommendation 9**

**5.26 The Committee recommends that the Commonwealth Government, through the Council of Australian Governments and the National Water Initiative as appropriate, encourage state and territory governments to require extractive industry projects to clearly report on the nature and extent of uncertainty existing in their baseline modelling on potential impacts.**

---

## **Bioregional assessments**

5.27 The Committee commends the Commonwealth Government's decision to extend the Bioregional Assessment Program to examine the potential environmental impacts of shale and tight gas projects. The research on cumulative impacts produced by the Bioregional Assessment Program is used to inform Commonwealth and state regulatory decisions on whether to approve project proposals or not.

### **Recommendation 10**

**5.28 The Committee recommends that the Commonwealth Government prioritise Bioregional Assessments to ensure that the information they provide can be used for upcoming proposals for extractive industry projects.**

5.29 The Commonwealth Government's Bioregional Assessment Program should be provided with more resources to maximise its ability to prioritise and complete the work. This improved resourcing would help to ensure that data is available for projects that would otherwise be postponed or declined because of inadequate modelling.

### **Recommendation 11**

**5.30 The Committee recommends that the Commonwealth Government provide the Bioregional Assessment Program with additional resources to equip the program to improve its data collection and research functions.**

## **Lack of research impacting regulatory decisions**

5.31 The Committee considers that it is unacceptable that regulatory decisions on extractive industry projects are being made in the absence of research on how extractive activities lead to particular impacts on groundwater ecosystems and the interactions between surface and subsurface resources. This lack of research is affecting decision-making, often with irreversible consequences. The organisms living in groundwater are essential to water quality, yet because few stygofauna species are listed for protection, and research on other organisms in groundwater sources in some instances is almost non-existent, these species are not given the same consideration in regulatory decisions as those species found in surface ecosystems. The Committee recommends that as a matter of urgency, the Commonwealth Government identify current research gaps affecting regulatory decisions on the impacts of extractive projects on water resources, and fund research into these areas as appropriate.

### **Recommendation 12**

**5.32 The Committee recommends that the Commonwealth Government identify current research gaps affecting regulatory decisions on the impacts of extractive projects on underground water ecosystems, and provide funding for further research into this areas as appropriate.**

5.33 Further, the Committee considers that proponents be required to report more stringently on stygofauna and microbial communities living in underground water systems and potential impacts on these organisms in their applications for regulatory approvals. Such organisms are often essential to water quality and flow, but in some

cases have not been given the same level of importance as that afforded to groundwater-dependent ecosystems.

### **Recommendation 13**

**5.34 The Committee recommends that the Department of the Environment and Energy ensure reporting requirements for proposed projects requiring approval under the water trigger include information on the potential impacts to the organisms living in groundwater ecosystems.**

### **The National Water Initiative**

5.35 This inquiry heard that considerable gaps and omissions remain in the current National Water Initiative (NWI) intergovernmental agreement. These include the inability of the NWI to appropriately take into account the extractive industry and the cumulative impacts of extractive projects. This is particularly relevant for water resources spread across different jurisdictions, such as the Great Artesian Basin and the Murray-Darling Basin.

5.36 The Committee notes the concerns of a number of submitters and witnesses about regulatory gaps in their respective state and territory frameworks governing water use, and recommends that the Commonwealth Government, through the Council of Australian Governments and the NWI, encourage jurisdictions to adopt consistent approaches that promote fair, equitable and sustainable water use allocations.

### **Recommendation 14**

**5.37 The Committee recommends that the Commonwealth Government, through the Council of Australian Governments and the National Water Initiative, encourage states and territories to adopt consistent regulatory approaches that promote the fair, equitable and sustainable allocation of water resources.**

5.38 The Committee welcomes the Productivity Commission's report into National Water Reform recommending that the NWI be renewed by 2020. In particular, the Committee endorses the report's recommendation that this renewed NWI ensure that extractive industries are included in water entitlement frameworks.

### **Recommendation 15**

**5.39 The Committee recommends that the Commonwealth Government accept the Productivity Commission's recommendation in its National Water Reform report that the National Water Initiative be renewed by 2020.**

### **Recommendation 16**

**5.40 The Committee recommends that the Commonwealth Government accept the Productivity Commission's recommendation in its National Water Reform report that state and territory water entitlement and planning frameworks explicitly incorporate extractive industries.**

5.41 This inquiry heard that some Traditional Owners feel excluded from decision-making processes on water resources that have ecological or cultural value for Indigenous groups. The Committee endorses the Productivity Commission's



---

recommendation that all governments incorporate Indigenous cultural objectives in their water plans, and that the relevant provisions of the revised NWI be informed by an Indigenous working group.

5.42 Even with these recommendations, the Committee considers that more work needs to be undertaken to ensure that Aboriginal water entitlements and rights are taken into account in regulatory decisions in appropriate and culturally sensitive ways. The Committee considers that one method of achieving this would be the creation of Indigenous Councils to advise regulatory decision makers in the various states and territories. The Committee encourages the Commonwealth Government to work with state and territory governments to see this happen.

#### **Recommendation 17**

**5.43 The Committee recommends that the Commonwealth Government accept the Productivity Commission's recommendation in its National Water Reform report that all governments undertake further work to incorporate clear, measurable and well-informed Indigenous cultural objectives in water plans, with tangible actions, monitoring and reporting arrangements to ensure that these objectives are implemented effectively.**

#### **Recommendation 18**

**5.44 The Committee recommends that the Commonwealth Government accept the Productivity Commission's recommendation in its National Water Reform report that an Indigenous working group be established to provide advice on the development of provisions related to the incorporation of Indigenous cultural objectives for the renewed National Water Initiative.**

5.45 The Committee further recommends that the revised NWI address the issues of inconsistent terminology across jurisdictions and the cumulative impacts of extractive industry projects on water, particularly as these relate to water resources crossing different jurisdictions.

#### **Recommendation 19**

**5.46 The Committee recommends that the renewed National Water Initiative include measures to encourage harmonisation of terminology used in regulatory frameworks governing water use across the various jurisdictions.**

#### **Recommendation 20**

**5.47 The Committee recommends that the renewed National Water Initiative include measures to take into account the cumulative impacts of extractive industry activities on water resources.**

#### **Abandoned mines**

5.48 This inquiry received concerning evidence outlining the legacy impacts of abandoned mines on water resources, including, for example, bright blue water in Queensland because of acid mine drainage. The Committee heard that regulatory gaps in the monitoring of abandoned mines mean that the extent of impacts on water

resources from abandoned mines is unclear. The Committee will consider this issue in greater detail in its inquiry into mining rehabilitation.

**Senator Janet Rice**

**Chair**

## **Australian Greens' additional comments**

1.1 The Greens welcome the Committee's majority report, which we believe contains important reform recommendations for both the current and future Commonwealth governments.

1.2 Despite these recommendations there remains clear disagreement within the Committee about both the scale of the problem that coal and unconventional developments present, and the speed and degree of risk aversion with which the Commonwealth Government should act.

### **Concerns about coal and unconventional gas developments**

1.3 The Greens commend the Commonwealth Government for its decision to expand the Bioregional Assessment Program to examine unconventional gas developments, given the importance of this program's work to date on cumulative impacts arising from coal mining and coal seam gas projects.

1.4 At present, the Victorian Government has a permanent ban on hydraulic fracturing, the Tasmanian and Western Australian Governments have moratoriums, the South Australian Government has proposed a ten year moratorium on hydraulic fracturing in its Limestone Coast area, and the New South Wales Government has some restrictions in place. Further, many governments around the world have imposed moratoriums on hydraulic fracturing. These constraints reflect the highly controversial nature of fracking, which involves huge amounts of water and carries the potential for environmental contamination and seismic activity.

1.5 Given Australia's limited water resources and the recognition in Australia and other countries of the potential dangers of hydraulic fracturing, the Greens recommend that the Commonwealth Government does not approve any new developments involving hydraulic fracturing and move towards phasing out existing hydraulic fracturing activity.

### **Recommendation 1**

**1.6 Australian Greens Senators recommend that the Commonwealth Government does not approve any new developments involving hydraulic fracturing and implements initiatives to phase out existing hydraulic fracturing activity.**

1.7 Evidence presented to this inquiry outlined concerns about the reinjection of wastewater into aquifers, in particular the unknown impacts that this activity has on organisms living in groundwater and the possibility that aquifer reinjection causes increased seismic activity. The Committee commends the recommendation of the independent Scientific Inquiry into Hydraulic Fracturing in the Northern Territory that aquifer reinjection be prohibited until such time as scientific investigations determine that associated risks can be mitigated. The Greens recommend that the Commonwealth Government implement a moratorium at a national level.

## **Recommendation 2**

**1.8 Australian Greens Senators recommend that the Commonwealth Government implement a moratorium on the reinjection of water into aquifers in the absence of full scientific investigations determining that associated risks can be mitigated.**

### **The impact of coal mining on water resources**

1.9 The water trigger was first established because of concerns about the environmental impacts of coal seam gas and large coal mining developments. Despite incomplete baseline data used to inform many coal and coal seam gas project proposals, and concerns from experts about the comprehensiveness of data and modelling used to inform applications, such as the proposed Adani Carmichael coal mine in Central Queensland, coal and coal seam gas projects continue to be approved at the state and Federal levels.

1.10 This is despite the known environmental impacts of these projects, the untenably high emissions intensity of coal used for electricity generation and increased pressure placed on underground water and other resources that are vital to the ongoing existence of Australia's agricultural industry. Viable and cost-effective sources of energy generation exist and are already replacing outdated sources of electricity generated from coal.

1.11 The Greens are of the view that no new coal mining projects should be approved, and the Commonwealth Government should begin to phase out all existing coal mines.

## **Recommendation 3**

**1.12 Australian Greens Senators recommend that the Commonwealth Government ceases approvals for new coal mining projects and works to phase out all existing coal mines.**

### **Non-compliance of existing projects**

1.13 Clear statements were made by a number of witnesses about examples of non-compliance by project proponents and project operators. The Committee has noted in the majority report that instances of non-compliance with approval terms have taken place. The Greens support Committee Recommendation 4 for further departmental resourcing for compliance and monitoring activities, however we believe there should be further efforts to assess the compliance of existing projects.

## **Recommendation 4**

**1.14 Australian Greens Senators recommend that the Commonwealth Government initiate an independent review to examine the extent to which projects already approved under the water trigger have complied with conditions attached to their approvals.**

---

## **Water resource modelling and bioregional assessments**

1.15 Many witnesses also noted that the degree of uncertainty in existing water modelling was inexcusably high. The limitations of existing parameters around the impact of specific projects means that both the wider effects and cumulative effects of individual projects are poorly understood and regulated. Therefore, while the Greens also support Committee Recommendation 10, we believe that the risks and uncertainty inherent in water and environmental modelling are so large that projects should not be proceeded with until bioregional assessments for the relevant regions have been completed.

### **Recommendation 5**

**1.16 Australian Greens Senators recommend that the Commonwealth Government decline to consider proposals for extractive industry projects until after bioregional assessments of the relevant regions are completed.**

#### **'Associated water' use**

1.17 The Greens are concerned about inconsistencies in the regulatory requirements for the extractive industry as compared to other industries in state and territory regulatory systems. In particular, evidence showed that the extractive industry in Queensland is permitted to take an unlimited amount of 'associated water' extracted in the course of regular operations, and that this water take occurs outside the state's water licensing requirements as applied to other users. The Greens consider that the current system permitting unlimited use of 'associated water' by the extractive industry should be ended.

### **Recommendation 6**

**1.18 Australian Greens Senators recommend that the Commonwealth Government work with the Queensland Government through the Meeting of Environment Ministers or another forum, as appropriate, to remove the current permissions that allow the extractive industry to take an unlimited amount of 'associated water' outside the state's ordinary water licensing requirements.**

**Senator Janet Rice  
Chair  
Senator for Victoria**



## Coalition Senators' dissenting report

1.1 Coalition Senators do not agree with the Committee's conclusion that the current regulatory processes do not sufficiently take into account the value of the environment as a valuable resource or the regulation regarding the use of water by extractive industries.

1.2 The effectiveness of the water trigger legislation was independently reviewed in April 2017.<sup>1</sup> The Independent Review of the Water Trigger Legislation (the review) concluded that the water trigger is an appropriate public policy response to the potential risks associated with coal seam gas and large coal mining. This review also found that there were no recommendations regarding legislative changes to the water trigger legislation.

1.3 Coupled with this independent review, the Department of the Environment and Energy (the Department) conducted a post implementation review of the water trigger legislation to address the requirements of the Office of Best Practice Regulation. The Department concluded that an adaptive strategy for the ongoing implementation of the water trigger was the most prudent approach to manage the risks associated with the inter-connectedness of ecosystem services, coal seam gas and large coal mining developments as they relate to water resources. There was no finding of a need to expand this legislative framework.

1.4 Coalition Senators do not agree with the recommendation to introduce a nation-wide moratorium on hydraulic fracturing activities. Australia is blessed with a diverse range of energy resources, including conventional and unconventional gas. The development of our gas resources supports Australian industry and Australian jobs. Numerous inquiries into unconventional gas development have come to the same conclusion – that the industry can be developed safely with appropriate regulation. The coal seam gas industry has been operating in Queensland for more than 20 years.

1.5 The risks associated with unconventional gas exploration and development can be mitigated and managed with rigorous, outcomes-focussed regulation and evidence based policy backed by scientific research.

1.6 The recommendation to cease the approvals for new coal mining projects and to work to phase out all existing coal mines is not supported. Australian coal is one of the highest quality in the world and we produce it more efficiently than most. That puts our coal sector, and thousands of Australians who work in it, in prime position to benefit from the increased demand for energy resources; providing jobs, energy security, royalties and essential regional economic contribution.

1.7 The Australian Government fully supports the Australian coal sector given the industry's significant and ongoing contribution to the Australian economy. The Coal Industry contributes around \$5 billion annually in royalties, and accounts for over

---

1 Commonwealth of Australia, *Independent Review of the Water Trigger Legislation*, April 2017.

51,000 direct jobs. Importantly, the majority of these jobs are located in regional areas.

1.8 Australia has significant reserves of thermal coal, used for generating electricity, and metallurgical coal, which is an essential ingredient in making steel. Indeed, over 61 per cent of Australia's electricity is generated from coal and over 68 per cent in the National Electricity Market. The ABS figures released on 2 August 2018 show that Australia's coal exports totalled \$60.1 billion in 2017-18, up 11 per cent on the previous year.

1.9 Our resources industry operates within a robust regulatory environment, and our resources expertise is world class.

**Senator Jonathon Duniam**  
**Deputy Chair**  
**Senator for Tasmania**



# Appendix 1

## Submissions, tabled documents and answers to questions on notice

### Submissions

- 1 Department of the Environment and Energy
- 2 Geoscience Australia
- 3 Northern Territory Government
- 4 Environmental Defenders' Offices of Australia
- 5 Associate Professor Grant Hose
- 6 Australian Farmers for Climate Action
- 7 Nature Conservation Council of NSW
- 8 Law Council of Australia
- 9 International Association of Hydrogeologists
- 10 Conservation Council of South Australia
- 11 NSW Irrigators' Council
- 12 Ms Gillian Pechey
- 13 Minerals Council of Australia
- 14 Buru Energy Limited
- 15 New South Wales Minerals Council
- 16 The Colong Foundation for Wilderness Ltd
- 17 National Farmers' Federation
- 18 University of Queensland Centre for Coal Seam Gas
- 19 Ms Sarah Asokendaran
- 20 Basin Sustainability Alliance
- 21 Property Rights Australia Incorporated
- 22 Australian Petroleum Production and Exploration Association Ltd
- 23 Mr Tony Windsor MP and Mr John Clements
- 24 Ms Corinne Unger
- 25 Mr Maxwell Winders
- 25.1 Supplementary to Submission 25
- 26 Caroon Coal Action Group Inc
- 27 Conservation Council of Western Australia
- 27.1 Response to Submission 27 from Vimy Resources

- 28 Lock the Gate Alliance
- 29 Miss Helen Bender
- 29.1 Response to Submission 29 from QGC Pty Ltd
- 30 Department of Agriculture and Water Resources
- 31 Ms Helen Bishop
- 32 Ms Fiona Bullivant

### **Tabled documents**

Additional information tabled by Miss Helen Bender at the public hearing in Brisbane on 1 May 2018.

### **Answers to questions on notice**

Answer to question on notice received from the Department of the Environment and Energy following the public hearing in Sydney on 2 May 2018.

## **Appendix 2**

### **Public hearings and witnesses**

*Tuesday, 1 May 2018 – Brisbane*

**Basin Sustainability Alliance**

Mr Lee McNicholl, Chair

**Wambo Cattle Company Pty Ltd**

Mr Maxwell Winders, Director

**Miss Helen Bender, private capacity**

**Ms Corinne Unger, private capacity**

**University of Queensland, Centre for Coal Seam Gas**

Professor Andrew Garnett, Director

**Ms Sarah Asokendaran, private capacity**

**Professor Jonathan Fulcher, private capacity**

**Minerals Council of Australia**

Dr Gavin Lind, Director, Workforce and Health, Safety, Environment and Communities

**Property Rights Australia**

Ms Joanne Rea, Chair

Mr Tom Crothers, Consultant

**Law Council of Australia (via teleconference)**

Ms Robyn Glindemann, Deputy Chair, Australian Environment and Planning Law Group, Legal Practice Section

*Wednesday, 2 May 2018 – Sydney*

**International Association of Hydrogeologists**

Dr Lange Jorstad, President, Australian Chapter

**NSW Irrigators' Council**

Mr Mark McKenzie, Chief Executive Officer

**Australian Petroleum Production and Exploration Association**

Dr Malcolm Roberts, Chief Executive Officer

Mr Keld Knudsen, Policy Director, Exploration

Mr Nick Fox, Head of Environment and Access (Santos)

**Environmental Defenders' Office of Australia**

Dr Megan Kessler, Scientific Director, New South Wales

Ms Revel Pointon, Lawyer, Queensland

**Lock the Gate Alliance**

Ms Georgina Woods, Policy Coordinator

**Macquarie University, Department of Biological Sciences**

Associate Professor Grant Hose

**Geoscience Australia**

Dr Stuart Minchin, Chief Environmental Geoscience Division

**Department of the Environment and Energy**

Mr Bruce Edwards, Assistant Secretary, Policy and Reform Branch, Environment Standards Division

Mrs Emily Grant, Director, Office of Water Science Secretariat and Engagement

Mr James Tregurtha, Acting First Assistant Secretary, Environment Standards Division

**Department of Agriculture and Water Resources**

Mr Christopher Biesaga, Director, Great Artesian Basin Section and Lake Eyre Basin Section

Mr Paul Morris, First Assistant Secretary, Water Division

***Monday, 10 September 2018 – Canberra*****Australian Farmers for Climate Action**

Ms Verity Morgan-Schmidt, Chief Executive Officer

**Mr Angus Emmott, private capacity (via teleconference)****Panel of Farmers from Queensland (via teleconference)**

Mr Bruce Currie

Ms Jody Brown

**Lock the Gate Alliance (via teleconference)**

Ms Georgina Woods, NSW Coordinator

**Ms Libby Laird, private capacity (via teleconference)****Mr Peter Willis, private capacity (via teleconference)**

***Responses to certain evidence given during public hearings***

1. Correspondence from Central Petroleum Ltd - response to certain evidence given during a public hearing on 1 May 2018
2. Correspondence from GVK Hancock Coal Pty Ltd - response to certain evidence given during a public hearing on 10 September 2018
3. Correspondence from the NSW Minerals Council - response to certain evidence given during a public hearing on 10 September 2018