



Government of **Western Australia**  
Department of **Water**

## Submission to the Legislative Council Standing Committee on Environment and Public Affairs

Inquiry into the implications for Western Australia  
of hydraulic fracturing for unconventional gas

Department of Water

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# 1 Introduction

The Department of Water (DoW) appreciates the opportunity to make a submission to the Legislative Council inquiry. This submission focuses on part 'c' of the terms of reference, namely:

*the use of ground water in the hydraulic fracturing process and the potential for recycling of produced water.*

## 1.1 Overview: hydraulic fracturing

The hydraulic fracturing process involves drilling a well, perforating the well casing and injecting fracing fluids under pressure, to fracture the gas-bearing rocks. Fracing fluids typically consist of 90 per cent water, 9.5 per cent proppants (usually sand) and 0.5 per cent additives and chemicals. A proportion of the fracing fluids will be returned to the surface (generally 10 to 40 per cent for shale gas and up to 80 per cent for tight gas operations).

## 1.2 Western Australia's unconventional gas reserves

Western Australia's unconventional on-shore gas resources are found in the north (Canning Basin) and the mid-west (Perth and Carnarvon Basins) regions of the State. They are usually found at depths below 2000 metres, which is generally well below aquifers that are currently used for water production or are likely to be used in the future.

Although there is significant interest world-wide in developing shale and tight gas reserves, particularly in the United States (US), DoW notes that this level of development has to date not been replicated in Western Australia. Existing activity focuses on undertaking the necessary exploration work to determine project viability.

## 1.3 Hydraulic fracturing and water requirements

Water is required for use in hydraulic fracturing, with some also needed for the drilling process. Water is not generally required on an on-going basis after the well has been fractured, but may be required for any process activities. In Western Australia, most of the water that has been used for petroleum, gas and hydraulic fracturing activities is taken from aquifers. A water well (or bore) may be constructed to take or abstract the groundwater for use in the drilling and hydraulic fracturing of petroleum wells. The quality of the water for use in drilling and hydraulic fracturing does not need to be potable.

The volume of water it takes to hydraulically fracture a well varies from project to project. It depends on the size and length of the well, and the properties of the rocks that are to be fractured. Each fracture-stage can require a certain amount of water. Generally there are a fewer stages in the exploration phase than in other phases of petroleum field development. It is noted that in the US, a single-stage fracture usually requires approximately 2,000 kilolitres of water (1,000 litres = 1 kilolitre (KL)) (US Department of Energy et.al.,2009).

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Horizontal wells are generally drilled to exploit shale and tight gas horizons. Based on the water requirements per fracture stage noted in the US (above), horizontal wells with a length of 1 kilometre (km) that are fractured ten times would use around 20,000kL of water and an additional 1,000kL for drilling. In the US, horizontal wells are typically drilled to lengths of around 1.5km and occasionally to lengths of around 3km. In comparison, the average water allocation to irrigate a one-hectare vegetable crop in the Perth region for one year is around 15,000kL of water.

The variability in water requirements is evident from recently published data on shale gas operations in the US. The ACOLA study of shale gas in Australia (Australian Council of Learned Academies (ACOLA) 2013, *Engineering Energy: Unconventional Gas Production A Study of Shale Gas in Australia (Final Report Project Six)*) reports median volumes of water used per shale gas well in the US (the number of fractures per well is not specified) ranging from 10,600kL to 21,500kL for the different shales (Nicot & Scanlon 2012 and Beauduy 2011 in ACOLA 2013) while estimates of the New York City water supply watershed range from 11,400kL to 30,400kL per well (New York City Department of Environmental Protection 2009 in ACOLA 2013).

At this early stage, it cannot be estimated how many production wells will be required to fully develop a gas field in Western Australia, or how many production wells will be drilled each year.

## 2 Overview of the Legislative Approvals Regime for managing on-shore hydraulic fracturing activities for unconventional gas activities

This section provides an overview of the roles undertaken by the Department of Mines and Petroleum (DMP) and the DoW in relation to regulating potential on-shore hydraulic fracturing activities. Section 3 is specific to the DoW's statutory role in relation to public drinking water source areas.

### 2.1 The Department of Mines and Petroleum

The DMP is the lead agency in Western Australia responsible for the regulation of all on-shore petroleum and gas activities, administering the *Petroleum and Geothermal Energy Resources Act 1967 (PGERA)*, and the *Petroleum Pipelines Act 1969*.

The Government, through DMP, introduced new regulations in 2012 entitled *Petroleum and Geothermal Energy Resources (Environment) Regulations*. These regulations require petroleum and gas activities, including unconventional gas activities, to be carried out in accordance with best industry and regulatory practices, and provide a robust, enforceable and transparent regulatory framework.

Proponents intending to undertake petroleum or gas activities must submit a number of applications to the DMP, including an Environmental Plan (EP) for each stage of project development. The proponent is responsible for disclosing all down-hole chemicals and substances to the DMP in their EP. The DMP will assess the chemicals disclosed as part of the EP assessment process. Pending approval, the chemical disclosure information must be provided in the EP summary which will be made publicly available on the DMP's website ([www.dmp.wa.gov.au](http://www.dmp.wa.gov.au)).

DMP is currently drafting petroleum resource management and administration regulations. These regulations will focus on well operations and well-integrity issues to minimise the risk of well-integrity failure and the risks to the water resources.

Depending on the location, scale and scope of planned activities, the DMP as lead agency may seek advice on individual applications from other State regulatory bodies such as the DoW, the Department of Environment Regulation (DER) and the Office of the Environmental Protection Authority (OEPA).

### 2.2 The Department of Water - Statutory Approvals Regime

The water required by the gas industry can be sourced from surface water or groundwater resources or from alternative sources such as from drainage water or from recycling. Water can also be transported by truck, rail or other means. Approval from DoW is required to access water from a groundwater or surface water resource.

The DoW only licences wells that are constructed to access water – i.e. production wells constructed to take water.

Water resource management legislation is undertaken in Western Australia pursuant to a range of legislation of which three statutes are especially relevant to the terms of reference, viz:

Table 1 Water resources management legislation

Current Act	
<i>Rights in Water and Irrigation Act 1914 (WA)</i>	The principal legislation for the allocation and management of water resources.
<i>Country Areas Water Supply Act 1947 (WA)</i>	Provides for the protection of public drinking water source areas in rural areas and the regulation of clearing control areas.
<i>Metropolitan Water Supply, Sewerage and Drainage Act 1909 (WA)</i>	Provides for the protection of public drinking water source areas in the metropolitan area.

This legislation is administered by the DoW to plan, protect, manage and regulate access to the State's water resources. In addition, there is legislation outside the water portfolio – for example the *Environmental Protection Act 1986 (EP Act)* – that also has the capacity to manage the impacts of specific development projects on water resources (see section 5). The DoW manages the State's water resources on behalf of the Minister for Water in accordance with approved delegations of authority. Decisions are made based on applicable law, government and department policies, standards, processes and guidelines, and relevant previous decisions.

### 2.3 Regulation pursuant to the *Rights in Water and Irrigation Act 1914 (RiWI Act)*

The *RiWI Act* and the *Rights in Water and Irrigation Regulations 2000 (RiWI Regulations)* are the primary legislative tools which make provision for the regulation, management, use and protection of water resources. The objectives of the *RiWI Act* (section 4(1)) are:

- to provide for the management of water resources, and in particular for
  - their sustainable use and development (including domestic, commercial, recreational, cultural and navigational purposes) to meet the needs of current and future users
  - protection of their ecosystems and the environment in which water resources are situated, including by the regulation of activities detrimental to them
- to promote the orderly, equitable and efficient use of water resources
- to foster consultation with members of local communities in the local administration of Part III of the *RiWI Act* and enable them to participate in that administration
- to assist the integration of the management of water resources with the management of other natural resources

Under the *RiWI Act*, the right to the use, flow and control of the water in watercourses, wetlands and underground water sources is vested in the Crown. Specifically, the *RiWI Act* requires all artesian wells or bores and non-artesian wells within proclaimed groundwater areas, to be licensed for their construction (under section 26D) and the taking of water, including for dewatering purposes (under section 5C), except if exempted under the Act. The impacts of taking water are