

# Guideline

## Coal seam gas water management

### Treated coal seam gas (CSG) water injection well construction requirements

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*This document establishes the technical requirements for construction of a well to be used for the injection of treated CSG water into an aquifer. This guideline does not apply to the injection of brine.*

#### Well construction standards

##### Purpose

The purpose of these well construction requirements is to protect groundwater resources from contamination by surface runoff or the movement of injected water into or between aquifers other than the target formation; and, pressure loss caused by uncontrolled flow to the surface or by leakage to lower pressure aquifers.

##### Scope

These requirements apply to the construction of wells for injection of fluid into a target aquifer from the top of the main isolation valve to the terminal depth but excludes any down-hole injection equipment such as injection tubing, packers or annular fluid.

##### General requirements

- a) Unless stated otherwise in these requirements, injection wells must be constructed according to the current standards applicable to water bore drilling activities under the *Water Act 2000* as if they were water bores. The current standards<sup>1</sup> applicable to water bore drilling activities contain conditions which are essential to the management and protection of underground resources. These requirements address aspects such as drilling fluids, casing material, cement grouting, slotted casing, and screens
- b) Only water based drilling muds are permitted to be used
- c) An injection well must be constructed to provide access for injection to only a single geological unit that is isolated above and below by aquitards or aquicludes for at least 10 kilometres beyond the water quality impact zone; or
- d) If the injection site is located in a surface aquifer, the target stratigraphic unit must be isolated below by an aquitard or aquiclude for at least five kilometres down-gradient
- e) The standards set down in this guideline for the construction of new injection wells also apply to the reconditioning of injection wells; and
- f) To remove any doubt, where an inconsistency exists between these requirements and the standards applicable to water bore drilling activities under the *Water Act 2000*, these requirements prevail.

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<sup>1</sup> Bore construction standards for both the national standards and the standards applicable to the Great Artesian Basins are available at [www.business.qld.gov.au](http://www.business.qld.gov.au), using 'bore construction standards' as the search term.

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### Specific requirements for casing

- a) Casing material and casing wall thickness must be sufficient to withstand the dry overburden pressure<sup>2</sup> to the base of the overlying aquitard or aquiclude multiplied by 1.5; and
- b) Casing material must be sufficient to withstand anticipated corrosive conditions. Acceptable solutions for production casing where corrosive water may be encountered include:
  - the use of inert liner material such as PVC, ABS or FRP; or
  - stainless steel may be used in corrosive conditions when water temperatures are in excess of 80 degrees Celsius.

### Specific requirements for sealing

- a) All well zones behind and between the casing(s), other than the injection zone and up to 30 metres above the injection zone within the target stratigraphic unit must be properly sealed through to the surface by cement grout to prevent:
  - the movement of injected water into or between aquifers and/or borehole zones; and
  - the interconnection or leakage between aquifers and/or borehole zones
- b) The surface casing must be sheathed with cement grout having a minimum annular thickness of 20 millimetres (mm) above the maximum dimension of the casing (for example coupling or shoe)
- c) The production casing must be sheathed with a minimum 15 mm of cement grout
- d) All sealing must be sufficient to withstand the anticipated formation and hydrostatic pressures imposed on the well during its installation and use, including peak test pressures
- e) All cement grout must possess a minimum specific gravity of 1.39 when wet and maintain its integrity without separation until set; and
- f) Cement grout must not contain additives which may contribute to corrosive conditions or the corrosion of the well (e.g. calcium chloride or other chloride-based accelerants).

### Conversion of existing well

- a) The conversion of an existing well or bore to an injection well must comply with these requirements for the construction of injection wells. Existing wells or bores include:
  - gas and oil wells (including exploration holes & bores) established under the *Petroleum Act 1923*, *Petroleum and Gas (Production and Safety) Act 2004* or the *Geothermal Exploration Act 2004*
  - water bores (including test holes and test bores) established under the *Water Act 2000*; and
  - exploration holes established under the *Mineral Resources Act 1989*; and
- b) If the applicant proposes to convert an existing well to an injection well, a risk profile must be produced to demonstrate how the conversion will address the risk of cross contamination and loss of pressure.

<sup>2</sup> Overburden pressure is the pressure or stress imposed on a layer of soil or rock by the weight of overlying material. The overburden pressure at a depth  $z$  is given by:

$$p(z) = p_0 + g \int_0^z \rho(z) dz$$

where  $p(z)$  is the density of the overlying rock at depth  $z$  and  $g$  is the acceleration due to gravity.  $p_0$  is the datum pressure, like the pressure at the surface.

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### Decommissioning injection wells

The development of injection wells is different from the development of petroleum and gas wells in that there is minimal risk of hazardous surface conditions from residual gas in the event of abandonment. If the proponent decides to abandon the well and the surface land occupier does not wish to assume legal responsibility, it should be decommissioned in accordance with the Minimum Construction Requirements for Water Bores in Australia<sup>3</sup>. If the land holder wishes to use the bore for water supply he/she must be able to demonstrate that the bore complies with the construction standards applicable and obtain the necessary water authorisation under the *Water Act 2000*. Prior to abandoning an injection well the well must be completely sealed with concrete, cement grout or bentonite cement grout from the terminal depth to the surface.

### Disclaimer

While this document has been prepared with care it contains general information and does not profess to offer legal, professional or commercial advice. The Queensland Government accepts no liability for any external decisions or actions taken on the basis of this document. Persons external to the Department of Environment and Science should satisfy themselves independently and by consulting their own professional advisors before embarking on any proposed course of action.

### Approved:

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### Enquiries:

Permit and Licence Management

Ph. 1300 130 372 (select option 4)

Ph:13 QGOV (13 74 68)

Fax. (07) 3330 5875

Email: [palm@des.qld.gov.au](mailto:palm@des.qld.gov.au)

### Version history

Version	Effective date	Description of changes
1.00	3 April 2013	First published version of the guideline.
2.00	3 April 2013	Minor updates.
2.01	9 August 2018	The document template, header and footer have been updated to reflect current Queensland Government corporate identity requirements and comply with the Policy Register.

<sup>3</sup> Land and Water Biodiversity Committee. (2003). Minimum Construction Requirements for Water Bores in Australia, 2nd Ed (under revision 2011).