

ANATOMY OF A COAL SEAM GAS WELL



The NSW Government has introduced stringent new codes of practice to regulate the Coal Seam Gas (CSG) industry, including new well integrity standards.

For any well to be drilled, it is a requirement of a company's exploration licence that it be drilled in accordance with the NSW Government's Code of Practice for Well Integrity, which stipulates:

- Mandatory practices for well design and construction to ensure CSG activities are environmentally safe and groundwater resources are protected;
- Guidelines for well monitoring and maintenance; and
- Methods for the management of water from the CSG extraction process.

Under the code, the design of all CSG wells must guarantee the safe production of gas by:

- Preventing any interconnection between coal seams and aquifers;
- Ensuring that gas is contained within the well and associated pipe work and equipment without leakage;
- Ensuring isolation between different aquifers and water bearing zones;
- Not introducing substances that may cause environmental harm; and

- Requiring all chemicals used to be disclosed during the approvals process.

Drilling and testing

A CSG well is created by drilling through layers of earth and rock up to 1000 metres below the surface. Multiple layers of steel casing and cement are pressure-injected so the well adheres to the surrounding rock.

A strong seal prevents gas or fluid leakage into permeable layers, including aquifers.

The process of drilling and installing the well can take over a month. Before activation, the well is subjected to a high pressure test. A geophysical logging tool is lowered into the well hole to inspect the casing and ensure it meets Government standards.

These measures limit the potential for CSG drilling activities to interfere with water resources and the environment.

Regulation of wells

The independent Environment Protection Authority (EPA) has been appointed as the lead regulator of environmental and health impacts of CSG activities in NSW. The EPA is responsible for compliance and enforcement and has the power to inspect and prosecute CSG companies for environmental and health breaches.

An Office of Coal Seam Gas (OCSG) has been established in the NSW Department of Trade and Investment to oversee the regulation of CSG matters within the scope of the *Petroleum (Onshore) Act 1991* and the *Work Health and Safety Act 2011*.

This includes:

- The administration of petroleum titles for CSG;
- The granting of exploration activity approvals;
- Workplace health and safety;
- Enforcement and compliance;
- CSG regulatory policy; and
- The regulation of rehabilitation (including security bonds).

End of Well

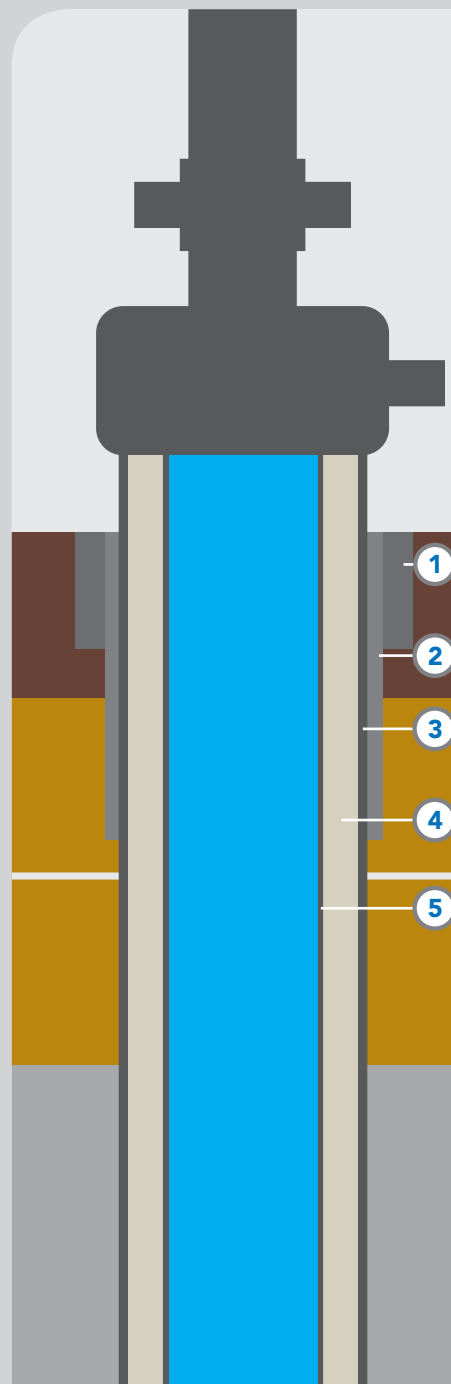
Once a well has exhausted the gas reserves from the coal seam,

it is cemented and plugged in accordance with regulatory requirements.

The title holder must rehabilitate all well sites and the surrounding land to their previous state, or as per their agreement with the landholder. Rehabilitation of the well may include restoring the

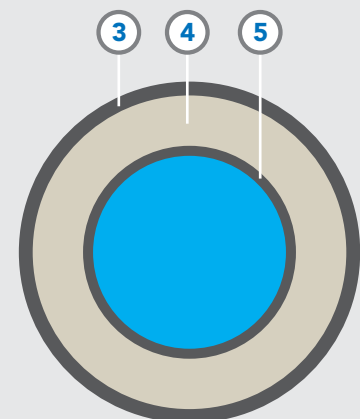
natural surface contour of the land and planting seeds to ensure adequate plant coverage of the area.

The OCSG will hold a substantial security deposit from the title holder to be used in the event that they fail to rehabilitate a well site to Government standards.



Typical well reinforcement details and cross-section

- 1 14" conductor at 6m
Cement to surface
- 2 9-5/8" steel casing at 140m
Cement to surface
- 3 7" casing at top of coal
Cement to surface
- 4 Thick cement encasement
- 5 2-7/5" production tubing



Cross-section