

Coal Seam Gas Water Management Policy

June 2010

Purpose

The purpose of this policy is to ensure that salt produced through coal seam gas (CSG) activities does not contaminate the environment and to encourage the beneficial use of treated CSG water.

The policy finalises the discussion paper published by the Department of Infrastructure and Planning titled *Management of Water Produced from Coal Seam Gas Production Discussion Paper*, May 2009. This policy relates to amendments to the *Environmental Protection Act 1994* (EP Act) enacted in 2010.

What is coal seam gas water?

CSG water is water extracted from coal seams in order to release coal seam gas. CSG is a natural gas consisting primarily of methane, which is adsorbed into coal. Once produced, it can be used for the same purposes and applications as conventional natural gas.

CSG water typically contains significant concentrations of salts. The salinity of CSG water is variable and is measured as the concentration of total dissolved solids. The total dissolved solids values may vary from 200 to more than 10,000 milligrams per litre.

For comparison, good quality drinking water has total dissolved solids values of up to 500 milligrams per litre. The total dissolved solids value of sea water is between 36,000 and 38,000 milligrams per litre.

What is saline effluent?

Treatment of CSG water through desalination technologies produces concentrated saline waste water.

This saline effluent contains concentrations of salts in excess of the source CSG water. The concentration of the saline effluent depends on the treatment process used and the salinity of the source CSG water.

Why has this policy been developed?

CSG production is an expanding industry supplying the domestic market for gas in Queensland. It will expand further with the establishment of export production facilities for LNG in Gladstone.

Significant quantities of water are generated in CSG production. The salty nature and commonly poor quality of CSG water means that it has the potential to cause environmental harm if released to land or waters through inappropriate management. The government wishes to see this water only stored and used in a manner that protects the environment from harm and maximises the opportunity to beneficially use the resource.

Relevant legislation

CSG water extraction is authorised under the *Petroleum and Gas (Production and Safety) Act 2004* or the *Petroleum Act 1923*.

Production of CSG and the associated CSG water must be authorised by an environmental authority issued under the EP Act. CSG water is a waste that must be either disposed of in accordance with the conditions of an environmental authority or used beneficially in accordance with a beneficial use approval.

The disposal of brine that may be created in the treatment of CSG water or the disposal of solid salt is also regulated under the EP Act. Brine and solid salt may also be used under a beneficial use approval.

References in this policy to the 'administering authority' are to Department of Environment and Resource Management's (DERM) exercise of formal powers under the EP Act.

Background

In October 2008, the government released the Queensland Coal Seam Gas Water Management Policy. That policy outlined the following principles for management of CSG water:

- Discontinue the use of evaporation dams as a primary means to dispose of CSG water; remediation of existing evaporation dams is to occur within three years with transitional arrangements to be developed in

consultation with industry.

- Dams necessary for water aggregation and the storage of brine from treatment facilities are to be fully lined to a standard determined by DERM.
- CSG producers are responsible for treating and disposing of CSG water.
- CSG water must be treated to a standard defined by DERM before disposal or supply to other water users.
- A CSG water management plan (CWMP) is to be incorporated into the environmental management plan (EMP) required for a large scale coal seam gas environmental authority application.
- CSG water in excess to that which can be directly injected or beneficially used, is to be aggregated for disposal.

In May 2009, the government released the Management of Water Produced from Coal Seam Gas Production Discussion Paper. This discussion paper acknowledged the increasing risks, both ecological and agricultural, associated with the significant quantities of salt being brought to the surface and requiring disposal as a result of the expansion of CSG production. It also acknowledged the undesirability of an increasing area of evaporation dams if these were to continue to be used as the primary means to dispose of untreated CSG water.

The discussion paper introduced three new issues:

- circumstances under which industry would be required to cooperate on developing and funding a CSG water aggregation and disposal system (or systems)
- reasonable and appropriate remediation action for existing evaporation dams
- appropriate disposal options for the saline effluent resulting from CSG water treatment.

Issues related to the CSG industry working cooperatively on developing a water aggregation and disposal system are not specifically addressed in this policy. They are to be dealt with through other government initiatives.

Policy framework for coal seam gas water management

1. Unless producers use direct injection of CSG water, or have arrangements for environmentally acceptable direct use of untreated CSG water, they must treat CSG water to a standard defined by DERM before disposal or supplying to other users.

The guideline: Preparing an Environmental Management Plan for Coal Seam Gas Activities sets out preferred and non-preferred management options for CSG water. These are:

- Category 1 – preferred management options include:
 - injection where detrimental impact unlikely
 - untreated use where detrimental impact unlikely
 - treatment to an agreed standard for agricultural, industrial and potable uses
- Category 2 – non-preferred management options include:
 - disposal via evaporation dams
 - disposal via injection where a detrimental impact is likely
 - disposal to surface waters
 - disposal to land.

The water management options in each category are not in any preferred order.

For CSG water management options involving beneficial use of the water, a project proponent must comply with a general approval of a resource for beneficial use, or apply for a specific approval of a resource for beneficial use.

A beneficial use approval changes the status of the material from a waste to a resource that can be used for a beneficial purpose. The holder of a beneficial use approval is obliged, through approval conditions, to manage that resource in a way that minimises the risk of environmental harm.

A general beneficial use approval is an approval of a resource, from which anyone can benefit. A specific beneficial use approval is an approval of a resource, of which only a stated person has the benefit.

The guideline: Approval of Coal Seam Gas Water for Beneficial Use describes the minimum standards for different types of beneficial use. DERM will issue a notice of decision to approve a resource for beneficial use (a general beneficial use approval) for CSG water for the following uses:

- aquaculture and human consumption of aquatic foods
- coal washing
- dust suppression
- industrial use
- irrigation
- livestock watering.

2. Evaporation dams are to be discontinued as a primary means for disposing of CSG water.

Recent (2010) amendments to the EP Act prohibit construction of CSG evaporation dams approved under existing CSG authorities (apart from those where the construction of the dam has substantially commenced before the changes to the EP Act take effect on the 5 July 2010).

A CSG evaporation dam is defined as an impoundment, enclosure or structure that is designed to be used to hold CSG water for evaporation.

The prohibition exists until the holder of a CSG environmental authority gives the administering authority a revised CSG environmental management plan (EMP) demonstrating that there is no feasible alternative other than to build the dam, and the holder receives a notice in writing from the administering authority approving the construction of the dam.

An EMP must not include using a CSG evaporation dam in connection with carrying out a relevant CSG activity, unless the plan includes an evaluation of best practice environmental management for CSG water and alternative ways for managing the water. The evaluation must demonstrate that there is no feasible alternative for managing the water, other than a CSG evaporation dam.

All CSG environmental authority holders must submit a revised EMP within 12 months of the changes to the EP Act, which take effect on the 5 July 2010. This will ensure that existing holders and new holders are subject to the same requirements, and existing holders are meeting best practice environmental management. If a holder of a CSG environmental authority fails to comply with this section, the administering authority has the ability to amend the conditions of the environmental authority by reason of a contravention of the EP Act.

It is expected that only in very rare circumstances will justification exist for using an evaporation dam. The government considers that there will be no suitable justification for proposing disposal of CSG water in an evaporation dam during the production phase of a project.

Evaporation dams may be the only feasible option for CSG water disposal associated with exploration and appraisal wells. Evaporation dams may be considered when:

- water quality and quantity is uncertain
- infrastructure at, and access to, the well site is limited
- the well site is remote to the rest of the project activities.

If authorisation of an evaporation dam is to occur, it will be limited to the activity of exploring for petroleum or gas.

Exploring for petroleum or gas is carrying out an activity for the purpose of finding petroleum or gas. For example:

- conducting a geochemical, geological or geophysical survey
- drilling a well
- carrying out testing in relation to a well
- taking a sample for chemical or other analysis.

When DERM is assessing an evaluation, which has concluded that there is no feasible alternative for managing CSG water other than an evaporation dam, the following criteria will be considered:

- (a) is exploring for petroleum or gas being carried out?
- (b) has sufficient information been provided to demonstrate that legislative, environmental, technological, economic or social requirements have all been evaluated and taken into consideration when deciding that this is the most feasible option?
- (c) is the proposed quantity of water to be produced from the well or group of wells less than 400 megalitres?
- (d) is the proposed evaporation dam less than 20 hectares in size?
- (e) is there a physical barrier, tenure constraint or factor of remoteness involved (>50 kilometres) that prevents an exploration well or group of wells from being connected to other water treatment or disposal facilities?

Under a CSG EMP, a re-evaluation of the use of any evaporation dam must be undertaken on an annual basis to determine if water management practices can be improved and whether any preferred management options in the CSG water management hierarchy can be employed.

Any approved evaporation dam must be designed and operated so that, if it is not intended to be connected to a project's water treatment system during the production phase, it can be decommissioned and rehabilitated as soon as possible and no longer than 10 years from when the dam was first commissioned.

Use of evaporation dams for the disposal of brine resulting from CSG water treatment processes is recognised as an acceptable management method for that particular waste stream. For the purposes of this policy, brine is defined as saline water with a total dissolved solid concentration greater than 40,000 milligrams per litre. A brine dam means a dam designed to receive, contain or evaporate brine.

The government's policy does not preclude dams for aggregation of CSG water or CSG water concentrate. Where options for injection and reuse are not immediately available, CSG water or CSG water concentrate may be contained in dams designed to aggregate water (such as deep dams with a small footprint), rather than dams designed to evaporate water (such as shallow dams with a large footprint).

To encourage preferred solutions for the treatment, use or disposal of CSG water and CSG water concentrate, the administering authority requires that during any period of 30 days, following the first 90 days after commissioning the operation of an aggregation dam, the total volume of water leaving that dam, other than by evaporation, must be not be less than 85 per cent of the volume of water that has entered the dam.

3. Dams necessary for water aggregation and the storage of brine from treatment facilities are to be fully lined to a standard determined by DERM.

DERM has developed performance-based standards, rather than prescriptive standards, for dams receiving CSG water, CSG water concentrate or brine. These standards will form part of the guideline: Dams in Environmentally Relevant Activities and the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams.

The objective is that any dam containing CSG water, CSG water concentrate or brine, must be designed to effectively avoid environmental harm through contamination of surrounding or underlying land and groundwater.

The following design standards will be applied to achieve this objective.

Aggregation dams and CSG water evaporation dams must:

- be designed with a floor and sides made of material to contain the wetting front and any entrained contaminants within the bounds of the containment system during its operational life, including any period of decommissioning and rehabilitation
- have a system to detect any passage of the wetting front or entrained contaminants through either the floor or sides of the dam
- either, be capable of repair to rectify any passage of the wetting front through the floor or sides of the dam, or be decommissioned and rehabilitated.

Brine dams must:

- be designed with a floor and sides made of material that will contain the wetting front and any entrained contaminants within the bounds of the containment system during its operational life, including any period of

decommissioning and rehabilitation

- have a system for the collection and proper disposal of any contaminants that move beyond the bounds of the containment system
- have a system that will detect any passage of the wetting front or entrained contaminants through either the floor or sides of the dam
- either, be capable of repair to rectify any passage of the wetting front through the floor or sides of the dam, or be decommissioned and rehabilitated.

The system implemented to detect the passage of the wetting front through either the floor or sides of the dam must consist of more than just monitoring groundwater aquifers.

The design, construction, operation, modification and decommissioning of any regulated dam that is part of a CSG project must be undertaken in accordance with the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams and the accompanying guideline: Dams in Environmentally Relevant Activities.

4. A CSG water management plan is to be incorporated into the environmental management plan required for an application for a level 1 environmental authority.

Recent amendments to the EP Act provide that where an application is for a CSG environmental authority, the accompanying EMP must state the following:

- (a) the quantity of CSG water the applicant reasonably expects will be generated in connection with carrying out each relevant CSG activity
- (b) the flow rate at which the applicant reasonably expects the water will be generated
- (c) the quality of water, including changes in water quality, which the applicant reasonably expects will happen while each relevant CSG activity is carried out
- (d) the proposed management of water, including the use, treatment, storage or disposal of the water
- (e) the measurable criteria (management criteria) against which the applicant will monitor and assess the effectiveness of the management of water, including criteria for each of the following—
 - (i) the quantity and quality of water used, treated, stored or disposed of
 - (ii) protection of environmental values affected by each relevant CSG activity
 - (iii) the disposal of waste, including, for example, salt generated from the management of water
- (f) the proposed action to be taken if any of the management criteria are not satisfied, to ensure the criteria will be able to be satisfied in the future.

The EMP must not provide for using a CSG evaporation dam in connection with carrying out a relevant CSG activity, unless the plan includes an evaluation of best-practice environmental management for CSG water and alternative ways for managing the water. The evaluation must show that there is no feasible alternative for managing the water than a CSG evaporation dam.

The content requirements for a CSG water management plan (CWMP) are specified in the guideline: Preparing an Environmental Management Plan (EM plan) for Coal Seam Gas (CSG) Activities.

Once the revised EMP has been submitted, the annual returns thereafter must include an evaluation of the effectiveness of the management of CSG water under the management criteria specified in the EMP. The evaluation is required to state whether or not the CSG water has been effectively managed under the criteria; and if the water has not been effectively managed, the action that will be taken to ensure that water will be effectively managed under the criteria in the future. This process implements an adaptive environmental management regime for CSG water, whereby management criteria are established and evaluated on an annual basis.

5. What remediation action for existing evaporation dams is reasonable and appropriate?

The policy outlined in the Queensland Coal Seam Gas Water Management Policy, September 2008, requires remediation of existing evaporation dams to occur within three years. This three-year period expires on 1 October 2011.

For existing evaporation dams, the remediation action considered necessary by 1 October 2011 includes:

- all existing dams containing CSG water, CSG water concentrate or brine must meet the standards for either aggregation dams and CSG water evaporation dams, or brine dams, as set out in section 3
- all existing evaporation dams must be converted to operate as aggregation dams, be decommissioned; or a revised CSG EMP that includes an evaluation demonstrating no feasible alternative for managing the water, other than a CSG evaporation dam at a particular location, must have been submitted and the administering authority must have approved the use of the dam in writing.

6. Transitional arrangements will be developed by government in consultation with industry to address issues with existing evaporation dams. Remediation of existing evaporation dams is to occur within three years.

The government is aware that most CSG environmental authority holders will require more than 18 months to transition existing operations and infrastructure to meet the above remediation standards. For that reason, an appropriate transitional arrangement could include the voluntary submission of a draft transitional environmental program (section 330 EP Act) for the approval of the administering authority, by which existing dams will be able to be transitioned to these standards. The government considers that transitional environmental programs (TEPs) should not need to extend for longer than a three-year period. However, a longer period is available subject to public notification requirements, as described under the EP Act. The TEP may include either:

- a program to ensure all existing dams containing CSG water, CSG water concentrate or brine meet the standards as outlined in section 3
- a program to convert CSG evaporation dams into aggregation dams or brine dams
- a program to decommission and commence rehabilitation of any CSG evaporation dam that does not meet the standards, or that can not be converted to an aggregation dam or brine dam.

7. What management or disposal options are appropriate for the saline effluent and solid salt wastes resulting from water treatment?

The treatment of CSG water results in both high quality water but also a saline effluent that needs to be carefully managed. This saline effluent, if subject to evaporation, can produce a dry solid salt after the water evaporates. The decommissioning and rehabilitation of dams will also produce dam lining material contaminated with salt that will require proper disposal.

The government's goal is to prevent salt produced through CSG activities from contaminating the environment.

The government's policy follows the requirement of the EP Act that decisions about the disposal of waste be made on the basis of a waste management hierarchy from the most acceptable solution to the least acceptable solution.

For the management, treatment and disposal of brine and solid salt, the hierarchy is in order of decreasing preference:

1. waste reuse or recycling by chemically processing or treating brine or salt residues to create useable or saleable products (e.g. soda ash)
2. injection of brine into a natural underground structure that is geologically isolated and does not contain groundwater, which does or could supply water for potable or agricultural purposes
3. waste disposal of:
 - 3.1 brine solution by piped ocean outfall
 - 3.2 solid salt into a suitable existing licensed regulated waste disposal facility
 - 3.3 salt into a purpose-built licensed and regulated waste disposal facility on freehold land owned by the CSG

operator.

Any proposal for using a method of managing brine or solid salts that is lower than the highest method indicated in the hierarchy, must demonstrate why each of the more desirable approaches (higher up the hierarchy) could not be used. The administering authority will then consider approving and setting conditions for the proposal under the EP Act.

Disposal of brine solution to marine waters will only be allowed if it is from a suitably designed piped ocean outfall. As concentrated brine can be toxic to aquatic organisms, the administering authority will not authorise such discharges unless expert scientific analysis shows that the environmental values in the receiving marine waters will not be adversely affected by the discharge.

Solid salt wastes will only be able to be disposed of in a licenced regulated waste disposal facility.

The CSG operator must locate purpose-built facilities on land that is owned by the operator. If salt is to be disposed of in this way the CSG operator must ensure that the footprint and the number of any purpose-built facilities is minimised.

Such facilities will be listed on the contaminated land register and will require ongoing management action by the CSG operator, in accordance with a site management plan, before the gas production tenure underlying any site used for salt disposal can be surrendered.

Any facility must be designed and constructed by a suitably qualified and experienced person to provide the performance required for ensuring that the solid salt residue is contained within the facility for the foreseeable future.

The design and construction of any facility must:

- ensure that the salt is contained within the facility and does not contaminate the environment
- not occur above the natural surface level of the surrounding land
- minimise the risk of any adverse impact on sensitive environments, land with high ecological value, agricultural lands and useful surface water and groundwaters
- be located so that it is protected from regional or local flooding.

Definitions

Adaptive environmental management regime is a structured, iterative process of optimal decision making in the face of uncertainty, with an aim to reduce uncertainty over time via system monitoring and instigating change where required.

Aggregation dam is a dam that receives and contains CSG water or CSG water concentrate. An aggregation dam must be designed and operated so that during any period of 30 days, following the first 90 days of operation of the dam, the total volume of water leaving the dam, other than by evaporation, must not be less than 85 per cent of the volume of water that has entered the dam.

Brine is defined as saline water with a total dissolved solid concentration greater than 40,000 milligrams per litre.

Brine dam means a dam designed to receive, contain or evaporate brine.

CSG water is defined as underground water brought to the surface of the earth or moved underground in connection with exploring for, or producing, coal seam gas.

CSG water concentrate is the concentrated saline water waste stream from a water treatment process that does not exceed a total dissolved solid concentration of 40,000 milligrams per litre.

CSG evaporation dam is defined as an impoundment, enclosure or structure that is designed to be used to hold CSG water for evaporation.

Saline effluent includes both CSG water concentrate and brine.