

Guideline

Environmental Protection Act 1994

Application requirements for petroleum activities

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Part 1: Introduction

This guideline provides information to those preparing variation or site-specific applications for environmental authorities for petroleum activities, that are to be carried out on 1 or more petroleum tenures granted under the *Petroleum Act 1923*; petroleum authorities granted under the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act) or the *Petroleum (Submerged Lands) Act 1982*. Petroleum activities include coal seam gas (CSG) **exploration**¹ or production.

The primary purpose of this guideline is to assist applicants in identifying impacts on environmental values and then in turn propose environmental protection commitments to help the administering authority decide the conditions of the environmental authority. Where environmental harm is unavoidable, the conditions of the environmental authority are designed to identify and authorise an acceptable level of environmental harm, and to ensure that any authorised environmental harm is managed and monitored appropriately.

This guideline will assist applicants in lodging a legislatively compliant, well supported environmental authority application and explains the mandatory regulatory requirements that must be met for an application to be properly made for the purposes of the *Environmental Protection Act 1994* (EP Act). If the application does not include all the mandatory requirements it will be determined to be improperly made and the applicant will need to re-apply.

The guideline also provides recommendations about the level of information an applicant should submit with an application to assist in streamlining the assessment process and to reduce the need for the administering authority to issue a request for additional information. In some instances, an environmental authority application will be submitted after an environmental impact statement (EIS) has been completed for the project. The information request provisions will not apply to an environmental authority application where an EIS process has been completed prior to an application being made. However, this exclusion will only apply when information in the EIS is sufficient to assess the environmental risks of an activity and when the risks of the activity and the way it will be carried out have not changed since the EIS was completed.

Part 2 of this guideline describes the recommended structure for application documents for petroleum activities, including a list of potential project activities and environmental values that could be relevant to the project area. Part 3 describes the main content sections that must be included to assess the likely impacts to environmental values. The level of detail required for each section depends on the specific characteristics of the project activities and the environmental values of the project area. The amount of information provided must be commensurate to the risk of environmental harm and be based on an assessment of the potential impacts of the proposed activities on the environmental values of the project site. Part 4 of this guideline defines relevant terms and these terms are bolded the first time they appear in the document.

Legislative framework

What is a petroleum activity?

Petroleum activities are defined as:

- (a) activities that are authorised activities for a 1923 Act petroleum tenure under the *Petroleum Act 1923*; or
- (b) activities that, under the P&G Act, are authorised activities for a petroleum authority under that Act; or
- (c) exploring for, exploiting or conveying petroleum resources under a licence, permit, pipeline licence, primary licence, secondary licence or special prospecting authority granted under the *Petroleum (Submerged Lands) Act 1982*; or

¹ Terms defined in Part 4 of this guideline are **bolded** the first time they appear.

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- (d) rehabilitating or remediating environmental harm because of the activities mentioned in items (a) to (c) above; or
- (e) actions taken to prevent environmental harm because of the activities mentioned in items (a) to (d); or
- (f) activities required under a condition of an environmental authority for activities mentioned in paragraphs (a) to (e); or
- (g) activities required under a condition of an environmental authority mentioned in paragraphs (a) to (e) that has ended or ceased to have effect, if the condition:
 - ◆ continues to apply after the authority has ended; or
 - ◆ ceased to have effect and has not been complied with.

It is an offence to carry out a petroleum activity without an environmental authority.

What is an eligible ERA?

An eligible ERA is an environmentally relevant activity (ERA) that is able to comply with the eligibility criteria developed and prescribed under a regulation. To be an eligible ERA the activity must not be carried out as part of a **significant project** and should be able to comply with most, if not all, of the standard conditions developed for the activity.

Applicants who wish to apply for an environmental authority for an eligible ERA can do so via two application processes, a standard application or a variation application. A standard application should be used where the applicant can comply with all of the eligibility criteria and standard conditions for the activity. Where the applicant can still comply with all of the eligibility criteria, but requires a change to one or more of the standard conditions, a variation application should be submitted. An applicant must identify the environmental values, risks and impacts, management practices and rehabilitation considerations prescribed in this guideline in relation to any condition/s that they are seeking to vary.

What is an ineligible ERA?

Activities for which eligibility criteria are in effect but with which the applicant cannot comply, or which no eligibility criteria have been developed, are termed ineligible ERAs. Ineligible ERAs include projects carried out as part of a significant project. Where an applicant requires an environmental authority for an ineligible ERA, they will be required to submit a site-specific application. Applications for ineligible ERAs must submit all information relevant to the activity/ies in line with the information prescribed in this guideline.

Mandatory application requirements

The application must include the mandatory content required under s.125 of the EP Act. Section 125 requires that the application:

- Be made to the administering authority.
- Be in the approved form.
- Describe all environmentally relevant activities for the application.
- Describe the land on which each activity will be carried out.
- Be accompanied by the fee prescribed under a regulation.
- If 2 or more persons jointly make the application—nominate 1 joint applicant as the principal applicant.
- State whether the application is a standard application, a variation application or a site-specific application.
- State whether the applicant is a registered suitable operator.

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- If a development permit under the *Sustainable Planning Act 2009* (Planning Act), or an approval of the Coordinator-General under section 84(4)(b) of the *State Development and Public Works Organisation Act 1971* (State Development Act), is required under either of those Acts for carrying out the environmentally relevant activities for the application—describe the permit or approval.
- If the application is a standard or variation application—include a declaration that each relevant activity complies with the eligibility criteria.
- If the application is a variation application—state the standard conditions for the activity or authority the applicant seeks to change.
- If the application is a variation or site-specific application—include an assessment of the likely impact of each relevant activity on the environmental values including:
 - ◆ A description of the environmental values likely to be affected by each relevant activity.
 - ◆ Details of any emissions or releases likely to be generated by each relevant activity.
 - ◆ A description of the risk and likely magnitude of impacts on the environmental values.
 - ◆ Details of the management practices proposed to be implemented to prevent or minimise adverse impacts.
 - ◆ Details of how the land the subject of the application will be rehabilitated after each relevant activity ceases.
- Include a description of the proposed measures for minimising and managing waste generated by each relevant activity.
- Include details of any site management plan that related to the land the subject of the application.
- Address any other matter prescribed under an environmental protection policy or regulation, including the prescribed matters under s.24AA of the EP Reg for an application for an environmental authority for a CSG activity that is an ineligible ERA (CSG water management plan) which are:
 - ◆ Whether the proposed management of the coal seam gas water is consistent with the coal seam gas water management policy, including the prioritisation hierarchy for managing and using coal seam gas water.
 - ◆ If the proposed management of the coal seam gas water is inconsistent with the prioritisation hierarchy for managing and using coal seam gas water, the reason for managing the coal seam gas.
 - ◆ Whether the proposed management of salt or brine from the management of coal seam gas is consistent with the coal seam gas water management policy, including the prioritisation hierarchy for managing saline waste.
- If the proposed management of the brine or salt is inconsistent with the prioritisation hierarchy for managing saline water, the reason for managing coal seam gas water in that way. If any of the mandatory content requirements listed above are not included with the application, the application will be deemed improperly made and returned to the applicant without assessment. The applicant will need to re-apply, ensuring that the application meets these requirements.

Additional requirements for site-specific CSG activities

A site-specific application for CSG activities must be developed in accordance with the legislative content requirements (as outlined above), Coal Seam Gas Water Management Policy 2012 as well as s.126 of the EP Act.

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Section 126 (1) of the EP Act requires the following matters (in addition to the matters outlined above) to be included in a site-specific application for a CSG activity:

- The quantity of **CSG water** the applicant reasonably expects will be generated in connection with carrying out each relevant CSG activity.
- The flow rate at which the applicant reasonably expects the water will be generated.
- The quality of the water, including changes in the water quality that the applicant reasonably expects will happen while each relevant CSG activity is carried out.
- The proposed management of the water including the use, treatment, storage or disposal of the CSG water.
- The measurable criteria (the management criteria) against which the applicant will monitor and assess the effectiveness of the management of the CSG water including criteria for each of the following:
 - ◆ The quantity and quality of the water used, treated, stored or disposed of.
 - ◆ Protection of the environmental values affected by each relevant CSG activity.
 - ◆ The disposal of waste, including, for example, salt generated from the management of the water.
 - ◆ The action that is proposed 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.

Section 126 (2) of the EP Act, specifies that a site-specific application for a CSG activity 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 managing the CSG water.
- Alternative ways for managing the water.
- The evaluation shows there is no feasible alternative to a CSG evaporation dam for managing the water.

Where an amendment application relates to an environmental authority for a CSG activity and the proposed amendment would result in changes to the management of CSG water and the CSG activity is an **ineligible ERA**, the application must state the matters required under s.126 (1) of the EP Act and comply with s.126 (2).

Relationship between the application documents and the environmental authority

The application documents are required to demonstrate that the applicant has considered all potential impacts of the proposed petroleum activities. This includes identifying all petroleum and rehabilitation activities for the whole life of the project, from the first activity to the final surrender of the environmental authority. Once developed, the application documents can continue to be used by the holder of the environmental authority, providing them with a framework for environmental management that is consistent with the environmental authority.

Based on environmental values and environmental protection commitments proposed in the application documents, the administering authority will prepare a draft environmental authority for the petroleum project. When the environmental authority is granted, it becomes the primary regulatory document for a petroleum activity used by the administering authority to ensure environmental compliance. The EP Act provides for a range of enforcement tools in addition to heavy penalties for non-compliance with the conditions of an environmental authority.

Regulatory requirements

The administering authority must consider the standard criteria when making a decision under the EP Act. The standard criteria are defined in Schedule 4 of the EP Act and include, but are not limited to:

- principles of ecologically sustainable development
- any Commonwealth, State government, plans standards and agreements
- an EIS
- **wild rivers declarations**
- the character resilience and values of the receiving environment
- submissions made by applications and submitters
- financial implications
- best practice environmental management
- the public interest.

In addition to the standard criteria, the administering authority must also consider the **regulatory requirements** when making an environmental management decision. The regulatory requirements are in Chapter 4 of the EP Reg. Section 51 of the EP Reg links the relevant environmental values and quality objectives under the environmental protection policies (EPPs) to the matters that must be considered by the administering authority when making an environmental management decision.

Section 51 also requires the administering authority to carry out an environmental objective assessment against the environmental objectives and performance outcomes listed in Schedule 5, Part 3, Table 1. An environmental objective assessment is prescribed as a standard criterion for making an environmental management decision.

For example, if you are applying for a petroleum activity that involves the indirect release of contaminants to groundwater, the administering authority must consider the environmental objectives and performance outcomes for groundwater and waste listed in Schedule 5, Part 3, Table 1. The performance outcome for groundwater is that the activity will be operated in a way that protects the environmental values of groundwater and any associated surface ecological systems. The administering authority must decide whether the activity achieves either performance outcome 1 or 2:

1. Both of the following will apply—
 - a. There will be no direct or indirect release of contaminants to groundwater from the operation of the activity; and
 - b. There will be no actual or potential adverse effect on groundwater from the operation of the activity.
2. The activity will be managed to prevent or minimise adverse effects on groundwater or any associated surface ecological systems.

The administering authority must be satisfied that all reasonable and practical measures will be taken to minimise the effect. In determining whether all reasonable and practical measures have been taken, the administering authority must consider:

- (a) The nature of the harm or potential environmental harm
- (b) The sensitivity of the receiving environment
- (c) The current state of technical knowledge for the activity

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- (d) The likelihood of successful application of different measures that might be taken to minimise the adverse effects
- (e) The financial implications of the different measures as they would relate to the type of activity.

The Environmental Protection and Other Legislation Amendment Regulation 2013 states that in regards to the environmental objective assessment, there is nothing that prevents the administering authority from granting an application that doesn't achieve each relevant environmental objective mentioned in Schedule 5, Part 3, Table 1. Conversely, there is nothing to prevent the administering authority from refusing to grant the application if it achieves each environmental objective.

In addition to the standard criteria (including the environmental objective assessment), Chapter 4, Part 3 provides for additional regulatory requirements for particular environmental management decisions. For example, s.63 of the EP Reg describes the matters and conditions that must be considered by the administering authority for activities involving direct **release** of waste to groundwater. It is very important for applicants to have a thorough understanding of the regulatory requirements which might apply to their application and proposed activities because, in certain instances, if particular requirements are not met, the application must be refused.

Sufficient information must be included in the application documents to enable the administering authority to evaluate the project in relation to each of the regulatory requirements. Where these requirements are not covered in the application, the administering authority may use its discretion to issue an information request. However, this will result in extended assessment times. Where an application is deficient on several mandatory requirements, the department may choose to refuse an application rather than go through the information request process.

To streamline the approvals process, the administering authority offers a pre-design/pre-lodgment service for all prospective applicants to provide direction and advice about environmental authority applications. Pre-design meetings provide the department an opportunity to allocate a project manager for the application and enable a project team to be formed. Project teams consist of departmental specialists who can provide early advice to proponents about the requirements for the application, the approvals process and associated timelines. Pre-design lodgment meetings also allow the project team to provide up-to-date information about how to best demonstrate that current requirements, policy and guidelines will be adhered to in the application documents.

Information about conditioning an environmental authority

Section 52 of the EP Reg describes the conditions the administering authority must consider imposing on an environmental authority. In conditioning environmental authorities, the administering authority must:

- If a regulatory requirement requires that certain conditions be imposed on an environmental authority, impose those conditions (s.203(2) of the EP Act).
- For standard and variation applications, condition the environmental authority to require the holder of the authority to take all reasonable steps to ensure the relevant activity complies with the eligibility criteria for the activity (s.204(2) of the EP Act).
- Impose a condition prohibiting the use of restricted stimulation fluids (s.206 (2) of the EP Act).

Section 203 of the EP Act also states that the administering authority may impose a condition on an environmental authority which it considers is necessary or desirable. The conditions must include any condition the administering authority is required to impose under the regulatory requirements and, for petroleum activities carried out in a wild river area, the conditions stated for the relevant petroleum activities in the wild river declaration for the area.

In accordance with s.207 of the EP Act, a condition imposed on an environmental authority may:

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- Be a standard condition for the authority or the relevant activity; or
- Require the holder of the authority to give the administering authority a written notice (a statement of compliance) about a document or work relating to a relevant activity; or
- If the administering authority is satisfied all cost-effective on-site mitigation measures for a relevant activity have been, or will be, undertaken—require or otherwise relate to an environmental offset (an environmental offset condition); or
- Relate to access to land on which the relevant activity for the authority is being carried out; or
- Relate to rehabilitating or remediating environmental harm because of a relevant activity; or
- Relate to action taken to prevent environmental harm because of a relevant activity.

In addition, a condition imposed on an environmental authority may state that the condition continues to apply after the authority has ended or ceased to have effect.

It is important to note that a condition may be imposed, even if the applicant did not ask for it. In some circumstances, the administering authority may only be able to grant an environmental authority with particular conditions that are necessary or desirable to reduce environmental harm. Further, while the administering authority endeavours to develop conditions that both the administering authority and the applicant are satisfied with, an applicant's agreement is not required for conditions to be included on an environmental authority.

To expedite the process of preparing and negotiating a draft environmental authority for CSG projects, model conditions have been developed which reflect best practice environmental management. The model conditions are not mandatory, and provide a consistent basis for developing a CSG project environmental authority. Depending on the specifics of each project and project location, the conditions may need to be altered, extra conditions added, or some conditions removed. The model conditions are available from the administering authority upon request.

Part 2: Recommended structure of application documents for petroleum activities

To ensure the environmental authority application can be assessed, the application must as a minimum, meet the mandatory content requirements as prescribed in s.125 and s.126 (for CSG activities) of the EP Act. As explained in Part 1 of this guideline, if the mandatory content requirements are not submitted as part of the application, the application will be deemed improperly made and returned to the applicant without assessment.

Applications lodged with inaccurate, incomplete or missing supporting documents, or substandard plans, may result in information requests being made. A request for additional information is made under s.140 of the EP Act. When this notice is issued, the assessment 'clock' stops to allow the person to respond. As such, applications which do not contain the necessary information to enable an assessment to occur and which necessitate an information request will result in delays to the administering authority deciding the application.

To avoid delays in the assessment of applications, it is recommended that applicants follow the recommended structure and content detailed in this guideline. This will enable the community access to accurate and detailed information about the proposal under the public notice process (which applies to all site-specific environmental authority applications, and on a case-by-case basis, in particular for major amendment applications).

The issue of an information request is not a mandatory step in the process. Where an application fails to address several regulatory requirements, the department may use its discretion and not issue an information request but rather decide the application based on the submitted information. It is important to ensure all the mandatory content and material addressing the regulatory requirements is included with the application or when responding to an information request.

Application documents should follow the recommended structure outlined below:

Description of environmental values

The application must identify the environmental values where the proposed petroleum activities will be undertaken and the potential impact the activities may have on those values. An environmental value is defined in s9 of the EP Act to be:

- (a) a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety; or
- (b) another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation.

Reference should be made to the EPPs made under the EP Act for any values which may be prescribed under legislation and also to any published local, state and federal government guidelines (in that order).

Risks and impacts

Correct and comprehensive identification of the potential impacts on environmental values is crucial for an efficient assessment of the application. Information requests are most frequently issued on applications where this has not been done correctly. This results in delays in the assessment of the application. The potential impact on environmental values may extend beyond the project area to surrounding areas and include potential regional and cumulative impacts (e.g. in a water catchment or air shed).

Assessment of the adverse impacts on environmental values must, for each value, include an assessment of the following aspects:

- The magnitude, relative size or actual extent of any impact in relation to the environmental value being affected.
- The severity of any adverse effect or the scale of any beneficial outcome.
- The duration of the effect, for example the impact may be seasonal, or it may end with the activity or extend beyond the cessation of the activity.
- An indication of the level of uncertainty of impacts and any assumptions used to address the uncertainty in any of the data or proposed commitments to protect the environmental values.

In determining the potential impact of the activities, research, investigations, surveys, modelling and monitoring may be required. The raw data associated with this work is commonly required as part of the assessment process and should be submitted as part of the environmental authority application.

Management practices

The environmental protection commitments should describe the environmental protection objectives and associated standards, measurable indicators and control strategies to ensure the objectives will be achieved. Environmental protection commitments proposed for each environmental value should include a description of the objectives, control strategies and associated standards and measurable indicators:

- The objectives are to define the outcomes that are intended to be achieved.
- The indicators are the values that are to be measured to gauge whether the objectives are being achieved.
- The standards are the levels, limits or targets that are to be used in auditing the performance of management and control strategies.
- The control strategies are specific methods/procedures/tools to be implemented to demonstrate that the objectives are being achieved.

The environmental protection commitments should be based on practical options and be derived from site-specific environmental assessments, environmental best practice and proven research and/or justification in science, legislation, guidelines, etc. Considerable assessment effort is often required to assess applications that include unsubstantiated environmental protection commitments, which can result in significant delays in finalising the assessment of applications. The commitments should also include provisions for **monitoring** and must be based on allocation of sufficient technical and financial resources to be achievable.

Appropriate indicators, standards and control strategies can be determined from existing legislation, regulations, federal, state and local government policy, EPPs, model conditions, results of environmental impact assessment, results from research, investigations, surveys, monitoring, modelling, community consultation, technical guidelines and any other guidelines including those from international agencies.

For example, in proposing protection commitments to protect soil health and function and its ability to grow native vegetation, an objective may be to minimise top soil erosion. An appropriate indicator to gauge whether the objective is being met could be biennial measurements of top soil erosion rates for erodible soils (as mapped). The standard to measure whether the objective is being achieved could be that soil erosion rates are measured at less than 5 millimetres per year.

Supporting documentation

The application documents should include as attachments, where appropriate:

- Any reports supporting the description of the environmental values and potential impacts of petroleum activities, such as ecological site assessments and noise or groundwater modelling.
- Maps, plans (at least A3 in size) or shape files, detailing to scale, relevant features described in Part 3 of this guideline and/or aerial photographs. Maps, plans, shape files and/or aerial photographs will also be relevant to present information identifying monitoring locations, the locations of potential releases of contaminants to the environment and areas proposed for rehabilitation.
- For any regulated structures proposed to be constructed:
 - ◆ A hazard category assessment report and certification in accordance with the Manual for assessing Hazard Categories and Hydraulic Performance of Dams by a suitably qualified and experienced person.
 - ◆ A design plan and design report and associated certification by a suitably qualified and experienced person.

The typical content for a design report is provided in Appendix 1.

Part 3: Content of an application for an environmental authority for petroleum activities

The main sections that must be included in an application for an environmental authority for petroleum activities is outlined below. The information is not exhaustive but outlines the information and issues to consider when determining environmental values, impacts, control strategies, objectives and commitments pertaining to petroleum activities.

3.1 General

Description of petroleum tenures/petroleum authorities

The location of project activities should be identified and supported by maps, plans, aerial photographs and/or shape files. This information needs to be presented in relation to areas of environmental value so that the

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administering authority can properly assess environmental impacts on those values, draft environmental authority conditions and authorise the activity accordingly.

This section should provide the details of:

- The project name and general location of the project.
- Identification of each relevant resource authority in the project.
- Identification of relevant blocks/sub-blocks.
- Real property descriptions, including the lot on plan of any land that is required to be notified and included on the environmental management register (i.e. contaminated land or land that is being used for a notifiable activity (Schedule 3 of the EP Act).
- Real property descriptions, including the lot on plan of any land that is State forest, timber reserves, resource reserves and/or unallocated State land.

Description of project activities

This section should provide a detailed description of the activities which form the project including:

- The planned project life (in years) identifying **construction**, operation and rehabilitation phases.
- The types of petroleum activities being carried out (e.g. coal seam gas, shale gas, shale oil, tight gas, conventional oil, conventional gas, petroleum facility, petroleum pipeline activities).
- Details of all petroleum **infrastructure** (e.g. wells, **aggregation dams**, **brine dams**, water treatment facilities, pipelines [oil, gas and water]), low point drains, other infrastructure (e.g. workshop, office, storage sheds, roads), compressor stations, power (including confirmation of whether power lines are to be above ground or buried (preferred)) and fuel supplies and any other activities which may cause environmental harm (e.g. **clearing** vegetation for a pipeline route).
- The scale (i.e. maximum areas) and locations of disturbance (ha) to all areas including a description of any environmental values found at these locations (e.g. ESA's), number of **exploration**, **appraisal** and **production wells** and details of the petroleum activities to be undertaken during the life of the project (including linking activities to the tenures where they will occur.)
- A description of exploration and production methods, hours of operation and annual production rates (e.g. oil, gas), forecasts of water volumes including CSG water, formation water or any waste water.
- The planned project life (in years) identifying construction, operation and rehabilitation phases.
- Activities that would be prescribed environmentally relevant activities (ERA's) (i.e. in Schedule 2 of the EP Reg) if they were not being conducted as part of a petroleum activity (e.g. chemical storage, hydrocarbon gas refining, gas producing, electricity generation, fuel burning, regulated waste storage, regulated waste treatment, waste disposal, waste transfer station operation, sewage treatment).
- Notifiable activities (Schedule 3 of the EP Act) carried out on the site (e.g. coal gas works, petroleum product or oil storage, landfill, disposing of waste, waste storage, treatment or disposal at a place other than where it was generated).

General description of environment

This section should include identification of:

- all relevant stakeholders
- **sensitive places** and **commercial places**

- any **category A, B or C Environmentally Sensitive Areas (ESAs)**
- any **State-significant biodiversity values**
- other existing tenures and land uses in the near vicinity of the proposed project activities
- any endangered, vulnerable, rare or near threatened wildlife species
- dominant ecosystems, topographic features, geology and soils
- **watercourses, wetlands, springs** (including relevant environmental values), **river improvement trust asset areas** or wild river declaration areas
- groundwater and aquifers (including relevant environmental values and assets identified in relevant water resource plans (under the *Water Act 2000*) that apply in the project area)
- **floodplains**
- annual and long-term climatic conditions
- places/aspects potentially of interest to the administering authority or stakeholders such as places of heritage significance.

3.2 Air

Description of environmental values

The environmental values relevant to the air environment may include:

- The qualities of the air environment that are conducive to protecting the health and biodiversity of ecosystems.
- The qualities of the air environment that are conducive to human health and wellbeing.
- The qualities of the air environment that are conducive to protecting the aesthetics of the environment, including the appearance of buildings, structures and other property.
- The qualities of the air environment that is conducive to protecting agricultural use of the environment.

The application must also provide a statement about the impact of the project activities on regional air quality values, as defined in the Environmental Protection (Air) Policy 2008 (EPP Air) and the National Environment Protection Measure for Ambient Air Quality (1998) (NEPM Air).

The description of the environmental values in the application must be substantiated with background air quality monitoring data.

Risks and impacts

The application must provide a statement on the impact of the project activities on regional air quality values, as defined in the EPP Air in the first instance, followed by the NEPM Air.

Emissions and releases

Air contaminants likely to cause environmental nuisance

Consideration should be given to any project activities that will produce air contaminants that are likely to cause nuisance (dust, odour, light), bearing in mind the location of **sensitive receptors**. Potential nuisance impacts of the petroleum project activities on air quality should be identified.

Greenhouse gas emissions

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The application should provide an inventory of projected annual emissions for each relevant greenhouse gas, with total emissions expressed in 'CO₂ equivalent' terms. Estimate emissions from activities associated with the proposed project, including the fossil fuel based electricity to be used and the emissions resulting from such activities as transportation of products and consumables at various stages of the project should be included. The methods used to make the estimates should also be included. The Australian Department of Climate Change and Energy's Efficiency's National Greenhouse Accounts (NGA) Factors (2011) can be used as a reference source for emission estimates and supplemented by other sources where practicable and appropriate.

Fugitive emissions

Identify the sources of fugitive releases of contaminants to air from the project activities and provide details of the expected contaminants to be released over time. For CSG activities, this should include estimates of coal seam methane to be released fugitively from well heads and any associated infrastructure.

Point source air emissions

The application must identify all point sources from fuel burning equipment that is capable of burning 500kg or more fuel per hour, by name and location and clarify whether this equipment is to be located in **hubs** or **populated areas**. All sensitive places that may be adversely affected by the release of contaminants must be identified. The locations of any existing and proposed point sources of contaminant emissions to air, along with all sensitive places, must be depicted on a map. Expected contaminants (e.g. NO_x, CO, particulates), release point references, fuel burning reference name/number, stack emission heights, minimum efflux velocities, maximum concentrations (mg/Nm³) and mass emission rates (g/sec) for each release point and contaminant must also be specified. The application must include the results of air dispersion modelling carried out for all combined point source emissions to air from all fuel burning equipment that is capable of burning fuel at a rate of 500kg or more per hour. The results of this modelling must include ground level concentrations for key air quality indicators (e.g. NO_x, CO and particulates) and demonstrate that the air quality objectives in the EPP Air, for the protection of the relevant air quality values, have been met.

Where it is proposed to vent or flare surplus gas the application should also provide details of contaminant concentrations and mass loads likely to be released to the atmosphere and discuss any impacts from these processes.

For fuel burning equipment that burns less than 500kg of fuel per hour, the application must contain a register including, as a minimum, the following information for each piece of equipment:

- fuel burning or combustion equipment name and location
- stack emission height (metres)
- minimum efflux velocity (m/s)
- mass emission rates (g/s).

Management practices

When proposing control strategies, consideration must be given to meeting the relevant air quality objectives in the EPP Air. Where not specified in the EPP Air, the NEPM Air must be referenced.

Air contaminants likely to cause environmental nuisance

A commitment must be given to ensure that the release of odour, dust, light or any other air borne contaminants resulting from the petroleum activities will not cause an environmental nuisance at any sensitive place or commercial place, including details of how this commitment will be achieved. A description of the measures that will be taken to investigate and remedy, or mitigate, any reported nuisance (that is not frivolous or vexatious)

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must be stated. Include proposed control procedures that will be implemented to minimise dust, visible light at night and odour.

Greenhouse gas emissions

The application must describe the strategies that will be employed to minimise releases of greenhouse gases to the atmosphere, using best practice methods, which may include, but not necessarily be limited to:

- A description of the proposed measures (alternatives and preferred) to avoid and/or minimise greenhouse gas emissions directly resulting from activities of the project, including such activities as transportation of products and consumables, and energy used by the project.
- An assessment of how the preferred measures minimise emissions and achieve energy efficiency.
- A comparison of the preferred measures for emission controls and energy consumption with best practice environmental management in the relevant sector of industry.
- A description of any opportunities for further offsetting greenhouse gas emissions through indirect means.

Means of reducing greenhouse gas emissions could include such measures as:

- Minimising clearing at the site (which also has imperatives besides reducing greenhouse gas emissions).
- Using less carbon-emitting transport modes or fuels.
- Integrating transport for the project with other local industries so that greenhouse gas emissions from the construction and running of transport infrastructure are minimised.
- Maximising the use of renewable energy sources.
- Co-locating coal seam methane use for energy production with coal extraction.
- Carbon sequestration at nearby or remote locations.

The application should also include commitments for continuous improvements in greenhouse gas emissions, which could include, but not necessarily be limited to:

- Periodic energy audits with a view to progressively improving energy efficiency.
- A process for regularly reviewing new technologies to identify opportunities to reduce emissions and use energy efficiently, consistent with best practice environmental management.
- Any voluntary initiatives such as projects undertaken as a component of the national Greenhouse Challenge Plus Program (operated by the Department of Climate Change and Energy Efficiency) or research into reducing the lifecycle and embodied energy carbon intensity of the project's processes or products.
- Opportunities for offsetting greenhouse gas emissions by renewable energy uses.
- Commitments to monitor audit and report on greenhouse gas emissions from all relevant activities and the success of offset measures.

The application documents should assess the potential impacts of the project on the state and national greenhouse gas inventories and describe the strategies that will be employed to minimise releases of greenhouse gases to the atmosphere, using best practice methods.

Fugitive emissions

Provide details of any proposed strategies or control equipment to prevent and reduce the associated impacts to air quality resulting from all fugitive releases of contaminants to air.

Point source air emissions

Provide details of any proposed pollution control equipment that will be required to meet air quality objectives and supporting evidence that the objectives will be met by the control equipment (e.g. by dispersion modelling). For fuel burning or combustion equipment describe for each piece of equipment the name, location, contaminants released, stack emission height, minimum efflux velocity and mass emission rates.

Describe an appropriate monitoring program commensurate to the risk of the proposed activities. Monitoring provisions for the release points will need to comply with the most recent edition of Australian Standard AS 4323.1-1995: Stationary Source Emissions – Selection of Sampling Positions. Samples taken should be representative of the contaminants discharged when operating under maximum operating conditions. Monitoring of contaminant release should be carried out in accordance with the latest edition of the Air Quality Sampling Manual.

The emissions data used in air dispersion modelling along with any relevant control strategies will be prescribed as point source air emission limits in the environmental authority.

3.3 Land

Description of environmental values

The environmental values relevant to the land environment may include:

- physical description of the terrain, geology, shallow ground water systems, floodplains, springs, soil descriptions and soil suitability
- land tenure and use, strategic cropping land, other resource tenures (e.g. mining), population centres and residences, roads, easements and other major infrastructure
- soil health and function and the ability for soil to sustain growth of native vegetation, crops and/or other flora
- bioregions and regional ecosystems
- flora, including vegetation communities, endangered, vulnerable, rare or near threatened species, **pest species**
- fauna including fauna present, protected **animal breeding places** (as determined by survey if required), endangered, vulnerable, rare or near threatened species, pest species
- category A, B and C ESAs
- areas with any **high ecological significance values** (HES values) including but not necessarily limited to wetlands, nationally threatened ecological communities, large tracts of **remnant vegetation**, corridors, special biodiversity areas
- State-significant biodiversity values which occur on the relevant resource authority(ies).

Risks and impacts

Identify all project activities that may cause an impact to land environmental values. Where petroleum activities involve **significant disturbance to land** or clearing vegetation, ecological site assessments must be conducted involving an assessment of the condition, type and ecological value of any vegetation in the area proposed to be significantly disturbed or cleared. The assessment must include at least a desktop study of the surrounding land, up to 1km from the proposed disturbance to land or clearing activity. The findings identified during any ecological assessment in relation to the proposed areas where activities are to be undertaken should be used to discuss the potential and likely impacts associated with any proposed activity. Where other projects exist or are known to be proposed in the vicinity, the cumulative impacts should be described.

Application requirements for petroleum activities

The potential impacts of the petroleum activities on the environmental values must be identified, such impacts may include:

- Harming, destroying or clearing **protected plants** and remnant vegetation.
- Harming, destroying or removing wildlife, **protected animals** or **tampering with an animal breeding place**.
- Isolating, fragmenting, or dissecting tracts of vegetation resulting in a reduction in the current ecosystem functioning or ecological connectivity.
- Soil degradation, salinisation, contamination including excavation, filling and degradation of **strategic cropping land**.
- Project infrastructure increasing and concentrating overland flows.
- Flood plain inundation, erosion and safety issues resulting from flooding on the relevant resource authorities (referencing flood plain mapping at all times possible).
- Water contamination and flora damage from improperly managed **acid sulfate soils**.
- Spread of pest species due to human, vehicle and machinery movement and disturbance of land in pest infestation areas.
- Contamination from incidental spills, chemical storages and waste storages.

Protected plants

The *Nature Conservation Act 1992* (NC Act) protects native plants indigenous to Australia (protected plants) and regulates the clearing of individual protected plants. Clearing protected plants requires a permit issued under the NC Act. For further information refer to obligations under the NC Act and to the administering authority of that Act. Whilst a separate permit is required for the clearing of protected plants, protected plants are of significant environmental value. Where clearing of protected plants is proposed as part of the activities, the application documents should provide information regarding the type of plants(s) and the area(s) affected, including their protection status (i.e. extinct in the wild, endangered, vulnerable, near threatened or least concern) and any advice obtained from experts on the species behavioural ecology and population dynamics. Provision of this information with the application will also assist proponents to streamline any offsets package that may be required under the Queensland Biodiversity Offsets Policy (refer Section 3.3. Offsets) prior to the issue of any environmental authority.

Protected animals

The Nature Conservation (Wildlife Management) Regulation 2006 (the Wildlife Regulation) contains regulations concerning the tampering of animal breeding places. A permit is required to tamper with animal breeding places. For further information refer to the obligations under the Wildlife Regulation and to the administering authority of that regulation. Whilst a permit is required for tampering with animal breeding places, these are of significant environmental value. Where tampering with protected animals is proposed as part of the activities, the application documents should provide information regarding the type of animal(s) and the number of animal(s) affected, including their conservation status (i.e. extinct in the wild, endangered, vulnerable, near threatened or least concern) and any advice obtained from experts on the species behavioural ecology and population dynamics.

Strategic cropping land

The *Strategic Cropping Land Act 2011* (SCL Act) protects land identified as highly suitable for cropping and manages the impacts of development on that land. A permit under the SCL Act is required for activities that will impact strategic cropping land. The administering authority of the SCL Act is the Department of Natural Resources and Mines. Where impacts on strategic cropping land are proposed, the application should provide information regarding the location and amount of land affected, the soil type and local and regional soil mapping and any ground truth data, soil surveys, monitoring or advice obtained by experts. In addition, an environmental authority under the EP Act cannot be granted until any required permit under the SCL Act has been granted.

Management practices

The findings identified during the ecological assessment(s) should be used as the basis of proposing and justifying avoidance, minimisation, mitigation and offset strategies. Consideration should be given to:

- Strategies to avoid significant disturbance to land and clearing, and the taking of protected plants or animals, in particular, in areas identified with HES values.
- Measures to minimise **threatening processes** and adverse impacts of project activities on flora and fauna, biodiversity, ecosystems, significant species and habitat.
- Mitigation measures (e.g. SMPs, DMPs, or strategies such as clearing at a time of the year when a certain species is unlikely to be breeding).
- Soil management and erosion control.
- Maintenance of natural flow paths on floodplains.
- Containment of chemicals and wastes to ensure contaminants are not released to land.

Offsets

If all possible cost-effective on-site avoidance, minimisation and mitigation measures are proposed to minimise the extent and scale of significant disturbance to land, and there is still a residual (adverse) impact on State-significant biodiversity values, an offset will be required under the Queensland Biodiversity Offsets Policy. An offset may include works or activities to be undertaken on land on which a petroleum or gas activity is carried out, or on other land in the state. An offset can be a land-based biodiversity offset (i.e. direct or transfer) or a monetary payment to an environmental offset trust.

Offset specific conditions will be included in any environmental authority where impacts to State-significant biodiversity values are unavoidable. For land-based offsets, these conditions may require the applicant to enter into an offset agreement by a stated timeframe and comply with that agreement. Alternatively, the administering authority may require the applicant to enter into a Deed of Agreement prior to the issue of an environmental authority. The Deed of Agreement will set out how offsets will be delivered and managed over the life of the project and include reporting and monitoring requirements. All land based offsets require a financial assurance to be held for 12 months, or until such time as the offset is delivered.

The application must include an assessment of potential impacts to values which may require an offset, including:

- State-significant biodiversity values within the relevant resource authorities.
- State-significant biodiversity values outside the relevant resource authorities to the extent required for necessary approvals under the Planning Act and/or NC Act and not subject to the offset requirements of the Policy for Vegetation Management Offsets.

Application requirements for petroleum activities

- A map, at appropriate scale, of the values which will be impacted by the project and which may require an offset supported by:
 - ◆ Adequate survey information including mapping at a suitable scale supported by GIS spatial datasets (e.g. Environmental Systems Research Institute ArcMap shape files).
 - ◆ Detailed survey methodology including the date of survey.
- Detailed justification for the level of impact to each value, including how impacts have been avoided and minimised and consideration of alternative measures and methods for carrying out the petroleum activities.

Where there are residual impacts to State-significant biodiversity values on the relevant resource authorities, or where there may be residual impacts in the future to these values, the applicant must include an offset strategy with the application. The offset strategy must detail:

- How impacts to state-significant biodiversity values will be avoided and minimised for the life of project.
- The tenure of the impact area(s).
- The known values (including the extent) which will be impacted (relevant to the Queensland Biodiversity Offsets Policy).
- The area(s) in hectares of each to be impacted that contains state-significant biodiversity value.
- Whether the impact area(s) includes an existing offset area.
- Other known values which are being addressed through other offset policies.
- When (either at the time of approval or on a rolling plan) offsets will be delivered.
- How offsets will be provided (e.g. direct offset, offset transfer, indirect offset or offset payment).
- Where the offset delivery mechanism involves a land-based offset:
 - ◆ An ecological equivalence assessment (if applicable) of the areas requiring offset.
 - ◆ Information including spatial analysis supported by GIS spatial datasets (e.g. Environmental Systems Research Institute ArcMap shape files), demonstrating that an offset which meets the requirements of the relevant policy is available within the landscape.
- Where the offset delivery mechanism involves a direct (land-based) offset:
 - ◆ the location of the proposed offset areas
 - ◆ an ecological equivalence assessment of the offset areas
 - ◆ details of the legally binding mechanism to be used to secure the offsets
 - ◆ an offset management plan for all offset areas.
- Where the offset delivery mechanism involves a offset transfer (land-based):
 - ◆ information to demonstrate that the offset area(s) is available and able to be legally secured within 12 months
 - ◆ broker agreement
 - ◆ Deed of Agreement with the administering authority
 - ◆ financial assurance.
- Where the offset delivery mechanism involves an offset payment:

- ◆ information to demonstrate that the areas to be offset do not include:
 - an existing legally secured offset area under the *Vegetation Management Act 1999*
 - a **critically limited ecosystem**
 - a **threshold regional ecosystem**
 - NC Act flora species that are listed as endangered, vulnerable, near threatened
 - NC Act fauna species that are listed as endangered, vulnerable, near threatened.
- ◆ an official receipt from the Balance the Earth Trust.

The offset strategy must also include a reporting framework which may be based on existing reporting tools such as the annual return, which:

- Reports progress of offsetting requirements as specified in the agreement.
- Demonstrates whether or not the offset requirements are being met.
- Identifies any changes to offset delivery during the reporting period.
- Is available for auditing by a third party to identify where investigation and/or compliance action is required by the administering authority.

Low point drains

The application should address control strategies including monitoring provisions to ensure that any waste water (e.g. produced water, CSG water) released via low point drains meets required quantity and quality standards and that adverse impacts to soil quality and vegetation do not occur. Water quality standards for low point drains should be derived from irrigation trigger values from the ANZECC and ARMCANZ Water Quality Guidelines 2000.

Use of chemicals and chemical storage

The application should include control strategies to prevent land contamination from the storage and use of chemicals, corrosive substances, toxic substances, dangerous goods and flammable and combustible liquids. Current best practice environmental management standards for control strategies are included in Australian Standard AS 1940–2004 The storage and handling of flammable and combustible liquids.

3.4 Noise

Description of environmental values

Describe the existing environmental values that may be affected by noise from the proposed petroleum project. Background noise monitoring should be undertaken at relevant sensitive receptors that could potentially be affected by the proposed petroleum activities. The results of the background noise monitoring should be reported in the application documents. Measured **background noise levels** should be described in terms of $L_{A90,T}$, $L_{A10,T}$ and $L_{A1,T}$, where T should not be less than 15 minutes. Measured background noise levels should be representative of day (7.00am to 6.00pm) evening (6.00pm to 10.00pm) and night (10.00pm to 7.00am) periods.

The location of noise emissions and sensitive places must be adequately depicted on a map. Provide comments regarding any current activities near the proposed petroleum project area that may contribute to background noise levels (e.g. road traffic, quarrying activities, etc).

Risks and impacts

Application requirements for petroleum activities

The Environmental Protection (Noise) Policy 2008 (EPP Noise) describes a hierarchy for the management of noise. The application must demonstrate how noise is to be managed in accordance with the following order of preference:

- 1) Avoid (e.g. locating an activity in an area that is not near a sensitive receptor).
- 2) Minimise, in the following order of preference:
 - (i) orientate an activity to minimise noise (e.g. facing a part of an activity that makes noise away from a sensitive receptor or using a natural attenuating feature such as a gully)
 - (ii) use best available technology (e.g. use of electric driven equipment or construction of noise abatement barriers or enclosures).
- 3) Manage (e.g. using heavy machinery only during business hours).

The application must state the potential noise impacts of project activities on sensitive or commercial places on, or in proximity to, the petroleum project area and include details of background monitoring data and condition reports for any buildings that are likely to be affected by the project.

The predicted noise generated by the project should be presented in a form appropriate to the particular petroleum project. This could include predicted noise levels at specific locations for different phases of the project such as fixed and itinerant activities (construction, operation and de-commissioning elements).

Noise modelling should be undertaken and contour maps provided to show the spread of predicted noise levels in the area. All significant emission sources should be identified, quantified and incorporated into the model, even if only indicative locations can be given. Modelled noise levels should be described in terms of $L_{A90,T}$, $L_{A10,T}$ and $L_{A1,T}$, where T should not be less than 15 minutes. Conditions and assumptions for which the predictions apply in the modelling should be disclosed, together with any local effects which should be taken into account. This is particularly important for contours where it is not always feasible to include effects such as local shielding or reflections. If the exact location of some proposed infrastructure is not known, it would be reasonable to include modelling predictions for different potential locations.

For major noise sources likely to exhibit tonal and/or impulsive characteristics, one-third octave band noise spectre need to be included. Noise sources with other annoying characteristics, for example frequency and amplitude modulation, should be accurately described in terms of the noise level and the frequency and duration of occurrence.

Emissions and releases

Vibration

The application must state whether blasting activities are proposed and whether a risk assessment has indicated that vibration is likely to adversely impact sensitive receptors. If blasting is proposed, or vibration impacts are likely at sensitive receptors, the applicant must clearly identify the environmental values that may be affected by vibrations and the nature of any adverse impacts, including any potential structure-borne vibration impacts at sensitive receptors.

Further information on assessing noise impacts is provided in the guideline Prescribing Noise Conditions on Environmental Authorities for Petroleum Activities.

Management practices

Environmental protection commitments must be proposed in the application that will protect the identified acoustic environmental values. The environmental protection commitments, objectives and control strategies should be detailed in a Noise Management Plan. The Noise Management Plan should include:

Application requirements for petroleum activities

- A commitment by the Chief Executive Officer for the holder of the environmental authority, or their delegate, to ensure adequate allocation of staff and resources to the establishment and operation of the Noise Management Plan.
- Definition of roles, responsibilities and authorities within the staffing identified for the establishment and operation of the Noise Management Plan.
- Delivery of training to staff and contractors and maintenance of competencies.
- Risk/constraint analysis methods to be undertaken prior to any new operation (e.g. drill site) or installation of new equipment that has the potential to create noise nuisance.
- Procedures and methods to undertake assessments to ensure compliance with the noise limits provided in Prescribing Noise Conditions on Environmental Authorities for Petroleum Activities in the event of a **valid complaint** being received and when there are no **alternative arrangements** in place, taking into account any tonal or **impulsive noise** impacts.
- Procedures for handling noise complaints.
- Community liaison and consultation procedures including but not limited to consultation for when night time petroleum activities (i.e. between 10.00 pm and 6.00 am) are likely to exceed 25 dBA.
- Procedures for managing records associated with all aspects of the Noise Management Plan including standardised forms for recording monitoring results and complaints.
- Details of petroleum activities and measured and/or predicted noise levels of noise sources associated with those activities.
- Reasonable and practicable control or abatement measures (including relocating the activity, altering the hours of operation, or having an alternate arrangement in place with any potentially affected person) to achieve best practice noise emission criteria.
- The level of noise at **sensitive receptors** that would be achieved from implementing control and abatement measures.
- Mediation processes to be used in the event that noise complaints are not able to be resolved.

Vibration

The environmental protection commitments, objectives and control strategies to minimise any expected vibration nuisance should be detailed in the application. The application should also detail the necessary procedures to develop blast management plans in accordance with Australian Standard AS2187.2–2006: Explosives – Storage and Use which are used for every blasting activity. Blast management plans ensure that all measures are taken to minimise the likelihood of any adverse effects being caused by air blast overpressure and/or ground-borne vibrations at any sensitive receptor and demonstrate current best practice environmental management. All blasting activities must be designed to meet a maximum air blast overpressure level of 120dB (linear peak) and ground-borne vibration peak particle velocity of 10mm/s at any time when measured at or extrapolated to any sensitive receptor. Alternative arrangements are not a suitable control strategy where there is any potential for structural borne vibration impacts at sensitive receptors,

The administering authority has prepared detailed information about how the administering authority assesses and conditions noise impacts from petroleum activities. For more information, refer to the guideline, Prescribing Noise Conditions for Environmental Authorities for Petroleum Activities (EM632).

3.5 Community

Description of environmental values

The application documentation should identify **affected persons** and the communities that may be affected by the proposed petroleum activities. It is acceptable to provide this information graphically via a map. Reference may be made to any other document produced by the applicant that fulfils this requirement (e.g. requirements of resource legislation). In addition, the qualities or physical **characteristics** of the environment that are conducive to public amenity or safety should be identified along with all environmental values that are important to the community, as identified through submissions about the project, where they have been made.

Risks and impacts

State the potential impacts of proposed petroleum activities on the aesthetics, amenity or safety of the community and affected persons. Consideration should be given to presenting the information about affected persons and communities as a graphical assessment, identifying in particular, persons that are most likely to be affected by the proposed location of major infrastructure or activities such as drilling, in comparison to persons that may be affected generally or more remotely by petroleum activities. Include the impacts of the project identified through public submissions during the public notice stage, where that has occurred.

Management practices

The application should propose commitments and strategies to protect or enhance the identified environmental values under best practice environmental management. Describe the management of environmental hazards and any necessary provisions for public safety. Describe strategies that will be employed to maintain the aesthetics and amenity of the local surrounds and community where the project activities are being conducted. A commitment should be given to:

- Record, investigate and resolve complaints and incidents relating to project activities.
- Notify the administering authority and landholders within 24 hours after becoming aware of any release of contaminants not in accordance with the environmental authority or where environmental harm, or the potential for environmental harm has occurred.

3.6 Heritage

Description of environmental values

Detail any **heritage places** (i.e. non-Indigenous and other historic-period heritage) within the project area. Include as a minimum any places recognised in the following sources:

- The Queensland Heritage Register, including **state heritage places**, **archaeological places**, or protected areas.
- Local heritage registers for places of **cultural heritage significance** and/or heritage overlays or other lists of heritage places found in local planning schemes.

Indigenous heritage values should be managed according to the requirements of the *Queensland Heritage Act 1992*, *Aboriginal Cultural Heritage Act 2003* or *Torres Strait Islander Cultural Heritage Act 2003* and do not need to be detailed in the application documents.

Risks and impacts

The application must include and describe the potential impact of proposed activities on places entered in the Queensland Heritage Register, local heritage register, or listed in a planning scheme. Solutions to the management of these impacts are also required and should be developed in consultation with the administering authority and/or the relevant local authority with regard to specific situations.

Management practices

The application should provide a commitment to strategies for the appropriate management of impacts of petroleum activities on any known heritage places and discoveries of heritage places and/or **archaeological artefacts** during implementation/construction.

Adverse impacts to non-registered or listed heritage places may be managed through strategies including, but not limited to: additional site recording prior to project commencement or loss, site avoidance through realignment or site avoidance and implementation of suitable buffers for protection.

Section 89 of the *Queensland Heritage Act 1992* requires that the administering authority of that Act be notified of the discovery of anything a person knows, or reasonably ought to know, is an archaeological artefact that is an important source of information about an aspect of Queensland's history. The application should outline a process for handling new discoveries of archaeological artefacts or other important places made during implementation/construction in compliance with this legislative requirement.

3.7 Waste

General

The application must describe the proposed source, nature, composition, rate and the immediate or ultimate destination of all wastes generated by the petroleum activities.

Description of environmental values

Describe the existing environmental values that may be affected by waste from the proposed petroleum project. Examples of environmental values to be protected relevant to waste issues may include:

- the life, health and wellbeing of people
- the diversity of ecological processes and associated ecosystems
- land use capability, having regard to economic considerations.

Risks and impacts

Not including CSG water, brine and solid salt residues, describe the following for the proposed petroleum activities:

- The types and amounts of the waste expected to be generated, including characterisation of drilling fluids, waste waters including sewage effluent and oily waters.
- The likely impact of the waste on the environment.
- The hazardous characteristics of the waste.
- How the waste will be dealt with, including, in particular:
 - ◆ the amount of the waste that is proposed to be disposed of to a landfill
 - ◆ the amount of the waste that is proposed to be dealt with that is not going to a landfill
 - ◆ location of waste management storage or disposal facilities
 - ◆ the location of any land that will become contaminated as a result of the storage or disposal of waste.
- Contamination risks from the storage, transport and any proposed disposal of wastes (such as drilling fluids, drilling muds, waste waters including sewage effluent and oily waters).

Management practices

Application requirements for petroleum activities

The commitments are to be based on the objects and principles of waste management, and the waste and resource management hierarchy in the *Waste Reduction and Recycling Act 2011* (Waste Act). The commitments must include environmental protection objectives, measurable indicators and standards, and control strategies such as:

- A description of how the project will recognise and apply the waste management hierarchy (as provided for in the Waste Act).
- A program for recycling or disposal of all wastes (reusing and recycling where possible).
- Waste management commitments with auditable targets to reduce, reuse and recycle.
- Waste management control strategies considering:
 - ◆ the type of wastes (must include drilling fluids or muds and hydrocarbons)
 - ◆ segregation of the wastes
 - ◆ storage of the wastes
 - ◆ transport of the wastes (especially trackable and regulated wastes)
 - ◆ monitoring and reporting matters concerning the waste
 - ◆ procedures for dealing with accidents, spills and other incidents that may impact on the waste management
 - ◆ disposal, reuse and recycling options.
- A disposal procedure for general and hazardous wastes (including specific reference to any on-site disposal or transport of any trackable waste).
- Measures to minimise the production of hazardous petroleum wastes and land contamination (e.g. description of the management of hydrocarbon contaminated soil and drilling wastes such as remediation through land application, bioremediation, or removal to a place that can lawfully accept the waste).
- Outline of the process to be implemented to allow for continuous improvement of waste management systems.
- Identification of responsible staff and a staff awareness and induction program that encourages reuse and recycling.

Dams

The application must contain details of all existing **low hazard dams** and regulated dams used in the carrying out of petroleum activities including the following information:

- location details including latitudes and longitudes and distances to sensitive receptors such as private dwellings, camp accommodation, creeks, rivers, wetlands, public recreational areas
- purpose of the dam (e.g. aggregation dam, brine dam, permeate dam, production evaporation dam, exploration and appraisal evaporation dam)
- certified hazard assessment reports, design plans and 'as constructed' drawings
- **hydraulic performance**
- the maximum surface area (ha)
- the maximum volume of dam (m³)
- maximum depth of dam (m)

Application requirements for petroleum activities

- liner selection
- leak detection system.

All new or proposed dams in an application must be detailed (addressing the points above to the extent possible), and be assessed, designed, constructed and certified in accordance with the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams and the accompanying guideline Structures which are dams or levees constructed as part of Environmentally Relevant Activities. For all new dams classified as significant or high hazard, a dam design report addressing all the requirements detailed in Appendix 2 must be included with the application documents. A register for any existing regulated dams must also be included in the application.

Section 126(2) of the EP Act requires that a site-specific application for CSG activities must not provide for an evaporation dam unless the plan includes an evaluation of best practice environmental management for managing the CSG water and alternative ways for managing the water and the evaluation shows there is no feasible alternative to a CSG evaporation dam.

If an applicant proposes to dispose of CSG water via an evaporation dam for production or exploration activities, the applicant must provide the following information:

- (a) an evaluation of the legislative, environmental, technological, economic, and social requirements;
- (b) an assessment of best practice environmental management for managing the CSG water;
- (c) an assessment of the feasibility of other management options in the prioritisation hierarchy for managing and using CSG water;
- (d) the feasibility study suitably demonstrated the necessity for the evaporation dam;
- (e) a discussion of the alternative ways for managing the water and why these options have been ruled out;
- (f) a demonstration that there is no feasible alternative to the evaporation dam.

The application must provide a description of:

- any existing evaporation dam/s including latitude & longitude coordinates,
- capacities
- existing construction and containment standards to contain the wetting front, including leak detection systems
- and provide for an annual re-evaluation of each evaporation dam.

The administering authority will consider if the applicant has investigated all other management options for the CSG water and has identified waste disposal via an evaporation dam as a last resort. All other options of the prioritisation hierarchy for the management and use of CSG water must have been considered first. A condition or conditions may be applied specifying the authorisation of evaporation dams and reference details for each authorised dam.

Evaporation dams are being phased out as an approved water disposal method in CSG production operations, and will rarely be approved for CSG production activities.

Description of environmental values

The application must describe the existing environmental values that must be protected from storing wastes in dams. Examples of environmental values of the land environment to be protected may include:

- the life, health and wellbeing of people
- air quality (e.g. protection of odour impacts)
- visual amenity values

- soil, surface and ground water quality
- land use capability, having regard to economic considerations
- protection of wildlife, including migratory birds
- the diversity of ecological processes and associated ecosystems.

Risks and impacts

The assessment, design and construction of regulated dams must be undertaken in accordance with the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams and the accompanying guideline Structures which are dams or levees constructed as part of Environmentally Relevant Activities. The manual, guideline and methodologies contained therein must be referenced in the application when proposing any new low hazard or regulated dam. Dams should be located in areas above the 1-in-100-year floodplain or, if it is demonstrated that there is no alternative but to locate them in these areas, be specifically designed so as to minimise adverse impacts. The consequences of dam failure or overtopping on the surrounding environment must also be considered in assessing the potential adverse impacts from the dams on identified environmental values.

Management practices

The key objective in relation to dam management is that any low hazard or regulated dam containing wastewater must be designed to effectively avoid environmental harm through contamination of surrounding or underlying land and groundwater. The operation, modification and decommissioning of any dam that is part of a petroleum activity must be carried out in accordance with the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams and the accompanying guideline Structures which are dams or levees constructed as part of Environmentally Relevant Activities.

Control strategies will necessarily relate back, but not be limited to, required dam standards as provided for in these documents. The selection of liner(s) must be based on best practice technologies such as double liner systems or composite liner systems consisting of high density polyethylene/compacted clay/geosynthetic clay. In addition, regulated dams must have effective leak detection systems such as testing during construction, electrical detection, blanket collection systems, groundwater monitoring bores surrounding the dam and through the embankment and seepage collection systems comprising of a sand drain within the embankment.

Control strategies for minimising environmental impacts to wildlife must be provided including fencing, avian and terrestrial netting and egress systems. Avian netting is recommended where a regulated dam is proposed in migratory bird flight paths and the contents of the dam pose a risk to avian health.

Strategies for impacts from floods should also be included in the application such as minimising impacts from the placement of dam infrastructure such that:

- Flood flows are not concentrated in a way that will or may cause or threaten an adverse environmental impact, diverting flood flows from natural drainage paths and alter flow distribution.
- The local duration of floods is not increased.
- The risk of detaining flood flows is not increased.
- There is no **unacceptable risk** posed to the safety of persons from flooding.
- There is no unacceptable risk of damage posed to property from flooding.

Sewage treatment and disposal

The applicant must provide details of any proposed sewage treatment or disposal systems including:

Application requirements for petroleum activities

- A description of the system:
 - ◆ its peak design capacity in equivalent persons
 - ◆ proposed plant specification and performance
 - ◆ proposed operational parameters.
- The systems operation, maintenance, and management arrangements.
- The proposed method of disposal for treated effluent and biosolids including water, salt and nutrient balances if proposing to dispose treated effluent to land and the method of application (e.g. drip irrigation, spray irrigation).
- Details of a monitoring program to assure the performance of the system and that adverse environmental impacts are prevented.

The following documents should be taken into consideration when installing, operating and maintaining sewage treatment works and disposal systems:

- Queensland Water Recycling Guidelines
- Planning Guidelines for Water Supply and Sewerage
- On-Site Sewage Facilities: Guidelines for Vertical and Horizontal Separation Distance
- Australian Standard AS/NZS 1547:2000 On-site Domestic Wastewater Management
- Australian Guidelines for Sewerage Systems: Use of Reclaimed Water
- Australian Guidelines for Sewerage Systems: Biosolids Management
- Australian Guidelines for Sewerage Systems: Effluent Management.

Coal seam gas (CSG) water

As discussed in Part 1, there are specific and additional requirements for CSG activities and these are provided in s.126 of the EP Act. Specifically, a site-specific application for a CSG activity must be developed and detail the generation and management of CSG water, **CSG water concentrate**, brine and solid salt residue. Refer to Part 1 for the content requirements for a site-specific application for CSG activities.

In addition, petroleum tenure holders have ongoing obligations under Chapter 3 of the *Water Act 2000* (Water Act) to monitor and assess the impact of their right to take underground water. The Water Act provides that petroleum tenure holders must:

- Undertake baseline assessments to establish the level and quality of water in a bore.
- Prepare underground water impact reports (UWIRs) that identifies areas which are predicted to be impacted because of the exercising of their rights and establish underground water obligations including the obligation to monitor and manage impacts on aquifers and springs.
- Undertake bore assessments of bores in the areas that are predicted to be impacted to determine whether the individual bores have or will be impacted or impaired.
- Enter into 'make good' agreements with owners of water bores that have or will be impacted.

In addition to meeting the requirements of s.126 of the EP Act and Chapter 3 of the Water Act, s.24AA of the EP Regulation requires that a site-specific application for CSG activities addresses the requirements of the Coal Seam Gas Water Management Policy 2012 and the prioritisation hierarchy for managing and using CSG water and the prioritisation hierarchy for managing saline waste contained therein. The prioritisation hierarchy for CSG water management options in the Coal Seam Gas Water Management Policy 2012 are:

Application requirements for petroleum activities

- Priority 1—Beneficial use for one or more of the following: the environment, existing water users, and existing or new water-dependent industries. Beneficial use of CSG water may include things like:
 - ◆ injection into depleted aquifers for recharge purposes
 - ◆ substitution for an existing water entitlement
 - ◆ supplementary water for existing irrigation schemes
 - ◆ new irrigation use, with a focus on sustainable irrigation projects
 - ◆ livestock watering
 - ◆ urban and industrial water supplies
 - ◆ coal washing and dust suppression
 - ◆ release to the environment in a manner that improves local environmental values.
- Priority 2—After feasible beneficial use options have been considered, treating and disposing CSG water in a way that firstly avoids, and then minimises and mitigates impacts on environmental values, for example:
 - ◆ disposal to surface water
 - ◆ disposal via evaporation dams.

If priority 2 options are proposed, reasons and evidence-based explanations for the use of these options instead of preferred options, need to be included.

The prioritisation hierarchy for managing saline waste in the Coal Seam Gas Water Management Policy 2012 are:

- Priority 1—Brine or salt residues are treated to create useable products wherever feasible.
- Priority 2—After assessing the feasibility of treating the brine or solid salt residues to create useable and saleable products, disposing of the brine and salt residues in accordance with strict standards that protect the environment including injecting brine underground or disposing to a regulated waste facility.

Note: there are particular regulatory requirements for activities involving the injection of wastes directly to groundwater (see s.63 of the EP Reg).

Description of environmental values

The application must include a description of the environmental values of the groundwater resources within the tenure. The environmental values of the groundwaters of the encompassed area should be described for each aquifer in terms of:

- values identified in the Environmental Protection (Water) Policy 2009 (EPP Water)
- sustainability, including both quality and quantity
- physical integrity, fluvial processes and morphology of groundwater resources
- geology/stratigraphy (such as alluvium, volcanic, metamorphic)
- aquifer type (such as confined, unconfined)
- depth to and thickness of the aquifers
- depth to water level and seasonal changes in levels
- groundwater flow directions (defined from water level contours)

Application requirements for petroleum activities

- interaction with surface water
- interaction with saline waters
- possible sources of recharge
- possible pathways for discharge and associated groundwater dependent ecosystems
- vulnerability to pollution.

Risks and impacts

The application document must provide information detailing the quantity and flow rate of CSG water reasonably expected to be generated in connection with carrying out each relevant CSG activity. The information should include the volumes and flow rate/s of CSG water expected to be produced for each year over the life of the project. This information should be graphically represented and grouped by activity type (i.e. exploration, appraisal and production).

Identify the quality of the CSG water. Include any changes in the water quality reasonably expected to happen while each relevant CSG activity is carried out. Water quality data should include as a minimum:

- data obtained from groundwater surveys that is sufficient to enable specification of the major ionic species present in the target groundwater
- pH
- electrical conductivity [$\mu\text{S}/\text{m}$]
- turbidity [NTU]
- total dissolved solids [mg/L]
- temperature [$^{\circ}\text{C}$]
- dissolved oxygen [mg/L]
- alkalinity (bicarbonate, carbonate, hydroxide and total as CaCO_3) [mg/L]
- anions (bicarbonate, carbonate, hydroxide, chloride, sulphate) [mg/L]
- cations (aluminium, calcium, magnesium, potassium, sodium) [mg/L]
- silica [mg/L]
- dissolved and total metals and metalloids (including but not necessarily being limited to: aluminium, arsenic, barium, borate (boron), cadmium, chromium III, copper, iron, fluoride, lead, manganese, mercury, nickel, selenium, silver, strontium, tin and zinc) [$\mu\text{g}/\text{L}$]
- total phosphorus [mg/L]
- ammonia, nitrate, nitrite as nitrogen [mg/L]
- total petroleum hydrocarbons [$\mu\text{g}/\text{L}$]
- BTEX (as benzene, toluene, ethyl benzene, ortho-xylene, para-xylene, meta-xylene and total xylene) [$\mu\text{g}/\text{L}$]
- polycyclic aromatic hydrocarbons (including but not necessarily being limited to naphthalene, phenanthrene, benzo[a]pyrene) [$\mu\text{g}/\text{L}$], and
- gross alpha + gross beta or radionuclides by gamma spectroscopy [Bq/L].

The application should provide an explanation of the variation of chemical concentrations as a result of chemical reactions over time (e.g. changes between extraction, storage, treatment and discharge).

Water quality considerations must include the biological, carcinogenic, mutagenic or toxic properties of the CSG water (particularly with reference to those elements which have exceeded trigger levels in published guidelines including the *Australian and New Zealand guidelines for fresh and marine water quality* (ANZECC guidelines), Australian Drinking Water Guidelines and Queensland Water Quality Guidelines.

Management practices***Beneficial use***

Beneficial use of CSG water is different to the disposal of CSG water. Beneficial use of CSG water is only to be carried out at such a level that benefit accrues to the user of the resource. For example, providing treated CSG water to water users (like farmers) as a resource (like water for livestock). Beneficial uses proposed on tenure, must be consistent with the authorised and ancillary activities permitted under the tenure type(s) (as per the *Petroleum and Gas (Production and Safety) Act 2004*) (P&G Act). Beneficial uses on tenure may be authorised either under the conditions of the environmental authority or under a beneficial use approval issued under the Waste Act. Applicants are encouraged to discuss the details of the proposal with the administering authority in order to confirm which approvals process is applicable.

If an applicant is proposing beneficial use as a management option to be authorised under the environmental authority, the following information must be provided:

- The location (by tenure type and/or real property descriptions).
- The type of proposed beneficial use.
- The duration of the proposed beneficial use project/s.
- Landholder and title details of the location of the proposed beneficial use.
- Description of the environmental values of the receiving environment.
- Description of the treatment technology to be used included in the design (including peak treatment capacities).
- Description of the location of any proposed treatment facilities included and identification of any sensitive receptors.
- Description of the wastes generated as a result of the treatment process.
- Waste management arrangements for the by-products of the treatment process.
- Expected water quality acceptance criteria for the treatment facility.
- The quantity and quality of the water to be beneficially used.
- That the quality of the water to be used is fit for purpose (e.g. reference to published guideline values for particular uses).
- Seasonal and timing issues associated with the beneficial reuse and contingencies (e.g. storage arrangements when unable to irrigate due to saturated soils).
- A detailed assessment of the environmental impacts and sustainability of the proposed beneficial use in the receiving environment (e.g. soil water, nutrient and salt balances).
- A demonstration that the beneficial use can be carried out so as to prevent environmental impacts occurring.

Aquifer injection of treated CSG water

Where aquifer injection of treated CSG water is proposed as a management option, the environmental authority application and approval process for injection is required to occur in stages. This is due to the fact that injection requires knowledge gathering and field testing to determine feasibility. This staged approach is advocated by the Australian Guidelines for Water Recycling: Managed Aquifer Recharge which proposes a risk-based approach to developing aquifer recharge projects that builds on knowledge and mitigates risks progressively during the course of project development.

The staged approach of injection consists of 4 phases. Phase 1 is the preliminary data gathering and analysis that forms an integral part of a CSG project proposal. Phase 1 is to be included in a site-specific application for CSG activities where injection is proposed as a CSG water management option. Phases 2, 3 and 4 will be included as conditions in an environmental authority, and each phase will result in new conditions being added to the environmental authority via an amendment.

Application requirements for petroleum activities

Phase 1

The applicant must undertake studies to determine the feasibility of aquifer injection. The feasibility studies must include:

- data obtained from groundwater surveys that is sufficient to enable specification of the major ionic species present in the target groundwater
- pH
- electrical conductivity [$\mu\text{S}/\text{m}$] and
- total dissolved solids [mg/L].

The information should also include a survey of existing groundwater supply facilities (e.g. wells, or excavations). The information to be gathered should include:

- water well ownership, legal status, permitted take (if any), location and pump type, as well as:
 - ♦ pumping parameters
 - ♦ draw down and recharge at normal pumping rates
 - ♦ seasonal variations (if records exist) of groundwater levels.

The assessment must describe probable and potential environmental effects that might result from the injection project. In addition, the applicant must consider the following Guidelines as they indicate the environmental values that are likely to apply to target aquifers:

- toxicants in water, sediment and biota
- Queensland Water Quality Guidelines
- ANZECC
- Australian Drinking Water Guidelines.

A monitoring plan must be developed for Phase 1 injection feasibility that includes details of the area within which groundwater resources are likely to be impacted by the proposed CSG extraction operations. The monitoring plan must be able to assess the significance of the injection project to groundwater recharge and provide for the assessment of:

- groundwater quality for impacted and adjacent aquifers
- piezometric contours for impacted and adjacent aquifers
- surface feature hydrology such as springs and permanent water courses
- ecological assessment of groundwater dependent ecosystems
- potential impacts on environmental values.

The monitoring plan should be progressively developed through each of the injection phases.

Observation points (e.g. wells, surface water features and springs) to monitor groundwater resources both before and after commencement of operations must be developed. All monitoring wells must have the capability to provide both hydrological and water quality information.

Phase 2

Phase 2 consists of gathering detailed knowledge of the aquifer characteristics and its general hydrologic behaviour and identifying a target aquifer for injection. In determining the feasibility of a target aquifer for injection, the proponent must obtain and provide the following:

- The geochemical compatibility of the injection fluid with the formation water and the formation itself.
- Formation permeability (storativity and transmissivity).
- Confinement of the CSG water injection system, having regard to fluid flow pathways in the formations beyond the water quality impact zone.

Application requirements for petroleum activities

- Baseline hydrogeological data within an area and geological formation that may be affected by injection of fluid.
- The values of the aquifer (identification of groundwater dependent ecological assets, use in human settlements, agricultural, mining and industrial enterprises).
- Water entitlements that have been issued within the hydraulic impact zone.
- Legal issues (land use, ownership and possible adverse environmental effects).
- Seismology (potential for seismic events due to the injection program).
- Water yield projections (including an estimation of the volume and rates of water to be injected).
- Identification of CSG raw water yields.
- Quality of untreated CSG water produced from across the gas field.
- The necessary advanced treatment technologies (micro-filtration, reverse osmosis or de-ionisation and any other physical or chemical buffering processes used to meet the water quality objectives associated with the environmental values of the receiving aquifer).
- Include a description of expected gas field development and its relationship to water management practices in respect to injection infrastructure at 5, 10 and 15 years from commercial inception.

In addition, the proponent must have consideration to the hydrologic behaviour of the target aquifer and prepare a hydrogeological conceptual model that:

- Relates to the state of the receiving groundwater/geological system prior to injection activities commencing.
- Identifies the aerial extent of the hydraulic impact zone.
- Identifies the water quality impact zone and assesses if any identified environmental values will be impacted and in what way.

Phase 3

Phase 3 comprises the trial injection of fluid into the aquifer to assess response behaviour and to gain understanding of reactivity and long-term geochemical response. The Phase 3 report should include the following information:

- The characteristics of the target aquifer (e.g. aquifer areal extent, thickness, and depth, geologic structure, aquicludes or aquitards, formation fracture pressure, topography).
- The injection process (e.g. volume, pressure and flow rate of the injection fluid; chemical characteristics of the injection fluid).
- Identification and characterisation of recharge and discharge processes that may influence movement and storage of injection fluid.
- Groundwater monitoring plan.
- Water quality acceptance criteria.
- The capacity of the aquifer.
- Description of the proposed injection system including:
 - ◆ strategy and redundancy
 - ◆ conveyance/aggregation/buffer storage
 - ◆ injection pre-treatment (e.g. filtration, mineral balance, oxygen removal, disinfection)
 - ◆ injection headworks
 - ◆ injection well
 - ◆ injection field (including redundancy considerations)
 - ◆ well integrity monitoring program
 - ◆ receiving environment monitoring program.
- Preventative measures and residual risk.

Application requirements for petroleum activities

- Feasibility considerations including:
 - ◆ technical feasibility
 - ◆ economic and social feasibility
 - ◆ the private and public benefits and costs.

A final feasibility report is required at the end of Phase 3 in order for full scale operational injection to be authorised under the EA. This report should include options or combinations of injection versus other methods to determine optimal ratio subject to technical, operational and economic parameters.

Phase 4

Phase 4 provides for the construction and operation of a full-scale injection system and hydro-geological model verification and refinement. Authorisation for full-scale injection systems will include ongoing monitoring and reporting on the following operational and maintenance requirements:

- injection pressure measured on a continuous basis
- flow rate and cumulative volume
- injection flow rate versus injection pressure time series plot
- injection fluid temperature
- water chemistry (e.g. target formation and injection fluid)
- maintenance program and actual undertakings for the aggregation system, treatment train, headworks, injection field and monitoring wells
- integrity testing of injection wells.

Release of treated CSG water to surface water

While the release of CSG water to surface water is a priority 2 management option in the Coal Seam Gas Water Management Policy 2012. If such a release is proposed as a management option, a site-specific application for CSG activities must include a characterisation of the proposed discharge quality and address whether the velocity, volume, rate and timing of the release of the CSG water is compatible with the natural flow regime of the surface water. This information is necessary as the administering authority must, in deciding the application, consider hydrological and ecological impacts on a watercourse as a result of changes to the flow regime from a discharge of CSG water.

If the release is deemed to have a material impact on raw drinking water supply sources, an approved Coal Seam Gas Recycled Water Management Plan under the *Water Supply (Safety and Reliability) Act 2008* (Water Safety Act) will also be required to prove that the treatment process, and supporting management arrangements, will consistently deliver water of the quality required to protect public health in drinking water supplies. Assessment of the effects of more than 1 point of release of CSG water to surface water will be required to ascertain the full spatial extent of impact of the releases and the actual cumulative impact on natural flow regime, environmental and raw drinking water sources and any other relevant values. Alternatively an Exclusion Decision under the Water Safety Act may be required.

The following key information must be provided in a site-specific application for CSG activities if proposing to release CSG water to surface water:

- The environmental values of the surface water. Environmental values of waters are particular values or uses of the water that are conducive to a healthy ecosystem and that require protection from the effects of habitat alteration, waste releases, contaminated runoff and changed flows. The environmental values of an aquatic ecosystem to be enhanced or protected under the EPP Water includes the attributes of the water's aquatic ecosystem including its biota, physical form, riparian vegetation, flow and physiochemical water quality and are:

Application requirements for petroleum activities

- ◆ Uses of water that are conducive to a healthy ecosystem and that require protection from the effects of habitat alteration, waste releases, contaminated runoff and changed flows.
- ◆ Aquatic ecosystems to be enhanced or protected under this policy include the attributes of the water's aquatic ecosystem including its biota, physical form, riparian vegetation, flow and physiochemical water quality.
- The management goals, management intent and water quality objectives of the surface water as per the EPP Water and the Queensland Water Quality Guidelines, state and regional planning documents as well as ANZECC.
- A description of the character and resilience of the surface water including:
 - ◆ Identification of potentially impacted water bodies and catchment areas (to the most downstream point where impacts could occur).
 - ◆ The pre-development flow regime conditions and definition of background hydrological conditions in the surface water system including the proposed release site and details on the current hydrological regime. Where possible, this should include modelling (e.g. IQQM for larger catchment scales, Gold Sim for smaller catchment scales) using available hydrological data and agreed modelling assumptions. Modeling must be supported by an interpretation of the results and justification that the models have been used appropriately.
 - ◆ Details on the current local ecosystem health and water quality including and include appropriate and historical local reference data collected in the same water above the proposed discharge location or in a similar stream in the area that is not affected by a discharge. Background water quality monitoring data should cover the wetting stage through to the recessional and pool stages of the watercourse and include comprehensive replicate monitoring data. Monitoring data for the last 3 to 5 years (or a longer period), upstream and downstream of the release point should be include in order to take into account the natural variability of the receiving waters.
 - ◆ An assessment of the background water quality monitoring data and whether water quality objectives are being met (as per the EPP Water and the Queensland Water Quality Guidelines, state and regional planning documents as well as ANZECC).
 - ◆ Details of other point sources, stream bank condition, diffuse catchment pollutant sources and local catchment issues.
- How the release regime is going to meet the management goals of the receiving water, ensuring the protection of the environmental values and compliance with the water quality objectives (WQO) for the receiving water.
- How the proposed release accords with the management hierarchy in the EPP Water and that best practice measures have been adopted to avoid and minimise the proposed discharge
- The physical, chemical and biological source characteristics of the CSG water directly from wells and in feed pond(s).
- The treatment proposed for the CSG water prior to release and the expected water quality acceptance criteria from that treatment process.
- Comprehensive discharge characterisation data for all parameters likely to be relevant to treated CSG water. For this purpose, an assessment of the proposed quality of the discharge should be carried out against water quality triggers for aquatic ecosystem protection provided in published guidelines such as ANZECC and Australian Drinking Water Guidelines. Where not provided in these guidelines, reference

Application requirements for petroleum activities

can be made to United States water quality standards such as the Safe Drinking Water Act, Region 9 Environmental Protection Agency Water Quality Guidelines and the Texas Surface Water Quality Standards

- If there is an initial mixing zone from the proposed discharge:
 - ♦ whether there is any practicable alternative that would reduce or eliminate the initial mixing zone, and
 - ♦ whether the size of the initial mixing zone is likely to adversely affect an environmental value or the ecological condition of the receiving environment, including, for example, a watercourse or wetland, and
 - ♦ whether concentrations of contaminants in the initial mixing zone are acutely toxic to the biota.
- The location of any release points and the proposed method of release.
- The proposed flow parameters of the release relevant to stream ecosystems including:
 - ♦ timing of flows
 - ♦ frequency of flows
 - ♦ duration of flows
 - ♦ duration of no flows
 - ♦ magnitude of flows
 - ♦ rate of rise and fall of flows
 - ♦ ratio and duration of treated CSG water release at the closest downstream town water supply source.
- A prediction, based on available data or relevant hydrological modelling, of the nature and scale of the impacts on the natural flow regime of the surface water including:
 - ♦ the spatial and temporal extent of impacts to stream water quality and stream flow regime including assessment of impacts on any 'no flow periods'
 - ♦ a description of the hydrological stages (e.g. wetting, recessional, pooled, dry) that will occur as a result of the discharge
 - ♦ cumulative impacts of CSG water releases on the flow regime.
- The nature and extent of impacts on aquatic flora and fauna, including benthos.
- The nature and extent of the impact of the CSG water on the biological integrity of the surface water.
- The nature and extent of the impact of the CSG water on the banks and bed of the surface water channel.
- The water quality and flow requirements of ecological assets and ecosystem functions and the resultant refined conceptual understanding of the receiving environment.
- The species with critical links to the flow regime and specific water quality sensitivities and how impacts will be mitigated.
- The proposed treated CSG water quality monitoring program.
- The proposed receiving environment and biological monitoring and assessment program including details of locations upstream and downstream of the CSG release point.

Application requirements for petroleum activities

- The nature and extent of impacts on other users of water resources in the project area, including downstream users.
- The cumulative effects of other industries and diffuse pollutant sources on surface water quality.

There are an extensive number of documents that have been produced to assist applicants in assessing impacts to surface waters, including protecting environmental values. These documents should be referenced in developing an impact assessment for waste water discharges to surface waters. These documents include:

- Coal Seam Gas Water Management Policy 2012
- Protecting Environmental Values from CSG Water Discharged to Surface Waters (available on request)
- Operational Policy: Waste Water Discharge to Queensland Waters (available on request)
- Healthy Headwaters Coal Seam Gas Water Feasibility Study reports (available on request) including:
 - ♦ Stream Ecosystem Health Response to Coal Seam Gas Water Release: Decision Support System
 - ♦ Stream Ecosystem Health Response to Coal Seam Gas Water Release: Direct Toxicity Assessment
 - ♦ Stream Ecosystem Health Response to Coal Seam Gas Water Release: Biological Monitoring Guidelines
 - ♦ Stream Ecosystem Health Response to Coal Seam Gas Water Release: Guidelines for Managing Flow Regimes.

Proposed releases of CSG water must be supported with a comprehensive receiving environment monitoring program (REMP). For recommended contents of REMPs, refer to Section 3.8 Water).

Applications should also consider the following:

- Any relevant water resource plan objectives and outcomes.
- Murray Darling Basin Salinity Strategy (for Queensland Murray Darling Basin region only and only in relation to any impacts of salinity from the activities).
- Any relevant requirements of the *Water Act 2007* (Commonwealth).
- Water Supply Act.
- *Environmental Protection Biodiversity and Conservation Act 1999* (Commonwealth).
- The cumulative impact of the proposed release on any relevant State and Federal agreements (e.g. no net increase to salt loads entering other jurisdictions under the Basin Salinity Management Plan to which Queensland is a signatory).

Brine and solid salt residue resulting from water treatment or evaporation

The Coal Seam Gas Water Management Policy 2012 provides a hierarchy for brine and solid salt residue management. A site-specific application for CSG activities must consider this hierarchy when proposing management strategies for brine and solid salt residues. The hierarchy in the Coal Seam Gas Water Management Policy 2012 in order of decreasing preference is:

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.

Applicants must demonstrate that each priority option for brine and solid salt management has been considered in full and determined not feasible (because of, for example, environmental, technical, economic, legislative or social considerations) prior to considering the next priority.

Where management options are still being investigated, describe the detail of any pilot programs or trials for CSG water management options, including:

- objectives of project
- key deliverables of the project
- project timelines
- quantity and quality of brine/solid salt residues to be used
- location/area relevant to the project
- duration of pilot program/trial.

In relation to brine and solid salts, the total quantity produced over the life of the project and annually must be provided in a site-specific application for CSG activities in addition to details on the composition of the salt. The analysis must provide information sufficient to justify the management options chosen. Justification exists to stage management strategies for brine and residual solid salts for the exploration phase of a project whereby disposal options may be proposed for the initial production of water whilst research and assessment of other strategies is being undertaken (such as drilling and assessing suitable aquifers for injection), or the results of pilots or trials are being finalised.

3.8 Water

Describe the project activities that will impact on water, including consideration of:

- Sources of water, quality of water and uses of water.
- The potential sources/generation of contamination of waters from the petroleum activities.
- The quantity of water required to be used for undertaking petroleum activities, where the water will be sourced and potential effects on other users of water resources in the project area.
- The background water quality of any streams proposed to be discharged into and the environmental impact of such discharges on the aquatic ecosystem (include a discussion of mixing zones).
- Identification of downstream uses/users of affected waters.
- Identification of groundwater quality impacts on existing groundwater users in the affected areas.
- Identification of impacts on groundwater dependent ecosystems.
- The cumulative effects of other industries discharging into the same waterways or extracting from the same aquifers.

Description of environmental values

The environmental values relevant to Queensland **waters** include:

- For water mentioned in Schedule 1, column 1 of the EPP Water— the environmental values stated in the document opposite the water in Schedule 1, column 2, or
- For other water—the environmental values as follows:

Application requirements for petroleum activities

- ◆ For high ecological value waters—the biological integrity of an aquatic ecosystem that is effectively unmodified or highly valued.
- ◆ For slightly disturbed waters—the biological integrity of an aquatic ecosystem that has effectively unmodified biological indicators, but slightly modified physical, chemical or other indicators.
- ◆ For moderately disturbed waters—the biological integrity of an aquatic ecosystem that is adversely affected by human activity to a relatively small but measurable degree.
- ◆ For highly disturbed waters—the biological integrity of an aquatic ecosystem that is measurably degraded and of lower ecological value than waters mentioned above.
- ◆ For waters that may be used in primary industry or for agricultural purposes, the suitability of the water for:
 - agricultural use
 - aquacultural use
 - producing aquatic foods for human consumption.
- ◆ For waters that may be used for recreation or aesthetic purposes, the suitability of the water for:
 - primary recreational use
 - secondary recreational use.
- ◆ For waters that may be used for drinking water—the suitability of the water for supply as drinking water.
- ◆ For waters that may be used for industrial purposes—the suitability of the water for industrial use.
- ◆ Cultural and spiritual values of the water.

Environmental values for groundwater can also be derived from the Guidelines for Groundwater Protection in Australia.

The description of the environmental values must include, where relevant:

- A description of surface waters (watercourses, wetlands and springs) and groundwater in the catchments of the project area. Relevant features are to be marked on scaled project maps.
- A description and characterisation of relevant groundwater aquifers and recharge discharge processes.
- Baseline monitoring data about the quantity and quality of waters which could be potentially affected by activities including data on groundwater that may be affected by extraction or injection of water.
- A description of the environmental values of waters which could potentially be affected by the activities, including any significant environmental issues identified through landholder and community consultation, where undertaken.
- A description of the environmental values of springs such as the diversity of wetland dependant native species and the presence of threatened species, cultural and spiritual values (encompassing relevant aesthetic, historical, scientific, social or other significance to past, present or future generations).
- A compilation of water users in the project area whose water quality may be affected by the activities.

Risks and impacts

Application requirements for petroleum activities

Excluding proposed discharges of treated CSG water to surface water (as these have been discussed in Section 3.7 Waste), the application must identify actual and potential impacts on waters that will result from the carrying out of the petroleum activities. In this regard, the application must include the following considerations:

- The potential sources of contaminants to waters from the petroleum activities (e.g. well stimulation).
- A description of the works to be carried out, or within close proximity to all watercourses, wetlands or springs including a demonstration of how these works cannot be avoided.
- Details of the nature and extent of any petroleum and gas activities that will be carried out in a wild river area for which a wild river declaration has been made.
- Whether the management intent of any receiving water will be met where there is a proposed discharge of waste water to surface waters and how this will be assured.
- The spatial and temporal extent of potential changes in stream hydrology and water quality.
- the nature and extent of impacts on the environmental values of affected surface waters, including a discussion on the extent of impacts to predevelopment flow regimes and water quality
- The nature and extent of impacts on aquatic flora and fauna, including benthos.
- The nature and extent of impacts on stream bed and banks of the surface water channel.
- The nature and extent of stormwater contamination and the quantity and quality of stormwater releases into surface waters.
- The nature and extent of impacts to groundwater.
- The nature and extent of impacts on other users of water resources in the project area, including downstream users.

Management practices

Stormwater management

Commitments should be provided relevant to developing erosion and sediment control strategies and managing stormwater to minimise contamination and prevent its release to waters if it is contaminated.

Erosion and sediment control planning must provide consideration of the following:

- Diverting uncontaminated stormwater run-off around areas disturbed by petroleum activities or where contaminants or wastes are stored or handled that may contribute to stormwater.
- Where contaminated stormwater runoff and incident rainfall is collected and treated, reused, or released.
- Roofing or minimising the size of areas where contaminants or wastes are stored or handled.
- Revegetating the disturbed area as soon as practicable after the completion of works.
- Using alternate materials and or processes (such as dry absorbents) to clean up spills that will minimise the generation of contaminated waters.
- Erosion and sediment control structures are placed to minimise erosion of disturbed areas and prevent the contamination of any waters.
- An inspection and maintenance program for the erosion and sediment control features.
- Provision for adequate access to maintain all erosion and sediment **control measures** especially during the wet season months from December to March.
- Erosion and sediment control measures for construction of wells and pipelines on slopes >10%

Application requirements for petroleum activities

- An effective stormwater monitoring program.

Groundwater

As part of the environmental protection commitments to manage identified impacts on the quality of groundwater resources, the applicant must propose a strategy to minimise and mitigate these impacts. It is recognised that minimisation and mitigation of impacts on water levels in aquifers and on existing entitlement holders resulting from extraction of groundwater is regulated under legislation other than the EP Act and there will be separate reporting and approval requirements for these arrangements. The requirements of other legislation do not need to be duplicated in the application documents. Wherever necessary, a reference should be made to these obligations as part of the broader mitigation strategy.

There are a number of groundwater impacts that may result from activities other than extraction of CSG water such as aggregation of water in dams and potential contamination of groundwater from storage and disposal of wastes. The proposed strategy in the application must clearly identify specific impacts that are being addressed, the extent to which the strategy may minimise these impacts, and propose performance indicators that could be used to assess the effectiveness of the strategy. The strategy may include various ways to minimise and mitigate impacts on the quality of groundwater resources. In proposing measures to protect groundwater, the Guidelines for Groundwater Protection in Australia should be referenced.

As part of the environmental protection commitments, a groundwater monitoring program must be developed that is supported by an appropriate hydro-geological conceptualisation and monitoring rationale that is commensurate to the risks identified. The monitoring program must include:

- Indicators for environmental values of groundwater resources including those associated with groundwater-surface water interaction (e.g. springs, wetlands) and groundwater dependant ecosystems.
- Indicators for environmental values of surface waters.
- A trigger action response plan which includes, but is not limited to:
 - ◆ A list of possible contaminants of concern (PCoCs) associated with storage activities (fuel, chemical and waste storage).
 - ◆ Identification and characterisation of water quality indicators to be used in impact monitoring which are relevant to the contaminant being stored, including trigger and action concentration levels for the relevant PCoCs and water quality indicators at which investigations will be undertaken.
 - ◆ Trigger and action response/notification measures.
- Sampling of groundwater parameters including frequencies
- Sampling methodologies in accordance with the latest edition of the Water Quality Sampling Manual, Australian Standard AS/NZS 5667:11 1998 Water Sampling Guidelines – Part 11 Guidance on sampling groundwater and Geoscience Australia’s Groundwater Sampling and Analysis – A Field Guide (Record 2009:27 GeoCat #6890.1).
- Sampling procedures (including sampling equipment) that consider monitoring bore characteristics (such as headworks design, depth and length of screens and sampling location), the parameters to be measured and the levels at which they will be measured to (i.e. sub ppb for some parameters).
- Sampling of groundwater in accordance with any requirements for baseline bore, well and **stimulation** impact monitoring.
- Information pertaining to monitoring bore locations.
- A sufficient number of monitoring sites to provide the following information:

Application requirements for petroleum activities

- ◆ Detection of any groundwater contamination resulting from the proposed activities.
- ◆ Seepage to groundwater and surrounding soils from any regulated dam and its effect on groundwater and soils.
- ◆ Background water quality (i.e. groundwater quality in representative **bores** that have not been affected by the proposed activity(ies).
- ◆ The determination of groundwater flow direction, groundwater flow rate and hydraulic conductivity.
- Undertaking a geodetic survey of all monitoring bores to determine the relative water surface elevations of each bore and reported in metres relative to the **AHD**.
- A rationale containing details on the program purpose, program conceptualisation and verification of assumptions.

Surface waters

While largely specific to CSG activities, the documents referenced above provide relevant information about the protection of environmental values of surface waters generally and can be referenced accordingly. Control strategies for the protection of surface water environmental values must ensure that flow regimes, water quality, aquatic flora and fauna, and habitat values are protected. In order to meet the regulatory requirements of the EP Reg, where a discharge of CSG water to surface water is proposed, a site-specific application for CSG activities must specifically address hydrological and ecological impacts on the receiving watercourse (as described in the Release of treated CSG water to surface water section).

In addition, where a waste water discharge is proposed as part of the petroleum activities, a REMP for surface waters should be included in the application that includes:

- Water quality targets within the receiving environment to be achieved, and clarification of contaminant concentrations or levels indicating adverse environmental impacts during the REMP.
- Monitoring for any potential adverse environmental impacts caused by the release.
- Monitoring of stream flow and hydrology.
- Consideration of sodic soils and potential for water course bank slumping.
- Monitoring biological indicators (for macroinvertebrates in accordance with the AusRivAS methodology) and metals/metalloids in sediments in accordance with ANZECC and A Guide to the application of the ANZECC Water Quality Guidelines in the Minerals Industry (Batley et al) and/or Australian/New Zealand Standard *AS/NZS 5667.12 Water Quality – Sampling – Guidance on Sampling of Bottom Sediments*.
- Monitoring of a selection of invertebrate species (minimum of 3 from the local receiving environment) to assess ecosystem health in respect to the availability of calcium and magnesium (necessary for the formation of exo-skeletal structures (e.g. zoo and phytoplankton, diatoms).
- Methods for analysis and interpretation of all monitoring results.
- Locations of monitoring points (including the locations of proposed background and downstream impacted sites for each release point).
- The frequency or scheduling of sampling and analysis sufficient to determine water quality objectives and to derive site-specific reference values within 2 years (depending on wet season flows) in accordance with the Queensland Water Quality Guidelines. For ephemeral streams, this should include periods of flow irrespective of mine or other discharges.
- Sampling and analysis methods and quality assurance and control.

- Any historical data sets to be relied upon.
- Description of the statistical basis on which conclusions are drawn.
- Any **analogue** or reference sites.
- Recording of planned and unplanned releases to watercourses, procedures for event monitoring, monitoring methodology used and procedure to establish background surface water quality.

Works in watercourses, wetlands and springs

All attempts must be made to avoid undertaking lineal infrastructure works in, or within, close proximity to watercourses, wetlands or springs. Where there are no reasonable or practical alternatives, pipelines, roads and seismic surveys may need to intersect with a watercourse, wetland or spring. The applicant must provide details of how activities in watercourses, wetlands and springs will be managed to minimise and mitigate any impact of the activity. Consideration must be given to reducing the impact on flow in a watercourse, minimising the amount and time of the disturbance, the use of sediment control measures and minimising water turbidity and/or contamination. The guideline Activities in a watercourse, lake or spring associated with a resource activity or mining operations provides advice about planning activities and impact management during activities in watercourses, lakes or springs.

Wild rivers

Where petroleum activities are going to be carried out in a declared wild river area, the application must include a commitment that the project activities will comply with the conditions stated in that declaration.

3.9 Stimulation activities

Description of environmental values

The application must describe the environmental values that may be potentially, or actually, impacted from stimulation activities such as hydraulic fracturing. This should include a description of the environmental values of groundwater resources on, and beyond, the relevant petroleum tenures that are found where stimulation activities are to be carried out. Refer to section 3.8 Water, for further information about determining environmental values of groundwater.

Risks and impacts

If well stimulation is planned as part of the petroleum activities, the application must include a risk assessment in order for the administering authority to assess and condition the activity. If well stimulation is not planned or the risk assessment is not supplied in the application, the environmental authority will condition that well stimulation activities cannot be undertaken. Based on the risk assessment the administering authority will develop necessary and desirable environmental authority conditions which will include baseline and impact monitoring conditions as part of the authorisation to undertake this activity.

The risk assessment for stimulation activities must address issues at a relevant geospatial scale such that changes to features and attributes are adequately described and must include, but not necessarily be limited to:

- a process description of the stimulation activity to be applied, including equipment and a comparison to best international practice
- details of where, when and how often stimulation is to be undertaken on the tenures covered by this environmental authority
- a geological model of the field to be stimulated including geological names, descriptions and depths of the target gas producing formation(s)
- naturally occurring geological faults

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- seismic history of the region (e.g. earth tremors, earthquakes)
- proximity of overlying and underlying aquifers
- description of the depths that aquifers with environmental values occur, both above and below the target gas producing formation
- identification and proximity of **landholders' active groundwater bores** in the area where stimulation activities are to be carried out
- the environmental values of groundwater in the area
- an assessment of the appropriate limits of reporting for all water quality indicators relevant to stimulation monitoring in order to accurately assess the risks to environmental values of groundwater
- description of overlying and underlying formations in respect of porosity, permeability, hydraulic conductivity, faulting and fracture propensity
- consideration of barriers or known direct connections between the target gas producing formation and the overlying and underlying aquifers
- a description of the well mechanical integrity testing program
- process control and assessment techniques to be applied for determining extent of stimulation activities (e.g. microseismic measurements, modelling etc)
- practices and procedures to ensure that the stimulation activities are designed to be contained within the target gas producing formation
- groundwater transmissivity, flow rate, hydraulic conductivity and direction(s) of flow
- a description of the chemical compounds used in stimulation activities (including estimated total mass, estimated composition, chemical abstract service numbers and properties), their mixtures and the resultant compounds that are formed after stimulation
- a mass balance estimating the concentrations and absolute masses of chemical compounds that will be reacted, returned to the surface or left in the target gas producing formation subsequent to stimulation
- an environmental hazard assessment of the chemicals used including their mixtures and the resultant chemicals that are formed after stimulation including:
 - ◆ toxicological and ecotoxicological information of chemical compounds used
 - ◆ information on the persistence and bioaccumulation potential of the chemical compounds used
 - ◆ identification of the chemicals of potential concern in stimulation fluids derived from the risk assessment
- an environmental hazard assessment of use, formation of, and detection of polycyclic aromatic hydrocarbons in stimulation activities
- confirmation and identification of whether radioactive tracer beads are used and if so, an environmental hazard assessment of their use in stimulation activities
- an environmental hazard assessment of leaving chemical compounds in stimulation fluids in the target gas producing formation for extended periods subsequent to stimulation
- human health exposure pathways to operators and the regional population
- risk characterisation of environmental impacts based on the environmental hazard assessment

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- potential impacts to landholder bores as a result of stimulation activities
- an assessment of cumulative underground impacts, spatially and temporally, of the stimulation activities to be carried out on the tenures covered by the environmental authority
- potential environmental or health impacts which may result from stimulation activities including but not limited to water quality, air quality (including suppression of dust and other airborne contaminants), noise and vibration.

In addition to the risk assessment, the application must be supported by evidence that fluids used in stimulation will not include **restricted stimulation fluids**. The results of any baseline bore and well water quality analyses that may be included in the risk assessment should describe the overall condition of these waters in relation to the environmental values of the groundwater resource and water quality objectives as provided for in guidelines such as the EPP Water and ANZECC.

Management practices

The application must include environmental protection commitments and objectives in relation to stimulation activities. This should include a commitment to take all reasonable and practical measures to ensure that stimulation activities do not negatively affect water quality, other than that within the **stimulation impact zone** of the target formation, and that stimulation activities will be carried out so as to not cause a connection of the target gas producing formation and another aquifer.

Control strategies should include details of process control monitoring to be undertaken during stimulation activities to detect water quality impacts and interconnectivity (e.g. methods to monitor the propagation of hydraulic fracturing). In addition, a site-specific application for CSG activities should include a stimulation baseline and impact monitoring program which includes monitoring of water quality in landholders bores and nearby CSG wells, and include a program for monitoring the quality of stimulation fluids and flowback waters.

3.10 Rehabilitation

Section 125 of the EP Act requires that a properly made application for an environmental authority must include details of how the land, which is the subject of the application, will be rehabilitated after each relevant activity ceases. This includes details of how any land that will be contaminated or disturbed by the proposed activity will be remediated or rehabilitated to reinstate environmental values and ensure that the land is suitable for intended future uses.

A plan of operations under Chapter 5 Part 12 of the EP Act is required for petroleum activities when a petroleum activity is authorised under a petroleum lease and any relevant activity for the authority is an ineligible ERA. Where a plan of operations is required, detailed information on rehabilitation must be included in the plan in the form of a rehabilitation program. For more information about rehabilitation programs in a plan of operations, refer to the guideline Preparing a plan of operations for an environmental authority relating to a petroleum lease (EM1009).

For petroleum activities which do not require a plan of operations, the application must still address section 125 of the EP Act by addressing the following information.

The application should include justification as to the options and management measures proposed, particularly with regard to a hierarchy for rehabilitation. The strategies listed at the top of the hierarchy should be adopted in preference to those listed lower, unless there are significant environmental, economic or social issues that override such a selection. The rehabilitation hierarchy is:

1. Reinstating a native ecosystem as similar as possible to the original ecosystem as the preferred option.
2. Establishing an alternative outcome with a higher environmental value than the previous land use.

3. Reinstating the previous land use (e.g. grazing or cropping).

Over the entire disturbed area within a project there may be more than 1 final land use objective for rehabilitation (e.g. native ecosystem or grazing or future development/commercial/industrial land). Additionally, within each type of final land use category, there may be different sub-categories of rehabilitation objectives and completion criteria depending on the diversity of ecosystem types present within the project area. The proposed final land use will be determined by a number of factors including:

- Relevant legislative and regulatory requirements imposed on a particular petroleum activity.
- The views of all stakeholders, particularly the current or future landowner and the local community.
- The land-use of surrounding areas and the needs of the local community.
- The receiving environment.
- The conservation, ecological and heritage values of the area.

As far as practicable, the application should clearly identify the location of all petroleum activities that will cause significant disturbance to land and require subsequent rehabilitation. These activities can include, but not necessarily be limited to, dams, well sites, seismic survey lines, pipeline corridors, roads, camps, sewage effluent irrigation areas, production facilities, water treatment facilities and waste disposal facilities.

Section 560 of the P&G Act obliges the petroleum authority holder to remove equipment or improvements from the land on relinquishment (other than a petroleum well, pipeline, water observation bore or water supply bore) unless the owner of the land otherwise agrees. However, to surrender the environmental authority under the EP Act, all infrastructure is required to be decommissioned and rehabilitated unless it relates to **permanent infrastructure** (e.g. roads or tracks) or a water dam and both the landholder and the administering authority has agreed in writing to its continuance. The applicant should identify all permanent infrastructure that are intended to remain after the petroleum activities cease and mark relevant features on scaled project maps.

Continuous improvement of the rehabilitation objectives and final acceptance criteria is encouraged to accommodate results of research/trials, changing technology and rehabilitation practice. Rehabilitation must commence progressively as areas become available and must be managed to minimise contamination of land and waters and the proliferation of species not consistent with rehabilitation objectives.

Description of the environmental values

Where known, the application must identify the environmental values of any areas to be significantly disturbed over the life of the project and identify the environmental values of those areas including pre-disturbed land use (refer Section 3.3 Land, for guidance about identifying environmental values of land that is to be significantly disturbed).

Risks and impacts

Significant disturbance to land will generally result in adverse impacts as clearing of vegetation will occur, resulting in soil disturbance, which will increase the risks of erosion and sediment contamination near surface water. In the longer term, and in particular instances, significant disturbance may produce beneficial outcomes, for example, where the pre-disturbed land is vegetated with weeds and will be rehabilitated to the final land use of native ecosystem. Accordingly, where areas of significant disturbance to land are known, the applicant must assess the impacts of disturbance in consideration of the environmental values of pre-disturbed land and also, final land use. Where there are multiple final land uses on the relevant resource authorities, a map must be provided depicting the areas of different final land uses.

Final rehabilitation criteria

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The rehabilitation objectives, indicators and final acceptance criteria for rehabilitation goals will be prescribed on any environmental authority that may be issued. Final acceptance criteria will be based on best practice environmental management and consider pre-disturbed land use and the views of local landholders and the wider community. It must be measurable and be a means against which rehabilitation success can be measured, assessed and audited in a consistent, objective and repeatable manner. Analogue sites, to benchmark rehabilitation success, are required to be identified in the application documents.

Applicants should include proposed final acceptance criteria. The model final acceptance criteria that may be issued for petroleum activities are:

For all land use(s):

- All significantly disturbed land is reinstated to the pre-disturbed soil suitability class including remediation of contaminated land.
- The landform is safe for humans and fauna.
- The landform is **stable** with no subsidence or erosion gullies for at least 3 years.
- All significantly disturbed land is reinstated so that the distribution of vegetation communities represents the analogue site.
- The water quality of any residual **void** or water bodies constructed by the petroleum activity(ies) meets criteria for subsequent uses and does not have potential to cause environmental harm.
- There is no ongoing contamination to waters.
- There is no ongoing contamination to groundwater from dams or landfill monocells (demonstrated via groundwater monitoring and leak detection monitoring systems).
- The maintenance requirements for rehabilitated land are no greater than that required for the land prior to its disturbance caused by carrying out the petroleum activities.

Additional requirements for sites that are being reinstated to native ecosystems:

- Each vegetation community must be re-established so that each of the following rehabilitation parameters are maintained for at least 3 years.
- The rehabilitated site shows distinct and progressive re-establishment of the various strata which characterise the vegetation community in the analogue site(s).
- All dominant species within each strata are re-established at densities equivalent to that of the analogue site.
- A minimum of 70% **species richness** and **species diversity** is observed when compared to the relevant analogue site(s).
- A minimum of 50% **foliage cover** is observed when compared to the relevant analogue site(s).
- Each vegetation community must be rehabilitated and maintained until it can be demonstrated that it is resilient and self-sustaining (demonstrated by reproduction and colonisation).
- Percentage of organic litter cover, count and density of hollow bearing logs and nest boxes (as replacement for trees with hollows $\geq 10\text{cm}$ diameter) and fallen woody material (total length of logs $\geq 10\text{cm}$ diameter per hectare and number of logs $\geq 10\text{cm}$ per hectare) that have been installed at numbers and densities no lower than the analogue site.

Rehabilitation monitoring program

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The application must include a rehabilitation monitoring program as part of the environmental commitments, objectives and control strategies and which includes, but is not necessarily limited to:

- Methods to measure subsidence and erosion rates at rehabilitated buried transmission pipeline corridors and buried flow lines.
- Monitoring of identified indicators at analogue sites to measure progressive and final rehabilitation success relevant to the final land use(s).
- Frequency and seasonality of monitoring analogue sites and rehabilitated areas to assess rehabilitation success.
- Identification of the experimental design for analysing analogue and rehabilitated site data including statistical methods of analyses.

Part 4: Glossary

Note: Where a term is not defined in this guideline, the definition in the *Environmental Protection Act 1994*, its regulations and *Environmental Protection Policies*, then the *Acts Interpretation Act 1954*, then the Macquarie Dictionary then the *Petroleum and Gas (Production and Safety) Act 2004* or its regulations and *Petroleum Act 1923* must be used in that order.

Acid sulfate soils	Soil or sediment containing highly acidic soil horizons or layers affected by the oxidation of iron sulfides (actual acid sulfate soils) and/or soil or sediment containing iron sulfides or other sulfidic material that has not been exposed to air and oxidised (potential acid sulfate soils). The term acid sulfate soil generally includes both actual and potential acid sulfate soils. Actual and potential acid sulfate soils are often found in the same soil profile, with actual acid sulfate soils generally overlying potential acid sulfate soil horizons.
Administering authority	Means: (a) For a matter, the administration and enforcement of which has been devolved to a local government under section 514 of the <i>Environmental Protection Act 1994</i> —the local government; or (b) For all other matters—the Chief Executive of the Department of Environment and Heritage Protection; or (c) Another state government department, authority, storage operator, board or trust, whose role is to administer provisions under other enacted legislation.
Affected persons	A person affected, or who may be affected, by the release of a contaminant or waste from carrying out the activity.
Aggregate environmental score	The relative impact related to an average operation or activity on a single site, wherever located. It is expressed in terms of a calculation derived from the average emissions of contaminants from a particular environmentally relevant activity and the risks associated with other attributes of the site where the activity is undertaken.

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Aggregation dam	A dam that is used to aggregate and contain CSG water prior to use, treatment or disposal of that water (by means other than evaporation). The primary purpose of the dam must not be to evaporate the water even though this will naturally occur.
AHD	Australian height datum and is the datum used for the determination of elevations in Australia. The determination uses a national network of benchmarks and tide gauges and sets mean sea level at zero elevation.
Alternative arrangement	A written agreement between the holder of the environmental authority and an affected, or potentially affected, person at a sensitive receptor for a defined noise nuisance impact and may include an agreed period of time for which the arrangement is in place. An agreement for alternative arrangement may include, but not necessarily be limited to, a range of noise abatement measures to be installed at a sensitive receptor and/or provision of alternative accommodation for the duration of the defined noise nuisance impact.
Analogue site	An area of land which contains values and characteristics representative of an area to be rehabilitated prior to disturbance. Such values must encompass land use, topographic, soil, vegetation and other ecological characteristics. Analogue sites can be the pre-disturbed site of interest where significant surveying effort has been undertaken to establish benchmark parameters such as that for ground truthing assessment.
Animal breeding places	Of an animal. Means a place (e.g. bower, burrow, cave, hollow, nest or other thing) that is commonly used by the animal to incubate or rear the animal's offspring.
Appraisal well	A petroleum well to test the potential of 1 or more natural underground reservoirs for producing or storing petroleum. For clarity, an appraisal well does not include an exploration well.
Aquifer	An identifiable stratigraphic formation that has the potential to produce useful flows of water and may include formations where, due to hydraulic fracturing activity, a changed hydraulic conductivity allows such water flows.
Archaeological artifact	Means: <ul style="list-style-type: none"> Any artefact that is evidence of an aspect of Queensland's history, whether it is located in, on or below the surface of land; and not A thing that is Aboriginal cultural heritage under the <i>Aboriginal Cultural Heritage Act 2003</i> or Torres Strait Islander cultural heritage under the <i>Torres Strait Islander Cultural Heritage Act 2003</i>.
Archaeological	A place entered in the Queensland Heritage Register under Part 5 of the <i>Queensland</i>

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place	<i>Heritage Act 1992.</i>
Background noise level	The sound pressure level, measured in the absence of the noise under investigation, as the $L_{A 90,T}$ being the A-weighted sound pressure level exceeded for 90% of the measurement time period T of not less than 15 minutes, using Fast Response.
Bed and banks	For a watercourse or wetland, it means land over which the water of the watercourse or wetland normally flows or that is normally covered by the water, whether permanently or intermittently. It does not include land adjoining, or adjacent to, the bed or banks that is from time to time covered by floodwater.
Bore	A water observation bore or a water supply bore that is either sub-artesian or artesian.
Category A Environmentally Sensitive Area	Category A Environmentally Sensitive Area means any area listed in section 25 of the Environmental Protection Regulation 2008.
Brine	Saline water with a total dissolved solid concentration greater than 40 000mg/l.
Brine dam	A dam designed to receive, contain or evaporate brine.
Category A Environmentally Sensitive Area	Any area listed in section 25 of the Environmental Protection Regulation 2008.
Category B Environmentally Sensitive Area	Any area listed in section 26 of the Environmental Protection Regulation 2008.
Category C Environmentally Sensitive Area	<p>Category C Environmentally Sensitive Area means any of the following areas:</p> <ul style="list-style-type: none"> • Nature Refuges as defined in the conservation agreement for that refuge under the <i>Nature Conservation Act 1992</i>. • Koala Habitat Areas as defined under the Nature Conservation (Koala) Conservation Plan 2006. • State Forests or Timber Reserves as defined under the <i>Forestry Act 1959</i>. • Declared catchment areas under the <i>Water Act 2000</i>. • Resources reserves under the <i>Nature Conservation Act 1992</i>. • An area validated as Essential Habitat or Essential Regrowth Habitat from ground-truthing surveys in accordance with the <i>Vegetation Management Act 1999</i> for a species of wildlife listed as endangered, vulnerable, rare or near threatened under

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	<p>the <i>Nature Conservation Act 1992</i>.</p> <ul style="list-style-type: none"> • Of Concern Regional Ecosystems identified in the database called 'RE description database' containing Regional Ecosystem numbers and descriptions. • Threshold regional ecosystems as defined and listed in Appendix 6 of the Queensland Biodiversity Offsets Policy. • Critically limited regional ecosystems as defined and listed in Appendix 5 of the Queensland Biodiversity Offsets Policy.
Characteristic	<p>Of a contaminant, material or waste, it means any of the following:</p> <ul style="list-style-type: none"> • The physical and chemical properties and reactivity of the contaminant, material or waste. • The biological, carcinogenic, mutagenic or toxic properties of the contaminant, material or waste. • The variation of the concentration, emission rate or flux over time, of the contaminant, material or waste. <p>Of the receiving environment, means any of the following:</p> <ul style="list-style-type: none"> • The physical, chemical, ecological or biological properties of the receiving environment. • The variability of the receiving environment (e.g. whether a watercourse is tidal or subject to periodic flooding or drought).
Clearing	<p>For vegetation, it means removing, cutting down, ringbarking, pushing over, poisoning or destroying in any way including by burning, flooding or draining. It does not include destroying standing vegetation by stock, or lopping a tree.</p>
Commercial place	<p>A work place used as an office or for business or commercial purposes, which is not part of the petroleum activities and does not include employee accommodation or public roads.</p>
Construction	<p>In relation to a dam, it includes building a new dam and modifying or lifting an existing dam.</p>
Control measure	<p>A device, equipment, structure, or management strategy used to prevent or control the release of a contaminant or waste to the environment. Examples of a control measure include an acoustic enclosure, a bund around a storage pond, a fabric filter to collect dust, a release or overflow valve on machinery, or a strategy for operating a furnace in a way that achieves combustion of a contaminant at a particular oxygen level.</p>
Critically limited regional ecosystem	<p>An ecosystem that has a remnant extent below 5% of their pre-clearing extent and are less than 500ha in total extent, or that have a remnant extent less than 200ha, or that</p>

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	are at risk of the remnant extent falling below 200ha. They are listed in Appendix 5 of the Queensland Biodiversity Offsets Policy.
Cultural heritage significance	<p>Aesthetic, architectural, historical, scientific, social, or other significance, to the present, past or future generations, as assessed against the following criteria:</p> <ul style="list-style-type: none"> • The place is important in demonstrating the evolution or pattern of Queensland's history. • The place demonstrates rare, uncommon or endangered aspects of Queensland's cultural heritage. • The place has potential to yield information that will contribute to an understanding of Queensland's history. • The place is important in demonstrating the principal characteristics of a particular class of cultural places. • The place is important because of its aesthetic significance. • The place is important in demonstrating a high degree of creative or technical achievement at a particular period. • The place has a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons. • The place has a special association with the life or work of a particular person, group or organisation of importance in Queensland's history.
CSG water	Underground water brought to the surface of the earth, or otherwise interfered with, in connection with exploring for or producing coal seam gas. CSG water is a waste, as defined under s13 of the <i>Environmental Protection Act 1994</i> .
CSG water concentrate	The concentrated saline water waste stream from a water treatment process that does not exceed a total dissolved solid concentration of 40 000mg/L.
Development well	A petroleum well which produces or stores petroleum. For clarity, a development well does not include an appraisal well.
Endangered wildlife species	Means native wildlife that is prescribed under Schedule 2, part 1 of the Nature Conservation (Wildlife) Regulation 2006 as endangered wildlife.
Equivalent person or EP	An equivalent person under volume 1, section 2 of the Guidelines for Planning and Design of Sewerage Schemes, October 1991, published by the Water Resources Commission, Department of Primary Industries, Fisheries and Forestry.
Evaporation dam	A land-based structure designed to contain or impound CSG water, the purpose of which is to contain or impound the water, until the water content has been removed by

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	evaporation.
Exploration well	<p>A petroleum well that is drilled to:</p> <ul style="list-style-type: none"> • Explore for the presence of petroleum or natural underground reservoirs suitable for storing petroleum; or • Obtain stratigraphic information for the purpose of exploring for petroleum. <p>For clarity, an exploration well does not include an appraisal or development well.</p>
Exploring for petroleum	<p>Carrying out an activity for the purpose of finding petroleum or natural underground reservoirs as per section 14 of the <i>Petroleum and Gas (Production and Safety) Act 2004</i> for example:</p> <ul style="list-style-type: none"> • 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.
Environmental Authority	An environmental authority issued by the administering authority under Chapter 5 of the <i>Environmental Protection Act 1994</i> .
Financial assurance	Under the <i>Environmental Protection Act 1994</i> , it means a security deposit, either cash or a bank guarantee, held by the administering authority to cover the potential costs of rehabilitating areas significantly disturbed by the petroleum activities. Financial assurance can be required for other legislation and policy.
Floodplain	<p>Has the meaning in the <i>Water Act 2000</i>. An area of reasonably flat land adjacent to a watercourse that:</p> <ul style="list-style-type: none"> • Is covered from time to time by floodwater overflowing from the watercourse; and • Does not, other than in an upper valley reach, confine floodwater to generally follow the path of the watercourse, and • Has finer sediment deposits than the sediment deposits of any bench, bar or in-stream island in the watercourse.
Foliage cover	The proportion of the ground, which would be shaded if sunshine came from directly overhead and is defined for each stratum. It includes branches and leaves and is similar to the crown type of Walker and Hopkins (1990) but is applied to a stratum or plot rather than an individual crown.
Foreseeable future	The period used for assessing the total probability of an event occurring. Permanent structures and ecological sustainability should be expected to still exist at the end of a

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	150-year foreseeable future with an acceptably low probability of failure before that time.
Groundwater	Water that occurs naturally in, or is introduced artificially into, an aquifer, whether or not it would, if tapped by a bore, flow naturally to the surface.
Hazard	Any thing which has the intrinsic potential to harm or assist in the absence of a control.
Hazard category	A category, either low, significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the Manual for Assessing Hazard Categories and Hydraulic Performance.
Heritage place	Any place that may be of cultural heritage significance, or any place with potential to contain archaeological artefacts that are an important source of information about Queensland's history.
High ecological significance values	Protected estate (protected areas under the NC Act), World Heritage areas, marine parks, wetlands, habitat for endangered, vulnerable, rare or near threatened species (listed under the NC Act and <i>Environment Protection and Biodiversity Conservation Act 1999</i>), and regional ecosystems that are endangered, or of concern, or have other significant values (e.g. wetlands, nationally threatened ecological communities, large tracts of remnant vegetation, corridors and special biodiversity areas).
High value regrowth	Means <ul style="list-style-type: none"> • Any of the following: <ul style="list-style-type: none"> - an endangered regional ecosystem - an of concern regional ecosystem - a least concern regional ecosystem, and • It has not been cleared since 31 December 1989; and • It is shown on a regrowth vegetation map.
Hubs	More than 1 unit of fuel burning or combustion equipment capable of burning fuel at a rate of at least 500 kg/hour individually or combined, located within 5km of any other fuel burning or combustion equipment capable of burning fuel at a rate of at least 500kg/hour individually or combined.
Hydraulic fracturing	A technique used to create cracks in underground coal seams to increase the flow and recovery of gas or oil out of a well. It involves pumping a fluid, comprised largely of water and sand, under pressure, into a coal seam. This action fractures the coal seam which provides a pathway that increases the ability for gas to flow through the coal.

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Hydraulic performance	The capacity of a regulated dam to contain or safely pass flowable substances based on a probability (AEP) of performance failure specified for the relevant hazard category in the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams.
Impulsive noise	Sound characterised by brief excursions of sound pressure (acoustic impulses) that significantly exceed the background sound pressure. The duration of a single impulsive sound is usually less than 1 second.
Ineligible environmentally relevant activity (ERA)	An environmentally relevant activity that does not comply with the eligibility criteria in effect for the activity, or for which eligibility criteria are not in effect, or that is carried out as part of a significant project.
Infrastructure	<p>Plant or works including, for example, communication systems, compressors, powerlines, pumping stations, reservoirs, roads and tracks, water storage dams, evaporation or storage ponds and tanks, equipment, buildings and other structures built for the purpose and duration of the conduct of the petroleum activity(ies) including temporary structures or structures of an industrial or technical nature, including, for example, mobile and temporary camps.</p> <p>Infrastructure does not include other facilities required for the long-term management of the impact of those petroleum activities or the protection of potential resources. Such other facilities include dams other than water storage dams, pipelines and assets, that have been decommissioned, rehabilitated, and lawfully recognised as being subject to subsequent transfer with ownership of the land.</p>
$L_{Aeq, adj, 15 mins}$	The A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character that within any 15 minute period has the same square sound pressure as a sound level that varies with time.
$L_{A 90, adj, 15 mins}$	The A-weighted sound pressure level, adjusted for tonal character that is equal to or exceeded for 90% of any 15 minute sample period equal, using Fast response.
Lake	<p>Means:</p> <ul style="list-style-type: none"> • A lagoon, swamp or other natural collection of water, whether permanent or intermittent. • The bed and banks and any other element confining or containing the water.
Landholders' active groundwater bores	For the purposes of stimulation baseline and impact monitoring in the environmental authority, it means bores that are able to continue to provide a reasonable yield of water in terms of quantity for the bores authorised purpose or use. This term does not include monitoring bores owned by the administering authority of the <i>Water Act 2000</i> .

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Leachate	A liquid that has passed through, or emerged from, or is likely to have passed through or emerged from, a material stored, processed or disposed of on site which contains soluble, suspended or miscible contaminants likely to have been derived from the said material.
Limit of reporting	The lowest amount of an analyte in a sample that can be quantitatively determined with stated, acceptable precision and accuracy under stated analytical conditions (i.e. the lower limit of quantitation).
Linear infrastructure	Powerlines, pipelines, roads and access tracks.
Lopping	Cutting or pruning the branches of a tree. It does not include removing its trunk or cutting or pruning its branches so severely that it is likely to die.
Low hazard dams	Any dam that is not classified as high or significant as assessed using the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams and which contains contaminants in concentrations which exceed, or will exceed, during the dam's operational life, the values or range shown in Table 3 of the manual.
Monitoring	In relation to monitoring the impact of an activity on the receiving environment, it means analysing, assessing, examining, inspecting, measuring, modelling or reporting any of the following: <ul style="list-style-type: none"> • The quantity, quality, characteristics, timing and variability of the release of the contaminant. • The effectiveness of control measures. • Characteristics of, and impact on, the receiving environment. • The effectiveness of remedial or rehabilitation measures.
Max L_{pZ} , 15 min	The maximum value of the Z-weighted sound pressure level measured over 15 minutes.
Max L_{pA} , 15 min	The absolute maximum instantaneous A-weighted sound pressure level, measured over 15 minutes.
Permanent infrastructure	Includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads, pipelines, etc), which is to be left by agreement with the landholder.
Pest species	Means any of the following:

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	<ul style="list-style-type: none"> • A species declared under the <i>Land Protection (Pest and Stock Route Management) Act 2002</i>. • A species declared under local government model local laws. • A species which may become invasive in the future.
Plan of operations	Is a planning document required under the <i>Environmental Protection Act 1994</i> which must be submitted to the administering authority prior to carrying out activities on a mining or petroleum lease. The plan contains information about where activities will be carried out, an action program which demonstrates how the holder of the environmental authority will comply with conditions, a rehabilitation program and a proposed amount of financial assurance.
Populated areas	Includes towns and cities which have a population of 200 or more people and with a minimum density of 40 people/km ²
Pre-development	In regards to surface water flows, it means the flows that would have occurred in the system without any water resource development (i.e. without any diversions or dams or storages on the main stream and tributaries). Pre-development flows are not the same as 'natural flows' although in some catchments they may be similar.
Prescribed storage gases	Has the meaning provided in section 12 of the <i>Petroleum and Gas (Production and Safety) Act 2004</i> .
Primary protection zone	An area within a 200 metre buffer from the boundary of any Category A, B or C Environmentally Sensitive Area.
Protection plants	Native plants that are prescribed under the <i>Nature Conservation Act 1992</i> as extinct in the wild, endangered, vulnerable, near threatened or least concern plants.
Rare or near threatened wildlife species	Native wildlife that is prescribed under Schedule 5, part 1 of the <i>Nature Conservation (Wildlife) Regulation 2006</i> as near threatened wildlife.
Regulated dam	Any dam in the significant or high hazard category as assessed using the <i>Manual for Assessing Hazard Categories and Hydraulic Performance of Dams</i> , as amended from time to time.
Regulated structure	Any dam or levee in the significant or high hazard category as assessed using the <i>Manual for Assessing Hazard Categories and Hydraulic Performance of Dams</i> , as amended from time to time.

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Regulatory requirements	Are prescribed in the Environmental Protection Regulation 2008 and are those matters that must be considered by the administering authority when making an environmental management decision. An application for an environmental authority is an environmental management decision.
Rehabilitation	Is the process of reshaping and revegetating land to restore it to a safe, non-polluting, stable and self-sustaining landform and in accordance with agreed completion criteria.
Release	Of a contaminant into the environment, it means: <ul style="list-style-type: none"> • To deposit, discharge, emit or disturb the contaminant. • To cause or allow the contaminant to be deposited, discharged, emitted or disturbed. • To allow the contaminant to escape. • To fail to prevent the contaminant from escaping.
Remnant vegetation	Vegetation, part of which forms the predominant canopy of the vegetation, and: <ul style="list-style-type: none"> • Covers more than 50% of the undisturbed predominant canopy; and • Averages more than 70% of the vegetation's undisturbed height; and • Is composed of species which are characteristic of the vegetation's undisturbed predominant canopy cover.
Resource activity other than mining	Means: <ol style="list-style-type: none"> (a) any of the following under the GHG storage Act— <ol style="list-style-type: none"> (i) a GHG exploration permit (also called a GHG permit) (ii) a GHG injection and storage lease (also called a GHG lease) (iii) a GHG injection and storage data acquisition authority (also called a GHG data acquisition authority) (b) a geothermal tenure under the <i>Geothermal Energy Act 2012</i> (c) a 1923 Act petroleum tenure granted under the <i>Petroleum Act 1923</i> (d) a petroleum authority granted under the <i>Petroleum and Gas (Production and Safety) Act 2004</i> (e) a licence, permit, pipeline licence, primary licence, secondary licence or special prospecting authority granted under the <i>Petroleum (Submerged Lands) Act 1982</i>.
Restricted stimulation fluids	Fluids used for the purpose of stimulation, including fracturing, that contain the following chemicals in more than the maximum amounts prescribed under regulation 81B of the Environmental Protection Regulation 2008:

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	<ul style="list-style-type: none"> petroleum hydrocarbons containing benzene, ethyl benzene, toluene or xylene; or chemicals that produce, or are likely to produce, benzene, ethyl benzene, toluene or xylene as the chemical breaks down in the environment. <p>The amount of any chemical is not measured in relation to water included in the restricted stimulation fluid.</p>
River improvement trust asset areas	An area within a river improvement area declared under the <i>River Improvement Trust Act 1940</i> that is, or has been subject to, restoration or flood mitigation works. The location and details of these areas can be obtained from the relevant river improvement trust.
Sensitive place	Means: <ul style="list-style-type: none"> A dwelling (including residential allotment, mobile home or caravan park, residential marina or other residential premises, motel, hotel or hostel). A library, childcare centre, kindergarten, school, university or other educational institution. A medical centre, surgery or hospital. A protected area. A public park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment.
Sensitive receptor	An area or place where noise (including low frequency, vibration and blasting) is measured to investigate whether nuisance impacts are occurring and includes: <ul style="list-style-type: none"> A dwelling (including residential allotment, mobile home or caravan park, residential marina or other residential premises, motel, hotel or hostel). A library, childcare centre, kindergarten, school, university or other educational institution. A medical centre, surgery or hospital. A protected area. A public park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment. A work place used as an office or for business or commercial purposes, which is not part of the petroleum activity(ies) and does not include employees accommodation or public roads.
Significantly disturbed land	Disturbance to land as defined in section 28 of the Environmental Protection Regulation 2008.
Significant project	As in the <i>Environmental Protection Act 1994</i> and means a project declared as significant under the <i>State Development and Public Works Organisation Act 1971</i> .

Application requirements for petroleum activities

Species diversity	The diversity within an ecological community that incorporates both species richness and the evenness of species' abundances.
Species richness	The number of different species in a given area.
Spring	The land to which water rises naturally from below the ground and the land over which the water then flows.
Stable	In relation to land, it means landform dimensions are, or will be, stable within tolerable limits now and in the foreseeable future. Stability includes consideration of geotechnical stability, settlement and consolidation allowances, bearing capacity (trafficability), erosion resistance and geochemical stability with respect to seepage, leachate and related contaminant generation.
State heritage place	A place entered in the Queensland Heritage Register under Part 4 of the <i>Queensland Heritage Act 1992</i> .
State-significant biodiversity values	Those regional ecosystems, essential habitat, wetlands, watercourses, legally secured offset areas and connectivity areas provided in Appendix 1 of the Queensland Biodiversity Offsets Policy.
Stimulation	A technique used to increase the permeability of a natural underground reservoir using a combination of physical processes and the addition of chemicals and includes hydraulic fracturing/hydrofracking, fracture acidizing and the use of proppant treatments.
Stimulation fluid	The fluid injected into an aquifer to increase the permeability of a natural underground reservoir.
Stimulation impact zone	A 100 metre maximum radial distance from the stimulation target location within a gas producing formation.
Strategic cropping land	Means land recorded in the decision register as being strategic cropping land under the <i>Strategic Cropping Land Act 2011</i> .
Structure	A dam or levee.
Tampering with an animal breeding place	Damage, destroy, mark, move or dig up the breeding place.

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Threatening processes	Processes, features and actions that can have a detrimental effect upon the health and viability of an area of vegetation. For example, altered hydrology, land use practices, invasion by pest and weed species, land degradation, edge effects and fragmentation.
Threshold regional ecosystems	Regional ecosystems that contain the regional ecosystem's threshold for its conservation status. These ecosystems are listed in Appendix 6 of the Queensland Biodiversity Offsets Policy.
Tolerable limits	A range of parameters regarded as being sufficient to meet the objective of protecting relevant environmental values. For example, a range of settlement for a tailings capping, rather than a single value, could still meet the objective of draining the cap quickly, preventing damage and limiting infiltration and percolation.
Top soil	The surface (top) layer of a soil profile, which is more fertile, darker in colour, better structured and supports greater biological activity than underlying layers. The surface layer may vary in depth depending on soil forming factors, including parent material, location and slope, but generally is not greater than about 300mm in depth from the natural surface.
Transmissivity	The rate of flow of water through a vertical strip of aquifer which is 1 unit wide and which extends the full saturated depth of the aquifer.
Trenchless methods	Construction methods for the installation of pipelines and cables below the ground with minimal excavation. Trenchless methods can include, but not necessarily be limited to: <ul style="list-style-type: none"> • moling • pipe ramming method • horizontal directional drilling • utility tunneling, pipe jacking, auger boring • microtunnelling and pipe jacking • online replacement.
Unacceptable risk	Those risks identified as unacceptable through a risk assessment that substantially conforms with Australian Standard 4360:2004 Risk Management or any updated version that becomes available from time to time.
Valid complaint	A complaint the administering authority considers is not frivolous, nor vexatious, nor based on mistaken belief.
Void	Any man-made, open excavation in the ground (includes borrow pits, drill sumps, frac pits, flare pits, cavitation pits and trenches).

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Vulnerable wildlife species	Native wildlife that is prescribed under Schedule 3, part 1 of the Nature Conservation (Wildlife) Regulation 2006 as vulnerable wildlife.
Waters	Includes all or any part of a creek, river, stream, lake, lagoon, dam, swamp, wetland, spring, unconfined surface water, unconfined water in natural or artificial watercourses, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, stormwater run-off, and underground water.
Watercourse	Has the meaning provided in Schedule 5, section 12 of the Environmental Protection Regulation 2008. A river, creek or stream in which water flows permanently or intermittently— (a) in a natural channel, whether artificially improved or not; or (b) in an artificial channel that has changed the course of the watercourse. A watercourse includes the bed and banks and any other element of a river, creek or stream confining or containing water.
Well infrastructure	Infrastructure required for the construction, completion and operation of a well including but not limited to cellar pits, dams and drill sumps.
Well site	A maximum area of land disturbance for the purposes of constructing, installing and operating an exploration, appraisal or development well or such wells as part of a multi-well arrangement and includes well lease infrastructure.
Wetland	A wetland as defined under the Queensland Wetlands Program and is areas of permanent or periodic/intermittent inundation; with water that is static or flowing fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed 6 metres. To be classified as a wetland, the area must have 1 or more of the following attributes: <ul style="list-style-type: none"> • At least periodically, the land supports plants or animals that are adapted to and dependent on living in wet conditions for at least part of their life cycle. • The substratum is predominantly undrained soils that are saturated, flooded or ponded long enough to develop anaerobic conditions in the upper layers. • The substratum is not soil and is saturated with water, or covered by water at some time. <p>For the purposes of resource activities other than mining, wetlands do not include springs and watercourse and those wetlands that are defined in the document entitled Wetland Mapping and Classification Methodology (Environmental Protection Agency, 2005) as:</p> <ul style="list-style-type: none"> • H2M1 Riverine or ex-riverine (lacustrine) water bodies associated with dams and weirs located in a channel.

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	<ul style="list-style-type: none"> • H2M3p Ponedged pastures. • H2M5 Palustrine/lacustrine water bodies where ecological character has changed due to gross mechanical disturbance (e.g. cropping). • H2M6 Palustrine/lacustrine water bodies that have been converted, completely or mostly, to a ring tank or other controlled storage. • H2M7 Riverine water bodies that have been converted mostly to canals or irrigation channels. • H3C1 Artificial stand-alone water storages not within a natural water body or channel. • H3C2 Artificial Channel drain/canal—bore drains, swales, bores and irrigation channel overflows/ponding.
Wild river declaration	Is a statutory instrument under the <i>Wild Rivers Act 2005</i> . A declaration lists the relevant natural values to be preserved and delineates certain parts of the wild river area and the different constraints that may apply in these areas. With reference to environmental authorities for petroleum, each declaration also specifies conditions to be included in a new authority if the activity is to be located within the wild river area.

Disclaimer:

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Signature

Date

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Appendix 1: Contents of a design plan

A best practice design plan sets out how all identified hazard scenarios are addressed in the planned design and operation of a regulated structure. The document must describe the physical dimensions of the regulated structure, the materials and standards to be used for construction of the regulated structure and the criteria to be used for operating the regulated structure.

Regulated structures must be designed and constructed in line with the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams to prevent:

- Floodwaters from entering the regulated structure from a watercourse or drainage line to the annual exceedance probability specified for determining spillway capacity.
- Wall failure due to erosion by floodwaters arising from the watercourse or drainage line to the annual exceedance probability specified for determining spillway capacity.
- Overtopping as a result of a flood event of the annual exceedance probability specified for determining spillway capacity.

All aggregation dams must:

- (a) be designed with a floor and sides 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
- (b) have a system that will detect any passage of the wetting front or entrained contaminants through the floor or sides of the dam.

All brine dams must:

- (a) be designed with a floor and sides 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
- (b) have a system that will detect any passage of the wetting front or entrained contaminants through the floor or sides of the dam
- (c) have a system for the collection and proper disposal of any contaminants that move beyond the bounds of the containment system
- (d) be constructed with the capacity to continuously remove any leachate from beneath the floor or beyond the sides of the dam.

The following information must also be included in the application material:

1. A design report which provides:
 - (a) certification of the design plan
 - (b) a description of all the documents which constitute the design plan
 - (c) a statement of:
 - (i.) the applicable standards including engineering criteria, industry guidelines, relevant legislation and regulatory documents relied upon in preparing the design plan; and
 - (ii.) all relevant facts and data used in preparing the design plan, including any efforts made to obtain necessary facts and data, and any limitations or assumptions to facts and data used in preparing the design plan

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- (iii.) the hazard category of the structure
 - (iv.) the reasoning of the certifying suitably qualified and experienced person as to how the design plan provides the necessary required performance
- (d) documentation of hydrological analyses and estimates required to determine all elements of the design including volumes and flow capacities
 - (e) detailed criteria for the design, operation, maintenance and decommissioning of the structure including any assumptions
 - (f) design, specification and operational rules for any related structures and systems used to prevent failure scenarios
 - (g) reasoning for how the design plan provides the required performance
 - (h) details of any other matter which may substantially affect, or is critical to, the design plan
 - (i) evidence that the certifier is a suitably qualified and experienced person.
2. Drawings showing the lines and dimensions of built structures and land forms associated with the regulated structure.
 3. Design, specification and operational rules for any related structures and systems used to prevent failure scenarios.
 4. A description of any containment systems.
 5. An operational plan that includes normal operating procedures and rules.
 6. A plan for the decommissioning and rehabilitation of the structure at the end of its operational life.
 7. Details of reports on investigations and studies done in support of the design plan, and any other matter required by the suitably qualified and experienced person.

Where a regulated structure is to be managed as part of an integrated containment system and the design storage allowance volume is to be shared across the integrated containment system, the design plan must include all of the above requirements and the following additional information:

1. The operational rules for the system as a whole.
2. The standards of serviceability and accessibility of water transfer equipment or structures.
3. The operational rules for each individual regulated structure that forms part of the integrated system.
4. The design plans.

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Approved by

Rachel Burgess-Dean

Signature

25 March 2013

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