

Guideline

Environmental Protection Act 1994

Preparing an environmental management plan for coal seam gas activities

The purpose of this guideline is to provide information to those preparing an Environmental Management Plan (EM Plan) under the Environmental Protection Act 1994 for level 1 petroleum activities involving coal seam gas (CSG) exploration or production, that are to be carried out on one or more petroleum tenures granted under the Petroleum Act 1923; or petroleum authorities granted under the Petroleum and Gas (Production and Safety) Act 2004.

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Part 1: Introduction

This guideline describes the broad structure and possible content requirements and considerations an applicant should include in the EM Plan to meet the statutory obligations in the *Environmental Protection Act 1994*. The purpose of an EM Plan is to propose environmental protection commitments to help the administering authority decide the conditions of the environmental authority. The administering authority for level 1 petroleum activities is the Department of Environment and Resource Management (DERM).

EM Plans that are developed through the Environmental Impact Statement (EIS) process must describe the preferred option where several options are considered within the EIS. Management options must be converted into specific commitments within the EM Plan.

Part 2 of this Guideline describes the preferred structure of an EM Plan, 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 in the EM Plan. 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 should be commensurate to the risk of environmental harm and 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.

Information on the assessment and approval process for petroleum projects is contained in the DERM guideline *Assessment and approval process for environmental authorities for petroleum activities*.

Legislative framework

Chapter 5A of the EP Act provides for petroleum activities to be issued with environmental authorities (chapter 5A activities). Applications for an environmental authority (chapter 5A activities) for a Level 1 chapter 5A activity must be accompanied by an EM Plan under section 310C of the EP Act.

The EM Plan must provide sufficient information for DERM to evaluate a project in relation to each of the regulatory requirements. The content required in an EM Plan for a level 1 petroleum activity is detailed in section 310D of the EP Act. The EM Plan for CSG activities must:

- be in the approved form; and
- describe each of the following—
 - each relevant resource authority for the environmental authority;
 - all relevant petroleum activities the subject of the application;
 - the land on which the activities are to be carried out;
 - the environmental values likely to be affected by the activities;
 - the potential adverse and beneficial impacts of the activities on the environmental values; and
- state the environmental protection commitments the applicant proposes for the activities to protect or enhance the environmental values under best practice environmental management;
- contain enough other information to allow the administering authority to decide the application and conditions to be imposed on the environmental authority;
- address any other matter prescribed under an environmental protection policy or regulation;
- include a **rehabilitation** program for land proposed to be disturbed under each relevant resource authority for the application;

- state a proposed amount of **financial assurance** for the environmental authority as part of the rehabilitation program; and
- contain a CSG water management plan (CWMP) with an appropriate adaptive environmental management regime.

The EM Plan should identify and describe the environmental values and all potential environmental impacts that will be caused by the petroleum activities and define the critical environmental values that are to be protected through the conditions of the environmental authority. For each of the environmental values to be protected, environmental protection commitments must be proposed in terms of environmental protection objectives and associated standards, measurable indicators and control strategies to ensure the objectives will be achieved. The environmental protection commitments of an EM Plan should be based on practical options and derived from site-specific environmental assessments, environmental best practice and proven research. The commitments should also include provisions for **monitoring** and must be based on allocation of sufficient technical and financial resources to be achievable.

A new or revised EM Plan may be required to accompany an application to amend an environmental authority for an existing operation if, were the amendment to be made, there is likely to be a substantial increase in the risk of environmental harm because of a substantial change in:

- the quantity or quality of contaminant authorised to be **released** into the environment; or
- the results of the **release** of a quantity or quality of contaminant authorised to be released into the environment.

A substantial change includes:

- an increase of 10% or more in the quantity of a contaminant to be released into the environment; or
- if the amendment is to add a level 1 chapter 5A activity to the authority.

Level 1 chapter 5A activities are defined in Schedule 5 of the *Environmental Protection Regulation 2008* (EP Reg) and those relevant to this Guideline are:

- a petroleum activity that is likely to have a significant impact on a **Category A or B environmentally sensitive area**;
- extending an existing pipeline by more than 150km under a petroleum authority;
- constructing a new pipeline of more than 150km under a petroleum authority;
- a petroleum activity carried out on a site containing a high hazard dam or a significant hazard dam (i.e. a **regulated dam**);
- a petroleum activity involving injection of waste fluid into a natural underground reservoir or aquifer; and
- a petroleum activity, that would otherwise be a chapter 4 activity for which an **aggregate environmental score** is stated in schedule 2 of the EP Reg.

Relationship between the EM Plan and the environmental authority

The EM Plan is a planning document that is 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.

Based on environmental protection commitments proposed in the EM Plan, DERM will prepare a draft environmental authority for the petroleum project in consultation with the applicant. When the environmental

authority is granted, it becomes the primary regulatory document for a level 1 petroleum activity that DERM uses to assess environmental compliance of the project.

DERM may impose conditions on the environmental authority it considers necessary or desirable. The conditions must include any condition the administering authority is required to impose under a regulatory requirement and, for chapter 5A activities carried out in a wild river area, the conditions stated for the relevant chapter 5A activities in the wild river declaration for the area.

Chapter 4 of the EP Reg prescribes the regulatory requirements with which the administering authority must comply when making environmental management decisions. Section 51 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 52 describes the conditions the administering authority must consider imposing. Chapter 4 Part 3 provides for additional regulatory requirements for particular environmental management decisions, for example, activities involving direct release of waste to groundwater (s63), or activities involving indirect release of contaminants to groundwater (s64).

Additionally, s309Z of the EP Act states that the administering authority may condition the environmental authority holder to do all or any of the following:

- install and operate stated plant or equipment in a stated way within a stated period;
- take stated measures to minimise the likelihood of environmental harm being caused;
- carry out and report on a stated monitoring program;
- prepare, and comply with, a transitional environmental program;
- give relevant information reasonably required by the administering authority for the administration or enforcement of the EP Act;
- carry out or report about stated rehabilitation or remediation work;
- prohibit the holder from changing, replacing or operating the plant or equipment installed at the relevant place for the environmental authority, if the change, replacement or operation increases, or is likely to substantially increase, the risk of environmental harm;
- make a provision that causes the environmental authority to cease to have effect; or
- impose an obligation on the environmental authority holder that continues to apply after the authority has ended or ceased to have effect.

A condition may be imposed, even if the applicant did not ask for it.

Single project authorities

A person may apply for an environmental authority for petroleum activities only if they are the holder of, or applicant for a relevant petroleum tenure. The person may only make a single application for a single environmental authority for all relevant activities that form the project. A project is defined as all petroleum activities being carried out, or proposed to be carried out, under one or more petroleum tenements in any combination, as a single integrated operation. The holder of an environmental authority can not apply for a separate environmental authority for an additional petroleum activity proposed to be carried out as part of the project (even if the additional activity is proposed to be carried out under another tenure as part of the project).

To expedite the process of preparing and negotiating the draft environmental authority for CSG projects, DERM has negotiated a set of model conditions for CSG projects with the industry peak body, the Australian Petroleum Production and Exploration Association (APPEA). The model conditions are not mandatory, but

provide a consistent basis for negotiation of any level 1 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.

Part 2: Structure of an EM Plan

Description of petroleum tenures/petroleum authorities

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; and
- 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 EP Act)).

Description of project activities

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

- the types of petroleum activities (e.g. wells, **dams**, pipelines [gas and water], **infrastructure** [e.g. workshop, office, storage sheds, roads], petroleum facilities and equipment, compressor stations, power and fuel supplies and any other activities which may cause environmental harm [e.g. **clearing** vegetation for a pipeline route]);
- scale, i.e. maximum areas of disturbance (ha or m²) or estimated number (e.g. number of wells) of each of the petroleum activities to be undertaken during the life of the project (including linking activities to which tenures they will be occurring on);
- description of exploration and production methods, hours of operation and annual production rates;
- the planned project life (in years) identifying construction, operation and rehabilitation phases;
- activities that would be chapter 4 activities for which an aggregate environmental score is stated (environmentally relevant activities in Schedule 2 of the EP Reg) if they were not environmentally relevant activities conducted under Chapter 5A (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); and
- notifiable activities (Schedule 3 of EP Act) carried out on the site (e.g. petroleum product or oil storage, landfill; disposing of waste, waste storage, treatment or disposal).

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**;
- 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 identification of **River Improvement Trust Asset Areas** or Wild Rivers);
- ground waters and aquifers;
- environmental values and assets identified in relevant Water Resource Plans (under the *Water Act 2000*) that may apply in the project area;
- annual and long term climatic conditions; and
- places/aspects potentially of interest to DERM or stakeholders such as places of heritage significance.

Identification of environmental values and potential impacts on environmental values from the activities

The EM Plan must identify the environmental values where the proposed petroleum activities will be undertaken and the potential impact the activities may have on those values. 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 airshed). Assessment of the beneficial or 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;
- indication of the level of uncertainty 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 to ascertain the extent of the impacts.

Environmental protection commitments

An environmental protection objective, control strategy and associated standards and measurable indicators are to be proposed for each identified environmental value. 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; and the standards are the levels, limits or targets that are to be used in auditing the performance of management and control strategies to demonstrate that they are achieving the objectives.

Appropriate control strategies, indicators and standards can be determined from existing legislation and 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.

The environmental protection commitments provided in the EM Plan must be capable of being easily translated into environmental authority conditions.

Supporting documentation

The EM plan must include as attachments, where appropriate:

- a copy of the current Operational Plan;
- a copy of the initial work program, later work program, initial development plan or later development plan as required under the P&G Act;
- 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 and plans; at least A3 in size, detailing to scale, relevant features described in Part 2 of this Guideline, and / or aerial photographs. Maps, plans 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.

Part 3: Content of an EM Plan

The following details the main sections that must be included in an EM Plan. Information provided henceforth is not exhaustive and provides information and issues to consider when determining environmental values, impacts, control strategies, objectives and commitments pertaining to a CSG project.

3.1 General section

Financial assurance

DERM requires a financial assurance to be lodged for all level 1 petroleum projects (s3100 EP Act). The financial assurance must be provided in the amount and form required by DERM at the time of submission of any original, later or amended EM Plan. This does not include any securities required under the relevant petroleum legislation. The proposed amount of financial assurance for level 1 petroleum projects must be calculated in accordance with DERM's guideline *Financial Assurance for Petroleum Activities*.

The financial assurance must include the cost of rehabilitating any disturbance to land undertaken as part of an activity on a petroleum authority that has been the subject of whole or partial surrender due to the grant of a new petroleum authority over that land which now forms part of the current project or a transfer application.

A granted environmental authority will not be released until the appropriate financial assurance has been received by DERM. The financial assurance will remain in force until DERM is satisfied that no claim on the assurance is likely. Subsequent to the first EM Plan submission for a new project, or amendment of a project, the financial assurance calculation must be recalculated and updated throughout the life of the project through the submission of an Operational Plan on a regular basis (e.g. three yearly).

3.2 Air section

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; and
- the qualities of the air environment that are conducive to protecting agricultural use of the environment.

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

Potential adverse or beneficial impacts of the project activities on the identified environmental values

Consideration should be given to any project activities that will produce air contaminants that are likely to cause nuisance (dust, odour, light); greenhouse gas emissions; and, point source air emissions (fuel burning or combustion equipment). Impacts of the petroleum project activities on air quality should be considered both in terms of localised air quality and on the regional air shed.

Provide a statement of the impact of the project activities on regional air quality values, as defined in the National Environment Protection Measure for Ambient Air Quality (NEPM Air). Provide information on any

potential impacts of the activities on air quality at sensitive or commercial places. Where the proposed project will result in the release of greenhouse gases, a statement on the assessment and proposed strategies for minimisation and management of these emissions must be provided.

Identify the sources of potentially significant point and fugitive releases of contaminants to air from the project activities and sensitive or commercial places that may be adversely affected by these contaminants. The locations of any existing and planned sources of contaminant emissions to air and sensitive places must be depicted on a map.

Where it is proposed to vent, or flare surplus gas or where fuel burning equipment is installed, provide details of contaminant concentrations and mass loads likely to be released to the atmosphere from all point sources. For each type of equipment used or to be installed, the applicant must supply the following details:

- type of contaminants to be released; and
- the ground level concentrations of contaminants calculated using an appropriate air dispersion model.

Proposed environmental protection commitments, objectives and control strategies

Consideration must be given to the air quality objectives in the *Environmental Protection (Air) Policy 2008*.

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. A description of the measures that will be taken to investigate and remedy or mitigate any reported nuisance (that is not frivolous or vexatious) must be stated. Include proposed control procedures that will be implemented to minimise dust, visible light at night and odour.

Greenhouse gas emissions

Provide estimates of the quantity and type of greenhouse gases that are likely to be released at various stages of the project. Describe the strategies that will be employed to minimise releases of greenhouse gases to the atmosphere, using best practice methods.

Point source air emissions

Provide details of any proposed pollution control equipment that will be required to meet air quality objectives. For fuel burning or combustion equipment describe for each; 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 DERM's *Air Quality Sampling Manual*.

3.3 Dams Section

Description of environmental values

The environmental values relevant to dams may include a combination of those environmental values described in the Water, Land or Waste section of this document.

Potential adverse or beneficial impacts of the project activities on the identified environmental values

The impacts of the petroleum project activities on the environmental values may include a combination of the impacts identified in the Water, Land or Waste section of this document.

Proposed environmental protection commitments, objectives and control strategies

The design, **construction**, operation, modification and decommissioning of dams must be undertaken in accordance with DERM's *Manual for Assessing Hazard Categories and **Hydraulic Performance** of Dams* and the accompanying Guideline *Dams in Environmentally Relevant Activities*. The manual and guideline must be referenced for the performance standards for **CSG water dams** and **brine dams** and the content requirements of the Register of regulated dams. The Register of regulated dams must be submitted with the EM Plan.

3.4 Land Section

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;
- bioregions and regional ecosystems present;
- flora; vegetation communities, endangered, vulnerable, rare or near threatened species, **pest** species;
- fauna; fauna present, including protected **animal breeding places** (as determined by survey if required), endangered, vulnerable, rare or near threatened species, pest species;
- Category A, B and C environmentally sensitive areas (ESAs); and
- areas with any other **high ecological significance values** (e.g. wetlands, nationally threatened ecological communities, large tracts of remnant vegetation, corridors, special biodiversity areas).

Potential adverse or beneficial impacts of the project activities on the identified environmental values

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.

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

- clearing **protected plants** and remnant vegetation;
- **tampering with an animal breeding place**;

- isolating, fragmenting, or dissecting tracts of vegetation resulting in a reduction in current ecosystem functioning or ecological connectivity;
- soil degradation, salinisation, contamination;
- effects of floodwater on project infrastructure; and
- spread of pests due to human, vehicle and machinery movement and disturbance of land in pest infestation areas.

Protected Plants

The NC Act protects native plants indigenous to Australia (protected plants) and regulates the clearing of individual protected plants. A clearing permit is required to clear protected plants unless an exemption applies under Part 4 Division 2 of the *Nature Conservation (Protected Plants) Conservation Plan 2000* (the conservation plan). In general, exemptions granted under the conservation plan will only apply to clearing least concern protected plant species. If one does not exist, an application can be made to DERM for an exemption from the requirement for clearing permits for least concern protected plants (s41 conservation plan). Exemptions will be subject to conditions. Clearing of endangered, vulnerable, rare or near threatened protected plants will require a clearing permit. Clearing permit applications received by DERM relating to endangered, vulnerable, rare and near threatened protected plant species will be assessed on a case by case basis. All approvals are subject to conditions, which may include **offset** conditions.

Protected Animals

The *Nature Conservation (Wildlife Management) Regulation 2006* (the Wildlife Regulation) contains regulations concerning the tampering of animal breeding places. Section 332 of the Wildlife Regulation states that a person must not, without a reasonable excuse, tamper with an animal breeding place that is being used by a protected animal to incubate or rear the animal's offspring.

Where tampering with an animal breeding place is proposed, provide information regarding the type of animal(s) and the number of animal(s) affected, including their conservation status (i.e. endangered, vulnerable, rare, near threatened) and any advice obtained from experts on the species behavioural ecology and population dynamics.

Where petroleum activities necessarily involve tampering with animal breeding places the tampering may be authorised by application to DERM for an approved species management program (SMP) or damage mitigation permit (DMP) under the Wildlife Regulation. It is a reasonable excuse for a person to tamper with an animal breeding place if the tampering happened in the course of a lawful activity that was not directed towards the tampering and the tampering could not have been reasonably avoided.

Proposed environmental protection commitments, objectives and control strategies

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 made to:

- strategies to avoid significant disturbance to land and clearing, and the **taking** of protected plants or animals, in particular, in areas identified with high ecological significance (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);
- use of offsets;
- soil management and erosion control;

- maintenance of natural flow paths on floodplains; and
- effective pest management programs that includes strategies to:
 - identify pest species and infestation areas;
 - prevent or minimise the introduction or spread of pests (through movement by humans, vehicles, machinery and soil and vegetation disturbance); and
 - control and manage pest infestations and outbreaks resulting from petroleum activities;

Biosecurity Queensland has published the *Petroleum Industry (including coal seam methane gas) Minimising Pest Spread Guidelines*, dated June 2008, which provides advice about preparing a pest management program.

If all cost-effective on-site mitigation measures (to avoid or minimise negative impacts of the petroleum project activities) are proposed and there is still a residual (adverse) impact on areas with high ecological significance (HES) values, an offset must be proposed to counterbalance the impacts of the activity. This may include works or activities to be undertaken on land on which a petroleum activity is carried out or on other land in the State. An offset could be a direct land based biodiversity offset or a monetary payment to an environmental offset trust.

The Queensland Government *Environmental Offsets Policy* and any relevant specific issue offset policies must be referenced when considering or proposing offsets.

3.5 Noise Section

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 EM Plan. 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 (7am to 6pm) evening (6pm to 10pm) and night (10pm to 7am) periods.

The location of noise emissions and sensitive places should 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.).

Potential adverse or beneficial impacts of the project activities on the identified environmental values

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.

Proposed environmental protection commitments, objectives and control strategies

Environmental protection commitments must be proposed that will protect:

- the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and
- the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following:
 - sleep;
 - study or learn;
 - be involved in recreation, including relaxation and conversation; and
 - the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

Consideration must be given to best-practice environmental management including noise mitigating technology, to control and prevent background creep, contain and minimise variable noise, and avoid sleep disturbance.

The *Environmental Protection (Noise) Policy 2008* (EPP Noise) describes a hierarchy for the management of noise. To the extent that it is reasonable to do so, noise must be dealt with in 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. noise abatement barriers or enclosures);
- 3) manage (e.g. using heavy machinery only during business hours).

The details of the proposed noise control and/or abatement measures must be provided together with the expected noise reduction.

Noise monitoring must be proposed including the following descriptor, characteristics and matters:

- $L_{AN,T}$ (where N equals the statistical levels of 1, 10 and 90 and T = 15 mins);
- background Noise $L_{A90,T}$;
- the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to statistical levels;
- atmospheric conditions including temperature, relative humidity and wind speed and directions;
- effects due to any extraneous factors such as traffic noise;
- location, date and time of monitoring;
- if the complaint concerns low frequency noise, Max $L_{pLIN,T}$; and
- if the complaint concerns low frequency noise, one third octave band measurements in dB(LIN) for centre frequencies in the 10 – 200 Hz range.

The method of measurement and reporting of noise levels should comply with the latest edition of the *Noise Measurement Manual* published by DERM or the most recent version of *AS1055 Acoustics – description and measurement of environmental noise*.

3.6 Social Section

Community

Description of environmental values

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). Identify the qualities or physical characteristics of the environment that are conducive to public amenity or safety. Identify the environmental values that are important to the community, as identified through submissions about the project, where they have been made.

Potential adverse or beneficial impacts of the project activities on the identified environmental values

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.

Proposed environmental protection commitments, objectives and control strategies

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; and
- notify DERM of any release of contaminants not in accordance with the environmental authority or where environmental harm, or the potential for environmental harm has occurred.

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; and
- local heritage registers of places of **cultural heritage significance** and/or heritage overlays or other lists of heritage places found in local planning schemes.

For EM Plans developed through the EIS process, any heritage places identified in heritage surveys undertaken as part of the EIS process should also be summarised.

Indigenous heritage values should be managed according to the requirements of the *Aboriginal Cultural Heritage Act 2003* or *Torres Strait Islander Cultural Heritage Act 2003* and do not need to be detailed in this EM Plan.

Potential adverse or beneficial impacts of the project activities on the identified environmental values

Investigate 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. Include solutions to the management of these impacts, which should be developed in consultation with DERM and/or the relevant local authority with regard to specific situations.

Proposed environmental protection commitments, objectives and control strategies

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 are 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 DERM be notified of the discovery of any thing 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 EM Plan 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 Section

Activities

Describe the proposed source, nature, composition, rate and the immediate or ultimate destination of wastes generated by the petroleum activities. The description of the activities involving the generation of waste should include separate detailed sections on **CSG water** and **brine** and solid salt residue resulting from water treatment or evaporation.

Description of environmental values

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

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

Potential adverse or beneficial impacts of the project activities on the identified environmental values

For the proposed petroleum activities describe:

- the types and amounts of the waste;
- 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 in other ways mentioned in the waste management hierarchy;
 - location of waste management storage or disposal facilities; and

- the location of any land that will become contaminated as a result of the storage or disposal of waste.
- potential contamination from storage and use of chemicals, corrosive substances, toxic substances, gases, dangerous goods and flammable and combustible liquids; and
- potential contamination from use of drilling muds and disposal of drilling waste.

Proposed environmental protection commitments, objectives and control strategies

The commitments are to be based on the waste management hierarchy and principles outlined in the *Environmental Protection (Waste Management) Policy 2000* (EPP Waste). 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;
- 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; and
 - disposal, reuse and recycling options.
- a disposal procedure for general and hazardous wastes (including specific reference to any onsite 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 the waste management systems; and
- identification of responsible staff and a staff awareness and induction program that encourages reuse and recycling.

Coal Seam Gas (CSG) Water

Coal Seam Gas Water Management Plan (CWMP)

A CSG Water Management Plan (CWMP) must be developed and incorporated in the EM Plan.

The CWMP must:

- provide an estimate of the volume of CSG water produced annually over the life of the project;
- describe the **characteristics** of CSG water produced;
- describe how and where CSG water will be produced, aggregated, stored and kept separate from other **waters** until it is used, treated, distributed or disposed of;

- describe how CSG water will be dealt with in accordance with the CSG water management hierarchy (see below) including a description of the estimated amount of CSG water that will be dealt with under the preferred water management options in category 1 and the water management options that are not preferred in category 2;
- where CSG water is proposed to be **treated**, describe:
 - the treatment process;
 - how and where the treated water will be stored and used; and
 - how and where the waste generated by the treatment process will be stored, used and/or disposed of;
- if any CSG water is proposed for direct disposal as waste, provide information sufficient to demonstrate that legislative, environmental, technological, economic, and social requirements have all been evaluated and taken into consideration in deciding that disposal as waste is the only feasible option;
- describe the detail of any pilot programs or trials for CSG water solutions, including
 - objectives of project;
 - quantity and quality of CSG water applied;
 - location/area;
 - duration of activity;
- describe the characteristics of any receiving environment;
- describe the **control measures** that will be implemented for each water management option (aggregation, storage, treatment, use, or disposal) to prevent or control the release of a contaminant or waste to the environment;
- describe the indicators or other criteria against which the performance of the CSG water management practices will be assessed;
- describe a monitoring program sufficient for the prediction and early detection of any detrimental impacts on the receiving environment from CSG water management practices;
- describe the procedures that will be adopted to regularly review the monitoring program and to report to management and DERM should unforeseen or non-compliant monitoring results be recorded;
- describe the procedures that will be implemented to prevent unauthorised environmental harm from unforeseen or non-compliant monitoring results;
- describe procedures for dealing with accidents, spills, failure of containment structures, and other incidents that may arise in the course of the CSG water management practices and result in the unexpected release of contaminants or waste to the environment; and
- describe the procedures to be used to identify and implement strategies that minimise the quantity of CSG water generated at the surface of the land, promote efficiency in the use of CSG water as a resource through direct use and treatment, improve the water management practices employed where non preferred management options are being used, and minimise the total area of land disturbed by CSG water dams.

CSG water management hierarchy

The EPP Waste establishes a hierarchy of waste management practices that provides guidance on the preferred methods for dealing with wastes. The waste management hierarchy is simplified for the purposes of CSG water management in this guideline into a hierarchy with two categories: the preferred water management

options in category 1 and the water management options that are not preferred in category 2. The water management options listed within each category are not in a hierarchical order. For CSG water management options involving beneficial use of the water, the project proponent will need to take advantage of a general approval of a resource for beneficial use, or apply for a specific approval of a resource for beneficial use. Refer to DERM's guideline *Approval of coal seam gas water for beneficial use*.

Category 1 – Preferred Management Options

Injection where detrimental impact is unlikely

This option involves injecting either treated CSG water, CSG water or brine into a natural underground reservoir, or aquifer, where the injection is unlikely to have a detrimental impact on the identified environmental values and water quality objectives of the waters in the target formation or surrounding environment. The applicant must demonstrate that the injection fluid has inconsequential reactivity with the target formation and native groundwater it will come into contact with.

The salinity of the CSG water or treated CSG water injected must not exceed the average salinity of the water in the target formation, within the **water quality impact zone**. The target formation must be a single geological unit that is isolated above and below by an aquitard or aquiclude within the hydraulic impact zone.

The salinity of brine may be higher than the salinity of the native groundwater in the target formation. However, the target formation for brine injection must:

- be a single geological unit that is not regionally consistent and extensive;
- be isolated above and below by an aquitard or aquicludes within the hydraulic impact zone; and
- not be an aquifer that does or could supply water for potable, agricultural, industrial and commercial purposes.

A key objective for the assessment of an injection proposal is to ascertain that there is no or minimal risk to the environment values and the groundwater resource associated with the aquifer or geological formation where fluid is proposed to be injected. Therefore the key component to include in an application for injection is to prepare a risk assessment providing details on potential hazards including their inherent risk, preventative measures and the residual risk.

Examples of criteria, controls and monitoring to prevent hazards are outlined in Chapter 5 of the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) Managed Aquifer Recharge*¹. An example of a risk assessment for hazards is outlined in Appendix 11 of the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) Managed Aquifer Recharge*.

Potential hazards include but are not limited to:

- impacts on water quality within the target formation and surrounding aquifers;
- impact on physical integrity of aquifer or geological formation due to reactions between source water, aquifer material and native groundwater;
- the potential for migration of injected fluid or native groundwater out of the target formation during the injection operations;
- over-pressurisation of target formation and its impact on surrounding aquifers;
- impacts on users or resources;

¹ Natural Resource Management Ministerial Council, Environment Protection and Heritage Council and the National Health and Medical Research Council, 2009, *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) Managed Aquifer Recharge*.

- impacts on other aquifers of environmental, economic or social importance; and
- impacts on groundwater-dependent ecosystems.

The risk assessment must be supported by necessary hydrogeological assessment that:

- identifies and characterises geometry of the target formation and associated recharge and discharge processes that may influence movement and storage of injection fluid;
- identifies any injection wells, all existing bores, springs, environmental assets and watercourses connected to groundwater, faults and other geologic features that occur within the water quality impact zone and the hydraulic impact zone;
- identifies the water quality impact zone and the **hydraulic impact zone in the target formation**;
- identifies the estimated volume and rates of water to be injected;
- assesses the effectiveness of aquitards and aquicludes for confining the injection fluid within the target formation;
- assesses the potential for migration of injection fluid or native groundwater out of the target formation through wells, bores, springs, connected watercourses, faults or other geologic features;
- where an injection trial has been undertaken, includes the Injection Trial Report;

The assessment must also include a monitoring plan providing details on the type of monitoring and how these relate to preventative measures for potential hazards identified in the risk assessment. Monitoring procedures are outlined in Chapter 7 of the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) Managed Aquifer Recharge*. The monitoring plan must include:

- establishment of baseline data;
- validation of assumptions, predicted impacts and effectiveness of preventative measures;
- operational monitoring to manage potential hazards; and
- verification to assess the performance of the injection activities and compliance.

Untreated Use

This option involves reusing the CSG water without first substantially changing its composition. Potential uses will depend on the composition of the water. CSG water aggregation dams will be required to hold CSG water prior to use. These must be designed to the minimum DERM design standards outlined in the *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams* and in accordance with the DERM guideline *Dams in environmentally relevant activities*.

Examples of uses include livestock watering, domestic uses, intensive animal feedlot operations, aquaculture, recreational uses, mining and extractive industry uses (e.g. coal mine wash plants), industrial uses (e.g. cooling tower water) or augmentation of water storage dams. The water must be of an appropriate quality for the proposed use and comply with the conditions of the environmental authority, the general approval of a resource for beneficial use, or a specific approval of a resource for beneficial use. This option may also involve the project proponent obtaining other authorisations for the extraction and use of the water. Where water is proposed to be used for augmentation of public water supplies it will need to comply with stringent water quality criteria and monitoring arrangements appropriate to the protection of public confidence in the water supply source.

If this option is chosen, the following information must be provided in the CWMP:

- a description and location of the proposed use;

- a description of the environmental values of the receiving environment;
- quantity and quality of the water to be used;
- the duration of the proposed use; and
- a detailed assessment of the environmental impacts and sustainability of the proposed use in the receiving environment.

Treatment and Use

This option includes treatment of CSG water through a process to remove or reduce contaminants to make the water suitable for a desired end use. Water treatment processes may include desalination (e.g. reverse osmosis, ion exchange, capacitive desalination or deionisation, electrodialysis reversal, freeze/thaw technology or distillation), chemical treatment, or any ancillary sterilisation or filtration. CSG water aggregation dams will be required to hold CSG water prior to treatment. Any regulated CSG water dam must be designed to DERM performance standards in the *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams* and in accordance with the DERM guideline *Dams in environmentally relevant activities*.

Examples of uses may include potable water for human or animal consumption, or irrigation water for agricultural purposes. This option will also necessarily include the storage of treated CSG water in dams after treatment and the storage and management of brine and solid salt residues. Depending on the quality of the treated CSG water, there may not be any specific design standards for dams containing treated CSG water. Brine dams must be designed to DERM performance standards in the *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams* and in accordance with the DERM guideline *Dams in environmentally relevant activities*.

The water must be treated so as to be of an appropriate quality for any proposed use and comply with the conditions of the environmental authority, the general approval of a resource for beneficial use, or a specific approval of a resource for beneficial use. This option may also involve the project proponent obtaining other authorisations for the extraction and use of the water.

If this option is chosen, the following information must be provided in the CWMP:

- a description of the design and location of any proposed treatment facilities;
- a description of the location and type of proposed use;
- a description of the environmental values of the receiving environment;
- a description of the waste management arrangements for the by-products of the treatment process;
- quantity and quality of the water to be used;
- the duration of the proposed use; and
- a detailed assessment of the environmental impacts and sustainability of the proposed use in the receiving environment.

Direct supply via pipeline to a water supply dam managed by a water service provider

This option involves the supply of water of a suitable quality (determined by the responsible entity for the water supply dam) via a pipeline to a water supply dam managed by a water service provider. If this option is chosen, proof of a contract for the supply of the water between the environmental authority holder and the responsible entity must be provided along with an indication of the amount and quality of water to be supplied.

Category 2 – Non-preferred Management Options***Disposal via evaporation dams***

Evaporation dams are no longer to be used as the primary method for disposal of CSG water. They may be used for the containment and evaporation of brine from water treatment processes. DERM prefers that CSG water be contained in dams designed to aggregate water (i.e. deep dams, with a small footprint) rather than dams designed to evaporate water (i.e. shallow dams, with a large surface area) and linked into the water treatment/use/disposal infrastructure for the petroleum project as soon as it is feasible to do so during the life of the project. However, in some circumstances, where an applicant can demonstrate that there is no feasible alternative for using, treating, storing or disposing of CSG water, evaporation dams may be authorised on application to DERM. To demonstrate that there is no feasible alternative requires consideration to be given to best practice environmental management and an evaluation of all potential options for managing CSG water with respect to economic, technological, social and legislative considerations.

At the end of the life of an evaporation dam, the brine must be evaporated to dryness and the solid salts must be removed from the dam for appropriate disposal to a regulated waste disposal facility designed for that purpose, or for further treatment, or for use as an input to another production process. Evaporation dams must be located with a sufficient buffer distance from the boundary of the relevant petroleum tenure to minimise the risk of any adverse impact on sensitive environments, land with high ecological value, agricultural lands and useful surface water and groundwater.

The following information must be provided in the CWMP for any proposal involving evaporation dams:

- characteristics of the surrounding landscape and vegetation, including physical and chemical properties of the soil and regolith, and of local and regional surface and ground waters;
- a design plan (certified fit for purpose as an **evaporation dam** and meeting the DERM performance standards for CSG water or brine dams in the *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*); and
- a plan that sets out procedures and criteria to be used for operating the evaporation dam, including maintenance, monitoring and decommissioning of the dam and, the management of the contents of the dam (brine, salt solids, liner materials and contaminated soil).

Disposal via injection where a detrimental impact is likely

This option involves injection of CSG water where the salinity of the CSG water injected either:

- exceeds the average salinity of the water in the target formation within the water quality impact zone; or
- where the injection of the CSG water is likely to have a detrimental impact on the identified environmental values and water quality objectives for the waters of the target formation or surrounding environment (e.g. the injection fluid is reactive with the target formation or the native groundwater); or
- the target formation is not a single geological unit that is isolated above and below by an aquitard or aquiclude within the hydraulic impact zone.

This option is not preferred because it is likely to result in the long term degradation of environmental values rather than their protection or enhancement. If this option is proposed, the same considerations and information must be provided as described in *Category 1 – Preferred Management Options: Injection where detrimental impact is unlikely* (refer page 18).

Disposal to surface waters

The disposal of any CSG water (treated or untreated) directly to surface waters (in particular temporary streams) is not a preferred water management option. The following information must be provided in the CWMP for any proposal to release untreated or treated CSG water to an aquatic environment:

- the location of any discharge points and the proposed method of discharge;
- the estimated volume, frequency and rates of water to be discharged;
- details of any treatment proposed for the CSG water prior to release;
- a description of the physical, chemical and biological components and their concentrations for both the CSG water and the aquatic environment proposed to receive the discharge and an analysis of the compatibility of the waters;
- how the discharge regime is going to ensure protection of the environmental values and compliance with the water quality objectives (WQO) for the aquatic environment proposed to receive the discharge as defined in accordance with the *EPP Water* and the *Queensland Water Quality Guidelines 2009*; and
- consideration of the cumulative impact of the discharge on any relevant state and federal agreements (e.g. no net increase to salinity in the Murray / Darling River) or natural resource management plans.

Any disposal to waters should be consistent with the requirements of s13 of the Environmental Protection (Water) Policy 2009 (EPP water) and current DERM policy for licensing water discharge to Queensland Waters.

The following hierarchy (in order of preference) will apply to the assessment of surface water discharges of CSG water:

Hierarchy	Release	Receiving environment	Regulatory Requirements
1	Direct release of CSG water to a dam that is not managed by a water service provider/responsible entity.	Dam that is not managed by a water service provider/responsible entity(defined in <i>Water supply (Safety & Reliability) Act 2008</i>)	Environmental values of the dam need to be considered and protected. These will include uses of the stored water,
2	Release close proximity e.g. <10km & upstream of dam or water reservoir	Dam or water reservoir, including upstream (significantly disturbed ecosystem)	Environmental values of the dam or water reservoir and the stream carrying the inflow need to be considered and protected. These will include uses of the stored water, a modified aquatic ecosystem and may include other uses such as recreation and fishing in the storage and any related to stream abstractions. Protecting the aquatic ecosystem values from flow impacts is not a key determining factor, this being balanced by the beneficial water reuse objective. <i>Water supply (Safety & Reliability) Act 2008</i> requirements may apply.

3	Release only during infrequent specified stream flow events	Temporary streams or perennial streams	<p>Specific flow release timing relative to in-stream flow.</p> <p>Discharge quality limits based on dilution (to achieve near-field guidelines/WQOs) where not met at point of discharge.</p> <p>Human use water quality objectives protected in downstream waters.</p>
4	Frequent or continual release	Perennial stream	<p>Undertake Risk Assessment. May also include:</p> <p>Demonstrated need for discharge given no feasible alternatives</p> <p>Aquatic ecosystem & end-use values assessed and may be key determining factors.</p> <p>Assessment and limits to achieve water quality objectives/guidelines in-stream.</p> <p>Water quality and hydrological modelling for concentration, load and flow assessment where appropriate.</p> <p>Determine zone of influence and identify refugia (permanent/semi-permanent water locations), flow changes, water storage/uses, groundwater downstream of the release</p> <p>Assess potential for erosion</p> <p>Water Resource Plan and risk categorisation where appropriate</p> <p>Consider release implications for Murray Darling Salinity Targets</p>
5	Frequent or continual release	Temporary stream	<p>Least favoured and will only be authorised in an exceptional situation.</p> <p>Requirements as above with more detailed assessment of flow impacts on the environment.</p>

Note: For more detailed information regarding release to surface waters see DERM's operational policy *Waste water discharge to Queensland waters*.

Disposal to land

The disposal of any CSG water (treated or untreated) directly to land will not be authorised except under certain circumstances and if it is approved for beneficial use (e.g. for dust suppression or irrigation). Any disposal to land will need to be authorised under a beneficial use approval (general or specific approval).

Beneficial use of CSG water for irrigation or dust suppression should only involve application rates that maximise productivity or conversely minimise a dust nuisance, rather than be used as a method to dispose of surplus water. The management practices applied to either of these uses must include:

- the way in which, or rate at which CSG water is released;
- protection of soil and native vegetation on relevant land from damage;
- the minimisation of deep drainage below the root zone of any vegetation (ensuring minimisation of infiltration to groundwater); and
- the prevention of runoff to any surface waters.

Brine and solid salt residue resulting from water treatment or evaporation

The following hierarchy must be used to determine the management strategies for brine and residual solid salts from water treatment and evaporation, in order of preference:

- 1) Injection of brine if the target formation is:
 - a single geological unit that is not regionally consistent and extensive;
 - isolated above and below by an aquitard or aquicludes within the hydraulic impact zone; and
 - not an aquifer that does or could supply water for potable, agricultural, industrial and commercial purposes; or
- 2) Waste reuse/recycling through chemically processing / treating brine or salt residues to create useable/ saleable products such as soda ash; then
- 3) Waste disposal through:
 - (i) disposal of brine to an ocean/estuarine environment; then
 - (ii) disposal of salt into an existing licensed regulated waste disposal facility; then
 - (iii) disposal of salt into a purpose built regulated waste disposal facility (landfill mono cell) on freehold land owned by the P&G tenure holder.

The EM Plan must include an analysis providing information sufficient to justify the management options chosen, and where higher management options in the hierarchy are not chosen, provide information sufficient to demonstrate they are not feasible because of, for example, environmental, technical, economic, legislative or social considerations. 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.

Injection

If this option is proposed, the same considerations and information must be provided as described in *Category 1 – Preferred Management Options: Injection where detrimental impact is unlikely* (refer page 18).

Injection of brine into target formations that are not hydraulically isolated from other aquifers by substantial and competent aquitards or that have the potential to supply water for potable, agricultural, industrial and commercial purposes, is not a management option that is supported by DERM.

Encapsulation

Encapsulation is only suitable for solid salt residues, not brine. Any encapsulation strategy proposed for disposal of solid salt residue must ensure, primarily, that a **landfill monocell** facility is used for the disposal and that the facility is designed and constructed by a **suitably qualified person** so that the salt content is contained within the facility for the **foreseeable future**. Consideration for the encapsulation of salt in a landfill monocell should include the following:

- the facility should not occur above the natural surface level of the surrounding land;
- the facility should be located such that there are no obvious below ground structures that are likely to bring water into contact with the exterior of the containment and have systems to prevent such contact;
- the facility should not be flat and shallow, but compact, to minimise the surface area of the containing structure;
- the facility should be located with a sufficient buffer distance from the boundary of the relevant petroleum tenure/freehold tenure to minimise the risk of any adverse impact on sensitive environments, land with high ecological value, agricultural lands and useful surface water and groundwater; and
- the facility should be designed and located so that it is protected from any potential adverse consequences of regional or local flooding to the probable maximum flood level.

The landfill mono cell will be regarded as contaminated land and will be listed on the contaminated land register. Appropriate site investigations will be required to determine if remediation in accordance with a site management plan will be required before a relevant resource authority can be surrendered.

3.8 Water section

Description of environmental values

The environmental values relevant to the water environment may 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:
 - 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—

- (i) agricultural use; or
- (ii) aquacultural use; or
- (iii) producing aquatic foods for human consumption;
- for waters that may be used for recreation or aesthetic purposes, the suitability of the water for—
 - (i) primary recreational use; or
 - (ii) 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.

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

- a description of surface waters (watercourses, wetlands and springs) and ground waters 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. Groundwater quality must be identified as well as any changes that will occur as a result of the activity;
- 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 compilation of water users in the project area that may be affected by activities; and
- 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.

Potential adverse or beneficial impacts of the project activities on the identified environmental values

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

- 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;
- extent of spatial and temporal impacts on groundwater aquifers in terms of drawdown, water quality and physical integrity of aquifers;
- 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);
- the identification of downstream uses/users of affected waters;
- identification of impacts on existing groundwater users in the affected areas;
- identification of impacts on groundwater dependent ecosystems; and
- consideration of the cumulative effects of other industries discharging into the same waterways or extracting from the same aquifers.

Proposed environmental protection commitments, objectives and control strategies

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;
- 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%; and
- an effective monitoring program.

Groundwater

As part of the environmental protection commitments to manage identified impacts on the quality and quantity of groundwater resources, the EM Plan must propose a strategy to minimise and mitigate these impacts. It is recognised that minimisation and mitigation of impacts (make good) resulting from extraction of groundwater on the environment (such as springs), on water levels in aquifers and on existing entitlement holders will be under a legislation other than the EP Act and there will be separate reporting and approval requirement for these arrangements. The requirements of other legislation do not need to be duplicated in the EM Plan, 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 under the EM Plan 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 and quantity of groundwater resources.

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

- identify a network of locations, formations and parameters to be monitored and the frequency of measurements;
- be able to detect any significant risks and changes to groundwater quality due to petroleum activities being undertaken, including any seepage or leakage from a regulated dam or waste disposal facility; and

- identify how the program will integrate with other groundwater monitoring activities or programs.

Sewage Treatment and Disposal

Provide details of any proposed sewage treatment or disposal systems including:

- a description of the system:
 - its capacity in equivalent persons;
 - proposed plant specification and performance;
 - proposed operational parameters; and
- the systems operation, maintenance, and management arrangements;
- the proposed method of disposal for treated effluent and biosolids; and
- details of a monitoring program to assure the performance of the system.

Due regard to the following documents should be taken when installing, operating and maintaining sewage treatment works and disposal systems:

- *DERM On-Site Sewage Code*
- *DERM On-Site Sewage facilities: Guidelines for Vertical and Horizontal Separation Distance*
- *Standards Australia AS/NZS 1547:2000 On-Site domestic Wastewater Management*
- *National Water Quality Guidelines: Use of Reclaimed Water*
- *Queensland Water Recycling Guidelines*.

Wild Rivers

Where petroleum activities are going to be carried out in a Wild River Area the EM Plan must include a commitment that the project activities will comply with the conditions stated in the **Wild River declaration** for the area.

Watercourses, wetlands and springs

All attempts must be made to avoid undertaking petroleum activities, in or within, close proximity to watercourses, wetlands or springs. Where there is no reasonable or practical alternative, pipelines, roads and seismic surveys may need to intersect with a watercourse, wetland or spring. The EM Plan must provide detail 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 disturbance, that sediment control measures are used and water turbidity and/or contamination is minimised. DERM's guideline *Activities in a watercourse, lake or spring associated with mining operations*, dated April 2008, provides advice about planning activities and impact management during activities in watercourses, lakes or springs.

3.9 Rehabilitation Program

The EM Plan must discuss decommissioning of above and below ground infrastructure and the rehabilitation of the associated disturbed areas under each relevant resource authority.

Over the entire disturbed area within a project there may be more than one 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 objective, e.g. native ecosystem, there may be different sub-categories of rehabilitation objectives and completion criteria depending on the diversity of ecosystem types present within

the project area. Where there is a complex network of final land use objectives for rehabilitation a map must be provided depicting the different relevant areas and final rehabilitation goals.

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; and
- the conservation, ecological and heritage values of the area.

Section 560 of the P&G Act obliges the petroleum authority holder to remove equipment or improvements from land on relinquishment (other than a petroleum well, pipeline, water observation bore or water supply bore) unless the owner of the land otherwise agrees. **Permanent infrastructure** such as roads, tracks or dams, which are to be left for the landowner/holder, requires a written agreement to be submitted with the final rehabilitation report.

The rehabilitation goals should include creating a final land form that is safe, non-polluting, **stable** and self-sustaining. The rehabilitation objectives, indicators and completion criteria for each type of land disturbance and disturbed area are to be described and will differ depending on the petroleum activity feature being rehabilitated. These will need to be agreed between the environmental authority holder and DERM and should be based on best practice environmental management and consider the local landholders and wider community. The rehabilitation objectives, indicators and completion criteria can be amended at any time by application for an amendment of the environmental authority and submission of a report to DERM substantiating the reasons for the proposed amendment. Continuous improvement of the rehabilitation objectives and completion 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.

Where the applicant has not finalised all details regarding rehabilitation objectives, indicators and completion criteria for different types of disturbances and final land uses, DERM will include as a minimum:

- remediation of contaminated land;
- the requirement for rehabilitation to be undertaken to an agreed final land use (e.g. reshaped to a stable landform similar to that of surrounding undisturbed areas with a self-sustaining vegetation cover); and
- a commitment that all reasonable and practicable measures are taken to re-establish drainage lines, reinstate the **top layer** of the soil profile, control erosion and pests, and promote, establish and maintain healthy and suitable vegetation growth.

In these situations, a commitment requiring the submission of a report detailing more information about the proposed rehabilitation objectives, indicators and completion criteria at an agreed later date may be required. This may need to be accompanied by an amendment application for the project environmental authority.

The proposed rehabilitation goals, objectives, indicators and completion criteria could be shown in tabular format as shown below:

Petroleum activity feature	Relevant resource authority	Rehabilitation Goal	Rehabilitation objectives	Indicators	Completion criteria
Pipeline corridors	Tenure number	1. Safe	(a) Site safe for humans and animals	(a) landform re-established	(a) no subsidence or major erosion gullies
		2. Non-polluting	(a) Sediment and erosion control structures in place (b) Storm water runoff does not pollute nearby watercourses	(a) sediment traps and design of erosion control measures (b) Surface water monitoring	(a) Certification from suitably qualified and experience person and performance of control structures (b) Monitoring meeting release limits
		3. Stable	(a) Minimise erosion	(a) re-establish surface drainage lines (b) Vegetation cover	(a) no subsidence or areas of major erosion for at least x years (b) x% foliage cover recorded over a period of x years
		4. Self-sustaining	(a) Describe post activity land use or land suitability or land capability	(a) Species diversity (b) Presence of key species	(a) Certification that x% species diversity achieved and maintained for x years (b) Certification that key species present over a period of x years

Note: the contents of this table are for example purposes only. The only part of the table that must be replicated exactly are the heading contents in the first row and the rehabilitation goals of safe, non-polluting, stable and self-sustaining, which should be re-described for every petroleum activity feature.

The rehabilitation objectives, indicators and completion criteria must be described for all major petroleum activities that have caused a significant disturbance to land, including, but not limited to: dams, well sites, seismic survey lines, pipeline corridors, roads, associated infrastructure, production facilities, water treatment facilities and waste disposal facilities (in particular landfill monocells for salt).

Part 4: Definitions

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

affected persons, for an activity means a person affected, or who may be affected by the release of a contaminant or waste from carrying out the activity.

aggregate environmental score is 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.

aggregation dam means 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.

animal breeding place, 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.

archaeological artefact means

- 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 *Aboriginal Cultural Heritage Act 2003* or Torres Strait Islander cultural heritage under the *Torres Strait Islander Cultural Heritage Act 2003*.

archaeological place means a place entered in the Queensland heritage register under Part 5 of the *Queensland Heritage Act 1992*.

assessed or **assess** by a suitably qualified and experienced person in relation to a hazard assessment of a dam, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time:

- exactly what has been assessed and the precise nature of that assessment;
- the relevant legislative, regulatory and technical criteria on which the assessment has been based;
- the relevant data and facts on which the assessment has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and
- the reasoning on which the assessment has been based using the relevant data and facts, and the relevant criteria.

associated works in relation to a dam means:

- operations of any kind and all things constructed, erected or installed for that dam; and
- any land used for those operations.

background noise level means the sound pressure level, measured in the absence of the noise under investigation, as the $L_{A90,T}$ being the A-weighted sound pressure level exceeded for 90 percent of the measurement time period T of not less than 15 minutes, using Fast Response.

bed and banks for a watercourse or wetland 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; but does not include land adjoining or adjacent to the bed or banks that is from time to time covered by floodwater.

brine means saline water with a total dissolved solid concentration greater than 40 000mg/l.

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

Category A Environmentally Sensitive Area (s25 EP Reg)

- any of the following under the NC Act:
 - (i) a national park (scientific);
 - (ii) a national park;
 - (iii) a national park (Aboriginal land);
 - (iv) a national park (Torres Strait Islander land);
 - (v) a national park (Cape York Peninsula Aboriginal land);
 - (vi) a national park (recovery);
 - (vii) a conservation park;
 - (viii) a forest reserve;
- the wet tropics area under the *Wet Tropics World Heritage Protection and Management Act 1993*;
- the Great Barrier Reef Region under the *Great Barrier Reef Marine Park Act 1975* (Cwlth);
- a marine park under the *Marine Parks Act 2004*, other than a part of the park that is a general use zone under that Act.

Category B Environmentally Sensitive Area (s26 EP Reg)

- any of the following areas under the NC Act:
 - (i) a coordinated conservation area;
 - (ii) a wilderness area;
 - (iii) a World Heritage management area;
 - (iv) an international agreement area;
 - (v) an area of critical habitat or major interest identified under a conservation plan;
 - (vi) an area subject to an interim conservation order;
- an area subject to the following conventions to which Australia is a signatory:
 - (i) the 'Convention on the Conservation of Migratory Species of Wild Animals' (Bonn, 23 June 1979);
 - (ii) the 'Convention on Wetlands of International Importance, especially as Waterfowl Habitat' (Ramsar, Iran, 2 February 1971);
 - (iii) the 'Convention Concerning the Protection of the World Cultural and Natural Heritage' (Paris, 23 November 1972);
- a zone of a marine park under the *Marine Parks Act 2004*;
- an area to the seaward side of the highest astronomical tide;

- the following under the *Queensland Heritage Act 1992*;
 - (i) a place of cultural heritage significance;
 - (ii) a registered place;
- an area recorded in the Aboriginal Cultural Heritage Register established under the *Aboriginal Cultural Heritage Act 2003*, section 46, other than the area known as the 'Stanbroke Pastoral Development Holding', leased under the Land Act 1994 by lease number PH 13/5398;
- a feature protection area, State forest park or scientific area under the *Forestry Act 1959*;
- a declared fish habitat area under the *Fisheries Act 1994*;
- a place in which a marine plant under the *Fisheries Act 1994* is situated;
- an endangered regional ecosystem identified in the database known as the 'Regional ecosystem description database' kept by DERM.

Category C Environmentally Sensitive Area means any of the following areas:

- Nature Refuges as defined under the *Nature Conservation Act 1992*;
- Koala Habitat Areas as defined under the *Nature Conservation Act 1992*;
- State Forests or Timber Reserves as defined under the *Forestry Act 1959*;
- Declared catchment areas under the *Water Act 2000*;
- Resources reserves under the *Nature Conservation Act 1992*;
- an area identified as 'essential habitat', defined under the *Vegetation Management Act 1999*, for a species of wildlife listed as endangered, vulnerable, rare or near threatened under the *Nature Conservation Act 1992*;
- any wetland shown on the Map of Referable Wetlands available from DERM's website; or
- "Of concern" regional ecosystems identified in the database maintained by DERM called 'Regional ecosystem description database' containing regional ecosystem numbers and descriptions.

certification or **certified** by a suitably qualified and experienced person in relation to a **design plan** or an annual report regarding dams, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time:

- exactly what is being certified and the precise nature of that certification;
- the relevant legislative, regulatory and technical criteria on which the certification has been based;
- the relevant data and facts on which the certification has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and
- the reasoning on which the certification has been based using the relevant data and facts, and the relevant criteria.

characteristic

- of a contaminant, material or waste, means any of the following:
 - (i) the physical and chemical properties and reactivity of the contaminant, material or waste;
 - (ii) the biological, carcinogenic, mutagenic or toxic properties of the contaminant, material or waste;

(iii) the variation of the concentration, emission rate or flux over time, of the contaminant, material or waste; or

- of the receiving environment, means any of the following:
 - (i) the physical, chemical, ecological or biological properties of the receiving environment;
 - (ii) the variability of the receiving environment (e.g. whether a watercourse is tidal or subject to periodic flooding or drought).

clearing means:

- in relation to grass, scrub or bush; the removal of vegetation by disturbing root systems and exposing underlying soil (including burning), but does not include:
 - the flattening or compaction of vegetation by vehicles if the vegetation remains living; or
 - the slashing or mowing of vegetation to facilitate access tracks; or
 - the clearing of noxious or introduced plant species; and
- in relation to trees; cutting down, ringbarking, pushing over, poisoning or destroying in any way.

commercial place means 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 employees accommodation or public roads.

construction in relation to a dam includes building a new dam and modifying or lifting an existing dam.

control measure means 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.

cultural heritage significance means aesthetic, architectural, historical, scientific, social, or other significance, to the present generation or past or future generations, as assessed against the following criteria:

- 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 means 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 EP Act.

CSG water dams include any type of dam used to contain groundwater that is necessarily or unavoidably brought to the surface in the process of coal seam gas exploration or production.

dam means a land-based structure or a **void** that is designed to contain, divert or control **flowable substances**, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and **associated works**. A dam does *not* mean a fabricated or manufactured tank or container, designed and constructed to an Australian Standard that deals with strength and structural integrity of that tank or container.

design plan is the documentation required to describe the physical dimensions of the dam, the materials and standards to be used for construction of the dam, and the criteria to be used for operating the dam. The documents must include design and investigation reports, specifications and certifications, together with the planned decommissioning and rehabilitation works and outcomes. A design plan may include 'as constructed' drawings.

evaporation dam means 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 evaporation.

financial assurance 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.

flowable substance means matter or a mixture of materials which can flow under any conditions potentially affecting that substance. Constituents of a flowable substance can include water, other liquids fluids or solids, or a mixture that includes water and any other liquids fluids or solids either in solution or suspension.

foreseeable future is 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 150 year foreseeable future with an acceptably low probability of failure before that time.

hazard in relation to a dam as defined, means the potential for environmental harm resulting from the collapse or failure of the dam to perform its primary purpose of containing, diverting or controlling **flowable substances**.

hazard category means 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 of Dams* published by DERM.

heritage place means 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 include 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 *Environment Protection and Biodiversity Conservation Act 1999*), 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).

hydraulic impact zone means as defined in Chapter 7.3 of the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) Managed Aquifer Recharge*.

hydraulic performance means 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* published by DERM.

infrastructure means dams, roads and tracks, equipment, buildings and other structures built for the purpose and duration of the conduct of the petroleum activities, but does not include other facilities required for the long term management of the impact of those 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.

landfill monocell means an isolated unit for disposal and containment of one specific waste type designed and constructed to provide a high standard of protection from potential contamination from the specific waste type to the surrounding environment for the foreseeable future.

monitoring, in relation to monitoring the impact of an activity on the receiving environment, includes analysing, assessing, examining, inspecting, measuring, modelling or reporting any of the following:

- 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.

offset is an action taken to counter-balance any unavoidable negative environmental impacts that might result from an activity.

perennial stream or perennial river is a stream or river that has continuous flow in parts of its bed all year round.

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 landowner.

pest means a species:

- declared under the *Land Protection (Pest and Stock route Management) Act 2002*;
- declared under Local Government model local laws; and
- which may become invasive in the future.

protected plants means native plants that are prescribed under the NC Act as 'extinct in the wild', 'endangered', 'vulnerable', 'rare', 'near threatened' or 'least concern' plants.

regulated dam means any dam in the significant or high hazard category as assessed using the *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams* published by DERM.

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, includes:

- to deposit, discharge, emit or disturb the contaminant; and
- to cause or allow the contaminant to be deposited, discharged, emitted or disturbed; and
- to allow the contaminant to escape; and
- to fail to prevent the contaminant from escaping.

River Improvement Trust Asset Area means an area within a River Improvement Area declared under the *River Improvement Trust Act 1940* 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

- 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.

significantly disturbed land or **significant disturbance to land** means land that is

- contaminated land; or
- disturbed and human intervention is needed to rehabilitate it:
 - to a state required under this guideline; or
 - if the guideline does not require the land to be rehabilitated to a particular state – to its state immediately before the disturbance.

Examples of a significant disturbance to land:

- areas where soil has been compacted, removed, covered, exposed or stockpiled;
- areas where vegetation has been removed or destroyed to an extent where the land has been made susceptible to erosion;
- areas where land use suitability or capability has been diminished;
- areas within a watercourse, wetland, or spring where petroleum activities have occurred causing the loss of habitat or a decline in ecological processes and requiring human intervention to restore or stabilise the disturbed area and/or protect the quality of the water downstream of the disturbance;
- areas submerged by waste or water ;
- areas under temporary infrastructure. Temporary infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be removed after petroleum activities have ceased; or
- areas where land has become contaminated land and a suitability statement has not been issued.

However, for the purpose of this guideline the following areas are not significantly disturbed:

- areas off the relevant resource authority (e.g. roads or tracks which provide access to the relevant resource authority);
- areas previously significantly disturbed which have been rehabilitated to DERM's satisfaction;
- areas under permanent infrastructure (e.g. roads, bridges, buildings) as agreed by DERM and the landholder;
- areas that were significantly disturbed prior to the grant of the relevant resource authority, unless those areas are re-disturbed whilst undertaking petroleum activities or are conducted on a relevant resource authority that was replaced (through conditional surrender) with another type of relevant resource authority and the rehabilitation liability has been transferred to the new resource authority.

spring means 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, 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 means a place entered in the Queensland heritage register under Part 4 of the *Queensland Heritage Act 1992*.

suitably qualified person means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.

take in relation to an animal as

- hunt, shoot, wound, kill, skin, poison, net, snare, spear, trap, catch, dredge for, bring ashore or aboard a boat, pursue, lure, injure or harm the animal; or
- attempt to do any these acts.

take in relation to a plant means to gather, pluck, cut, pull up, destroy, dig up, fell, remove or injure the plant or any part of the plant or attempt to do any of these acts.

tampering with an animal breeding place, means damage, destroy, mark, move or dig up the breeding place.

temporary streams are streams that do not flow continuously all year round. They include ephemeral streams, which only flow after significant rainfall, as well as intermittent streams, which only stop flowing during extended dry periods. Temporary streams go through a series of hydrological stages, from a wetting stage following rain (including the first flush), through a recessional stage, to a pooled stage or completely dry stage.

threatening processes are 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.

tolerable limits means 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 layer means the surface 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.

treated CSG water means CSG water that has undergone a process to remove or reduce contaminants to make the water suitable for a desired end use.

void means any man-made, open excavation in the ground (includes borrow pits, drill sumps, frac pits, flare pits, cavitation pits and trenches).

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.

water quality impact zone means as defined Chapter 7.3 of the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) Managed Aquifer Recharge*.

watercourse is a creek, river or stream

- in which water flows intermittently or permanently in a visibly defined channel, whether artificial, artificially improved or natural; and
- that has evidence of biological dependence on any water that flows in the creek, river or stream or on the **bed or banks**.

wetland means an area shown as a wetland on a 'Map of referable wetlands', a document approved by the chief executive (environment). A map of referable wetlands can be viewed at www.derm.qld.gov.au .

wild river declaration is a statutory instrument under the *Wild Rivers Act 2005*. 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:

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

Approved by

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