



Government of **Western Australia**  
Department of **Water**

# Western Australian water in mining guideline



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*Looking after all our water needs*

Department of Water  
Water licensing delivery series  
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# Summary

## What is this about?

This guideline sets out how to meet the Department of Water's regulatory requirements for mining projects. In particular, it draws on the *Rights in Water and Irrigation Act 1914*, policies, water allocation plans and regional experience in water management issues. The department is also responsible for implementing other water management legislation, including the *Country Areas Water Supply Act 1947*, the *Water Agencies Powers Act 1984* and the *Metropolitan Water Supply, Sewerage and Drainage Act 1909*, and has responsibility for providing advice to other agencies through the state's land-use planning processes.

The guideline provides advice on water management issues that need to be considered in mine planning and the type of information the department may require as part of the licence assessment process. While this guideline focuses mostly on groundwater licence applications, most of its processes are also applicable to applications for surface water licences.

This guideline has been developed to improve knowledge on regulatory processes across the state government agencies, relating to water in mining proposals. A key objective of this guideline is to provide guidance on the nature of issues that may need to be addressed through an assessment process, and assist mining companies with the regulatory process.

## What regions and projects is this guideline applicable to?

This guideline applies to mining projects across Western Australia that are undertaken in accordance with the *Mining Act 1978*. It is not intended to cover petroleum or geothermal activities.

It is primarily applicable to new projects, but can also be used to guide licence applications for project expansions and mine upgrades. The department may use the guideline to improve water management at selected sites, when renewing licences or at other selected times.

Licence applicants should note that where an allocation plan is in place, local water management requirements may apply. Where the potential impact on groundwater resources is considered to be minor, some of the requirements set out in this guideline may not be necessary.

Proponents should contact the relevant Department of Water regional office where the mining project will be located, for specific local requirements. Such requirements may vary across the regions, depending on the complexity of issues to be addressed, in particular during the preliminary consultation stages.

## Why are we doing this?

Mining projects can have significant impact on groundwater and surface water resources, and their associated values. Mine operators and developers have asked for clear guidance from Department of Water, the water regulator, to deal with the complexities of water management and the approvals process.

This guideline sets out a flexible process, whereby proponents and the department work together to define what the key issues are, and what information is required for the licence assessment process. The approval requirements for a particular project will vary depending on the local water regime, the scale and details of the proposed mining operation, and the level of demand or potential for impact on water resources. Where the impact on water resources is considered to be minor, for example, where saline groundwater use is in low demand, some of the requirements in this guideline will not be necessary.

The process outlined in this guideline supports the assessment and granting of instruments under the *Rights in Water and Irrigation Act 1914*, specifically:

- section 26D licences to construct and alter a well (26D licence)
- section 5C licences to take water and manage its use (5C licence)
- section 11/17/21A permits to interfere with bed and banks (bed and banks permit)

Refer to the department's website [www.water.wa.gov.au](http://www.water.wa.gov.au) for information on the circumstances where licensing and permitting may apply, and proclaimed groundwater and surface water areas in the state.

## What is leading-practice water management?

Leading-practice water management is simply the best way of managing water and any associated issues at a given site. It is as much about a company's approach to managing its water resources, as it is about a fixed set of practices or a particular technology.

Leading practice involves developing clear water management objectives for a site, strategies to achieve those objectives, and the set-up of an adaptive management framework that allows the proponent to assess and, where necessary, adjust site management.

Many mining companies currently demonstrate leading practice management. As new challenges emerge, it is critical that companies are flexible and innovative in developing water efficient solutions to match their site-specific requirements.

This guide does not provide a comprehensive coverage of leading practice across all aspects of water management on mines. For these details, refer to the Australian government Department of Resources, Energy and Tourism guidelines for *Leading practice sustainable development program for the mining industry – Water management* (2008).



## How does this guideline relate to other legislation and policy?

The *Rights in Water and Irrigation Act 1914* governs the regulation and rights associated with water resources in Western Australia. Licences and permits are regulatory instruments which define how much water can be taken and specify required management conditions. Policies and water allocation plans provide further guidance on specific licensing requirements and, where relevant, are identified through this document. Refer to the Department of Water website for full details of publications.

The department recognises proponents of mining projects may require approval from a number of government agencies. To reduce duplication, it aligned this guideline with approval processes administered by the Environmental Protection Authority (EPA), Department of Environment and Conservation (DEC) and Department of Mines and Petroleum (DMP). The guideline has also been aligned with the Lead Agency Framework, which is administered by DMP for mining-related projects. It is generally expected that mining proposals go through the EPA assessment process. This guideline also links with the *Administrative agreement between the Department of Mines and Petroleum and Department of Water: For mineral exploration and mining operations in water resource areas of Western Australia* (Department of Water and Department of Mines and Petroleum 2012).

In cases where a licence to take water is not required, the department will provide advice to the EPA, DEC and DMP, in response to a statutory referral. Where relevant, other agencies will place conditions on their regulatory instruments in regard to water resource management, as recommended by Department of Water.

## Is this guideline consistent with the National Water Initiative?

The overall objective of the National Water Initiative is to achieve a nationally compatible system for managing water resources and use – a planning-, regulatory- and market-based approach that aims to optimise economic, social and environmental outcomes.

The National Water Commission (2010) released a mining position statement in May 2010 outlining its priorities for water reform in the mining industry, which included adopting a standard water accounting framework to allow consistent reporting. Although the commission's preference was for mining to be included in broader water markets and water planning processes, such as water trading and allocation plans, it recognised that, in some circumstances, inclusion of mining was not always applicable. This is due to the nature of aquifers in many mineral provinces (for example, those with heterogeneous fractured rock aquifers), the isolation of mining projects or the lack of competition for water resources. These circumstances are particularly applicable to the large mineral provinces of Western Australia.

This guideline is therefore a key part of the Department of Water response to planning for mining projects, in that it provides for a consistent and transparent framework for assessing mine water requirements and management across the state. It also provides for statutory-based planning through its links with water licensing.

## How did the Department of Water develop this guideline?

This guideline has been adapted from the *Pilbara water in mining guideline* (Department of Water 2009d), a widely accepted document which had undergone a consultation process with regional stakeholders.

The Department of Water worked with the mining industry to develop the original Pilbara guideline and ensure its usability. The Pilbara guideline has been successfully used by industry and regulators for three years from 2009 to 2012. This document has only had minor changes to allow it to be applicable state-wide and, therefore, only targeted further consultation was conducted.

There is general industry support for this guideline and the approach presented, and the department's efforts to provide a clear and consistent approach to water-related approvals, taking into account the interaction with other decision-making agencies and approval processes.

This guideline builds on and will replace the Pilbara guideline by including a mine closure and decommissioning stage, and updated guidance and policy. The guideline has been developed with advice from a range of stakeholders. It ensures an efficient pathway through the licence assessment process and aligns the licence assessment with other assessment processes, such as those established under the *Environmental Protection Act 1986*.

# 1 Objectives for the guideline

Department of Water is seeking to achieve the following objectives, outlined below, through the implementation of this guideline.

## 1.1 Guideline objectives

- Provide clear guidance to proponents of the department's *Rights in Water and Irrigation Act 1914* approval process.
- Provide a streamlined whole-of-government approach to the approvals process.
- Develop a consultative and cooperative relationship between regulator and proponents.
- Facilitate early identification of water management issues and clearly outline information requirements for assessment.
- Clearly define water management objectives, and do so early on.
- Facilitate development of an adaptive management framework that meets water management and regulatory requirements.
- Emphasise the life-of-mine approach to water management.

## 1.2 Mine water management objectives

The department's objectives for mine water management are to:

- ensure all possible water sources are considered when planning water supply for mining operations
- ensure that fit-for-purpose water is used wherever possible and high-quality water is used only in situations where it is essential or no other suitable water source is available, and with the fewest adverse effects
- maximise water-use efficiency at all mine sites, particularly water-deficient sites, to reduce the need for water to be abstracted from the environment
- optimise the use of mine dewatering surplus, either on site or off site, to maximise efficiency and reduce adverse effects of releases to the environment
- minimise the adverse effects of the abstraction and release of water on environmental, social and cultural values
- ensure mining activity does not adversely affect the quality and quantity of public-and-private drinking water supplies
- adopt a consistent approach for reporting of water use, which links to the national water accounting framework and enables sharing of water information
- ensure the cumulative effects of mining operations are considered and managed

- distinguish between mining activities that relate to consumptive uses (e.g. ore processing) or non-consumptive purposes (e.g. dewatering and surplus water disposal requirements)
- ensure water management planning includes consideration of mine voids after mining operations cease
- use a monitoring and evaluation process, to adaptively manage the effects of abstractions and releases on the water resources
- maximise cooperation in water management activities between nearby water users, to reduce impacts on the environment
- develop and maintain positive relationships between stakeholders so they share the information needed to properly manage water resources
- plan for, and manage, the effects of climate variability and change.

## 2 The guideline

This guideline is structured as a six-stage process to match the mine life cycle. The stages are:

- A preliminary consultation
- B scoping the water management task
- C water licence application and Environmental Protection Authority assessment
- D development of an operating strategy and final licence decision
- E construction, operation and closure planning
- F final closure and decommissioning

The guideline provides policy principles relevant to the mining industry and detailed information for each stage of the process, to be considered when applying for a water licence for the mining project. These are provided in sections 2 and 3.

Policies are developed by Department of Water to ensure that available water is allocated and used consistently and in accordance with the *Rights in Water and Irrigation Act 1914*. Policies provide a structure for assessing licence applications and setting conditions. The department has publicly available policies regarding the preparation of hydrogeological reports and operating strategies, and the timely submission of required information.

The department has aligned this guideline with the requirements and approval processes of other government agencies, including the EPA, DEC and DMP, where relevant.

There is no set timeframe for proceeding through the assessment and approval processes. Stage A to C assessment and approval processes are mainly driven by EPA requirements, as other decision-making agencies are constrained from making decisions that implement the mining proposal, until the EPA has made a decision.

The Department of Water makes a decision on the operating strategy and 5C licence at stage D, and the nominal timeframe for this stage is usually within 90 days. Complex projects may take longer. Timeframes vary based on many factors, ranging from the complexity of issues to be addressed, the level of understanding of the water resources and water-dependent ecosystems, the potential need to undertake pre-development baseline monitoring, and the timely provision of required information by the proponent.

The six-stage process defined in this guideline is represented and summarised in Figure 1. The figure displays inputs and outputs, and includes the role of the department during each stage of the process.

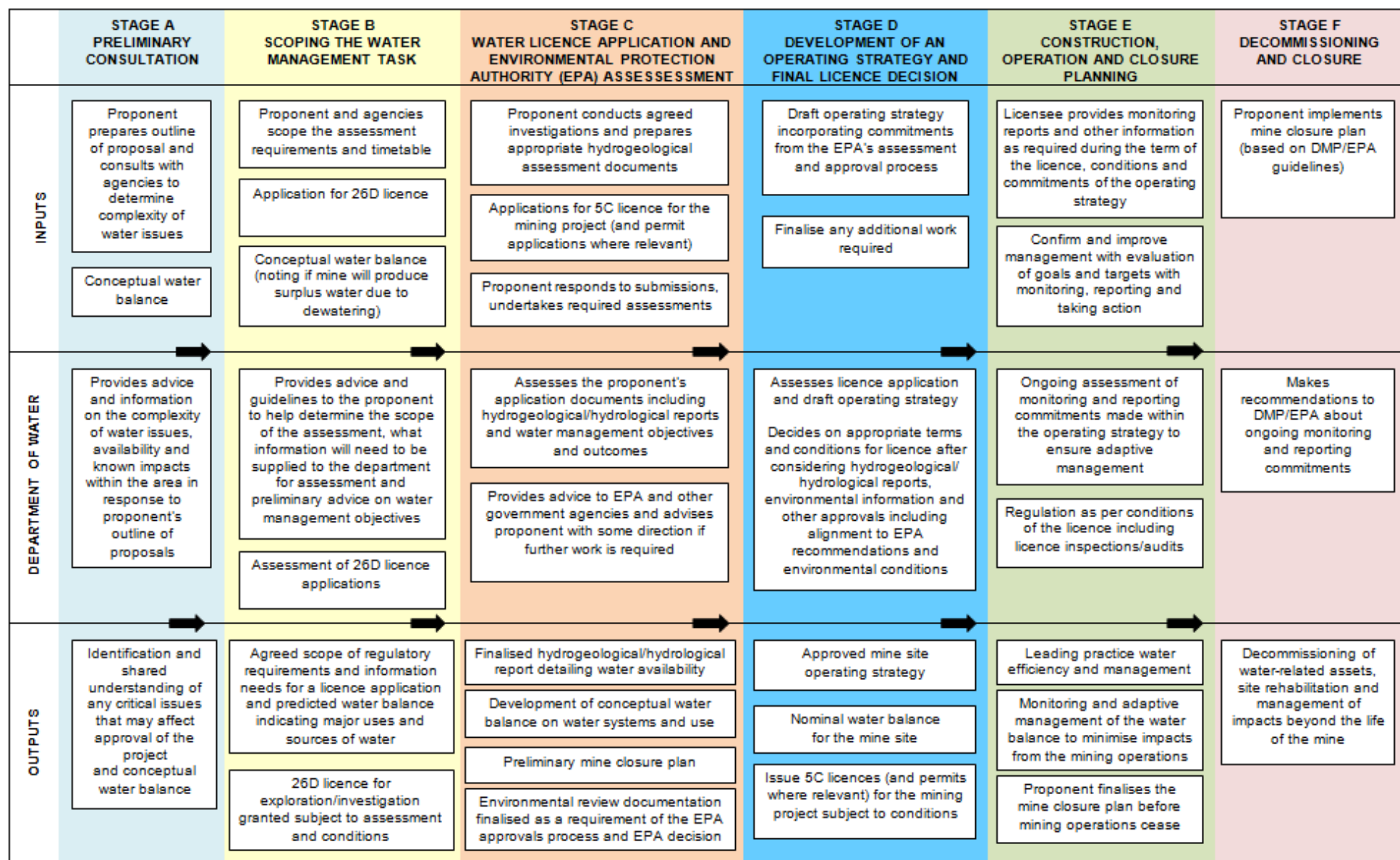


Figure 1 Summary process flow chart

## 2.1 Stage A – Preliminary consultation

In Stage A, the proponent needs to consider each of the water management components for the mining operation listed in Table 1. The purpose of this stage is for the project proponent and the Department of Water to establish a common understanding of the proposed project's water requirements and challenges.

The proponent provides the department with an outline of the proposal, including a summary of proposed water requirements and an indicative water balance.

The department and the proponent will identify critical issues that may prevent a water licence being granted. Key considerations at this stage include identifying the:

- regulatory requirements for abstracting and using water e.g. licensing or permitting requirements under the *Rights in Water and Irrigation Act 1914*
- possible sources of water, and their quantity and quality
- legal requirements for access to water sources
- water volume and quality needs of the proposed operation, including whether water will be taken for consumptive (e.g. ore processing) or non-consumptive (e.g. dewatering) purposes
- management of dewatering volumes and use of surplus (either on-site or off-site)
- broad ecological, social and cultural values that may be impacted by water abstraction, including potential impacts on other local water users
- need for efficient use of water
- risk of major flooding.

Stage A generally corresponds with the pre-feasibility stage of project development. Water source options and water balance requirements are indicative or conceptual at this stage, as resource investigations, drilling logs and pump rates are unknown.

Proponents should liaise with representatives of other regulatory agencies to determine approval and information requirements. This will reduce duplication where similar information is required and ensure approval processes are coordinated and working relations are established between the proponents, other regulatory agencies and the department.

The EPA report *General guide on referral of proposals to the Environmental Protection Authority under section 38 of the Environmental Protection Act 1986* (2010) will assist proponents to determine whether or not their proposal should be referred to the EPA for environmental impact assessment. This report, and guidance on the information to be submitted when making a referral, may be obtained from the EPA.

In some cases, the department may refer the proposal if the project is likely to have a significant effect on water resources or the environment. Referral usually occurs for mining proposals that are within public drinking water source areas.

### **Stage A input**

The input is a description of the proposed project, including an initial conceptual water balance (for example, see Figure 2). The project description should contain a similar level of detail to the information provided for an EPA referral (to minimise duplication, the same document can be provided to the Department of Water).

### **Stage A output**

Outputs include the proponent's conceptual water balance indicating whether the mine is expected to produce mine dewatering surplus, identification of critical issues, and proponent awareness of water regulation requirements relevant to the project.



Table 1 Preliminary consultation guideline

Component		Preliminary consultation
A.1	Water demands	<p>Consider the potential water demands for the mining project.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>· intended scale</li> <li>· estimates of water use</li> <li>· duration of project.</li> </ul>
A.2	Water source options	<p>Consider the potential water sources, and water quantity and quality requirements for the mining project.</p> <p>Options include:</p> <ul style="list-style-type: none"> <li>· groundwater</li> <li>· surface water</li> <li>· recycled or reused water</li> <li>· surplus water (e.g. from dewatering)</li> <li>· third-party supply (e.g. from other mine operations)</li> <li>· desalination</li> <li>· scheme water supply</li> <li>· local or remote supply</li> <li>· non-potable or potable water, noting that public drinking water source areas and/or drinking water source protection plans may exist or be required to protect drinking water quality.</li> </ul>
A.3	Water access options	<p>Consider the legal requirements for access to each water source option, including:</p> <ul style="list-style-type: none"> <li>· access to the land</li> <li>· public drinking water source areas</li> <li>· <i>Native Title Act 1993</i> requirements</li> <li>· ecological and cultural assets and wetlands</li> <li>· appropriate tenure (mining tenements) under the <i>Mining Act 1978</i></li> <li>· pastoral leases.</li> </ul>
A.4	Water quality	<p>Consider the water quality risks. Potential concerns include, but are not limited to:</p> <ul style="list-style-type: none"> <li>· mining in areas where pyritic overburden or waste occurs</li> <li>· mining in areas where ores with sulphides are evident</li> <li>· water level changes in acid sulphate soil environments</li> <li>· potential for solutes to be released through non-acidic reactions</li> <li>· mining in areas where saline groundwater or surface water is present</li> <li>· impact on receiving water body due to discharge of surplus water.</li> </ul>

Component		Preliminary consultation
A.5	Water-dependent ecosystems	<p>Identify and map the location of potential water-dependent ecosystems, extending beyond the mine footprint to capture the potential drawdown area. Both mapping and values assessment is necessary for the proponent to capture any critical risks to water-dependent ecosystems. Risks should be considered in terms of the effect of the mining activities on the ecosystems and on ecosystem value.</p> <p>Water dependent systems include but are not limited to:</p> <ul style="list-style-type: none"> <li>· surface water and surface expressions of groundwater (wetlands, watercourses, floodplains, lakes, salt lakes, springs, seeps and soaks, river base flow, river pools)</li> <li>· vegetation (e.g. groundwater or surface water dependent, riparian, terrestrial)</li> <li>· cave and aquifer ecosystems (e.g. stygofauna).</li> </ul> <p>The <i>Australian groundwater-dependent ecosystems toolbox</i> (Sinclair Knight Merz 2011) provides further guidance.</p>
A.6	Other water-dependent values	<p>Identify and map the location of water-dependent social, cultural and economic values of the project area, near the mine footprint and its water resource.</p> <p>This includes but is not limited to:</p> <ul style="list-style-type: none"> <li>· sites of Indigenous value</li> <li>· sites of other social, cultural or historic value</li> <li>· public drinking water source areas</li> <li>· other water users and industries (such as agriculture).</li> </ul>
A.7	Critical risks to water-dependent values	<p>Consider existing information on the features that are present and their significance. Identify the knowledge gaps for which field survey and/or consultation will be needed to fulfil Stage B.</p> <p>Consider the potential risks to each use from the proposal, including:</p> <ul style="list-style-type: none"> <li>· drawdown impacts (including changes in water level)</li> <li>· water quality impacts (including to public drinking water source areas)</li> <li>· through-flow impacts</li> <li>· discharge impacts.</li> </ul>

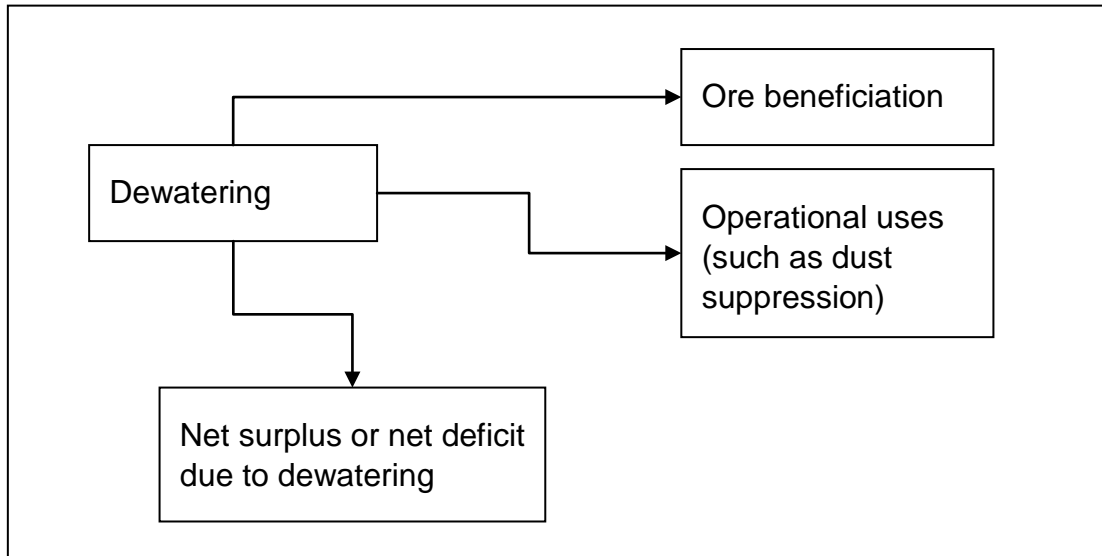
Component		Preliminary consultation
A.8	Cumulative impacts	<p>Consider the potential cumulative impacts of the proposed project and other operations.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>· other mining operations within the catchment</li> <li>· other water users in the area</li> <li>· proposed operations within the catchment (where publicly available information exists (e.g. public environmental reviews))</li> <li>· opportunities for cooperation.</li> </ul>
A.9	Baseline information	<p>Consider what information is already available in the area (all sources), to use as baseline data, and identify critical information gaps. Where critical information or data is lacking, consider establishing monitoring as soon as possible.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>· existing hydrological and hydrogeological information</li> <li>· existing environmental, social and cultural information</li> <li>· meteorological data</li> <li>· drilling information</li> <li>· pre-development water regime of water-dependent values</li> <li>· risk of major flooding.</li> </ul>
A.10	Water balance	<p>Consider the likely balance of water use and potential water supply, at a conceptual level, noting estimates may be indicative as the proposal is still undergoing feasibility studies.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>· potential quantity and quality of the water</li> <li>· dewatering requirements, and if the mine site is expected to produce mine dewatering surplus</li> <li>· major water uses</li> <li>· supply options (where mine dewatering does not meet demand).</li> </ul>
A.11	Allocation plans (Department of Water)	<p>For areas where allocation plans have been developed, refer to them for information about water allocation and local licensing policies (e.g. related to water-dependent ecosystems). Allocation plans are available at the department's website and further information can be attained from the appropriate regional office.</p>

Component		Preliminary consultation
A.12	Other regulatory agencies	<p>Identify what issues are to be dealt with by the department and which are the responsibilities of other agencies.</p> <p>Consider the role of the:</p> <ul style="list-style-type: none"> <li>· Office of the Environmental Protection Authority</li> <li>· Department of Mines and Petroleum</li> <li>· Department of Environment and Conservation</li> <li>· Department of Indigenous Affairs</li> <li>· Department of State Development (state agreements)</li> <li>· Department of Regional Development and Lands (Pastoral Lands Board)</li> <li>· Economic Regulation Authority (licensing of water service providers)</li> <li>· Department of Health (public health relating to water quality)</li> <li>· Department of Agriculture and Food (potential reuse of mine dewatering surplus).</li> </ul>
A.13	Stakeholder consultation	<p>Identify any critical stakeholders for consultation.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>· water service providers</li> <li>· Indigenous groups</li> <li>· community groups</li> <li>· local water users (other mines or different industries).</li> </ul> <p>Note: Public review and comment provisions occur under the <i>Environmental Protection Act 1986</i> and <i>Rights in Water and Irrigation Act 1914</i>.</p>

### Example of a conceptual water balance

The following example of a conceptual water balance indicates the level of detail needed at stage A of the project development process. The proponent also needs to classify the predicted water balance into one of the following general water demand categories:

- significant deficit            demand much greater than extractive requirement
- deficit                            demand greater than extractive requirement
- neutral                            demand equals extractive requirement
- surplus                            demand less than extractive requirement
- significant surplus            demand much less than extractive requirement



*Figure 2 Example conceptual water balance for a below-watertable operation – showing principal water source and uses.*

## 2.2 Stage B – Scoping the water management task (Resource evaluation and assessment)

In Stage B, the proponent and the department define regulatory requirements under the *Rights in Water and Irrigation Act 1914* (e.g. 26D licence, 5C licence or permit requirements) and confirm the scope of studies and investigations for the proposed mining project.

Stage B also corresponds with the scoping phase of the Environmental Protection Authority's environmental impact assessment process and approvals required by other government agencies. Department of Water will provide advice on water-related issues to other agencies.

Investigative work required by the department, to enable assessment of a 5C licence application, may be aligned with the information and formatting requirements of lead regulatory agencies to eliminate overlap and duplications.

The information to be gathered should allow the proponent to develop adequate management arrangements to address any of the identified water-related issues and provide baseline data for comparison at later stages to determine impacts. The proponent needs to provide sufficient information for the department to conduct a thorough assessment of the risks and effects of taking and using water (e.g. may also include socio-economic factors).

Proponents taking a thorough approach to the scoping stage reduce the risk of delay in the assessment phase, caused by missing or inappropriate information.

In stage B, the proponent works with the Department of Water to determine the level of hydrogeological or hydrological assessment needed to support a 5C licence application, as per *Operational policy no. 5.12 – Hydrogeological reporting associated with a groundwater well licence* (Department of Water 2009c).

The hydrogeological assessment and any additional investigations should also be designed to meet other agency impact assessment requirements (e.g. EPA approval process) including the impacts on the environment and other users, and be broadly targeted around:

- understanding the water resource and regime, and potential life-of-mine impacts of the project on the resource, the environment and other water users
- potential for re-injection, if required
- establishing baseline information to be used for future assessment of changes
- informing management strategies such as monitoring and contingencies
- constructing a hydrogeological model, where required.

The information to be investigated by the proponent, through its hydrogeological assessment and investigative work, is detailed in table 2.

The proponent may need to lodge one or more applications for 26D licences to allow commencement of drilling for investigative purposes. The 26D licences to undertake

hydrogeological assessment are usually granted, unless drilling poses a risk to the aquifer or the environment, the proposed mining activity is incompatible with a public drinking water source area or the water resource is fully-allocated. Clearing and native title issues and access to land are usually addressed by the granting of mining tenements by Department of Mines and Petroleum under the *Mining Act 1978*.

Note: a 26D licence for exploration/investigation is not a guarantee Department of Water will grant a 5C licence.

There may be a requirement for 5C licence applications to be made for small-scale water abstraction to undertake pre-mining preliminary investigative works or pump testing. Where this licence is required to support exploration/investigation, it would be granted at this stage. Note: assessment of 5C licence applications for the taking of water in the construction and operational stage of the mining project cannot be completed in most cases until the EPA has completed its environmental impact assessment process.

Bed-and-bank permit applications may also be required for the mining project, relating to the taking or diverting of water from watercourses. Assessment of these applications are usually completed after the EPA has completed its environmental impact assessment process, except where the permit is associated with a 5C licence to take water for pre-mining preliminary investigative works.

In stage B, the proponent is establishing the feasibility of the mining proposal – as investigations to determine the sustainability of the water resource, the interactions with water-dependent ecosystems, and impact assessment processes have not been undertaken yet. At the end of stage B, the proponent understands the investigations to be undertaken and the timelines for their completion.

### Stage B input

The proponent should collate all available information regarding water resources and the critical issues identified in stage A.

The proponent makes applications in accordance with the *Rights in Water and Irrigation Act 1914* requirements (e.g. for 26D licences and for 5C licences and/or 11/17/21A permits, as relevant).

### Stage B output

The output is an agreed scope of investigations and regulatory requirements. Section 26D licences for exploration/investigation are granted to enable hydrogeological assessment.

Agreement should be reached between the proponent and the department on the level of hydrogeological assessment and other investigations required, with a timeline for completion of these investigations and a predicted water balance.

Table 2 Project scoping guideline

Component		Project scoping
B.1	Water access	<p>Investigate the access options for all water infrastructure related to the mining project.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>• points of abstraction, including the estimated volumes (per annum) to be taken from each location and water source</li> <li>• infrastructure pathways (pipeline and road impact on streams)</li> <li>• taking of water in water source protection areas</li> <li>• land access</li> <li>• national parks or other estate</li> <li>• potential monitoring sites</li> <li>• public drinking water source areas</li> <li>• native title areas (claims and determinations).</li> </ul>
B.2	Exploration for water sources	<p>Assess requirements for a 26D licence. Licensing is required for all confined/artesian bores across the state, and for all bores in proclaimed groundwater areas, unless an exemption applies.</p> <p>A 26D licence is required for:</p> <ul style="list-style-type: none"> <li>• constructing a bore or well (see note below for monitoring bores)</li> <li>• altering a bore or well (see note below for monitoring bores)</li> <li>• constructing bores for re-injection purposes.</li> </ul> <p>Note: non-artesian monitoring bores are currently exempted from licensing based on the Rights in Water and Irrigation Exemption (Section 26C) Order 2012.</p> <p>Considerations include:</p> <ul style="list-style-type: none"> <li>• Refer to report <i>Minimum construction requirements for water bores in Australia</i> (National Uniform Drillers Licensing Committee 2012) for best practice guidance on bore construction and/or decommissioning a bore.</li> <li>• Investigations including exploration drilling and testing may be needed to locate and characterise aquifers, confirm yields and determine the effects of the proposed abstraction, to support a 5C application and the assessment processes undertaken by other regulatory agencies.</li> <li>• The proponent should be identifying key groundwater or surface water features where triggers, thresholds or limits may be applied to characterise water interactions with the environment, and develop water management objectives and mitigation strategies in the next stage of the assessment process.</li> </ul>



Component		Project scoping
B.3	Water source	<p>Investigate the sustainability of the water source options for the project.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>• local and regional hydrogeology and hydrology of sources</li> <li>• groundwater and surface water connectivity</li> <li>• recharge</li> <li>• reliability</li> <li>• water quality</li> <li>• impacts of abstraction regimes on bore pressures of adjoining water users, including community water supply and stock bores</li> <li>• minimisation of impacts on the water resource and the environment</li> <li>• regulatory requirements for abstraction</li> <li>• the relevant water allocation plan for the area</li> <li>• drinking water source protection plans, where relevant</li> <li>• requirements of <i>Operational policy no. 5.12 – Hydrogeological reporting associated with a groundwater well licence</i> (Department of Water 2009c)</li> <li>• reusing mine dewatering surplus on-site, or off-site where availability exceeds demand</li> <li>• alternative sources of supply to maximise reuse and efficiency.</li> </ul>
B.4	Fit-for-purpose water use	<p>Investigate lower quality water–use options for the project.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>• minimum standards of water quality for different purposes</li> <li>• infrastructure changes enabling the use of lower quality water</li> <li>• benefits such as security of supply and avoidance of adverse effects at other sources</li> <li>• the availability of fit-for-purpose water</li> <li>• water efficiency, refer to <i>Operational policy no. 1.02 – Policy on water conservation / efficiency plans – Achieving water use efficiency gains through water licensing</i> (Department of Water 2009a)</li> <li>• any opportunities to re-use or recycle water.</li> </ul>

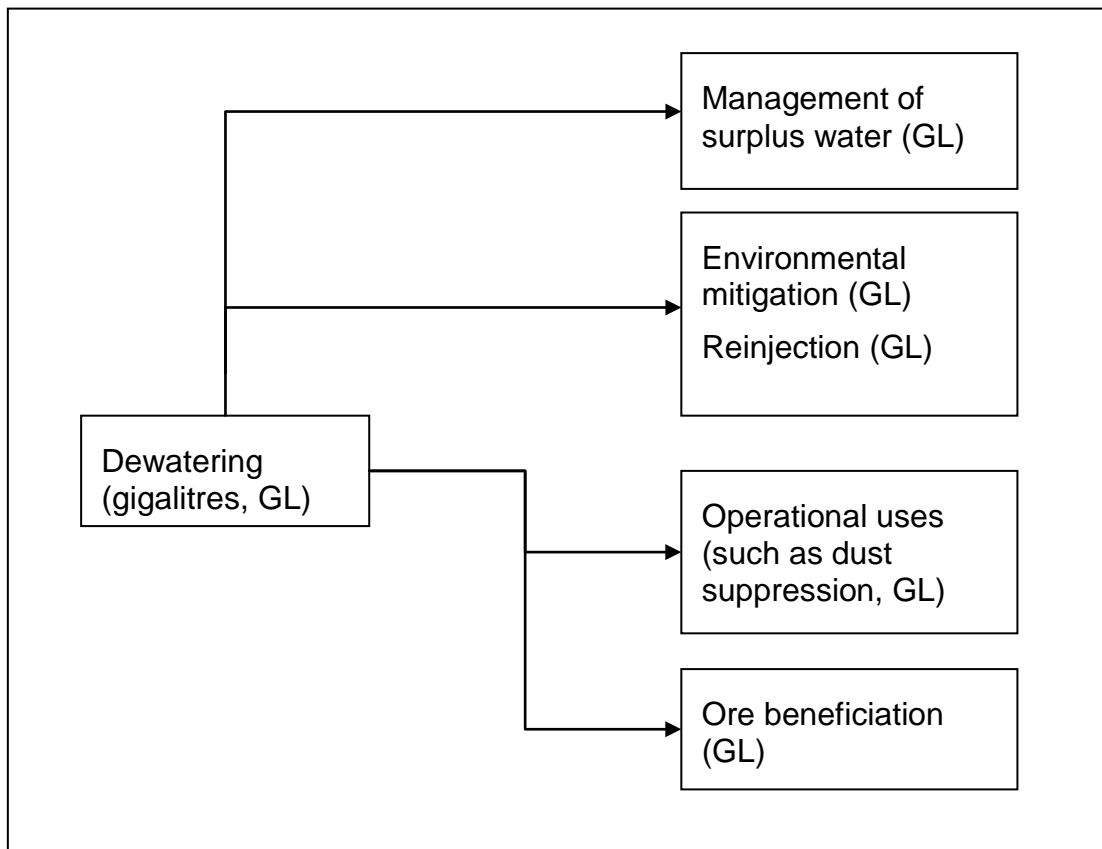
Component		Project scoping
B.5	Alternative sources	<p>Investigate alternatives to the traditional surface and groundwater sources.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>• suitability of non-potable supplies</li> <li>• opportunities to reuse or recycle water at all stages of the mine operation (e.g. treated wastewater for processing, dust suppression)</li> <li>• possible provision by a third party</li> <li>• trading options, as per <i>Operational policy 5.13 – Water entitlement transactions for Western Australia</i> (Department of Water 2010).</li> </ul>
B.6	Dewatering	<p>Investigate dewatering needs for mining below the watertable, if applicable.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>• planned dewatering schedule and estimated volumes</li> <li>• impacts of abstraction regimes, including reduction of water levels on existing users, such as community water supply and stock bores</li> <li>• local and regional hydrogeology-and-hydrology of sources</li> <li>• groundwater and surface water connectivity</li> <li>• minimisation of impacts on the water resource, environment and other water users.</li> </ul>
B.7	Optimising water use	<p>Investigate water optimisation options for mines, with surplus water from dewatering.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>• mitigation of environmental impacts, considering the suitability of the receiving aquifer (i.e. aquifer re-injection, or surface water / GDE maintenance)</li> <li>• efficient on-site use (including processing and dust suppression)</li> <li>• opportunities for use by other mining or non-mining projects.</li> </ul>
B.8	Water use efficiency	<p>Investigate infrastructure methods to achieve water use efficiency.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>• major infrastructure options</li> <li>• phasing of different water use activities</li> <li>• engineering alternatives</li> <li>• alternative bore field configurations to minimise water wastage</li> <li>• minimising water use for dust suppression</li> <li>• use of mine voids for water storage</li> <li>• methods to prevent water losses due to evaporation or leakage</li> <li>• refer to <i>Operational policy no. 1.02 – Policy on water conservation / efficiency plans: achieving water use efficiency gains through water licensing</i> (Department of Water 2009a).</li> </ul>

Component		Project scoping
B.9	Integrated water management	<p>Investigate the opportunities for integrated water management at:</p> <ul style="list-style-type: none"> <li>· port operations</li> <li>· rail operations</li> <li>· mine operations</li> <li>· other supporting infrastructure</li> <li>· non-mining projects (e.g. agricultural land or pastoral leases).</li> </ul>
B.10	Water-dependent ecosystems	<p>For the water-dependent ecosystems identified at stage A, investigate:</p> <ul style="list-style-type: none"> <li>· the pre-mining condition of water-dependent ecosystems</li> <li>· investigations, monitoring or consultation undertaken to fill any knowledge gaps</li> <li>· the water regime required to maintain values (e.g. pre-abstraction regime)</li> <li>· changes to the water regime from the mining proposal</li> <li>· impact of the predicted water regime on the values</li> <li>· options to minimise or avoid impacts</li> <li>· consultation or agreements with local communities and landowners</li> <li>· approvals from other agencies for unavoidable impacts (or offsets).</li> </ul> <p>To identify impacts on water-dependent ecosystems and support the reporting requirements, consider the design of hydrological and hydrogeological investigations and models.</p> <p>This may require:</p> <ul style="list-style-type: none"> <li>· hydrogeological conceptual models showing the interconnectivity between groundwater and ecosystems (e.g. exact locations of no-flow boundaries, absoluteness of confining layers at a local scale)</li> <li>· identifying if the groundwater model is fit for purpose for GDE impact assessment</li> <li>· discussion of the reliability or uncertainty of groundwater modelling results and their effect on the GDE impact assessment.</li> </ul> <p>Note: information on water-dependent ecosystems and values may need to be reported to the EPA as part of the environmental impact assessment process.</p>

Component		Project scoping
B.11	Other water-dependent values	<p>For the water-dependent Indigenous, social, cultural or economic values identified at stage A, investigate:</p> <ul style="list-style-type: none"> <li>the significance of sites and values (a socio-economic study may be required – these sites and values may need to be reported to the EPA as part of the environmental impact assessment process)</li> <li>water regime (water levels or flows) required to maintain values (e.g. pre-abstraction regime)</li> <li>changes to the water regime from the mining proposal</li> <li>impact of the predicted water regime on the values</li> <li>impacts on other water users and industries (current and prospective), including the impact on water availability in the area</li> <li>options to minimise or avoid impacts</li> <li>consultation or agreements with local communities and landowners</li> <li>approvals from other agencies for unavoidable impacts.</li> </ul> <p>Note: approval under the <i>Aboriginal Heritage Act 1972</i> is required before an Indigenous site can be disturbed. Proponents should consider water-related and spiritual values of these indigenous heritage sites.</p>
B.12	Water quality impacts	<p>Investigate potential impacts of operations on water quality. Consider:</p> <ul style="list-style-type: none"> <li>public drinking water source areas and drinking water quality protection requirements to avoid potential contamination from high-risk activities (e.g. fuel storage or tailings facilities)</li> <li>any presence of acid-forming material</li> <li>source materials or conditions (including metals and sulphate) that may lead to contaminant discharge or non-acidic drainage</li> <li>tailings facility design and management</li> <li>in situ leaching or recovery design</li> <li>turbidity, salinity and acidity impacts</li> <li>baseline water quality of receiving water bodies (and relevance of ANZECC guideline for water quality during operations noting that some background levels may exceed the ANZECC guidelines)</li> <li>buffering and mitigation capacity of the receiving environment or water bodies that receive water of a different quality or pH</li> <li>designing baseline monitoring programs (to provide definition of local water quality and triggers)</li> <li>defining water quality triggers for operations and emergencies.</li> </ul> <p>Water quality protection notes are also available at the department's website and provide information about how to protect water quality.</p> <p>Note: DEC is the primary regulatory agency for point source pollution and contaminated sites, based on the <i>Environmental Protection Act 1986</i> and the <i>Contaminated Sites Act 2003</i>.</p>

Component		Project scoping
B.13	Water release or reuse options	<p>Investigate the options for release or reuse of mine surplus water.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>• relocation for use nearby</li> <li>• in-pit storage (for reuse or infiltration)</li> <li>• sub-surface re-injection or managed aquifer recharge</li> <li>• controlled discharge</li> <li>• uncontrolled discharge</li> <li>• catchment or aquifer modification</li> <li>• stream realignment</li> <li>• local rules or policies in the relevant water allocation plan</li> <li>• refer to Department of Water's <i>Strategic policy 2.09 – Use of mine dewatering surplus</i> (2013).</li> </ul>
B.14	Releasing water	<p>Investigate the potential impacts of releasing water to the environment. Release of water from the mine site needs to be planned, controlled, monitored and communicated, including proposed emergency actions during extreme weather events or floods.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>• minimising the volume of water for discharge, through separation of clean and dirty water on-site</li> <li>• likely releases, including the location of release points</li> <li>• receiving-water-points water regime</li> <li>• monitoring requirements (pre-, during, and post-mining) to determine the impact of releases on the receiving environment</li> <li>• changes in water release regime throughout the life of the project</li> <li>• ecosystem impacts</li> <li>• likely stream morphology changes</li> <li>• seasonal changes</li> <li>• flood events (taking into account predictive climate models in the design of mining infrastructure, such as tailings dams, to accommodate a greater scale of storm events on-site)</li> <li>• sensitivity of receiving water-dependent environments</li> <li>• scale of impact downstream</li> <li>• cultural and social impacts of release, and <i>Aboriginal Heritage Act 1972</i> legal requirements.</li> </ul> <p>Note: DEC usually regulates dewatering discharge through the licensing provisions of the <i>Environmental Protection Act 1986</i>. In circumstances where DEC does not have regulatory control, the Department of Water may recommend dewatering discharge is managed, so the quality of water being released is fit for the receiving environment.</p>

Component		Project scoping
B.15	Cumulative impacts	<p>Investigate the potential scale of cumulative impacts on the water regime that may occur as a result of the project. Cumulative impacts investigations requires data sharing between water users using the same water resource (e.g. to develop groundwater or surface water models).</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>• multiple areas of potential abstraction</li> <li>• overlapping water use impacts (e.g. areas of drawdown or mounding, impacts on nearby or downstream users)</li> <li>• dewatering discharge locations</li> <li>• distribution of ecosystems within the project area</li> <li>• catchment-scale groundwater levels</li> <li>• alternatives to avoid or manage the cumulative impacts</li> <li>• for discharge of surplus dewater into salt lakes in the Goldfields, refer to <i>Development of framework for assessing the cumulative impacts of dewatering discharge to salt lakes in the Goldfields of Western Australia (Outback Ecology 2009)</i>.</li> </ul>
B.16	Post-closure planning and management	<p>Investigate the consequences and outcomes of various post-closure water management options.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>• conceptual final landform design, and the extent to which pits are filled (e.g. backfilling to watertable or creation of pit lakes), providing rationale where site is not returned to pre-mining natural conditions</li> <li>• regional aquifer and hydraulic connections</li> <li>• potential impacts of mine voids on water resources (e.g. salinity, acidification or mobilisation of soluble metals), and the potential to reactivate old mine voids as a water source or for future mining</li> <li>• rehabilitation water requirements and duration</li> <li>• catchment scale and temporal outcomes</li> <li>• rehabilitation or reconstruction of surface water features</li> <li>• climate change impacts on closure outcomes.</li> </ul>
B.17	Water Balance	<p>Develop a predicted water balance, showing major uses and sources of water, and identifying the period the water balance relates to (e.g. a year or month). An itemised water balance is an essential requirement in the assessment process, and during the operational stage of the mining project, for reporting and adaptive management.</p> <p>The water balance needs to include the predicted volume of water:</p> <ul style="list-style-type: none"> <li>• needs, at a coarse scale</li> <li>• required from available sources, at a coarse scale.</li> </ul>



*Figure 3 A predicted water balance for a below-watertable operation, showing major sources and uses of water, including estimated volumes.*

## 2.3 Stage C – Water licence application and EPA assessment

In stage C, the proponent conducts the hydrogeological assessment and other investigations agreed upon in stage B. The proponent prepares and submits an application for a 5C licence to Department of Water for the mine operation stage of the project. The application needs to be supported with all relevant documentation before the assessment may be undertaken.

Where a proposal has been submitted to the EPA for assessment, the EPA may require environmental review documents (e.g. water management plans and/or other requested documents) to contain information on the hydrological and hydrogeological setting and how any water issues will be managed to prevent significant environmental impacts. These documents are generally available to the public.

The department provides input into the EPA's assessment process. The EPA will refer any water management issues (linked to the *Rights in Water and Irrigation Act 1914* or other relevant water legislation) to the department for advice and comment.

Where possible, the department will align assessment of the water licence application with the relevant agencies (e.g. EPA, DEC) where there are shared water-related issues. Department of Water is constrained from making decisions on water licences and permits that allow the mining project to be implemented (e.g. granting a 5C licence for the mine operation stage), while the proposal is undergoing EPA assessment.

When preparing information to support the EPA's environmental impact assessment process and the water licence application (e.g. the hydrogeological assessment), the proponent needs to outline what the water management objectives and outcomes are, and how the water resources will be managed over the life of the project.

The information regarding water management objectives and outcomes may be requested by the department, in support of the licence application, where:

- the project has complex water requirements across the life of the mine
- it is required by the EPA and/or other regulatory agencies (e.g. environmental review documents and mine closure plan submitted to support the mining proposal application)
- the proponent needs to demonstrate the basis of contingencies to address impacts on water resources or adopt leading-practice water management.

There are benefits for both the proponent and the department, in developing and communicating water management objectives and outcomes, including:

- it provides clarity on the water management approach for the life of the project, including any regulatory requirements or commitments, which can be used in the finalisation of the operating strategy in stage D
- it outlines monitoring requirements and adaptive management mechanisms, including trigger, response and contingencies, and the reasons for them.



Table 3 provides a checklist of issues to be considered and documented by the proponent in this stage of the process.

Stage C marks the beginning of the assessment process for a 5C licence under the *Rights in Water and Irrigation Act 1914*. The proponent needs to submit 5C licence applications for the mining project during this stage. Applications for a 5C licence that do not meet the department's requirements cannot be assessed, and the department may ask proponents for further information, reject their applications, or return them for not supplying sufficient information. Refer to *Operational policy no. 5.11 – Timely submission of required further information* Department of Water 2009b). Where necessary, applications for bed-and-banks permits (associated with the 5C licence to implement the mining project) will also need to be submitted during this stage.

Proponents can reduce the risk of delay or non-approval of projects by engaging with the EPA, DEC and the department in stages A to C, and following this guideline.

The proponent may consolidate the reports submitted by incorporating the water balance and the water management objectives into the hydrogeological assessment. This information will contribute to the finalisation of the operating strategy and the water licence decision in stage D.

Applications for 26D licences, preliminary water abstraction licences associated with investigations and infrastructure setup (and bed and bank permits where necessary) will continue to be considered and assessed when required by the department.

### Stage C input

Inputs to this stage include section 5C licence applications for the mining project (and section 11/17/21A permit applications, where necessary). In stage C, the proponent undertakes the investigations and submits the required information and reports (e.g. hydrogeological, environmental and/or social impact assessments) that were scoped in stage B.

### Stage C output

The main stage C output (i.e. the completion of the EPA's environmental impact assessment process and the EPA's decision on the mining proposal) is dependent on the required information and reports being submitted by the proponent so an assessment may be undertaken.

Defining the water management objectives and outcomes is an essential output of this stage, providing a framework for adaptive management of the mining project.

**Table 3** *Guideline for determining water management objectives and outcomes*

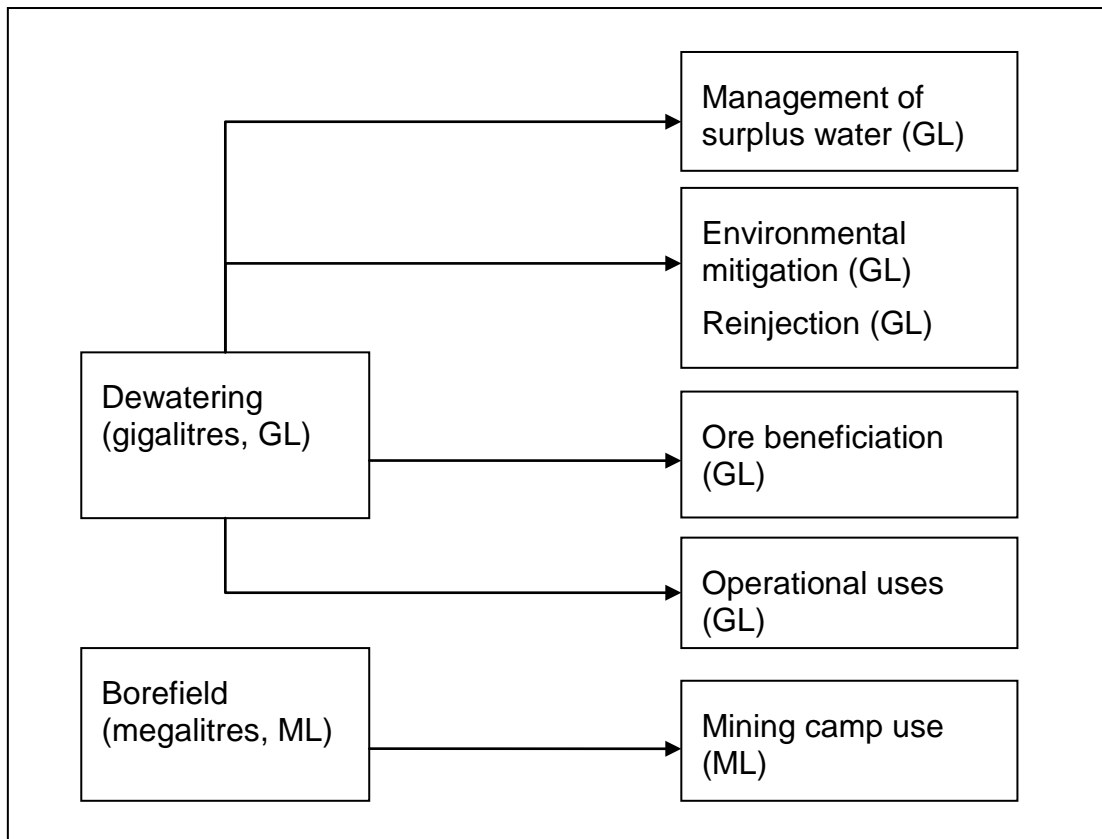
<b>Component</b>		<b>Development of water management objectives and outcomes</b>
C.1	Adaptive management framework	<p>Describe the adaptive management framework that will operate at the mine. If the project is being formally assessed by the EPA, then the EPA's objectives relating to water should be included in the water management objectives for the mining project.</p> <p>Consider:</p> <ul style="list-style-type: none"> <li>• What are the water management objectives of the project?</li> <li>• What regulatory conditions/requirements need to be met?</li> <li>• What are the strategies for achieving the water management objectives?</li> <li>• What is the process for determining or measuring whether the water management objectives are being met?</li> <li>• What contingencies plans or measures are in place?</li> <li>• How and when will an evaluation of the water management objectives take place?</li> </ul>
C.2	Water sources	<p>Describe and justify the water supplies chosen for the life of the project, for consideration in a future operating strategy, including any water-related outcomes or conditions from the EPA's environmental impact assessment.</p> <p>The description needs to include:</p> <ul style="list-style-type: none"> <li>• location (including map) and hydrogeology/hydrology of the area</li> <li>• longevity of the project water requirements and sources</li> <li>• site-specific water constraints (the environment, cultural values and other users)</li> <li>• variability of the sources</li> <li>• reliability (quality and quantity), given process needs and variability of supply, and contingency sources or measures</li> <li>• identify and assess the benefits and effects of using the chosen source.</li> </ul>
C.3	Abstraction	<p>State the abstraction volumes and pumping rates required to supply the operation for the life of the project, including dewatering requirements and pumping regimes. Hydrogeological investigations may be necessary to verify recharge rates of the water resource and ascertain whether the yield will be sustainable.</p> <p>The description needs to include estimates of pumping rates and abstraction volumes, and the expected duration of pumping, for:</p> <ul style="list-style-type: none"> <li>• the initial construction of the mine</li> <li>• the operating life of the mine (including anticipated expansions)</li> <li>• after-closure requirements.</li> </ul>

Component		Development of water management objectives and outcomes
C.4	Fit-for-purpose water use	<p>Describe how the operator will ensure the quality of water to be used for different aspects of the operation will be appropriate to the needs of those aspects, noting circumstances where low quality or recycled water is available or unavailable.</p> <p>The description needs to include:</p> <ul style="list-style-type: none"> <li>· the quality needs of each purpose</li> <li>· the sources chosen to meet those needs</li> <li>· specific justifications for any proposed use of potable water for purposes that need only low-quality water.</li> </ul>
C.5	Water-dependent ecosystems	<p>Undertake and report on investigations on the water-dependent ecosystems described in stages A and B.</p> <p>Outcomes are to:</p> <ul style="list-style-type: none"> <li>· establish management objectives for these ecosystems</li> <li>· describe the key features of the mitigation, offsets, monitoring and adaptive management framework that will ensure that impacts do not exceed agreed/approved levels.</li> </ul> <p>Details may be incorporated at stage D in the operating strategy.</p> <p>Significant impacts – such as those extending beyond the boundary of the mining project – should be referred to the EPA for assessment.</p> <p>The project proponent would need to develop management measures with nearby landowners.</p>
C.6	Water-dependent social and cultural values	<p>Undertake and report on investigations on the sites of Indigenous, social, cultural and economic value described in stages A and B.</p> <p>Outcomes are to:</p> <ul style="list-style-type: none"> <li>· establish management objectives for these sites</li> <li>· describe the key features of the mitigation, offsets, compensation, monitoring and adaptive management framework to be used to ensure impacts do not exceed approved levels.</li> </ul> <p>Details may be incorporated at stage D in the operating strategy.</p> <p>Significant impacts (such as those extending beyond the boundary of the mining project) should be referred to the EPA for assessment.</p> <p>The project proponent would need to develop management measures with nearby landowners.</p>

Component		Development of water management objectives and outcomes
C.7	Water quality	<p>Describe the proposed methods for managing any possible effects on water quality of the source and aquifer during the life of the mine, during the closure process and after the operation is closed down.</p> <p>The description needs to include management of:</p> <ul style="list-style-type: none"> <li>· water-dependent ecosystems</li> <li>· water storage management, including measures to manage potential leakage or run-off from tailings storage facilities</li> <li>· discharges of water</li> <li>· acid, non-acid and metalliferous drainage, solute generation and releases</li> <li>· public drinking water source areas to avoid contamination risk</li> <li>· salinity.</li> </ul>
C.8	Use and release of surplus water	<p>Describe and justify the options chosen for the release or re-injection of water at water surplus mines.</p> <p>The description needs to include:</p> <ul style="list-style-type: none"> <li>· site-scale management regime</li> <li>· catchment-scale management regime</li> <li>· management outcomes agreed with the department</li> <li>· potential impacts on the receiving environment</li> <li>· sharing arrangements and proposals for re-use of mine dewatering surplus by other mining or non-mining projects.</li> </ul>
C.9	Water use efficiency	<p>Describe the mechanisms proposed for maximising water use efficiency for the mining project. Give the reasons for the choices and state the targets chosen for efficiency of water use in these operations.</p> <p>The description of targets needs to include:</p> <ul style="list-style-type: none"> <li>· baseline water demand at each point of operation</li> <li>· measures implemented to reach targets</li> <li>· measures not used and an explanation why</li> <li>· forecast water use after the application of measures</li> <li>· targets for improved efficiency.</li> </ul> <p>Note that where additional groundwater supplies are required, evidence of efficient water use will need to be provided.</p> <p>Refer to <i>Operational policy no. 1.02 – Policy on water conservation / efficiency plans – Achieving water use efficiency gains through water licensing</i> (Department of Water 2009a) for measures to improve water use efficiency.</p>

Component		Development of water management objectives and outcomes
C.10	Cumulative impacts	<p>Describe the measures taken to manage cumulative impacts to the water regime.</p> <p>The description needs to include:</p> <ul style="list-style-type: none"> <li>· changes from previous resource targets for areas of cumulative impact</li> <li>· individual arrangements for addressing any cumulative impacts</li> <li>· cooperative arrangements with other water users in the area that are likely to have an impact on the water regime.</li> </ul>
C.11	Interference with stream beds and banks	<p>Identify locations where interference to bed or banks of watercourses, by infrastructure or operations, will occur. Mining tenements granted under the <i>Mining Act 1978</i> are subject to licensing and permitting requirements under the <i>Rights in Water and Irrigation Act 1914</i>.</p> <p>An application for a section 11/17/21A permit to interfere with bed and banks would be required in proclaimed areas for:</p> <ul style="list-style-type: none"> <li>· activities that involve the taking or diversion of water, including diversion of the watercourse</li> <li>· any activity on a general purpose lease, which interferes with the bed or banks of the watercourse.</li> </ul> <p>The permit requirements include a description of the proposed techniques for minimising disturbance to riparian areas. These include:</p> <ul style="list-style-type: none"> <li>· consolidation of infrastructure requiring a creek crossing with existing creek-crossing alignments or previously disturbed areas</li> <li>· avoidance of high-velocity sections and bends on the watercourse</li> <li>· use of best practice rehabilitation and bank stabilisation techniques (e.g. use of geo-chemically compatible material).</li> </ul> <p>The permit requirements also include a statement of:</p> <ul style="list-style-type: none"> <li>· possible changes to flow in the watercourse during the life of the mine</li> <li>· where exemption to vegetation-clearing regulations may occur.</li> </ul>

Component		Development of water management objectives and outcomes
C.12	Post-closure planning and management	<p>Describe the mechanisms proposed for managing the long-term, after-closure changes to the water regime resulting from mine operations. This is likely to be conceptual, as operations have not commenced and closure planning is iterative during the mine life.</p> <p>The description needs to include:</p> <ul style="list-style-type: none"> <li>· recovery of abstraction draw down and timing of closure, factoring in predicted climate change</li> <li>· prediction of changes in water quality of any planned pit lake over time</li> <li>· prediction of long-term impact on downstream water quality and flow regimes from modifications to surface water features</li> <li>· water management objectives for the affected water resources and decommissioning of water assets (e.g. bores)</li> <li>· future re-use options for water storage facilities</li> <li>· management of water quality issues in nearby water resources from the containment of tailings (e.g. due to seepage, run-off or erosion).</li> </ul>
C.13	Water balance	<p>Describe the estimated water balance. The description needs to include identification of all:</p> <ul style="list-style-type: none"> <li>· water uses and associated volumes</li> <li>· water sources and associated volumes.</li> </ul>



*Figure 4 Example of a stage C water balance which shows the sources and uses of water, including estimated volumes.*

## 2.4 Stage D – Development of an operating strategy and final licence decision

In stage D, the proponent finalises and submits an operating strategy, incorporating relevant conditions and commitments under ministerial statements (based on the EPA's assessment in the previous stage) and setting out in detail how water will be managed over the life of the project.

*Operational policy 5.08 – Use of operating strategies in the water licensing process* (Department of Water 2011) provides a guideline for preparing an operating strategy. Guidance on how to apply this to mining activities is documented in table 4.

The operating strategy needs to include a detailed water balance and dewatering schedule, and incorporate a monitoring and reporting program against set water management objectives and triggers. Water efficiency, contingency and mitigation strategies also need to be identified in the required document.

Information on infrastructure (e.g. pipelines and water distribution systems) and mining plans is required to provide a baseline from which Department of Water can review and assess reports submitted by the proponent. Accurate measurement of abstraction and water use data across the mine site enables the department to reconcile the water balance and assess targeted and actual performance.

The Department of Water will assess the proponent's operating strategy and may negotiate changes to ensure it adequately addresses agreed water management objectives and outcomes, including EPA or other regulatory agency decisions.

After approving the operating strategy, the department finalises the assessment of the 5C licence application, considering information provided in supporting documents, including the operating strategy. The operating strategy is related to the licence and is legally enforceable through licence conditions.

The operating strategy and water balance provides clarity on the mine operations until the end of the project and needs to be based on the best currently available information. The water balance should be updated when actual data is obtained from mine operations, leading to adaptive management and improved knowledge of water resources. This will assist progression into the closure stage, by ensuring actual effects can be related to predicted impacts and recovery rates.

### Stage D input

Inputs include 5C licence applications (and permit applications, where relevant), all supporting information, including water management objectives and outcomes, and a draft operating strategy.

### Stage D output

Outputs include approved 5C licence(s) with licence conditions (and permits, where relevant) granted under the *Rights in Water and Irrigation Act 1914*, the approved operating strategy, and a nominal water balance as shown in Figure 5.



Table 4 Information that will assist operating strategy preparation

Component		Preparation and assessment of the operating strategy
D.1	Area of impact: project area	<p>Provide a brief description of, and appropriate maps for, the project area.</p> <p>Include:</p> <ul style="list-style-type: none"> <li>project area, including the extended footprint</li> <li>geographic context and interaction with other water users</li> <li>water-related outcomes, commitments or conditions from the EPA's impact assessment (e.g. ministerial statement)</li> <li>climate effects on the water regime.</li> </ul>
D.2	Area of impact: aquifer	<p>Provide maps and a description of the affected water resources (groundwater and surface water) with reference to hydrogeological and hydrological information source.</p> <p>Include:</p> <ul style="list-style-type: none"> <li>the level of knowledge of the aquifer or surface water resource</li> <li>dewatering schedule including estimated volumes and zone of drawdown</li> <li>use of the department's <i>Operational policy no. 5.12 – Hydrogeological reporting associated with a groundwater well licence</i> (Department of Water 2009c) for guidance on the level of information required</li> <li>identification of potential interactions with other water users.</li> </ul>
D.3	Areas of impact: ecological and cultural values	<p>Provide detail on the adaptive management framework described in stage C for water-dependent ecosystems and locations of Indigenous, social, cultural and economic value. The framework must ensure impacts do not exceed approved levels.</p> <p>This will involve:</p> <ul style="list-style-type: none"> <li>including appropriate maps and descriptions</li> <li>identifying measurable water management thresholds expected to maintain ecosystems and sites</li> <li>establishing a trigger and response system that articulates the actions to be taken in response to measurable triggers, including an early warning system that thresholds are approaching</li> <li>describing contingency plans to be enacted if thresholds are reached</li> <li>describing the approved mitigation, offsets or compensation strategies for unavoidable impacts.</li> </ul>

Component		Preparation and assessment of the operating strategy
D.4	Area of impact: water quality	<p>Provide a description on how water quality will be managed.</p> <p>Water quality impacts need to be considered in terms of risk to the water resources and the receiving environment. Assessment will include consideration of baseline pre-mining conditions, and impacts at storage sites, mining boundaries and discharge points.</p> <p>Consider the relevance of the <i>Australian and New Zealand guidelines for fresh and marine water quality</i> (Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000) for establishing baseline monitoring criteria. In public drinking water source areas, water quality needs to be managed in accordance with Australian drinking water guidelines criteria (National Health and Medical Research Council and the Natural Resource Management Ministerial Council 2011).</p> <p>Include:</p> <ul style="list-style-type: none"> <li>· acid rock, non-acidic and metalliferous drainage</li> <li>· salinity and other solutes (e.g. sulphate, iron, arsenic, etc)</li> <li>· possible contamination risk to the water source and receiving environment</li> <li>· special land use considerations such as public drinking water source areas and conservation reserves</li> <li>· potential impacts due to interaction with other water users.</li> </ul>

Component		Preparation and assessment of the operating strategy
D.5	Area of impact: infrastructure requirements	<p>Provide a description, including maps and schematic diagrams, of the location of any water-related infrastructure to determine the basis of water abstraction and water use on the mine site for water balance calculations.</p> <p>Include:</p> <ul style="list-style-type: none"> <li>· groundwater bores or wells</li> <li>· types and installation details of pumps</li> <li>· surface water extraction points and infrastructure (e.g. dams)</li> <li>· water storage areas</li> <li>· diversion points including diversion of water and/or watercourse</li> <li>· discharge points</li> <li>· types and installation details of water meters (refer to current meter order – Rights in Water and Irrigation Act 1914 (Approved Meters) Order 2009)</li> <li>· water distribution systems</li> <li>· options to consolidate infrastructure and implement water conservation and/or efficiency measures</li> <li>· schedule of water-related infrastructure maintenance (e.g. maintenance of pumps and flow meters, checking pipe work for water leak detection) and any other requirements.</li> </ul>
D.6	Abstraction and water use	<p>List the proposed water abstraction volumes, usage volumes and discharge or re-injection (if applicable) volumes, as both monthly and annual figures.</p> <p>Include and, where possible, tabulate:</p> <ul style="list-style-type: none"> <li>· estimates of volumes and flow rates for the mining project</li> <li>· abstraction from each groundwater well or surface water source</li> <li>· individual uses such as dust suppression, process water and any other possible usage</li> <li>· each point of discharge/re-injection</li> <li>· operating and dewatering schedules, where variations in abstraction are expected</li> <li>· estimates of mine dewatering surplus</li> <li>· water efficiency measures on the mine site</li> <li>· project timeline, including expected date of mine closure.</li> </ul>

Component		Preparation and assessment of the operating strategy
D.7	Water balance	<p>Provide a mine site water balance and quantitative water balance diagram, highlighting where significant volumes of water are abstracted and released and identifying the period the water balance relates to (e.g. year or month).</p> <p>Include:</p> <ul style="list-style-type: none"> <li>· where all water is sourced and predicted volumes</li> <li>· a map showing location of flow meters within the project area</li> <li>· how water is used, recycled and disposed of, and predicted volumes</li> <li>· discharge points and predicted volumes</li> <li>· effect of climatic, recharge and discharge changes on the water balance model</li> <li>· continual improvement and adaptive management cycle.</li> </ul>
D.8	Water release management	<p>Provide a description of water releases to the environment.</p> <p>Include and, where possible, tabulate:</p> <ul style="list-style-type: none"> <li>· release regime (quantity, timing, volumes)</li> <li>· receiving water bodies</li> <li>· final quality of released water and baseline quality of receiving water bodies</li> <li>· length of affected downstream stream water environment</li> <li>· measures to ensure management of water quality changes</li> <li>· potential impacts due to interaction with other water users.</li> </ul>
D.9	Water use efficiency management	<p>Provide a water use efficiency plan demonstrating best practice in water efficiency across the mine site. This should be incorporated as an integral part of the operating strategy.</p> <p>Include and, where possible, tabulate:</p> <ul style="list-style-type: none"> <li>· water use efficiency targets</li> <li>· methods to achieve water use efficiency targets</li> <li>· water recycling strategies and programs</li> <li>· fit-for-purpose uses of waste and recycled water</li> <li>· water optimisation offsets where efficiency gains are not desirable</li> <li>· monitoring requirements to assess whether targets are met</li> <li>· auditing requirements to identify efficiency improvements.</li> </ul>

Component		Preparation and assessment of the operating strategy
D.10	Cumulative impact management	<p>Provide a detailed description of strategies used to mitigate cumulative impacts on the water regime, considering groundwater and/or surface water resources as relevant.</p> <p>Include:</p> <ul style="list-style-type: none"> <li>· arrangements for shared monitoring, where appropriate</li> <li>· arrangement for shared modelling, where appropriate</li> <li>· site-scale management strategies</li> <li>· catchment-scale management strategies</li> <li>· how the proposed strategies relate to the regional and mine water management objectives</li> <li>· mechanisms for ensuring compliance with the water management objectives.</li> </ul>
D.11	Post-closure planning and management	<p>Provide a strategy for post-closure water management, planned to be undertaken when mining operations cease.</p> <p>Include:</p> <ul style="list-style-type: none"> <li>· commitments and triggers that need to be met until the end of the project (e.g. water level, water quality, vegetation, rehabilitation, erosion or run-off management)</li> <li>· monitoring program to evaluate trends and recovery of the water resource</li> <li>· mitigation strategies for impacts that continue post-mining</li> <li>· how the strategies will meet regional and mine water management objectives</li> <li>· site rehabilitation and post-mining water requirements</li> <li>· decommissioning requirements for water assets (e.g. bores, dams, etc)</li> <li>· management provisions for unforeseen closure or change to care and maintenance</li> <li>· adaptive management approach to review and report on changes to management objectives.</li> </ul>

Component		Preparation and assessment of the operating strategy
D.12	Monitoring	<p>Provide a detailed monitoring program, including methods, procedures and schedules for monitoring commitments for water use activities.</p> <p>Monitoring requirements include:</p> <ul style="list-style-type: none"> <li>• reference sites to assess background levels and set triggers</li> <li>• abstraction volumes and rates from individual wells</li> <li>• water sample analysis from individual wells, as detailed in <i>Operational policy no. 5.12 – Hydrogeological reporting associated with a groundwater well licence</i> (Department of Water 2009c)</li> <li>• water levels (e.g. at water table and in aquifers to determine impacts from mining and/or dewatering activities)</li> <li>• water usage volumes, separated into specific uses</li> <li>• volume of water discharged from each individual discharge point and water quality considerations</li> <li>• monitoring relating to the impacts of dewatering and release of water on surrounding environment (e.g. vegetation monitoring, surface water levels and flow rates)</li> <li>• monitoring water use efficiency plans and programs</li> <li>• monitoring at extended footprint</li> <li>• shared monitoring for cumulative impacts</li> <li>• post-closure monitoring and recovery of the water resource.</li> </ul>
D.13	Reporting	<p>Provide a detailed schedule of reporting, including information that is to be included in any required report (e.g. annual or triennial review of monitoring data, or a focused monitoring regime of key and divergent data in a quarterly review).</p> <p>Include as a minimum:</p> <ul style="list-style-type: none"> <li>• reporting of monitoring data, including key and divergent data, historical data and graphs of trends (abstraction volumes should be reported as monthly and annual figures)</li> <li>• actual water balance against that in the operating strategy</li> <li>• breaches of conditions, including breaches of operating strategy commitments as well as actions taken</li> <li>• time frames for notification to the department in cases where the commitments in the operating strategy cannot be met, including reasons why and actions proposed</li> <li>• time frames for notification to the department of any emergency situation, relating to a <i>Rights in Water and Irrigation Act 1914</i> licence, so permission to take immediate action can be obtained.</li> </ul>

Component		Preparation and assessment of the operating strategy
D.14	Defining triggers and thresholds	<p>Clearly define environmental impact triggers to aid the implementation of contingency measures. Triggers may relate to the EPA's environmental impact assessment process and project approval commitments.</p> <p>Define the triggers based on benchmarks and investigation results. Consider:</p> <ul style="list-style-type: none"> <li>· Is there potential to affect other water users?</li> <li>· Is there potential to affect water-dependent ecosystems?</li> <li>· Is there potential for quality of the water resource to be degraded after activities start?</li> </ul> <p>Where there are no potential impacts, no triggers are required. Where an impact is possible, a trigger is required and where an impact is likely, staged triggers are also required as an early warning system that a trigger is at risk of being breached. Examples of triggers include, but are not limited to, percentage of reduction (increase) of vegetation, water quality parameters, erosion levels, and groundwater or surface water levels.</p> <p>Note: in public drinking water source areas, water quality needs to be managed in accordance with Australian drinking water guidelines criteria (National Health and Medical Research Council and the Natural Resource Management Ministerial Council 2011).</p>

Component		Preparation and assessment of the operating strategy
D.15	Contingency measures	<p>Provide detailed contingency measures that include actions to reduce environmental risks and mitigate adverse changes to the water regime.</p> <p>Define contingency measures for environmental risk and operational risk:</p> <ul style="list-style-type: none"> <li>· Is there potential to affect other water users? <ul style="list-style-type: none"> <li>a) none – no required measures</li> <li>b) possible – design monitoring to quantify impact</li> <li>c) likely – describe appropriate contingency actions.</li> </ul> </li> <li>· Is there potential to affect water-dependent ecosystems? <ul style="list-style-type: none"> <li>a) none – none required</li> <li>b) possible – review monitoring</li> <li>c) likely – contingency actions.</li> </ul> </li> <li>· Is there potential for the degradation of water quality of the resource? <ul style="list-style-type: none"> <li>a) none – none required</li> <li>b) possible – review monitoring</li> <li>c) likely – contingency actions.</li> </ul> </li> </ul> <p>Examples of contingency measures include, but are not limited to, alternative discharge points and extraction points, reducing pumping rates and increased monitoring.</p>
D.16	Administrative requirements	<p>Provide the administrative requirements for an operating strategy.</p> <p>Include:</p> <ul style="list-style-type: none"> <li>· the water year (the licensed water entitlement relates to) and a summary of all monitoring, reporting and contingency commitments listed in the operating strategy</li> <li>· a list of references and related documents, including any relevant hydrogeological reports, relevant company policies and EPA-approved management commitments or plans</li> <li>· intended date of submission of reporting documents, such as annual and triennial aquifer reviews</li> <li>· operating strategy review date</li> <li>· details of persons responsible for ensuring operating strategy commitments and <i>Rights in Water and Irrigation Act 1914</i> licence conditions are met</li> <li>· sharing arrangements to manage water regime interactions with other water users (e.g. surplus water, where relevant).</li> </ul>



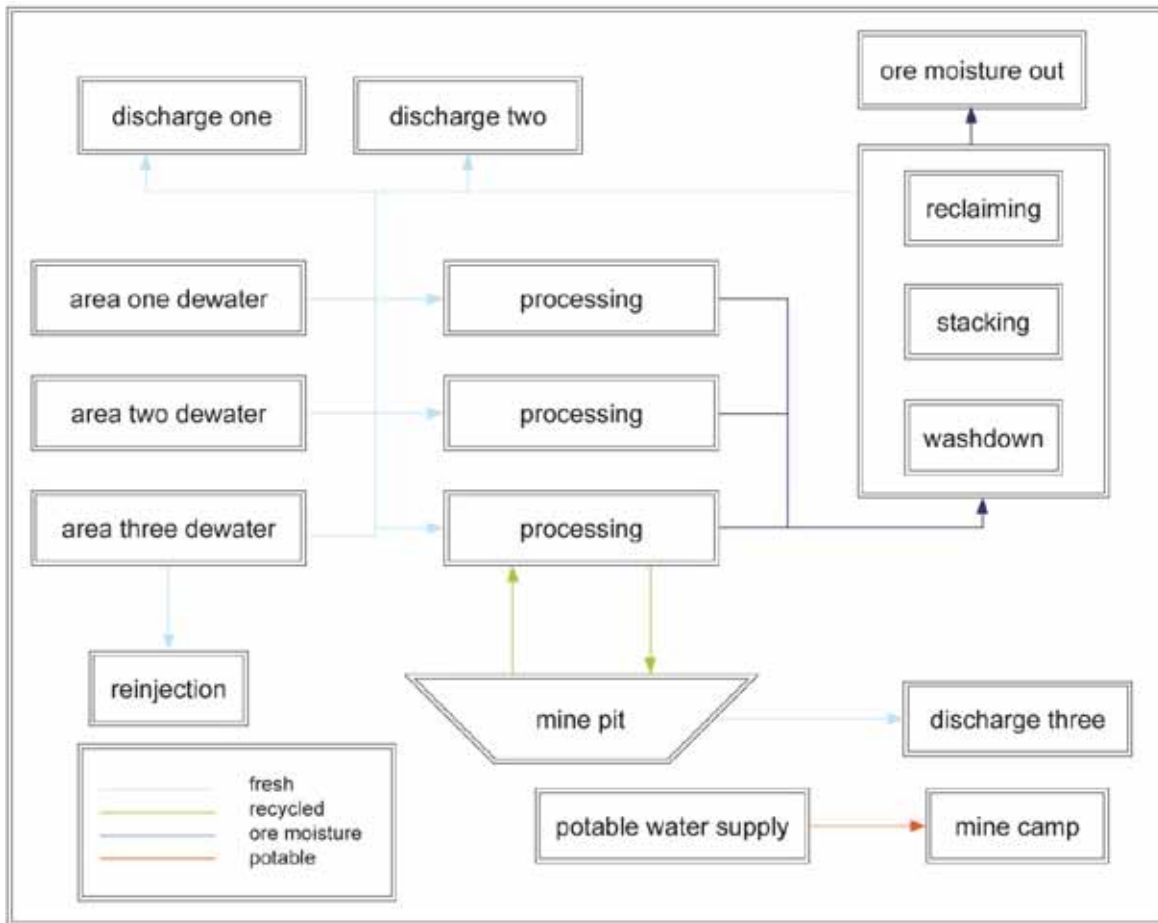


Figure 5 Example of a mine site water balance, showing all water sources, usage and discharge points, and associated volumes.

## 2.5 Stage E – Construction, operation and closure planning

In stage E, the proponent manages the taking and use of water, in accordance with the licence and the approved operating strategy, throughout the life of the mine. This typically involves regular monitoring, reporting by the proponent to Department of Water and other agencies, as required, and using adaptive management practices.

Adaptive management is a systematic process for improvement and is critical to leading-practice water management. Adaptive management works by evaluating how effective a process or strategy is in meeting a defined objective. The proponent uses the results of their evaluation to modify their management and monitoring programs. Proposed changes to the operating strategy and related water management objectives and outcomes are reviewed and approved by Department of Water.

The Department of Mines and Petroleum and Environmental Protection Authority *Guidelines for preparing mine closure plans*, released in June 2011, assists proponents to consider all aspects of mine closure planning and management. Mining proposals for dewatering purposes with potential to have significant environmental impact (e.g. mining operations extending the pit below the watertable) are required to submit a mine closure plan to DMP for approval as part of the mining proposal application (in the pre-mining stages).

Before the end of the operational mining stage, the proponent will need to review and finalise the mine closure plan, where necessary. This is the stage where monitoring data will enable ongoing analysis of impacts and confirm whether the required management outcomes are being met. The proponent will need to consider the water requirements, if any, for the post-mining stage of the mining project and apply to amend or relinquish the 5C licences to take water when active mining ceases.

Table 5 provides guidance to proponents for developing an adaptive management program. The adaptive management model is shown at figure 6.

### Stage E input

Inputs are the operating strategy and licence conditions finalised in stage D.

### Stage E output

Outputs include an adaptive management cycle for the life of the project, including reports at agreed intervals, and proposed changes to the operating strategy and monitoring programs, where necessary.

By the end of the operational stage, the output is the mine closure plan and an agreed scope of works for decommissioning the mine's water-related assets and rehabilitating the mine site.

Table 5 Adaptive management guideline

Component		Construction, operation and closure planning
E.1	Reporting	<p>Changes in impacts need to be reported against:</p> <ul style="list-style-type: none"> <li>· commitments made in the operating strategy</li> <li>· water management objectives and outcomes in this guideline</li> <li>· mine closure plan (if appropriate)</li> <li>· ministerial commitments made by the EPA.</li> </ul>
E.2	Evaluating the management	<p>On a regular cycle, assess all of the management actions against the management objectives.</p> <p>Have the management objectives been met?</p> <ul style="list-style-type: none"> <li>· If yes, is current management suitable to continue? Are there lessons to inform better management?</li> <li>· If no, were planned responses to triggers implemented? Were they adequate?</li> </ul>
E.3	Evaluating the impacts	<p>On a regular cycle, assess the condition of the water resource.</p> <p>Have the water resource objectives been met?</p> <ul style="list-style-type: none"> <li>· If yes, is current management suitable to continue? Are there lessons to inform better management?</li> <li>· If impacts are observed, implement corrective actions as per operating strategy.</li> <li>· If no, were planned responses to triggers implemented? Were they adequate?</li> </ul>
E.4	Updating management	<p>Establish a system of review and continuous improvement as part of the adaptive management process over the life of the mine.</p> <p>Based on evaluation of mining operations and auditing of water use, implement any required changes to management.</p> <p>Changes can include:</p> <ul style="list-style-type: none"> <li>· improving the adaptive management framework</li> <li>· improving mine site practices</li> <li>· reviewing the monitoring program</li> <li>· reviewing water efficiency targets</li> <li>· implementing water efficiency improvements</li> <li>· reviewing the water balance and making changes</li> <li>· reviewing the operating strategy and recommending changes</li> <li>· submitting the updated operating strategy to the department for approval.</li> </ul>

Component		Construction, operation and closure planning
E.5	Updating the monitoring program	<p>On a regular cycle, review and compare the monitoring program to monitoring objectives.</p> <p>That review can include:</p> <ul style="list-style-type: none"> <li>· assessing reliability and applicability, to support decisions</li> <li>· reviewing appropriateness of methodology and scale</li> <li>· improvement based on ongoing analysis of impacts, to allow for overall integration, including mine closure plan finalisation.</li> </ul>
E.6	Post closure planning and management	<p>Review and finalise the mine closure plan using the results of data collated during mining. The plan should describe the mechanisms for managing the long-term after-closure changes to the water regime, resulting from the mine operations.</p> <p>The description needs to include:</p> <ul style="list-style-type: none"> <li>· mitigation strategies for impacts that continue post-mining</li> <li>· how the strategies will meet regional and mine water management objectives</li> <li>· a proposed monitoring program to verify predicted trends</li> <li>· water management objectives for mine closure for the affected water resources and decommissioning of water assets (e.g. bores)</li> <li>· a prediction of changes in water quality of any planned pit lake over time</li> <li>· a prediction of long-term impact on downstream water quality and flow regimes, from modifications to surface water features</li> <li>· future reuse options for water storage facilities</li> <li>· water quality issues related to containment of tailings (e.g. managing seepage or runoff to nearby water resources)</li> <li>· approach to review and report on changes to management objectives.</li> </ul>

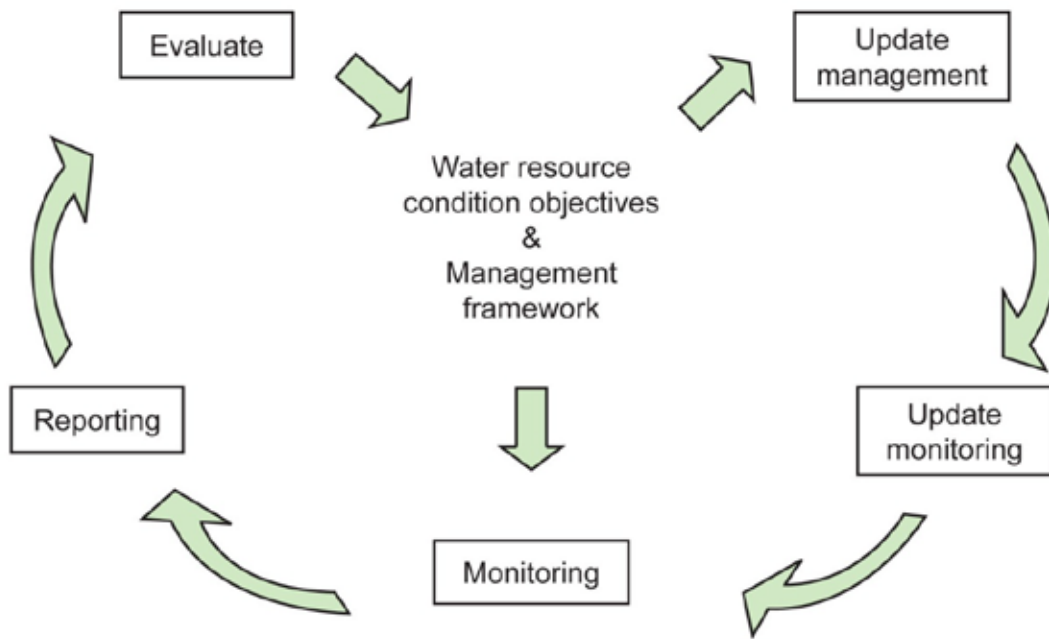


Figure 6 An adaptive management model.

## 2.6 Stage F – Final closure and decommissioning

In stage F, the proponent scales down operations and manages long-term impacts of the operation beyond the life of the mine. Mine closure plans and decommissioning requirements link to water management outcomes and commitments from the Environmental Protection Authority and Department of Mines and Petroleum approval processes, and the operating strategy for managing environmental and water-related impacts of the mining project.

The proponent is responsible for implementing the mine closure plan, undertaking monitoring and decommissioning, rehabilitating the site and adaptively managing the post-closure impacts on the surrounding water resources and environment. The proponent will review their water licensing requirements for undertaking mine closure and rehabilitation works, and apply to amend or relinquish any water licences relating to the operational stage.

Management of impacts after the active mining stage has ended is an important component of mine project management. Longer term management of environmental impacts is continued by the EPA, DEC and/or DMP based on the commitments and actions in the mine closure plan.

Department of Water has an advisory role in post-closure management in circumstances where water licensing is not applicable. This generally occurs through the referral processes undertaken by other agencies.

Primary concerns for the department include:

- verifying water resources, neighbouring water users and the environment are not impacted unduly by the project, as evidenced by baseline monitoring
- ensuring the proponent has a strategy for decommissioning water bores and closure of water storage facilities and dams when no longer required
- ensuring impacts on water resources from the containment of tailings (e.g. seepage, runoff or erosion) are managed by the proponent.

In many cases, proponents may negotiate with pastoral lease holders or other nearby mining companies or irrigators for use of surplus water beyond the mine life. However, if an agreed outcome with a third party cannot be reached, water will need to be disposed of in a way that will not cause any detrimental impact to the water quality of the surrounding catchment or groundwater area.

### Stage F input

An input is the mine closure plan and scope of works to be implemented for mine closure, decommissioning and rehabilitation. Amendment of water licences relating to the operational stage would be required when the active mining stage ends.

### Stage F output

The output is the implementation of the post-closure management actions.

Table 6 Post-closure management

Component		Final closure and decommissioning
F.1	Post closure management	<p>Implement post-closure water management for the mine site, based on water-related commitments, outcomes and actions provided by the proponent in the mine closure plan and the operating strategy.</p> <p>Include:</p> <ul style="list-style-type: none"> <li>· monitoring and reporting against baseline data to determine water resource recovery and assess the effectiveness of mitigation strategies for post-mining impacts</li> <li>· revegetation in the rehabilitation of inclined areas, where appropriate, to manage runoff and erosion</li> <li>· decommissioning of water assets</li> <li>· adaptive management processes to review and make changes to post-closure strategies to meet the required water management objectives and outcomes.</li> </ul>
F.2	Decommissioning of bores	<ul style="list-style-type: none"> <li>· Bores that have no intended future use beyond closure must be decommissioned in accordance with the publication <i>Minimum construction requirements for water bores in Australia</i> (National Uniform Drillers Licensing Committee 2012).</li> </ul>

### 3 Policies for water allocation and use in the mining industry

The set of policies outlined in Table 7 has been developed for issues associated with mining activities and provides guidance on water management and assessment considerations that may be relevant to applications for *Rights in Water and Irrigation Act 1914* licences and permits.

Department of Water will consider the applicability of the policies in these guidelines on a case-by-case basis during assessment of any applications. The department prepares water allocation plans. These include local licensing policies to protect the resource, the environment and other users. Where inconsistencies occur between this guideline and a relevant water allocation plan, the plan will override the guideline to the extent of any inconsistency.

Table 7 Policies for water allocation and use in the mining industry

Policy group	Policy principles
<b>1 Exploration for water resources</b>	
1.1 Exploration	<ul style="list-style-type: none"> <li>a) A licence under section 26D of the <i>Rights in Water and Irrigation Act 1914</i> is required before a proponent can investigate the groundwater resource. There is no guarantee licences to take water (under section 5C of the <i>Rights in Water and Irrigation Act 1914</i>) will be issued at the completion of the investigation for the mining project.</li> <li>b) Where discharges of abstracted groundwater from pump-testing occur, proponents will need to manage sediment loading before releasing the water and meet water-release criteria relevant to the discharge site, including creeks and infiltration trenches. The criteria are required to ensure that the quality of the water, the health of the flora and fauna, and the soils at the discharge site are not compromised.</li> <li>c) Proponents should obtain a section 5C licence for pump testing and pre-mining preliminary investigative works.</li> </ul>
<b>2 Environmental policy</b>	
2.1 Ecological impact management	<ul style="list-style-type: none"> <li>a) The department must inform the Environmental Protection Authority if a water licence being sought under the <i>Rights in Water and Irrigation Act 1914</i> would have a significant effect on the environment. The environmental impacts of the project's water licence(s) would be considered by the EPA during its environmental impact assessment process, along with any other potential impacts of the mining project.</li> </ul>



Policy group	Policy principles
	<p>b) In establishing whether a proposal would have significant effect on the environment, the department applies relevant policies including <i>Operational policy no. 5.12 – Hydrogeological reporting associated with a groundwater well licence</i> (Department of Water 2009c) and <i>Statewide policy no. 5 – Environmental water provisions policy for Western Australia</i> (Water and Rivers Commission 2000a), as well as policies and guidance from the EPA. On renewal, existing licences may be amended to require identification of water-dependent ecosystems, where they were not included previously.</p> <p>c) Activities must be designed to minimise adverse impacts to ecosystems. A monitoring and adaptive management framework must be implemented by the proponent to ensure impacts do not exceed approved/agreed levels.</p>
<b>3 Water quality policy</b>	
3.1 General	<p>a) The department may require a licensee to monitor and report against the quality of a water resource, in particular its salinity and acidity. Water resource use must not alter the water quality such that it adversely affects a water-dependent environmental, cultural or social value or other users. Requirements to monitor and report may be included as conditions on the licence.</p> <p>b) Where self-supply water is used for mining camp purposes it is advisable that the water be filtered, treated and tested, according to public health advice available from the Department of Health Water Quality branch. Department of Water also has water quality protection notes to provide guidance on using community and private supplies. The <i>Australian drinking water guidelines</i> (National Health and Medical Research Council and the Natural Resource Management Ministerial Council 2011) and <i>Australian and New Zealand fresh and marine water quality guidelines</i> (Australian and New Zealand Environment and Conservation Council of Australia and New Zealand 2000) also provide information on relevant drinking water quality criteria. Mine site design and layout must ensure mine camp potable supplies are adequately protected to prevent contamination of the water source.</p>
3.2 Salinity	<p>a) Where a licence application has the potential to increase the baseline salinity of a water resource, the applicant is required to assess and define how the water quality deterioration will be managed in the long term. The department may apply additional licence conditions to manage the water use impacts, protect water quality and water dependent ecosystems.</p>

Policy group	Policy principles
3.3 Acidity, potential acid forming and non-acid forming materials	<p>a) Any licence under section 5C of the <i>Rights in Water and Irrigation Act 1914</i> will not be granted until the EPA's assessment process has been completed and the risks associated with the take of water (e.g. due to dewatering), that may expose potentially acid-forming material and lead to groundwater acidification, are addressed by the proponent.</p> <p>b) The licensee will be required to address the risks of potentially acid forming material and solutes released from non-acidic geochemical reactions and demonstrate the potential environmental impacts from metalliferous drainage can be managed through an impact management strategy within the operating strategy. The information submitted in support of the licence application will be used to develop licence conditions and monitoring requirements for the licence.</p>
3.4 Point source pollution and contaminated sites	<p>a) Point-source pollution of water through industrial or other activities is regulated through the <i>Environment Protection Act 1986</i>. The Department of Environment and Conservation must be contacted if evidence of a pollution event is identified.</p> <p>b) New production bores are not to be located within 500 m of an identified contaminated site (see DEC's <i>Contaminated sites database</i>). The distance may be varied if the applicant can demonstrate the proposed abstraction will not affect the water levels connected to the contaminated site, the environment or public health. This policy does not apply to monitoring bores, bores constructed for environmental management purposes or remedial work associated with the contaminated site.</p> <p>c) Water quality protection in Western Australia is subject to the by-laws of the <i>Country Areas Water Supply Act 1947</i>.</p>
3.5 Public drinking water source areas	<p>a) Mining activities within a public drinking water source area require approval from Department of Water. The administrative agreement between the Department of Mines and Petroleum and Department of Water provides guidance on the administrative process. All mining activities that have the potential to contaminate public drinking water supplies need to comply with the department's water quality protection note <i>Land use compatibility in public drinking water source areas</i>. Where a proposal is considered compatible with a public drinking water source area, the proponent will need to demonstrate how they plan on managing their activities to protect the quality of the water source. The proponent must inform the relevant water service providers and give them the opportunity to provide advice on the proposal.</p>

Policy group	Policy principles
<b>4 Cultural policy</b>	
4.1 Cultural sites	a) Applicants are required to meet any statutory requirements under the state's <i>Aboriginal Heritage Act 1972</i> and the Australian Government's <i>Native Title Act 1993</i> .
<b>5 Dewatering and surplus water management</b>	
5.1 Impacts from abstraction	<p>a) All new licence applications for groundwater abstraction for commercial or other purposes, requiring construction of a bore or use of an existing bore, must recognise dewatering activities in the area will have an impact on the water levels, quality and pump rates required for use. Applicants are responsible for ensuring the likely effects on the water resource, the environment and other nearby water users due to abstraction or dewatering are minimised.</p> <p>b) Groundwater monitoring bores must be installed to monitor water levels and determine the effects of dewatering on the aquifer, nearby water users and water levels of connected systems. This is a minimum requirement and may be increased (e.g. may also include monitoring of salinity or water quality) depending on the level of risk. The department and the proponent will jointly determine when monitoring is required at a site.</p>
5.2 Use and release of water	<p>a) Prior to the issuing of a water licence, the proponent must submit a water balance and define the end use or discharge of the dewater. The assessed options for reuse, aquifer re-injection, and/or release of dewater must be included within the hydrogeological assessment or other supporting documentation. The schedule of options will detail how the water could be reused and/or released including, but not limited to, volume, location, duration, impacts or benefits to the surrounding environment.</p> <p>b) The following are the department's options for use and/or release of dewatering volumes (once referred to as a hierarchy).</p> <ol style="list-style-type: none"> <li>1 Mitigation of environmental impacts (e.g. maintenance of groundwater-dependent ecosystems through re-injection or infiltration of water into the aquifer).</li> <li>2 Use for fit-for-purpose activities (such as processing and dust suppression). The proponent needs to demonstrate the water is of suitable quality for the end use.</li> <li>3 The proponent needs to provide options for the best use of mine dewatering surplus, noting it is an opportunistic use linked to the mining process, and security of supply will be determined by</li> </ol>

Policy group	Policy principles
	<p>dewatering profiles, mine schedule and economic considerations. Provisions for the reuse of mine dewatering surplus may be scoped into state agreements by negotiation with Department of State Development. The whole-of-government approach to the use of mine dewatering surplus is provided in the Department of Water's <i>Strategic policy 2.09 – Use of mine dewatering surplus</i> (Department of Water 2013).</p> <ul style="list-style-type: none"> <li>i) Transfer of water to a third party to meet other demand, including other proponents in the area and public water supply, is in consultation with relevant government agencies. Where it is proposed to use the water for public supply, a drinking water source protection plan should be developed and approved by the Department of Water and Department of Health.</li> <li>ii) Re-injection back into the aquifer at designated sites determined by the proponent and agreed by the department.</li> <li>iii) Controlled release to the environment where the dewater release is allowed to flow (either through a pipe or overland) into a designated watercourse or wetland determined by the proponent and agreed by the department.</li> </ul> <p>c) The department will assess release of dewater on a case-by-case basis, recognising background water levels (quality and quantity) of the source water and receiving environment, the seasonal flows of watercourses and ANZECC guidelines, where relevant.</p> <p>d) Dewatering discharges are regulated by Department of Environment and Conservation under requirements of the <i>Environmental Protection Act 1986 and Environmental Protection Regulations 1987</i>. Department of Water will license the abstraction of water and the potential drawdown impacts due to dewatering of the groundwater resource.</p> <p>e) Proponents undertaking dewatering will not be permitted to discharge to the environment where there is a likelihood that it will cause impacts on other land users (including inundation of land) or significant environmental damage (including water quality, acidification, erosion, damage to river bed and/or banks and altered water levels at sites with ecological and cultural assets). The department will provide advice to the EPA on water management issues relevant to the <i>Rights in Water and Irrigation Act 1914</i> prior to the EPA making a decision on the proposal. To reduce and, where possible, eliminate risks, the department may include licence conditions that require monitoring, management and mitigation.</p>

Policy group	Policy principles
5.3 Optimisation of surplus dewater	<p>a) Any proposed agreement with third parties on the use of dewatering should be done in consultation with the department and other relevant government agencies. These agreements may be included in state agreement acts. The use of surplus water will be supported by the department, where the use of that water can be shown to acceptably manage or reduce environmental impacts, facilitate appropriate and sustainable development, or have some other economic, social or environmental benefit.</p> <p>Note: The department does not have a regulatory approval role for third party reuse of surplus water. The Economic Regulation Authority has responsibility for regulatory approval if it is a water service arrangement under the <i>Water Services Licensing Act 1995</i>. The department's <i>Strategic policy 2.09 – Use of mine dewatering surplus</i> (Department of Water 2013) provides further policy detail on surplus water re-use options.</p>
<b>6 Mine site operations and closure</b>	
6.1 Management of water resources	<p>a) Long-term water quality and quantity impacts on the environment or other water users are to be managed based on the approved operating strategy. The management approach needs to include a monitoring program, triggers and response actions, and mitigation strategies for the duration of the potential impact.</p> <p>Note: Management of water-related impacts that continue beyond the mining stage should be addressed in the mine closure plan prepared in accordance with DMP/EPA requirements. A preliminary mine closure plan is needed by stage C for DMP and EPA approval processes.</p> <p>b) The taking of water from groundwater sources or watercourses for management and remediation of mine sites and mine voids requires licensing in accordance with the <i>Rights in Water and Irrigation Act 1914</i> requirements (e.g. including whether the water resource is proclaimed or the groundwater source is artesian). Licence conditions regarding the diversion, dewatering, monitoring and management of water may be applied (e.g. volume, frequency, pump rate, diversion location, water levels and water quality).</p>
6.2 Mine voids	<p>a) Use, management and closure of mine voids must not unduly impact the environment or water resources. Any use of mine voids for the storage or transfer of water should be considered when developing the operating strategy.</p>

Policy group	Policy principles
<b>7 Water use optimisation</b>	
7.1 Water use efficiency and optimisation of water at site	<p>a) Where the proponent identifies a project's operations to be water deficit, water use efficiency methods must be utilised together with a water use efficiency plan (included within the operating strategy).</p> <p>b) Where the proponent identifies water surplus in operations, options for use and/or release of dewatering discharge must be considered (e.g. re-injection or reuse of mine dewatering surplus by third parties).</p>
7.2 Fit for purpose	<p>a) Proponents with a variety of site water requirements should assess all fit-for-purpose water options available to them. Fit-for-purpose water needs to be prioritised, where it is available, before high-quality water. New licence applications for industrial water will be assessed on a case-by-case basis. Proposals for the use of high-quality water will not be approved without justification for the use of water for that purpose.</p>
<b>8 Fractured rock resources</b>	
8.1 Water availability and impact management	<p>a) Applications to abstract water from fractured rock resources will be dealt with on a case-by-case basis, where the proponent can:</p> <ul style="list-style-type: none"> <li>· adequately demonstrate water is available and impacts on water-dependent values and other users can be managed properly</li> <li>· the aquifer can recover over a period of time after cessation of mining, such that water-dependent values are not affected on an ongoing basis</li> </ul> <p>Allocation limits may not be appropriate in these resources, given the localised and heterogeneous nature of their geology.</p>
8.2 Long-term impacts and closure	<p>a) Depletion of aquifer storage and long-term issues after the cessation of mining should be addressed by the proponent prior to commencement of mining and included in the closure plan for the mine. Parameters for assessing the recovery of the resource should be based on site-specific conditions.</p> <p>b) When assessing recovery of a fractured rock resource, the department will consider:</p> <ul style="list-style-type: none"> <li>· changes in groundwater level and storage depletion</li> <li>· changes in water quality</li> <li>· zones of impact based on pre-mining conditions.</li> </ul>

Policy group	Policy principles
<b>9 Uranium mining</b>	
9.1 In situ recovery	<p>a) The proposal must be based on a full understanding of the hydrological, hydrogeological and hydrogeochemical features of the aquifer, the current and potential uses and values (e.g. environmental, cultural, social, economic values) of the groundwater resources and connected ecosystems, cumulative impacts and potential risks to these values, and natural radioactivity in the project area.</p> <p>Note: Uranium mining is a trigger for referral under the Federal government's <i>Environmental Protection and Biodiversity Conservation Act 1999</i> administered by the Department of Sustainability, Environment, Water, Population and Communities.</p>
9.2 Groundwater impacts	<p>a) Mining should not compromise groundwater in the mineralised aquifer to the extent that it cannot be remediated to meet the agreed post-mining use at mine completion.</p>
<b>10 Cumulative impacts</b>	
10.1 Cumulative impact management	<p>a) The EPA considers cumulative impacts under the <i>Environmental Protection Act 1986</i>. Department of Water will regulate cumulative impacts of additional mining operations through the 5C licensing process, and through advice to the EPA and other regulatory agencies.</p> <p>b) New entrants to an area that cause impacts beyond those agreed for current commercial abstraction-and-release will be responsible for investigating and identifying potential cumulative impacts, as part of the impact assessment and approval process for the mining proposal.</p> <p>c) Ongoing management and monitoring of impacts will require negotiation between the responsible operations. This may involve:</p> <ul style="list-style-type: none"> <li>· significant communication, including data sharing between stakeholders</li> <li>· shared monitoring and modelling</li> <li>· management of impact areas</li> <li>· reporting of impacts based on commitments identified in the operating strategy and/or the EPA's impact assessment process.</li> </ul> <p>Actions beyond respective mine tenement boundaries may be required to achieve water and environmental outcomes, based on agreement with neighbouring water users.</p>

## 4 Implementation and review

### 4.1 Reviewing the guideline

Department of Water will ensure this guideline remains relevant and applicable, through periodic reviews. Improvements in technology, developments in the mining industry and new knowledge gained from practical experience will all feed into potential adjustments to the guideline.



## Shortened forms

ANZECC	Australian and New Zealand Environment Conservation Council
DEC	Department of Environment and Conservation
DMP	Department of Mines and Petroleum
EPA	Environmental Protection Authority

# Glossary

<b>abstraction</b>	The permanent or temporary withdrawal of water from any source of supply, so that it is no longer part of the resources of the locality.
<b>allocation limits</b>	The amount of water set aside for annual licensed use. Each water resource (aquifer) within a subarea has an allocation limit set that will be amended over time to reflect significant measurement outcomes and sustainability determinations.
<b>aquifer</b>	A geological formation or group of formations that is able to receive, store and transmit significant quantities of groundwater.
<b>bore</b>	A narrow and normally vertical hole drilled in soil or rock to measure or withdraw groundwater from an aquifer.
<b>confined aquifer</b>	An aquifer lying between confining layers of low permeability strata (such as clay, coal or rock), so that the water in the aquifer cannot easily flow vertically.
<b>dewatering</b>	Removing underground water to facilitate construction or other activity. It is often used as a safety measure in mining below the watertable or as a preliminary step to development in an area.
<b>discharge</b>	The water that moves from the groundwater to the ground surface or above, such as a spring. This includes water that seeps onto the ground surface, evaporation from unsaturated soil, and water extracted from groundwater by plants (evapotranspiration) or engineering works (groundwater pumping).
<b>drawdown</b>	The lowering of a watertable resulting from the removal of water from an aquifer or reduction in hydraulic pressure.
<b>ecological water requirements</b>	The water regime needed to maintain ecological values of water-dependent ecosystems at a low level of risk.
<b>environmental water provisions</b>	The water regimes that are provided as a result of the water allocation decision-making process which takes into account ecological, social, cultural and economic impacts. They may meet, in part or in full, the ecological water requirements.

<b>first-in-first-served</b>	A process by which groundwater entitlements are allocated consistent with the order in which licence applications are received by the Department of Water.
<b>groundwater</b>	Water which occupies the pores and crevices of rock or soil beneath the land surface.
<b>groundwater area</b>	The boundaries that are proclaimed under the <i>Rights in Water and Irrigation Act 1914</i> and used for water allocation planning and management.
<b>groundwater subarea</b>	Areas defined by the Department of Water within a groundwater area, used for water allocation planning and management.
<b>Groundwater-dependent ecosystem</b>	An ecosystem that is dependent on groundwater for its existence and health.
<b>hydrogeology</b>	The hydrological and geological science concerned with the occurrence, distribution, quality and movement of groundwater, especially relating to the distribution of aquifers, and groundwater flow and quality.
<b>impermeable</b>	Not permitting the passage of a substance (in this case, water) through pores of a more dense substance.
<b>licence</b>	A formal instrument which entitles the licence holder to ‘take’ water from a watercourse, wetland or underground source.
<b>mine dewatering surplus</b>	The dewatering volume that is left after accounting for the water used on the mine site for purposes such as dust suppression or mineral processing, or returned to the environment to support environmental values of groundwater-dependent ecosystems, surface waters or aquifers.
<b>proclaimed area</b>	An area gazetted under the <i>Rights in Water and Irrigation Act 1914</i> for the purpose of managing water resources through licensing or permitting.
<b>public drinking water source areas</b>	Includes all underground water pollution control areas, catchment areas and water reserves constituted under the <i>Metropolitan Water Supply Sewerage and Drainage Act 1909</i> and the <i>Country Areas Water Supply Act 1947</i> .
<b>recharge</b>	Water that infiltrates into the soil to replenish an aquifer.

<b>re-injection</b>	The pumping of water back into an aquifer.
<b>riparian right</b>	The right of a land owner to take water from a watercourse, that flows through their property, unlicensed and free of charge for the purpose of stock and domestic use, without sensibly diminishing the flow of water downstream.
<b>salinity</b>	The measure of total soluble salt or mineral constituents in water. Water resources are classified based on salinity in terms of total dissolved salts (TDS) or total soluble salts (TSS). Measurements are usually in milligrams per litre (mg/L) or parts per thousand (ppt).
<b>social value</b>	A particular in situ quality, attribute or use that is important for public benefit, welfare, state or health (physical and spiritual).
<b>social water requirement</b>	Elements of the water regime that are needed to maintain social and cultural values.
<b>stock and domestic water use</b>	<p>Water that is used for ordinary domestic purposes associated with a dwelling, such as water for cattle or stock other than those being raised under intensive conditions; water for up to 0.2 hectares (if groundwater) or two hectares (if surface water) of garden from which no produce is sold. This take is generally considered a basic right.</p> <p>Note: Intensive conditions under the <i>Rights and Water Irrigation Act 1914</i> means 'conditions in which the cattle or stock: a) are confined to an area smaller than that required for grazing under normal conditions and b) are usually fed by hand or by mechanical means'.</p>
<b>subarea</b>	A subdivision within a surface or groundwater area, defined for the purpose of managing the allocation of groundwater resources. Subareas are not proclaimed and can therefore be changed by the department without being gazetted. See also groundwater subarea.
<b>sub-artesian aquifer</b>	A confined aquifer in which the hydraulic pressure is insufficient to cause the well to flow at the surface.
<b>sustainability</b>	Meeting the needs of current and future generations through integration of environmental protection, social advancement and economic prosperity.

<b>sustainable groundwater yield</b>	The amount of water that can be abstracted/extracted over time from a water resource while maintaining the ecological values (including assets, functions and processes).
<b>watercourse</b>	Any river, creek, stream or brook in which water flows, including any collection of water (such as a reservoir) where water flows into, through or out of it, regardless of whether the water flows are intermittent or occasional or have been artificially improved, altered or diverted from the natural course, and includes the bed and banks.
<b>water efficiency</b>	The minimisation or optimisation of water use through adoption of best management practices.
<b>water entitlement</b>	The quantity of water a person is entitled to take on an annual basis in accordance with the <i>Rights in Water and Irrigation Act 1914</i> or a licence.
<b>wetland</b>	Wetlands are areas that are permanently, seasonally or intermittently waterlogged or inundated with water that may be fresh, saline, flowing or static, and include areas of marine water of which the depth at low tide does not exceed six metres.

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