



From 11:59pm Thursday 15 July, Victoria went into lockdown and new restrictions are now in place. [Learn more](#)



EARTH RESOURCES

Guidelines for the management of water in mines and quarries

1. Background

These guidelines provides basic information for operators on how to manage discharges of wastewater from a mine site to ensure compliance with Victorian legislation. It includes protection of ground and surface water quality for downstream users.

These guidelines are advisory only and is not intended to prescribe exact requirements and practices. They are intended to assist with project specific environmental planning. Note that the information contained within these guidelines also apply to wastewater discharges from quarry operations.

2. Purpose of the guidelines

The purpose of these guidelines is to provide direction for management of Victorian water resources by the mining and extractive industries.

The guidelines list the relevant Victorian legislation that may be associated with a mine water use program. It does not attempt to describe particular designs, methodology or implementation of water management systems. Information of this type is provided by a variety of other publications, some of which are mentioned in the references at the end.

A distinction in terminology is required. For situations of reclamation, reuse or recycling on site (no offsite discharge) the discussion term is water. In any case of offsite discharge, storage or other process, wastewater is the term used.

Mine water management proposals should be based on the principles of waste minimisation, applied through the waste hierarchy listed below.

This means that the proposal should, in order of priority, promote wastewater:

1. Avoidance
2. Reduction
3. Reuse
4. Recycling
5. Recovery of energy
6. Treatment
7. Containment
8. Disposal

Water conservation is part of any sound resource management practice. Whenever possible, a mine or quarry should attempt to close the loop of water use so that a discharge is not required. If a discharge is required, the quality must comply with the applicable Acts and Regulations.

Careful planning and development of an appropriate water management strategy benefits the proponent for a successful mining or quarry project.

Discharge from a mine or quarry must be managed in an effective and responsible manner, resulting in minimal impact on the environment and other beneficial uses.

Proponents are encouraged to discuss their mine water management proposals at an early stage with the Department of Jobs, Precincts and Regions, Earth Resources Regulation.

3. Legislation and policy directions

A range of Victorian legislation applies either directly or indirectly to the management of water at a mine site or quarry.

3.1 *Mineral Resources Development Act 1990 and Extractive Industries Development Act 1995*

The *Mineral Resources Development Act 1990* (MRD Act) encourages an economically viable mining industry to operate in a way that supports environmental, social and economic objectives of the State. These objectives include encouraging and facilitating exploration for minerals while establishing a legal framework that ensures mineral resources are developed using methods and management practices that minimise impacts on the environment.

The *Extractive Industries Development Act 1995* (EID Act) requires the extractive industry to meet safe operating standards and ensures rehabilitation of quarried land to an appropriate, stable landform.

Included in these Acts are requirements for industry operators to prepare and seek approval for a work plan. As the main guidance document, the work plan will describe the management of onsite water use and its context through operation, progressive rehabilitation and closure.

The work plan also outlines monitoring and auditing requirements for each site that will contribute to the water management strategy.

Once approved, the work plan imposes conditions on the activities undertaken in relation to water. The work plan may also include offsite disposal of wastewater with the relevant EPA approvals and licences in place.

A number of additional guidelines providing information about work plans and onsite tailings storage management for mining and extractive industries can found in the [Guidelines and codes of practice](#) section.

3.2 Environment Protection Act 1970

The *Environment Protection Act 1970* (EP Act) is administered by the [Environment Protection Authority \(EPA\)](#) [↗] and covers all aspects of the environment making provision for the establishment of environmental objectives as well as control and licensing of waste discharges.

The EP Act also requires both application of the waste hierarchy and continuous improvement as part of all regulated premises' environmental management processes.

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3.2.1 State Environment Protection Policy (SEPP)
3.2.2 The SEPP Waters of Victoria 2003 (WoV)
3.2.3 SEPP Groundwaters of Victoria 1997
3.2.4 Environment protection (Scheduled Premises and Exemptions) Regulations 1996
3.2.5 Industrial waste management policies

3.3 Catchment and Land Protection Act, 1994 (CaLP Act)

The CaLP Act is administered by the Department of Environment, Land, Water & Planning (DELWP) through Catchment Management Authorities (CMA). CMA are established under the CaLP Act and designed to maximise community involvement in decision making within the integrated catchment management (ICM) structure.

This structure underpins sustainable management of land and water resources and contributes to biodiversity management. The main priorities of CMAs include salinity, weeds, environmental flows, nutrient inflows to streams and declining biodiversity.

CMA comprises a board, implementation committees and support staff. The CMA is responsible for the development and coordination of approved regional catchment management strategies.

These strategies also rely on community involvement in the development of detailed work programs within the catchment. These programs and associated quality outcomes will be taken into consideration by all other agencies during licensing, permitting and other decision making processes.

The CaLP Act applies to the management and protection of water catchments throughout Victoria. Schedule 5 of the CaLP Act lists 124 proclaimed special water supply catchment areas covering a total area of 52,262 km².

Any water or wastewater disposal schemes in these special areas would also be subject to scrutiny by Catchment and Agriculture Services and Land Victoria Division of DELWP to ensure that the values of the water supply catchment are not compromised.

3.4 Water Act 1989

This Act is administered by DELWP and regional water authorities. The Act applies to all surface water in Victoria, including river management, water supply, irrigation and sewerage. Among other things, the Act encompasses:

- environmental flows
- rights to water
- allocation of water entitlements
- issuing of licences
- control of construction of works on waterways
- protection of groundwater
- underground (groundwater) disposal
- waterway management.

As listed in Schedule 12 of the Act, authorities empowered to carry out any function under the Act include:

1. regional water authorities
2. water boards
3. city and shire councils
4. catchment management authorities.

Please take note that for any construction on a waterway, including works to deviate a waterway, whether temporary or permanent, a licence is required.

A licence for construction on a waterway is unlikely to be issued if the dam is to be used for storage of process or recycled water. A water authority may reject a proposal where it is considered that the risks are too high or unlikely to be manageable.

The knowledge base surrounding environmental flow regimes for particular rivers and seasons is growing rapidly. Any proposed change to environmental flows related to water or groundwater extraction and discharge will be considered in the context of Impact on the flow regime.

The *Water Act 1989* also applies to situations where "water" is the primary objective of a drilling program such as a series of aquifer reinjection bores or dewatering bores.

A licence under this Act is required for such bores. This Act applies to the drilling and construction of bores and the licensing of drillers for water drilling.

Drilling to explore for mineral resources is authorised under the *Minerals Resources Development Act 1990* and drillers carrying out mineral exploration drilling do not require licences under the *Water Act 1989*.

The approval and regulation of tailings storage facilities is outlined on the [Environmental guidelines for the management of small tailings storage facilities](#) page.

3.4.1 Water Act (Irrigation Farm Dams) Act 2002

This amendment to the Water Act 1989 requires licensing of all irrigation and commercial use from waterways, springs, soaks and dams. Under these amendments, some previously unlicensed water use for quarries and mines now needs to be licensed.

Operators of quarries and mines are subject to the Act in a similar way to any other commercial users of water.

For example, a licence is required for:

1. the construction of new works on waterways
2. a new private dam constructed off waterways within the criteria specified in the Act
3. wherever water is taken from a waterway and stored in the quarry or mine
4. The intersection of water as defined under the Act also constitutes groundwater extraction for the purposes of dewatering.
 - a. For example, a licence must already be in place during mining or quarrying activities when it is anticipated or possible that groundwater will be intersected.

If in doubt about the need for a licence, it is essential to contact your local water authority for advice.

Some mine and quarry dams would not need a take and use licence. These are:

1. tailings or slime dams
2. settling ponds
3. process dams (in which recycled water from processing is used)
4. dams created after the cessation and closure of mining or quarrying activities.

For further information, proponents should obtain a copy of *Water Act 1989 Guidelines for Quarries and Mines 2004* prepared by DELWP Water Resource Policy Division.

4. Salinity

Salinity is one of the most serious and widely recognised forms of land degradation in Victoria. As of August 2000, DELWP estimated the area affected by salinity to include 140,000ha of irrigated land and 120,000ha of dryland.

As a result, salinity management plans have been developed through consultation between the Government and the community. Any saline water discharges to land or waterways will come under the control of such plans.

If a proponent is planning a mine wastewater disposal scheme in Northern Victoria then additional consultation with the Salinity Management Plan Coordinators from the regional office of DELWP or the local Catchment Management Authority will be necessary to determine whether a salinity management plan is affected.

Salinity is a key issue for mining and extractive industries. SEPP WoV requires that the discharge of saline wastewater, including discharges from groundwater pumping and irrigation drains, should not pose an environmental risk to beneficial uses.

To enable this, all discharge proponents must implement the waste hierarchy to maximise the avoidance, reuse and recycling of saline wastewater before discharging it to surface waters. Where discharge of saline wastewater cannot be practically avoided, reused or recycled, the impact on surface waters needs to be minimised by discharging to artificial drains, evaporation basins or through treatment.

This will reduce risks posed to beneficial uses of the environment.

Any discharge of saline water must also be in accordance with Government approved salinity plans and strategies and the Murray Darling Basin Agreement. Additionally, EPA will not normally approve a saline discharge without a biological assessment of the receiving waters.

Research indicates that aquatic organisms are only able to live in a fairly narrow range of salinities and any significant change in salinity can lead to modification of the species composition of the ecosystem.

As discussed in section 3, the EPA will assess the specific environment, the hydrological regime and the water quality and set discharge limits accordingly.

Limits set for the licence may take into account factors such as the beneficial uses, contaminant loads and background concentrations. Further, EPA may consider allowing a proponent to have a mixing zone where no practical alternative (including application of waste hierarchy) exists.

However, where a mixing zone is allowed, a proponent will be required to develop a plan for continuous improvement aimed at reducing the size of the mixing zone to eventual elimination. Any proposed mixing zone must be discussed as part of the wider community consultation process.

For example, if a mine or quarry dewatering proposal includes discharge of process wastewater upstream of the potable water supply for a community, the existing water quality cannot be changed to any category lower than potable, such as agricultural supply quality.

In this case, reuse, reprocessing or treatment of the waste prior to discharge would be required.

5. Water management strategy components

The proponent needs to ensure that the proposed water management strategy for the mine meets the mining and processing requirements of the project while minimising the environmental impacts of any water management or disposal activities.

Before preparing a water management strategy the proponent should carry out a baseline study of the characteristics of local surface and groundwater and the nature of their beneficial uses.

The scope and content of the baseline study will depend on the proposed management approach and the nature of the effected streams or aquifers. In preparing the proposal, early contact with the MPR, local CMA, EPA and water authority will benefit the proponent's desktop data collection because each agency will have some information relevant to the proposal.

Each proposal must include all potential impacts and control measures or management practices within the strategy. Proponents must adopt the principles of Waste Minimisation in designing water management proposals.

This means that design should incorporate mechanisms for minimal water use, maximum reuse and recycling or onsite disposal such as the evaporation ponds. Ideally, the water management plan goal should be to design a water balance model that achieves a nil discharge of mine wastewater and a reducing use of potable and other supplies.

The following components need to be incorporated into any feasibility study on mine wastewater disposal:

- developed understanding of the receiving water quality
- clear identification of the nature of the downstream water uses
- minimise discharges by maximising use at the mine site, both surface and underground
- waste segregation through separation of clean site water and contaminated wastewater
- location of discharge points to minimise environmental impacts
- monitoring the disposal wastewater volume and quality for compliance with regulations
- monitoring the receiving water quality for compliance with statutory requirements.

Mine wastewater may have a number of contaminants. The discharge of low quality mine wastewater to surface waters will have undesirable consequences such as detrimentally affecting human health, the aquatic ecosystem and agricultural interests.

Water quality is measured in terms of physical and chemical parameters such as:

- temperature
- salinity
- pH
- toxicants (heavy metals, oil and grease, Organochlorines and phosphates, etc.)
- suspended solids (turbidity)
- dissolved oxygen.

In addition to the quality of insitu biological markers like species richness, species diversity and chlorophyll the presence of particular invertebrates is a useful indicator of the health for an aquatic ecosystem.

Instream biological monitoring of water quality has had an increasing role in evaluation of the ecological health of water bodies.

When considering groundwater use, consideration must be given to adverse effects on the water table caused by:

- onsite groundwater extraction (dewatering) with consequent drawdown, or
- mounding through excessive recharge of mine water to an aquifer.

A discharge proposal will be based on the demonstrated application of waste minimisation principles and the capacity to comply with quality parameters outlined by the licensing authority.

This means that the proponent will have to design the most appropriate disposal system for the particular operation and environmental circumstances.

6. Methods of disposal

A mine wastewater disposal feasibility study should also inform the decision regarding which method of disposal is most appropriate for a particular site. Water management may change over time depending on the amount of inflow to the mine, the level of use, evaporation from process dams and unpredictable weather conditions.

These variables must be incorporated into the strategy, particularly related to the choice of disposal method.

Possible methods are discussed below (the methods discussed are "illustrative" only and do not represent a comprehensive list of alternatives). A table showing the approval agency and issues to consider is included in Appendix 1.

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6.1 Containment in dams, tanks and underground tanks
6.2 Evaporation ponds
6.3 Irrigation
6.4 Direct discharge to streams or natural wetlands
6.5 Treatment prior to release
6.6 Recharge to aquifers

7. Environmental monitoring and reporting

The quality and quantity of all discharges must be measured, recorded and reported to the appropriate authorities in accordance with licence and work plan requirements. A mine water management plan will often be required as part of the environmental management plan or work plan for the mine operations.

All mining work plans are required to incorporate an environmental monitoring program. This normally includes monitoring of surface and groundwater parameters showing compliance with the relevant Acts and Regulations relevant to water management at the site.

Typically, a wastewater discharge monitoring program will include taking samples of the discharge wastewater as well as samples of the receiving water (from surface and groundwater), both upstream and downstream of the discharge point.

Sediment samples from upstream and downstream of the discharge point will also be required. Samples will need to be collected before, during and after the life of the mine operation.

A framework for developing a monitoring program should include the following elements:

- Identification of the scope of the program.
- Definition of the objectives of the program.
- Outline of baseline data collection for environment segments to be impacted.
- Determination of water quality indicators to be measured.
- Selection of sample collection sites e.g. surface, groundwater and sediment.
- Determination of monitoring frequency i.e. daily, weekly, monthly, etc.
- Selection of an appropriate testing laboratory (NATA registered).
- Reporting of results, particularly any breach of specified limits.
- Regular audits of the program by an independent body to assess the adequacy and applicability of the program as well as opportunities for continuous improvement.

A properly designed monitoring program will assist the operator to run the mine efficiently while minimising impact on the environment. The data produced may also be important for demonstrating compliance and credibility to the community.

8. Further information

For further information on matters discussed in these guidelines or to discuss a proposal for mine or quarry water management, proponents should [contact us at one of our regional offices](#).

9. References

Australian, New Zealand Australian and New Zealand Guidelines for Environment Conservation Council Fresh and Marine Water Quality 2000

Guidelines for environmental management minerals exploration and mining
Department of Energy

Guidelines for the preparation of work plans

Victorian Department of Jobs, Precincts and Regions, Earth Resources Regulation

Environmental guidelines for management of tailings storage facilities

Victorian Department of Jobs, Precincts and Regions, Earth Resources Regulation

Environment Protection Agency best practice environmental management in Commonwealth of Australia mining:

- Water management. May 1999
- Environmental monitoring and performance. June 1995

State environment protection policy groundwaters of Victoria Dec. 1997

Environment Protection Authority

State environment protection policy waters of Victoria, June 2003

Environment Protection Authority

Stream watch for living streams

Melbourne Water Corporation

Minesite water management handbook

Minerals Council of Australia

Salinity management framework, restoring our catchments, August 2000

Department of Environment, Land, Water & Planning

Salt disposal working group

Victorian manual of salt disposal in the Murray Darling Basin. Oct. 1993

Catchment and Land Protection Act 1994

Environment Protection Act 1970

Mineral Resources Development Act 1990

Water Act 1989

Victorian Government

Victoria's framework for action 2002 native vegetation

Victorian Department of Environment, Land, Water & Planning

Water Act 1989 Guidelines for quarries and mines 2004

Department of Environment, Land, Water & Planning, Water Resource Policy Division

10. List of contacts

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10.1 Rural water authorities
10.2 Catchment management authorities
10.3 Environment Protection Authority offices

Appendix 1: Approvals required for waste water management proposals

Disposal Method	Legislation	Agency	Issue of Concern	Approval
Discharge to surface of land within licence or WA (eg tailings dam, evaporation dam)	MRD or EID Acts Water Act (if construction on a waterway)	DJPR Earth Resources Regulation, DELWP, Regional Water Authority	Design must ensure that there will be no offsite discharge Impacts on downstream water quality	Mining licence or work authority and approved work plan Water Act licence (if construction on a waterway)

Disposal Method	Legislation	Agency	Issue of Concern	Approval
Discharge to groundwater (eg reinjection)	MRD or EID Acts Water Act and EP Act	DJPR Earth Resources Regulation, DELWP, Regional Water Authority EPA	Design ensures management of all likely events Impact on water table level Reduction of groundwater quality	Mining licence, work authority, work plan Water Act licence works approval and waste discharge licence
Discharge to watercourse or natural wetland	MRD or EID Acts EP Act	MRD or EID Acts EP Act	Design ensures management of all likely events Reduction of surface water quality	Mining licence, work authority, work plan works approval and waste discharge licence

Glossary

MRD Act: Mineral Resources Development Act 1991

EID Act: Extractive Industries Development Act 1995

EP Act: Environment Protection Act 1970

Water Act: Regional Water Authority and Department of Environment, Land, Water & Planning (DELWP)

EPA: Environment Protection Authority