

Water Quality Protection Note

Dewatering of soil

Purpose of this note

This agency is responsible for managing and protecting Western Australia's water resources. This note

- offers a considered, timely and consistent view on this issue;
- guides on accepted practices that protect the quality of water resources; and
- provides for future development of an environmental code of practice or guidelines that seek to balance the views of industry, government and the community, while sustaining a healthy environment.

The note advises on how to minimise adverse environmental effects on water resource quality associated with de-watering and the disposal of discharge water. These effects include:

- lowering static watertables in bores used by others;
- impacts on local vegetation and levels of nearby surface water bodies and their ecosystems;
- turbidity and sedimentation in surface water bodies; and
- addition of contaminants such as acidity and metals into waters used for recreation, agricultural and domestic water supplies.

This note is intended as a general guide on issues of environmental concern, and to offer potential solutions based on professional judgement and precedent. Its use does not override any statutory obligation or Government policy requirement. Anyone may propose alternative practical environmental solutions suited to local conditions. The note's recommendations should not be used by regulators in place of a site-specific assessment of a project's environmental risks. Any conditions set should consider the values of the surrounding environment, the safeguards in place, and take a precautionary approach. This note may not be used as this agency's policy position on a specific matter, unless confirmed in writing by an authorised officer. The note may also be varied at our discretion as new data becomes available.

The former State Government agencies *Department of Environmental Protection* and the *Water and Rivers Commission* are presently being combined to form the *Department of Environment*. This process will not be complete until enabling legislation has been passed by Parliament and proclaimed. This note aims to provide a generic 'combined agency' position on the nominated topic.

Scope

These notes apply to de-watering operations that draw water from groundwater seepage, excavations that intersect aquifers or run-off from storm events. The main purpose is to guide the environmental management of de-watering associated with construction sites, however aspects may relate to agricultural land drainage.

Specific advice about mine-site de-watering is available in guideline document *Water Quality Protection Guidelines- Mining and Mineral Processing*. Refer to the Internet site: <http://www.wrc.wa.gov.au/protect/policy/guidelines.htm>

This note is not intended to cover de-watering that occurs during the construction or use of bores that have the primary purpose of soil or groundwater investigation. Special provisions also apply to de-watering at contaminated sites. Proposals involving suspected contaminated sites should be referred to our Land and Water Quality Branch for appraisal and response.

Recommendations

Planning to de-water soil

1. A comprehensive assessment of the potential environmental impacts of de-watering should be undertaken as part of the project feasibility phase, to highlight issues and develop management strategies to overcome issues of concern.
2. The assessment should:
 - a. Define the commencement date, duration, anticipated quantity and frequency of de-water discharge;
 - b. Determine via scientific modelling the radius of influence and profile of any watertable drawdown cone (including threat to any vegetation or existing structures from land settling);
 - c. Determine the quality of water to be discharged, including probable contaminant concentrations based on natural groundwater contaminants and the local land use history;
 - d. Determine whether the soil contains iron pyrites or other characteristics likely to result in acid – sulphate release in de-water. These conditions may be caused when peat swamps are exposed to air after the watertable is lowered. De-water should not take place unless effective measures are taken to prevent acidic water (low pH) causing the release of arsenic or toxic metals into the environment.
 - e. Assess the need and viability of de-water treatment e.g. settling, biological stabilisation, pH adjustment, chemical flocculation or filtration;
 - f. Include a baseline assessment of the receiving environment (before de-watering), including seasonal variability of water flow and quality; and
 - g. Verify that discharge water quality will consistently comply with the indicative criteria set out in **Appendix C**, where de-watering could affect local water resource values. Alternative criteria may be proposed to regulatory bodies for assessment based on-site detailed scientific studies.
 - h. Confirm the results of consultation with any local residents or businesses likely to be affected during de-watering. A contact person should be available during dewatering to manage any issues arising.
3. Discharge of de-water to the environment should not cause any of the following effects:
 - a. Loss of any values of receiving waters or significant threat to those values;
 - b. Harm to native vegetation, or erosion of structures or services;
 - c. Soil erosion or local flooding;
 - d. Sediment build-up in drains, waterways or wetlands;
 - e. Nuisance to the local community e.g. foul odours, impact on plants / properties, or hazards; and
 - f. Loss or reduced flows in public or private water sources.
4. The proponent should prepare and implement appropriate management strategies to address any environmental issues over the life of the project. This should include design measures to minimise the impact of storm water run-off on the de-watering operation.

5. De-watering activities near coastal or estuarine environments should be assessed to avoid the potential to draw salt water into a less saline aquifer.
6. A water abstraction licence may be required in declared *Groundwater Areas* and for use of any artesian bores. Please contact this agency's local office for further information.

Discharge disposal options

7. This agency will oppose de-water discharge that:
 - a. Enters wetlands recognised as Conservation Category or Resource Enhancement, and via Directory of Important Wetlands, Environmental Protection Policies, Ramsar or Register of National Estate;
 - b. Enters poorly defined watercourses, as water may leave the channel, flooding adjoining land and vegetation;
 - c. Compromises the values (beneficial uses) of any surface water or groundwater; or
 - d. Enters watercourses, causing or adding to soil erosion or sediment accumulation problems.
8. Subject to the constraints above, de-water disposal options in order of preference are listed as follows:
 - a. **Recycling** is our preferred option where the water quality is suitable for reuse e.g. for dust control, process circuit water, cooling water systems, wash-down water, or maintenance of vegetation. This is consistent with our philosophy of achieving zero discharge from a site where it is practical and cost effective. The reuse activity must also be accepted by the Department of Health (DH) Local Government Authority (LGA) and this agency.
 - b. **Recharge of local groundwater** is acceptable provided:
 - De-water quality meets the relevant indicative criteria set out in **Appendix C**;
 - There is sufficient area and aquifer capacity to recharge, without risk to native vegetation, wetlands, structures or services;
 - Entrained silt or clay organic material will not clog the recharge area;
 - Recharge will not degrade soil or water resource quality; and
 - Recharge will not lead to local flooding or adverse land surface impacts.
 - c. **De-water use off-site** may be achieved via a written agreement to provide water to a neighbouring site for a specific need. The water quality should consistently meet the quality criteria appropriate for the intended use. The off-site use must be acceptable to the DH, LGA and this agency.
 - d. **Irrigation of vegetated land** is acceptable provided the water quality meets the ANZECC /ARMCANZ 2000 guidelines for irrigation water quality, and the proponent demonstrates that it meets ambient plant evapo-transpiration needs and has no adverse social or environmental impacts.
 - e. **Discharge to nearby surface water** is acceptable provided:
 - The water quality meets the indicative criteria set out in **Appendix C**;
 - Prior written approval is received from the owner/operator of any drainage systems used to convey the de-water;
 - It is approved by other relevant State Government agencies e.g. Departments of Conservation and Land Management (DCLM) and Environment (DoE) in their areas of interest, and meets LGA planning and environmental health requirements;
 - Discharge to the Swan or Canning Rivers is approved by the Swan River Trust; and
 - Discharge to waterways in declared Management Areas (Albany Waterways, Avon River, Leschenault Inlet, and Wilson Inlet (and their respective catchment areas), and the Peel Inlet's environs) is approved by this agency.
 - f. **Storing the water** in a low seepage rate impoundment for evaporative disposal.

9. Other options will be considered on a site-by-site basis and should be referred to this agency for assessment and advice.

Operation and management

10. Where water may contain significant suspended solids, cause turbidity in receiving waters, or contain water of variable quality, the proponent should install and operate a settling basin/ balance tank with a capacity to contain a minimum of 2 hours of de-water prior to release to the environment. Where this is not practical due to lack of space, other forms of solids reduction such as filtration or chemical coagulation should be used.
11. A secondary function of a settling basin is to remove floating matter, and to allow aeration and dissolved iron to precipitate and settle. It may be necessary to dose acidic discharge water with alkalis such as lime to raise pH, and to artificially aerate the water to enhance the removal of iron. Treatments such as chemical dosing with metal salts, followed by settling may be considered if appropriate. Disinfection may be required if the de-water contains significant levels of micro-organisms e.g. where de-water takes place near septic tank systems.
12. The operator should control de-watering so there is no harm caused from changes to:
 - a. the watertable below neighbouring properties, and /or
 - b. the water quality or flow regime of surface water bodies (including wetlands).
13. Any incidental detrimental affects on people, property or water bodies should be immediately and effectively remedied by the dewater operator upon discovery or notification.

Monitoring and Reporting

14. The de-water operator should monitor:
 - a. De-water discharge rate- continuously metered;
 - b. Physical parameters post treatment at settling pond overflow e.g. pH, Electrical Conductivity and turbidity on commencement, and thereafter at a minimum of weekly intervals;
 - c. Site specific chemical and biological parameters post treatment using a National Association of Testing Authorities accredited laboratory on commencement, and thereafter at monthly intervals;
 - d. Static water levels via piezometers in the surrounding watertable to assess draw-down effects (and any possible impacts on structures) at a minimum of monthly intervals; and
 - e. impacts on vegetation, wetlands and water resources by carrying out periodic investigations immediately pre-start, each 6 months after commissioning, and at completion.
15. Records and results of the monitoring program should be retained for up to 2 years, for inspection or reporting on request by government agencies.

More information

We welcome your views on this note. The note will be updated from time to time as comments are received or industry standards change. If you wish to comment on the note or require more information, please contact our Resource Quality Branch at the Hyatt Centre in East Perth.

Phone: (08) 9278 0300 (business hours); fax: (08) 9278 0585; or

E-mail: use the {feedback option} at our Internet site <http://www.wrc.wa.gov.au>; citing the topic and version.

Appendices

Appendix A. - Statutory requirements include:

Table 1	What is regulated?	Statute	Regulatory agency
	Development approval	<i>Town Planning and Development Act 1928</i>	Local government authority
	Impact on values and ecology of natural water bodies.	<i>Environmental Protection Act, 1986</i>	Department of Environmental Protection
	Discharge of water into drainage to and reserves adjoining the Swan– Canning Estuary.	<i>Swan River Trust Act, 1988</i>	Swan River Trust
	Licence to abstract groundwater from declared Groundwater Areas and any artesian aquifer and take water from any proclaimed watercourses.	<i>Rights in Water and Irrigation Act, 1914</i>	Water and Rivers Commission
	De-watering in Public Drinking Water Source Areas (PDWSAs) near Perth.	<i>Metropolitan Water Supply, Sewerage and Drainage Act, (MWSSD Act) 1909</i>	
	De-watering in PDWSAs in country districts.	<i>Country Areas Water Supply Act, 1947</i>	
	Licence to discharge de-water into declared waterways (see Discharge Disposal Options).	<i>Waterways Conservation Act, 1976</i>	
	Approval to discharge water into Water Corporation drainage systems.	<i>MWSSD Act</i>	Water Corporation
	Approval to discharge into local drains in road and drain reserves	<i>Local Government Act 1995 by-laws</i>	Local; Government Authority (council)

Appendix B. - References and further reading

National Water Quality Management Strategy (NWQMS)- Australian and New Zealand Environment and Conservation Council (ANZECC), Agriculture and Resource Management Council (ARMCANZ); National Health and Medical Research Council (NHMRC), Canberra:

1. ARMCANZ & ANZECC- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, 2000.
2. NHMRC & ARMCANZ- *Australian Drinking Water Guidelines*, 1996.
3. Swan River Trust *Guidelines for de-watering activities in the Swan Coastal Plain - Waterways Guidelines No 7*, 1994.
4. Water and Rivers Commission, Department of Environmental Protection, Department of Minerals and Energy - *Water Quality Protection Guidelines- Mining and Mineral Processing*, 2000.
5. Water and Rivers Commission-Water Quality Protection Notes:
 - Aquifer recharge.
6. Department of Agriculture W.A.-Farmnote 20/ 2001 *Groundwater pumping for salinity control*.

Appendix C Indicative criteria for de-water discharge impact on receiving waters

Indicator	Limiting criteria ^{a,b}
pH	Causes the receiving water's seasonal background pH to vary within ± 0.5 units.
Dissolved solids (TDS)	Causes a maximum increase in the receiving water's seasonal background TDS of 10%.
Dissolved oxygen (DO)	Causes a maximum decrease in the receiving water's seasonal background DO concentration of 10%.
Non filterable residue (NFR)- use 45 μm filter	Causes a maximum increase in the receiving water's seasonal background NFR concentration of 10%.
Floating matter/ foam	Causes no visible floating oil, foam, grease, scum, litter or other objectionable matter in the receiving water body.
Sediment	Causes no discernible deposition of sediment that is likely to affect the visual, recreational and ecological values of receiving waters.
Colour and odour	Causes no discernible variation in the colour or odour of the receiving water.
Micro-organisms	As recommended by Department of Health or its delegate, with reference to guidelines for specific water use published by the National Health and Medical Research Council.
Temperature	Causes a maximum seasonal variation of the receiving water temperature of $\pm 2^0$ C
Toxicants (e.g. cyanide, pesticides, heavy metals)	<ul style="list-style-type: none"> Causes a maximum increase in the receiving water's seasonal background concentration of any toxicant of 10%; and Causes a maximum rise in the receiving water's seasonal background concentration of any toxicant to the lesser value of NWQMS ^{e,f}- 75% of guideline criteria for its beneficial uses; or the investigation trigger ^c concentration for protection of 90% ecosystem species.
Nutrients (i.e. plant-available nitrogen or phosphorus)	<ul style="list-style-type: none"> Causes a maximum increase in receiving water's seasonal background nutrient levels of 10%; and For ecosystems in conservation-valued waterways or wetlands: causes the receiving water's seasonal background nutrient levels not to exceed the NWQMS investigation trigger ^{e, c} level criteria for protection of 90% of species.
Radionuclides (maximum activity levels in receiving water)	<p>Non specific radiation emitters:</p> <p>Gross alpha ^d 0.1 Becquerel (Bq) / litre</p> <p>Gross beta ^d 0.5 Bq / L (after subtracting the Potassium 40)</p> <p>(Unspecified alpha & (beta-emitters ^{e,f}) 0.1 milli-Sievert for an individual nuclide</p> <p>Specified radiation emitters:</p> <p>Radium 226 0.5 Bq/L</p> <p>Radium 228 0.5 Bq/L</p> <p>Uranium 0.2 mg/L (equivalent to 0.25 Bq / L)</p> <p>Radon 222 100 0 Bq/L</p>

Notes on Indicative water criteria:

- Any variation from the seasonal background quality levels should be determined as the sum of all inputs to receiving waters.
- Any mixing zone should not exceed 10% of a wetland's seasonal area, nor 10% of any waterway's seasonal width.
- Applies to waters with ecosystems slightly to moderately disturbed by human land-use activities.
- Specific radionuclides and their activity concentrations should be identified if either the gross alpha or beta concentrations are exceeded. If more than one radionuclide is present, the total annual dose from all radionuclides, excluding the dose from potassium-40, should not exceed 0.1 milli-Sievert.
- For detailed evaluations, liaise with regulatory agencies and refer to the NWQMS- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* for non potable water use indicators and methodology for protecting the environmental values applying near industrial sites.
- The NWQMS- *Australian Drinking Water Guidelines* should be used in addition to drinking water sources to assess the risks to other human water usage, in the absence of specific guidance on environmental values/ beneficial uses.