Government of Western Australia
Department of Water

Water quality protection note 27
August 2013

Looking after all our water needs

Liners for containing pollutants, using engineered soils

Purpose

Liners consist of low-permeability barriers that are designed and constructed to control stored liquid leakage. This note describes the attributes of soil liner and construction methods for sealing ponds, mining residue storage areas and other materials-holding facilities, where, if fluid were to escape in sufficient quantities, it could harm water resources. The note only covers contained materials that present a low environmental hazard (i.e. the contaminant would normally be present in the external environment in low concentrations). For higher risk contaminants, a containment system using a synthetic membrane liner or matrix of liners and seepage recovery systems should be used (see Water quality protection note (WQPN) 26 *Liners for containing pollutants using synthetic membranes*). Soil liners are not completely impervious to fluid movement, but provided they are constructed using appropriate materials and engineering, leakage of small quantities of contaminated fluid is unlikely to cause significant water quality impacts.

The Department of Water is responsible for managing and protecting the state's water resources. It is also a lead agency for water conservation and reuse. This note offers:

- our current views on the lining of holding structures with engineered low permeability soils to limit contaminated fluid escape into the surrounding environment
- guidance on acceptable practices used to protect the quality of Western Australian water resources
- a basis for the development of a multi-agency code or guideline designed to balance the views of industry, government and the community, while sustaining a healthy environment.

Appendices provide supporting information to this note, including a description of sensitive water resources, note limitations, intended usage, relevant statutory controls with administering agencies, information for assessment of development proposals and references, disclaimers and feedback advice.

Scope

This note applies to constructed ponds and materials-storage compounds used to contain substances. These substances must present a low hazard to waters should they escape into the environment, due to their nature, mobility or concentration. The substances

include acidic or alkaline waters, animal wastes, brines, low toxicity mineral processing residues, nutrient-rich organic waste, oily wastes, sewage and turbid (soil-laden) waters.

Liners are needed where fluid leakage must be minimised to avoid a measurable impact on nearby surface water or groundwater resource quality, to avoid vegetation damage and protect aquatic plants and animals.

Leakage rates should not cause a discernible change in the background quality of receiving waters and should not harm the containment barrier, the surrounding environment or land uses. The soil liner material may be natural, imported to the site or excavated from a nearby borrow pit, provided it meets the recommended liner properties.

This note does not apply to:

- metal or concrete containment barriers, or synthetic liners such as plastic membranes which are described in our WQPN 26 *Liners for containing pollutants using synthetic membranes* (reference 2)
- toxic or hazardous materials storage (where discernible seepage to the environment is unacceptable)
- settings where natural soil conditions at the site provide an equivalent or better seepage barrier performance than a liner
- single liners for secure landfills, class IV to V (reference 1).

Advice and recommendations

Containment design

1 Selection of an appropriate liner system depends on the hazard posed by the stored material, susceptibility of the liner material to damage by the contained material, anticipated time span for effective containment, local soil conditions, and the vulnerability of the surrounding environment.

   More secure containment structures (such as multi-barrier systems) should be used in sensitive environments and for moderate- to high-hazard material containment. Typically, mining and metal processing residues stored near conservation category wetlands or drinking water sources require more secure containment than animal waste slurry in a low-sensitivity, rural catchment.

   If local soils are highly permeable (such as coarse sand, gravel or karst), a high reliance is placed on the liner to contain fluid movement. Natural soils with fine textures such as clays, silts or non-fractured rock can augment the liner performance.

2 Commonly used soil liner systems consist of:

   a natural in-situ low-permeability soils, grubbed to remove stones and plant roots, ripped and watered to optimum moisture content, compacted then rolled to achieve the final containment structure

   b single-layer liners with material sourced from another location, placed in thin layers, moisture-conditioned, compacted, graded then rolled to achieve water retention

   c multi-layer liners with interstitial granular fluid recovery or seepage monitoring layers.

   Ancillary liner systems may include:

a geo-textiles used to prevent incompatible soils from blending, while allowing the passage of fluids

b contaminant filtering media such as crushed limestone, carbon beds, and sandy loams.

3 All liners should be installed on a stable sub-base. The underside of the lowest liner should be at least 2 m above the highest wet season watertable, unless:

a effective underdrainage measures are installed to prevent upward water pressure on the liner

b the containment does not hold material that relies on natural degradation processes in underlying soils to meet environmental objectives. Allowance should be made for rising or mounding of the watertable resulting from predicted leakage from the containment compound.

4 All lined storage compounds should have internal and external stormwater control facilities to minimise embankment erosion. Compounds should retain sufficient freeboard (at least 50 cm) to prevent unplanned overflow resulting from a 20-year average return frequency storm event (reference 3). The storage compound should also effectively contain the captured rainfall from a 20-year recurrence interval wet season, after allowing for losses via evaporation and seepage and the capacity of any water reuse recovery system used.

5 Lined storage compounds should be located outside flood-prone areas. A freeboard of at least 50 cm above the 100-year average recurrence interval flood level is recommended.

Liner material

6 Soils used for the lining should conform to a design specification for an effective water retaining structure. The soils should be free from plant roots and reactive, soluble and organic matter. Unless this department approves otherwise, the selected liner material should consist of an inert and insoluble blend of sand, clay and silt particles that meet the minimum criteria described in the table below.

Soil characteristic	Acceptability criterion	Test method
Percentage fines	More than 25 per cent passing a 75 micron sieve	Australian Standard (AS) 1289 3.6.1-2009
	More than 15 per cent passing a 2 micron sieve	
Liquid limit	30 to 70 per cent	AS 1289 3.1.2- 2009
Plasticity index	More than 15	AS 1289 3.3.1- 2009
Emerson class number	5 to 6	AS 1289 3.8.1- 2006

7 The liner material should be homogeneous in nature and properties, with no sandy patches exceeding the liner specification or rocks retained on a 37.5 mm sieve. Any non-conforming liner material shall be removed and replaced with conforming soil. Where necessary, soils may be blended or have bentonite clay mixed in to achieve desired uniformity and geo-technical characteristics.

8 The liner material properties should not be altered by acidic or alkaline content of the contained waste. Acidic materials may cause metal oxides in liner soils to dissolve, while alkaline wastes may dissolve silica in the liner, changing the hydraulic conductivity and increasing seepage rates.

Liner construction

9 A competent and experienced geo-technical professional should supervise construction of lined containment facilities.

10 A water allocation licence meeting the provisions of the *Rights in Water and Irrigation Act 1914* may be required to take water from the environment for liner conditioning. For licensing information, contact our nearest regional office.

11 Liners should be installed in at least two layers of equal thickness to ensure adequate compaction is achieved and to minimise the risk of leakage. The thickness of each layer thickness should be matched to the compaction capabilities of the construction equipment (layers may be up to 15 cm at their finished depth). The liner material should be moisture-conditioned to achieve the maximum (in place) design soil density exceeding the 95 per cent maximum dry density (MDD) determined using *AS 1289.5.2.1* (2003) and *AS 1289 5.4.2* (2007) (reference 5).

12 The minimum thickness of the compacted soil liner should be 30 cm. Construction tolerances should be within 5 cm.

13 The completed liner should uniformly cover both the base and perimeter of the storage compound to achieve one integrated holding facility. Particular care (using water stops and spot compaction) should be taken where pipework penetrates embankments to limit the risk of embankment 'piping' or slumping.

14 Suitable graded slopes on embankments, drainage controls and protective covers (such as rip-rap or sprayed concrete) should be used to avoid the risk of slumping and erosion. Internal erosion protection from wave action should be considered where the bank-to-bank width exceeds 50 m.

15 External drainage diversion works should be installed to protect perimeter banks from erosion by stormwater runoff.

16 Erosion controls should be put in place for any stockpiled soils used for containment construction or rehabilitation. Controls should include redirecting stormwater away from soil stockpiles and capturing turbid runoff from the stockpile. Windbreaks, covers or other suitable controls such as sealants or cover crops should be used to prevent stockpiled soil from being blown away.

Liner certification

17 The construction supervisor should conduct appropriate sampling and testing, and certify in writing that the following recommendations were followed:

   a Soil used in the containment lining needs to conform to the design specification for a water retaining structure and the specified liner material characteristics (see *Liner material* recommendations above).

   b The liner should be placed in the design layers matched to the compaction equipment used, moisture-conditioned and compacted (using a 'sheep's foot' roller

with tyne length matched to compacted layer thickness or similar) to achieve the completed liner soil density described above.

c Test cores should be taken from the completed containment compound as follows:

– For a containment compound footprint of less than 1 ha, tests should be conducted based on a four-by-four grid equally spaced over the base of the waste containment area. Figure 1 shows a minimum of five test locations (marked '●').

In addition, one full-depth core test per 30 lineal m of perimeter embankment is recommended. Figure 1 shows a minimum of six equally spaced test locations (marked '⊕').

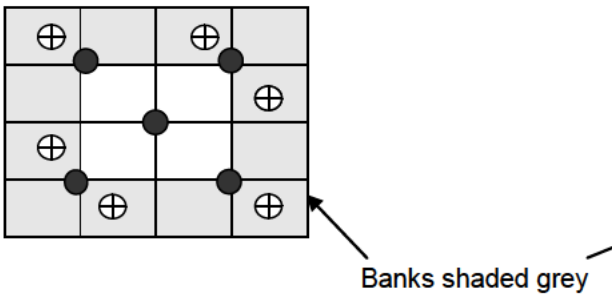


Figure 1

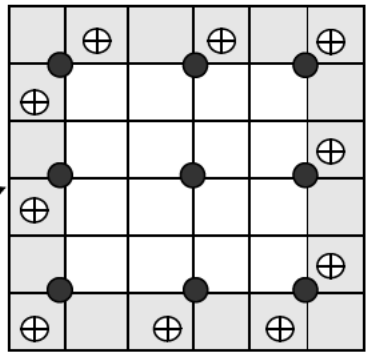


Figure 2

– For containment compound footprints greater than 1 ha, tests should be based on at least an equally spaced six-by-six grid over the base of the waste containment area, with a minimum of one test per 500 m^3 of liner material. Figure 2 shows a minimum of nine equally spaced test sites (marked '●').

In addition, one full-depth core test per 50 lineal m of perimeter embankment is recommended. Figure 2 shows a minimum of ten equally spaced test locations (marked '⊕').

d Each soil sample core needs to be laboratory tested to confirm that the design soil density has been achieved.

e Each soil sample core should have its coefficient of permeability determined (under constant pressure head) via an accredited soil testing laboratory in accordance with *AS 1289.6.7.1* (2001). The maximum acceptable core coefficient of permeability is 10^{-9} m/s when subjected to a 1 m pressure head of water. This equates to a tolerable liner seepage rate of about 3 cm per year.

f If any soil core fails a permeability test, a further sample should be taken from the liner adjacent to the failed core hole and retested. If this second core test fails the permeability limit, the liner shall be reworked until soil core testing indicates the required coefficient permeability limitation has been achieved.

g Core test holes should be refilled with cement slurry, bentonite or other suitable sealant.

h Adequate care needs to be exercised with embankments to achieve:

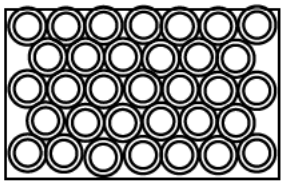
- a low-permeability seal integrated with the base liner
- erosion resistance and resistance to the threat of slumping or piping failure. For slopes, this involves placing extra fill and cutting back to design dimensions. Special attention should be given to sealing any pipework that penetrates external embankments, by installing water stops.

i The completed containment facility should be proof-tested to confirm initial seepage from each containment module is less than 4 kL/ha/day of contained area under 1 m water pressure (head) 24 hours after flooding.

Liner integrity protection

18 The base of the containment area should be flooded on completion (where practical). Water cover or moisture conditioning maintained with sprinklers should be used to avoid shrinkage, cracking and consequent loss of seal. Alternatively, where there is insufficient available water, a continuous plastic membrane or a 15 cm deep coarse granular cover may be used. This cover should be maintained until stored material is introduced in sufficient quantities to prevent shrinkage of a dry soil liner.

19 Where there is a need to periodically remove stored material by mechanical means, protective measures should be in place to avoid liner damage. One option is to provide a granular or crushed rock to a depth of at least 30 cm to cover the liner. Another option is to create a soil-filled layer of used tyres. The tyres need to be laid flat and packed closely. Typical tyre layout when shown from above:



Drainage controls

20 Where contained material with high moisture content requires consolidation, a piped subsoil drainage system set in granular material above the base liner is recommended. This system should drain seepage to a lined holding pit outside the containment for water recycling or evaporative disposal.

21 If pipework penetrates the perimeter containment embankments, then control measures (such as grouting) may be necessary to prevent seepage along the exterior of the pipes resulting in escape of contaminants or potential embankment failure.

22 Any sub-soil drain system should be designed to resist silt intrusion (by surrounding with crushed rock or a filter fabric, for example) and have accessible ports for maintenance clean-out, via flushing or rodding.

Containment integrity monitoring

23 External monitoring facilities (such as slotted casing monitoring bores) may be required to assess changes in local groundwater quality and the watertable level occurring beneath the containment facility. WQPN 30 *Groundwater monitoring bores* provides guidance on monitoring facilities (reference 2).

24 Data gathered on contaminant leakage and any groundwater mounding should be held by the facility operator for a minimum of two years after collection. If requested, monitoring data should be supplied to regulatory authorities.

Appendix A: Information on sensitive water resources, note limitations and updates

Sensitive water resources

Our water resources sustain ecosystems, aquatic recreation and aesthetic values as well as providing drinking, industry and irrigation supplies. Along with breathable air, uncontaminated water is essential for viable communities. Natural water resources should remain within defined quality limits to retain their ecological, social and economic values. Hence they require appropriate protection measures to minimise contamination risks.

Information on water quality parameters and processes to maintain water values are published in the Australian Government's National Water Quality Management Strategy papers. These papers are available online at <www.environment.gov.au> select *water > water policy and programs > water quality.*

The Department of Water strives to improve community awareness of catchment protection measures (for both surface water and groundwater) as part of a multi-barrier protection approach to sustain acceptable water resource quality. Human activity and many land uses pose a risk to water quality if contaminants in significant quantities are washed or leached into water resources.

Sensitive waters include estuaries, natural waterways, wetlands and groundwater. These waters support one or more of the environmental values described below.

Public drinking water sources

Overview

Public drinking water source area (PDWSA) is the collective name given to any area proclaimed to manage and protect a community drinking water source. PDWSA include underground water pollution control areas, water reserves and catchment areas administered by the Department of Water under the provisions of the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947*.

For online information on the location of PDWSA, see <www.water.wa.gov.au> select *tools and data > maps and atlases > geographic data atlas*, then open *environment > public drinking water source areas.*

Within PDWSA, priority areas are defined (P1, P2 or P3) via publicly consulted drinking water source protection plans or land use and water management strategies. Priority areas are used to guide land planning, rezoning and development approval processes. Priority areas are assigned considering the current local planning scheme zoning, land tenure, the water source's strategic value and its vulnerability to harm. Each priority area is managed using a specific risk-based strategy to provide for effective water resource protection. The Department of Water develops these documents in consultation with other government agencies, landowners, industry and the community.

P1 areas are defined to ensure human activity does not degrade a water source. These areas are declared over land where the provision of high-quality drinking water for public

use is the primary beneficial land value. P1 areas typically cover land controlled by the state government or one of its agencies. These areas are managed under the principle of *risk avoidance*, so most land development and human activity is normally opposed.

P2 areas are defined to ensure there is *no increased risk of pollution* to the water source once a source protection plan has been published. These areas are declared over land where low-intensity development exists (involving rural usage such as dry land grazing or cropping). Protection of public water supply sources is a high priority in P2 areas. These areas are managed in accordance with the principle of *risk minimisation*, and so the intensity of development should be restricted (via management conditions) and activities with a low water contamination risk are normally considered acceptable.

P3 areas are defined to *manage the risk of pollution* to the water source. These areas are declared over land where public water supply sources must co-exist with other land uses such as residential, commercial and/or light industrial development. Protection of P3 areas is mainly achieved through land use management measures e.g. contamination barriers. Environmental guidance (such as these notes) or site-specific development approval conditions are used to limit the water resources contamination risk from the land use or activity. If, however, the water source becomes contaminated, then water supplied from P3 sources may need to be more intensively treated or an alternative water supply source commissioned.

Additional protection zones are defined close to the point where drinking water is extracted or stored. These zones are called *wellhead protection zones* (WHPZ) and *reservoir protection zones* (RPZ). Statutory land use constraints apply to activities within these zones surrounding sources to safeguard these waters most vulnerable to contamination.

WHPZ are assigned around water production wells based on hydrological factors. Statutory land use restrictions apply within these zones as groundwater moves rapidly towards wells due to aquifer depressurisation by pumping. Any contaminants leaching from the ground surface in a WHPZ could rapidly migrate into scheme water supplies (before effective remedial action can occur). In sedimentary basins, WHPZ are usually circular, with a radius of 500 metres in P1 areas and 300 metres in P2 and P3 areas. These zones do not extend outside PDWSA boundaries.

RPZ are defined over and around public water supply storage or pipe-head reservoirs. Statutory access and land use restrictions apply in RPZ. The aim is to restrict the likelihood of contaminants being deposited or washing into water sources in any runoff. RPZ are normally within state-controlled areas encompassing land up to two kilometres measured outward from the reservoir top water-level and include the inundated area when the reservoir is full.

For additional explanatory information on PDWSA, see WQPN 25 *Land use compatibility in public drinking water source areas,* WQPN 36 *Protecting public drinking water source areas,* WQPN 75 *Proclaimed public drinking water source areas,* WQPN 76 *Land use planning in PDWSA* and WQPN 77 *Risk assessment in PDWSA.* These notes are available online at <www.water.wa.gov.au> select *publications > find a publication > series browse.*

Established activities within PDWSAs

Many land use activities were approved and established before publication of a source protection plan or land use and water management strategy.

Activity operators should ensure that modern environmental facilities and practices are progressively implemented and maintained so that the water resource contamination risk is minimised (within practicable and economic constraints).

New or expanded activities in PDWSA

Any development proposals that could affect a drinking water source should be referred to this department's local regional office with detailed supporting information for an assessment and written response.

The development proposal may be:

- approved (with or without conditions)
- delayed pending receipt of additional information before a decision is made; or
- opposed due to a statutory or policy conflict or inadequate protective measures provided to safeguard the water source.

To assist the assessment, operators should demonstrate that under all operating conditions the facilities and processes used on-site do not pose a significant water contamination risk.

Buffers to water supply sources

Native vegetation buffers should be used to separate compatible land use areas from the sources of drinking water including the full supply margins of reservoirs, their primary feeder streams and/or production bores. Advice on suitable buffer forms and dimensions is provided in WQPN 6 *Vegetated buffers to sensitive water resources*.

Within clearing control catchments

Controls on vegetation clearing for salinity management in country areas are provided under part IIA of the *Country Areas Water Supply Act 1947*.

These controls apply in the Wellington Dam, Harris River Dam, Mundaring Weir and Denmark River catchment areas and the Kent River and Warren River water reserves.

Details of clearing controls may be obtained from our regional offices, see online information at <www.water.wa.gov.au>, select *Contact us*.

Private water supply sources

Private water sources vulnerable to contamination include:

- drinking water sources for people or domesticated animals
- commercial or industrial water supply sources (requiring specific qualities that support activities such as aquaculture, cooling, food and mineral processing or crop irrigation)
- urban or municipal irrigation sources (where water quality may affect vegetation performance or people's health and wellbeing).

Underground ecosystems

Important underground ecological functions that may be at risk of contamination include groundwater- and cave-dwelling animals and microorganisms (generally located within soils that have open pore spaces such as sand, gravel and limestone).

Waterway ecological and social values

Waterways that have high social and conservation significance are described in the Western Australian Environmental Protection Authority (EPA) Guidance statement 33 *Environmental guidance for planning and development*, section B5.2.2. This statement is available online at <www.epa.wa.gov.au> select *policies and guidelines > environmental assessment guidelines > guidance statements.*

The Department of Water manages natural waterways under Section 9 of the *Water Agencies (Powers) Act 1984* and the *Rights in Water and Irrigation Act 1914*. For online information, see <www.water.wa.gov.au> and select *managing water*. Apart from aquatic ecosystems and water sources, waterways provide social values including aesthetic appeal, drainage pathways and recreational opportunities for watercraft use, fishing, tourism, swimming and related aquatic activities. Engineered drains and constructed water features are normally not assigned ecological values because their primary function and operational factors outweigh their ecological value.

This department also administers the *Waterways Conservation Act 1976* which defines Western Australian waterways subject to specific regulatory controls. Currently proclaimed waterways include the Avon River, Peel-Harvey Inlet, Leschenault Inlet, Wilson Inlet and Albany waterways management areas.

Within the Swan-Canning Estuary catchment

The Swan River Trust is responsible for the protection and management of the Swan-Canning River system. The trust safeguards ecological and social values under the *Swan and Canning Rivers Management Act 2006.* Written approval is needed for any land- or water-based development within the Swan, Canning, Helena or Southern rivers and their associated foreshore areas within the *Swan River Trust development control area (DCA*). Human activity and development close to these areas are likely to have an effect on the waters of the river system. Development proposals within or abutting the DCA should be referred to the trust for assessment.

Developments outside the DCA, but near river tributaries or drainage systems should also be referred to the trust for assessment and advice. This is because water quality within the area may be affected by chemicals leached into groundwater flow. For detailed information, see online advice at <www.swanrivertrust.wa.gov.au>, phone 9278 0900 or email: planning@swanrivertrust.wa.gov.au .

Wetland ecology

Many important wetlands have been given conservation status under the Ramsar Convention (described online at <www.ramsar.org>), Japan and Australia migratory bird agreement (JAMBA), China and Australia migratory bird agreement (CAMBA), and Republic of Korea and Australia migratory bird agreement (ROKAMBA).

Wetlands are also protected under various national and Western Australian government policies. Conservation wetland data to guide land planning and development activities is provided via the following publications:

- *Directory of important wetlands in Australia* defines wetlands scheduled by the Australian Government. It is available online at <www.environment.gov.au> select *water > water topics > wetlands.*

- Wetlands with defined high conservation significance are described in the EPA (WA) guidance statement 33 *Environmental guidance for planning and development* (section B4.2.2). This statement is available online at <www.epa.wa.gov.au> select *policies and guidelines > environmental assessment guidelines > guidance statements.*

The Department of Parks and Wildlife is the custodian of the state wetland datasets, and is responsible for maintaining and updating relevant information. These datasets are available online at <www.dpaw.wa.gov.au>.

Wetlands datasets identified for conservation value or for resource enhancement include:

- Geomorphic wetlands of the Swan Coastal Plain
- South coast significant wetlands
- Geomorphic wetlands Augusta to Walpole (this dataset awaits detailed evaluation).

Wetlands that are highly disturbed by land use, or have been landscaped to provide a social amenity or drainage control function in urban settings, may not be assigned conservation values unless they are actively managed to maintain these values.

Note limitations

Many Western Australian aquifers, waterways and wetlands await detailed scientific evaluation, present data on their quality is sparse and their values remain unclassified.

Unless demonstrated otherwise, any natural waters that are slightly disturbed by human activity are considered to have sensitive environmental values. Community support for these water values, the setting of practical management objectives, provision of sustainable protection services and effective implementation are vital to protecting or restoring water resources for both current needs and those of future generations.

This note provides a general guide on environmental issues, and offers solutions based on data searches, professional judgement and precedents. Recommendations made in this note do not override any statutory obligation or government policy statement. Alternative practical environmental solutions suited to local conditions may be considered. This note's recommendations shall not be used as this department's policy position on a specific matter, unless confirmed in writing. In addition, regulatory agencies should not use this note's recommendations in place of site-specific development conditions based on a project's assessed environmental risks. Any regulatory conditions should consider local environmental values, the safeguards in place and take a precautionary approach.

Where a conflict arises between this note's recommendations and any activity that may affect a sensitive water resource, this note may be used to assist stakeholder negotiations. The negotiated outcome should not result in a greater water quality contamination risk than would apply if the recommended protection measures were used.

Water quality protection note updates

This note will be updated as new information is received, industry/activity standards change and resources permit. The currently approved version is available online at <www.water.wa.gov.au> select *publications > find a publication > series browse > water quality protection notes.*

Appendix B: Statutory approvals relevant to this note include:

What's regulated?	Western Australian statutes	Regulatory body/ agency
Licensing of prescribed premises	*Environmental Protection Act 1886),* Part V Environmental regulation	Department of Environment Regulation <www.der.wa.gov.au>
Management of human wastes Community health issues	Health (treatment of sewage and disposal of effluent and liquid waste) Regulations 1974	Department of Health <www.health.wa.gov.au> Local Government (council)
Transport, storage and handling of fuels, solvents, explosive and other dangerous goods	*Dangerous Goods Safety Act 2004* Dangerous goods safety regulations 2007	Department of Mines and Petroleum – Resources Safety Division <www.dmp.wa.gov.au>
Industrial sites in existing public drinking water source areas	*Metropolitan Water Supply, Sewerage and Drainage Act 1909* *Country Areas Water Supply Act 1947*	Department of Water - regional office <www.water.wa.gov.au>
Taking water from the environment in proclaimed areas (water allocation licensing)	*Rights in Water and Irrigation Act 1914*	
Emergency response planning	*Fire and Emergency Services Authority of WA Act 1998*	Department of Fire and Emergency Services <www.dfes.wa.gov.au>
Assessment of the environmental impact of significant development	*Environmental Protection Act 1986,* Part IV – Environmental impact assessment	Minister for the Environment, advised by the EPA <www.epa.wa.gov.au>
Land zoning and development approval	*Planning and Development Act 2005*	Western Australian Planning Commission Department of Planning <www.planning.wa.gov.au> Local Government (council)

Relevant statutes are available from the State Law Publisher at <www.slp.wa.gov.au>.

Appendix C: Data needed to support project assessments

Where facilities near sensitive waters are to be constructed or upgraded, the following data should be supplied with the development proposal:

1 Site owner/ operating tenant's name and contact details.

2 A site plan showing the location of the project facilities relative to tenements, leases, lots and roads. The plan should show the topography, any remnant vegetation cover, existing and proposed development areas and onsite water features and sources.

3 Details of site investigation of soil strata, depth to water table (if applicable) and data on the location, extent, hydrology, quality and dependencies on local water resources (including any seasonal variations) that could be affected by site facilities or operations.

4 The present local government planning scheme land use zoning (where applicable). Current land use description, any site contamination history and its remediation.

5 Full description and scale of the activities planned for the project site, (including any site amenities, infrastructure, crops, animals, earthworks and chemical applications), construction and operating workforce and planned project operational life.

6 Describe the intended commissioning date, operating hours and any expansion options.

7 Details of any proposed vegetation clearing, environmental buffers, site earthworks and services, including water supply, sewerage and drainage provisions.

8 Description of all materials/ chemicals to be stored or handled on site in commercial quantities, including a water use budget.

9 Description of the types, quantities and quality of solid and liquid waste (if applicable) that will be generated at or disposed from the facility.

10 Description of planned material containment, waste management (treatment and disposal) and water recycling; with an environmental management plan and nutrient and irrigation management plan (where applicable)

11 Details of any environmental modelling conducted or planned monitoring system to demonstrate the effects of the project on local water resources

12 Planned operational and equipment maintenance procedures.

13 Details of any contingency measures proposed to minimise the impacts of chemical spills and safely dispose of contaminated waters that may result from storms, fire, flood, equipment malfunction or vandalism. Information should include workforce training, site monitoring and emergency response facilities.

14 Any project contractual agreements or regulatory approvals received.

For significant projects, development proponents should engage the services of a qualified and experienced consultant to professionally prepare their development proposal. This should ensure that government agencies can efficiently assess and respond to the proposal without delays caused by inadequate or poorly defined information.

References and further reading

1 Previous Department of Environment and Conservation (WA) publications:

Landfill waste classification and waste definitions 1996 (as amended), <www.der.wa.gov.au>.

2 Department of Water (WA) water quality protection notes (WQPN) available online at <www.water.wa.gov.au> select *publications* > *find a publication* > *series browse* > *water quality protection notes*

a WQPN 26 *Liners for containing pollutants, using synthetic membranes*

b WQPN 30 *Groundwater monitoring bores*

c WQPN 39 *Ponds for stabilising organic wastes*

d WQPN 111 *Landfills for the disposal of putrescible materials*

3 Engineers Australia publication available for purchase at <www.engineersmedia.com.au> search *EA books*

Australian rainfall and runoff (current edition).

4 Price, R. E. & Williams, D.J. *Geomembrane lining systems*, proceedings of the third international conference on environmental issues and waste management in energy and mineral production1994, pp. 573–577, Curtin University of Technology, Perth, WA see < www.curtin.edu.au >.

5 Standards Association of Australia publications available for purchase at <www.saiglobal.com> select *publications*

a AS 1289 *Methods of testing soil for engineering purposes*

b AS 1726 *Geotechnical site investigations.*

6 United States Environmental Protection Authority publication, see <www.epa.gov> *Proposed guide for industrial waste management for public comment* (EPA530-R-99-001) Washington DC 1999.

Disclaimer

Feedback

We welcome your thoughts on this note. Feedback will help us prepare future versions.

To comment on this note or seek any clarification, please contact our water source protection planning branch (details below), citing the note topic and version.

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To locate our regional offices online, see www.water.wa.gov.au, then select *Contact us*.

This publication is available online at <*www.water.wa.gov.au*> select *Publications > find a publication > series browse > water quality protection notes*. For those with special needs it can be made available in alternative formats such as audio, large print, or Braille.

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