



WQPN 44, OCTOBER 2006

Roads near sensitive water resources

Purpose

Roadways and their associated drainage and bridge works are vital links in the economic and social life of our communities. They require good site selection, planning and construction, maintenance and incident management during their operational life to limit the risk of harm to water resources. Environmental issues include land clearing, minimising turbidity and petroleum derivatives in stormwater run-off, solvent loss from bitumen preparation, spread of vegetation dieback disease, chemical spills due to transport accidents, pollutants from maintenance and clearing activities, and environmental damage caused by those who access sensitive water resources via the road. Use of effective pollution prevention and risk management measures during the design, construction, operation and maintenance of roadways can help minimise water contamination problems.

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:

- the Department's current views on road siting, construction and management;
- guidance on acceptable practices used to protect the quality of Western Australian water resources; and
- 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.

This note provides a general guide on issues of environmental concern, and offers potential solutions based on professional judgement and precedent. The recommendations made do not override any statutory obligation or Government policy statement. Alternative practical environmental solutions to suit local conditions may be considered. Regulatory agencies should not use this note's recommendations without a site-specific assessment of any project's environmental risks. Any conditions set should consider the values of the surrounding environment, the safeguards in place, and take a precautionary approach. The note shall not be used as this Department's policy position on a specific matter, unless confirmed in writing.

Scope

This note applies to all new or upgraded roadways (sealed or unsealed) and associated works such as bridges and drainage that could affect sensitive water resources (see description in [Appendix C](#)). The note aims to cover all phases of the lifecycle of a roadway, including feasibility studies and planning, construction, operation and maintenance, and potential closure followed by environmental restoration.

The note covers roadways used by motorised vehicles only. Walk-ways, stock routes, cycle paths, and bridle trails are excluded.

Recommendations

Location of roads

Harmony with the local environment

1. Roadways, with any associated drains and bridges should (if practical) blend into the natural landscape and morphology of the site. Waterway and wetland crossings should be avoided or at least minimised. Necessary crossings should create the least practical interference with the natural flow and aquatic habitat of surface waters. Environmental features need careful consideration when planning for roadways, eg, drainage patterns, ecosystems, fauna habitats, local climate, existing land uses, soil types, topography and vegetation cover.
2. Clearing of vegetation and reshaping land should be minimised, and vegetated buffers to sensitive water resources should be preserved. These fringing buffers provide vital water quality benefits (eg filter for sheet stormwater run-off and help maintain water body ecology). Areas susceptible to erosion or sedimentation should be avoided as harm to local water resources may result. Other aspects that need to be addressed include managing plant disease risk eg *Phytophthora cinnamomi* in the southwest of the State, and degradation of remnant native vegetation by weed invasion and human contact.

Buffers to sensitive water resources

3. Perennial indigenous vegetation buffers should be retained or re-established between any roadway and sensitive water resources. Appropriate buffers reduce the immediate contamination risk to water resources by acting as stormwater contaminant filters and allow time for effective remedial action in the event of a chemical spill incident. These buffers may need to be supported by other protective measures eg roadside hollows to capture chemical spills along designated industrial transport routes. The buffers should be wide enough to be self sustaining, and (where practical) fenced to exclude people, vehicles and stock intrusion. For more information, see this Department's Water Quality Protection Note *Vegetation buffers to sensitive water resources* (see [Appendix A, Reference 5b](#)).

Protection of waterway and wetland vegetation

4. Where the footprint of roads and bridges may affect waterways or wetland buffer vegetation, they should be relocated or if this is impractical, the impact minimised. Fringing buffers provide significant water quality benefits through their ability to sustain aquatic ecosystems and filter pollutants in stormwater run-off. Roadways should therefore be placed sufficiently high in the landscape to permit retention of waterway or wetland vegetation, and allow for the effective operation of contaminant filter and sediment control functions.
5. Public roads near sensitive water resources should be located on land zoned as a road reserve by the Department for Planning and Infrastructure, the Department of Land Administration or the Local Government Authority (LGA).

Consultation

6. This Department and the community should be consulted when any roadways are proposed through or near any potentially sensitive water resources.

This ensures that transport corridors are negotiated well in advance of road construction; so they are suitably located, constructed, and can be operated and maintained with an appropriate balance of environmental, as well as social and economic considerations. Any road-works proposed within 200 metres of a sensitive water resource should be referred to this Department's regional office for assessment, with supporting information addressing how the environmental risks will be managed.

Within Public Drinking Water Source Areas (PDWSA)

These are areas declared for the management and protection of water sources used for public drinking water supply. They are proclaimed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947*. PDWSA include Underground Water Pollution Control Areas, Water Reserves and Catchment Areas.

7. Within Priority 1 (P1) areas, well-head and reservoir protection zones defined in Drinking water source protection plans, this Department normally opposes new roads, as they are incompatible with the risk avoidance strategy used to protect water sources. Roads may occasionally be approved with conditions, where the proponent shows that the road is needed to either lessen problems posed by present local transport routes or is vital to the State's interests.
8. Within Priority 2 (P2) areas, this Department normally gives conditional approval to road developments, provided the proponent demonstrates the road will not cause an increased risk to water resource values. The conditions of approval should be designed to minimise the water contamination risks. Road-works in P2 areas should provide for both optimum traffic safety and minimal risk of environmental impacts eg from chemical spillage due to transport accidents.
9. Within Priority 3 (P3) areas, roads are compatible with this Department's source protection strategy provided best industry design and construction practice is followed. These notes propose best environmental practice options for roadways.
10. Road developers should use scientific investigation and potential contaminant movement modelling to define protective buffers to water source reservoirs, bores and wells. The model should take the following into account:
 - a. the properties of any likely water contaminant (including its initial concentration, solubility and degradation potential);
 - b. method of contaminant movement and probable duration between its release point and the water supply source under a variety of weather scenarios;
 - c. local meteorological data;
 - d. potential for vegetation and soil filtering, bio-chemical attenuation processes along the contaminant travel pathway, and any synergistic effects in the environment; and
 - e. the receiving water quality regime and requirements to sustain its present usage and a suitable factor of safety so that the model is conservative.

Such modelling does not override any statutory controls or Departmental policy position related to protection of public water supplies.

11. Under some circumstances it may be impractical to carry out the scientific studies recommended above eg for small-scale developments or for severely disturbed buffer zones. In such cases the default separation distance from road-works (where conditional or compatible) should be at least 100 metres to drinking water source bores, the full supply level of storage reservoirs and their feeder streams.

Near conservation valued wetlands

12. Roadways and associated facilities, eg parking bays, should not be constructed through or within natural wetlands with recognised or probable conservation values, or their fringing vegetation buffer.
13. Any proposed road development that is likely to have a significant effect on the values of a wetland or its vegetation buffer should be referred to the Environmental Protection Authority (EPA) in accordance with Section 38 of the *Environmental Protection Act 1986* for possible environmental impact assessment. Where passage through a wetland is unavoidable, a target of no change in its function should be achieved through offsets eg enhanced protection of a nearby equivalent wetland or a constructed extension to the affected wetland to provide the same values and area (see [Appendix A, Reference 3](#) for details of related EPA documents). For additional information on wetland management categories, boundaries and buffer determination, see [Appendix A, Reference 4a](#) and [Appendix C](#).
14. A wetland buffer helps to maintain vital ecological processes and functions, and protect the wetland from potential harm. To sustain the wetland it is important to determine, safeguard and effectively manage these buffers. The local regional office of the Department of Environment and Conservation can provide detailed information on defining and protecting wetlands.

Near Environmental Protection Policy wetlands

15. The *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* and *Environmental Protection (South West Agriculture Zone Wetlands) Policy 1998* prohibit the unauthorised filling, mining, drainage change, and effluent discharge into lakes, under Part III of the *Environmental Protection Act 1986*. Roadways must not be constructed through, or otherwise harm such wetlands, unless approved either by the Minister for the Environment on the advice of the EPA or the Department of Environment and Conservation.

Near conservation valued waterways

Five Waterways Management Areas have been declared under the *Waterways Conservation Act 1976* to protect specific estuaries and their associated waterways that are considered especially vulnerable to degradation. These are the Albany Waterways, Avon River, Leschenault Inlet, Peel-Harvey, and Wilson Inlet Management Areas.

Many other waterways while not protected by the *Waterways Conservation Act*, have valuable ecological and social values that should be retained or are being restored with the guidance of Natural Resource Management regional groups where degraded (see www.nrm.org.au).

16. If a road development is located within a Waterways Management Area, or may have an effect on any natural waterway or its fringing vegetation, the proponent should consult with this Department's regional office on appropriate measures to minimise ecological damage and water contamination risks during the construction and subsequent operation of the road.
17. Apart from essential waterway crossings, roads and their engineered drainage system should be positioned (if practical) outside the bounds of waterways and associated fringing vegetation.
18. To protect waterways and their associated riparian area, a foreshore area or waterway buffer should be determined based on an assessment of the biological and physical features associated with the waterway, its values and pressures, as outlined in the Department of Water's *Foreshore Policy 1 - Identifying the Foreshore Area* (WRC, 2002). The features to be used in the assessment are known as *bio-physical criteria* (see [Appendix A, Reference 5c](#)).

This approach to buffer setting allows flexibility and site-specific decision-making by considering a range of criteria and allows for negotiated outcomes, rather than using a standard buffer distance that may not match the local conditions. This is considered a sustainable approach to waterway management that does not restrict the social and economic opportunities for waterways, and protects their ecological values.

19. Details of how to use biophysical criteria to determine the size or width of a foreshore area or waterway buffer, including the underlying rationale, can be found in the Department's Water Note 23 *Determining Foreshore Reserves* (WRC, 2001), see [Appendix A, Reference 5c](#). The onus is on the development proponent to demonstrate and justify the process and outcome of defining an appropriate 'foreshore area' on a site-specific basis.

Within the Swan River Trust management area

20. The Swan-Canning estuary and abutting reserves are managed by the Swan River Trust using the *Swan River Trust Act 1988*. Written approval from the Trust is necessary for any land or water-based development that may have an effect on the estuary.

Other location constraints

21. A minimum vertical separation distance of two metres from the road sub-base to the high (wet-season) water table should be retained for free-draining soils, to avoid waterlogging and allow for soil filtration of potential contaminants and aerobic microbial action.

Native vegetation

22. The clearing of native vegetation is regulated under the *Environmental Protection Act 1986* and *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. The Department of Environment and Conservation is responsible for administering this legislation, which prohibits clearing of native vegetation, unless for an exempt purpose or where a clearing permit has been granted. Exemptions under the regulations do not apply in gazetted environmental sensitive areas (see [Appendix A, Reference 4c](#) and [Appendix B](#)).

Approval for development or upgrade of roads

23. For summary details of approvals; relevant statutes and managing agencies, see [Appendix B](#).

Road design

24. Roads (where practical and in accord with safe design standards) should closely follow the land contour to minimise the extent of cut and fill that may alter natural water movement patterns or require extensive artificial drainage works. The design should avoid impact on waterways and wetlands, especially those with recognised conservation values.

25. Road-works that must cross waterways and wetlands should:

- a. not change natural hydrological regimes or cause storm event flooding of upstream land. For sites with semi-perennial water, bridges are preferred to fords, pipe-work or box culverts due to less interference with flow regimes and aquatic habitat;
- b. replicate where practical the natural cross-sectional area and shape of the waterway or wetland so that flows are not concentrated or flooding risk increased. Summary information on the road crossing hydraulic calculations and backwater impacts should be provided to this Department with any development submission;
- c. avoid creating barriers or impediments to migration of aquatic fauna. The number, size, shape and location of any necessary culverts should be selected to minimise the impacts on aquatic habitats.

Techniques, such as ensuring sufficient light entry in crossings and fitting rock baffles or other flow velocity controls along the base of culverts, may be used to facilitate fish passage. Fish-ways or fish ladders should also be installed to allow migrating fish to overcome constructed barriers in their path. Several types of fish-ways can be built to provide passage along the length of the river. For more information see the Department's Water Note 26 *Simple fish-ways* (WRC, 2002), see [Appendix A, Reference 5c](#) or contact our nearest regional office;

- d. avoid (where practical) alteration to natural waterway and wetland geomorphology (including beds and banks) and ensure unnatural sedimentation is prevented;
- e. incorporate measures to prevent significant erosion of waterway or wetland banks;
- f. avoid crossings at channel bends or at angles much less than 90 degrees to the main flow channel; and
- g. avoid meandering or dynamic waterways where the channel change process is active and is likely to continue in the future. Crossings interfere with this natural process of meander progression and structural damage to bridges may occur, as well as increased channel erosion.

See [Appendix D](#) for a diagram illustrating environmental protection measures at waterway and wetland crossings.

26. The following measures should be used (where practical) near sensitive water resources to limit the risks and effects of transport accidents, especially where traffic densities may be high:

- a. sight distances (horizontal and vertical visibility) should be suited to the intended road use, seasonal weather patterns and designated vehicle speed limits;
- b. slow vehicle passing lanes installed on major transport routes;
- c. advisory and hazard warning signs installed and maintained, however erection of distracting advertising signs should be avoided;

- d. broad road shoulders installed to allow an emergency stopping place for vehicles;
- e. provide suitable carriage-way buffers to trees and service poles, especially on bends;
- f. intersections minimised, with turnout lanes, median strips and roundabouts used;
- g. reflective road markers and vibration strips used to define lanes and indicate deviations on tourist and transport routes; and
- h. where gradients are steep, install and maintain robust perimeter guard rails and heavy transport arrester beds.

Unpaved roadways

27. These should be avoided where practical, as they require regular maintenance to limit the risk of traffic accidents and often generate turbid stormwater run-off. Where a paved surface is uneconomic, roads should run parallel to the land contour, avoiding slopes exceeding one in ten to minimise erosion. Where roads in steep terrain are unavoidable, erosion prevention measures and drainage structures should be employed to limit environmental harm.

Road drainage

28. Drainage systems should incorporate the principles of water-sensitive design, see [Appendix A Reference 5d](#). Appropriate techniques include kerb-less roads in flat terrain, vegetated roadside soakage swales, contaminant bio-filters and local stormwater disposal in built-up areas. Drains direct to natural waterways and wetlands with social and ecological values should be avoided. Otherwise effective measures should be in place to control litter and chemical discharge resulting from any transport accidents.

Parking bays, stopping places and picnic areas

29. Where practical, parking facilities or amenities should not be placed close to sensitive water resources (particularly where uncontrolled tourism access to these waters is likely to harm their values). Where unavoidable, they should be provided with managed landscape viewing facilities, toilet and litter disposal facilities, signage and barrier fencing to deter general access to the water body and its fringes. In public drinking water source catchments, such proposals should be referred to this Department for assessment and response prior to their implementation.

Road construction

Erosion and sediment control

30. Road designers or contractors should develop site-specific erosion and sediment control plans to minimise environmental impacts of stormwater run-off during construction activities. The following sediment control measures should be included in the plans:

- a. clearing and exposed soil working surfaces kept to a minimum, and protected from stormwater erosion;
- b. during wet seasons, silt fences and sediment traps should be optimally placed to prevent soil export to waterways and wetlands;

- c. vehicle wash-down facilities should be available to remove excess soil when leaving construction sites. Wash-down facilities for mechanical plant or vehicles should be constructed and operated as recommended in this Department's Water Quality Protection Note *Wash-down of mechanical equipment*, see [Appendix A, Reference 6](#);
- d. temporary entry or exit roads to construction sites should be provided with a coarse rock surface to prevent the transfer of soil off-site, where it may affect nearby drainage channels or spread weeds and vegetation dieback disease.

Construction depots

- 31. These should be located as far as practical from sensitive water resources. They should be located on previously cleared gently-sloping (ie less than one in ten), well-drained land.
- 32. Environmental protection measures at depot should include:
 - a. raw material storage located where it will not be flooded or eroded. Where stormwater run-off may occur, settling ponds should intercept flows and provide sufficient detention or other effective means to effectively control turbidity; and
 - b. fuelling facilities for vehicles and construction plant should follow the recommendations given in this Department's Water Quality Protection Note *Tanks for above ground chemical storage near sensitive water resources*, see [Appendix A, Reference 5b](#).

Water supply

- 33. The availability of scheme or local water supply should be carefully considered when planning road-works. Waters taken from surface or groundwater sources generally require a licence under the *Rights in Water and Irrigation Act 1914*. Information on regulated waters and licensing requirements should be obtained from this Department's regional offices.

Waste disposal

- 34. All wastes from employee amenities (eg toilets, showers and crib rooms) and portable sewage units should be either discharged to sewer or managed in accordance with the *Health Act 1911*, and the requirements of the Local Government Authority (LGA). Buffers of at least 100 metres from any on-site wastewater management and disposal facilities to surface waters should be maintained.
- 35. Any solid putrescible, hazardous or intractable waste generated on the site should be disposed of at a site acceptable to the LGA which conforms to the Department of Health and the Department of Environment and Conservation administered regulations (see [Appendix A, Reference 4b](#)), *Guidelines for acceptance of solid waste to landfill*.

Chemical use and management

- 36. Waste or spilt construction site chemicals (eg fertilisers, fuel, herbicides, insecticides, oils, degreasers, anti-freeze, solvents for asphalt products, sealers and paints) and wash-water associated with these materials should be stored, handled and contained to minimise their soakage or run-off to the environment. An option is to provide temporary containment compounds where these products are frequently used, such as at fuelling areas and equipment washing areas.

37. Secondary containment should be used to prevent harmful chemicals from entering ground or surface water resources. For more information, see this Department's Water Quality Protection Note *Toxic and hazardous substances - storage and use*; see [Appendix A, Reference 5b](#).

Mechanical servicing

38. Routine plant and vehicle servicing involving liquids such as coolants, hydraulic oils, brake fluid or lubricants should take place within weather-proof structures designed to contain fluid spills. The operator should install effective systems for the capture and export of waste liquids for recycle or approved disposal.
39. All facilities and operations should be compatible with this Department's Water Quality Protection Notes *Mechanical servicing and workshops* and *Mobile mechanical servicing and cleaning*. This activity requires this Department's written approval within public drinking water source areas that are designated as *Underground Water Pollution Control Areas*.

Workforce environmental awareness

40. Awareness programs for contractors and construction crews should be prepared and implemented, covering environmental protection (including water resource protection).

Operational management practices

41. An Environmental management practice (EMP) manual should be prepared and utilised to protect the local environment and water resources. Typical examples of recommended practice can be found in the document *Stormwater Management Manual for Western Australia*, see [Appendix A, Reference 5d](#). The EMP should cover maintenance depots, operation and maintenance of roadways, drainage management and site restoration.
42. The EMP should address temporary control of waste, chemical spills, erosion and polluted run-off. Examples of practices for protecting disturbed erosive soils include brush or mulch cover, straw bale barriers, silt fences, slurry filled pillows and sedimentation basins.
43. Provision should be made for routine inspection and maintenance of drainage, erosion and sediment control facilities after construction has been completed. Aspects include programmed inspections, temporary cereal crop cover and follow-up permanent vegetation restoration. Land stabilisation practices help to intercept polluted run-off from the operation of roadways or from erosion and sedimentation generated at small construction sites.
44. The EMP may also be used for permanent or long-term stormwater control. Controls may be both structural and non-structural. Examples include erosion and sediment management using grassed swales, filter strips and stormwater infiltration areas. Post and mesh fencing of protective barriers along road reserves should help in separating road users from sensitive areas and reduce fauna access to the road, resulting in a lowered risk of accidents.

Operation and maintenance of roadways

45. Road, highway and bridge operation and maintenance programs involve inspection, routine and season-specific maintenance, and repairs including the rights-of-way where drainage control facilities are located. An infrastructure safety program should be developed in conjunction with general inspection and maintenance programs.

46. Roadway operators should develop and implement a routine inspection and maintenance schedule, with practical measures to minimise contamination of waters. Options include:
- a. mechanically swept or vacuum-cleaned urban streets and associated parking bays;
 - b. collection and removal of dead animals and road litter; and
 - c. litter abatement programs eg via way-stop litter bins, verge clean-up campaigns and drainage litter traps.
47. The roadway owner or operator should undertake the following roadway measures to minimise transport accidents and contaminated run-off, as part of a regular program:
- a. inspect barriers, fences, erosion and sediment control devices;
 - b. maintain retaining walls and pavements to minimise cracks and water damage;
 - c. repair pot-holes and shoulder erosion to minimise risk of vehicle accidents;
 - d. maintain stormwater energy dissipaters and velocity controls on open drains to lower run-off velocity and control soil erosion;
 - e. dispose of accumulated sediment collected from detention ponds, drainage systems, and pollution control structures, and any wastes generated during maintenance operations in accordance with appropriate local government and State agency requirements;
 - f. use techniques during bridge maintenance such as suspended tarpaulins, vacuum collection or booms to prevent paint spills, solvents and scrapings from becoming waterborne pollutants;
 - g. take care when re-contouring or smoothing unpaved roads to maintain a structurally sound surface, while providing an adequate crown and drainage so that erosion or scattering of base materials is avoided; and
 - h. keep drainage ditches and water diversion turnouts free from accumulated debris.

Maintenance of verges

48. The following measures to prevent verge erosion and water contamination should be used:
- a. local native plants in roadside revegetation projects. Avoid planting deciduous or exotic plants, as their leaf litter contributes significant nutrient loads to water bodies, while exotics may spread via seed movement along waterways, disrupting the natural ecology;
 - b. mulch, seed and sparingly fertilise, or apply topsoil and perennial plants to damaged vegetated areas and employ gabions or terracing on steep slopes;
 - c. establish environmentally safe programs for pesticide use and nutrient management;
 - d. restrict herbicide and pesticide application in highway rights-of-way to accredited operators, to ensure safe and effective application;
 - e. follow supplier's recommendations on optimum application rates for chemicals such as soil stabilisers, dust palliatives, herbicides, pesticides and plant growth inhibitors. Try to avoid frequent use and consequent intrusion of such chemicals into surface stormwater run-off. Within drinking water source areas, use of pesticides is limited by requirements of the Department of Health and this Department's policy *Pesticide use in Public Drinking Water Source Areas*, see [Appendix A, Reference 5a](#);

- f. regularly inspect, clean, regrade earth drains, and manage debris and vegetation growth in drains, ditches and swales to ensure they perform as effective drainage and contaminant filter systems. Keep ditch slopes covered with vegetation or other durable, non erosive material; and
- g. maintain road shoulders, slopes and swales to assure their effective function and operation in protecting the road asset and the local environment.

Maintenance of bridges

49. Where practical, pest control for timber structures should include the following measures:

- a. pest-specific pesticides should be used so as to minimise the impact on other terrestrial or aquatic invertebrates;
- b. where pesticide use cannot be avoided, use targeted methods such as shrouded spraying;
- c. conform to the chemical registration conditions (normally shown as label directions);
- d. avoid application of water soluble or mobile chemicals when rain is predicted within 48 hours;
- e. spillage control and capture measures should be in place prior to pesticide application to prevent residue entry into any waterway or wetland;
- f. pesticide operators should be qualified and experienced, and have received instruction on managing the local environmental risks; and
- g. all waste materials should be removed from the area for safe disposal at a local government approved site.

Nutrient use and control

50. Disturbed land should be revegetated using native plant species endemic to the area, as these plants will need little fertiliser, only initial watering and will enhance habitat for native fauna. Fertilisers, where use is necessary to promote the growth of vegetation on disturbed earth, should not contribute excessive nitrates and phosphates to surface waters.

51. Personnel qualified and experienced in soil testing and nutrient application should be used to determine the least amount of fertiliser to apply in a given situation. Slow release fertiliser should be used and timed to maximise nutrient delivery to growing plants, and minimise nutrient leaching or entry into stormwater run-off.

52. For fertiliser application rates near sensitive waters, see this Department's Water Quality Protection Note *Irrigation with nutrient-rich wastewater* ([Appendix A, Reference 5b](#)).

Performance audit

53. The road should be periodically inspected by government officers to audit the site operator's compliance with environmental and planning approval requirements.

Accidents and emergency response

The risk of contamination to sensitive water resources increases with human access and the type of traffic using the road. Higher risks are considered to apply where roads provide for goods haulage and access to tourist destinations.

54. The risks and potential consequences to sensitive waters should be defined at the road planning stage. Assessment should involve consultation with government agencies who manage the natural resources that could be affected by the roadway and its users.
55. Roads may require location-specific management plans to cope with accidental fuel or other chemical spillage. When a road is located near a sensitive water resource in a remote location, an effective response to a chemical spillage may be delayed due to the long travel distances from works depots. The design of the road therefore should include measures for interim spillage control and containment. These measures should ensure the spill is contained while the response personnel are being mobilised.
56. Absorbent matter such as sand or inert litter should be readily available to assist clean-up of any waste spill. Any materials used for clean-up should be disposed of at an approved facility.

Road closure and environmental restoration

57. Should a roadway no longer be required, its reserve should be de-proclaimed, the road closed and the roadway restored to a condition compatible with the adjoining or planned land usage. This should include removal of the paved surface and redundant drainage structures, deep ripping of compacted road base, replanting of native vegetation and restoration of natural water-courses. Soil stabilisation, import of topsoil, limited fertiliser addition and early establishment watering may be needed to ensure survival of the replanted vegetation.

More Information

We welcome your views on this note. Feedback provided on this topic is held on our file **12144**.

This note will be updated periodically as new information is received or industry/ activity standards change. Updates are placed on the Department's internet site www.water.wa.gov.au, select *Drinking water > Publications > Water Quality Protection Notes*.

To comment on this note or for more information, please contact the Water Source Protection Branch at this Department's offices in Perth, phone (08) 6364 7600 (business hours), fax 6364 7601 or use *Contact us* at the Department's internet site, citing the note number and version.

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

In October 2005, the State Government announced the formation of the Department of Water. From January 2006, the Department of Water has assumed primary responsibility for managing the State's water resources. Once the Department of Water is legally established, it will replace many of the present functions of the present Water and Rivers Commission and operate in parallel (with separate powers) to the Department of Environment and Conservation.



Department of Water

www.water.wa.gov.au
Telephone: (08) 6364 7600
Facsimile: (08) 6364 7601
Level 4, The Atrium
168 St Georges Terrace Perth
Western Australia 6000

Appendices

Appendix A - References and further reading

1. Australian Government - National Water Quality Management Strategy
 - a. *Australian and New Zealand Guidelines For Fresh and Marine Water Quality 2000*;
 - b. *Australian Guidelines for Water Quality Monitoring and Reporting 2000*;
see web page www.deh.gov.au/water/quality/nwqms/index.html.
 - c. *Australian Drinking Water Guidelines 2004*
See web page www.nhmrc.gov.au/publications/synopses/eh19syn.htm
2. Australian Department of the Environment and Heritage
Conservation guidelines for the management of wild river values 1998;
see web page www.heritage.gov.au/anlr/code/arc.html; or
contact this Department's Drainage and Waterways Branch for local information.
3. Environmental Protection Authority (WA)
 - a. *Draft Guidance statement 33 Environmental guidance for planning and Development 2005*;
 - b. *Position statement No 9 Environmental offsets June 2005*;
 - c. *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*;
 - d. *Environmental Protection (South West Agriculture Zone Wetlands) Policy 1998*;
 - e. *Environmental impact assessment (EIA) – Referral of proposals*;
 - f. *Position statement No 4 Environmental Protection of Wetlands 2004*.
see internet site www.epa.wa.gov.au, select *Guidance statements, Policies* or *EIA*.
4. Department of Environment and Conservation (WA)
 - a. Wetlands policy and publications
 - *Position statement: Wetlands*, WRC 2001;
 - *Wetlands of the Swan Coastal Plain*, WRC and DEP 1996;see internet page www.dec.wa.gov.au, select *Department of Environment > Water > Wetlands > Publications*.
 - b. Waste management
 - *Guidelines for acceptance of solid waste to landfill 2001*;
 - *drumMUSTER program*, see www.drummuster.com.au ;
 - *Landfill Waste Classification and Waste Definitions 2001*;
 - *Draft Strategy for the management of green and solid organic waste in WA 1997*;
 - *Western Australian Waste Reduction and Recycling Policy 1997*;

see internet page www.dec.wa.gov.au, select *Department of Environment > Land > Waste management > Publications*.

c. Vegetation Protection

- *A Guide for Local Government Clearing Native Vegetation under the Environmental Protection Act 1986, 2005;*
 - *A Guide to Clearing Permits under the Environmental Protection Act 1986, 2005;*
 - *A Guide to the Exemptions and Regulation for Clearing Native Vegetation, 2005;*
- see internet site www.dec.wa.gov.au , select *Department of Environment > Land > Native Vegetation Protection > Legislation*

5. Department of Water (WA)

a. Drinking water source policy

Pesticide Use in Public Drinking Water Source Areas, 2000

b. Water Quality Protection Notes

- *Dewatering of soils at construction sites;*
- *Extractive industries within Public Drinking water Source Areas;*
- *Irrigation with nutrient rich wastewater;*
- *Land use compatibility in Public Drinking Water Source Areas;*
- *Liners for containing pollutants, using engineered soils;*
- *Liners for containing pollutants, using synthetic membranes;*
- *Mechanical equipment wash-down;*
- *Mechanical servicing and workshops;*
- *Mobile mechanical servicing and cleaning;*
- *Nutrient and irrigation management plans;*
- *Soil filling in public drinking water source areas;*
- *Stormwater management at industrial sites;*
- *Tanks for above ground chemical storage; and*
- *Toxic and hazardous substances- storage and use.*

see web page <http://drinkingwater.water.wa.gov.au>, select *Publications > Water Quality Protection Notes*.

c. Waterways policy and guidelines

- *Foreshore Policy 1 - Identifying the Foreshore Area, WRC 2002;*
- *Water Note 11 - Identifying the riparian zone;*
- *Water Note 23 - Determining foreshore reserves;*
- *Water Note 26 - Simple fish-ways;*

see internet page <http://waterways.water.wa.gov.au>, select *Policy or Water Notes*.

d. Stormwater

Stormwater Management Manual for Western Australia;

see internet page <http://stormwater.water.wa.gov.au>, select *Publications*.

6. Main Roads Western Australia

a. Design standards;

b. Environmental policy statement;

see web page www.mainroads.wa.gov.au, select *Environment > Environmental Policy Statement or Standards > Drawings, or Road and Traffic Engineering or Structures Engineering*.

Appendix B - Statutory requirements include:

What's regulated	Statute	Regulatory office
Subdivision of land Land zoning and development approval	<i>Planning and Development Act 2005</i>	West Australian Planning Commission Department for Planning and Infrastructure Local Government Authority (Council)
Impact on the values and ecology of land or natural waters	<i>Environmental Protection Act 1986</i> <i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004</i>	Minister for the Environment advised by the EPA Department of Environment and Conservation – regional office
Approval for developments that affect the Swan–Canning estuary	<i>Swan River Trust Act 1988</i>	Swan River Trust
Licence to take surface water and groundwater (section 5c) For proclaimed waterways, a permit is required to obstruct or interfere with the bed and banks (section 17) Bore construction (section 26 D)	<i>Rights in Water and Irrigation Act 1914</i>	Department of Water – regional office
Industrial sites in existing public drinking water source areas	<i>Metropolitan Water Supply, Sewerage and Drainage Act 1909</i> <i>Country Areas Water Supply Act 1947</i>	
Licence to discharge waters into managed waterways	<i>Waterways Conservation Act 1976</i>	
Storage of fuels, solvent, explosive and dangerous goods	<i>Explosive and Dangerous Goods Act 1961</i>	Department of Consumer and Employment Protection

APPENDIX C - Sensitive water resources

Clean water resources used for drinking, sustaining aquatic and terrestrial ecology, industry and aesthetic values, along with breathable air, rank as the most fundamental and important needs for viable communities. Water resources should remain within specific quality limits to retain their values, and therefore require stringent and conservative protection measures. Guidance on water quality parameters necessary to maintain water values are published in the Australian Government's *National Water Quality Management Strategy Guidelines* (see web page www.deh.gov.au/water/quality/nwqms/index.html).

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 maintain the quality of water resources.

To be considered sensitive, water resources must support one or more of the environmental values described below. Human activity and land uses pose a risk to water quality if contaminants could be washed or leached into sensitive water resources in discernible quantities. These water resources include shallow groundwater accessed by water supply wells, waterways, wetlands and estuaries. Community support for these values, setting of practical management objectives and implementation of sustainable protection strategies are seen as key elements in protecting and restoring the values of these water resources.

Sensitive water resource values include:

- a. Public Drinking Water Source Areas (ie Water Reserves, Catchment Areas or Underground Water Pollution Control Areas) proclaimed or assigned under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909*, the *Country Areas Water Supply Act 1947* or the *Health Act 1911*.
- b. Private water supply sources, including the following uses:
 - human or stock consumption;
 - commercial or industrial water supplies (with specific qualities that support the activities eg aquaculture, cooling, food or mineral processing or crop irrigation); and
 - garden or municipal water supplies (which can affect people's health or wellbeing).
- c. Groundwater aquifers that sustain important ecological functions eg cave ecology.
- d. Waterways (excluding engineered drains or constructed features) with ecological and / or social values such as aesthetic appeal, boating, fishing, tourism, and swimming, including:
 - waterways of High Conservation Significance as described in the Environmental Protection Authority's Draft Guidance Statement 33 *Environmental Guidance for Planning and Development* (Section B5.2.2) see www.epa.wa.gov.au , select EIA > *Guidance statements*;
 - waterways managed under the *Waterways Conservation Act 1976*, ie the Avon, Peel-Harvey, Leschenault, Wilson Inlet and Albany Waterways Management Areas; and
 - waterways managed under the *Swan and Canning Rivers Management Act, 2006*.

Note: many waterways in the State remain to be scientifically evaluated and their value classified. Any such waterways that are substantially undisturbed by human activity, should be considered to have high conservation value unless proven otherwise.

- e. Wetlands possessing recognised or probable conservation values (generally excluding those highly disturbed, unless subject to active management to restore specified environmental values), and including:
- RAMSAR wetlands (see internet site www.ramsar.org);
 - Wetlands of High Conservation Significance as described in the Environmental Protection Authority's Draft Guidance Statement 33 *Environmental Guidance for Planning and Development* (Section B4.2.2), see www.epa.wa.gov.au , select EIA > *Guidance statements*;
 - Wetlands described by Department of the Environment and Heritage (Australia) in *A Directory of important wetlands in Australia*, (see web page www.deh.gov.au/water/wetlands/databases.html, or the Department of Environment and Conservation web page www.naturebase.net/national_parks/wetlands/wa_wetlands.html);
 - Conservation and Resource Enhancement category wetlands identified in the *Geomorphic Wetlands of the Swan Coastal Plain* dataset, all wetlands identified in the *South Coast Significant Wetlands* dataset and high value wetlands identified in the *Geomorphic Wetlands Augusta to Walpole* dataset.

Note: many wetlands in the State remain to be scientifically evaluated and classified. Any such wetlands that are generally undisturbed by human activity, should be considered to have high conservation value, unless proven otherwise. The Augusta to Walpole wetland dataset to date has not been subject to a detailed evaluation process.

The Department of Conservation and Environment is the custodian of wetland datasets and is responsible for maintaining and updating the information within them. The datasets can be viewed or downloaded from the internet site www.dec.wa.gov.au, select *Department of Environment > Tools, systems and data > Geographic Data Atlas > Inland waters > Wetlands*. Guidance on viewing the wetlands is provided on the same website at *Water > Wetlands > Data > Wetland mapping > How to view wetland mapping* or phone the Department on 6364 6500.

Appendix D - Protection measures for road crossing of waterways

