Statewide policy no. 1: Policy and guidelines for construction and silica sand mining in public drinking water source areas (Water and Rivers Commission 1999)

January 2018

Important information

The Department of Water and Environmental Regulation is now the custodian of this policy, which refers to the use of 'likely future maximum water table' (see section 3.2) to determine vertical separation distances between the depth of excavation and the groundwater level, to address risks to drinking water quality and public health.

Please note that we are currently reviewing this policy, and in some locations, historical maximum groundwater levels are being applied and accepted to determine separation distances.

Gnangara Underground Water Pollution Control Area interim policy

In this area (see our online mapping available www.dwer.wa.gov.au), the following interim policy applies:

The latest (2017) modelling using the Perth Region Aquifer Modelling System shows the trend in groundwater levels in Gnangara will change. This is due to our changing climate, planning increases in urbanisation, changing abstraction by irrigators and changes to the Gnangara pine plantation. These factors mean that 'likely future maximum groundwater levels' are difficult to determine and the historical maximum may no longer be appropriate to use as a benchmark.

Therefore, the department recommends a new groundwater reference level for Gnangara, using the **maximum groundwater levels from the year 2000**.

Depending on the feedback we receive, this will shape an updated guidance document about basic raw materials extraction. Once the Gnangara water allocation plan and Western Australian Planning Commission subregional structure plans are finalised, we will revisit this groundwater level recommendation if required.

We will issue a replacement guidance document soon. If you would like to provide input into the review of this policy, or need more information, please contact our Water source protection planning branch on drinkingwater@dwer.wa.gov.au.

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WATER AND RIVERS
COMMISSION

Statewide Policy No. 1

Policy and Guidelines for Construction and Silica Sand Mining in Public Drinking Water Source Areas

Endorsed: 1999
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Acknowledgments

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Contents

1. Policy

1.1 Objective of policy

The objective of this policy is to protect water quality and quantity within Public Drinking Water Source Areas from the adverse impacts of sand mining operations, and ensure that all sites are rehabilitated to an acceptable standard.

1.2 Scope of policy

This policy applies to all construction and silica sand mining operations within Public Drinking Water Source Areas.

The policy does not apply to heavy mineral sand mining operations and quarrying.

1.3 Application of policy

This policy applies to all proclaimed and proposed surface and groundwater Public Drinking Water Source Areas. This includes Catchment Areas, Underground Water Pollution Control Areas and Water Reserves proclaimed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* and the *Country Areas Water Supply Act 1947.*

This policy will be applied to all new sand mining operations and extensions to existing operations where formal approval is required. The Commission will encourage existing operations to implement appropriate parts of the policy. This would particularly apply to fuel storage and management, and waste disposal.

1.4 Policy principles

The Commission considers sand mining to be a restricted land use in Priority 1, 2 and 3 Public Drinking Water Source Areas.

All sand mining activities operating in Public Drinking Water Source Areas shall be subject to the following guidelines as a part of their licensing conditions:

- *Operations in Public Drinking Water Source Areas will only be acceptable if it can be demonstrated that there is sufficient clearance above the water table;*
- *Fuel and chemical storage facilities shall meet the Commission's specified standards;*
- *Operators shall incorporate appropriate minesite management procedures to ensure surface water run-off, waste disposal and water abstraction do not compromise the water resource objectives for the site;*
- *Operators shall demonstrate that end land uses are compatible with the water resource objectives for the area.*

The following guidelines for sand extraction activities in Public Drinking Water Source Areas reflect these policy principles.

2. Preamble

The objective of this policy is to protect water quality and quantity in Public Drinking Water Source Areas across the State from degradation by sand mining operations.

Construction and silica sand extraction has been widely recognised for its significant importance to the building industry and the State's economy. However, without appropriate siting and management, sand extraction can have impacts on the surrounding environment and water resources.

The Commission requires that consideration of water resource impacts be incorporated into the sand extraction planning process. The guidelines prescribe measures which, when implemented in sand mining operations, will minimise the risks to water quality and quantity.

Preparation of the policy and guidelines involved consultation with stakeholder representatives including the Department of Minerals and Energy, the Conservation Council of Western Australia, the Chamber of Commerce and Industry - Extractive Industry Committee and affected local government authorities.

The guidelines provide a range of standards and criteria for the management of potentially polluting components of sand mining operations. These standards will constitute the following conditions for approval:

- minimum final clearance to the groundwater table;
- control of methods of fuel storage, and management of fuel;
- management of plant and equipment servicing;
- management of waste disposal;
- the specification of intended end land use activities; and
- the implementation of guidelines for end land use activities and rehabilitation programs that have been approved by the Commission.

The policy and guidelines also provides information on water resources management to agencies regulating sand mining operations.

This policy will be implemented through the Department of Minerals and Energy's and local government agencies' approval procedures, and through Acts and by-laws administered by the Commission.

The Commission has the statutory responsibility to license water abstraction and to apply by-laws to control activities that have the potential to pollute, through permits.

2.1 Background

The Water and Rivers Commission has the responsibility to protect the quality and quantity of water resources utilised for public drinking water supply and to manage these resources in accordance with sustainable development.

Groundwater resources are crucial for Western Australia's water supply. The Gnangara and Jandakot groundwater mounds provide a major part of Perth's water supply.

Construction and silica sand extraction contributes significantly to the building industry and land development as well as to the State's economy. The importance of a ready supply of sand resources as close as possible to the customer has been recognised by many authorities.

Sand mining can affect the surrounding environment and may pose a risk to water resources through its operations, processing and storage of waste.

The Commission is concerned with the potential impact of sand mining on water resources used for public drinking water supply. The Commission considers that these impacts can be managed by the implementation of adequate planning and management measures. These measures are addressed in the policy and guidelines.

2.2 Justification

The Commission is aware of the importance of the Western Australian Planning Commission's Policy Statement for Basic Raw Materials and that the basic raw materials needs of the State and the Perth metropolitan region are supplied from sources located as close as possible to the consumer.

In the Perth metropolitan region the majority of the current extraction sites and future sources of sand are located within Public Drinking Water Source Areas (particularly the Wanneroo, Gnangara and Jandakot Underground Water Pollution Control Areas).

Groundwater resources from these areas provide a significant portion of Perth's public drinking water supply. The Commission is concerned with the potential impacts of sand mining on these important water resources.

2.2.1 Industry overview

Sand mining involves stripping of the over-burden (vegetation and topsoil) by bulldozers and scrapers. Ore (high quality sand) occurring in sand dunes is extracted by front-end loaders and trucked from the site.

If necessary, extracted ore is processed on site using wet-separation washing, milling and screening techniques to produce silica sand product. No chemical treatments are required.

The sand slurry is fed through a number of screens to remove stones and vegetable matter and separate sand by size. All residual clay, oversized material and heavy minerals are returned to mined pits. The finished sand product is stockpiled and transported from site by trucks. Highly specialised silica sands are often processed at sites remote from the extraction area.

Rehabilitation of disturbed land usually involves stabilisation of land surface to eliminate the potential for soil erosion by revegetation or the development of an alternative land use.

2.2.2 Risks to the water source

The major potential risks to public drinking water resources from sand mining include: hydrocarbon contamination; contamination from waste disposal systems or activities; the loss of water through evaporation; and the inadequate rehabilitation of disturbed areas.

The threat associated with hydrocarbon contamination in water supply areas is a key management issue.

Hydrocarbon contamination can result from leakage from fuel storage tanks, spillage during refuelling and inappropriate disposal of waste. There are serious health considerations associated with this contamination as benzene and polyaromatic hydrocarbons, which are soluble constituents of fuel, are recognised carcinogens. Remediation of hydrocarbon contamination of groundwater is very expensive, and in some cases impractical.

Waste disposal systems can cause contamination of groundwater with nitrates, phosphates, organic chemicals, metals, bacteria or viruses. Contamination is most severe in areas where the water table is close to the surface and where soils are sandy. These conditions occur in the Underground Water Pollution Control Areas throughout the metropolitan region.

The loss of significant quantities of groundwater can occur through evaporation and inappropriate rehabilitation. Direct evaporation of groundwater increases when the water table is close to the surface. Appropriate rehabilitation after minesite operations can stabilise this process.

2.3 Legislative and regulatory controls

The principal legislation that relates to the environmental impact of sand mining is: the *Environmental Protection Act 1986*, the *Mining Act 1978*, the *Local Government Act 1995*, the *Rights in Water and Irrigation Act 1914*, the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* and the *Country Areas Water Supply Act 1947*. Following are further details on how these Acts relate to sand mining.

2.3.1 *Environmental Protection Act 1986*

The *Environmental Protection Act 1986* aims to protect the environment and prevent pollution. The Act establishes the most significant controls on the exploitation of minerals and the use of water resources through its environmental impact assessment procedures, pollution control and licensing system and environmental protection policies.

Under this Act the occupier of the premises is required to take all reasonable and practicable measures to prevent or minimise the discharge of waste and the emission of noise, odour or electromagnetic radiation.

The Act is administered by the Department of Environmental Protection.

2.3.2 *Mining Act 1978*

The *Mining Act 1978* is administered by the Department of Minerals and Energy (DME) and governs extractive industries on Crown land. The Act includes several provisions relating to environmental matters such as environmental management of extractive operations and post-mining rehabilitation.

2.3.3 *Local Government Act 1995*

The relevant local government authority under the *Local Government Act 1995* administers sand mining operations located on private land. Under this Act, local governments have power to make conditions in relation to the possible impact of mining on the environment. These conditions are placed on individual Extractive Industry Licences and may relate to drainage, rehabilitation programs, buffer zones, or siting of works.

2.3.4 *Rights in Water and Irrigation Act 1914*

This Act covers the allocation of water. The Act is administered by the Water and Rivers Commission and affects both surface and underground water. The Act requires licensing for the taking of water from proclaimed surface and groundwater areas. Water licence allocations are aimed at ensuring equitable use of the State's water resources between competing interests and protecting the long term security of those resources.

2.3.5 *Metropolitan Water Supply, Sewerage and Drainage Act 1909* and the *Country Areas Water Supply Act 1947*

The quality of public drinking water resources is protected by the Underground Water Pollution Control Areas, Catchment Areas and Water Reserves proclaimed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* and the *Country Areas Water Supply Act 1947*. These Acts provide by-laws, which are administered by the Commission to control potentially water polluting activities, prevent or clean up pollution, and to regulate land use activities.

2.3.6 Related acts

The following Acts also regulate the operations of extractive industries:

- *State Planning Commission Act 1985*
- *Health Act 1911-1979*
- *Town Planning and Development Act 1928*.

2.3.7 Relevant policies

2.3.7.1 *Basic Raw Materials Policy Statement for the Perth Metropolitan Region*

This policy provides security for the extraction of deposits of basic raw materials located within the Perth Metropolitan Region. One of the key objectives of this policy is to ensure that extractive operations comply with environmental and amenity standards.

2.3.7.2 *Gnangara Land Use and Water Management Strategy*

The Western Australian Planning Commission and the Water and Rivers Commission has undertaken a consultative process to prepare the Gnangara Land Use and Water Management Strategy. The strategy ensures that appropriate groundwater protection is incorporated in the Metropolitan Region Scheme. It determines a new boundary for the source protection areas over the Gnangara Mound and balances groundwater protection with other competing land uses. Sand mining is recognised in the strategy as a restricted land use activity.

2.3.7.3 *Jandakot Land Use and Water Management Strategy*

This strategy establishes the physical and policy framework for the long-term protection planning and management of the Jandakot Mound. The strategy classifies sand mining as a restricted land use while recognising its importance in accordance with the Basic Raw Materials Policy.

2.3.7.4 *Jandakot Groundwater Protection Policy Statement of Planning Policy No. 6*

The main objective of this policy is to ensure development over the Jandakot Mound is compatible with public drinking water source protection. The policy also provides control measures to safeguard management of the possible impacts of land use activities on the groundwater. The policy classifies sand mining extraction as a restricted land use activity with restrictions placed on depth of mining to water table and storage of designated substances.

2.3.8 Related Policies

- *Draft Environmental Protection (State Groundwater) Policy 1998;*
- *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992;*
- *Wetland Conservation Policy for Western Australia 1997;*
- *Gnangara Mound Crown Land Statement of Planning Policy No.3 1995;*
- *Environmental Protection (Gnangara Mound Crown Land) Policy Approval Order 1992.*

2.4 Summary of the Commission's water resource protection strategy

The Water and Rivers Commission is responsible for managing and protecting Western Australia's water resources. The Commission defines three levels of priority classification for the protection of water resources in Public Drinking Water Source Areas. These three levels are:

Priority 1 (P1) source protection areas are defined to ensure that there is no degradation of the water source. P1 areas are declared over land where the provision of the highest quality public drinking water is the prime beneficial land use. P1 areas would typically include land under Crown ownership. Land development is generally not permitted in P1 areas.

Priority 2 (P2) source protection areas are defined to ensure that there is no increased risk of pollution to the water source. P2 areas are declared over land where low intensity development (such as rural) already exists. Provision of public water supply is a high priority in these areas. Some development is allowed under specific guidelines.

Priority 3 (P3) source protection areas are defined to minimise the risk of pollution to the water source. P3 areas are declared over land where water supply needs co-exist with other land uses such as residential, commercial and light industrial developments. Protection of P3 areas is achieved through management guidelines rather than restrictions on land use.

In addition to priority classification, **wellhead protection zones** and **reservoir protection zones** are defined to protect the groundwater from contamination in the immediate vicinity of production wells. Wellhead protection zones are circular, with a radius of 500 metres in P1 areas and 300 metres in P2 and P3 areas. Restrictions apply to storage of fuels, solvents, oils and pesticides within these zones.

In recognition of the State Policy on Basic Raw Materials in the Perth Metropolitan Region, the relevant land planning policies and the relative risks of sand mining to water resources, the Commission considers sand extraction to be a restricted land use in Priority 1, 2 and 3 Public Drinking Water Source Areas. Restricted land uses are supported subject to the proponent demonstrating appropriate measures to protect water resources.

3. Guidelines

3.1 Restricted land use

3.1.1 *The Commission considers construction and silica sand mining within Public Drinking Water Source Areas a restricted land use.*

3.1.2 *Written approval from the Commission is required to establish sand mining operations within Public Drinking Water Source Areas.*

The Commission considers that sand mining operations may pose a risk to both groundwater and surface water quality and quantity. A restricted land use category is considered appropriate as the risk can be either alleviated or managed through suitable siting and management practices.

Where land use and water management strategies exist (eg. *Jandakot Land Use and Water Management Strategy*) the Commission will only support sand mining operations in designated areas. Operations in Public Drinking Water Source Areas will only be acceptable if it can be demonstrated that there is sufficient clearance above the water table and adequate environmental management of activities.

3.2 Clearance above water table

3.2.1 *The Commission will require all sand mining operators to use dry methods of sand extraction in Public Drinking Water Source Protection Areas. No extraction activities shall occur below the water table.*

3.2.2 *The Commission will require all sand mining operations to maintain a minimum of 3 metres of undisturbed profile between the likely future maximum water table and the proposed final surface level in Priority 1 source protection areas.*

3.2.3 *The Commission will allow, in exceptional circumstances, the minimum 3 metres of undisturbed profile between the likely future maximum water table[1] and the proposed final surface level to be reduced to a minimum of 2 metres in Priority 1 source protection areas during mining. The operator must demonstrate that there will be no risk to water resources, through effective management measures at the close of operations. These must include a final 3 metre clearance to the likely future maximum water table.*

3.2.4 *The Commission will require all sand mining operators to maintain a minimum of 2 metres of undisturbed profile between the likely future maximum water table and the proposed surface level in Priority 2 and 3 source protection areas.*

3.2.5 *The proponent should engage an approved environmental professional to determine the likely future maximum winter water table for the site in liaison with the Commission[1].*

Environmental impacts arising from sand mining activities include impacts on local and regional groundwater flow regime and the possible risk of groundwater pollution. An adequate clearance between the finished surface level and the highest known groundwater levels is of critical importance in ensuring impacts on water resources are minimised.

In determining an appropriate clearance the following issues were considered:

- sufficient clearance to allow accidental fuel spills to be contained in the unsaturated zone for a reasonable period of time;
- sufficient clearance to ensure evaporation losses during mining are minimised; and
- sufficient clearance to ensure evapotranspiration losses from the rehabilitated minesite do not unacceptably reduce aquifer recharge.

3.2 a) Sufficient clearance to allow fuel spills to be contained in the unsaturated zone

Fuel spills and leaks from onsite storage facilities pose a threat of groundwater contamination. The most important element in the reduction of any groundwater hydrocarbon contamination is the extent to which the

[1] In the first instance, the historical maximum water table should be used to determine the likely future maximum water table.

unsaturated zone above the water table can contain the volume of fuel spilled.

In the event of a fuel spill, the unsaturated zone can minimise the possible lateral spread of the hydrocarbon plume, provide the opportunity for remediation and lessen the risk of contaminant interaction with the groundwater.

The vulnerability of water resources to contamination from fuel leaks depends on the retention capacity of the soils, depth to the water table, seasonal water table variations and quantity of fuel spilt.

Previously, a minimum 2 m clearance between the lowest mined profile and the highest known water table was required. The Commission has reviewed this requirement and commissioned the Centre for Groundwater Studies (CGS) to conduct a study. This study analysed the extent of diesel infiltration for likely fuel spill scenarios and also tested whether the depth of 2 m of unsaturated zone is sufficient to protect groundwater supplies from hydrocarbon contamination.

The simulated diesel spill scenarios modelled a range of situations, from large and extensive spills to smaller instantaneous releases over a longer period of time. The study assumed that the unsaturated zone consists of Bassendean Sands, which are typical of those being mined in Underground Water Pollution Control Areas near Perth.

The study demonstrated that for slow leaks (5000 L, 400 L and 200 L of fuel leaking over 12 hours), the maximum depth of hydrocarbon infiltration would be contained in the range 0.64 m to 1.28 m. The time taken to reach these depths would range from 2.5 days to 50 days.

Hydrocarbon infiltration is sensitive to changes in soil characteristics, increasing in porous sandy soils.

For rapid spills (400 L of fuel spilled in 1 minute), the maximum depth of hydrocarbon infiltration would be contained in the 1.03 to 2.05 m zone. The time taken to reach these depths would range from 1.6 days to 12 days.

Considering the results of the CGS's study, the Commission considers that the 2 m buffer zone of undisturbed sand profile is appropriate. This buffer minimises the risk of contamination of groundwater from hydrocarbons and allows time for remediation to take place.

3.2 b) Sufficient clearance to ensure evaporation losses during mining are acceptable

Direct evaporation of groundwater can take place when the water table is close to the surface, usually within 0.5 to 2 m (Bouwer, 1996). Evaporation losses were found to be inversely proportional to the depth of the water table. The relationship between the evaporation rate and water table depth for sandy sediments, shows that with a water table at a depth of 2 m the evaporation rate is approximately 1 mm/day (Bouwer, 1996).

Capillary rise also contributes to the process of evaporation. Empirical field data on sediments and other materials underlying the Swan Coastal Plain provides evidence that the water table in these sediments can create a zone of capillary rise of 1.5 to 2 m (Davidson, 1995).

Existing data provide reasonable indication that a minimum thickness of 2 m of unsaturated zone is necessary to prohibit the loss of significant quantities of water through evaporation.

3.2 c) Sufficient clearance to ensure evapotranspiration losses from the rehabilitated minesites do not unacceptably reduce aquifer recharge

Transpiration is the loss of water vapour from vegetation. Where the depth to the groundwater table is small (typically less than 3 m) the vegetation will often establish roots which draw water directly from the water table to meet their requirements. These plants are known as phreatophytes (Bouwer, 1996).

Bestow (1976) has demonstrated that in the Perth region, the amount of transpiration decreases as the depth to the water table increases by approximately 400 mm per metre. For example where the depth to water table is 2 m, Bestow predicts transpiration losses will be about 700 mm; however, for a depth of 3 m the predicted transpiration loss will be around 300 mm and for 4 m transpiration losses will be negligible.

Farrington et al. (1988) found that within the range 4 to 12 m of the water table depth over Gnangara Mound, the evapotranspiration rate is not correlated to depth of water table.

Perth area receives around 870 mm of rain per year, not all of which infiltrates into the soil. In Priority 1 areas the depth to water table should be maintained such that transpiration losses are small relative to rainfall. The minimum clearance in these areas is recommended to be 3 m (roughly equating to the minimum clearance for phreatophytic vegetation). This recognises that these sites will be revegetated following mining.

3.3 Methods of fuel storage

3.3.1 *The Commission will issue approval for the installation of elevated storage tank systems in Priority 1, 2 and 3 source protection areas (outside of wellhead protection zones). The proposal must comply with the Commission's Water Quality Protection Guideline for the Siting and Installation of Above Ground Bulk Fuel and Chemical Storage Facilities.*

3.3.2 *No elevated storage tank system shall be installed in a wellhead protection zone.*

3.3.3 *The maximum volume for any elevated storage tank system shall be 5000 litres (unless the Commission is satisfied that there are special circumstances warranting additional storage).*

3.3.4 *No ground storage tank system shall be installed within Priority 1 or 2 source protection areas or within wellhead protection zones.*

3.3.5 *Ground storage tank systems are a restricted land use in Priority 3 areas and require prior permit approval from the Commission.*

3.3.6 *Any storage of designated substances with the potential to pollute groundwater requires a permit approval from the Commission.*

Contaminants resulting from leakage or accidental spillage from a fuel storage area, and the use and disposal of petroleum hydrocarbons pose the most serious risk of contamination to water sources. Remediation of groundwater is a long term process that is expensive and in some cases ineffective.

Therefore, it is necessary to protect water resources from contamination through strict controls on fuel storage and fuel use. This can be achieved by minimising potential hydrocarbon inputs and avoiding spills and leaks from fuel storage systems.

3.4 Management of fuel

3.4.1 *The Commission requires that all sand mining operators working in priority source protection areas have in place a fuel management plan which has been approved by the Commission. The plan shall address:*

- *fuel spill prevention at fuel storage areas;*
- *details of fuel transport and refuelling;*
- *a contingency plan for dealing with fuel spillages;*
- *a groundwater monitoring program for hydrocarbons.*

Sand mining activities involve the operation of earth moving machinery and other fuel-driven equipment. Comprehensive safeguards are required to protect the water resources from possible contamination.

To obtain a fuel storage permit, the Commission requires that all sand mining operators have in place a fuel management plan which complies with the requirements of the Department of Minerals and Energy (DME). The DME has specific requirements for management of fuel, details of which can be obtained from Explosive and Dangerous Goods Division of DME.

3.5 Water abstraction requirements

3.5.1 *The Commission will require the operator to obtain a water allocation licence for any groundwater that will be extracted. The licence will stipulate the amount of water that may be drawn and will be subject to regular review. Should monitoring of the groundwater indicate any adverse trends, the allocation may be reduced. Results of monitoring may be required to be submitted to the Commission on a regular basis.*

Water abstracted from groundwater sources may be required by the sand mining industry for processing plants, haul road dust suppression, or for the transport of tailings from the plant to disposal sites. Water is also used for the on-site processing of sand. Loss of water can occur by infiltration and evaporation. To prevent adverse impacts on water resources resulting from water abstraction for sand mining operations, the proponent will require a water allocation licence from the Commission, which will be subject to auditing and review.

3.6 Cleaning of settling ponds

3.6.1 *In the event of emptying settling ponds the discharged water should comply with the following water quality criteria:*

- *in Priority 1 source protection areas for all health related components of discharged water, an increase of 1% of the NH&MRC health limit from the average natural concentration in groundwater recharge is allowed;*
- *in Priority 2 source protection areas for all health related components of discharged water, an increase of 25% of the NH&MRC health limit from the average natural concentration in groundwater recharge is allowed;*
- *in Priority 3 source protection areas for all health related components of discharged water, an increase of 50% of the NH&MRC health limit from the average natural concentration in groundwater recharge is allowed;*

Settling ponds are used to minimise turbidity and they are periodically emptied for cleaning. The discharged water shall meet the water quality criteria defined by the Commission.

3.7 Waste disposal management

3.7.1 Waste from employee amenities

3.7.1.1 *A septic system may be installed in Priority 1 and 2 source protection areas provided prior approval from the Commission is obtained. The Commission will issue approval to construct a septic system if the proposal conforms to all regulatory requirements.*

3.7.2 Waste from mechanical servicing

3.7.2.1 *Servicing of mechanical components of machinery involving liquids, such as coolants, hydraulic oils, lubricants or brake fluids (apart from routine maintenance) shall not be undertaken within Priority 1 and Priority 2 source protection areas.*

3.7.2.2 *On-site servicing of operating equipment within a Priority 3 source protection area is acceptable if the site operator demonstrates effective procedures for the complete capture and transport of the waste liquids to an approved disposal site.*

3.7.2.3 *Maintenance shall not take place inside a wellhead protection zone and must comply with the Commission's Water Quality Protection Guidelines for the Management of Fuel and Workshop Wastes.*

3.7.3 Waste water from the washdown of mechanical equipment

3.7.3.1 *All washdown of mechanical equipment shall be conducted in accordance with the Commission's Water Quality Guidelines for the Management of Fuel and Workshop Wastes.*

Sand mining operations may generate waste from:

i) employee amenities;
ii) mechanical servicing;
iii) washdown of mechanical equipment.

Wastewater disposal systems contribute to the contamination of water resources in areas not connected to a sewer. Septic systems have the potential to leach phosphorus, nitrogen and some microorganisms into the groundwater and waterways.

Contaminated water from washdown of mechanical equipment has the potential to contaminate groundwater resources with hydrocarbons and other chemicals.

3.8 Surface water management

3.8.1 *All stormwater shall be contained on site to remove sediments and turbidity.*

3.8.2 *Sedimentation basins shall be designed and maintained in accordance with the Commission's Water Quality Protection Guidelines for Minesite Stormwater Management.*

3.8.3 *Sand mining operations shall be carried out at a minimum distance of 100 m from any watercourse or wetland and 200 m distance from a wetland of conservation value. These separation distances shall maintain a minimum buffer of 50 metres undisturbed vegetation.*

Stormwater running through sand quarries may contain sediments and pollutants such as fuel and oil. Therefore, it is considered a potential threat to surface water resources. Stormwater entering sand mining pits should be controlled and diverted around operation areas.

Adequate vegetated buffer zones, that help to maintain ecological processes and primary food-webs, are required. Buffer zones can be composed of terrestrial or riparian vegetation, which exists between the boundary of land use activities and surface watercourses. Buffer zones help to maintain water quality, and have a conservation value as remnant vegetation.

3.9 Acceptable end land uses

3.9.1 *The Commission will only support end land uses after sand mining extraction that comply with the Commission's Water Quality Protection Note on Land Use Compatibility within Public Drinking Water Source Areas.*

Most of the construction and silica sands resources in the Perth Metropolitan Region are concentrated within areas used as a public drinking water source. These include the Jandakot Mound in the south and the Gnangara Mound in the north. Water protection legislation and policies safeguard these areas. The subsequent land uses of mined areas need to be carefully considered to ensure adequate groundwater protection.

3.10 Rehabilitation

3.10.1 *Land disturbed by sand mining operations shall be rehabilitated to an acceptable environmental standard which ensures the maintenance of existing water quality and is compatible with the surrounding area and the intended end land use.*

3.10.2 *Backfilling with imported material in Priority 1 and 2 areas is prohibited. In Priority 3 areas, the importation of fill is a restricted activity, requiring prior approval from the Commission.*

3.10.3 *The Commission will require that a sand mining operator employ an approved environmental professional to prepare a rehabilitation plan, which shall be submitted to the Commission for approval.*

This rehabilitation plan shall include (in addition to standard rehabilitation details required by Department of Conservation and Land Management, Department of Minerals and Energy, or local government authorities):

- *detailed information on the nature, source and quantities of materials to be used for back-filling in Priority 3 areas;*
- *an assessment of the potential groundwater contamination threats posed by the materials used for backfilling. This information shall include Toxicity Characteristic Leaching Procedure (TCLP) test analyses for any of the materials proposed to be used at the site that may pose a threat to groundwater quality;*
- *requirements for pesticide application;*
- *methods of remediation and clean up after mining operations.*

3.10.4 *The Commission will support mechanical methods of weed control such as scalping.*

Rehabilitation is strongly related to long term land use activities. The primary aim of rehabilitation is to restore stable, vegetated landforms to prevent erosion and other forms of land degradation.

From the water quality protection perspective, a long term objective of post-mine site rehabilitation shall be to establish a stable vegetation community which is self-regenerating and compatible with the priority classification for drinking water source protection.

The Commission has an obligation to ensure that adequate rehabilitation of a site is achieved after sand mining to protect groundwater and surface water resources.

Therefore, the rehabilitation objective should be to return the site to a state that is compatible with the adjacent area and the intended final land use.

It is recommended that revegetation be representative of the area in terms of plant species, composition, diversity and structure.

Pesticides are considered to pose a significant threat of contamination to water resources. Mechanical methods of weed control should be used wherever possible. Where there is no alternative the Commission will support the application of pesticides using techniques that will minimise the impacts to water resources.

4. Implementation

There are several instruments which may be used in the implementation of these policies and guidelines. The management and operational requirements prescribed in this document to protect water resources will be implemented through licences, permits and advice to other decision making authorities.

4.1 Sand mining operations on Crown land

The Department of Minerals and Energy (DME) under the *Mining Act 1978* administers sand mining operations occurring on Crown land. Mining approvals issued by the DME incorporate provisions for environmental management. Sand extraction proposals in Public Drinking Water Source Areas shall be referred to the Commission to obtain a groundwater extraction licence and a permit approval for storage of designated substances and waste disposal facilities. Other requirements prescribed by the policy and guidelines are recommended for inclusion in mining approval conditions.

4.2 Sand mining operations on private land

Local government authorities under the *Local Government Act 1995* regulate sand mining operations on private land. Extractive Industries Licences issued by local government authorities are in line with current town planning schemes and include conditions related to environmental management of the site. Sand extraction in Public Drinking Water Source Protection Areas shall be referred to the Commission to obtain a groundwater licence and a permit approval for storage of designated substances and waste disposal facility. Other requirements prescribed by the policy and guidelines are recommended for inclusion in Extractive Industries Licences.

4.3 Advice to proponents and other agencies

Part of the Commission's role is to provide advice on water resource management issues to other agencies, developers, landowners and consultants. The Commission will provide input on strategic and statutory planning documents and development applications.

Development of Management Plans, Statements of Planning Policy, Environmental Protection Policies, statutory planning schemes, regional plans, town planning schemes and scheme amendments may require consideration of impacts of sand mining on water resources. The Commission will provide advice on relevant provisions to facilitate implementation of these policy and guidelines.

Proponents are encouraged to contact the Commission in the early stage of planning to ensure the proposal will meet water resource protection requirements. Advice will also be given on water source management and protection issues.

Summary of Guideline Statements

Issue	Guideline Statements
3.1 Restricted land use	*3.1.1 The Commission considers the mining of construction and silica sands within Public Drinking Water Source Areas a restricted land use.* *3.1.2 Written approval from the Commission is required to establish sand mining operations within Public Drinking Water Source Areas.*
3.2 Clearance above water table	*3.2.1 The Commission will require all sand mining operators to use dry methods of sand extraction in Public Drinking Water Source Protection Areas. No extraction activities shall occur below the water table.* *3.2.2 The Commission will require all sand mining operations to maintain a minimum of 3 metres of undisturbed profile between the likely future maximum water table and the proposed final surface level in Priority 1 source protection areas.* *3.2.3 The Commission will allow, in exceptional circumstances, the minimum 3 metres of undisturbed profile between the likely future maximum water table and the proposed final surface level to be reduced to a minimum of 2 metres in Priority 1 source protection areas during mining. The operator must demonstrate that there will be no risk to water resources, through effective management measures at the close of operations. These must include a final 3 metre clearance to the likely future maximum water table.* *3.2.4 The Commission will require all sand mining operators to maintain a minimum of 2 metres of undisturbed profile between the likely future maximum water table and the surface level in Priority 2 and 3 source protection areas.* *3.2.5 The proponent should engage an approved environmental professional to determine the likely future maximum winter water table for the site in liaison with the Commission[1].*
3.3 Methods of Fuel Storage	*3.3.1 The Commission will issue approval for the installation of elevated storage tank systems in Priority 1, 2 and 3 source protection areas (outside of wellhead protection zones). The proposal must comply with the Commission's Water Quality Protection Guideline for The Siting and Installation of Above Ground Bulk Fuel and Chemical Storage Facilities.* *3.3.2 No elevated storage tank system shall be installed in a wellhead protection zone.* *3.3.3 The maximum volume for any elevated storage tank system shall be 5000 litres (unless the Commission is satisfied that there are special circumstances warranting additional storage).* *3.3.4 No ground storage tank system shall be installed within Priority 1 or 2 source protection areas or within wellhead protection zones.* *3.3.5 Ground storage tank systems are a restricted land use in Priority 3 areas and require prior permit approval from the Commission.* *3.3.6 Any storage of designated substances with the potential to pollute groundwater requires a permit approval from the Commission.*

[1] In the first instance, the historical maximum water table should be used to determine the likely future maximum water table.

Issue	Guideline Statements
3.4 Management of fuel	*3.4.1 The Commission requires that all sand mining operators working in priority source protection areas have in place a fuel management plan which has been approved by the Commission. The plan shall address:* • *fuel spill prevention at fuel storage areas;* • *details of fuel transport and refuelling;* • *a contingency plan for dealing with fuel spillages;* • *a groundwater monitoring program for hydrocarbons.*
3.5 Water abstraction requirements	*3.5.1 The Commission will require the operator to obtain a water allocation licence for any groundwater that will be extracted. The licence will stipulate the amount of water that may be drawn and will be subject to regular review. Should monitoring of the groundwater indicate any adverse trends, the allocation may be reduced. Results of monitoring may be required to be submitted to the Commission on a regular basis.*
3.6 Cleaning of settling ponds	*3.6.1 In the event of emptying settling ponds the discharged water should comply with the following water quality criteria:* • *in Priority 1 source protection areas for all health related components of discharged water, an increase of 1% of the NH&MRC health limit from the average natural concentration in groundwater recharge is allowed;* • *in Priority 2 source protection areas for all health related components of discharged water, an increase of 25% of the NH&MRC health limit from the average natural concentration in groundwater recharge is allowed;* • *in Priority 3 source protection area for all health related components of discharged water, an increase of 50% of the NH&MRC health limit from the average natural concentration in groundwater recharge is allowed.*
3.7 Waste disposal management	**3.7.1 Waste from employee amenities** *3.7.1.1 A septic system may be installed in Priority 1 and 2 source protection areas provided prior approval from the Commission is obtained. The Commission will issue approval to construct a septic system if the proposal conforms to all regulatory requirements.* **3.7.2 Waste from mechanical servicing** *3.7.2.1 Servicing of mechanical components of machinery involving liquids, such as coolants, hydraulic oils, lubricants or brake fluids (apart from routine maintenance) shall not be undertaken within Priority 1 and Priority 2 source protection areas.* *3.7.2.2 On-site servicing of operating equipment within a Priority 3 source protection area is acceptable if the site operator demonstrates effective procedures for the complete capture and transport of the waste liquids to an approved disposal site.* *3.7.2.3 Maintenance shall not take place inside a wellhead protection zone and must comply with the Commission's Water Quality Protection Guidelines for the Management of Fuel and Workshop Wastes.* **3.7.3 Waste water from the washdown of mechanical equipment** *3.7.3.1 All washdown of mechanical equipment shall be conducted in accordance with the Commission's Water Quality Protection Guidelines for the Management of Fuel and Workshop Wastes*

Issue	Guideline Statements
3.8 Surface water management	*3.8.1 All stormwater should be contained on site to remove sediments and turbidity.* *3.8.2 Sedimentation basins shall be designed and maintained in accordance with the Commission's Water Quality Protection Guideline for Minesite Stormwater Management.* *3.8.3 Sand mining operations shall be carried out at a minimum distance of 100 m from any watercourse or wetland and 200 m distance from a wetland of conservation value. These buffers shall maintain a minimum of 50 metres undisturbed vegetation.*
3.9 Acceptable end land uses	*3.9.1 The Commission will only support end land uses after sand mining extraction that comply with the Commission's Water Quality Protection Note on Land Use Compatibility within Public Drinking Water Source Areas.*
3.10 Rehabilitation	*3.10.1 Land disturbed by sand mining operations, shall be rehabilitated to an acceptable environmental standard which ensures the maintenance of existing water quality and is compatible with the surrounding area and the intended end land use.* *3.10.2 Backfilling with imported material in Priority 1 and 2 areas is prohibited. In Priority 3 areas, the importation of fill is a restricted activity, requiring prior approval from the Commission.* *3.10.3 The Commission will require that a sand mining operator employ an approved environmental professional to prepare a rehabilitation plan, which shall be submitted to the Commission for approval.* *This rehabilitation plan shall include (in addition to standard rehabilitation details required by Department of Conservation and Land Management, Department of Minerals and Energy or local government authorities):* • *detailed information on the nature, source and quantities of materials to be used for backfilling in Priority 3 areas;* • *an assessment of the potential groundwater contamination threats posed by the materials used for backfilling. This information shall include Toxicity Characteristic Leaching Procedure (TCLP) test analyses for any of the materials proposed to be used at the site that may pose a threat to groundwater quality;* • *requirements for pesticide application;* • *methods of remediation and clean up after mining operations.* *3.10.4 The Commission will support mechanical methods of weed control such as scalping.*

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Glossary

"bulk liquid storage tank system"	means any tank, whether or not mobile, having a capacity of 250 litres or more. It includes the pipework fittings and filling and dispensing apparatus associated with the tank. It does not include a tank that is part of any apparatus for the bacteriolytic treatment of sewage or that containing unpolluted water.
"Commission"	means the Water and Rivers Commission established by section 4 of the *Water and Rivers Commission Act 1995*.
"consultant"	a person or company engaged to provide professional, management or technical advice.
"designated substances"	means substances which have the potential to cause contamination of surface or groundwater resources when released to the environment. They include, but are not limited to: i) substances specified in the *Schedules* of the *Poisons Act 1964* (as amended); ii) substances specified in the Orders and Regulations made under the *Explosives and Dangerous Goods Act 1961* (as amended). Designated substances do not include quantities of materials less than 23 litres held in watertight containers and used for maintenance of hygiene or other ordinary on-site non-commercial purposes.
"elevated storage tank system"	means a bulk liquid storage tank system in which no portion of the tank is on or below the ground.
"ground storage tank system"	means a bulk liquid storage tank system in which any portion of the tank system is on or below the ground.
"occupier"	includes the owner and the person in actual occupation of land, or if there is no person in actual occupation, the person entitled to possession of the land.
"pesticide"	means a substance or mixture of substances that is represented, imported, manufactured, supplied or used as a means of directly or indirectly: (a) destroying, stupefying, repelling, inhibiting the feeding of, or preventing infestation by attacks of, any pest in relation to a plant, a place or a thing; or (b) destroying a plant; or (c) modifying the physiology of a plant or pest so as to alter its natural development, productivity, quality or reproductive capacity; or (d) modifying an effect of another agricultural chemical product; or (e) attracting a pest for the purpose of destroying it. A pesticide includes a substance or mixture of substances declared by the regulations to be an agricultural chemical product.

"priority 1 source protection area", "priority 2 source protection area" and "priority 3 source protection area"	means the portions of Public Drinking Water Source Areas designated, respectively, 'P1', 'P2', and 'P3' on the gazetted plans.
"restricted land use"	means development or land use, which may be compatible with the management objectives of the priority classification with appropriate site management practices.
"sand"	refers to filling, concrete, construction and silica sand.
"Public Drinking Water Source Area"	Refers to a Catchment Area, Underground Water Pollution Control Area or Water Reserve.
"Underground Water Pollution Control Area"	means an Underground Water Pollution Control Area constituted under section 57A of the *Metropolitan Water Supply, Sewerage and Drainage Act 1909.*
"unsaturated zone"	means the zone between ground surface and the water table. This zone still contains water, but the water is held to the soil particles by capillary forces.
"water contamination"	means degradation of the quality of water to the detriment of its use as a drinking water supply, or from its pre-existing condition.
"watercourse"	means: (a) any river, creek, stream or brook whether artificially improved or altered or not; (b) any conduit that wholly or partially diverts a river, creek, stream or brook from its natural course and forms part of that river, creek or brook; or (c) any natural collection of water into, through, or out of which anything referred to in paragraph (a) or (b) flows, whether artificially improved or altered or not, in which water flows or is contained whether permanently, intermittently or occasionally.
"Water Reserve"	means any area constituted as a Water Reserve under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947.*
"water resources"	means those water resources used or planned to be used for a drinking water supply and includes all waters mixing with such water.
"wellhead protection zone"	means that area within an Underground Water Pollution Control Area that surrounds a wellhead, the extent of which is identified on gazetted plans.
"water table"	the top of the saturated soil in an unconfined aquifer.

Further enquiries

Any project where the proponent/operator is unable to comply with the policy and guidelines, or where site conditions prevent their application, should be submitted to the Commission as early as possible in the development of the proposal so that the matter may be resolved.

Any enquiries relating to the content of these **policies and guidelines** should be directed to:

WATER AND RIVERS COMMISSION
HYATT CENTRE
3 PLAIN STREET
EAST PERTH WA 6004
TELEPHONE (08) 9278 0300
FACSIMILE (08) 9278 0301

PROGRAM MANAGER/PROTECTION PLANNING
TELEPHONE (08) 9278 0454
FACSIMILE (08) 9278 0585

For further enquiries on any matter relating to the **management of water resources in the regions**, please contact the Water and Rivers Commission's regional offices.

Region	**Telephone**	**Facsimile**
Swan-Goldfields-Agricultural Region 7 Ellam Street Victoria Park 6100	(08) 9355 3544	(08) 9472 1389
North West Region Chiratta Road Karratha 6714	(08) 9144 2000	(08) 9144 2610
South West Region U2 Leschenault Quays, Austral Parade Bunbury 6230	(08) 9721 0666	(08) 9721 0600
South Coast Region 5 Beven Street Albany 6330	(08) 9842 5760	(08) 9842 1204
Mid-West Gascoyne Region Pass Street Geraldton 6530	(08) 9964 5978	(08) 9964 5983