# FREMANTLE PORTS

## ENVIRONMENTAL GUIDELINES

Stormwater Management Plan

# FREMANTLE PORTS

STORMWATER MANAGEMENT PLAN (SMP) GUIDELINES

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In February 2011, Syrinx Environmental PL was commissioned by Fremantle Ports to develop Stormwater Management Plan (SMP) Guidelines for the Port of Fremantle. This current document is based upon the original SMP Guidelines developed by Syrinx Environmental PL (with their permission).

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# 1 GLOSSARY

It is recognised that some of the terms and abbreviations used in these guidelines are not commonly used in development decision-making. Definitions for these terms are provided below and reflect those provided in Better Urban Water Management (WAPC 2008) and the Stormwater Management Manual for Western Australia (DoW and SRT 2007).

| | |
|---|---|
| ARI | Average recurrence interval. |
| ASSM | Acid sulphate soil management. |
| BMPs | Best management practices. BMPs for water sensitive urban design techniques may relate to structural and non-structural elements for water quality management, water quantity management and water conservation and efficiency. |
| DoW | Department of Water |
| Non-Structural Controls | Pollution-prevention practices designed to prevent or minimise pollutants from entering stormwater runoff and/or reduce the volume of stormwater requiring management. |
| SMP | Stormwater Management Plan. |
| Structural Controls | Engineering devices implemented to manage runoff quality and quantity, to control, treat or prevent stormwater pollution and/or reduce the volume of stormwater requiring management. |
| Treatment train | Implementation of a combination of structural and non-structural controls in parallel or sequence to achieve best management of stormwater. |
| WAPC | Western Australian Planning Commission. |
| WSUD | Water sensitive urban design. WSUD is the philosophy of achieving better water resource management in an urban context by using an integrated approach to planning and incorporating total water cycle management objectives into the planning process. The |

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| | key elements of this design include protection from flooding; management of water quantity and quality to achieve ecological objectives; and water conservation, efficiency and re-use. |

# 2 INTRODUCTION

## 2.1 PURPOSE

This document is intended to provide guidance on the preparation of a Stormwater Management Plan (SMP) as required by Fremantle Ports in the 2017 Planning Guidelines (Fremantle Ports Planning Branch, 2017).

In addition, this note also provides recommendations on stormwater best management practices (BMPs) which may be applicable to sites within the Fremantle Ports boundary. These recommendations are based on state guidelines, precedents and catchment conditions. Note that the recommendations do not override any statutory obligation or government policy but rather support them and provide further detail applicable to the Fremantle Ports' Boundary.

## 2.2 SCOPE

This note applies to Fremantle Ports, its tenants and lease holders. It is applicable to all development within the boundary of the Port of Fremantle.

## 2.3 REFERENCES

The following documents are referred to in this guidance note:


1. ANZECC & ARMCANZ. (2000). Australia and New Zealand Guidelines for fresh and marine water quality. Canberra
2. ANZECC & ARMCANZ. (2000). Australian Guidelines for Water Quality Monitoring and Reporting. Canberra
3. Department of Water and Swan River Trust. (2007). Stormwater Management Manual for Western Australia. Perth, WA
4. Department of Health. (2007). *Chironomid midge and mosquito risk assessment guide for constructed water bodies*. Perth, WA, Western Australia.
5. Department of Water. (2008). Urban Water Management Plans – Guidelines for preparing plans and complying with subdivision conditions. Perth
6. Department of Water. (2010). Water Quality Protection Note 52: Stormwater management at industrial sites. Perth, WA
7. eWater. (2011). Guidelines for Water Management Modelling. Canberra, ACT
8. enHealth. (2004). Guidance on the Use of Rainwater Tanks. Canberra, ACT
9. Geoscience Australia. (2016). Australian Rainfall and Runoff: A Guideline to Flood Estimation. Canberra, ACT
10. Fremantle Ports. (2017). Planning Guidelines. Perth, WA
11. Government of Western Australia. (2007). State Water Plan. Perth, WA

12. NHMRC & NRMMC. (2006). National Water Quality Management Strategy: NWQMS Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1), Canberra, ACT
13. NHMRC & NRMMC. (2009). National Water Quality Management Strategy: Australian Guidelines for Water Recycling: Stormwater Harvesting and Reuse (Phase 2), Canberra, ACT
14. WAPC. (2008). *Better Urban Water Management*. Perth, WA

# 3 DEVELOPING A STORMWATER MANAGEMENT PLAN

## 3.1 PURPOSE

The purpose of the SMP document is to demonstrate compliance with the relevant Fremantle Ports Development Guidelines and Development Policies. The key requirement is that all stormwater is contained on-site. In line with the Development Guidelines the SMP shall address how on-site stormwater management will:

- Minimise environmental impacts of stormwater and its disposal;
- Protect buildings from flooding and waterlogging;
- Maximise opportunities to reuse stormwater and treat it as a resource; and
- Integrate with hard and soft landscaping, including car parking areas.

## 3.2 STRUCTURE AND CONTENT

Table 1 provides an outline of the structure and content that would typically make up an SMP submission to Fremantle Ports. This structure and content has been adapted from *Urban Water Management Plans – Guidelines for preparing plans and complying with subdivision conditions (Department of Water, 2008) and Better Urban Water Management (Western Australian Planning Commission, 2008)* documents.

Generally, the content of the SMP document should be clear and concise and should only contain relevant information that has been used to make a conclusion or decision regarding the management of water within the development. Information provided as figures and/or tables is preferred.

**Table 1 Expected structure and content of SMP**

| SMP RECOMMENDED CONTENT | COMMENTS |
|---|---|
| **Executive Summary** | |
| Provide summary information about the development and state each key element of the stormwater management strategy and provide a brief explanation of how the action/design response achieves the design objective. | Provision of this information in a table is ideal. |
| **Background Information** | |
| Introduction – provide an overview of the site and proposed development. | Provide a location/context plan and, where available, general arrangement plans of the proposed development. |
| Stormwater design objectives – clearly state the relevant design objectives and provide a reference for the origin of each design objective and any assumptions.<br><br>Design objectives should reflect and further the objectives presented in the Fremantle Ports Development Guidelines, Development Policies and Standard Conditions.<br><br>In addition, design objectives should reflect current regulation and guidelines for stormwater best management practice.<br>Sites generally will be required to be designed to manage stormwater onsite for 1 in 10 year storm events. | Refer *Australia and New Zealand Guidelines for fresh and marine water quality* (ANZECC & ARMCANZ, 2000) for environment/beneficial use protection, the State Water Plan (Government of Western Australia, 2007) for efficiency and reuse targets (p. 60), *Better Urban Water Management* (WAPC, 2008) for WSUD design objectives (p. 3) and *Water Quality Protection Note 52 Stormwater management at industrial sites* (DoW, 2010). |
| Site characteristics – discuss site characteristics such as land use, soil type, environmentally sensitive areas, ASSM, contaminated areas, surface water flow paths, groundwater and proposed development. | It may be useful to provide relevant drawings to assist discussion. |

| **Stormwater Management System** | |
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| On-site storage – provide information for required on-site storage and/or detention including: invert levels, top water and peak flow levels. | Stormwater flows and volumes may be estimated using the procedures provided in *Australian Rainfall and Run-off* Guidelines (Geoscience Australia, 2016).<br>Refer to ARI 10 year flow paths and flood levels. |
| Flood protection - provide information in regards to peak flow rates and discuss how buildings and infrastructure are protected from flooding.<br><br>Outline how the onsite storage system will be integrated with upstream and downstream systems in a greater than 1 in 10 year storm event. | Refer to ARI 100 year flow paths and flood levels. |
| Stormwater management system – provide a detailed description of the stormwater management system. Include a description of the size, location and design of the system.<br><br>Discuss locations and arrangements for agreed structural and non-structural best management practices and treatment trains.<br><br>Figures/drawings should be included for the whole development and where appropriate, for critical locations/element including:<br><br>• Pipe/swale network, including locations of best management practices (swales, bio-retention systems, soak wells etc.).<br>• Typical cross-sections of swales, storage areas and multiple-use corridors, including indicative landform/landscaping<br>• Long section(s) of the system showing the final surface levels, invert levels, groundwater levels. | Section 3 of this guidance note provides recommendations for selecting appropriate structural and non-structural best management practices for use within the Fremantle Ports boundary.<br>Refer to design and installation recommendations provided in *the Structural Controls, Stormwater Management Manual for Western Australia* (DoW & SRT, 2007).<br>The use of surface and groundwater modelling to develop an appropriate stormwater management system may be required such as the resources by eWater. |

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| Landscape concept – Discuss the integration of the best management practices/WSUD elements with on-site landscaping and car parking areas. | All landscape areas shall be designed in accordance with the Fremantle Ports Planning Guidelines 2017. In line with these guidelines, a minimum of 5% of the site must be landscaped and one tree shall be provided for every six car parking spaces.<br>Where applicable, the Planning Guidelines should be added as an appendix to the SMP. |
| Stormwater quality – address how the stormwater management system addresses water quality.<br><br>Discuss the expected water quality improvement provided by structural and non-structural best management practices.<br><br>Provide qualitative and quantitative assessment of water quality improvements and discuss compliance with design objectives. | For WSUD refer to the *Australian Rainfall and Runoff Guidelines* (Geoscience Australia, 2016). Refer to eWater Guidelines for Water Management Monitoring (2011). |
| Acid sulfate soils– discuss actions to address ASSM and/or contamination. | An ASSM plan may be required in addition to the SMP. |
| Groundwater – Where development alters the level of ground or impacts upon groundwater, show post-development groundwater levels and fill requirements (including existing and final surface levels), outlet controls and any subsoils (showing drawdown/impacts near sensitive environments). | |

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| Disease vector and nuisance insects – provide information on the management of disease vector and nuisance. | *Refer to the Chironomid midge and mosquito risk assessment guide for constructed water bodies* (enHealth, 2007). |
| **Water Sustainability Initiatives** | |
| Stormwater reuse – provide information on stormwater reuse measures including the designs, controls, management and operation of the proposed system. The designs shall demonstrate compliance with all relevant national and state regulations and guidelines.<br><br>Water conservation – explain and quantify reductions in the use of scheme water as a result of stormwater reuse. | Refer to *Guidance on the Use of Rainwater Tanks* (enHealth, 2004), *Structural Controls, Stormwater Management Manual* (DoW & SRT, 2007), *NWQMS: Australian Guidelines for Water Recycling: Stormwater Harvesting and Reuse* (NHMRC & NRMMC, 2009). |
| **Management of Development Works** | |
| Development management - Outline the management of the site during development activities. Where relevant, address: dewatering; ASSM; dust and sediment control and maintenance of any already installed best management practices during development. | Refer to controls outlined in a Construction Environmental Management Plan (CEMP) if applicable. |

| **Monitoring and Maintenance** | |
|---|---|
| Monitoring – outline whether any monitoring program is proposed, including its methods, frequency and parameters. A contingency plan should also be identified together with appropriate trigger values and responsibilities.<br>Maintenance – Address how the best management practices will be maintained and managed. Discuss expected maintenance frequency. | For monitoring refer *Performance Monitoring and Evaluation, Stormwater Management Manual for Western Australia* (DoW & SRT, 2007) and *Australian Guidelines for Water Quality Monitoring and Reporting* (ANZECC & ARMCANZ, 2000). Ensure monitoring is undertaken in a manner consistent with the relevant Australian Standards.<br><br>For maintenance of WSUD structural controls refer to *Structural Controls, Stormwater Management Manual for Western Australia* (DoW & SRT, 2007) |
| **Implementation** | |
| Roles and responsibilities – Outline the roles, responsibilities, funding and maintenance arrangements for implementing the SMP. | |

# 4 RECOMMENDED PRACTICES

Recommendations provided in this section reflect current best management practices (BMPs) for stormwater management as addressed in the Stormwater Management Manual for Western Australia (Department of Water and Swan River Trust, 2007) and Water Quality Protection Note 52: Stormwater Management at Industrial Sites (Department of Water, 2010). A treatment train approach to stormwater management is recommended, whereby combinations of measures (structural/engineered and non-structural/operational) are implemented in parallel or sequence to achieve best management of stormwater.

# 5 STRUCTURAL BEST MANAGEMENT PRACTICES

Structural BMP's are engineered devices implemented to manage runoff quantity and quality. Structural BMP's suitable for implementation within the Fremantle Ports boundary are identified in Table 2. These controls will assist in compliance with design objectives identified in the SMP. The selection of structural BMPs requires consideration of multiple factors, including catchment objectives, site characteristics, target pollutants, business values and capital and operating costs to achieve a balance between quantity and quality management objectives and to create a sustainable outcome. The Stormwater Management Manual for Western Australia (Department of Water and Swan River Trust, 2007) provides technical guidelines on all the structural controls identified in Table 2 and should be referred to in the development and design of structural controls.

**Table 2** – Best Management Practice (BMP) for industrial and commercial stormwater.

| | BMP function | | | Pollutants targeted | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BMP system (industrial and commercial land use)** | **Water quantity** | **Water quality** | **Water conservation** | **Litter & sediment** | **Particulate nutrients** | **Dissolved nutrients** | **Heavy metals** | **Oxygen demanding material** | **Micro-organisms** | **Hydrocarbons** | **Comments** |
| **Rainwater harvesting & reuse** | ✓[1] | | ✓ | | | | | | | | Rainwater tanks connected to roof catchments provides high quality water that can be reused for irrigation and site operations. Provision of tanks provides a space efficient approach to OSD so long as reuse can continually draw down tank for filling by consecutive rain events. |
| **Infiltration basins** | ✓[1] | ✓ | ✓ | ✓ | ~ | | ~ | ✓ | ✓ | ~ | Infiltration basins are likely to provide the lowest cost approach to OSD and disposal (site dependant). However, as their surface area cannot be utilised for other activities, and due to often shallow groundwater, they are often not space efficient. |
| **Infiltration trenches** | ✓[1] | ✓ | ✓ | ✓ | ~ | | ~ | ✓ | ✓ | ~ | Infiltration trenches are more costly than infiltration basins, however, as they are filled with media (such as gravel) site activities can occur on their surface. |
| **Soakwells** | ✓[1] | ✓ | | | | | | | | | Soakwells provide a low cost approach for OSD and disposal in small (<300m$^2$), isolated catchments. Unlikely to be a cost effective OSD and disposal control for larger catchments. |
| **Permeable pavement** | ✓[1] | ✓ | | ✓ | ~ | | | | | | Permeable pavement (100% porous paver) increases the perviousness of the catchment. The pavers can be placed within carparks, pedestrian areas and along drainage lines. The pavers are not recommended in areas with regular truck/forklift access. |
| **Swales and buffer strips** | ✓[2] | ✓ | ✓ | ✓ | ✓ | ~ | ~ | | ✓ | | Swales and buffer strips can be used for conveyance in lieu of traditional piped systems to assist in maintaining pre-development peak flow rates. These systems also provide limited OSD, disposal via infiltration and water quality benefits. |
| **Bioretention systems** | ✓[2] | ✓ | ✓ | ✓ | ✓ | ~ | ✓ | | ✓ | | Bioretention systems provide a space efficient approach to water quality improvement via the use of a sand filter media and vegetation. These systems also provide limited OSD, disposal via infiltration and water quality benefits. |
| **Litter & sediment management systems** | | ✓ | | ✓ | ✓ | | | ~ | | | Includes sediment traps, commercial gross pollutant traps or other sediment trapping vessels that should be used in conjunction with other structural controls to avoid system blockages, reduce maintenance & improve aesthetic amenity. |
| **Pollutant control systems** | | ✓ | | | | | ~ | | | ✓ | Includes containment of pollutants (such as chemicals, hydrocarbons and heavy metals) in structures/bunds (temporary and permanent) and weatherproof areas that allows isolation and recovery of pollutants and prevents contaminant entry into the stormwater system. |

1 Retention
2 Conveyance, retention, detention

# 6 NON-STRUCTURAL BEST MANAGEMENT PRACTICES

Non-structural BMP's are pollution-prevention practices designed to prevent or minimise pollutants from entering stormwater runoff and/or reduce the volume of stormwater requiring management. Non-structural BMP's recommended within the Fremantle Ports boundaries include:

Maintenance practices

- Prevent contaminants from floors and covered work areas from entering the stormwater system by using surface grades, bunds, or diversion drains to an impervious sump or treatment system.
- Designated material handling areas and maintenance areas (vehicle and machinery) should be kerbed and graded to contain spills, stormwater and liquid. These areas should be covered where possible.
- Wash-down areas should be designed to collect all wastewater in impervious collection sumps and bunds. The captured wastewater should be treated (silt trap, oil separation system) prior to discharge to wastewater or shall be removed by a licensed waste contractor.
- Ensure fuel storages are regularly checked and tested for leakages.
- Regularly inspect and maintain on-site stormwater systems. Litter, silt and plant matter should be removed from structural BMPs, preferably prior to the wet season.
- Drainage lines shall be maintained and unobstructed by any structures (including storage containers, stockpiles, equipment etc).
- Paved areas shall be regularly cleaned using 'dry' methods that prevent contamination of stormwater system (such as street sweeping).
- Regularly maintain machinery/vehicles to minimise the risk of leaks.
- Where possible, loading and unloading should take place in a covered area away from the vicinity of stormwater drains. Stormwater should be directed away from loading and unloading areas.
- Equipment such as absorbent material shall be available on-site to clean up minor contaminant spills. Hose down of floor residue into floor drains shall be avoided.
- Stormwater containment products, such as drain plugs and sand bags, shall be available on-site to contain major contaminant spills, until the contaminant is removed.

Education:

Identify and assess stormwater related risks on the site (e.g. activities that may contaminate stormwater). Ensure Environmental Management Plans or procedures outline how to manage the identified risks and provide professional training to those preparing the documents where required. These plans should be subject to regular audits to ensure they are occurring and to identify areas of improvement (both within the plan and workplace).

Train all staff to be aware of stormwater pollution, to undertake their roles in related management plans/procedures, report incidents and safely manage incidents.

Ensure staff training includes safe material handling and storage procedures to minimise the risk of a spill.

Stormwater pits shall have signage/stencilling indicating that they discharge to groundwater and the marine environment to assist in minimising illicit discharge of contaminants to stormwater.


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