Shire of BODDINGTON
Flowing with Natural Beauty

Boddington District Water Management Strategy

May 2019

Prepared by Edge Planning & Property for the Shire of Boddington
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Executive Summary

The *Boddington District Water Management Strategy* (DWMS) has been prepared to support the review of the *Shire of Boddington Local Planning Strategy* (LPS) and the preparation of the *Shire of Boddington Local Planning Scheme No. 3* (LPS3).

The DWMS seeks to guide land use and development and to conserve and manage water resources in and around the Boddington townsite. In particular, this is the area outlined in Figure 1 which is to be called the 'Development Footprint' (Strategy area). The DWMS also aims to provide guidance for developers (also includes proponents), residents, other stakeholders and the local government.

The DWMS has been developed to:

- outline that the Development Footprint is capable of supporting a change of land use as envisaged by the LPS;
- provide a broad framework to manage stormwater to support future development which adopts best management practices;
- minimise risks associated with flooding, nutrient export and pollution;
- promote development that minimises water use, supports water that is fit-for purpose and promotes re-use;
- protect key infrastructure, such as the waste water treatment plant (WWTP), from inappropriate development; and
- support the role and initiatives by the Department of Water and Environmental Regulation (DWER) and Water Corporation, along with the local government, the community and other stakeholders in sustainably using water.

The DWMS assists to outline that proposed land use change within the Development Footprint is able to achieve appropriate water management outcomes.

Most of the land within the Development Footprint, if located outside of floodways, is generally suitable for development if appropriately sited, designed, serviced and managed. Accordingly, proposed development provides an overall low level of risk to water resources and risks can be effectively managed. Subdivision/development set out in accordance with the LPS and the DWMS will be appropriately serviced (including with potable water, wastewater and stormwater management) and will not detrimentally impact water resources or associated environmental assets.

As there is no overarching water management planning that applies to the District, the DWMS establishes a framework for water management that includes guidance for preparing Local Water Management Strategies (LWMS) and Urban Water Management Plans (UWMP). LWMS's and UWMP's will undertake a site specific assessment of relevant issues and risks and set out in more detail associated mitigation/management and water conservation measures.

Contents

BODDINGTON DISTRICT WATER MANAGEMENT STRATEGY

1.0 PLANNING BACKGROUND AND PREVIOUS STUDIES

1.1 Location

The DWMS applies to the Development Footprint (Figure 1) in and around the Boddington and Ranford townsites. The Development Footprint is the expansion area for the Boddington and Ranford townsites and the location of future urban, rural residential and rural smallholding subdivision.

Boddington is located within the Peel Region and is situated 130km south-east of Perth and 100km east of Mandurah (Figure 2).

Boddington is located within the Murray River Basin (Figure 8). The Murray River basin contributes to the Peel-Harvey system which contains a unique, extensive and complex system of waterways and water resources.

1.2 Planning document the strategy is supporting

The local government has recently finalised a review of the Local Planning Strategy (LPS) and is reviewing the current LPS2 to prepare a new Local Planning Scheme No.3 (LPS3). There is now an opportunity to incorporate recent planning initiatives relating to water management such as the *Shire of Boddington Flood Management Study*.

As outlined in the LPS and LPS3, the Development Footprint is the location where nearly all subdivision in the Shire of Boddington (District) will occur.

1.3 Purpose

The DWMS has been developed to:

- outline that the Development Footprint is capable of supporting a change of land use as envisaged by the LPS;
- provide an overview of water resources within the Development Footprint;
- present a recommended approach for total water cycle management with an emphasis placed on water sensitive urban design (WSUD);
- provide a broad framework to manage stormwater to support future development which adopts best management practices which is appropriate for the site's characteristics;
- guide the design of structure plans that best suits the existing natural environment, while ensuring sufficient space for water is provided;
- minimise risks associated with flooding, nutrient export and pollution;
- promote development that minimises water use, supports water that is fit-for purpose and promotes re-use;
- protect key infrastructure such as the WWTP from inappropriate development;
- support the role and initiatives by DWER and Water Corporation, along with the local government, the community and other stakeholders in sustainably using water.

Shire of Boddington
District Water Management Strategy
Boddington and Surrounds

Development Footprint / Strategy Area

0 1km

SCALE 1:40,000 @ A3

MAY 2019

NORTH

FIGURE 1

ALBANY HIGHWAY

CROSSMAN ROAD

BANNISTER - MARRADONG ROAD

Shire of Boddington
District Water Management Strategy
Location Plan

FIGURE 2

The DWMS is a strategic level plan that is intended to apply for at least a 10-15 year or longer period. The DWMS identifies risks, principles, objectives and strategies to address better practice relating to water management in the District. LWMS's, UWMP's and other initiatives will separately be prepared which will assist with implementation. Non-structural methods, structural methods and best management practices are all necessary measures for promoting water management.

1.4 References to key State and local policies, guidelines and strategies

1.4.1 Integrating land use and water planning

The DWMS, in conjunction with the LPS, LPS3 and other planning tools, seeks to set out an integrated strategy for the management of land and water resources. The planning framework for land and water planning is illustrated in Figure 3 showing the Western Australian planning system and linkages to water sensitive urban design terms. The DWMS sets out how water resources can be considered in the land use planning system and to ensure consistency with *State Planning Policy 2.9 Water Resources*.

A number of key policies, guidelines and strategies have guided the preparation of the DMWS including:

- *State Water Strategy* (2003);
- *State Sustainability Strategy* (2003);
- *State Planning Policy 2 Environmental and Natural Resources* (SPP 2);
- *State Planning Policy 2.7 Public Drinking Water Source Policy* (SPP 2.7);
- *State Planning Policy 2.9 Water Resources* (SPP 2.9);
- *Better Urban Water Management* (2008);
- *Stormwater Management Manual for Western Australia, Department of Environment and Conservation* (2007); and
- *Decision process for stormwater management* (Department of Water and Environmental Regulation, 2017)

The following section outlines some of the key strategies and policies which have guided the preparation of the DMWS.

1.4.2 State Water Strategy

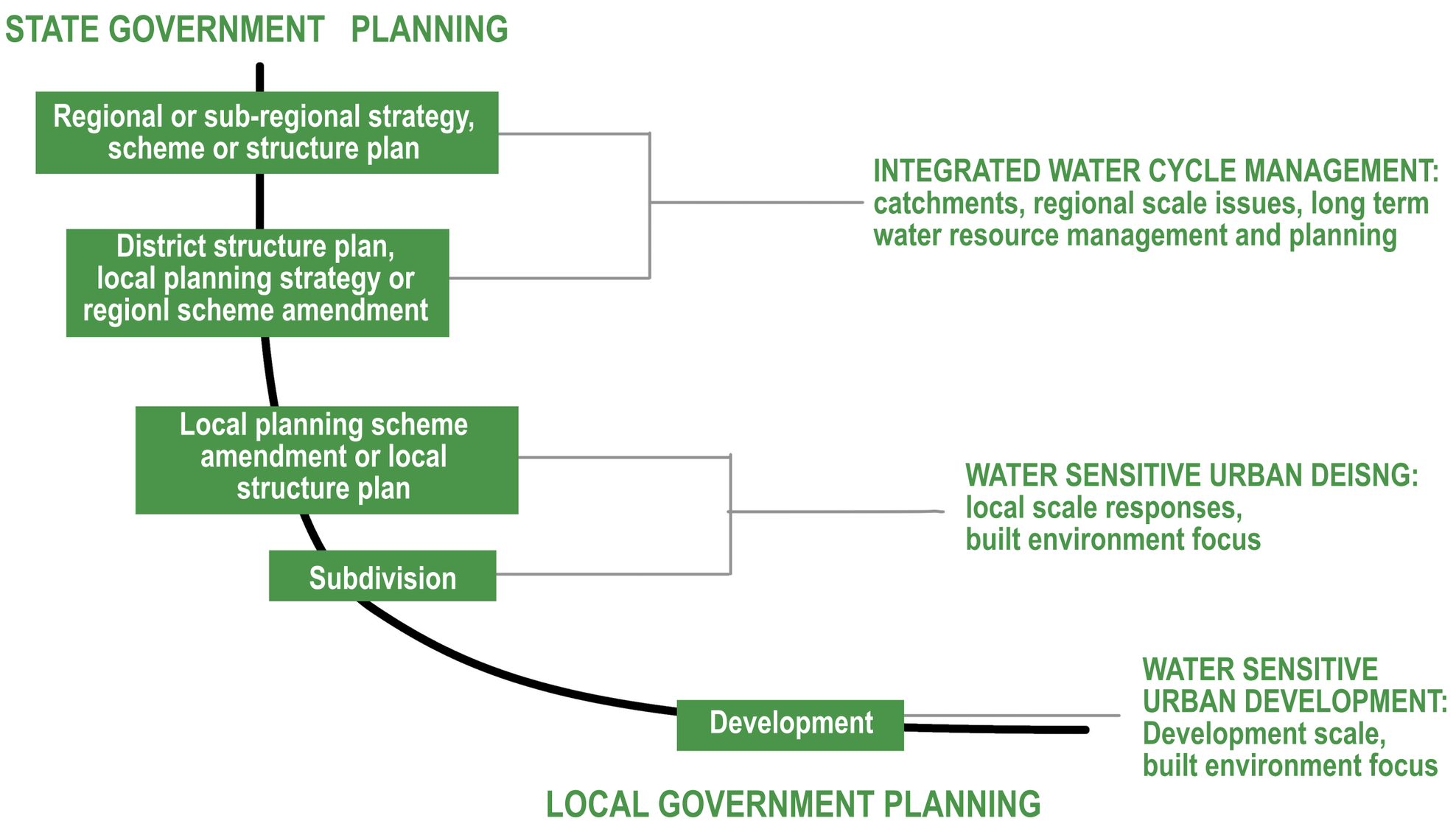
The *State Water Strategy* promotes a total water cycle management plan and it endorses the application of WSUD principles. The Strategy seeks improvement to the management and efficient use of water supplies including stormwater.

Total water cycle management addresses not only physical and environmental aspects of water resource use and planning, but also integrates other social and economic considerations. Management design objectives should therefore seek to deliver better outcomes in terms of:

- consideration of all water sources, including wastewater, stormwater and groundwater;
- sustainable use of all water sources;
- allocating and using water equitably including potable water consumption;

Shire of Boddington
District Water Management Strategy
Western Australian planning system and linkages to water sensitive urban design terms

FIGURE 3



SOURCE: Better Urban Water Management, 2008, Western Australian Planning Commission

- integrating water use with natural water processes, including maintaining environmental flows and water equality;
- stormwater quality management;
- shallow groundwater management; and
- flood mitigation.

1.4.3 State Planning Policy 2.9 – Water Resources

State Planning Policy 2.9 Water Resources (2006) outlines the key principles of integrated water cycle management as:

- consideration of all water resources, including wastewater in water planning;
- integration of water and land use planning;
- the sustainable and equitable use of all water sources, having consideration of the needs of all water users, including the community, industry and the environment;
- integration of human water use and natural water processes; and
- a whole of catchment integration of natural resource use and management.

Total water cycle management 'recognises that water supply, stormwater and sewage services are interrelated components of catchment systems and therefore must be dealt with using a holistic water management approach that reflects the principles of ecological sustainability' (DoW: 2007).

WSUD objectives set out in SPP 2.9 are to:

- manage a water regime;
- maintain and, where possible, enhance water quality;
- encourage water conservation;
- enhance water-related environmental values; and
- enhance water-related recreational and cultural values.

1.4.4 Stormwater Manual for Western Australia

The objectives for managing stormwater as stated in the *Stormwater Manual for Western Australia* are:

- Water Quality: to maintain or improve the surface and groundwater quality within the development areas relative to predevelopment conditions.
- Water Quantity: to maintain the total water cycle balance within the development areas relative to the predevelopment conditions.
- Water Conservation: to maximise the reuse of stormwater.
- Ecosystem Health: to retain natural drainage systems and protect ecosystem health.
- Economic Viability: to implement stormwater management systems that are economically viable in the long term.
- Public Health: to minimise the public risk, including risk from injury or loss of life, to the community.
- Protection of Property: to protect the built environment from flooding and waterlogging.

- Social Values: to ensure that social, aesthetic and cultural values are recognised and maintained when managing stormwater.
- Development: to ensure the delivery of best practice stormwater management through planning and development of high quality developed areas in accordance with sustainability and precautionary principles.

1.4.5 Better Urban Water Management

The *Better Urban Water Management* document seeks to integrate land use and water planning systems, and to implement SPP 2.9. This document outlines policy principles and design criteria that should be applied. Application of the document seeks to ensure the consideration of total water cycle management at an appropriate scale and level of detail at the various stages of the planning process.

1.4.6 Regional water plan

There is no finalised regional water management strategy that applies to the District.

1.4.7 District policy context

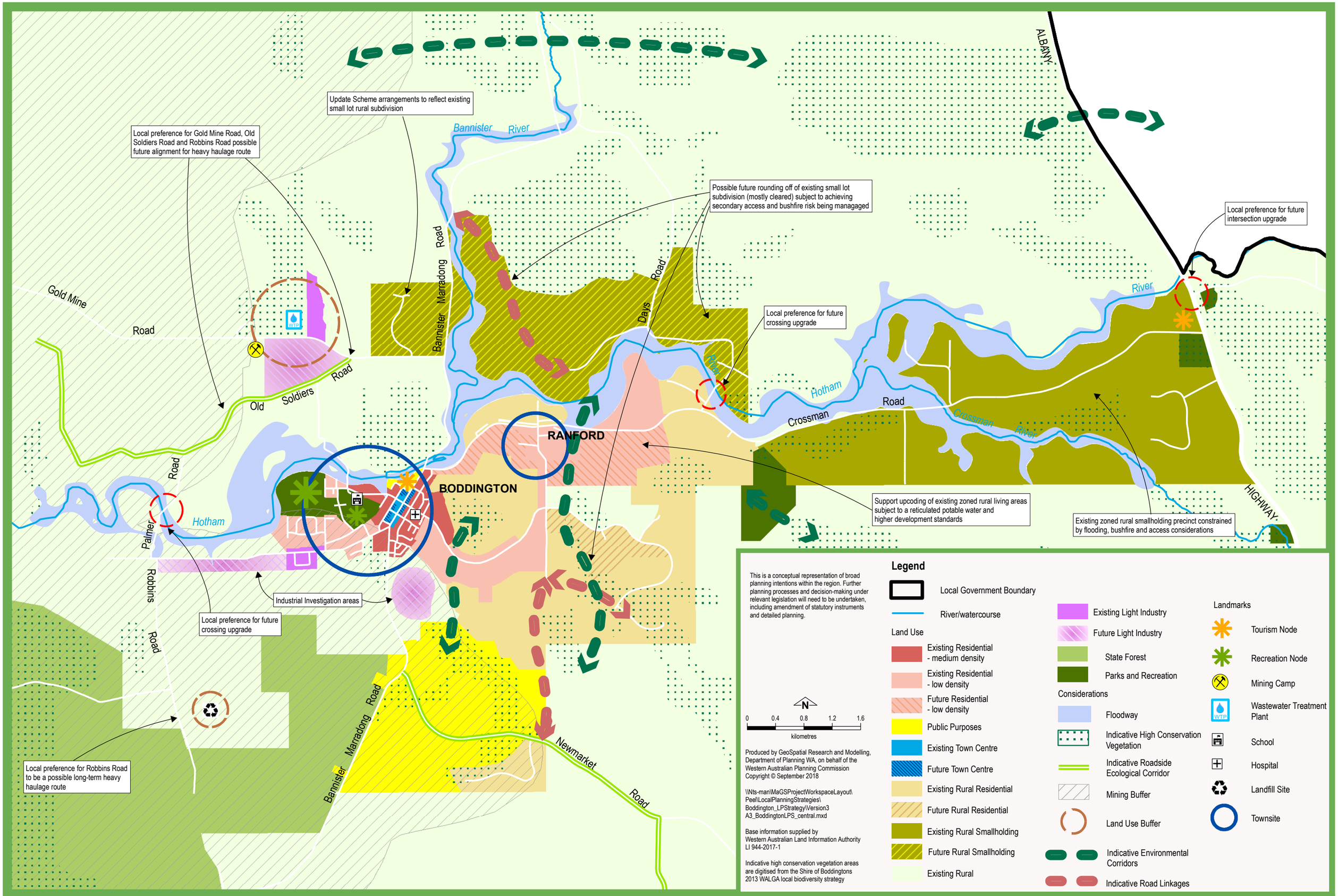
Key District level studies and policies relating to water management or which have important implications on water management include:

- *Shire of Boddington Floodplain Management Strategy*;
- *Boddington-Ranford Townsite Strategy;*
- *Boddington SuperTown Growth Plan;*
- *Boddington-Ranford Drainage Study;*
- *Local Planning Policy 3 Urban Drainage Contribution;*
- *Local Planning Policy 4 Rural Residential Lots and Water Supplies;*
- *Local Planning Policy 6 Development in Flood Affected Areas;*
- *Local Planning Policy 15 Buildings and Structures in and Near Drainage Easements;*
- *Local Planning Policy 17 Stormwater Management;*
- *Local Planning Policy 18 Cut, Fill and Retaining Walls;* and
- *Stormwater Management and Connection Policy.*

The LPS provides the strategic land use planning framework for the District.

The LPS allocates land for a range of uses in and around the Boddington townsite. Existing and future urban, rural living and industrial land will be located within a Development Footprint. The Development Footprint is shown on LPS Strategic Land Use Plan (Central) which is shown in Figure 4. The Development Footprint identifies land for potential subdivision/development in and around the Boddington townsite and includes the 'Crossman Corridor' (land generally between Boddington and Albany Highway near Crossman Road). The Development Footprint provides opportunities for further urban, rural residential and rural small holding subdivision/development should a developer suitably demonstrate the land is suitable and capable.

LPS2 controls and guides land use and development within the District. LPS2 is being reviewed through the preparation of LPS3. The LPS, LPS2 (currently) and the LPS3



BODDINGTON LOCAL PLANNING STRATEGY (CENTRAL)

FIGURE 4

(when finalised), will influence rezoning, structure plans, subdivision applications, development applications and building permits.

The Council, in 2014, granted final adoption to *Local Planning Policy 17 Stormwater Management*. This requires new development/subdivision to retain/detain stormwater on site. In particular, this is to detain the difference between the pre-development and post-development run-off rates for at least the 1 in 1 year - 1 hour average recurrence interval (ARI) storm event.

1.4.8 Proposed development

The LPS sets out the long-term planning directions for the District, Boddington townsite and surrounding areas, applies State and regional planning policies, and provides the rationale for the zones and other provisions. The key elements of the LPS include identifying locations for expanded urban and rural living development, providing clear expansion boundaries to protect surrounding mining and agricultural interests and environmental assets, and encouraging increased residential densities near the Boddington town centre where land is connected to reticulated sewerage and land is outside of the floodway.

The LPS Strategic Land Use Plan (Central) covering the Development Footprint is shown in Figure 4. A wide range of residential, other urban, rural residential and rural smallholding areas are shown which provide a long-term land supply. Generally lot sizes increase with distance from the Boddington town centre, with new lots below 2000m^2 required to be connected to the reticulated sewerage system.

The LPS proposes that rural landholdings will be maintained outside of the Development Footprint.

Relevant to the DWMS, the Strategic Land Use Plan (Central) shows key rivers, floodways, indicative high conservation vegetation, indicative environmental corridors and the WWTP buffer.

Boddington Lion Weir Bridge

2.0 DESIGN CRITERIA

2.1 Aim

The DWMS seeks to:

- satisfy the requirements of *Better Urban Water Management* and SPP 2.9;
- identify key water and land resource constraints to development;
- provide strategic guidance on water resources within the Development Footprint;
- prepare a management strategy for surface and groundwater, nutrient/pollution management, waterways protection and for managing stormwater;
- set out a range of best management practices including opportunities for promoting source control, water use/reuse, detention and other treatment practices;
- ensure that land within the Development Footprint is capable of supporting appropriate urban and rural living development and to address the total water cycle management including through:
  - conserving environmental assets and minimising pollutants entering waterways and groundwater;
  - encouraging the development of WSUD;
  - minimising total water use and promoting water re-use;
  - protecting subdivision/development from flooding; and
- develop a framework for the implementation of the DWMS.

2.2 Water Management Principles and Objectives

The DWMS adopts the principles and objectives set out in DoW's *Guidelines for District Water Management Strategies* (2013).

Principle 1: Manage catchments to maintain or improve water resources

Objective

1. Manage runoff from all rainfall events as high in the catchment as possible.
2. Manage post development hydrology to maintain and/or improve hydrological, hydrogeological and ecological functions.
3. Maintain or improve water quality of surface water and groundwater.
4. Manage, protect and restore waterways.
5. Minimise pollutant inputs through implementation of appropriate structural and non-structural controls.
6. Retain native vegetation and natural landform.
7. Safeguard the quality and availability of water resources for the future.

Principle 2: Manage flooding and inundation risks to human life and property

Objective

1. Provide adequate clearance from the 1% Annual Exceedance Probability (AEP) flood level and surface water or groundwater inundation and waterlogging.
2. Prevent increased flooding or inundation of upstream, downstream or adjacent developed areas.
3. Manage surface water flows to prevent damage to downstream infrastructure and assets.
4. Manage risk to public health from disease vector and nuisance insects.

Principle 3: Ensure the efficient use and reuse of water resources

Objective

1. Minimise water use within developments.
2. Maximise water reuse, including using wastewater and harvested stormwater.
3. Achieve highest value use of fit-for-purpose water, considering all available sources of water for their potential as a resource.

Principle 4: Recognise and maintain economic, social and cultural values associated with water

Objective

1. Improve social amenity by having multiple use corridors and by integrating water management measures into the street and lot landscape to increase visual, recreational, cultural, public health and ecological values.
2. Implement water management systems that are economically viable in the long term.
3. Ensure the delivery of best practice urban water management through planning and design of quality urban areas in accordance with sustainability and precautionary principles.

Hotham River

3.0 PRE-DEVELOPMENT ENVIRONMENT

3.1 Climate

Boddington has a Mediterranean climate with warm to hot, dry summers and mild, wet winters. Higher rainfall is typically experienced in the winter months generally between May and September. The mean annual rainfall in Boddington is approximately 650mm.

The rainfall in the winter months means the significant rainfall events and resultant flooding is more likely to occur in the winter period. The District, on occasions, does receive heavy rainfall in summer months which is often associated with an ex-tropical cyclone and can result in heavy rainfall and even create flooding.

Boddington, like other parts of Western Australia's south-west, has seen the impacts of a changing climate which has been evident through a drying trend since the 1970s. This has resulted in a decrease in rainfall and stream flow.

3.2 Landform, soil types and topography

Boddington is located on the Darling Plateau which contains a lateritic surface. West of the Boddington townsite is the Saddleback Greenstone Belt which contains significant mineral deposits including bauxite, gold and copper.

The surface of the Darling Plateau in the Development Footprint has been extensively dissected by rivers and watercourses. Boddington is characterised by rolling hills (with most hill tops being vegetated), valleys and rivers. Slopes vary from gentle to steeper sloping.

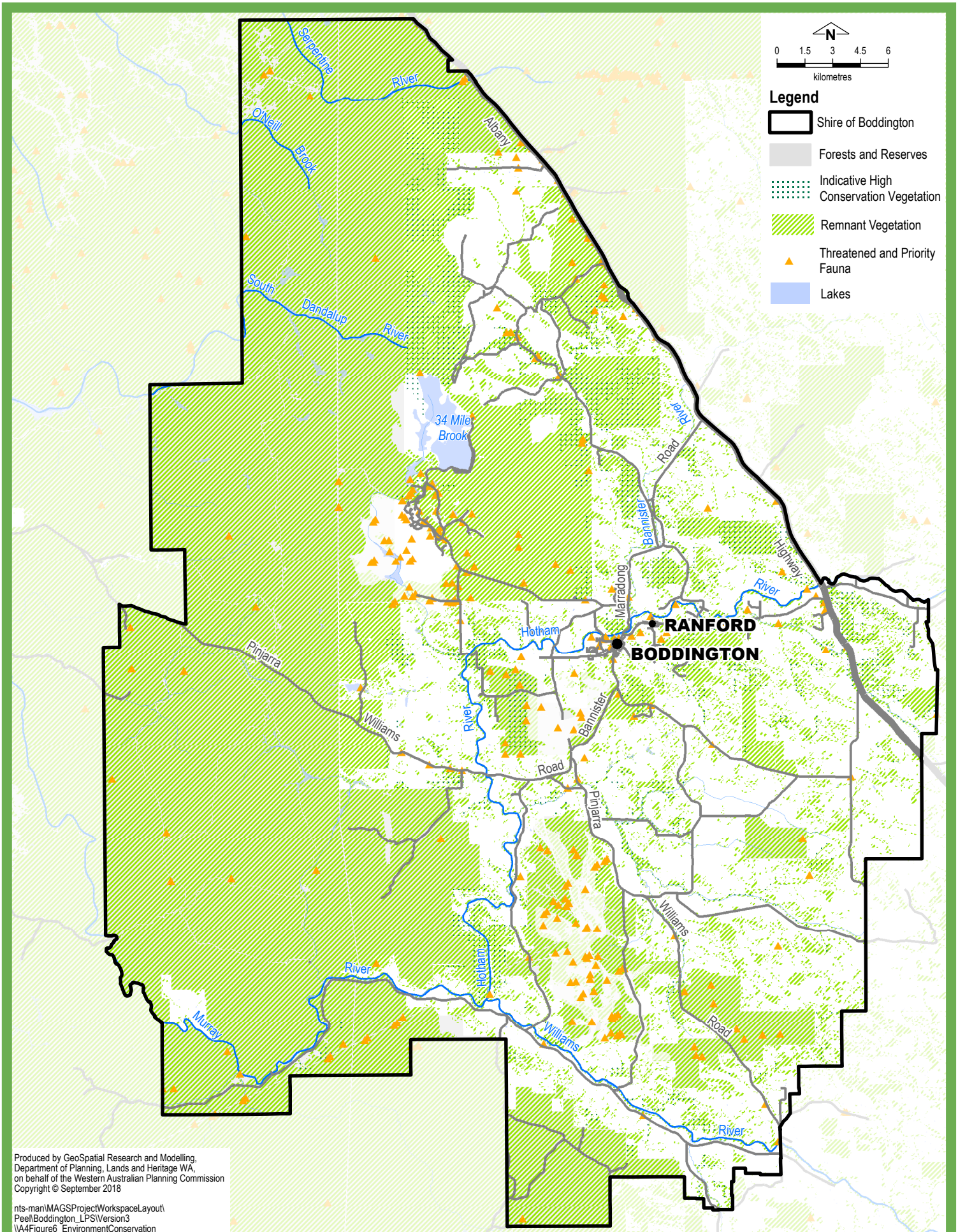
Details relating to soil types are outlined in *Local Rural Strategy - Shire of Boddington Physical Characteristics Study*. In general terms, the surface soils largely consist of gravels over clay, with some areas containing sand over gravel.

Where there is gravel over clay, there is little capacity for infiltration. As a result, these soils have a relatively high storm water runoff rate and a relatively high runoff coefficient. There is a higher level of infiltration where it is sand over gravel. In the lower portions of the landscape, alluvial deposits form valley flats and terraces along the rivers and watercourses. Waterlogging and flooding can occur in lower lying areas, especially in the vicinity of rivers and watercourses. Portions of the area are subject to erosion and sedimentation which can impact on water quality.

Mapping from Landgate's WA Atlas does not extend to Boddington for acid sulphate soils. While noting this, there is considered to be a low risk of acid sulphate soils occurring within 3 metres of the natural soil surface given the soil types within the Development Footprint.

3.3 Land use

The Development Footprint contains the Boddington and Ranford townsites and existing rural living areas. Most undeveloped sections of the Development Footprint



Produced by GeoSpatial Research and Modelling, Department of Planning, Lands and Heritage WA, on behalf of the Western Australian Planning Commission

nts-man\MAGSProjectWorkspaceLayout\Peel\Boddington_LPS\Version3\\A4Figure6_EnvironmentConservationHeritage.mxd

Base information supplied by:
Western Australian Land Information Authority
LI 944-2017-1

Indicative high conservation vegetation areas are digitised from the Shire of Boddingtons 2013 WALGA local biodiversity strategy

DBCA managed lands and waters, threatened and priority fauna supplied by Department of Biodiversity, Conservation and Attractions.

Remnant vegetation supplied by Department of Primary Industries and Regional Development.

Environment and Conservation Values

FIGURE 5

are freehold land which is used for farming or larger rural living properties. There are also reserves for community purposes and conserving environmental assets.

3.4 Environmental assets

Key environment and conservation values are outlined on Figure 5. The Development Footprint contains important native vegetation communities as outlined in the *Shire of Boddington Local Planning Strategy: Local Biodiversity Report* (2013). The predominant vegetation communities are jarrah/marri forest and marri-wandoo woodland.

Rivers and watercourses are generally bordered by native vegetation and contain small pools and soaks for part of the year. Riparian vegetation is an important environmental asset and there is a need to provide appropriate riparian buffers. There are also opportunities for appropriate replanting.

According to the Department of Environment Regulation, there are various Declared Rare and Priority Flora within the District. In the Development Footprint, there are Priority 3 and 4 Vegetation which need to be protected.

The Development Footprint is home to a range of native fauna.

There are no wetlands in the Development Footprint.

According to the Department of Environment Regulation's contaminated sites database, there are currently no registered contaminated sites within the District. Mapping layers obtained from the Department indicates that one site, the former rubbish dump on River Road, may be in the process of being registered. It is recognised that during the development and/or redevelopment of some sites, that an assessment is necessary and it may require the developer to appropriately remediate contamination from past and/or existing activities.

3.5 Heritage

There are various Aboriginal heritage sites within the area. These sites of cultural significance vary from individual locations to extensive sites such as along the Hotham River. Developers have an obligation under the *Aboriginal Heritage Act 1972* to protect places and objects in Western Australia that are important to Aboriginal people because of the connections to their culture.

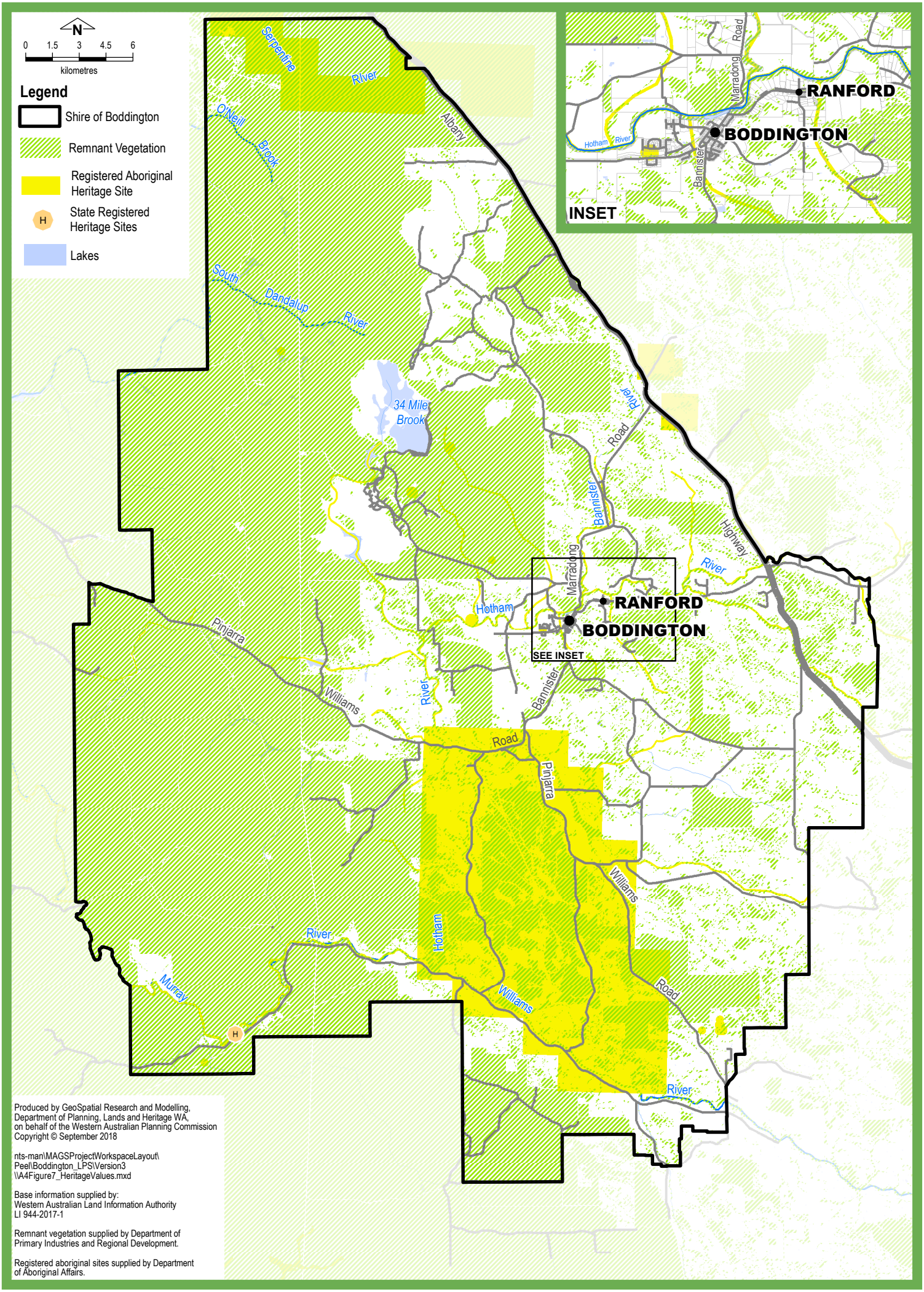
There are also various historic heritage sites including buildings and places in the Development Footprint, with details set out in the *Municipal Heritage Inventory*.

Figure 6 outlines some of the heritage values in the District.

3.6 Surface water

3.6.1 Overview

As outlined in Figure 7, the Development Footprint contains various rivers and waterways and associated catchments. The rivers and watercourses are ephemeral,



Heritage Values

FIGURE 6

as larger flows generally occur in the winter months although heavy rains and flows can occur at other times. As outlined in Figure 7, parts of the Development Footprint are also subject to flood risk.

There has been an increase in salinity levels since European settlement. In late summer, salinity in the pools is at a higher level and aquatic fauna can be vulnerable to reduced water quality.

3.6.2 Murray River System Surface Water Area

The Development Footprint is located in the Murray River System Surface Water Area (see Figure 8) as proclaimed under the *Rights in Water Irrigation Act 1914*. The DWER manages and allocates surface water resources. Any taking or diversion of surface water for purposes other than domestic or stock use is subject to licensing by the DWER. The issuing of a surface water licence is not guaranteed, but if issued will contain a number of conditions which are binding on the licensee.

3.6.3 Public drinking water supply area

There is no Public Drinking Water Supply Areas in the Development Footprint.

3.6.4 Flood risk

Parts of the Development Footprint are subject to flooding. Sinclair Knight Merz undertook detailed hydrologic and hydraulic modelling and prepared comprehensive flood mapping as set out in the *Shire of Boddington Floodplain Management Study* (2009). Figure 7 shows the mapped extent of flood risk land.

The *Shire of Boddington Floodplain Management Study* shows the floodway and flood fringe in and near the Boddington townsite. Development is generally not supported in the floodway, while development in the flood fringe may be considered. The *Shire of Boddington Local Planning Policy No. 6 Development in Flood Affected Areas* guides development within the floodplain. LPS3 will incorporate flood prone land in a Special Control Area to provide statutory backing.

3.7 Groundwater

The Development Footprint is located within the Karri Groundwater Area. This groundwater area is not proclaimed under the *Rights in Water Irrigation Act 1914*. Therefore, any groundwater abstraction is not required to be licenced by the DWER.

The Boddington townsite sits on a groundwater flow system which is approximately 4-5 metres deep. Some parts of the townsite, such as Prussian Park and parts of Johnstone Street have groundwater levels within 1 metre of the surface during winter months. Land Assessment Pty Ltd (1997) outline that the occurrence of groundwater in the area is generally limited and the quality is variable.

Groundwater flows are generally consistent with topography and flow towards rivers and watercourses.

Shire of Boddington
District Water Management Strategy
Surface Water Catchments and Flood Risk

1 in 100yr Floodway

1 in 100yr Flood Fringe

Catchment Areas

NORTH

0 1km 2km

SCALE 1:50,000 @ A3

MAY 2019

FIGURE 7

C23
C29
C21
C12
C18
C24
C22
C19
C13
C30
C31
C27
C25
C28
C26
C32
C20
C15
C11
C14

Shire of Boddington
District Water Management Strategy
Murray River Basin

NORTH

0 10km 20km

SCALE 1:50,000 @ A3

MAY 2014

FIGURE 8

PERTH

Rockingham

Mandurah

Jarrahdale

Pinjarra

Dwellingup

Boddington

Shire of Boddington

Brookton

Pingelly

Narrogin

Williams

Indian Ocean

Brookton Hwy

South West Hwy

Albany Hwy

Great Southern Hwy

Forrest Hwy

MURRAY RIVER BASIN

Bunbury - Karri Groundwater Area

3.8 Drainage infrastructure

3.8.1 Overview

Until a few years ago, the drainage system in the Boddington townsite was designed to simply deal with removing stormwater from the street system, generally for the 1 in 2 year (ARI) storm event (Porters Consulting Engineers: 2011). Accordingly, traditional approaches to drainage are widespread in Boddington. The local government's stormwater infrastructure is typically limited to a pit, pipe and open channel system with no or limited stormwater detention.

A *Stormwater and Drainage Master Plan* for the Boddington townsite was prepared in 1986. This lead to the creation of a pipe system designed to carry water during considerable stormwater events. In more recent years, the local government has undertaken a major upgrade of the drainage system in portions of the Boddington townsite. The upgrading better protects the town from natural surface stormwater runoff. This includes new kerbing and upgrading obsolete kerbing, the creation of stormwater swales, reforming of roads to better enable water disposal and the installation of new side entry pits.

In more recent years, there has been consideration of additional objectives than simply repositioning stormwater. This includes addressing the quality and quantity of stormwater prior to stormwater reaching a receiving water body. New subdivisions and developments are now required to incorporate WSUD features in response to soil, slope and other drainage considerations. The local government is required to suitably maintain drainage and stormwater management assets.

3.8.2 Boddington-Ranford Drainage Study

Porter Consulting Engineers completed the *Boddington-Ranford Drainage Study – Stage 1* in 2011. This reviewed drainage catchments and networks and reviewed future infrastructure required to service new subdivisions/developments in the Boddington and Ranford townsites.

The *Boddington-Ranford Drainage Study – Stage 2* was completed in 2015. This study examined in more detail the drainage infrastructure, its capacity and local deficiencies within each catchment through reference to the *Boddington SuperTown Growth Plan*, LPS, draft LPS3 and recent subdivision applications. The Study makes an assessment on costs needed to upgrade the existing drainage network to accommodate future growth and apportions cost to future subdivision/development.

The Study notes that the main drain upgrade undertaken a few years ago by the local government, along Pollard Street and Forrest Street, will connect the development area east of the townsite to the Hotham River. This is the main drain for the eastern precinct where the upgrade largely allows that area to develop. For this eastern precinct, the developers will be required to install all development drainage, detention and treatment systems along with making a developer contribution to the drainage upgraded by the local government. Subject to detailed design, if there are any capacity issues in the drainage downstream of the eastern precinct, then the costs for upgrading or duplication will be met by developers.

3.9 Key issues

Based on preceding sections, the key water management issues in the Development Footprint include:

- flooding;
- stormwater management including on-site detention, minimising nutrient/pollutant export and managing erosion/sediment;
- retaining native vegetation and replanting including in riparian areas;
- resourcing/maintenance;
- potable water supply and non-potable supply;
- wastewater servicing;
- protecting the WWTP buffer; and
- developers' responsibility for appropriate servicing of their subdivision/development.

Hotham River Bridge

4.0 POST-DEVELOPMENT WATER MANAGEMENT

4.1 Overview

Effectively managing water will, in part, require a coordinated approach between land use and water management planning consistent with *Better Urban Water Management*. This includes ensuring that new subdivision/development is appropriately located and serviced, and that best management practices including WSUD are adopted appropriate to site conditions.

There are considerable WSUD opportunities for future development in and around Boddington. WSUD takes a holistic approach of integrating total water cycle management. Implementation of WSUD incorporates water supply, wastewater, stormwater and groundwater management, urban design and environmental protection, and assists in maintaining and protecting social economic and cultural values.

Strategies to address water resource issues and meet the objectives and design criteria are outlined in this section or are referenced to supporting State or local policies and publications.

4.2 Water balance

A water balance for the Development Footprint has not been undertaken at this stage. During the subsequent planning stages, a water balance may be required to be undertaken by the developer. If required, this will determine the estimated water demands for internal, external and open space irrigation, as well as determining the preferred water sources.

The adoption of the initiatives set out in the DWMS has the potential to significantly reduce water demands. Key opportunities include the use of rainwater tanks, Waterwise gardens, and new dwellings and buildings having Waterwise fittings.

4.3 Water resource impacts and implications

Most of the land within the Development Footprint, if located outside of floodways, is generally suitable for development if appropriately sited, designed, serviced and managed. Accordingly, proposed development provides an overall low level of risk to water resources and risks can be effectively managed. Subdivision/development set out in accordance with the LPS and the DWMS will be appropriately serviced (including with potable water, wastewater and stormwater management) and will not detrimentally impact water resources or associated environmental assets.

4.4 Surface water

4.4.1 Overview

The overall stormwater management strategy should maintain the existing hydrology through retaining and detaining surface flows and the infiltration of stormwater runoff as close to the source as possible. The basic principle of stormwater quantity

management is to slow down the stormwater runoff and infiltrate as much as possible, mimicking the existing environment.

Effectively managing stormwater quality typically focuses on the treatment of frequent, low intensity stormwater events. These small but frequent flows account for the vast majority of nutrient loads and represent the best opportunity for water quality improvement. The use of relevant WSUD techniques into a treatment train is the most effective manner in which to meet stormwater quality design criteria.

Effectively managing stormwater quantity and quality requires both structural and non-structural measures.

Developers are responsible for developing the strategies for water quantity and quality management in the LWMSs and UWMPs. The following section describes the structural and non-structural measures that may be utilised by developments to meet the stormwater design criteria set out in sections 4.4.2 and 4.4.3.

4.4.2 Design criteria – surface water quantity

Stormwater management is to suitably address surface water quantity to the satisfaction of the local government and DWER. In particular, subdivision and development is to appropriately address:

- *Better Urban Water Management*;
- *Stormwater Management Manual for Western Australia*;
- *Australian Rainfall and Runoff*;
- this DWMS;
- the *Shire of Boddington Floodplain Management Strategy;*
- *Local Planning Policy 6 Development in Flood Affected Areas;*
- *Local Planning Policy 17 Stormwater Management; and*
- Council's *Stormwater Management and Connection Policy*.

Key design criteria from the above documents include that new development as well as any redevelopments should address the following:

- Retain and/or detain, stormwater runoff from constructed impervious surfaces generated by the first 15 mm of rainfall at-source as much as practical.
- It is expected this will primarily occur through the use of rainwater tanks and soakwells at a lot scale, and through appropriately designed infrastructure at an estate scale;
- detain flows from the 20% through to the 1% AEP event to maintain predevelopment peak flow rates or agreed rate of discharge;
- minor roads remain passable in the 20% AEP event;
- floodways should not be developed or obstructed in anyway; and
- habitable floor levels should be a minimum of 0.3 metres above the estate drainage 1% AEP water level and 0.5 metres above the 1% AEP natural floodway water level.

While noting that all development will be required to detain and/or retain stormwater on-site for design storm events, development in the urban area will generally be connected to the local government's stormwater system for major

stormwater events. Stormwater will be conveyed to dedicated discharge points and the major storm events are expected to utilise road corridors, open channels and public open space (POS) for discharge.

New development or redevelopment will need to take into consideration the existing stormwater infrastructure and its capacity.

The design criteria outlined above can be implemented through the use of various measures including rainwater tanks, lot soakwells, roadside swales and compensating basins. Further investigation and negotiation with the DWER and the local government should be undertaken in future LMWS documents.

4.4.3 Design criteria – surface water quality

Water quality treatment systems and WSUD structures should address the DWMS and be designed in accordance with the *Stormwater Management Manual for Western Australia, Australian runoff quality: a guide to water sensitive urban design,* and *Erosion and Sediment Control Manual for the Darling Range*.

The key design criteria that will be adopted to maintain stormwater quality include:

- treat all runoff generated by the first 15 mm of rainfall prior to discharge by through on site retention as close to source as possible;
- apply appropriate structural and non-structural measures to reduce nutrient loads; and
- where stormwater is piped to bio-treatment structures, they are to be sized at a minimum of 2% of the connected impervious catchment.

The quality of the stormwater infiltration will be maximised through measures including:

- adopting a treatment train to stormwater including buffer strips, rain gardens, sediment traps, vegetated roadside swales and gross pollutant traps. This will assist to remove phosphorous, nitrogen, suspended solids and other contaminants;
- implementing controls at or near the source to prevent pollutants entering the system and/or treat stormwater;
- installing in-transit measures to treat stormwater and mitigating pollutants that have entered the conveyance system;
- implementing 'end-of-pipe' controls to treat stormwater, addressing any remaining pollutants prior to discharging to receiving environments;
- encouraging all lot purchasers to practice Waterwise and nutrient wise gardens including minimising the area of lawn or establishing alternatives to lawn;
- adopting Waterwise and nutrient wise practices for POS;
- planting bioretention swales within road reserves and in POS where the vegetation will provide biofiltration to treat and remove the majority of nutrients, hydrocarbons and other pollutants. The swales should be designed according to the latest *FAWB Adoption Guidelines for Filter Media in Biofiltration Systems* and the *Stormwater Management Manual for WA* design guideline, in consultation with the local government;

- undertaking appropriate sediment and erosion control during construction;
- providing educational material to prospective purchasers of lots; and
- establishing a maintenance plan for the upkeep of the stormwater management system.

To reduce health risk from mosquitos, retention and detention treatments should be designed to ensure that between the months of November and May, detained immobile stormwater is fully infiltrated within a time period not exceeding 96 hours.

4.4.4 Flood management

The local government and DWER will adopt a precautionary approach to flooding risk as set out in the *Shire of Boddington Floodplain Management Strategy* and *Local Planning Policy 6 Development in Flood Affected Areas.* The 'onus of proof' rests with the developer to justify their proposal and associated flooding risks.

Design criteria are set out in section 4.4.2 of the DWMS, in the *Shire of Boddington Floodplain Management Strategy* and in *Local Planning Policy 6 Development in Flood Affected Areas.*

LWMS's and UWMP's are required to show a flood route (generally overland) for the 1% AEP event. This shall be clearly identified on the stormwater design drawings.

If a flood study is not available, the local government or DWER may require the developer commission a hydrological assessment. This is to demonstrate that the development will be safe from flood risk and will not increase the risk in other areas.

4.4.5 Local water management strategies

LWMS's should appropriately address water quantity and quality management. This includes setting out the pre and post-development peak flow, volumes and required storage. The location of detention and retention structures, proposed WSUD measures, and non-structural measures.

Infiltration testing should be carried out in conjunction with geotechnical investigations at a localised level to confirm areas that are suitable for the proposed infiltration methods and to identify appropriate infiltration rates. Further details relating to LWMS and geotechnical investigations are outlined in the DWMS.

4.5 Groundwater

4.5.1 Overview

Groundwater is to be appropriately managed including through the design of stormwater management and on-site effluent disposal systems. Infiltration at source is encouraged to maintain the existing groundwater hydrology, however this may not always be possible within some areas due to soil characteristics. Due to the low permeability in parts of the Development Footprint, adding suitable fill and subsoil drainage may be required. Where appropriate, the groundwater level can be controlled by implementing a network of sub-soil drains.

In low lying areas or areas which are susceptible to water logging, the developer may be required to prepare a suitable geotechnical report. Depending on site characteristics or the nature of the development, this is required to demonstrate that winter groundwater levels will not affect on-site effluent disposal, stormwater infiltration capacity or building construction.

In various parts of the Development Footprint, detailed groundwater management may not be required, however this is to be confirmed during the local structure planning process and the preparation of the LMWS.

4.5.2 Groundwater quantity

As noted in section 3.7, groundwater in the Development Footprint is not proclaimed and there is no requirement to obtain a licence to abstract groundwater. While noting this, LMWS's should suitably address the extent of groundwater based on geotechnical investigations and groundwater depth from the surface.

4.5.2 Design criteria – groundwater quality

LWMS's are required to appropriately address *Better Urban Water Management* and this DWMS. The main objective of the management of groundwater quality is to maintain or improve the existing groundwater quality. This can be achieved by either reducing the total nutrient load into the groundwater that originates from newly developed areas and/or by improving the groundwater via treatment of the surface runoff prior to infiltrating to the groundwater.

Measures to improve groundwater quality include:

- connecting lots to the reticulated sewerage system;
- adopting a treatment train approach to runoff and infiltration through the use of WSUD. This could include bioretention swales, median swales, buffer strips, rain gardens, gross pollutant traps, and permeable pavements;
- adopting a maintenance plan for the upkeep of the treatment train;
- promoting nutrient wise gardens, promoting native vegetation and minimising the use of fertilisers; and
- promoting the use of native vegetation, keeping turfed areas to a minimum, minimising the use of fertilisers in POS. Other measures include not exceeding fertiliser application rates, using low water soluble fertiliser, only fertilising when symptoms of nutrient deficiency occur and applying at the appropriate time of the year (spring or early autumn).

Adding suitable sand fill may be required for land with a shallow depth to groundwater. Placing a layer of sand on the natural ground surface increases the depth from the surface to the groundwater so that there is sufficient clearance to groundwater.

For the areas where no subsoil drainage is proposed, the finished earthworks levels must be at least 1.2 metres above the highest recorded groundwater level. For areas where subsoil drainage is proposed and where effluent disposal is suitably addressed, the local government will consider the finished earthworks level being at least 0.8 metres above the highest recorded groundwater level.

Sand fill may also be used to meet geotechnical site classifications for residential slabs and footings (as per the *Australian Standards AS2870-1996* or any updates). The geotechnical site classification should be appropriate for residential slabs and footings.

Educational programs are outlined in section 6.6.

4.6 Water-dependent ecosystems

Within the Development Footprint, key water-dependent ecosystems are the rivers, watercourses and associated riverine vegetation. Water resources should be designed and managed so that post-development receiving hydrological regimes are comparable to those pre-development. There are a range of measures to minimise impacts or enhance these areas through future development. This includes through appropriate setbacks, stormwater design, connection to reticulated sewerage, appropriate design of on-site effluent systems, replanting, fencing and encouraging appropriate fertiliser use.

There are opportunities to secure the ceding of foreshore land free of cost as a foreshore reserve through the subdivision process in accordance with WAPC policies. The local government will seek the creation of a foreshore reserve along rivers and will generally seek a reservation along watercourses within the Development Footprint which seeks to protect key environmental assets in local government management.

The width of the foreshore reserve should reflect the biophysical features of the riparian area. Alternatively, as a minimum, the local government will seek there is sufficient space for appropriate public access through walking/cycling and emergency vehicle access on a suitable alignment that does not impact environmental assets.

4.7 Contamination issues

The risk of contamination is low in the Development Footprint given there are no acid sulphate soils, no registered contaminated sites and overall soil types more effectively retain nutrients compared to soil types on the Swan Coastal Plain.

5.0 WATER SERVICES AND EFFICIENCY INITIATIVES

5.1 Overview

Water is a valuable resource that should be sustainably managed. Conservation of water through fit-for-purpose use and best management practices is encouraged so that water is not wasted.

It is desirable to reduce water demand in general and scheme water demand in particular for development where possible and practical. The *State Water Plan (2007)* has set a target to reduce annual household use of scheme water in Perth to less than 100 kilolitres (kL) per person (page 61), while *Better Urban Water Management* has a target of not more than 40-60 kL per person per year for scheme water.

5.2 Potable water

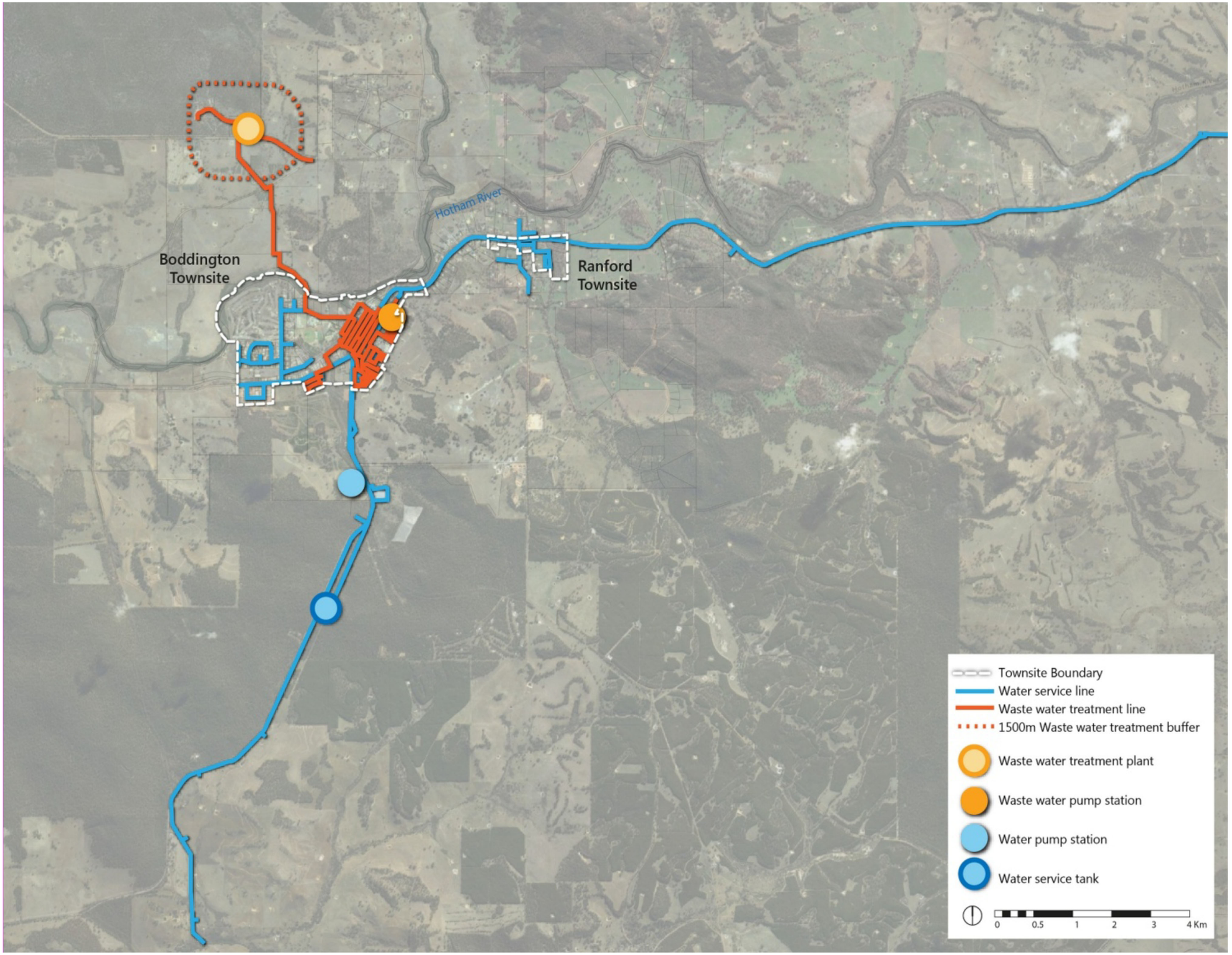
5.2.1 Water supply

The Water Corporation is the licenced service provider of water for the Boddington and Ranford townsites. Accordingly, the Water Corporation is responsible for the provision and anticipated future provision of water to the Boddington and Ranford townsites. As demand increases, the Water Corporation will be responsible for identifying and delivering projects that assist to address demand management or the provision of an enhanced potable water supply.

The reticulated water supply for the Boddington and Ranford townsites is supplied from the Harris Dam near Collie which is delivered through the Great Southern Towns Water Supply (GSTWS). From Harris Dam, water is pumped to a tank and later, gravity fed into the townsite reticulation system. Water is stored in Boddington's 4.5ML storage tank as well as a recently installed 2ML storage tank. Figure 9 outlines conceptual servicing plans for scheme (also known as reticulated or mains) water.

Scheme water will be from existing water sources. Supply from Harris Dam is as reliable as any surface water capture facility can be going into the future. The Water Corporation has determined that the current supply from the GSTWS can meet existing and future increases in development/demand in the medium term, including new urban areas, for the Boddington and Ranford townsites. Longer term, subject to growth rates, Water Corporation will progressively increase supply capacity for the townsites. This could occur through upgrading the pipeline or constructing a booster pump station if demand exceeds the current capacity of the Harris Dam delivery main.

Currently, planning and design is progressing with upgrading the capacity of potable water to the Ranford townsite to allow for additional subdivision/development as there is currently no capacity. Construction of a new pipeline between Boddington and Ranford will be shortly undertaken. Once completed, this will also assist to enhance fire-fighting capabilities through the provision of hydrants.



WATER AND WASTE WATER SERVICING

FIGURE 9

Scheme water will be supplied and utilised by new subdivisions in accordance with WAPC policy and determinations. Where subdivisions and development are provided with reticulated water, there are also a range of opportunities to conserve scheme water and promote fit-for-purpose water use. Further details are outlined in section 5.2.5.

5.2.2 Town Dam

The Boddington Town Dam is now superfluous to the Water Corporation's requirements given it ceased use for storing potable water in 2001. There is a need to clarify the future of the Town Dam including its management, tenure and use. If retained, the structural integrity of the dam is to be suitably addressed.

5.2.3 Preferred servicing

In accordance with WAPC policy, new lots below 1 hectare will be required to be connected to reticulated water, while lots above 4 hectares are not required to be connected to reticulated water.

The local government generally prefers that new rural residential lots (1-4 hectares) are connected to the reticulated water supply. However, where this is not available or feasible for existing rural residential areas, the local government will consider alternative sustainable water supply (groundwater, surface water, roof catchment/rainwater tank) for domestic and fire-fighting purposes.

Where reticulated water is provided, there is also an expectation that appropriate fit-for-purpose water supply and water efficiency measures are adopted.

5.2.4 Areas not serviced by reticulated water

Potable water will be provided through appropriate on-site supplies for future Rural Smallholding and some Rural Residential lots as guided by WAPC polices, the LPS and the Council's *Local Planning Policy 4 Rural Residential Lots and Water Supplies.* Usually, potable water is provided by roof catchment linked to rainwater tanks. Supplementary non-potable water supplies include from dams, groundwater and greywater re-use.

Where proposed rural living lots are not connected to reticulated water and where roof collection and a rainwater tank is the sole method of supply, the rainwater tank should be at least 135,000 litres for a potable water supply with an additional 10,000 litres for fire-fighting. The method of calculating the minimum collection area to service a rainwater tank is set out in the DoW's *Stormwater Management Manual for Western Australia*.

5.2.5 Water efficiency and conservation

There are a range of opportunities to use water efficiently and adopt fit-for-purpose measures. LWMS's will detail the water conservation strategy and implementation mechanisms.

Water efficiency is part of Water Corporation's 'business as usual' approach and is enabled through the use of technology and by changing behaviour to use less water. The Western Australian Government has introduced a range of measures to ensure that new houses built in Western Australia meet minimum standards for energy and water efficiency. The 5 Star Plus building standards, introduced in September 2007, are based around two new building codes, the *Energy Use in Houses Code* and the *Water Use in Houses Code* and help to improve the energy and water efficiency of new homes.

Water efficient shower heads and tap fittings are mandated as part of the *Building Code of Australia.*

Water efficient appliances, fixtures and fittings

There are various water efficient appliances, fixtures and fittings that are available to households and businesses. These water efficient measures are in part supported by the *Water Use in Houses Code* which requires:

- all tap fittings must be a minimum 4 stars Water Efficiency Labelling and Standards scheme (WELS) rated;
- all showerheads must be a minimum 3 stars WELS rated; and
- all sanitary flushing systems must be a minimum 4 stars WELS rated dual flush.

These ratings should be reviewed as more efficient appliances become available. Uptake of the other devices will be encouraged through State Government rebates, additional incentives from developers and through education programs.

Significant reduction in internal water use can be achieved with the use of water efficient appliances, fixtures and fittings. The water conservation strategy proposes that all dwellings and businesses use water efficient appliances, fixtures and fittings.

Fit-for-purpose

This can be achieved by using lower quality water such as groundwater, recycled water or grey water for uses that do not require high quality water e.g. irrigation, toilets, washing machines etc.

Retention of rainwater

Rainwater tanks are encouraged where possible for the collection and storage of water for use within the house or building or outside for watering gardens in place of reticulated water.

While noting that various subdivisions will be connected with scheme water, based on WAPC policy and determinations, rainwater tanks will be encouraged to be installed for all residential, rural living, industrial and commercial development with water available for internal and external use. Additionally, owners will be encouraged to install fittings to ensure the captured rainwater can service indoor and/or outdoor purposes. For instance, the installation of a 3,000 litre rainwater tank could potentially capture approximately 29kL per annum for each household's usage.

Water quality from rainwater tanks is generally considered to be of a high standard if regular maintenance is undertaken. This includes the installation of first flush diverters, prevention of access to any vermin or disease vectors, filters to minimise the entry of large particles and leaves, regular de-sludging to avoid a build-up of sediments at the base of the tank and regular inspection and maintenance of gutters and downpipes.

With appropriate maintenance, it is considered that the rainwater quality should be of a sufficient standard to be used for non-potable in-house use without further treatment. With further treatment, and subject to local government approval, rainwater is expected to be suitable for potable use.

It is expected that rainwater tanks will be included in all proposed water conservation strategies set out in LWMS's and/or UWMP's. Information can be provided to the lot purchaser by the developer at point-of-sale.

Water efficient gardens

The water savings from planning and implementing Waterwise gardens and implementing other outdoor Waterwise techniques can be in the order of 50kL per household per annum. This includes reducing the amount of lawn and planting water wise species which are generally endemic to the region or appropriate water-wise exotic plant species. As outlined above, the installation of a rainwater tank can be used to supplement or possibly even substitute for the use of mains potable water for usage on garden and other outdoor requirements.

Adopting water efficient gardens can include the following measures:

- limiting the amount of turfed area within the design and consider the use of mulch or gravel as alternatives;
- installing an irrigation system that is designed and installed according to best water efficient practices;
- garden beds to be mulched;
- encourage gardens are planted with local native plant species or Waterwise exotics; and
- encourage appropriate fertiliser use.

Design and maintenance of public open space

Implementing Waterwise landscaping and irrigation should be promoted for POS along with exploring opportunities for non-scheme water including groundwater and dams. Irrigating POS with groundwater may need to be supplemented with other sources due to the potential variable quantity and quality of groundwater in Boddington.

Water use in POS should be fit-for-purpose and appropriate to the function of the site. Related to this, considerations include long-term functionality, acceptable risk management (public health and environment), capital costs, on-going maintenance, retaining remnant native trees where possible, promoting the use of

local native species or other Waterwise species, and managing irrigation practices to minimise losses to evaporation.

Greywater reuse

Greywater reuse is generally encouraged by the local government, but adoption of greywater is approved on a case-by-case basis.

At the household scale, treated greywater is suitable for garden irrigation or infiltration in accordance with the *Code of Practice for the Reuse of Greywater in Western Australia*. Greywater can generally only be stored for up to 24 hours after which time there are significant impacts to water quality and subsequent risks to public health.

Households choosing to install a greywater system for garden irrigation or appropriate non-potable indoor use will be responsible for adhering to the *Code of Practice for Greywater Reuse in Western Australia* along with associated costs for operation and maintenance of the greywater system.

If greywater is used for domestic garden use, the supply would be greater than the demand during the winter months. Alternative uses or disposal to the sewerage network would have to be made during the winter months. However, during the summer months greywater could provide approximately 60% of the supply for domestic irrigation (Loh and Coghlan: 2003).

Community awareness and education

Developers should provide a strategy which will be appropriately implemented to ensure future occupants are educated on water wise practices and benefits applicable to the development including Waterwise gardens. Significantly, community and landowner educational programs increase the success of water conservation strategies.

Total lot water consumption

LWMS's and UWMP's should generally include a water balance investigation. Where required by the local government and DWER, they should set out the water conservation measures required to meet the total household consumption target of 100kL/person/year. Where a water balance investigation is not required, developers are required to demonstrate uptake of water efficient appliances and water efficient gardens, and educate landowners and business owners of lot scale water conservation measures including those set out in section 5 of the DWMS.

5.3 Wastewater servicing

The Water Corporation is responsible for the provision of wastewater services within the Boddington townsite. Portions of the Boddington townsite are sewered and connected to the WWTP. Figure 9 outlines conceptual servicing plans for wastewater.

The WWTP is located north north-west of the Boddington townsite. The WWTP, without upgrades, can cater for approximately 2,700 people. Based on preliminary modelling, this should provide for Boddington's growth for over a 10 – 15 year timeframe. Further investigations are required by Water Corporation to determine requirements to meet growth past this time. It is expected that an upgraded WWTP could secure wastewater disposal for the long term.

The Water Corporation has provided preliminary planning information for a long term sewerage system capable of supporting up to 9500 people in the Boddington Sewer District. This is commensurate with long term SuperTown growth. The planning sets out that additional pump stations will be required. Substantial growth in Boddington will require the WWTP to be expanded.

The local government or DWER will not support a scheme amendment, subdivision application or development application proposing 'sensitive uses' within the WWTP buffer.

Waste water from the WWTP is entirely re-used by Newmont Boddington Gold as part of its operations.

New lots less than 2000m^2 are required to be connected to reticulated sewerage. The Ranford townsite and other parts of the Development Footprint currently and will continue to rely on on-site wastewater disposal systems (generally septic tanks and leach drains). In some areas there may be a need for alternative treatment units to address site constraints or to minimise nutrient export. Development in unsewered areas is assessed against the Government Sewerage Policy to meet the standards specified by the local government and the Department of Health.

5.4 Non-potable (fit-for-purpose) water supply

Details are outlined in section 5.2.5. As outlined in section 5.3, Newmont Boddington Gold re-uses all of the waste water from the WWTP.

Hotham River Bridge

6.0 IMPLEMENTATION FRAMEWORK

6.1 Overview

The DWMS supports the LPS. The DWMS provides a framework within which subsequent development can occur consistent with the total water cycle management approach described in the document. The DWMS also provides overall guidance to the general stormwater management principles, water services and efficiency initiatives to guide the development of LWMS/UWMP documents.

6.2 Local planning

Most areas within the Development Footprint are broadly identified as been suitable for subdivision/development. Some smaller areas are not suitable due to limitations such as flooding, steeper slopes or environmental assets. Much of the expansion areas currently have a 'Rural' zoning in LPS2. There is a need to complete a scheme amendment and associated structure planning prior to subdivision.

A LWMS is generally required to complement the scheme amendment and structure plan. The LWMS's will largely be an extension of the DWMS given it should provide site specific information, designs and measures relating to water use, surface water and groundwater management, wastewater servicing and water efficiency initiatives.

The endorsed LWMS will guide UWMP's and civil engineering designs. An UWMP may be required to support the subdivision application or be imposed as a condition of subdivision approval by the WAPC.

6.3 Local water management strategies

The LWMS documents should be prepared by the developer in accordance with *Better Urban Water Management (2008)* and *Interim guidelines for Developing a Local Water Management Strategy* (2008) or any updates. The developer should liaise with the DWER and local government prior to preparing a structure plan or LWMS. This includes discussing proposed water management strategies and receiving further guidance on site-specific requirements.

In addition to matters set out in this DWMS, *Stormwater Management Manual for Western Australia* and Council policies, each LWMS should address the relevant issues for the scheme amendment/structure plan area. This is expected to include the following:

- review the water management objectives and develop appropriate water quantity and quality design objectives for the area;
- geotechnical investigations;
- assessment of risks, developing designs to accommodate the identified risks/constraints and setting out mitigation strategies;
- review and discussion of potential fit-for-purpose sources;
- undertaking whole of water cycle investigations;
- development catchments and flows;

- conceptual stormwater management plan addressing surface and ground water, identifying arterial drainage elements, flood paths, and the design, location and sizing of required treatment retention structures and flood detention structures;
- stormwater quantity and quality management;
- water balance investigation;
- water conservation and efficiency strategies;
- non-structural measures including promoting education;
- addressing disease vector and nuisance insect management;
- identification of specific issues likely to require specialised investigation and management at later stages of planning; and
- recommended implementation framework identifying funding and roles and responsibilities for ongoing operation and maintenance.

Given that approval from the local government and DWER will be required for the proposed measures, it is anticipated that consultation with these agencies will be undertaken and that referral to guiding policies and documents will be made.

6.4 Geotechnical investigations

As outlined in this DWMS, there is generally a need for a developer to undertake appropriate geotechnical investigations to support their proposal. The extent of the geotechnical investigations will vary due to the site's location, risks to water resources and environmental assets, the nature/scale of the development and whether the proposal is to support a structure plan, subdivision application or development application.

Where required, the geotechnical investigations will generally require a suitable number of test pits to be installed at depths to around 2.5 metres. This is to determine the soil characteristics and how this could impact on the proposed development. The investigation should include appropriate locations for onsite disposal of stormwater (flood detention structures and soakwells), soil types, suitability of soils for development and if treatment is required, settlement tests, bearing ratios and the hydraulic conductivity, which governs infiltration rates.

6.5 Monitoring and maintenance

6.5.1 Pre-development monitoring

Given the nature of soil types and water resources, especially groundwater, it is expected there will be a limited need for pre-development groundwater or surface water monitoring in the Development Footprint. Prior to development proceeding, developers should discuss and confirm with the DWER and local government whether a pre-development monitoring program is required. Alternatively, subject to the results of geotechnical investigations in lower lying areas, the DWER or local government may determine that a pre-development monitoring program is required.

Where groundwater and/or surface water-monitoring are required, it should be designed as part of the LWMS to assess the hydrological impacts of the proposed development. Additionally, it should establish a contingency action plan with

associated trigger values for specified parameters. Any monitoring should be consistent with DWER guidelines and advice.

6.5.2 Post-development monitoring

It is expected there will be a limited need for post-development groundwater or surface water monitoring in the Development Footprint unless it was determined that pre-development monitoring raised water resource impacts.

6.5.3 Maintenance

While noting that post-development monitoring is generally not required, there is a need for routine inspection and maintenance of WSUD elements by the developer, or developer's appointed consulting engineer/project manager, for the agreed time period following the completion of works.

6.6 Education programs

As outlined in the DWMS, community and landowner educational programs are a significant component of effectively conserving and managing water resources.

It is expected that future LWMS's and UWMP's documents will provide reference to measures such as public education. To assist in achieving this, the developer should provide relevant information to prospective purchasers and builders regarding the range of measures and household products that can be utilised to reduce water use and promote fit-for-purpose water. Examples of education topics include water conservation and water saving measures such as Waterwise gardens and Waterwise appliances, fertiliser application, water quality (and how some actions could damage water quality), the advantages of rainwater tanks and maximising on-site retention of stormwater.

6.7 Local Planning Strategy and Local Planning Scheme No. 3

The formulation of LPS3 and the recent endorsement of the LPS can assist in implementing sustainable water management. LPS2 contains no Special Control Areas, while various Special Control Areas are proposed in LPS3. Those that relate to water management are Flood Prone Land, Public Drinking Water Catchment and the WWTP Buffer.

6.8 Implementation recommendations

A) Developers or their proponents should liaise with the DWER and local government prior to preparing a structure plan or LWMS.
B) Future local structure plans will generally need to be supported by a LWMS and will require approval from the local government and DWER.
C) There is a need for routine inspection and maintenance of WSUD elements by the developer, for the agreed time period, following the completion of works.
D) Future LWMS's and UWMP's documents should address public education and associated implementation.

6.9 Roles and responsibilities

6.9.1 Overview

This DWMS provides a framework that future developers can utilise for more detailed site-specific investigations. The developer is responsible for working within the DWMS framework. It is however anticipated that future LWMS/UWMP documents will be formulated in consultation with the local government and DWER.

6.9.2 Department of Water and Environmental Regulation

The DWER, as the State Government's overarching water resource manager, will play numerous roles linked to the planning, use, protection and monitoring of groundwater and surface water. In the District, some of the Department's key roles are to:

- plan for the protection and sustainable use of water resources;
- licence surface water;
- plan for flood protection;
- provide advice to the local government, WAPC and other stakeholders in regards to land use planning and development proposals;
- review and as appropriate endorse LWMS's and UWMP's; and
- work with the community to undertake catchment management.

6.9.3 Water Corporation

The Water Corporation is the service provider for reticulated water and reticulated sewerage services in Boddington and responsible for the associated review that there is sufficient capacity to deliver planned development. The normal arrangements for funding, design, construction, handover and maintenance of services will apply.

6.9.4 Shire of Boddington

The local government's role includes:

- as a planning authority;
- reviewing and as appropriate endorsing LWMS's and UWMP's;
- undertaking drainage maintenance and developing new stormwater management systems;
- to maintain stormwater assets following handover from the developer; and
- adopting WSUD for land that it manages including POS.

6.9.5 Developer

The developer's role includes:

- to effectively consult with the local government and DWER prior to the preparation of LWMS's and UWMP's;
- the preparation and implementation of LWMS's and UWMP's to the satisfaction of the local government and/or the DWER;

- to fund the design and construction of stormwater control assets and the operation of these assets until handover to the local government; and
- to provide relevant information to prospective purchasers and builders.

6.10 Strategy review

It is not expected that this DWMS will be reviewed unless there are significant changes made to the Development Footprint for future Boddington expansion areas.

Hotham River

7.0 REFERENCES

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ATTACHMENT 1 - ABBREVIATIONS

The following abbreviations are used in this report:

ARI	Average Recurrence Interval
DoW	Department of Water
DWER	Department of Water and Environmental Regulation
DWMS	District Water Management Strategy
GSTWS	Great Southern Towns Water Supply
kL	Kilolitres
LPS	Shire of Boddington Local Planning Strategy
LPS2	Shire of Boddington Local Planning Scheme No. 2
LPS3	Shire of Boddington Local Planning Scheme No. 3
LWMS	Local Water Management Strategy
POS	Public Open Space
SPP	State Planning Policy
UWMP	Urban Water Management Plan
WAPC	Western Australian Planning Commission
WSUD	Water Sensitive Urban Design
WWTP	Waste Water Treatment Plant