Onsite Wastewater Management Plan

Technical Document (2024-2029)

MORNINGTON PENINSULA
Shire

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Disclaimer

The information contained in this document is based on independent research undertaken by Whitehead & Associates Environmental Consultants Pty Ltd (W&A). To our knowledge, it does not contain any false, misleading or incomplete information. Recommendations are based on an appraisal of site conditions subject to the limited scope and resources available for this project, and follow relevant industry standards.

The work performed by W&A included a limited soil investigation and desktop review, and the conclusions made in this report are based on the information gained and the assumptions as outlined. Under no circumstances can it be considered that these results represent the actual conditions throughout the entire Shire due to the regional scale of this study.

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Document Certification

This Onsite Wastewater Management Plan (OWMP) has been prepared following the standards and guidelines set out in the following documents, where applicable:

- Department of Environment, Land, Water and Planning (2022), *Risk Assessment Guidance Report* (DELWP, 2022);
- EPA Victoria (2024), *Guideline for Onsite Wastewater Management* (GOWM, 2024);
- EPA Victoria (2024), *Guideline for Onsite Wastewater Effluent Dispersal and Recycling Systems* (EDRS, 2024);
- Municipal Association of Victoria & Department of Sustainability and Environment (2014), *Victoria Land Capability Assessment Framework, 2nd Ed* (MAV & DSE, 2014);
- Standards Australia / Standards New Zealand (2012), *AS/NZS 1547:2012 On-site Domestic Wastewater Management (AS/NZS 1547:2012)*;
- Victoria Audit General’s Office (2018), *Managing the Environmental Impacts of Domestic Wastewater* (VAGO, 2018); and
- Victorian State Government (2024), *Obligations of Managers of Land or Infrastructure (Urban Stormwater Management and Onsite Wastewater Management)* (OMLI, 2024).

To our knowledge, it does not contain any false, misleading or incomplete information. Recommendations are based on an honest appraisal of the sites’ opportunities and constraints, subject to the limited scope and resources available for this project.

Acknowledgment of Country

Mornington Peninsula Shire Council acknowledges and pays respect to the elders, families and ancestors of the Bunurong / Boon Wurrung people, who have been the custodians of this land for many thousands of years.

We acknowledge that the land on which we meet is the place of age-old ceremonies, celebrations, initiation and renewal; and that the Bunurong / Boon Wurrung peoples’ living culture continues to have a unique role in the life of this region.

Acronyms

Term	Definition
AHD	Australian Height Datum
AO	Authorised Officer
AWTP	Aerated Wastewater Treatment Plant
CMA	Catchment Management Authority
DEM	Digital Elevation Model
DEECA	Department of Energy, Environment, and Climate Action (formerly DELWP)
DELWP	Department of Environment, Land, Water, and Planning (now DEECA)
DIR	Design Irrigation Rate
DLR	Design Loading Rate
DSE	Department of Sustainability and the Environment (former)
EDS	Effluent Dispersal System
EDRS	Guideline for Onsite Wastewater Effluent Dispersal and Recycling Systems (EPA Victoria, 2024)
EPA	Environment Protection Authority
GED	General Environmental Duty
GIS	Geographic Information System
GMA	Groundwater Management Area
GOWM	Guideline for Onsite Wastewater Management (EPA Victoria, 2024)
IWMP	Integrated Water Management Plan
LCA	Land Capability Assessment
LGA	Local Government Area
LPED	Low-Pressure Effluent Distribution System
MAV	Municipal Association of Victoria
OWDIG	Onsite Wastewater Design and Installation Guideline
OWM	Onsite Wastewater Management
OWMP	Onsite Wastewater Management Plan
OWMS	Onsite Wastewater Management System
RAF	Risk Assessment Framework
SILO	Scientific Information for Land Owners
SEW	South East Water
SRW	Southern Rural Water
MPSC	Mornington Peninsula Shire Council
VCAT	Victorian Civil and Administrative Tribunal
VPP	Victoria Planning Provisions
VVG	Visualising Victoria's Groundwater (Project)
WC	Water Corporation
WMIS	Water Measurement Information System
WSPA	Water Supply Protection Area

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1 Introduction

This document forms the Onsite Wastewater Management Plan (OWMP) together with the Operational Plan, and has been prepared in order to assist with the detailed assessment of unsewered lots in the Mornington Peninsula Shire (the Shire).

It provides additional detail and guidance on relevant background documents, an overview of onsite wastewater management (OWM) within the Shire, the various constraints which impact upon or are impacted by OWM, OWM Risk Analysis, and onsite wastewater management system (OWMS) sizing tables.

The *Environment Protection Act 2017* (*EP Act 2017*) and *Regulations 2021* (*EP Regulations 2021*) provide a foundation for a transformation of Victoria's environment protection laws and EPA. It includes a new approach for the prevention of harm under 'General Environmental Duty' (GED). There will be inherent changes to the way wastewater is managed in Victoria over the next few years, with the repeal of the State Environment Protection Policy (Waters) 2018 in June 2023 in light of the *EP Act 2017*.

2 Council Policies and Plans

The OWMP has been developed to complement other Council policies and plans through the actions identified in the Operational Plan. The following is a brief outline of the various Council plans which have been included in the development of this OWMP.

2.1 Community Amenity Local Law 2022

Council have developed the Community Amenity Local Law (2022) to prohibit, regulation, and control uses and activities. Section 18 of the law specifically relates to the management of OWMS in the Shire, stating that:

- An occupier of land where a reticulated sewerage system is not available for connection to a dwelling, must not dispose of sewage:
    - Other than to an OWMS; or
    - Contrary to the conditions of a permit issued by Council.
- The occupier of land that has an OWMS must maintain the system so as not to cause a nuisance to any person or to the environment.
- The occupier of land that has an OWMS must provide Council with a certificate from a qualified plumber or an Authorised Officer (AO) every three (3) years certifying that the system is in good working order, including evidence that the primary OWMS has been de-sludged or was not required to be de-sludged.

2.2 Council Plan 2021 – 2025

Council's community vision consists of three (3) themes:

1. A health natural environment and well-planned townships;
2. A robust, innovative and diverse economy; and
3. A flourishing, health and connected community.

The development of this OWMP ensures the community vision, specifically theme one (1), is achieved.

2.3 Wellbeing Plan 2021 – 2025

The Wellbeing Plan is incorporated into the Council Plan 2021-2025 and aims to enhance the health and wellbeing of the residents of the Shire. The main priorities in this plan are categorised into the following themes: climate impacts; stop violence; healthy eating; active living; mental health; sexual health; reduce tobacco; and reduce harm.

2.4 Planning Scheme

The Mornington Peninsula Planning Scheme sets out planning policies for the municipality, and contains information about zones, overlays, and other provisions which affect how land can be used and developed in the Shire. It identifies triggers for planning permit applications, and outlines application requirements and decision guidelines for the use, subdivision, and development of land in the different zones.

On land where OWM is required, a planning application may need supporting information such as a Land Capability Assessment (LCA) to show that the lot can accommodate an OWMS. Under Section 173 of the *Planning and Environment Act 1987*, Council can enter into a legal agreement with the owner of land with the agreement binding the owner to the covenants specified in the agreement. Such agreements can be used to prohibit, restrict or regulate the use of land, or can relate to conditions subject to which the land may be used or developed for specified purposes. A Planning Permit condition can require the owner to enter such a legal agreement, which is subsequently registered on the title of the property. In such cases, Section 173 agreements often contain maintenance requirements for OWMS, which on the sale of a property, transfer to an incoming owner.

2.5 Climate Emergency Response 2020 – 2030

Council declared a climate emergency in August of 2019, stating ‘we need to act to stop climate change; to turn back the emissions clock and regenerate our world. To create a better future story”.

Council aim for the Shire to have net-zero emissions across the Peninsula by 2040, and aim to achieve this by implementing seven (7) summit targets as follows: (1) Leadership & Governance; (2) Increased Climate Advocacy; (3) Zero Carbon Energy; (4) Resilient and Adaptive Community; (5) Sustainable Travel & Transport; (6) Sustainable Land Use & Environmental Restoration; and (7) Circular Economy & Zero Waste.

2.6 Integrated Water Management 2021

Council have developed an Integrated Water Management Plan (IWMP) to address the pressure of climate change, urbanisation, population growth, greater demands for food and changing land use and ensure a thriving, health, and resilient community. A core strategic outcome of the IWMP is “effective and affordable wastewater systems”.

MPSC have invested in wastewater management to mitigate these challenges, with key strategies such as supporting South East Water (SEW) reticulated sewerage programs, use of a new Information Management System that will store servicing and maintenance records internally, and community engagement programs. These strategies will continue to be implemented under the 2025 OWMP to mitigate public health and environmental risks posed by OWMS.

2.7 Housing and Settlement Strategy 2020 – 2036

The Housing and Settlement Strategy 2020 – 2036 outlines existing and future development potential of settlements areas. It was identified that there will be no linear development between towns along the coast or expansion into rural areas between townships.

This is supported by the Mornington Peninsula Green Wedge Management Plan (2018). Rural areas including farmland, public land, national parks, and reserves, are identified as ‘Green Wedge’ areas. These areas to remain as a rural land resource in recognition of its value for current and future generations. Urban Growth Boundary/s (UGB/s) have been developed around established settlement areas, with future development focused within the UGBs.

2.8 Council Budget

The Council Budget sets out finances for all Council projects and their management. To implement the OWMP, the Budget will need to provide scope for the management of the monitoring program required as part of the OWMP.

The budget currently allocates fees and charges for Septic Tank Permits. These fees and charges cover resources required to assess, discuss, permit the installation, inspect, and approve the use of new and modified systems.

It is noted that a portion of the funding for the development of this OWMP has been provided by the Department of Energy, Environment and Climate Action (DEECA) under the 'Onsite Domestic Wastewater Management Grant Program' (2022). As per Section 4 of the grant funding guidelines, the OWMP has been carried out under the 'Improving ODWM plans' criteria to strengthen risk assessment approaches in the review / revision of an existing ODWMP. This specific project was successful in helping to map lot-based OWM data.

2.9 Compliance and Enforcement Policy 2024

Council have prepared a Compliance and Enforcement Policy (2024) to aid in the compliance and enforcement process, providing Council staff with direction and manner in which these compliance and enforcement will be carried out. The policy applies to all enforcement actives carried out by AOs in regards to legislation and regulation. The compliance monitoring of OWMS will be carried out under this policy.

2.10 Onsite Wastewater Design and Installation Guideline 2025

Council have prepared the Onsite Wastewater Design and Installation Guideline (OWDIG, 2025) to assist OWMS designers and installers to ensure systems are installed in accordance with the current EPA Guidelines. The Guideline also provides the minimum requirements for LCAs, as stated in Section 6.2 of the Operational Plan. All OWMS within the Shire must meet the requirements set out in the OWDIG (2025).

3 Legislation and Regulation

3.1 Legislation

3.1.1 Local Government Act 2020

The *Local Government Act 2020* received Royal Assent on the 1989 Act. This Act improves local government democracy, accountability and service delivery for all Victorians. The Act outlines the provisions under which Council operates and empowers Councils to have local laws and regulations for OWM.

The Act empowers Council to enact local laws and set special charges for Council activities. Council can use these powers to raise revenue for its OWM programs and develop local regulations for OWM, as long as these regulations are consistent with state policy and legislation.

3.1.2 Environment Protection Act 2017 and Regulations 2021

The *EP Act 2017* replaced the 1970 Act on 1 July 2021, as is used to regulate OWMS within Victoria. Council will utilise the EPA '*Regulating Onsite Wastewater Management Systems: Local Government Toolkit'* (publication 1974: 2021) to assist in regulating OWMS within the Shire and adhering to the *EP Act 2017*.

The main change that the Act brings is the prevention of harm, whereas the superseded 1970 Act focused on the consequences of harm. The pollution offences will be replaced by the GED which is the primary way the EPA will achieve a prevention to harm approach. The GED makes it clear that it is the owner or authorised or unauthorised entities responsibility to reduce the risk to the environment. A delegation of functions and powers from EPA to Council under the Act will allow for Council to take action under the GED. The following sections outline the requirements specific to OWM within the Act:

- Part 3.2 – General Environmental Duty (Sections 25 to 27);
- Part 4.5 – Permits (Sections 81 to 84);
- Part 7.3 – Obligations for Managers of Land or Infrastructure (Section 156); and
- Part 9.3 – Inspection and inquiry powers (Section 246 to 258).

The *EP Act 2017* is supported by the *EP Regulations 2021*, which provide criteria for Council to consider when assessing OWM permit applications and enforcement. The *EP Regulations 2021* outlines the specific requirements for matters relating to obtaining a permit to construct, install, or alter an OWMS, as well as the operation and maintenance of an OWMS. The following outlines the requirements specific to OWM within the Regulations:

- Part 3.3 – Permits (Regulations 25 to 35); and
- Part 5.7 – Onsite wastewater management systems (Regulations 159 to 163).

3.1.3 Water Act 1989

Section 183 of the *Water Act 1989*, provides a Water Corporation (WC) with the power to inspect and monitor existing septic tank systems within their sewerage district, and if the system does not comply with the *EP Act 2017* and the *Public Health and Wellbeing Act 2008*, then (if feasible) the WC can require the owner to connect to the sewer where it is available under Section 147 of the *Water Act 1989*.

3.1.4 Safe Drinking Water Act 2003 and Regulations 2015

The *Safe Drinking Water Act 2003,* and the supporting *Regulation 2015*, requires a catchment to apply a multi-barrier approach to managing risks to water quality. This applies to both water suppliers and water storage managers, whom are required to:

- Ensure that drinking water meets quality standards specified by the Regulators;
- Prepare and implement a risk management plan;
- Provide independent audits of their performance in implementing the plans;
- Disclose various types of information relation to the quality of the drinking water they supply to the consumers; and
- Report any known or suspected contamination of the drinking water to the Secretary of the Department of Health.

3.1.5 Planning and Environment Act 1987

The *Planning and Environment Act 1987* is 'enabling' legislation, with more detailed planning matters dealt with by subordinate instruments under the Act, such as the Victorian Planning Provisions (VPP), planning schemes, regulations, and Ministerial Directions.

Key components of the planning framework established by the Act include:

- The system of planning schemes that sets out how the land may be used and developed;
- The VPP, which provide the template for the construction and layout of planning schemes;
- The procedures for preparing and amending the VPP and planning schemes;
- The procedures for obtaining planning permits under planning schemes; and
- The procedures for settling disputes, enforcing compliance with planning schemes and other administrative procedures.

Planning schemes set out how land may be used and developed, including the requirements for obtaining planning permits. Where OWM is required, a planning permit may need supporting information such as a LCA to show that the development can accommodate an OWMS. Under Section 173 of the *Planning and Environment Act 1987,* Council can require the preparation of a legal agreement.

3.1.6 Public Health and Wellbeing Act 2008

The *Public Health and Wellbeing Act 2008* lists types of nuisances which may be dangerous to health or offensive; these nuisances include those arising from water or any matter which is dangerous to health or offensive, including wastewater.

Council has a duty under the Act to remedy as far as is reasonably possible all nuisances arising in the Shire, and it is an offence to cause or allow a nuisance to occur. Under the Act, Council must investigate all complaints relating to a nuisance or the illegal management of wastewater and take action to rectify the nuisance where necessary.

3.1.7 Catchment and Land Protection Act 1994

The *Catchment and Land Protection Act* 1994 requires a Catchment Management Authority (CMA) to prepare and implement a Regional Catchment Management Strategy, which includes:

- An assessment of long term requirements and the prioritisation of these requirements;
- Identification of threats to environmental, economic and soil values; and
- Identification of opportunities for improving natural resource management processes.

The Act empowers CMAs and defines their powers and functions. The developed strategy influences and informs planning processes. The Act also requires property owners to take reasonable steps to protect the catchment, with particular regards to water resources, avoid soil disturbance, weed growth, and pests.

3.1.8 Victorian Building Regulations 2018

Under Part 8 Division 2 of the Victorian Building Regulations (Building work in special areas) (2018), Regulation 132 (Septic tank systems) applies as follows:

(1) The report and consent of the relevant council must be obtained to an application for a building permit that requires: (a) The installation or alteration of a septic tank system; or (b) The construction of a building over an existing septic tank system.

(2) The report and consent of the relevant council need not be obtained to an application for a building permit referred to in sub-regulation (1) if a permit for the construction, installation or alteration of the septic tank system that is relevant to the application has been issued under Section 53M(5) of the *EP Act 2017*.

3.2 Regulatory Authorities

3.2.1 Mornington Peninsula Shire Council

Under the *EP Act 2017*, Council is responsible for assessing permit applications; issuing permits for new and altered OWMS; monitoring of existing systems; and ensuring compliance with Council, EPA, and policy / legislative requirements (as outlined in Section 3 of this Operational Plan). Council is the responsible for all OWMS generating <5,000L/day. The legal requirements of Council include:

- Council must issue a permit to install / alter before a OWMS can be installed;
- Application for a permit to install / alter must be completed by the owner / builder / installer and submitted to Council for assessment;
- A Council officer assesses application and plans and conducts site inspections;
- Permit to install issued with approved plan and conditions;
- The OWMS must comply with permit conditions and relevant EPA Certificate(s) of Approval;
- System is inspected by a Council officer during installation; and
- Council must issue a Certificate to Use before the OWMS can be used.

In addition, Council can enforce maintenance of systems which are failing and potentially causing impacts to public health and the environment. This is discussed further in the Operational Plan.

3.2.2 EPA Victoria

EPA Victoria regulate what types of OWMS are approved for use under the *EP Act 2017*. OWM treatment system brands and models will need to be certified by an accredited conformity assessment body as conforming to the relevant Australian Standard. This accreditation will be given by the Joint Accreditation

System of Australia and New Zealand or any other accreditation body approved by the Authority (assessment body). The assessment body must certify the treatment system as conforming to the relevant Australian and New Zealand Standard. The appropriate standards for the different types of treatment systems is as follows:

- Septic Tanks (and vermiculture systems) – AS/NZS 1546.1:2008, *Onsite Domestic Wastewater Treatment Units, Part 1: Septic Tanks*;
- Waterless Composting Toilets – AS/NZS 1546.2:2008, *Onsite Domestic Wastewater Treatment Units, Part 2: Waterless Composting Toilets*;
- Secondary Treatment Systems – AS 1546.3:2017*, Onsite Domestic Wastewater Treatment Units, Part 3: Secondary Treatment Systems*; and
- Domestic Greywater Treatment Systems – AS 1546.4:2016*, Onsite Domestic Wastewater Treatment Units, Part 4: Domestic Greywater Treatment Systems*.

EPA holds a register of the OWMS with valid Certificates of Conformance within Victoria, which can be found at:

Onsite wastewater treatment systems with valid certificates | Environment Protection Authority Victoria (epa.vic.gov.au)

The EPA has developed policies and Guidelines to regulate the use of OWMS, including:

- EPA Victoria (2024), *Guideline for Onsite Wastewater Management* (GOWM, 2024); and
- EPA Victoria (2024), *Guideline for Onsite Wastewater Effluent Dispersal and Recycling Systems* (EDRS, 2024).

The EPA is responsible for the following activities related to OWM:

- Regulate the issuing of Certificates of Conformance for each OWMS type;
- Approval of commercial wastewater management systems with wastewater loading in the range of 5,000 – 100,000L/day (A03 Approval);
- Licencing commercial wastewater management systems with wastewater loading above 100,000L/day, and systems which discharge effluent to surface waters;
- Inspection of licenced commercial wastewater management systems and review of Annual Performance Statements for licenced commercial wastewater management systems;
- Compliance and enforcement activities for commercial wastewater systems;
- Developing policies and Guidelines;
- Provision of technical advice to Councils, owners and installers; and
- Possible referral authority for subdivisions.

3.2.3 Victorian Building Authority

The Victorian Building Authority (formerly the Plumbing Industry Commission) licenses all plumbers, drainers and septic tank installers across Victoria; and regulates the installation of all plumbing works including internal plumbing works on septic tank systems.

3.2.4 Municipal Association of Victoria

The Municipal Associated of Victoria (MAV) (with the Department of Sustainability and Environment (DSE)) has developed the Victorian LCA Framework (2014), providing procedures for undertaking LCAs to assist land capability assessors and regulators. This has been developed in accordance with EPA Guidelines and *AS/NZS 1547:2012*. It is understood that a review of these guidelines are currently underway to ensure compliance with the current EPA guidelines.

3.2.5 Water Corporations

Water and sewerage services within the Shire are provided by SEW and Southern Rural Water (SRW). This OWMP covers areas where reticulated sewer service is not provided by the WC and, hence, are unsewered. Where existing OWMS are located in an area that has sewer available, the WC can require the property be connected to sewer if the system is found to be causing a health or environmental risk.

3.2.6 Department of Energy, Environment and Climate Action

DEECA is responsible for the management of water resources, climate change, bushfires, public land, forests and ecosystems in Victoria. DEECA may be consulted by Council for specialist advice where an OWMS may impact on land or water resources.

3.2.7 Catchment Management Authority

MPSC falls within the Melbourne Water CMA. Within sensitive catchments, the examination of a system, its operation, and performance must be undertaken to ensure the protection of the asset. The role of the CMA is:

- To ensure the sustainable development of natural resource based industries;
- To maintain and where possible, improve the quality of land and water resources;
- To conserve natural and cultural heritage;
- To involve the community in decisions relating to natural resource management within their region;
- To advise on matters relating to catchment management and land protection and the condition of land and water resources in the region; and
- To promote community awareness and understanding of the importance of land and water resources, their suitable use, conservation and rehabilitation.

3.3 Administrative Authorities

The Victorian Civil and Administrative Tribunal (VCAT) is a tribunal at which civil disputes, administrative decisions and appeals can be heard before a Judge or Tribunal Member. It provides a dispute resolution service for both government and individuals within Victoria.

3.4 Standards and Guidelines

3.4.1 EPA Victoria – Guideline for Onsite Wastewater Management (2024)

The EPA Victoria (2024), *Guideline for Onsite Wastewater Management* (GOWM, 2024) is a reference document designed to support the environment protection regulatory framework within Victoria. The guideline provides information on the minimisation of the risks to human health and the environment for OWMS within unsewered and sewered areas, as well as single or multi-dwelling premises.

3.4.2 EPA Victoria – Guideline for Onsite Wastewater Effluent Dispersal and Recycling Systems (2024)

The EPA Victoria (2024), *Guideline for Onsite Wastewater Effluent Dispersal and Recycling Systems* (EDRS, 2024) is designed to support the environmental protection regulatory framework, and contains guidance for best practice for the design and operation of an effluent dispersal system (EDS). This guideline is complementary to the GOWM (2024) document.

3.4.3 Municipal Association of Victoria & Department of Sustainability and Environment – Model Land Capability Assessment (2014)

The Municipal Association of Victoria & Department of Sustainability and Environment (2014), *Model Land Capability Assessment* (MAV & DSE, 2014) reflects the requirements of the previous EPA Guidelines (Code of Practice, Publication 891.4) and also provides further details on in-soil effluent assimilation processes

and their influence on system design. This guideline is currently being reviewed, and once published, will take precedence over MAV & DSE (2014).

3.4.4 Standards Australian / Standards New Zealand – *AS/NZS 1547:2012 Onsite Domestic Wastewater Management*

AS/NZS 1547:2012 provides standardised guidance for the sizing, design, and construction of EDS. If there is an inconsistency between the *AS/NZS 1547:2012* and the current EPA Guidelines, the EPA Guidelines takes precedence. Where the current EPA Guidelines are silent on a topic, the relevant *AS/NZS 1547:2012* should be followed. *AS/NZS 1547:2012* will be used to inform the selection of a suitable EDS, and where the standard sizing tables are not used, will inform the sizing of EDS.

3.4.5 Standards Australian / Standards New Zealand – AS/NZS 1546.1-2 Onsite Domestic Wastewater Treatment Units

AS/NZS 1546.1:2008- Part 1: Septic Tanks:

Specifies performance requirements and performance criteria for septic tanks, technical means of compliance and provides test specifications that enable septic tanks to be manufactured to comply with the performance requirements and performance criteria.

AS/NZS 1546.2:2008 – Part 2: Waterless Composting Toilets:

Aims to: 1. Provide a set of performance statements that form a base against which any waterless composting toilet, conventional or innovative, may be assessed. 2. Provide manufacturers of waterless composting toilets with a performance evaluation test that will confirm the conditions under which it will function best. 3. Ensure that the operation and maintenance of the waterless composting toilet is done in a safe manner that meets basic health requirements given that it involves the removal or composted or partially composted material.

3.4.6 Standards Australian – AS 1546.3-4 Onsite Domestic Wastewater Treatment Units

AS 1546.3:2017 – Part 3: Secondary Treatment Systems:

Sets out the requirements for the design, commissioning, performance and compliance testing of secondary treatment systems and advanced secondary treatment systems designed to treat domestic wastewater up to 5,000L/day. Guidance on installation, operation and maintenance is also provided.

AS 1546.4:2016 – Part 4: Domestic Greywater Treatment Systems:

Specifies requirements for the performance, design, installation and testing of domestic greywater treatment systems and associated fittings for single domestic dwellings where adequate backflow protection is provided in accordance with *AS/NZS 3500.1.*

3.4.7 Standards Australian / Standards New Zealand – AS/NZS 3500.1-4:2021 Plumbing and Drainage

The Plumbing and Drainage Standard *AS/NZS 3500.1-4:2021* must be complied with for the installation of all plumbing work conducted on site. Any design solution should be fitted and installed by a licensed plumbing contractor in compliance with the requirements of the Australian Standard (2021).

3.4.8 Department of Environment, Land, Water and Planning – Guidelines for Development in Flood Affected Areas (DELWP, 2019)

The Guidelines for Development in Flood Affected Areas (DELWP, 2019) provide an assessment framework and method to assist decisions on development proposals in flood affected areas. Floodplain management authorities have the discretion to vary from the Guideline to accommodate local floodplain issues. Any development proposal should consider these Guidelines, with the design solution to meet the current EPA Guideline requirements in relation to flood prone land.

3.4.9 Victorian Auditor General's Office – Managing the Environmental Impacts of Domestic Wastewater (2018)

The aim of the Victorian Auditor General's Office (2018), *Managing the Environmental Impacts of Domestic Wastewater* (VAGO, 2018) acts as further stimulus in reducing the number of failing septic tanks throughout Victoria.

There is a historical legacy associated with failing OWMS across the state which poses a threat to public health and the environment. An OWMS backlog program was generated, with rural Victoria falling under the Country Towns Water Supply and Sewerage Program (2005) initiated by DEECA. The audit focused on the management of domestic wastewater in high risk parts of metropolitan Melbourne (the Yarra Ranges and Mornington Peninsula).

The audit found that these areas were not adequately managing the individual and cumulative risk and impacts from poorly performing onsite systems due to information gaps about OWMS in high risk unsewered townships due to limitations in their risk assessment process.

The audit made four (4) recommendations to MPSC, as follows:

1. Consult with water authorities, the Environment Protection Authority, the Department of Environment, Land, Water and Planning, and other key stakeholders in undertaking integrated water cycle management planning processes for their municipalities so that the management of domestic wastewater risks is not planned in isolation of the management of stormwater, floods, alternative water supplies and drinking water supplies.
2. Implement a rolling annual program of compliance inspections in high-risk properties and townships to bring onsite systems in line with permit and/or policy requirements and follow-up noncompliance.
3. Develop and implement a data management plan to collect accurate information on the number, location and performance of onsite systems—data collection should be prioritised using a risk-based approach to identify areas for collection based on highest to lowest risk.
4. Develop an education plan to inform property owners of their responsibilities and requirements to maintain and upgrade their onsite systems as required, which must include an evaluation framework to assess its effectiveness.

The recommendations were addressed in the 2018 Wastewater Management Plan (WMP), and will continue to be addressed in the 2025 OWMP as in Action Plan (refer Section 11 of the Operational Plan).

3.4.10 Department of Environment, Land, Water and Planning – Risk Assessment Guidance Report (2022)

In response to the VAGO (2018) report, DELWP developed the Risk Assessment Guidance report (DELWP, 2022) to assist Council's in the determination of OWM risk and to help standardise the development of OWMPs. The document provides "guidance for undertaking an OWMP risk assessment, including risk identification, analysis and evaluation components of the ISO 31000 risk management process". The document was published with a 'Risk Calculation' spreadsheet (DELWP Tool, 2022), which can be used to assess the cumulative risk of OWMS within catchments.

4 Overview of OWM in Mornington Peninsula Shire

4.1 The Local Environment

Mornington Peninsula Shire is divided into three (3) geographical areas, consisting of the Northern Peninsula, Southern Peninsula, and Western Port. The Shire is bound by the Frankston and Casey Local Government Areas (LGAs) in the north, and coastline on all other sides. A majority of development within the Shire is located in areas adjacent to the northern coastline, with townships and farmland throughout. There are multiple parks and reserves are located throughout the Shire.

Port Phillip is located to the north of the Shire, with the Bass Strait located to the south, and the Western Port Ramsar Wetland and Flinders Aquaculture Fisheries Reserve located to the east. The Shire is located entirely within the 'Bunyip River' river basin.

The diverse landscape of the Shire presents different opportunities and challenges for OWM. The constraints mapping (refer Section 6.2) describes in detail the different physical characteristics which are of most importance for sustainably managing treated effluent onsite, namely: soil type, slope, useable land, and climate.

4.1.1 Soils

Soils within the Shire were previously mapped in at a large scale, and have been published as Sargeant I. (2001), *Soil / Landform Mapping of the Mornington Peninsula* (Sargeant I., 2001). The geology and inherent soils of the Shire consist of Red Bluff Sandstone in the east, with significant areas of the Mornington Volcanic Group in the south; and the Bridgewater Formation and inland dune deposits in the west.

4.1.2 Climate

Climate, specifically the average annual number of days receiving >10mm of rainfall, plays a significant role in determining the appropriate loading rates of effluent and associated sizing of EDS for OWM. The number of days receiving >10mm of rainfall within the Shire ranges from 10 to 40 days, based on the climate analysis detailed in Section 6.2.4. A higher number of rainfall days is noted in the central region of the Shire due to higher elevations, specifically the localities of Arthurs Seat, Red Hill, Red Hill South, and Main Ridge. Lower rainfall is experienced in lower elevations throughout the rest of the Shire.

4.1.3 Bushfire

Bushfire risk areas are not incompatible with OWM; however, bushfire risk has implications for planning township areas or allowing single dwellings, and can preclude residential intensification in certain areas.

4.2 OWMS and Trends in Mornington Peninsula Shire

There are approximately 110,522 individual lots within the Shire. The developed areas of Somerville; Tyabb; Hastings; Bittern; Crib Point; Somers; Balnarring; Balnarring Beach; Merricks; Point Leo; Shoreham; Flinders; Fingal; Tootgarook; Capel Sound; Rosebud; McCrae; Arthurs Seat; Dromana; Safety Beach; Mount Martha; Mornington; Mount Eliza; and Baxter are largely connected to the SEW reticulated sewerage network. The areas of St. Andrews Beach; Rye; Blairgowrie; Sorrento; and Portsea are all a part of the SEW Early Connection Option (ECO) program, with approximately 6,000 lots connected to the network (IWMP, 2021). It is noted that many lots have not yet been connected.

There are approximately 68,600 sewered lots throughout the Shire, resulting in a total of 41,922 unsewered lots. Of these lots, there are a total of 16,678 lots that are identified as not developable by the general public. This includes lots identified as Crown Land, Public Land Management, Parkes and Reserves, waterways, and roads. Further, all lots <400m^2 have been excluded from assessment as they represent a land area too small to sustainably accommodate unsewered development. These areas most likely represent dataset irregularities (i.e. artefacts), or Council or utility sites.

Therefore, there are approximately 25,244 unsewered developable lots that are not located within reasonable distance to a sewer, or to which no sewer connection exists. Of these lots, there are approximately 22,000 OWMS on Council's permit management system. It is expected that there are a number of lots within the Shire which have OWMS which are unknown to MPSC, either constructed without a permit, before permits were required, or where continuity of records has been interrupted during amalgamation. Therefore, all of these numbers are approximate.

Some discrepancies may be found between other published total lot numbers and those used, due to issues associated with lot amalgamation and subdivision over time and the current version of cadastre obtained. The cadastre dataset used in this analysis will be progressively updated by Council to include the changes made to the lots within the Shire overtime.

Historically, greywater was managed separately to blackwater and permitted to discharge off-site. All waste off-site discharge is no longer permitted; however, there are a number of systems still operating in this

manner as per their permit conditions. The majority of older systems include a conventional septic tank with conventional absorption trenches or beds, which can operate effectively in many cases; however, require regular maintenance.

Common practice with these systems in Victoria is to bury the septic tank underground; therefore, tanks are often difficult to locate and many property owners cannot locate them. This typically results in inadequate maintenance of the septic tank and in particular inadequate desludging.

Without periodic desludging, tanks become overloaded with solids and do not provide adequate residence time for effluent to enable suspended solids to settle out. These solids then carry over to the EDS (typically an absorption trench / bed) and usually cause the soil to block up over time, causing failure of the trench and surcharge of effluent to the ground surface.

Newer systems installed in the Shire tend to provide higher levels of treatment through the use of an Aerated Wastewater Treatment Plant (AWTP), sand filter, or greywater treatment system, and no longer discharge greywater separately. These systems provide secondary treatment of the wastewater before dispersal to irrigation systems. These systems require more maintenance than a septic tank and servicing every three (3) months is a requirement of the system Certificate of Conformance. Considering the date of issue of many of the permits, there may be a large number of systems operating which do not meet current Council or EPA Guidelines. There have been a total of 27 reports in regards to OWMS since 1 November 2023 in the Shire Customer Management system.

5 Preliminary Data Collection

5.1 Data Acquisition

Geographic Information System (GIS) data, covering a wide variety of physical and planning components, has been acquired from MPSC, DEECA DataShare Portal, Bureau of Meteorology (BoM), Scientific Information for Land Owners (SILO), DELWP State Observation Bore Network, SEW, and Visualising Victoria's Groundwater (VVG).

The data obtained included: property and lot information (cadastre), roads, LGA / locality / township boundaries, sewer network, OWMS information, digital elevation model (DEM), planning scheme zonings and overlays, hydrology and drainage, climate data (rainfall), flood prone land (land subject to inundation), soil units / lithology / land system information, groundwater bore locations and information, and depth to watertable. All data was obtained during late 2023. The GIS data supplied was used for the development of individual constraint maps, informative maps, and overlay maps of the Shire. This information provided a comprehensive basis for the Risk Analysis.

6 GIS Data Analysis

6.1 OWM Constraint Mapping

6.1.1 Methodology and Rational

The following algorithm was developed using professional judgement and reviews of current literature. The algorithm generally follows the rationale developed for the Mansfield Domestic Wastewater Management Plan Pilot Project (Mansfield Shire Council, 2014); with adaptation by W&A to reflect specific concerns in the Shire. It details how the individual constraints were combined to determine the final Risk Rating for each unsewered lot within the Shire:

((Soil Suitability + Slope) x ((2 x Useable Lot Area) + Climate)) / 10

The algorithm incorporates the constraints imposed by landform and soil characteristics, as well as the local climate which will impact on the selection and sizing of OWMS for any given location. Detail on the individual constraints at outlined in the following Sections. The final risk value (number) derived from the algorithm for each lot was assessed to determine the appropriate 'Risk Rating' ranges. The following outlines the respective ranges and associated final Risk Rating classes:

- Very High: > 5.5;

- High: 4 ≥ and ≤ 5.5;
- Medium: 2 ≥ and < 4; and
- Low: < 2.

6.1.2 Constraint Classification Framework

For each of the constraints, the degree of constraint in relation to OWM for all lots within the Shire was assessed and individually assigned a constraint class that is then used as an input into the Risk Analysis. The criteria used to determine constraint categories were based on previous constraint assessments for unsewered towns in Australia undertaken by W&A and relevant Australian and Victorian guidelines for OWM.

Table 1 provides a rationale for the interpretations used to derive the risk ratings. The ratings give guidance towards the OWM requirements as stipulated by Council. For existing OWMS, the level of constraint may reflect the level of challenge that has been experienced in managing the system. This information will provide a guide in the ongoing management of systems.

Table 1: Risk Rating Descriptions

Risk Rating	Description
Very High	Constraints are present at a very high level and this significantly restricts opportunities for sustainable OWM. Traditional systems (i.e. septic tanks and trenches) are not appropriate and a detailed site and soil evaluation would be required to determine if OWM is achievable at all. If achievable, specialised, advanced treatment and EDS may be required.
High	Constraints are present at a high level and this substantially restricts opportunities for sustainable OWM. Traditional systems are not appropriate and a detailed site and soil evaluation would be required to determine if they are supported. Otherwise, specialised, advanced treatment and EDS may be required.
Medium	Constraints are present at a medium level and this limits the range of OWM options that are appropriate for the site. A detailed site and soil evaluation is required to identify the most appropriate OWMS and mitigation measures to be employed.
Low	Constraints are present at a low level and are unlikely to substantially limit opportunities for OWM. In most cases appropriately designed and managed traditional systems will be accepted.

6.2 Wastewater Management Constraints

The individual constraint maps were created using GIS, which applied constraint classes for a number of built constraints and land capability constraints, including site and soil parameters. Four (4) constraints were selected, which when consolidated, contribute to assessing the overall land capability for OWMS, and were used as an input into the Risk Analysis. These were selected based on the availability of digital data, and in the light of experience gained in designing and auditing OWMS. The constraints selected were:

- Soil Type (texture);
- Surface Slope;
- Useable Lot Area; and
- Climate.

Thematic informative maps were generated for each OWM constraint. The maps have been produced for use at a broad scale (~1:185,000) and the limitations of the data used in the creation of these maps for input in the Risk Analysis must be recognised and is detailed in Section 4.3 in the Operational Plan.

The risk bandings for each constraint have been informed by Table 3-2 of the DELWP Risk Assessment Guidance Report (2022). All constraints range from Low to High Risk, with useable lot area the only constraint to contain a Very High Risk rating.

6.2.1 Soil Type

Geology was also used as a reference towards the understanding of the soil and landform characteristics of the Shire. The soil type and its absorption capabilities in this report refer to effluent treatment and what type of wastewater system is suitable.

The surface geology of the Shire is shown in Appendix A as Figure A1. The geological units were based on the 'Surface Geology of Victoria' dataset (1:250,000) that was obtained from GeoSciences Victoria (DEPI, 2011). The Shire is underlain by 24 different surface lithological groups, with the a majority of the eastern region underlain by Red Bluff Sandstone, with significant areas of the Mornington Volcanic Group in the south; and the Bridgewater Formation and inland dune deposits in the west.

Soil-landform unit datasets were obtained from the DEECA DataShare Portal. The most current dataset, Sargent I. (2003), *Soil / Landforms of the Mornington Peninsula* (Sargent I., 2003), was used as the basis for the determination of soil suitability for OWM. The soil units are shown in Appendix A as Figure A2. Descriptions of the soil landscapes can be found at the following:

Soils/Landforms of the Mornington Peninsula | VRO | Agriculture Victoria

Soils and landform elements play a vital role in the design, operation, and performance of OWMS. Key soil properties can be evaluated to assess a soil's capacity for absorption of wastewater, including soil texture, structure, depth, permeability, drainage characteristics, and depth to limiting layers such as bedrock, hardpans, or watertables.

The 'most limiting' soil category / type (as per *AS/NZS 1547:2021* (Table E1)) has been used for the Risk Analysis, as outlined in the DELWP Report (2022). To ensure that the limiting soil layer for all EDS options was captured, the limiting soil layer within 0.8m of the soil surface was applied. The Shire consists of rapidly draining sandy soils (Category 1) soils in the west and some areas in the northeast and south east, with slowly permeable clay soils (Category 6) throughout the rest of the Shire.

It is important to note that soil landform units are not homogeneous and at this scale, soil attributes are expected to vary within soil landform units. Site specific investigations are required to confirm the broad scale assessment of the soil landform units, as the presence of a minor soil landform component could result in varying attributes to the predominant component used for the soil suitability constraint analysis.

The following criteria were used to determine the soil classification with regards to OWM suitability.

- High Risk: Category 1 and 6 soils;
- Medium Risk: Category 3 and 4 soils; and
- Low Risk: Category 2 and 5 soils.

Although the soil suitability constraint for a particular soil landform unit may be high, it does not necessarily mean that wastewater could not be sustainably managed onsite. It gives guidance to the loading rate and type of system(s) that could be suitable. It is important to note that site specific investigation is still necessary to confirm the regional constraint assessment and to determine the appropriate method for sustainable OWM. For lots constrained by unfavourable soil, it may be possible to mitigate this constraint by:

- Implementing secondary treatment;
- Applying a lower (soil) loading rate; or
- Improving soil by amelioration or importation of good quality soil.

The associated soil constraint map for the Shire is provided as Figure 1.

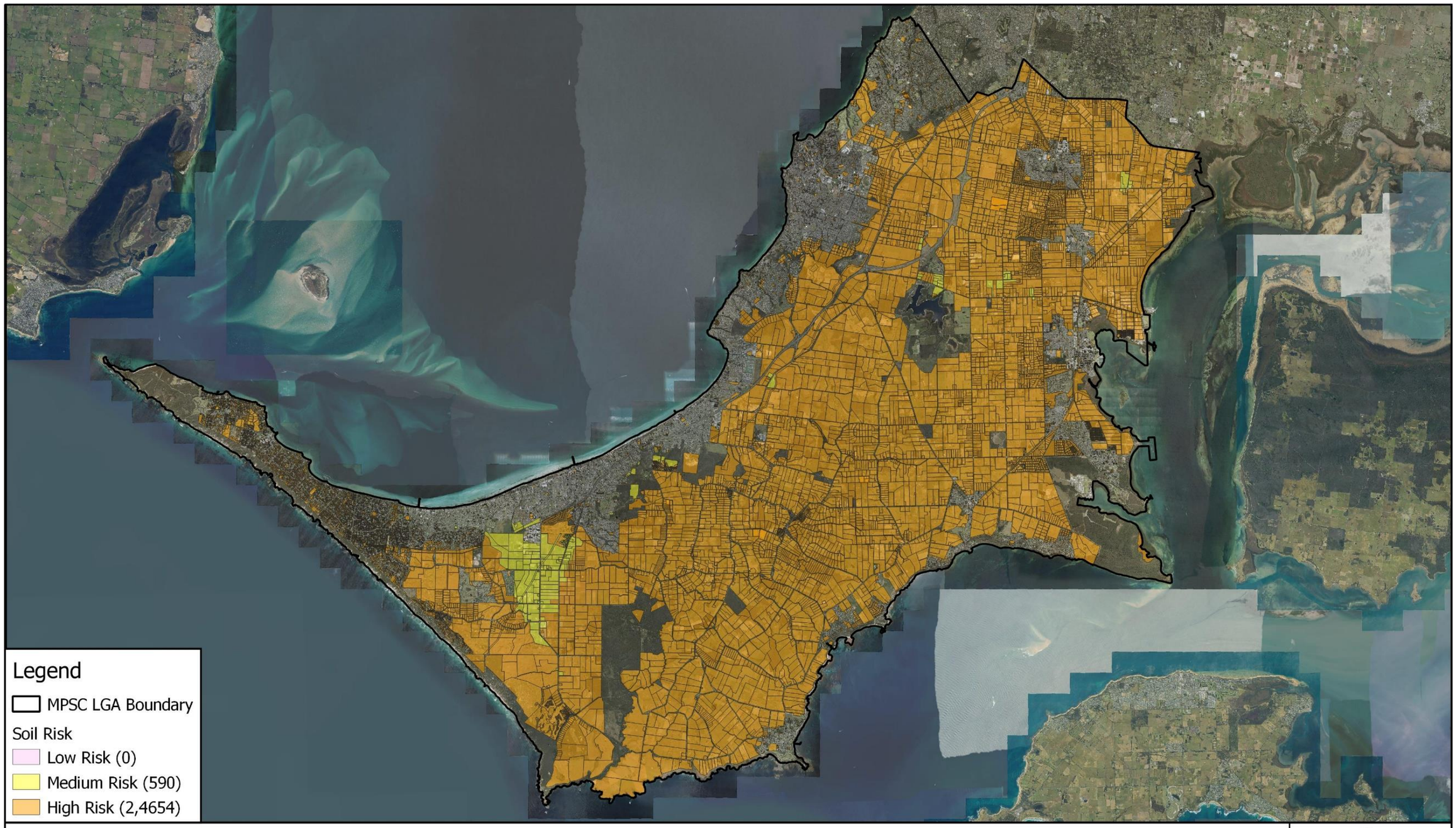

Figure 1: Soil Risk

MPSC OWMP 2025 - 2030

N

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0 10 20 30 40 km

(Approx Scale)

Revision	001
Drawn	CM
Approved	MS

6.2.2 Slope

The slope of the land affects what type, or even whether you can have, any wastewater dispersal on the land. Table K1 of *AS/NZS 1547:2012* details a range of factors likely to limit the selection and applicability of EDS, with slope gradient identified as a critical factor.

Steep slopes, particularly when combined with shallow or poorly drained soils, can lead to surface surcharge of effluent downslope of the EDS. Conventional OWMS are likely to be unsuitable and these lots will require a detailed site assessment and specific system design to produce a sustainable outcome. These steeply sloping sites are generally unsuitable for absorption trenches and beds and can also be problematic for irrigation techniques. Conversely, flat and gently sloping sites are less likely to experience such problems and are considered lower risk.

Surface elevation for the Shire was gridded with a maximum cell size of 10m for the entire Shire, with no vertical exaggeration to create a Digital Elevation Model (DEM). The surface elevation for the Shire ranges from approximately 0m to 290m Australian Height Datum (AHD). The DEM for the Shire has been presented in Appendix A as Figure A3.

Gridded slope data was derived from the DEM and combined with the cadastre data set to calculate the average slope as percent grade for each lot within the Shire. The average slope was based on the average slope of each lot, with slopes ranging from 0 – 50% throughout the Shire. Areas of elevated slope risk are identified in the localities of Arthurs Seat; Main Ridge; Red Hill; Red Hill South, and Main Ridge.

The following criteria were used to determine the slope classification with regards to OWM suitability.

- High Risk: Lots that have an average slope greater than 10%;
- Medium Risk: Lots that have an average slope, inclusive of, and between 6% and 10%; and
- Low Risk: Lots that have an average slope less than 6%.

For lots constrained by steep slope, it may be possible to mitigate this constraint by:

- Applying a lower soil (effluent) loading rate over a larger area;
- Designing an irrigation system to ensure even distribution of effluent over the slope; or
- Terracing to create a level LAA.

The associated slope constraint map for the Shire is provided as Figure 2.

Legend

MPSC LGA Boundary

Slope Risk

Low (19,815)

Medium (4,294)

High (1,135)

Figure 2: Slope Risk

MPSC OWMP 2025 - 2030

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Environmental Consultants

0 10 20 30 40 km

(Approx Scale)

Revision	001
Drawn	CM
Approved	MS

6.2.3 Useable Lot Area

The potential for sustainable OWM and the determination of suitable OWMS options is dependent on the amount of adequate area available for OWM. The useable lot area for effluent management broadly refers to available land (i.e. not built out or used for a conflicting purpose) where OWM will not be unduly constrained by site and soil characteristics.

The smaller the lot, the more difficult it is to treat and retain wastewater onsite in accordance with legislative requirements. A properly sized EDS provides for long-term, sustainable effluent loading rates that match the assimilative capacity of the soil and vegetation systems.

Useable lot area, irrespective of total lot size, plays a key role in determining a lot's capacity for sustainable long-term OWM and influences the selection of appropriate OWMS. However, as a general rule, the smaller the lot, the less land that will be available for effluent management after allowing for other development on the land. Older development controls and design standards did not always consider site-specific land capability constraints and, as a consequence, many existing and vacant residential lots may be too small to accommodate sustainable OWMS, particularly by today's more informed standards.

There are many factors that determine the available area on any given lot, including setback distances to sensitive features (groundwater bores, dams, intermittent / permanent waterways) and total development area (dwelling, sheds, pools, driveways, hardstand areas). Available areas may be unsuitable or constrained for OWM due to other factors, including (but not limited to): excessive slope (>20%); shallow soils; heavy (clay) soils with low permeability; poor drainage; stormwater run-on; and shading by vegetation.

For the Risk Analysis, useable lot area was determined by the setbacks to surface waterways, groundwater bores, and land subject to inundation (flooding). The following sections detail the methodology and results for each analysis and the determination of the final useable lot area.

6.2.3.1 Proximity to Surface Waters

The Shire is located entirely within the Melbourne Water CMA the Bunyip River basin. There are no Special Water Supply Catchment (SWSC) areas located within the Shire. Surface water features are displayed in Appendix A as Figure A4.

Buffer / setback distances are usually provided between EDS and sensitive receptors to help prevent adverse impacts on water quality, particularly should the OWMS fail. There is no simple and defined method for objectively determining safe buffer distances, so regulators often recommend conservative, minimum buffer distances that would be expected to satisfy the objective in the majority of situations.

The GOWM (2024) recommends two (2) tiers of buffer / setback distances from surface waterways, which is based on treatment standard. The primary buffer to surface water features has been conservatively adopted and applied to the appropriate surface watercourse / waterway using data (1:25,000 scale) provided by DEECA. Therefore a setback of 60m has been applied to waterways[1], wetlands, estuaries, ocean-beach at high tide mark, dams, reservoirs, and lakes.

AS/NZS 1547:2012 and EPA Guidelines details instances where recommended setbacks from sensitive receptors can be relaxed to accommodate certain types of systems where standard buffer distances cannot be achieved. These systems would require individual assessment and design in order to meet the requirements of the Standard and EPA Guidelines.

For lots constrained by proximity to surface waters, it may be possible to mitigate this constraint by:

- Implementing secondary treatment;
- Moving the LAA to increase buffer distance; or
- Replacing surface irrigation with subsurface irrigation.

[1] It should be noted that the surface water map does not distinguish between permanent and intermittent watercourses. Diversion channels have been defined as a watercourse for this particular purpose.

6.2.3.2 Proximity to Groundwater Bores

The Shire is located across two (2) groundwater catchments, with the East Port Phillip Bay in the west, and the Westernport catchment in the east. The western portion of the Shire is located within the Nepean Groundwater Management Area (GMA), consisting of sand and gravel. A GMA is defined as an area where groundwater of a suitable quality for irrigation, commercial, or domestic / stock use is available or expected to be available. Groundwater features within the Shire have been presented in Appendix A as Figure A5.

The location of EDS in close proximity to groundwater bores increases the potential for contamination of the groundwater. When water is extracted from the groundwater bores a zone of influence is created, whereby the head level of the groundwater is altered. Buffer / setback distances are recommended for both potable and non-potable groundwater bores.

The GOWM (2024) recommends a 50m setback for Category 1 and 2a soils, and 20m setback for Category 2b to 6 soils be maintained from such resources to protect human health. Setbacks in Category 1 and 2a soils can be reduced to 20m where treated and disinfected greywater or secondary treated effluent is applied. A conservative approach was taken when developing the OWMP, with a setback distance of 50m used for all the groundwater bores located within the Shire.

The spatial data of the groundwater bore locations within the Shire was acquired from the Water Measurement Information System (WMIS) Database Interface as managed by DEECA. Using GIS, the recommended groundwater buffer setback was applied to all of the groundwater bores located within the Shire. There are a total of 6,453 groundwater bores identified within the Shire as of late 2023.

AS/NZS 1547:2012 and the GOWM (2024) details instances where recommended setbacks can be relaxed to accommodate certain types of systems where standard buffer distances cannot be achieved. In most cases, the preferred result would be to have the identified bores condemned and capped to prevent further use, negating the need for setbacks from these resources. However, it is acknowledged that this outcome would not be acceptable to some owners who utilise the resource.

For lots constrained by proximity to groundwater bores, it may be possible to mitigate the constraint by:

- Implementing secondary treatment;
- Moving LAA to increase buffer distance; or
- Replacing surface irrigation with subsurface irrigation.

6.2.3.3 Land Subject to Inundation

The OWMS, including any tanks, fields, or absorption trenches / beds should be sited above any land subject to inundation. Flood impacted features have been presented in Appendix A as Figure A4.

Land that is subjected to frequent or intermittent inundation by floodwater has a significantly higher constraint for effective OWM. Effluent management areas should not be located within flood prone regions as floodwaters have a higher probability of inundation leading to insufficient treatment of the effluent and an increase in potential risks to public health and the environment.

Flood prone land is defined as land that is subject to inundation, and has been extracted from Planning Scheme mapping. Land subject to inundation was subtracted from the useable lot area.

A majority of flood impacted areas of the Shire are located in adjacent to waterways in proximity to the coast, mostly impacting the areas of Balnarring Beach and Hastings. A significant area of flooding is also identified adjacent Chinamans Creek within the northwest of Boneo, in the south of Capel Sound, and far west of Rosebud.

It may be possible to mitigate the lots constrained by flood prone land by:

- Implementing secondary treatment;
- Using pressure compensating subsurface irrigation; or
- Raising level of application by constructing a raised bed or sand mound.

6.2.3.4 Useable Lot Area Analysis

The cadastre data set was queried to determine the spatial relationship between each lot, its existing land area, the buffer zones, and land subject to inundation to determine the useable lot area for each lot within the Shire.

The following criteria was used to determine the useable lot area classification with regards to OWM suitability.

- Very High Risk: Lots with of useable area <0.4ha;
- High Risk: Lots with of useable area 0.4 – 2ha;
- Medium Risk: Lots with of useable area 2 – 10ha; and
- Low Risk: Lots with of useable area >10ha.

Lots containing less than 0.4ha of useable area invariably have a limited available effluent management area, so OWM contained entirely onsite may be unsustainable. Site specific hydraulic design for wastewater management may be necessary. If OWM is to be provided, it will be necessary to provide a high level of treatment and specialised EDS design using systems such as sand mounds or pressurised subsurface irrigation, to ensure long term sustainability. Other mitigation measures like the adoption of water conserving practices will be important in ensuring the system's effectiveness. Such systems are likely to have limited opportunity for expansion, as may be required if the household wastewater load changes in response to increased occupancy, or if a new reticulated water supply becomes available.

It should be taken into consideration that a lot with <0.4ha of useable land will not necessarily be totally unsuitable for OWM or currently be serviced by a failing system; however, it is likely to contain a number of significant limitations to the safe operation of OWMS assessed at a broad scale.

In the case of lots with useable areas between 0.4ha and 2ha, and in the absence of any other significant physical constraints, the availability of land for effluent management usually increases proportionately with a corresponding improvement in the potential for sustainable OWM. The choice of options is likely to be slightly greater than that available for lots with useable area less than 0.4ha; however, detailed site and soil investigation is still important to identify the most appropriate solution as other bio-geophysical constraints may limit opportunities for sustainable OWM. Again, conventional systems may not be appropriate for these sites. These lots have been assigned a 'high' overall constraint class.

In most cases, lots with more than 2ha of useable land will have far fewer problems providing sufficient space for sustainable onsite OWM. Overall constraint for OWM for these lots will be determined by the land capability constraints.

For lots constrained by useable area, it may be possible to mitigate this constraint by:

- Implementing secondary treatment;
- Secondary treatment with effluent dispersal to trenches at higher loading rates as outlined in *AS/NZS 1547:2012*; or
- Increasing loading rate by use of sand mound.

The useable land constraint map for the Shire is provided as Figure 3.

Legend

MPSC LGA Boundary

Useable Land Risk

Low Risk (1,029)

Medium Risk (2,486)

High Risk (3,132)

Very High Risk (18,597)

Figure 3: Useable Land Risk

MPSC OWMP 2025 - 2030

N

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0 10 20 30 40 km

(Approx Scale)

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Drawn	CM
Approved	MS

6.2.4 Climate

Climate plays a significant role in determining the appropriate loading rates of effluent and associated sizing of EDS for OWM. The climate feature of most interest in the Risk Analysis is the average number of days receiving >10mm of rainfall per year (as per the DELWP Report (2022)) as this can result in surface runoff, increase in soil moisture storage, and deep infiltration to groundwater.

There are two (2) Bureau of Meteorology (BoM) stations located within the Shire (Cerberus and Mornington) which records daily rainfall, and one (1) within proximity of the Shire (Rhyll). To fill data within the Shire, interpolated gridded data from the Scientific Information for Land Owners (SILO) database was used.

SILO is a climate and meteorological data service developed and hosted by the Queensland Government which provides representative data for the entire continent, produced using real climate data collected over long time periods by the BoM. The service provides a realistic representation of a broad range of climate statistics for most areas which are not serviced by local BoM stations.

Daily rainfall data for 32 SILO data points was collected throughout the Shire, with the number of days with rainfall exceeding >10mm averaged across a 40 year period to obtain an annual average value for each data point. This was then interpolated using GIS across the Shire to generate ‘climate zones’. The data is considered to be a realistic representation of climate patterns throughout the Shire on a long term basis, suitable for use in OWM investigations and designs.

It was found that the average annual number of days receiving >10mm of rainfall ranges from 14 to 28 days throughout the Shire, presenting a ‘Medium’ risk as per Table 3-2 of the DELWP Report (2022). It is noted that a higher number of rainfall days were noted in the elevated central region of the Shire, in areas in proximity of Red Hill, Red Hill South, and Main Ridge. This is consistent with higher topography and coastal conditions in those regions. Lower rainfall is experienced in the western region of the Shire.

Figure 4 shows the rainfall distribution pattern throughout the Shire.

Figure 4: Annual Days Exceeding 10mm of Rainfall

MPSC OWMP 2025 - 2030

Whitehead & Associates Environmental Consultants

0 10 20 30 40 km

(Approx Scale)

N

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6.3 Evaluation of Risk Analysis

A summary of the Risk Analysis can be found as Table 8, Figure 3, and Section 4.1.1 of the Operational Plan. It is evident that variability in constraint exists between the targeted localities within the Shire.

6.4 Cumulative Risk Assessment of OWM

A Cumulative Risk Assessment (CRA) is an indicative risk assessment tool used to identify potential risks associated with existing or proposed development in unsewered areas, and provides a means of quantifying risks within a specific 'Area of Interest' (AOI).

The CRA applied in the OWMP assesses existing OWMS within an AOI, and determines the risk posed from OWM to public health and environmental endpoints. The CRA also has the potential to be used to assess the impact of increasing the number of OWMS within a particular AOI as a result of development (i.e. subdivision).

In 2018, the Victorian Auditor General's Office (VAGO) released the 'Managing the Environmental Impacts of Domestic Wastewater' report. In response to the VAGO report (2018), DELWP (now DEECA) developed an OWM 'Risk Assessment Framework' in 2022 to assist Council's in the standardised development of OWMPs. The framework includes the 'Risk Assessment Guidance' report (DELWP Report, 2022) and 'Risk Calculation' spreadsheet tool (DELWP Tool, 2022).

The DELWP Report (2022) provides "guidance for undertaking an OWM risk assessment, including risk identification, analysis, and evaluation components of the ISO 31000 risk management process". The DELWP Tool (2022) provides a worked example of the risk evaluation process, outlined in Section 3.3 of the DELWP Report (2022). The framework is designed to evaluate the level of risk associated with existing and proposed OWMS within an AOI, and to identify appropriate management strategies.

The DELWP Tool (2022) assesses risk as the potential for OWMS to result in contamination of surface water and groundwater resources in regards to public health and the environment, based on the 'likelihood' and 'consequence' of contamination.

The 'likelihood' of contamination is defined as the probability of transfer of wastewater off-site towards a defined endpoint (i.e. watercourse, potable water reservoir, groundwater bore, or sensitive environmental area). The 'consequence' of contamination is defined as the contaminant load once wastewater has reached the defined endpoint, taking the distance to the endpoints into consideration. This takes into account reduction factors, specifically OWM treatment type and soil type. Further information on how the DELWP Tool (2022) calculates likelihood and consequence can be found in Section 3 of the DELWP Report (2022).

The key OWMS attributes used to assess OWM risk within an AOI are outlined in the following, with further detail found in Section 3.2.1 of the DELWP Report (2022).

- Lot area[2];
- Topography;
- Soil type;
- Proximity of onsite systems to watercourse, potable water supply offtake in SWSCs, flood plains;
- Proximity to / density of groundwater bores;
- Groundwater depth and quality;
- Weather conditions (rainfall);
- Number of onsite systems; and

[2] After discussion with EPA and DEECA, it was decided that 'usable lot area' was to be used in place of lot area to ensure large lots with significant constraining features (i.e. waterways) were not overlooked.

- Ongoing performance of systems (type and age of systems).

The CRA was carried out for the following AOIs within the Shire.

- Arthurs Seat (refer Figure 5);
- Cape Schanck (refer Figure 6);
- Red Hill (refer Figure 7);
- Red Hill South (refer Figure 8);
- Somerville (refer Figure 9); and
- Tyabb (refer Figure 10).

These AOIs were selected by Council due to current development pressures, OWM issues / complaints, controls in place to minimise OWM impacts, and location within / proximity to sensitive areas.

6.4.1 Catchment Delineation

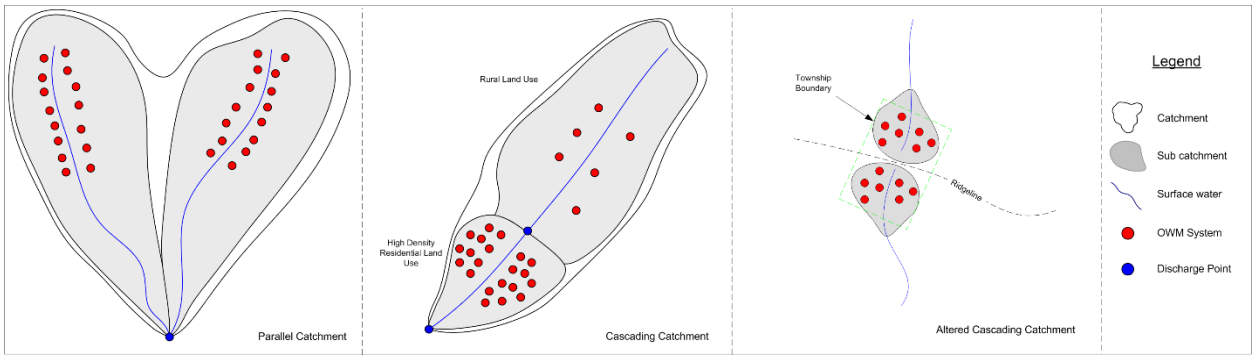
Once the AOIs were selected, drainage catchments were defined within GIS. Drainage catchment boundary delineation is a crucial factor of the risk assessment procedure, quantifying the number of OWMS to be assessed. A drainage catchment is defined as 'an area of land that collects rainfall and contributes to surface water (streams, rivers, wetlands) or to groundwater', as per the Australian Drinking Water Guidelines (2021).

Drainage catchments were broken into sub-catchments for assessment (refer Section 6.4.2). Previously, W&A discussed how this may be done with DEECA and EPA, where it was decided that drainage catchments can be defined as 'parallel' or 'cascading' catchments.

Parallel sub-catchments consist of adjacent drainage catchments that make up part of a larger catchment, draining to a common endpoint. These sub-catchments represent the traditional view of drainage catchments.

Cascading sub-catchments drain to a defined endpoint, with upslope land area partitioned from further analysis, with analysis continued until all sub-catchments are assigned, and the entire catchment area is captured. This form of catchment is best applied when a drainage catchment consist of multiple land-use types (low-medium density residential, rural) and OWMS risk profiles (system density, treatment type) are present.

Where a conventional hydrological catchment approach cannot adequately capture the entire area of interest, such as a township area positioned on a ridge, a modification of the 'cascading' sub-catchment delineation approach is considered suitable. In this instance, each sub-catchment would represent a portion of the area of interest, delineated to a separate endpoint. The following graphic illustrate each catchment methodology.



6.4.2 Study Catchments

Drainage channels were generated throughout the Shire using publically available DEM data, with drainage channels identified within the AOIs. Discharge points were defined along these drainage channels at the nearest practical location downstream of the AOI. Preliminary catchment boundaries were defined as the upslope area that logically drain to the defined discharge points using a terrain analysis tool in GIS (SAGA).

The AOIs were then broken into sub-catchments for assessment. In the case that multiple drainage channels within an AOI discharged to a common endpoint, the 'parallel' sub-catchment approach was used. If only a single drainage channel was identified, the 'cascading' sub-catchment approach was used. When an AOI consisted of multiple drainage channels and endpoints (i.e. township area), the 'altered cascading' sub-catchment approach was applied.

When a portion of a lot fell within the defined catchment boundary, the entire lot was included to prevent partial lots from being incorporated in the assessment. However, if only a minor portion of a lot was included and the development was positioned outside the catchment boundary, it was excluded from the assessment to avoid unnecessary catchment enlargement. The final study catchments are shown in Figures 5 – 10.

OWM information (i.e. septic permits) was obtained for each lot included in the catchments. A number of developed lots did not have any OWM details on record. To allow for the inclusion of these systems in the CRA, it was assumed these lots were serviced by primary treatment and subsoil absorption system, as this was the most common approach before the wide scale implementation of permits.

The location of the EDS was identified via aerial imagery, defined by areas of increased soil moisture or vegetation growth (i.e. darker coloured vegetation). When the location of the EDS could not be defined, assumptions of their locations were made, as follows:

- Primary Treatment: EDS located 20m downslope of the development area; and
- Secondary Treatment: EDS located 50m downslope of the development area.

As primary treatment systems commonly rely on gravity transfer; a shorter distance to the EDS was assumed. Secondary treatment systems commonly transfer effluent to the EDS under pressure (pump); therefore, a greater travel distance was assumed. Proximity of EDS to sensitive features were allocated using GIS analysis, and were applied to the relevant lots. All relevant information was exported from GIS, and applied to the DELWP Tool (2022).

6.4.3 Commercial Systems

It is important that all OWMS are included in the CRA to provide an accurate depiction of OWM risk within catchments. This includes systems managed by MPSC (<5,000L/day) and EPA (>5,000L/day). Currently, the DELWP Tool (2022) does not allow the incorporation of EPA managed systems. To allow for this, an Equivalent System (ES) approach was carried out.

Information of EPA managed systems within the study catchments was obtained from the EPA, with supplementary information provided by MPSC. This included the treatment capacity, system layouts, development capacity (bedrooms / seats), and anticipated daily site attendance. From this, the estimated daily wastewater generation was determined for the OWMS based on wastewater flow rates as per Table 4-4 of the GOWM (2024).

Once the daily wastewater generation was determined, an ES of 5,000L/day systems was determined (i.e. 10,000L/day system = 2ES), and was incorporated into the 'Optional risk factors' section of the DELWP Tool (2022). The EPA systems included in the model are outlined in Table 2.

Table 2: Commercial OWMS Included in CRA

Study Catchment	Commercial OWMS Wastewater Generation
Arthurs Seat	4,600L/day (~1ES)
Cape Schanck	173,160L/day (~35ES)
Red Hill	13,200L/day (~3ES)
Red Hill South	16,900L/day (~4ES)
	14,200L/day (~3ES)

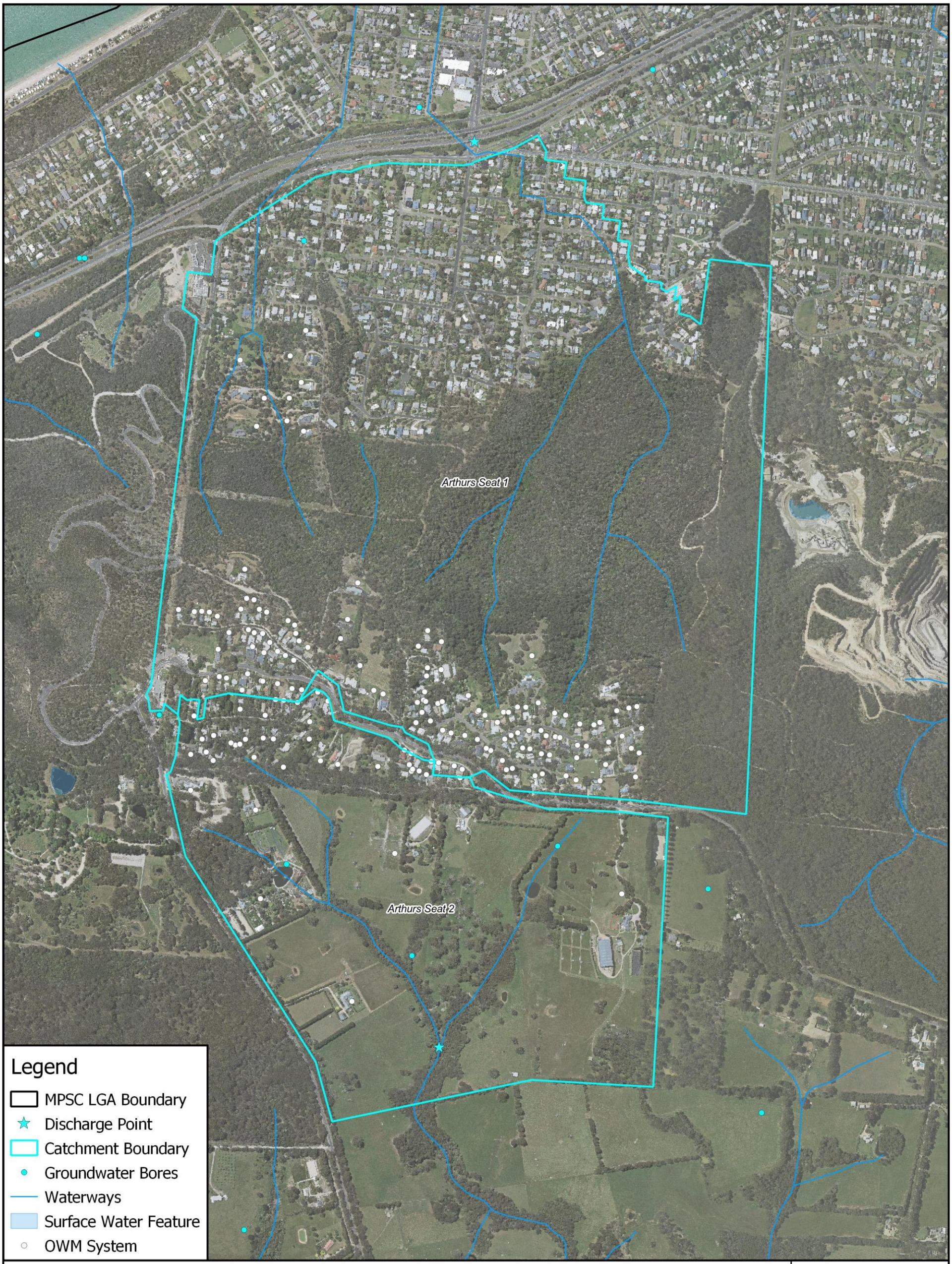


Figure 5: Arthurs Seat CRA

MPSC OWMP 2025 - 2030

Whitehead & Associates Environmental Consultants

0 500 1,000 m

(Approx Scale)

N

Revision	001
Drawn	CM
Approved	MS

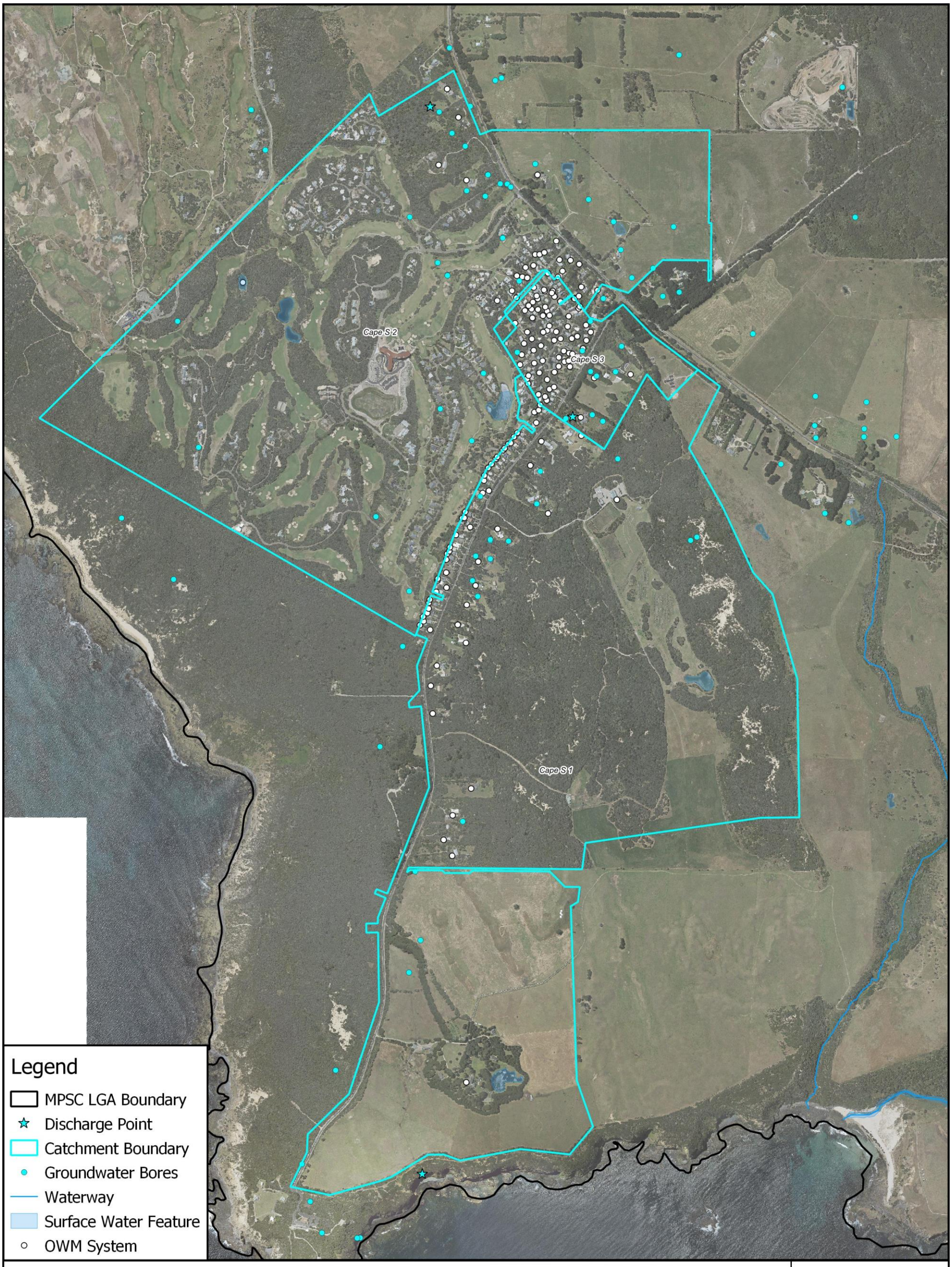


Figure 6: Cape Schanck CRA

MPSC OWMP 2025 - 2030

Whitehead & Associates
Environmental Consultants

0 500 1,000 1,500 m

(Approx Scale)

N

Revision	001
Drawn	CM
Approved	MS

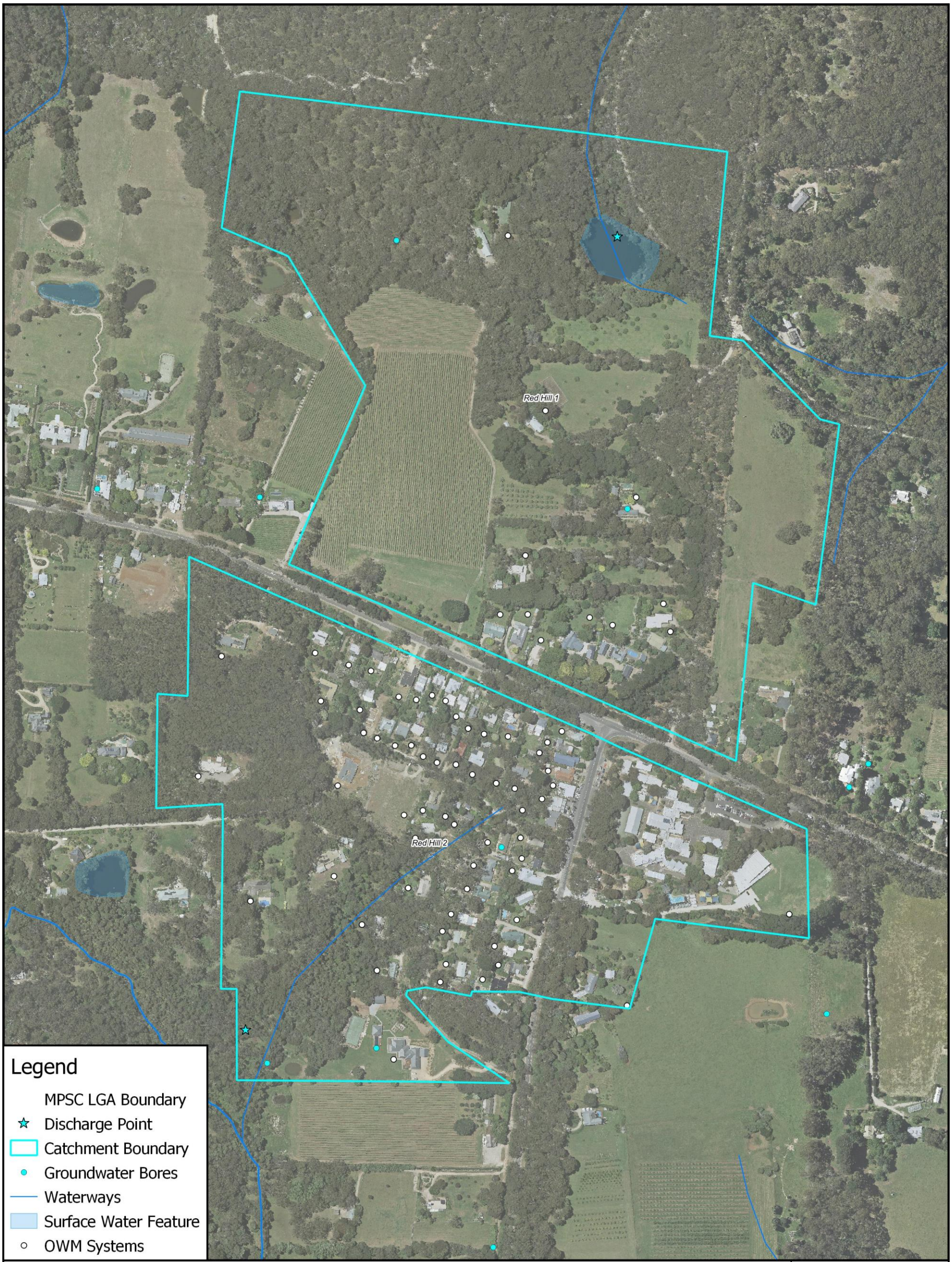


Figure 7: Red Hill CRA

MPSC OWMP 2025 - 2030

Whitehead & Associates
Environmental Consultants

Revision	001
Drawn	CM
Approved	MS

Figure 8: Red Hill South CRA

MPSC OWMP 2025 - 2030

N

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Environmental Consultants

0 0.5 1 1.5 2 2.5 km

(Approx Scale)

Revision	001
Drawn	CM
Approved	MS

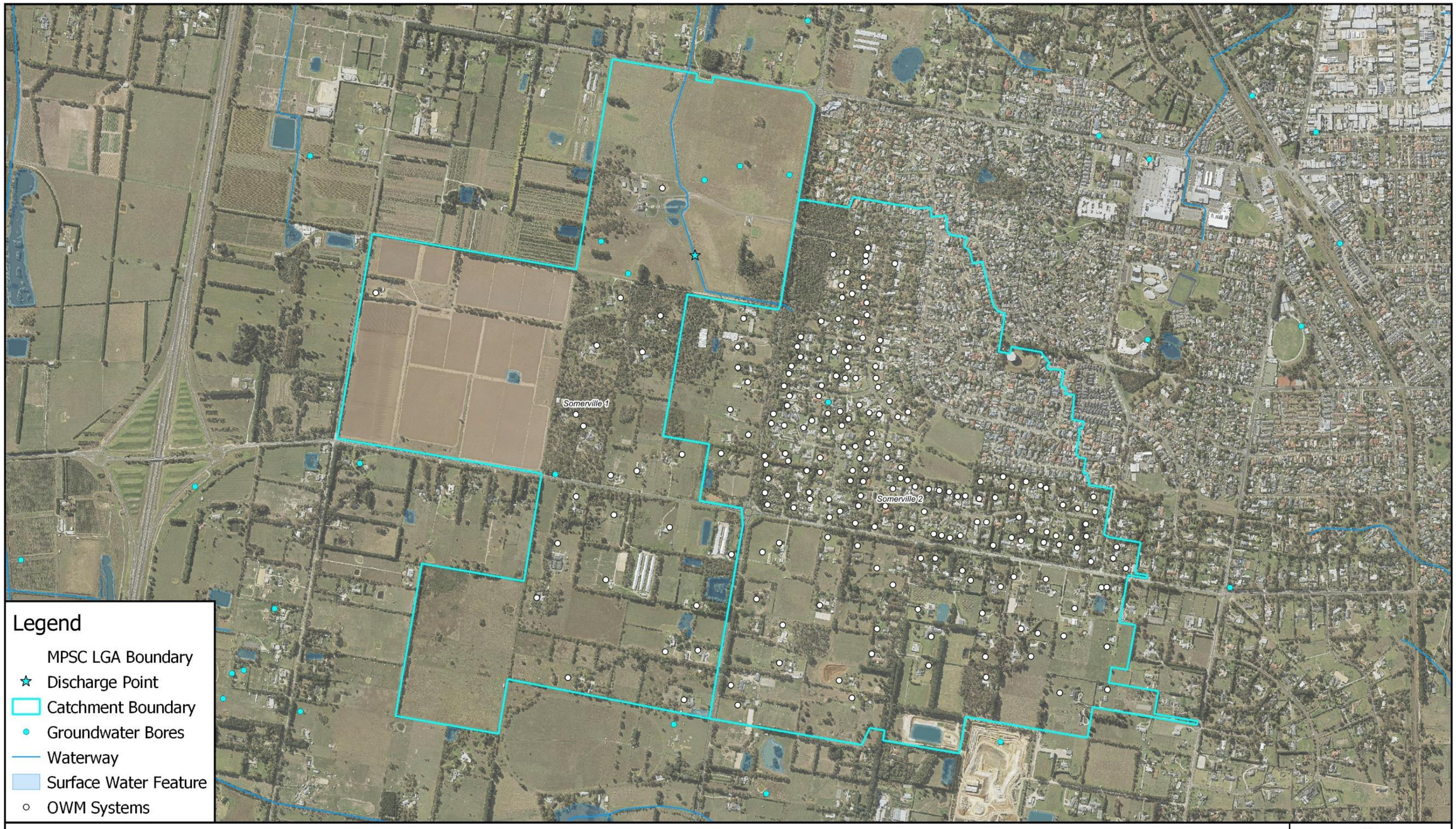

Figure 9: Somerville CRA

MPSC OWMP 2025 - 2030

N

Whitehead & Associates
Environmental Consultants

0 1 2 3 km

(Approx Scale)

Revision	001
Drawn	CM
Approved	MS

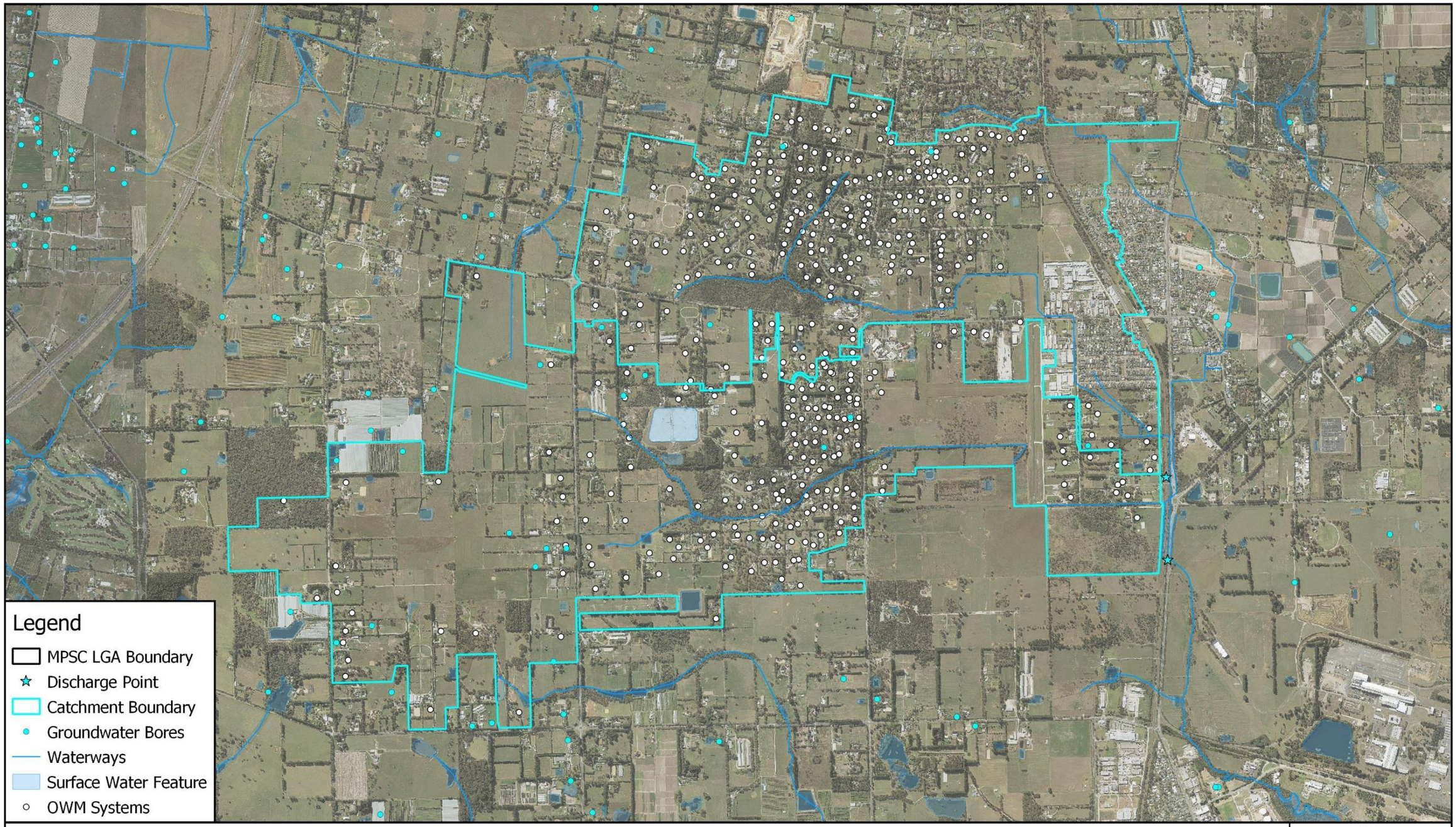

Figure 10: Tyabb CRA

MPSC OWMP 2025 - 2030

Whitehead & Associates
Environmental Consultants

0 1.5 3 4.5 km

(Approx Scale)

N

Revision	001
Drawn	CM
Approved	MS

6.4.4 CRA Inputs and Results

The following tables detail the CRA inputs and outputs, as outlined in Section 6.4 of this document and 3-2 of the DELWP Report (2022). An evaluation of the CRA has been presented in Section 4.2.1 of the Operational Plan.

Table 3: Arthurs Seat OWM Information

Treatment System		Arthurs Seat 1	Arthurs Seat 2
OWMS		117	50
Primary Treatment		78	33
Secondary Treatment	All	39	17
	<5 years	9	2
	5 – 15 years	10	10
	>15 years	20	5
Absorption System		98	40
Surface Irrigation		0	0
Subsurface Irrigation		19	10
Catchment Size (ha)		207.6	93.6
OWM Density (system / ha)		0.56	0.53

Table 4: Arthurs Seat OWM Risk Factors

Risk Factor	Low Risk	Medium Risk	High Risk
Soil	0	9	158
Slope	67	78	22
Proximity to Watercourse	123	24	20
Proximity to Potable Offtake	167	0	0
Proximity to Floodplain	167	0	0
Proximity to Groundwater Bores	133	33	1
Groundwater Depth	167	0	0

Table 5: Arthurs Seat CRA Results

Risk	1	2	Cumulative
Surface Water (Human Health)	M	M	M
Surface Water (Environmental)	L	L	M
Potable Water (Human Health)	M	M	M
Groundwater (Human Health)	M	M	N/A
Groundwater (Human Health)	L	L	
Flooding (Human Health)	L	L	
Flooding (Human Health)	L	L	

Table 6: Cape Schanck OWM Information

Treatment System		Cape Schanck 1	Cape Schanck 2	Cape Schanck 3
OWMS		57	60	72
Primary Treatment		33	19	45
Secondary Treatment	All	24	41	27
	<5 years	7	1	8
	5 – 15 years	8	3	4
	>15 years	9	37	15
Absorption System		44	21	58
Surface Irrigation		0	1	0
Subsurface Irrigation		13	38	14
Catchment Size (ha)		327.8	286.0	271.0
OWM Density (system / ha)		0.17	0.21	0.27

Table 7: Cape Schanck OWM Risk Factors

Risk Factor	Low Risk	Medium Risk	High Risk
Soil	0	0	189
Slope	122	65	0
Proximity to Watercourse	147	6	36
Proximity to Potable Offtake	189	0	0
Proximity to Floodplain	189	0	0
Proximity to Groundwater Bores	1	93	95
Groundwater Depth	142	47	0

Table 8: Cape Schanck CRA Results

Risk	1	2	3	Cumulative
Surface Water (Human Health)	L	L	L	L
Surface Water (Environmental)	L	L	L	L
Potable Water (Human Health)	L	L	L	L
Groundwater (Human Health)	L	L	L	N/A
Groundwater (Human Health)	L	L	L	
Flooding (Human Health)	L	L	L	
Flooding (Human Health)	L	L	L	

Table 9: Red Hill OWM Information

Treatment System		Red Hill 1	Red Hill 2
OWMS		10	63
Primary Treatment		9	46
Secondary Treatment	All	1	17
	<5 years	0	3
	5 – 15 years	1	3
	>15 years	0	11
Absorption System		9	54
Surface Irrigation		0	0
Subsurface Irrigation		1	9
Catchment Size (ha)		36.7	27.6
OWM Density (system / ha)		0.27	2.21

Table 10: Red Hill OWM Risk Factors

Risk Factor	Low Risk	Medium Risk	High Risk
Soil	0	0	73
Slope	29	44	0
Proximity to Watercourse	42	14	17
Proximity to Potable Offtake	73	0	0
Proximity to Floodplain	73	0	0
Proximity to Groundwater Bores	2	53	18
Groundwater Depth	69	4	0

Table 11: Red Hill CRA Results

Risk	1	2	Cumulative
Surface Water (Human Health)	M	H	H
Surface Water (Environmental)	L	M	H
Potable Water (Human Health)	M	H	H
Groundwater (Human Health)	M	H	N/A
Groundwater (Human Health)	L	M	
Flooding (Human Health)	L	M	
Flooding (Human Health)	L	L	

Table 12: Red Hill South OWM Information

Treatment System		Red Hill S 1	Red Hill S 2	Red Hill S 3	Red Hill S 4
OWMS		110	130	19	28
Primary Treatment		92	111	10	23
Secondary Treatment	All	18	19	9	5
	<5 years	8	3	2	2
	5 – 15 years	6	2	1	1
	>15 years	4	14	6	2
Absorption System		97	118	12	26
Surface Irrigation		0	0	3	0
Subsurface Irrigation		13	12	4	2
Catchment Size (ha)		79.4	182.8	66.6	89.9
OWM Density (system / ha)		1.39	0.71	0.29	0.31

Table 13: Red Hill South OWM Risk Factors

Risk Factor	Low Risk	Medium Risk	High Risk
Soil	0	0	287
Slope	155	132	0
Proximity to Watercourse	262	18	7
Proximity to Potable Offtake	287	0	0
Proximity to Floodplain	287	0	0
Proximity to Groundwater Bores	51	179	57
Groundwater Depth	284	3	0

Table 14: Red Hill South CRA Results

Risk	1	2	3	4	Cumulative
Surface Water (Human Health)	M	M	M	M	M
Surface Water (Environmental)	L	L	L	L	M
Potable Water (Human Health)	M	M	M	M	M
Groundwater (Human Health)	M	M	M	M	N/A
Groundwater (Human Health)	L	L	L	L	
Flooding (Human Health)	L	L	L	L	
Flooding (Human Health)	L	L	L	L	

Table 15: Somerville OWM Information

Treatment System		Somerville 1	Somerville 2
OWMS		18	183
Primary Treatment		15	146
Secondary Treatment	All	3	37
	<5 years	1	10
	5 – 15 years	2	15
	>15 years	0	12
Absorption System		16	158
Surface Irrigation		0	0
Subsurface Irrigation		2	25
Catchment Size (ha)		261.1	539.2
OWM Density (system / ha)		0.07	0.40

Table 16: Somerville OWM Risk Factors

Risk Factor	Low Risk	Medium Risk	High Risk
Soil	0	0	201
Slope	201	0	0
Proximity to Watercourse	188	9	4
Proximity to Potable Offtake	201	0	0
Proximity to Floodplain	201	0	0
Proximity to Groundwater Bores	155	40	6
Groundwater Depth	1	200	0

Table 17: Somerville CRA Results

Risk	1	2	Cumulative
Surface Water (Human Health)	M	M	M
Surface Water (Environmental)	L	L	M
Potable Water (Human Health)	M	M	M
Groundwater (Human Health)	L	M	N/A
Groundwater (Human Health)	L	L	
Flooding (Human Health)	L	L	
Flooding (Human Health)	L	L	

Table 18: Tyabb OWM Information

Treatment System		Tyabb 1	Tyabb 2
OWMS		246	275
Primary Treatment		224	146
Secondary Treatment	All	22	29
	<5 years	14	3
	5 – 15 years	5	14
	>15 years	3	12
Absorption System		228	153
Surface Irrigation		0	0
Subsurface Irrigation		18	22
Catchment Size (ha)		555.19	806.4
OWM Density (system / ha)		0.48	0.34

Table 19: Tyabb OWM Risk Factors

Risk Factor	Low Risk	Medium Risk	High Risk
Soil	0	6	415
Slope	386	35	0
Proximity to Watercourse	368	26	27
Proximity to Potable Offtake	421	0	0
Proximity to Floodplain	421	0	0
Proximity to Groundwater Bores	315	86	20
Groundwater Depth	265	155	1

Table 20: Tyabb CRA Results

Risk	1	2	Cumulative
Surface Water (Human Health)	M	M	M
Surface Water (Environmental)	L	L	M
Potable Water (Human Health)	M	M	M
Groundwater (Human Health)	M	M	N/A
Groundwater (Human Health)	L	L	
Flooding (Human Health)	L	L	
Flooding (Human Health)	L	L	

7 Modification / Replacement of Existing System

7.1 Modification for Existing Systems

Required modifications should be determined on a case-by-case basis, and discussed with Council prior to implementation. Systems that are to be modified or repaired must be structurally sound and adequately sized for the development. Any OWMS modification works should be carried out by the system manufacturer or a suitably qualified service agent.

7.1.1 Minor Repairs

The structural integrity and design of the septic tank determine its suitability for continued use. Generally, the older a septic tank, the more likely it is to be damaged (i.e. cracks, missing components, etc.). Rectification of these minor damages is possible to mitigate or repair these issues.

Repairing cracks will need to be done when the tank is empty, with care taken to ensure that all cracks are identified and repaired. Secondary treatment system components can often require repair or replacement following flooding, electrical faults, or pump failure. Pumps can be removed and replaced when necessary and internal pipes can be replaced where necessary if they have been dislodged or damaged.

7.1.2 Septic Tank Access Service Riser

Inaccessible tanks are highly unlikely to be desludged as regularly as is required for optimum system performance. Tanks are often installed completely below ground to achieve minimum fall for gravity drainage; however, this often result in the inability to locate the tank. Non-accessible tanks commonly present issues to OWM due to the likelihood that the tank had not been adequately managed.

Service risers are typically made from concrete or high density plastic and must be installed by a suitably experienced professional (i.e. plumber). The tank and riser lids should be protected from groundwater and stormwater ingress.

7.2 Replacement of Existing Systems

Replacement of systems and components should be carried out according to the site-specific conditions and requirements of the lot. Common upgrade and replacement options for OWMS are discussed in the following sections. Any OWMS replacement upgrade works should be carried out by the system manufacturer or a suitably qualified service agent.

7.2.1 Septic Tanks Upgrade to Secondary Treatment System

It is envisaged that where simple repairs and pump-outs fail to meet compliance standards, existing septic tanks will require complete replacement due to being undersized, structurally unsound, and / or discharging effluent inappropriately.

It is recommended that an upgrade to a secondary treatment system take place (dependent on site and soil constraints), which must be in accordance with a site-specific LCA and design report by an appropriately qualified professional. All proprietary treatment systems must have current Certificate of Conformance from the EPA.

Secondary treatment systems allow greater flexibility for EDS options. Existing trenches may be used to receive the secondary effluent. Alternatively, the existing trenches can be decommissioned and rehabilitated with clean soil where required, and replaced with a different EDS (i.e. subsurface irrigation).

7.2.2 Upgrades, Extensions, and Replacements for Absorption Systems

Absorption trenches / beds have relatively small footprints with high loading rates on the soil when compared to other EDS, resulting in an increased risk of systems being overloaded and failing hydraulically in the long term.

Furthermore, prolonged effluent application through absorption trenches / beds increases the risk of soil degradation by increasing salinity and sodicity, as well as the development of a ‘clogging layer.’ A range of options for upgrading absorption trenches / beds is provided in the following sections. Site constraints,

particularly available suitable space, will determine what options are feasible, and will be determined on a case by case basis as part of the recommended servicing strategy.

7.2.2.1 Soil Amelioration

Heavily textured clay subsoils are commonly the most limiting layer to water movement. Quite often, the soil chemistry of this layer is dominated by adsorbed sodium / magnesium ions, causing the clay dispersion when in contact with water. When used for effluent dispersal these clay particles move down with the percolating water and clog up the fine pores, thus reducing the soil's permeability over time. Subsoil clay that is dispersive should be treated with gypsum to counteract the excessive sodium and magnesium and bring about a strong flocculated condition of the clay particles.

Lack of topsoil material also presents a limitation of effluent dispersal. As per the Standard and EPA Guidelines, EDS are to be covered with a minimum 100mm – 150mm of 'good quality' topsoil material, with irrigation systems to be installed within 250mm of topsoil. Therefore, the importation of topsoil material may be required. To achieve this, it is recommended that the natural soil surface of the EDS is scarified / lightly tilled to a depth of 150mm, with the imported topsoil material applied to the EDS. It is recommended the imported material is finished with a batter slope of 1 (vertical): 3 (horizontal) to allow for management of the vegetation (i.e. mowing).

7.2.2.2 Alternative Absorption Trench / Bed Designs

Over the years there have been various modifications to conventional absorption trenches / beds, some of which have been developed into proprietary 'off-the-shelf' products including various brands of self-supporting arch drains and the *Advanced Enviro-Septic*™ modular trench. Other modified designs are based on existing technologies which, although not all are formally approved, have been shown to enhance performance. One recent example of this is the 'Wick' trench developed for use in clay soils as an alternative to standard absorption trenches, referred to as 'Wick Trenches' in the EPA Guidelines. Further details can be found in Section 9.4.3.

8 Effluent Dispersal System Sizing Tables (Water Balance)

8.1 Overview

Water balance modelling was undertaken to determine the minimum footprint areas for a broad range of EDS that could be used in unsewered properties in the Shire. All six (6) of the *AS/NZS 1547:2012* soil categories were used in the modelling for three (3) household sizes, which is based on number of bedrooms and likely maximum occupancy rate for domestic dwellings. The results are provided in the System Sizing Tables (refer Appendix B and D), which summarise the minimum basal (or 'wetted') for EDS. The Sizing Tables are suitable for designing EDS for Low and Medium Risk properties only. It is noted that most localities will only have one (1) to two (2) soil types, and that the system sizing provided for the other soil types are irrelevant for that location unless a significant amount of topsoil is imported for the construction of the EDS, which is uncommon and costly.

8.2 Water Balance Methodology

A water balance is a means of incorporating the impact of rainfall, evapotranspiration and plant and soil moisture fluxes into the design of EDS. Water balance is a critical factor in the effective design and operation of EDS. This is particularly relevant for the higher rainfall areas in the southern half of the Shire. A simplistic water balance is expressed by the following equation:

Precipitation + Applied Effluent = Evapotranspiration + Percolation + Runoff

On the left hand side of the equation are the water INPUTS, factors that add to the moisture within an EDS On the right hand side of the equation are the water LOSSES, factors that reduce the moisture content within an EDS. For an EDS to be balanced hydraulically the INPUTS should be equal to or less than the LOSSES, otherwise hydraulic overloading and failure may result if the inherent moisture storage capacity of the EDS is subsequently exceeded.

Rainfall data can be obtained from the BoM or SILO and commonly water balances are undertaken using median rainfall data for a local weather station. Pan evaporation (Class A Pan) is less readily available, and usually is only available for selected weather stations. Evapotranspiration is the combination of evaporation and transpiration of moisture from the soil through the open pores in the leaves of plants. Evapotranspiration rates vary with changes to soil and air moisture as well as season, but can be estimated by applying appropriate monthly crop factors to pan evaporation data. Percolation is equivalent to the rate of deep drainage of both rainfall and applied effluent through the soil and is controlled mainly by soil properties, but also in part by slope and other factors. The runoff factor allows for the fact that not all rainfall that falls on a ground surface will actually infiltrate the EDS and so contribute to soil moisture. During periods of high rainfall, the soil becomes saturated and excess rainfall runs off as it cannot percolate into the soil.

If all factors in the water balance are expressed in terms of millimetres (mm) per month, then it is possible to solve the equation to determine a minimum EDS (footprint) such that the LOSSES match or exceed the INPUTS. This is usually done using pre-prepared spreadsheets to simplify the numerous calculations involved in running the balance for each month of the year. The water balance methodology used for the Sizing Tables is the same as that described in MAV & DSE (2014). Specific inputs are discussed in the following sections.

8.3 Water Balance Inputs

8.3.1 Daily Wastewater Load

The daily wastewater load is the product of the design occupancy rate and the wastewater generation in litres per person per day. Section 4.2.1 of the GOWM (2024) specifies that the design occupancy rate is to be based on the number of bedrooms (including any rooms that could be used as a bedroom, such as a study or library) plus one (1). For example, a four (4) bedroom home is expected to accommodate up to five (5) persons in the normal course of events (this does not include accommodation, businesses or holiday homes). This takes into account the future potential occupancy, not just the current occupancy (which may be lower).

Table 4-1 of the GOWM (2024) specifies a wastewater generation rate of 180L/person/day for households with reticulated water supply and standard water fixtures. The water balance uses this figure. However, where it can be demonstrated that full-reduction fixtures have been, or will be, installed in the household and will remain in place, then a design loading rate of 150L/person/day can be adopted for a site-specific OWM design. Alternatively if tank water is the only water source, then a wastewater flow rate of 120L/person/day can be used. The design wastewater loads used in water balance modelling are shown in Table 21.

Table 21: Design Wastewater Loads for Water Balance Modelling

No. Bedrooms	Design Occupancy	L/person/day	L/household/day
≤3	4	180	720
4	5		900
≥5	6		1,080

8.3.2 Climate Data

For this project, interpolated rainfall and evapotranspiration data for each unsewered locality has been obtained from SILO and BoM databases, as discussed in Section 6.2.4. Median monthly rainfall and mean evapotranspiration data were used to create unique water balances for each system type for each locality.

8.3.3 Crop Factor

For this project, the monthly crops factors for pasture were used as per Table 20 of the EDRS (2024).

8.3.4 Runoff Factor

Conservative annual runoff factors of 10% (90% infiltration of rainfall) have been adopted for soil absorption systems (e.g. trench, bed etc.) and 20% (80% infiltration) for drip and spray irrigation systems in the Shire.

The difference in runoff factors is due to absorption systems being finished with a flat surface, whereas irrigation systems may be installed on sloping ground along contours.

8.3.5 Soil Type and Loading Rates

The Design Loading Rate (DLR) and Design Irrigation Rate (DIR) for the commonly used EPA accepted methods of EDS as listed in Table 4-8 of the GOWM (2024) were used as the basis of water balance modelling and the sizing of the EDS for all systems. All listed systems except for mounds were modelled, as mounds require a site-specific design which accounts for site factors. For simplicity, every soil category has been modelled regardless of whether they are observed in the locality. The DLR or DIR should be selected for the most limiting soil layer within 0.8m of the soil surface (usually the heavier-textured subsoil horizons).

8.4 Footprint Area of Effluent Dispersal Systems

The size of an EDS depends not only on the volume of the effluent to be applied, the quality of the soil and on local rainfall, but also on how the system is laid out and on the spacing of components (e.g. trenches) and the width of mandatory setbacks.

In a subsurface irrigation system, the drip-lines are often closely spaced and the land may be considered to have an even loading. Therefore, the total EDS is the required area as specified by the water balance (plus any setbacks which must be maintained). Irrigation systems can be designed to best fit the most suitable area, provided that the pump is capable of delivering effluent evenly throughout the entire system. For absorption and ETA trenches and beds, wick trenches and Low Pressure Effluent Distribution (LPED) systems, a minimum spacing between trenches or beds must be observed to prevent overloading of the soil between them. The current EPA Guidelines and *AS/NZS 1547:2012* specifies a minimum spacing of 1m. It is highlighted that the 'typical footprint' is indicative only, and is likely to represent the minimum footprint for a well-laid out system. The final area must be determined by the system designer / installer as part of the final OWM design (for all risk category properties).

9 Evaluation of Wastewater Management Systems

9.1 Overview

This appendix provides a review of the range of accredited wastewater treatment systems and EDS options for domestic and commercial application.

EPA Victoria will continue to regulate what types of OWMS are approved for use under the *EP Act 2017*. Wastewater treatment system brands and models will need to be certified by an accredited conformity assessment body as conforming to the relevant Australian Standard. This accreditation will be given by the Joint Accreditation System of Australia and New Zealand or any other accreditation body approved by the Authority (assessment body). The assessment body must certify the treatment system as conforming to the relevant Australian and New Zealand Standard. The appropriate standards for the different types of treatment systems are outlined in Section 2.3 of the Operational Plan.

EPA holds a register of the OWMS with valid Certificates of Conformance within Victoria, with the EPA website to be regularly consulted for an up-to-date list of accredited systems. Note that Council approval is required prior to the installation, alteration, or rectification of any OWMS.

9.1.1 Exclusions and Variations

These guidelines do not relate to the mass production of manufactured proprietary treatment systems approved by EPA Victoria. Information and standards for the internal design and manufacturing of such units should be obtained from EPA Victoria and the relevant Australian / New Zealand Standard.

However, these guidelines do address the design and installation of OWM components that are subject to meeting the system type EPA Victoria Certificate of Conformance. Some aspects of this document vary from the standard requirements of the relevant Certificates of Conformance. These variations are considered appropriate for the following reasons:

- Because they represent a higher standard of practice than that included in the Certificates of Conformance that can be justified by current best practice from around the world;
- Because they may reduce risk to public health and the environment in comparison to current practice;
- Because they will increase the capacity for achieving the performance objectives set out in the *EP Act 2017*; and
- Because they reflect a more site specific approach utilising local conditions to set requirements.

A proposed installation or rectification that does not conform to the standard drawings contained in this guideline may be acceptable, providing it is assessed by, and deemed acceptable to, Council. It is recommended that Council be consulted on any variation from this document in the installation of OWMS components.

9.1.2 Plumbing and Drainage Work

The Technical Document does not address standards of work for plumbing and drainage as they relate to OWM components. The Plumbing Regulations 2018 set out these requirements and generally require plumbing and drainage work to be carried out in accordance with *AS/NZS 3500.* A licensed plumber is required to carry out all plumbing and drainage work up to the connection point to the treatment system. This document does not eliminate any requirement to comply with the EPA Guidelines.

9.2 Pump-out Systems

Pump-out systems convey raw wastewater or septic tank effluent to a holding tank (pump-out tank or collection well) for removal by licenced pump-out contractor for dispersal in an approved sewer main access hatch or municipal sewage treatment plant (under contract). They are generally regarded as a last resort, typically used to service properties where:

- There is inadequate available space to sustainably land apply effluent;
- An existing EDS has failed and cannot be safely used to apply effluent; or
- The lot will be connected to sewer in future (i.e. an interim solution).

Adequate sizing of holding tanks is important to ensure that adequate storage capacity is provided to allow lead time to arrange a licenced pump-out contractor. Further details for the design of pump-out systems can be found as Section 4.6.3 of the GOWM (2024). Holding tanks should be fitted with high water level alarms and must incorporate both audible (buzzer) and visual (strobe) alarm components. The following minimum standards are required for high water alarm systems:

- A muting facility for the audible alarm is to be incorporated into the alarm design;
- The muting facility shall reset to audible after 24-hours;
- The alarm panel shall be located in a visible position within the building or other location approved by Council;
- The alarm system float switch shall be set at a level such that on activation, two (2) days storage remains within the collection well; and
- Provision of an information sign that provides contact names and telephone numbers should the alarm be activated.

All wastewater or effluent holding tanks should be installed with adequately sealed lids, and positioned so that they do not impact on existing structures or neighbouring properties and stormwater is diverted around the tanks. Stormwater ingress must be avoided, as it can result in excessive pump out costs and may result in displacement of raw wastewater to the ground surface.

The tanks must be positioned to allow access by a pump-truck and its vacuum hose attachment. Pump-out tanks should comply with the applicable setback distances for primary treatment, as outlined in Table 4 – 10 of the GOWM (2024).

9.3 Wastewater Treatment Systems

There are currently four (4) broad categories of wastewater treatment system types that are accredited by the EPA:

1. *AS/NZS 1546.1* – Septic Tanks (and vermiculture systems);
2. *AS/NZS 1546.2* – Waterless Composting Toilets;
3. *AS 1546.3* – Secondary Treatment Systems; and
4. *AS 1546.4* – Domestic Greywater Treatment Systems.

A brief summary of each is provided in the following. For more detailed information, consult the current EPA Guidelines (GOWM and EDRS, 2024) and the EPA website:

https://www.epa.vic.gov.au/for-community/environmental-information/water/about-wastewater/onsite-wastewater-systems

9.3.1 Greywater Treatment Systems

Greywater treatment systems are accredited to treat laundry, shower, bath, and hand-basin greywater only. Blackwater (toilet and kitchen waste) must not be treated in greywater treatment systems. Kitchen water should be kept separate from the greywater stream and treated with blackwater as kitchen greywater can be relatively high in contaminants compared to other greywater streams.

Greywater treatment systems can be useful for upgrading direct-diversion greywater systems where blackwater is to be kept separate, particularly if kitchen wastewater can be re-plumbed to the blackwater septic tank to prevent it entering the greywater treatment system. If a greywater treatment system is utilised at a site, the blackwater also needs to be treated and disposed of onsite in an appropriately designed and accredited system. A justification is required within the LCA by the assessor.

Greywater typically accounts for 65% of the total wastewater load for a domestic development, with the blackwater stream accounting for the remaining 35%, or appropriate leachate if opting for a waterless blackwater system (i.e. composting toilet).

Greywater that is treated to 'advanced' secondary standard, in accordance with the GOWM (2024) and *AS 1546.4*, can be used for toilet flushing, cold water supply to clothes washing machines, and surface and subsurface irrigation. Advanced secondary effluent must achieve the following criteria:

- Biochemical Oxygen Demand (BOD_5): <10mg/L.
- Total Suspended Solids (TSS): <10mg/L.
- E. coli (if disinfected): <10cfu/100mL.

This is also referred to as the 10/10/10 standard by EPA Victoria. The nutrient removal performance varies considerably between and within advanced secondary treatment system types.

9.3.2 Collection / Pump Wells / Wastewater Pumps

Collection / pump wells must be designed and constructed to comply with *AS/NZS 1546:2008*. The capacity of domestic collection / pump wells shall be calculated based on the dosing requirements of the downstream component (e.g. subsurface irrigation area, trench or additional treatment system such as a sand filter).

A minimum of 12-hours retention time must be provided above the operating level of the flat switch for emergency storage. The storage capacity of a pump well must also be adequate to handle the peak hourly flow form the system (when considering pump capacities). All pump wells must have a minimum capacity of 1,000L.

Collection / pump wells installed in commercial or industrial premises shall be designed and sized according to the projected demand by a suitably qualified person. A high level alarm light (strobe) and / or audible device (buzzer) must be located on the premises so that failure of the pump set is easily detected.

Pump wells may be configured as demand dosing or timer dosing. This will depend on the need for flow balancing / equalisation. Float switches do not provide any flow balancing capabilities to a system.

- Tank size for timer dosing systems must be calculated using a cumulative storage assessment to make sure flow balancing can be sustained. Consideration will need to be given to variations in incoming hydraulic load and the maximum daily loading rate of the receiving component;
- A high level alarm light (strobe) and/or audible device (buzzer) must be located on the premises so that failure of the pump set is easily detected;
- Standby pumps which incorporate automatic cut-in devices must be installed in all systems except those serving single dwelling houses or premises where the daily flow is less than 1,500 litres; and
- Pump sets and control switches shall be installed in accordance with the manufacturer's specifications and to the requirements of the electricity supply authority.

9.3.3 Pumps

Pumps must be designed and warranted by the manufacturer for use in wastewater and should have a design life of at least five (5) years. Components will need to be corrosion resistant and capable of transferring wastewater with characteristics that match the development. Typically, a pump will be designed to convey wastewater with predicted characteristics, including raw wastewater (significantly large solids), primary treated effluent (some solids), secondary treated effluent (dirty water) or advanced secondary treated effluent (clean water).

Systems that utilise chlorine for disinfection will have a greater potential for pump corrosion. Domestic wastewater pumps must be warranted by the manufacturer to operate at the duty required for the job (i.e. frequently but for short periods, or constantly). Pumps must be capable of delivering wastewater at a simultaneous flow rate and pressure that matches the hydraulic characteristics of the target component.

The required flow rate and total dynamic head must be calculated for all pressurised components (i.e. dosing manifolds). The total dynamic head must be calculated for all non-pressurised components (i.e. transfer pumps between non-pressurised treatment components and pump dosed trenches and beds).

9.3.4 Dosing Siphon

If there is a desire to avoid the use of electricity and mechanical devices, a dosing siphon can be used to pressure dose system components. Automatic dosing siphons consist of a single apparatus with no moving parts installed in a collection tank that can trigger a siphon action when effluent rises to a predetermined level. The siphon resets itself when the level drops to a predetermined level prior to the next cycle. Requirements for the use of dosing siphons include:

- Dosing siphons for single domestic houses should be installed in a 250L collection well;
- Alternative sizes for the collection well will be necessary if doses that are larger or smaller than typical domestic loads are required; and
- A minimum fall of 0.5m will be required between the outlet of this well and the distribution manifold of the pressurised component.

9.3.5 Primary Treatment Systems

According to the EPA, there are two (2) broad categories of primary treatment systems for use with combined wastewater, blackwater only, or as pre-treatment for greywater treatment systems:

1. Septic tanks; and
2. Aerobic biological filters (wet composting or vermiculture).

Primary-treated effluent quality can vary considerably, depending on a broad range of factors, and there are no minimum standards specified by EPA Victoria, however, primary effluent is anticipated to fall into the following ranges.

- Biochemical Oxygen Demand (BOD5): 150-250mg/L.
- Total Suspended Solids (TSS): <40-140mg/L.
- E. coli or thermotolerant coliforms (if disinfected): $<10^6$cfu/100mL.

Incinerating toilets do not produce effluent and dry composting toilets produce a concentrated leachate, to which effluent quality standards do not apply.

9.3.5.1 Septic Tanks

Septic tanks are traditionally the most common type of treatment system in established localities without reticulated sewerage. The technology is passive, where wastewater is gravity fed to a single tank, ideally fitted with a baffle and inlet and outlet 'T-pieces' to prevent extrusion of solids into the trenches or backflow to the inlet.

Dense solids settle to the bottom of the tank to form sludge, while a lower-density scum forms at the surface. Anaerobic digestion of colloidal and dissolved organic solids occurs, and some nitrogen and phosphorus is also removed. The primary-treated effluent is discharged by gravity for further treatment in a secondary treatment system, or to an EDS suitable for primary effluent (such as trenches, beds, or a mound).

Septic tanks should be pumped out before sludge build-up or scum thickness reduces the available capacity for wastewater detention to the point where treatment efficacy is being impacted. Depending on tank capacity, household occupancy and influent strength, the pump-out period would be required every three (3) to five (5) years for combined wastewater and blackwater septic tanks, and about 10-15 years for greywater only.

Septic tanks are subject to *AS/NZS 1546.1:2008*, as well as the EPA Guidelines and current system type EPA Certificate of Conformance.

9.3.5.2 Aerobic Biological Filters

Aerobic biological filters (wet composting or vermiculture systems) are also known as 'worm farms' and have increased in popularity over the past decade. Raw wastewater is discharged directly to the top of the filter (contained in a plastic tank similar to a septic tank) and a rich humus layer develops that separates the solids from liquid prior to composting the solids with the aid of soil micro and macro fauna, including earthworms.

The liquid is discharged by gravity to an EDS suitable for primary effluent and the composted solids are periodically removed by property owners or maintenance staff. Section 4.3.3 of the GOWM (2024) provides detail on the management of composted material. Unless otherwise directed by Council, the composted humus material is to be buried within the confines of the premises. The cover of soil over the deposited humus must be at last 300mm deep. Compost must not be buried in an area used for the cultivation of crops for human consumption, unless: compost is placed in a separate lidded composting bin providing aeration for at least three (3) months with no further addition; or compost has been seasoned underground for at least three (3) months. The system is a passive, biologically-driven treatment process that mimics processes occurring in nature.

Wet composting toilets (or vermiculture systems) are subject to *AS/NZS 1546.1:2008*, as well as the current EPA Guidelines and current system type EPA Certificate of Conformance.

9.3.6 Dry Composting toilets (waterless or low-flush)

Composting toilets are generally installed for water saving or lifestyle reasons (e.g. 'eco homes' or remote homes with limited water supply). They are very rarely retrofitted into existing homes, and require a separate greywater treatment system to treat all greywater streams (including kitchen greywater).

Any liquid in the system (i.e. urine) forms a concentrated leachate which is disposed of by gravity drainage to a small absorption trench, which has long-term sustainability implications and is not suitable for areas with shallow soils, heavy-textured soils, or high water tables.

Waterless composting toilets are subject to *AS/NZS 1546.2:2008*, as well as the current EPA Guidelines and current system type EPA Certificate of Conformance.

9.3.7 Combined Wastewater Secondary Domestic Treatment Systems

According to the EPA, there are three (3) broad categories of domestic secondary treatment systems:

- Aerated wastewater treatment plants (AWTP);
- Sand and Media filters; and
- Membrane bioreactors.

The technologies used in domestic-scale systems are also often used in commercial systems. The minimum standards for secondary effluent quality in Victoria, as per Table 4-5 of the GOWM (2024), are as follows:

- Biochemical Oxygen Demand (BOD_5): <20mg/L.
- Total Suspended Solids (TSS): <30mg/L.
- E. coli or thermotolerant coliforms (if disinfected): <10cfu/100mL.

Nutrient removal performance varies considerably between secondary treatment systems and largely depends on design and operation (as well as influent nutrient concentrations).

9.3.7.1 Aerated Wastewater Treatment Plants

Domestic AWTPs are pre-fabricated, mechanically aerated treatment systems designed to treat wastewater flows of <2,000L/day. They are tank-based systems, comprising either one (1) or two (2) discrete tanks that typically employ the following processes:

- Settling of solids and flotation of scum in an anaerobic primary chamber or separate primary tank (effectively operating as a septic tank). This stage is omitted in some models.
- Oxidation and consumption of organic matter through aerobic biological processes using (active or passive) mechanical aeration.
- Clarification – secondary settling of solids.
- Disinfection – usually by chlorination but occasionally using ultraviolet irradiation.
- Regular removal of sludge to maintain the process.

AWTPs are typically supplied as stand-alone, proprietary systems. They require regular maintenance in accordance with the EPA Certificate of Conformance for the specific model (usually quarterly) to ensure satisfactory performance and adequate disinfection. The operating (power) costs of AWTPs are relatively high compared to more passive systems such as trickling filters and reed beds, as the aerobic treatment phase requires air blowers to be run for several hours each day.

AWTPs are generally less suitable for premises with intermittent use or surge loads, such as holiday homes and commercial premises with very low flow / high flow wastewater cycles. AWTP must not be switched off when not in use as the deprivation of oxygen will kill the aerobic bacteria within a few days and populations can take weeks to be re-established when the system is turned on and wastewater supply resumes. Some AWTP models have a low-flow switch which re-circulates effluent to keep aerobic bacteria alive when not in use.

All AWTPs must be installed with an alarm that has visual and audible components to indicate mechanical and electrical malfunctions. The alarm shall have one (1) signal next to it and another in a suitable position attached to the house. The alarm shall incorporate a warning lamp, which may be reset only by the service

agent. Prior to the installation of a system, the owner must enter into an annual service contract for the AWTP with a service agent authorised by MPSC.

AWTP are subject to *AS 1546.3:2017*, as well as the current EPA Guidelines and current system type EPA Certificate of Conformance.

9.3.7.2 Sand and Media Filters

For all sand and media filters, the influent must first undergo a minimum of primary treatment (e.g. a septic tank). Sand and media filters are configured to provide a very large surface area to volume ratio, which hosts aerobic microorganisms that treat the effluent as it passes over the media, usually by gravity. Proprietary filter systems typically incorporate the primary treatment tank into a stand-alone unit and recirculate a proportion of the treated effluent through the filter to improve effluent quality. The system is typically located below or at ground level. Media filters can also be single-pass (i.e. non-recirculating) and therefore require a larger surface area to ensure adequate hydraulic residence time (HRT) of effluent.

Media filters are generally more resilient to intermittent flows and shock loading than AWTPs, and can have significantly lower operating costs. Recirculating systems have a relatively small footprint (and demand for materials) compared to single-pass sand filters; however, single pass filters can be designed with passive (gravity) dosing, requiring no electricity to operate. Site-specific hydraulic designs are required to support passive dosing systems.

For consistently high-strength influent wastewater (such as food or dairy processing premises), an additional primary treatment stage or secondary pre-treatment stage may be required, with the filter providing final effluent ‘polishing’.

9.3.7.3 Membrane Filters

Membrane filters provide advanced secondary treated effluent using microfiltration or reverse osmosis membranes, usually following primary and secondary treatment in separate chambers or tanks. Use of membranes requires high energy use and therefore the ongoing costs as well as upfront costs of membranes systems which are high when compared to other systems. Furthermore, the systems require regular, ongoing maintenance to ensure membranes are not damaged or remain fouled.

9.3.8 Combined Wastewater Secondary Commercial Treatment Systems

These systems are for predominantly human waste (minimal trade wastes) with flows 2,000L/day-5,000L/day (in accordance with EPA regulations). The treatment technologies used are broadly similar to those used in domestic wastewater treatment systems, but are expanded in scale.

Some systems are modular in design, using numerous small treatment units either in series or in parallel, allowing expansion of treatment capacities where required. In many cases, companies will provide systems to both the domestic and the commercial market.

9.3.9 Key Issues for Wastewater Treatment System Selection and Design

For domestic and commercial wastewater management systems alike, the key issues that determine the selection of wastewater treatment systems are:

- Flow volumes / loads;
- Flow rates and peaks, including intermittent usage;
- Wastewater strength (particularly organics); and
- The degree of constraint of the site for land application of effluent.

Depending on the nature of the development, these aspects of wastewater management can vary significantly and pose challenges to the system designer and owner. Specialist design is typically required for commercial wastewater streams and for seasonal fluctuations in flows (such as holiday rental properties).

9.4 Effluent Dispersal Systems

The range of available EDS options are discussed in the following sections. The preferred EDS option and its location must be determined based on the outcomes of the appropriate level of LCA as per Section 6.2 of the Operational Plan. The Table 4-8 of the GOWM (2024) and Table 5.2 of the *AS/NZS 1547:2012* provide recommended DLRs / DIRs for EDS, based on soil type.

9.4.1 Absorption Trenches / Beds

Absorption trenches / beds have conventionally been used for land application of septic tank effluent. These systems rely substantially on effluent absorption to the soil and impose relatively high loading rates on the soil when compared to irrigation, increasing the risk of systems being overloaded and failing hydraulically in the long term.

Furthermore, prolonged effluent application through absorption systems increases the risk of soil degradation by increasing salinity and sodicity, as well as the build-up of impermeable or slowly-permeable 'bio-mats' (clogging layer) which can prevent movement of effluent into the soil, leading to 'creeping failure'. These systems offer very limited opportunity for effective reuse of effluent and do not represent current best practice.

Over the years there have been various modifications to conventional absorption trenches and beds, some of which have been developed into proprietary 'off-the-shelf' products including various brands of self-supporting arch drains and the *Advanced Enviro-Septic*™ modular trench.

Absorption trenches / beds are considered inappropriate for sites with shallow soils, high groundwater, or heavy-textured (clay) soils due to limited infiltration capacity. They are also generally not suitable for gravels and sands, as the very high permeability of these materials can inhibit treatment within the soil profile and allow effluent to rapidly percolate to the groundwater table. Areas with high rainfall are also at high risk of surface and groundwater contamination from absorption trenches / beds.

Absorption trenches / beds may be used with secondary-treated effluent, which can be dosed at a higher rate than primary-treated effluent, in accordance with the Table 4-8 of the GOWM (2024) and Table 5.2 of *AS/NZS 1547:2012*.

Absorption trenches / beds must be inspected by Council;

- Prior to backfilling; and
- After completion of all work (and landscaping / turfing).

9.4.2 Evapotranspiration-Absorption (ETA) Trenches / Beds

Evapotranspiration-absorption (ETA) trenches / beds are essentially shallower absorption systems that allow some plant uptake of the effluent from the soil profile, reducing the amount of effluent that is leached to deeper soils and groundwater.

They can improve public health and environmental outcomes for areas with heavy-textured soils, shallow soils, or high watertables when compared to conventional absorption systems. However, they are prone to similar problems to conventional absorption trenches / beds, including build-up of bio-mats and rapid percolation in highly-permeable soils.

ETA systems are suitable for both primary and secondary treated effluent; however the design loading rates (DLRs) nominated by both Table 4-8 of the GOWM (2024) and *AS/NZS 1547:2012* do not vary with the level of treatment (as is the case for absorption systems).

ETA beds must be inspected by Council:

- Prior to backfilling; and
- After completion of all work (and landscaping / turfing).

9.4.3 Enhanced ETA Trenches / Beds

In recent years, there have been several proprietary and custom-built modifications to standard ETA trenches / beds, which further optimise evapotranspiration of effluent and minimise deep drainage.

The most common example is the custom-made geotextile-wrapped and / or lined arch or pipe trenches, which use capillary action in the geotextile to 'wick' effluent into the topsoil and root zone above, and are referred to in Section 4.4.1.3.1 of the GOWM (2024) and Section 2.4.2.3 of the EDRS (2024) as a 'wick trenches'. Wick trenches are generally considered suitable for low-permeability soils. Like standard ETA systems, the modified versions are suitable for both primary and secondary treated effluent.

Table 4-8 of the GOWM (2024) nominates DLRs for wick trenches using secondary-treated effluent. For primary-treated effluent, however, the nominated DLRs for standard ETA systems should be adopted as per Table 5.2 of *AS/NZS 1547:2012*. The long term performance of modified ETA systems has not been tested as they are a relative recent innovation. Use of primary-treated effluent could result in clogging of geotextile materials over time.

9.4.4 Mounds

Wisconsin mounds are often an appropriate onsite solution for lots with limited space, shallow soil profiles, poor drainage, or high water tables. Mounds are effectively raised soil absorption systems comprising layered fill, into which effluent is dosed. Effluent receives further treatment as it percolates down through the mound and is then absorbed by the natural soils below the mound. A properly designed mound can have a higher evapotranspiration potential than an ETA bed of equivalent size, further enhancing effluent dispersal on constrained lots.

Mounds have a considerable up-front cost in the materials and construction, and are suitable for primary or secondary treated effluent, providing further treatment of effluent as it moves through the sand profile.

In addition, there are proprietary mound systems which use a modified fill media primarily from industrial waste products of aluminium or iron smelting, which have a very high phosphorus adsorption capacity. When designed, installed, and maintained correctly, these systems can present a good solution for constrained sites. However, the success of these systems has been variable in the past, largely due to inappropriate design and installation.

Mounds must be inspected by Council;

- Once the basal area of the mound has been prepared;
- Prior to covering the distribution manifold and before the agricultural pipe has been placed over the pressure manifold. At this inspection the squirt height from all orifices will be measured. There should be no more than 15% variation in squirt height across the whole manifold; and
- After completion of all work and landscaping / turfing.

9.4.5 Subsurface Irrigation or Covered-surface Drip Irrigation

Subsurface irrigation (SSI) or covered-surface drip irrigation (CSDI) systems are becoming more popular in recent years. Properly designed systems apply effluent at much lower volumetric rates and over larger areas than absorption / ETA systems and mounds.

Effluent is applied in the root zone of plants, 100mm – 150mm below the surface in 250mm of topsoil material, at a rate that more closely matches plant and soil requirements (evapotranspiration), leading to effective effluent reuse. The reliance on soil absorption is relatively low and hence the risk of contaminants accumulating in the soil or leaching to groundwater is also low.

SSI typically comprises a network of proprietary, pressure-compensating drip-irrigation line that is specially designed for use with effluent and contains specially designed emitters that reduce the risk of blockage, biofilm development and root intrusion. SSI virtually eliminates the risk of people inadvertently coming into contact with effluent and also minimises the risk of effluent being transported off-site, even during rain. SSI may be installed on sloping lots, provided the DIR is reduced accordingly to ensure that effluent migration down slope is taken up adequately within the root system (as per Table M2 of *AS/NZS 1547:2012*).

When properly designed, installed and operated, these systems will ensure good distribution of effluent at uniform, controlled application rates. By properly sizing the EDS to ensure sustainable hydraulic and nutrient loading rates, water, and nutrients can be effectively utilised and are unlikely to seep to groundwater or run-off to surface waters. Care must be taken in designing and installing systems in areas that experience temperatures below freezing.

SSI / CSDI systems must be inspected by Council prior to:

- Occupation of a new dwelling; and
- Commissioning of the treatment system.

9.4.6 Low Pressure Effluent Distribution Irrigation

LPED irrigation systems were originally developed for use in sandy soils where conventional absorption system can result in overloading of soils. However, Table 4-8 of the GOWM (2024) and Table 5.2 of *AS/NZS 1547:2021* prohibit the use of LPED systems in Category 1 and weakly structured Category 2a soils, as well as all Category 6 soils. LPED systems can be beneficial for Category 5 soils; however, the large area they must occupy for such soils would be better served by subsurface irrigation using secondary treated effluent (refer Section 9.4.5).

In LPED systems, effluent is discharged into 25mm – 30mm perforated pipes contained within 50 mm – 100mm slotted pipes, to distribute effluent more evenly into the surrounding aggregate and to prevent soil intrusion into the perforations. The pipes are laid in narrow, shallow trenches filled with aggregate and capped with topsoil in order to optimise contact with aerobic bacteria in topsoil and to facilitate plant uptake of effluent. The system can be pressurised using a pump or a passive dosing device, with a detailed hydraulic design to ensure even distribution throughout the system.

LPED irrigation can be used with either primary or secondary effluent, but is more commonly used as an alternative to absorption trench and bed systems for primary effluent. It is recommended that an outlet filter is installed on primary treatment systems to reduce the amount of suspended solids and organics being conveyed into the LPED system. Table 4-8 of the GOWM and Table 5.2 of *AS/NZS 1547:2012* provide DIRs for LPED systems, with a single DIR for both primary and secondary effluent.

9.4.7 Surface Spray Irrigation

Surface spray irrigation (using mist or droplet sprinklers) while increasing in popularity over the past 20 years, is now considered an outdated technology that can pose unacceptable public health and the environment risks due to potential exposure and also surface runoff during rainfall.

Often, an inadequate number of sprinklers are installed to ensure even coverage over an adequately large area; and commonly the sprinklers are not fixed and must be frequently moved by the resident to reduce over-loading which is often neglected over time. In addition, surface irrigation is not considered appropriate for slopes greater than 10% as the risk of runoff increases. Surface spray irrigation is more suitable for relatively large and flat areas, with limited access to the irrigation field and large buffer distances to surface watercourses and drains.

For typical domestic and small commercial sites, SSI or CSDI is considered best practice. As per Section 2.4.3.3 of the EDRS (2024), surface irrigation system should only be installed on large residential properties or large industrial / commercial developments with sufficient area to able restricted access to the EDS, ensuring no human or animal exposure. Council does not permit any new surface irrigation systems to be installed on small residential lots, but permits the existing surface irrigation systems to be managed as per their current permit.

9.4.8 Key Issues for Wastewater Treatment System Selection and Design

The key issues that influence the selection and design of EDS are:

- The level of treatment of the effluent (primary, secondary, or advanced secondary);
- Soil characteristics (particularly texture, structure, depth, dispersibility, and phosphorus adsorption capacity);

- Site characteristics (particularly slope, aspect, and shading); and
- Proximity to sensitive receiving environments (such as surface waters and groundwater).

For constrained sites, the preferred effluent management strategy can dictate the level of wastewater treatment required. For example, a small lot with insufficient area to apply the entire effluent load may require a composting toilet with advanced greywater treatment for beneficial reuse to reduce volume of treated effluent being applied to the limited available space. In some cases, there may be no suitable solution, or a pump-out tank may be required to tanker wastewater off-site for dispersal at an approved facility.

10 Glossary of Terms

Term	Definition
Aerobic treatment	Biological treatment processes that occur in the presence of oxygen (i.e. aerobic bacteria digest wastewater contaminants). Aerobic bacteria are organisms that require oxygen to survive and grow.
Anaerobic treatment	Biological treatment processes that occur in the absence of oxygen.
Blackwater	Wastewater grossly contaminated with faeces (i.e. from a toilet).
Desludging	Removal of the semi solid waste from a tank.
Effluent	Water discharged from a treatment plant.
Evapotranspiration	Transfer of water from the soil to the atmosphere through evaporation and plant transpiration. Calculated using the FAO Penman-Monteith method to derive (ET_0).
Organic Matter	Material that comes from the tissues of organisms (plants, animals, or microorganisms) that are currently or were once living.
Greywater	Wastewater from showers, baths, sinks, washing machines, dish washers.
Hardpan	A hardened, compacted and/or cemented horizon.
Locality	The broader locality surrounding a town (place name within mapped boundaries).
Non-Potable	Water not suitable for human consumption.
Parcel	The smallest unit of land able to be transferred within Victoria's cadastral system, usually having one proprietor or owner (land.vic.gov.au). For the purposes of this OWMP, parcel and lot are given to have the same meaning.
Peds	An aggregate of soil particles.
Permeability	The ability of the soil to allow water to pass through.
P-sorb	Phosphorus adsorption capacity of soil.
Property	Land under common occupation (land.vic.gov.au). May include multiple lots.
Risk	The 'likely' consequence of off-site (OWM) impacts based on the cumulative effect of individual lot constraints (soil suitability, slope, useable lot area, climate and location) and variables affecting the specific land capability and associated limitations of the lot to sustainably manage wastewater in compliance with *EP Act 2017* objectives.
Settlement	An area of residential development within the Rural Living Zone or Rural Conservation Zone.
Sewage	Solid and liquid wastewater conveyed through sewers.
Sewerage	A system of sewers.
Town	The town servicing a locality, which is predominantly zoned Township Zone. It contains both residential and commercial development.

11 References

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Environment Protection Authority (1996), *Publication 451 Onsite Domestic Wastewater Management*.

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Environment Protection Authority (2024), *Guideline for Onsite Wastewater Effluent Dispersal and Recycling Systems*.

Ian Sargeant (Department of Primary Industries) (2003), *Soil / Landforms of the Mornington Peninsula*.

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Standards Australia / Standards New Zealand (2003), *AS/NZS 3500 Plumbing and Drainage, Part 1: Water Services and Part 2: Sanitary Plumbing and Drainage*.

Standards Australia / Standards New Zealand (2008), *AS/NZS 1546:1-2 Onsite Domestic Wastewater Treatment Units*.

Standards Australia / Standards New Zealand (2016-2017), *AS 1546:3-4 Onsite Domestic Wastewater Treatment Units*.

Standards Australia / Standards New Zealand (2012), *AS/NZS 1547:2012 Onsite Domestic Wastewater Management.*

Appendix A

Informative Maps

Figure A1: Geology

MPSC OWMP 2025 - 2030

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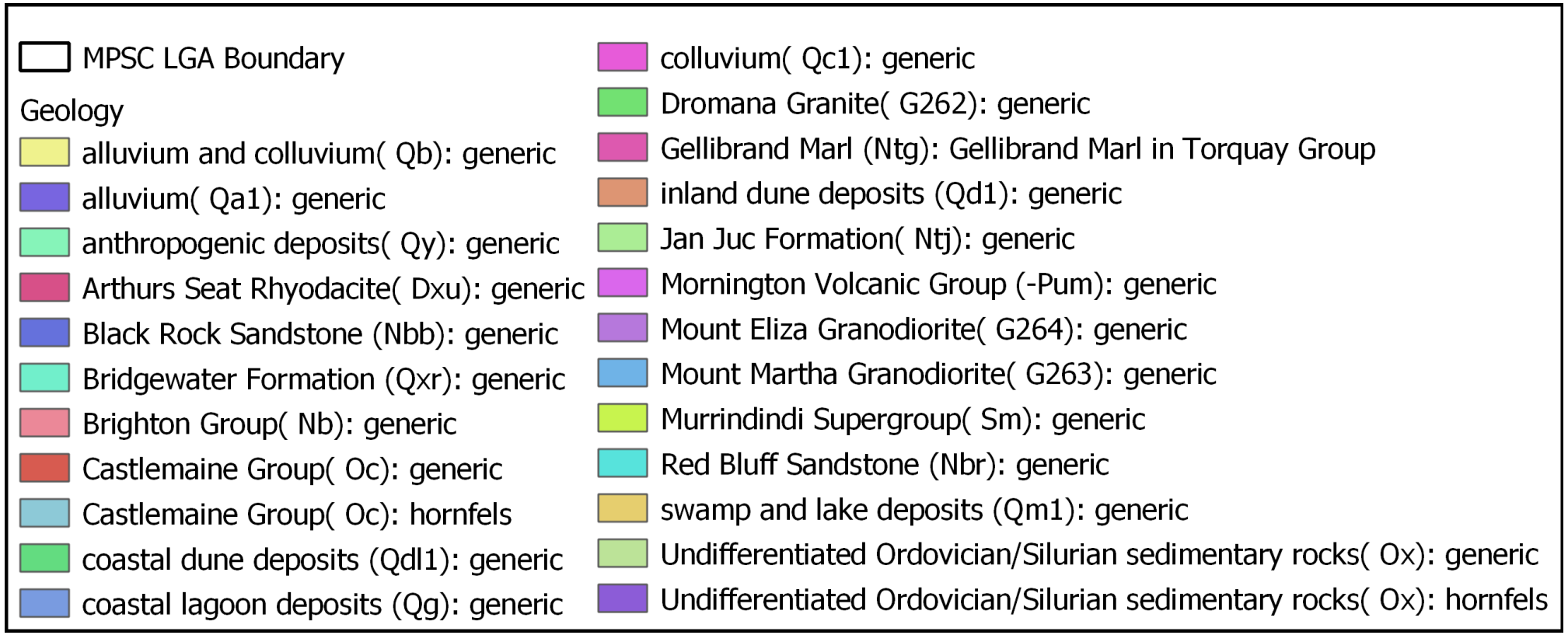
0 10 20 30 40 km

(Approx Scale)

Revision	001
Drawn	CM
Approved	MS


MPSC LGA Boundary
Geology
alluvium and colluvium(Qb): generic
alluvium(Qa1): generic
anthropogenic deposits(Qy): generic
Arthurs Seat Rhyodacite(Dxu): generic
Black Rock Sandstone (Nbb): generic
Bridgewater Formation (Qxr): generic
Brighton Group(Nb): generic
Castlemaine Group(Oc): generic
Castlemaine Group(Oc): hornfels
coastal dune deposits (Qdl1): generic
coastal lagoon deposits (Qg): generic
colluvium(Qc1): generic
Dromana Granite(G262): generic
Gellibrand Marl (Ntg): Gellibrand Marl in Torquay Group
inland dune deposits (Qd1): generic
Jan Juc Formation(Ntj): generic
Mornington Volcanic Group (-Pum): generic
Mount Eliza Granodiorite(G264): generic
Mount Martha Granodiorite(G263): generic
Murrindindi Supergroup(Sm): generic
Red Bluff Sandstone (Nbr): generic
swamp and lake deposits (Qm1): generic
Undifferentiated Ordovician/Silurian sedimentary rocks(Ox): generic
Undifferentiated Ordovician/Silurian sedimentary rocks(Ox): hornfels

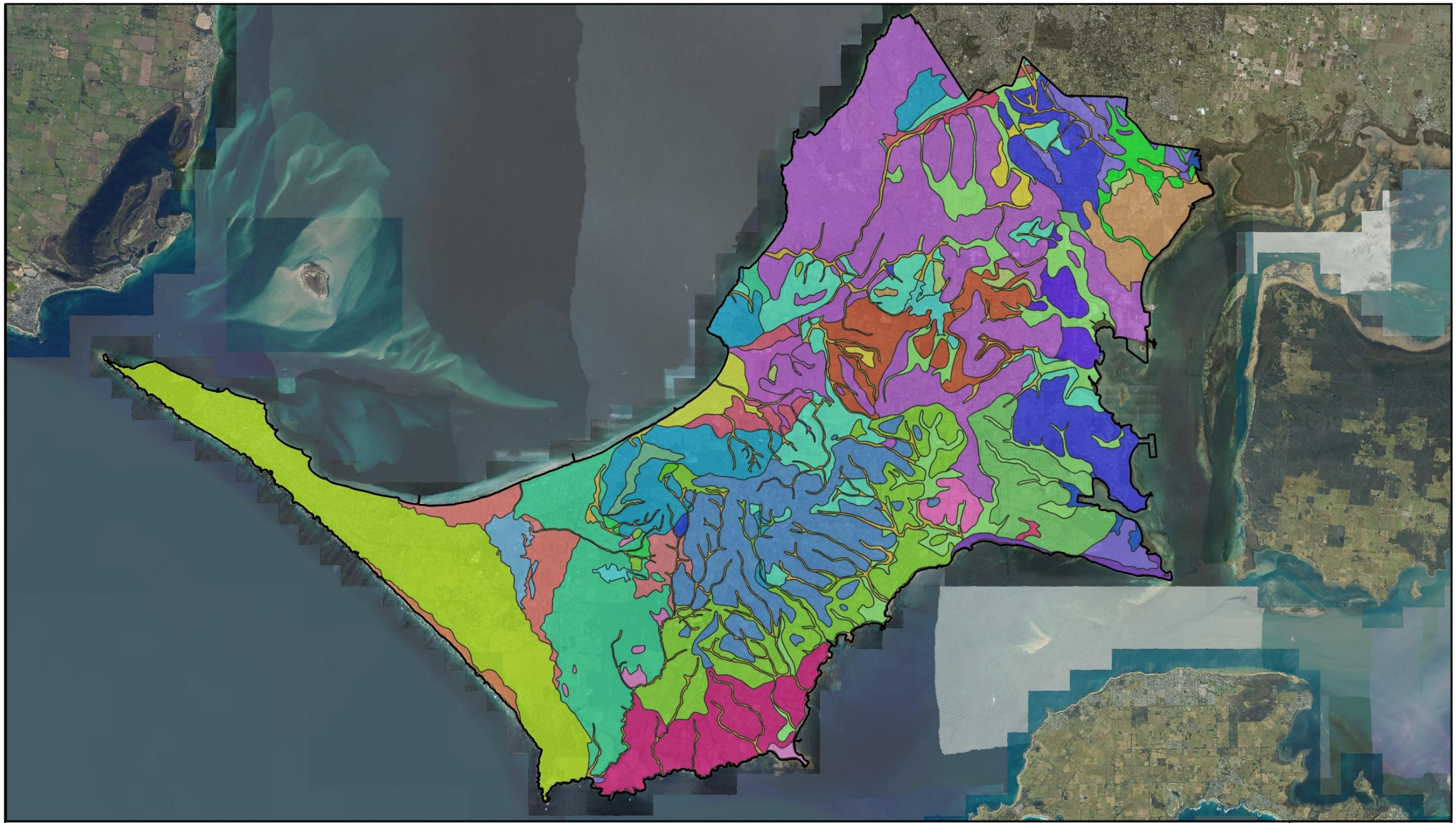


Figure A2: Soil Type

MPSC OWMP 2025 - 2030

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(Approx Scale)

Revision	001
Drawn	CM
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MPSC LGA Boundary
Soil Type
Arthurs Seat
Arthurs Seat; sand overlay
Arthurs Seat; steep
Bittern
Bittern with Bittern sandy loam
Bittern with Flinders
Bittern with Langwarrin
Bittern; sandy loam surf
Bittern; sandy surface
Boneo
Cerberus
Cranbourne (old Cn)
Cups
drainage line; variable
Dromana
Dunns Creek
Dunns Creek & sand dunes
Flinders
Flinders and Flinders clay
Flinders and Red Hill
Flinders with Red Hill
Flinders; sand overlay
Gunnamatta (old Gu)
Hastings (old Ha)
Langwarrin
Langwarrin with Bittern
Langwarrin; sand overlay
Merricks
Merricks; clay
Pearcedale
Red Hill
Rosebud
Rosebud with swamps
swamp
Toomuc
Toomuc with Cranbourne
Tootgarook (old Tg)
Type A
water

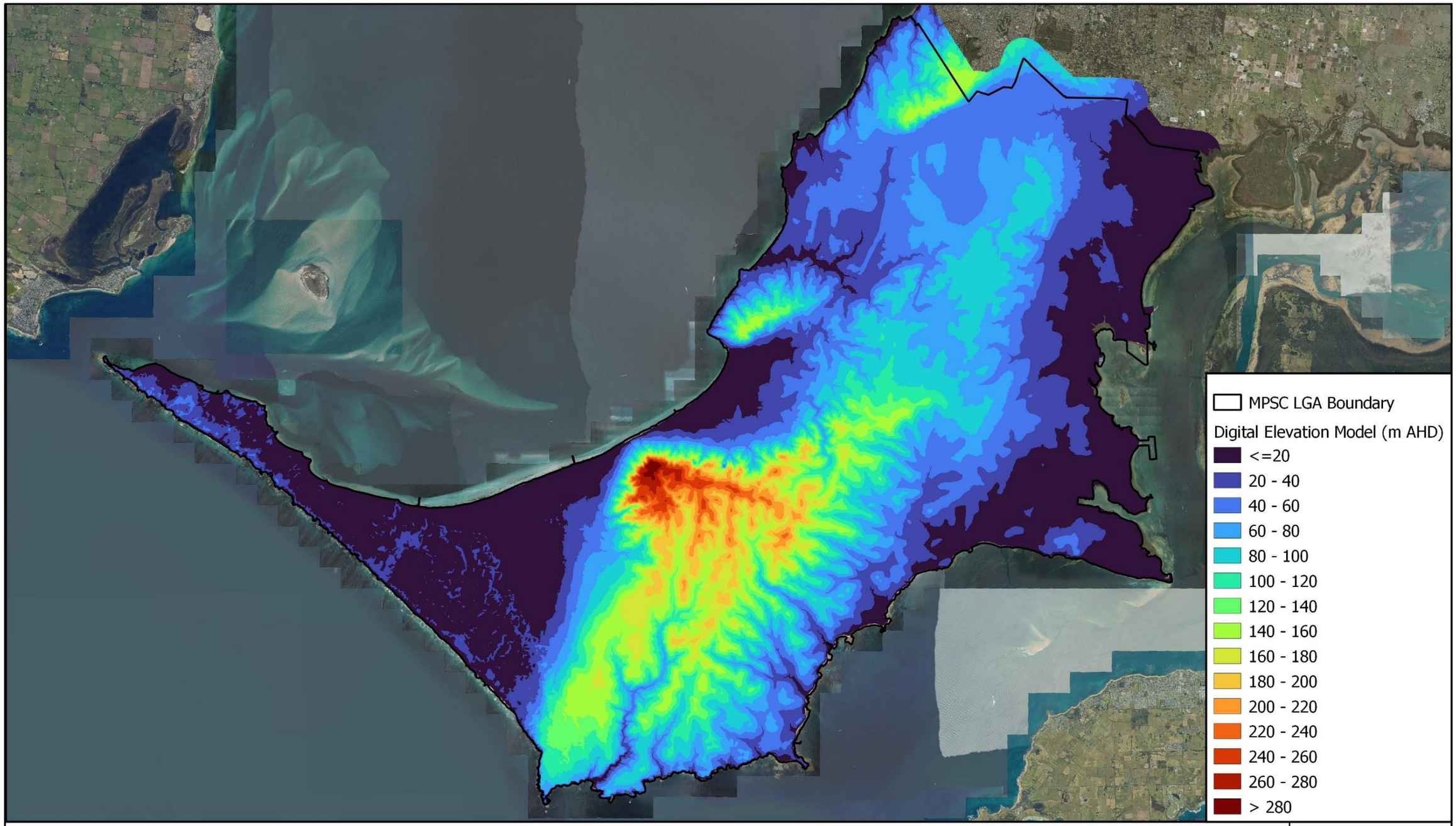

Figure A3: Surface Elevation

MPSC OWMP 2025 - 2030

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0 10 20 30 40 km

(Approx Scale)

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Legend

- MPSC LGA Boundary
- Waterway
- Surface Water Feature
- Land Subject to Inundation Overlay

Figure A4: Surface Water Features

MPSC OWMP 2025 - 2030

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0 10 20 30 40 km

(Approx Scale)

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Figure A5: Groundwater Features

MPSC OWMP 2025 - 2030

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(Approx Scale)

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Appendix B

Locality Reports

Information for Locality boundaries has been obtained from the Vicmap Admin dataset series, available at the following:

https://datashare.maps.vic.gov.au/search?q=uuid%3D47352a58-1fd6-5b50-a2ec-9df8afdf8ac9.

The Locality boundaries are defined by Local Governments and registered by the Registrar of Geographic Names (GeoNames). The dataset used contains Bounded Localities. Locality reports have only been provided for the targeted areas outlined in Section 4.1.2 of the Operational Plan. ECO Localities have not been included as OWM is not supported for new developments.

Sizing Tables for each Locality in regards to each EDS type were created using conservative monthly water balances, following methods described in the MAV & DSE Model LCA (2014). Monthly median rainfall and mean evapotranspiration data for each locality was sourced from BoM and SILO climate databases. The SILO databases use accurate meteorological data collected throughout Australia over long time periods. Sizing Tables have also been provided for Localities note assessed in the Locality Reports, and can be found as Appendix D.

The DLRs and DIRs were taken from the current EPA Guidelines and Table 5.2 of AS/NZS 1547:2012. Where the current EPA Guidelines and AS/NZS 1547:2012 has precluded use of a particular type of system on a certain soil type, it is shown as 'N/A' for that soil type in the Sizing Tables.

Where the evapotranspiration deficit requires unrealistically large EDS for a particular system on a certain soil type, it is also shown as 'N/A' for that soil type in the Sizing Tables. Detailed, site-specific LCAs and system designs would be required to further investigate the feasibility of systems deemed 'N/A' in the sizing tables. Mitigation measures, such as importation of topsoil to appropriate depths in the EDS, may be required to sustainably achieve effluent dispersal on constrained lots.

A. Arthurs Seat Locality Report

1a. Introduction

Arthurs Seat is a mostly rural locality directly south of Dromana, with higher density residential development in the north. The locality has a population of approximately 414 residents, with 249 private dwellings (ABS Census, 2021). There is approximately 308 unsewered developable lots within the locality, with only the Eagles Cable Car development currently sewered. The northern region of the locality is densely forested, consisting of the Arthurs Seat State Park.

2a. Summary of Constraints to OWM

Characteristic	Description
Climate	Rainfall: 817.6mm/year. Evaporation: 1,188.7mm/year.
Surface waterways	Arthurs Seat contains three (3) main waterways draining to Port Phillip in the north, Rosebud to the west, and Main Ridge to the south. A small number of farm dams are located throughout larger agricultural lots in the south of the locality.
Groundwater	Approximately 17 groundwater bores throughout the locality, most significantly within large agricultural lots in the south of the locality. Shallow groundwater (<5m) identified adjacent waterways in the south of the locality.
Flooding	The locality is not flood impacted.
Useable lot area	Very High: 209. High: 42. Medium: 45. Low: 12.
Slope	High: 79. Medium: 115. Low: 114.
Geology	Dromana Granite; Mornington volcanic Group; and Jan Juc Formation.
Soil type	High: 302. Medium: 6. Low: 0. A majority of the locality has been mapped as containing slowly permeable (Cat 6) soils, with higher permeability (Cat 5) soils in the north.
Risk Analysis Rating	Very High: 62. High: 175. Medium: 69. Low: 1.

3a. Risk Analysis (Maps)

Risk Analysis mapping has been presented a Figure B1.

4a. System Selection

Due to the dominance of heavy-textured soils in the locality, conventional absorption systems are not likely feasible and are discouraged. Table 4-8 of the GOWM (2024) prohibits absorption and LPED systems on Category 6 soils.

5a. System Sizing Tables

Sizing Tables for Arthurs Seat are provided in the following.

Arthurs Seat - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	245		365	485	725	N/A[7]
Conventional Absorption System	N/A[3]		95	430	N/A[4]	
Evapotranspiration-Absorption System			95	270		
LPED Irrigation	N/A[6]		485	725	1,455	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	305		455	605	905	N/A[7]
Conventional Absorption System	N/A[3]		120	540	N/A[4]	
Evapotranspiration-Absorption System			120	340		
LPED Irrigation	N/A[6]		605	905	1,820	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	365		545	725	1,090	N/A[7]
Conventional Absorption System	N/A[3]		145	645	N/A[4]	
Evapotranspiration-Absorption System			145	405		
LPED Irrigation	N/A[6]		725	1,090	2,185	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

[7] Not suitable due to climatic conditions.

Likely unsuitable due to open space limitations.

6a. General Conclusion

Lots within Arthurs Seat have been predominantly assigned a High or Medium Risk Rating to sustainable OWM. Predominantly Standard LCAs will be required, with the use of System Sizing tables deemed appropriate for Medium Risk lots.

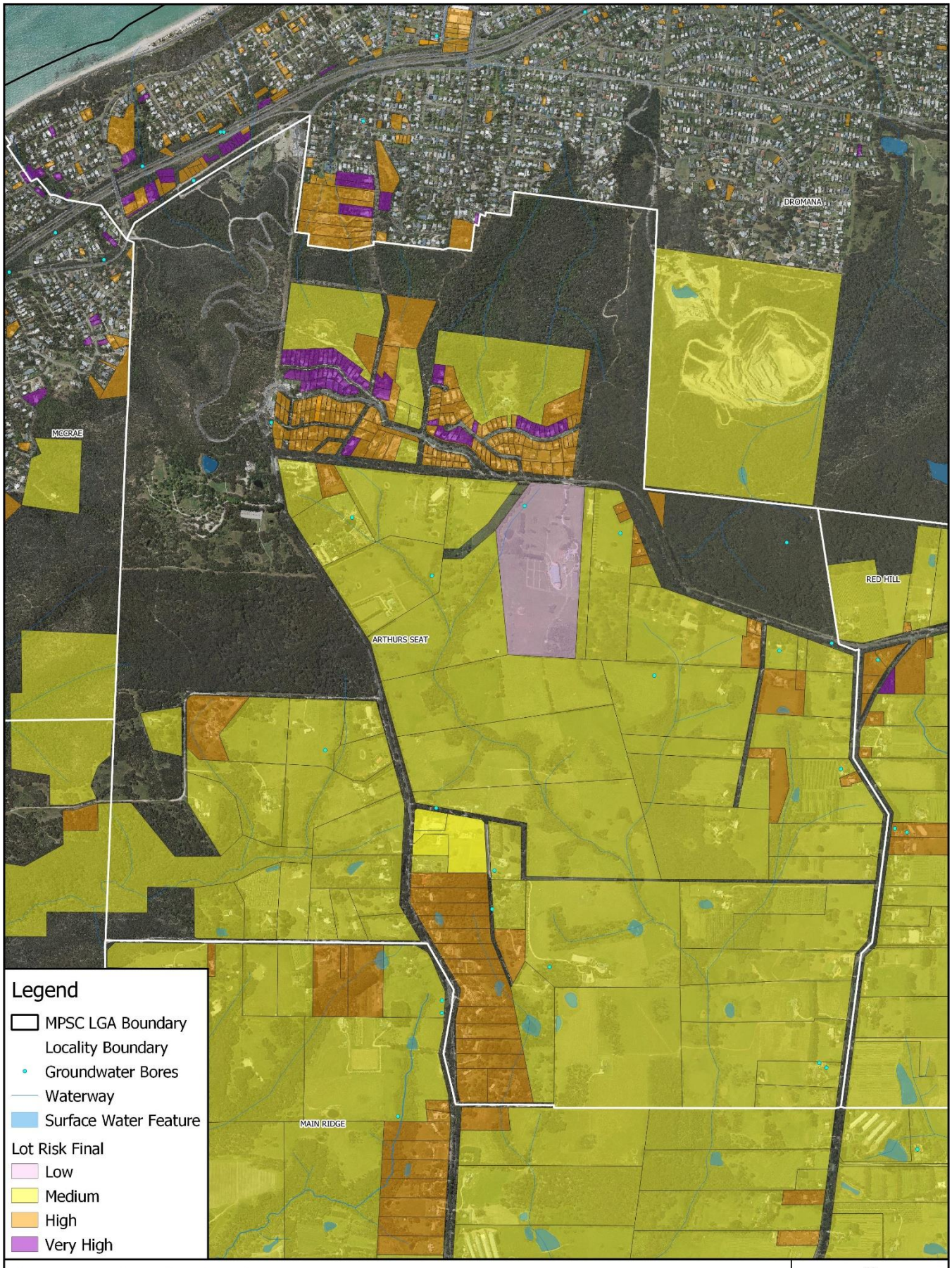

Figure B1: Arthurs Seat Locality

MPSC OWMP 2025 - 2030

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Environmental Consultants

0 0.5 1 1.5 km

(Approx Scale)

Revision	001
Drawn	CM
Approved	MS

B. Bittern Locality Report

7a. Introduction

Bittern is a mostly rural locality, and is located directly south of Hastings, with high density residential development within the centre. The locality has a population of approximately 4,276 residents, with 1,261 private dwellings (ABS Census, 2021). There is approximately 581 unsewered developable lots within the locality, with sewered lots throughout the east of the locality.

8a. Summary of Constraints to OWM

Characteristic	Description
Climate	Rainfall: 736.7mm/year. Evaporation: 1,219.7mm/year.
Surface waterways	There are minimal surface water features throughout the locality, with the upper reaches of waterways located in the north and south, with some farms dams located throughout the west.
Groundwater	Approximately 80 groundwater bores throughout the locality, mostly identified in the south. Groundwater is generally between 5-10m deep within the locality.
Flooding	The locality is flood impacted in the east, adjacent Western Port Bay and Warringine Park.
Useable lot area	Very High: 281. High: 231. Medium: 45. Low: 24.
Slope	High: 3. Medium: 9. Low: 569.
Geology	Red Bluff Sandstone; Murrindindi Supergroup; coastal lagoon deposits; swamp and lake deposits; and coastal dune deposits.
Soil type	High: 581. Medium: 0. Low: 0. The entire locality has been mapped as containing slowly permeable soils (Cat 6).
Risk Analysis Rating	Very High: 3. High: 279. Medium: 275. Low: 24.

9a. Risk Analysis (Maps)

Risk Analysis mapping has been presented a Figure B2.

10a. System Selection

Due to the dominance of heavy-textured soils in the settlement area of locality, conventional absorption systems are not likely feasible and are discouraged. Table 4-8 of the GOWM (2024) prohibits absorption and LPED systems on Category 6 soils.

11a. System Sizing Tables

Sizing Tables for Bittern are provided in the following.

Bittern - Sizing Tables

1 - 3 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	210		300	375	505	1,675
Conventional Absorption System	N/A[3]		90	335	N/A[4]	
Evapotranspiration-Absorption System			90	230		
LPED Irrigation	N/A[6]		375	505	775	N/A[6]

4 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	265		375	470	630	2,090
Conventional Absorption System	N/A[3]		115	420	N/A[4]	
Evapotranspiration-Absorption System			115	285		
LPED Irrigation	N/A[6]		470	630	970	N/A[5]

>5 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	315		445	560	755	2,510
Conventional Absorption System	N/A[3]		135	500	N/A[4]	
Evapotranspiration-Absorption System			135	345		
LPED Irrigation	N/A[6]		560	755	1,165	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012.*

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Likely unsuitable due to open space limitations.

12a. General Conclusion

Lots within Bittern have been predominantly assigned a High or Medium Risk Rating to sustainable OWM. Predominantly Standard LCAs will be required, with the use of System Sizing tables deemed appropriate for Medium Risk lots.

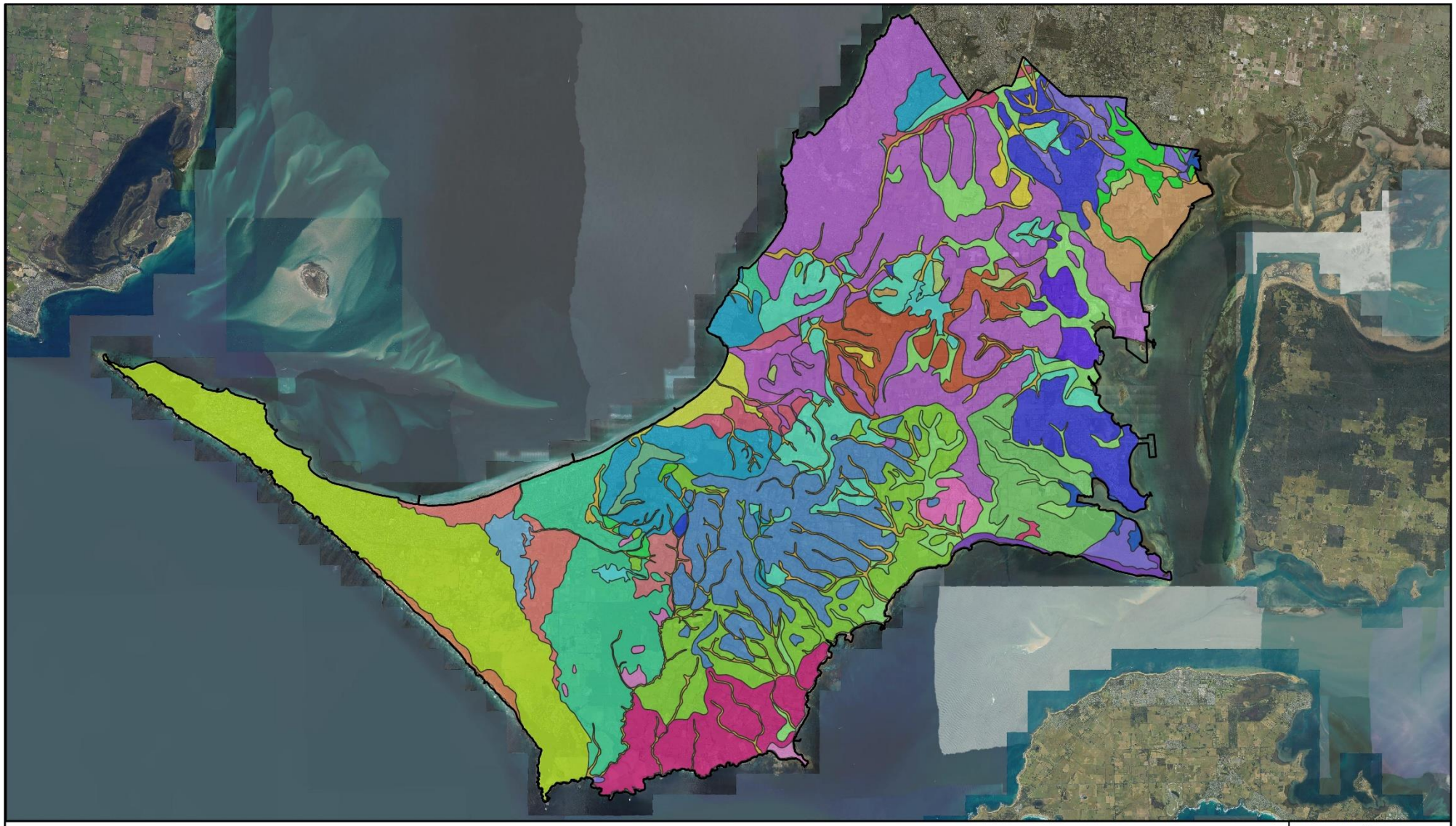

Figure A2: Soil Type

MPSC OWMP 2025 - 2030

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0 10 20 30 40 km

(Approx Scale)

N

Revision	001
Drawn	CM
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C. Cape Schanck Locality Report

13a. Introduction

Cape Schanck is a mostly rural locality, and is located directly south of Boneo. The locality contains a large golf course, resort and medium to high density residential area in the west. The locality has a population of approximately 569 residents, with 374 private dwellings (ABS Census, 2021), with approximately 485 unsewered developable lots within the locality. The golf course, resort and portion of private dwellings in the area are serviced by a private large reticulated sewer system located within the golf course. As the reticulated sewer system is not managed by SEW, all lots serviced the system have been included in the analysis.

14a. Summary of Constraints to OWM

Characteristic	Description
Climate	Rainfall: 845.8mm/year. Evaporation: 1,211.5mm/year.
Surface waterways	There are minimal surface water features throughout the locality, with a waterway forming a portion of the eastern boundary, discharging to the coastline in the south. There are some farm dams located in the east, with multiple (ornamental) ponds located within the golf course.
Groundwater	Approximately 131 groundwater bores throughout the locality, mostly identified throughout the centre. Groundwater is generally between >10m deep within the locality, with shallow groundwater (<10m) identified in the northwest and centre of the locality.
Flooding	The locality is marginally flood impacted in the south adjacent the coastline; however, does not impact any unsewered developable lots.
Useable lot area	Very High: 363. High: 58. Medium: 25. Low: 39.
Slope	High: 51. Medium: 121. Low: 313.
Geology	Coastal dune deposits; Bridgewater Formation; inland dune deposits; and Mornington Volcanic Group.
Soil type	High: 484. Medium: 1. Low: 0. Almost the entire locality has been mapped as containing rapidly draining soils (Cat 1), with sandy loams identified in the north. Enclaves of slowly permeable clays (Cat 6) identified in proximity to waterways.
Risk Analysis Rating	Very High: 30. High: 368. Medium: 54. Low: 33.

15a. Risk Analysis (Maps)

Risk Analysis mapping has been presented a Figure B3.

16a. System Selection

Due to the dominance of rapidly drained soils throughout the locality, conventional absorption systems are not likely feasible and are discouraged. Table 4-8 of the GOWM (2024) prohibits absorption and LPED systems on Category 1 soils.

17a. System Sizing Tables

Sizing Tables for Cape Schanck are provided in the following.

Cape Schanck - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	210		300	375	505	1,675
Conventional Absorption System	N/A[3]		90	340	N/A[4]	
Evapotranspiration-Absorption System			90	230		
LPED Irrigation	N/A[6]		375	505	775	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	265		375	470	630	2,095
Conventional Absorption System	N/A[3]		115	420	N/A[4]	
Evapotranspiration-Absorption System			115	290		
LPED Irrigation	N/A[6]		470	630	970	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	315		445	560	760	2,510
Conventional Absorption System	N/A[3]		135	505	N/A[4]	
Evapotranspiration-Absorption System			135	345		
LPED Irrigation	N/A[6]		560	760	1,165	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012.*

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Likely unsuitable due to open space limitations

18a. General Conclusion

Lots within Cape Schanck have been predominantly assigned a High or Medium Risk Rating to sustainable OWM. Predominantly Standard LCAs will be required, with the use of System Sizing tables deemed appropriate for Medium Risk lots.

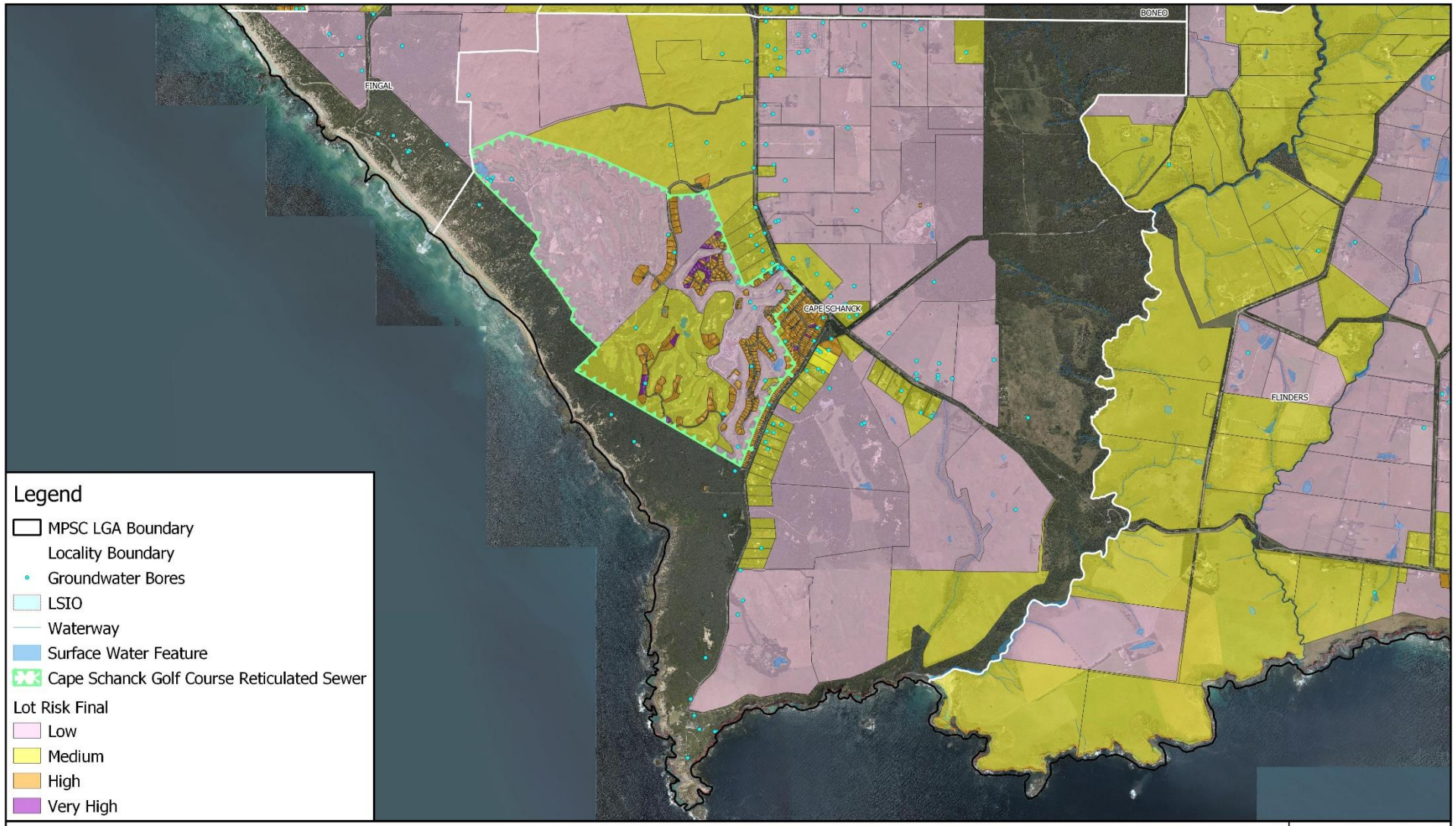


Figure B3: Cape Schanck Locality

MPSC OWMP 2025 - 2030

Whitehead & Associates Environmental Consultants

0 1 2 3 4 5 6 7 km

(Approx Scale)

N

Revision	001
Drawn	CM
Approved	MS

D. Merricks Locality Report

19a. Introduction

Merricks is a rural locality, and is located approximately east of Merricks. The locality has a population of approximately 184 residents, with 113 private dwellings (ABS Census, 2021). There is approximately 158 unsewered developable lots within the locality, with two (2) sewered lots identified in the southwest. The locality consists of agricultural property throughout, with the settlement area in the centre of the locality.

20a. Summary of Constraints to OWM

Characteristic	Description
Climate	Rainfall: 766.2mm/year. Evaporation: 1,224.5mm/year.
Surface waterways	The locality multiple waterways draining to Merricks Beach in the south, with a number of farm dams located throughout.
Groundwater	Approximately 19 groundwater bores throughout the locality, most significantly in the north. Shallow groundwater (<5m) identified adjacent waterways.
Flooding	Flood impacted adjacent Merricks Beach, with development identified in the area.
Useable lot area	Very High: 35. High: 36. Medium: 59. Low: 28.
Slope	High: 0. Medium: 7. Low: 151.
Geology	Mornington Volcanic Group; alluvium and colluvium; colluvium; and Undifferentiated Ordovician/Silurian sedimentary rocks.
Soil type	High: 158. Medium: 0. Low: 0. The entire locality has been mapped as containing slowly permeable soils (Cat 6).
Risk Analysis Rating	Very High: 0. High: 37. Medium: 93. Low: 28.

21a. Risk Analysis (Maps)

Risk Analysis mapping has been presented a Figure B4.

22a. System Selection

Due to the dominance of heavy-textured soils in the locality, conventional absorption systems are not likely feasible and are discouraged. Table 4-8 of the GOWM (2024) prohibits absorption and LPED systems on Category 6 soils.

23a. System Sizing Tables

Sizing Tables for Merricks are provided in the following.

Merricks - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	210		295	365	490	1,525
Conventional Absorption System	N/A[3]		90	330	N/A[4]	
Evapotranspiration-Absorption System			90	225		
LPED Irrigation	N/A[6]		365	490	745	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	260		365	460	615	1,905
Conventional Absorption System	N/A[3]		110	410	N/A[4]	
Evapotranspiration-Absorption System			110	285		
LPED Irrigation	N/A[6]		460	615	930	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	315		440	550	735	2,285
Conventional Absorption System	N/A[3]		135	490	N/A[4]	
Evapotranspiration-Absorption System			135	340		
LPED Irrigation	N/A[6]		550	735	1,115	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Likely unsuitable due to open space limitations.

24a. General Conclusion

The lots within Merricks have been assigned a High or Medium Risk Rating to sustainable OWM. Predominantly Standard LCAs will be required, with the use of System Sizing tables deemed appropriate for Medium Risk lots.

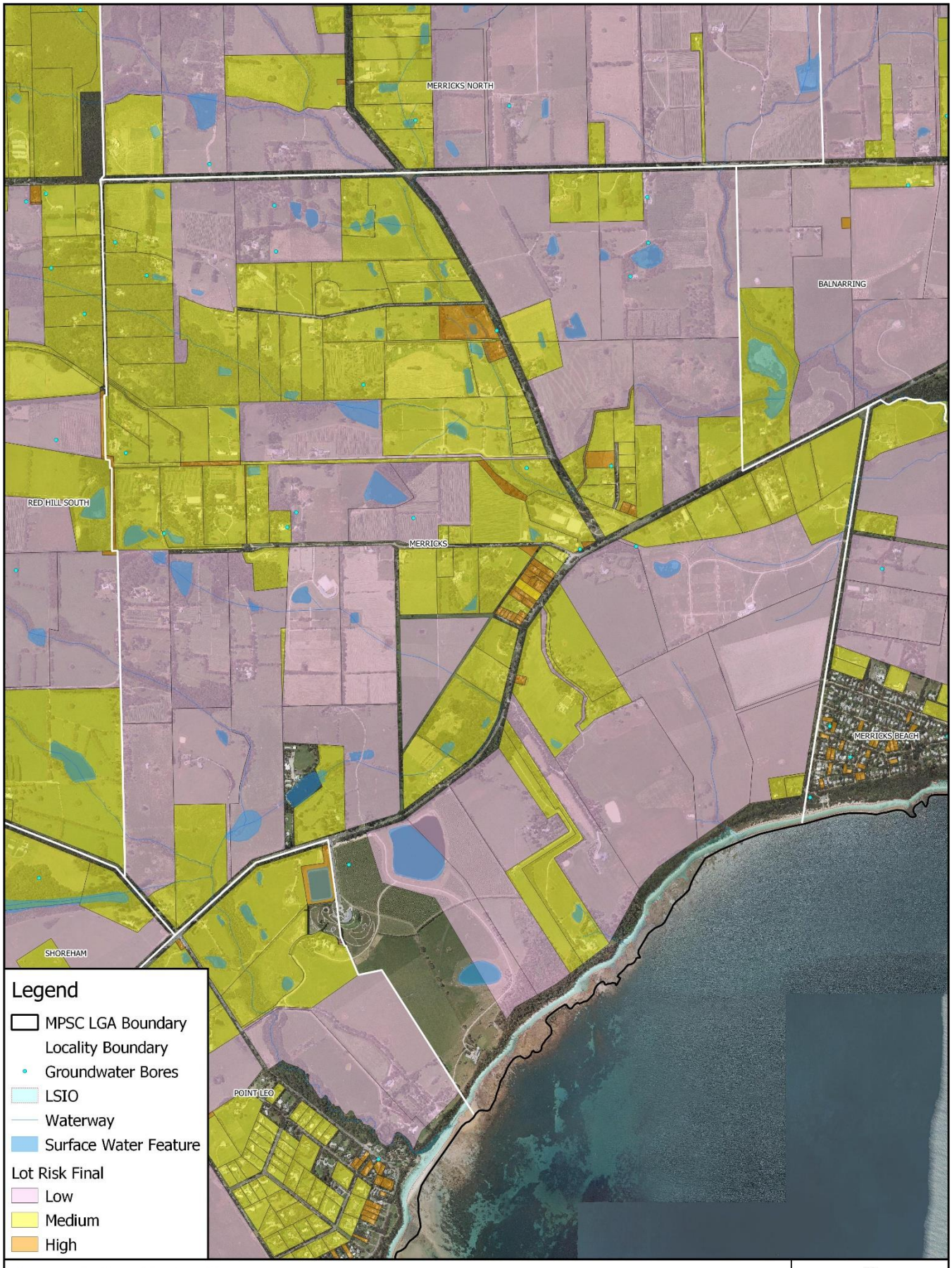


Figure B4: Merricks Locality

MPSC OWMP 2025 - 2030

N

Whitehead & Associates Environmental Consultants

0 0.5 1 1.5 2 km

(Approx Scale)

Revision	001
Drawn	CM
Approved	MS

E. Red Hill Locality Report

25a. Introduction

Red Hill is a rural locality directly east of Arthurs Seat, with settlement areas in the west and east, and agricultural land throughout. The locality has a population of approximately 1,009 residents, with 481 private dwellings (ABS Census, 2021). There is approximately 654 unsewered developable lots within the locality, with no sewered lots identified.

26a. Summary of Constraints to OWM

Characteristic	Description
Climate	Rainfall: 838.8mm/year. Evaporation: 1,198.2mm/year.
Surface waterways	There are multiple waterways throughout the locality, draining to Dromana and Port Phillip Bay in the north, and adjacent localities in the south. Multiple farm dams are located throughout the locality.
Groundwater	Approximately 67 groundwater bores throughout the locality, mostly located in the south. Shallow groundwater (<5m) identified adjacent waterways.
Flooding	The locality is not flood impacted.
Useable lot area	Very High: 303. High: 138. Medium: 178. Low: 35.
Slope	High: 56. Medium: 354. Low: 244.
Geology	Mornington Volcanic Group; Castlemaine Group; Dromana Granite; and Castlemaine Group.
Soil type	High: 654. Medium: 0. Low: 0. The entire locality has been mapped as containing slowly permeable soils (Cat 6).
Risk Analysis Rating	Very High: 20. High: 369. Medium: 265. Low: 0.

27a. Risk Analysis (Maps)

Risk Analysis mapping has been presented a Figure B5.

28a. System Selection

Due to the dominance of heavy-textured soils in the locality, conventional absorption systems are not likely feasible within the settlement area. Table 4-8 of the GOWM (2024) prohibits absorption and LPED systems on Category 6 soils.

29a. System Sizing Tables

Sizing Tables for Red Hill are provided in the following.

Red Hill - Sizing Tables

1 - 3 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	250		385	520	815	N/A[7]
Conventional Absorption System	N/A[3]		100	465	N/A[4]	
Evapotranspiration-Absorption System			100	285		
LPED Irrigation	N/A[6]		520	815	1,865	N/A[6]

4 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	315		480	650	1,020	N/A[7]
Conventional Absorption System	N/A[3]		120	580	N/A[4]	
Evapotranspiration-Absorption System			120	355		
LPED Irrigation	N/A[6]		650	1,020	2,335	N/A[5]

>5 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	375		575	780	1,220	N/A[7]
Conventional Absorption System	N/A[3]		145	700	N/A[4]	
Evapotranspiration-Absorption System			145	425		
LPED Irrigation	N/A[6]		780	1,220	2,800	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

[7] Not suitable due to climatic conditions.

Likely unsuitable due to open space limitations.

30a. General Conclusion

The lots within Red Hill have been assigned a High or Medium Risk Rating to sustainable OWM. Predominantly Standard LCAs will be required, with the use of System Sizing tables deemed appropriate for Medium Risk lots.

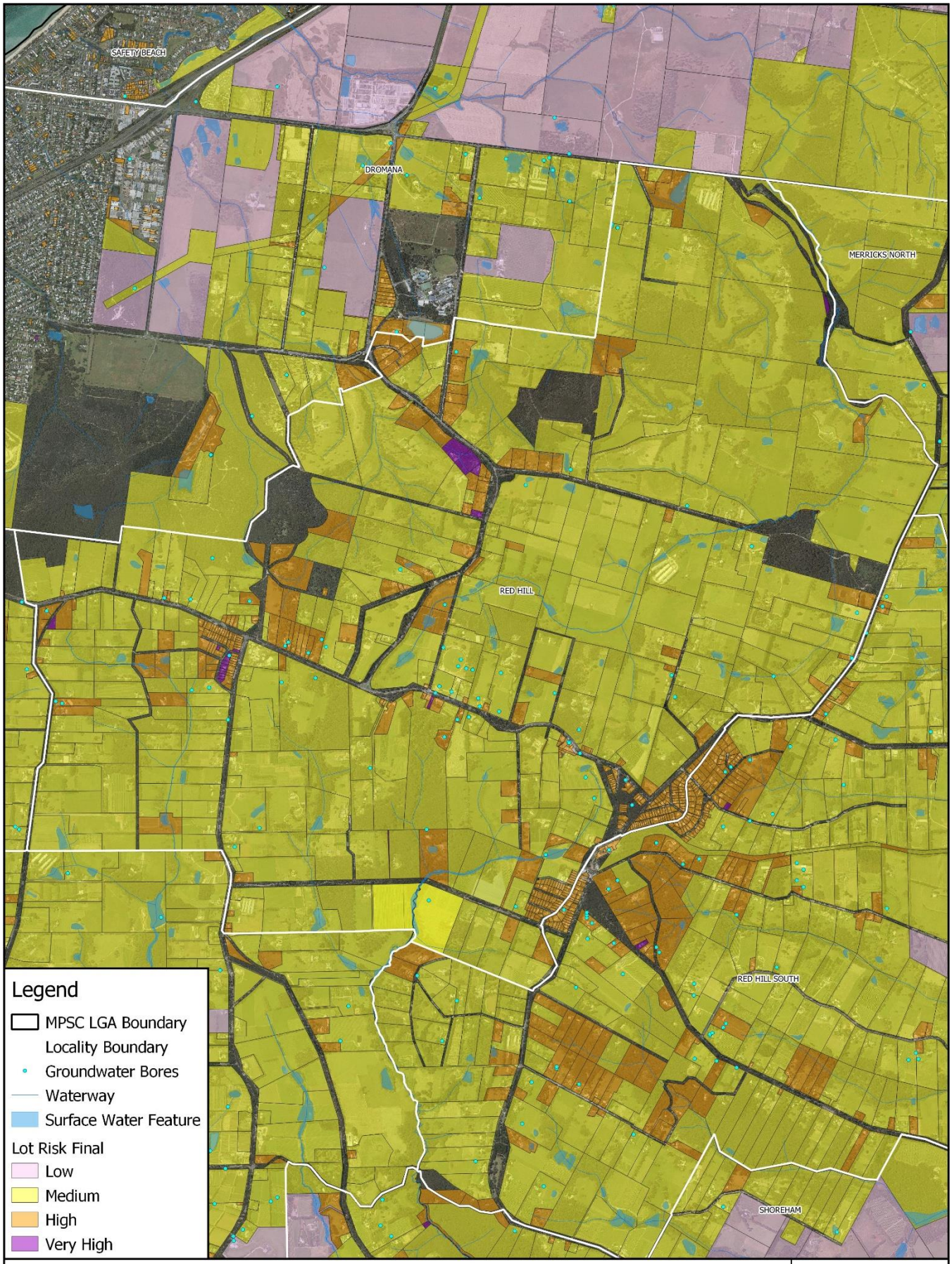


Figure B5: Red Hill Locality

MPSC OWMP 2025 - 2030

N

Whitehead & Associates Environmental Consultants

0 1 2 3 km

(Approx Scale)

Revision	001
Drawn	CM
Approved	MS

F. Red Hill South Locality Report

31a. Introduction

Red Hill South is a rural locality directly east of Red Hill, and to the west of Merricks. The locality has a population of approximately 708 residents, with 422 private dwellings (ABS Census, 2021). There is approximately 468 unsewered developable lots within the locality, with no sewered lots identified.

32a. Summary of Constraints to OWM

Characteristic	Description
Climate	Rainfall: 851.3mm/year. Evaporation: 1,200.4mm/year.
Surface waterways	The locality contains a number of waterways draining to towards adjacent localities in the southeast. Multiple farm dams located throughout agricultural lots.
Groundwater	Approximately 73 groundwater bores throughout the locality, mostly located within agricultural lots. Shallow groundwater identified adjacent waterways.
Flooding	The locality is not flood impacted.
Useable lot area	Very High: 145. High: 130. Medium: 180. Low: 13.
Slope	High: 16. Medium: 301. Low: 151.
Geology	Mornington Volcanic Group; Castlemaine Group; Undifferentiated Ordovician/Silurian sedimentary rocks; Dromana Granite; and Undifferentiated Ordovician/Silurian sedimentary rocks.
Soil type	High: 468. Medium: 0. Low: 0. The entire locality has been mapped as containing slowly permeable (Cat 6) soils.
Risk Analysis Rating	Very High: 2. High: 245. Medium: 216. Low: 5.

33a. Risk Analysis (Maps)

Risk Analysis mapping has been presented a Figure B6.

34a. System Selection

Due to the dominance of heavy-textured soils in the locality, conventional absorption systems are not likely feasible and are discouraged. Table 4-8 of the GOWM (2024) prohibits absorption and LPED systems on Category 6 soils.

35a. System Sizing Tables

Sizing Tables for Red Hill South are provided in the following.

Red Hill South - Sizing Tables

1 - 3 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	240		360	475	705	N/A[7]
Conventional Absorption System	N/A[3]		95	425	N/A[4]	
Evapotranspiration-Absorption System			95	270		
LPED Irrigation	N/A[6]		475	705	1,365	N/A[6]

4 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	300		445	590	880	N/A[7]
Conventional Absorption System	N/A[3]		120	530	N/A[4]	
Evapotranspiration-Absorption System			120	335		
LPED Irrigation	N/A[6]		590	880	1,705	N/A[5]

>5 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	360		535	710	1,055	N/A[7]
Conventional Absorption System	N/A[3]		145	635	N/A[4]	
Evapotranspiration-Absorption System			145	400		
LPED Irrigation	N/A[6]		710	1,055	2,050	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

[7] Not suitable due to climatic conditions.

Likely unsuitable due to open space limitations.

36a. General Conclusion

The lots within Red Hill South have been assigned a High or Medium Risk Rating to sustainable OWM. Predominantly Standard LCAs will be required, with the use of System Sizing tables deemed appropriate for Medium Risk lots.

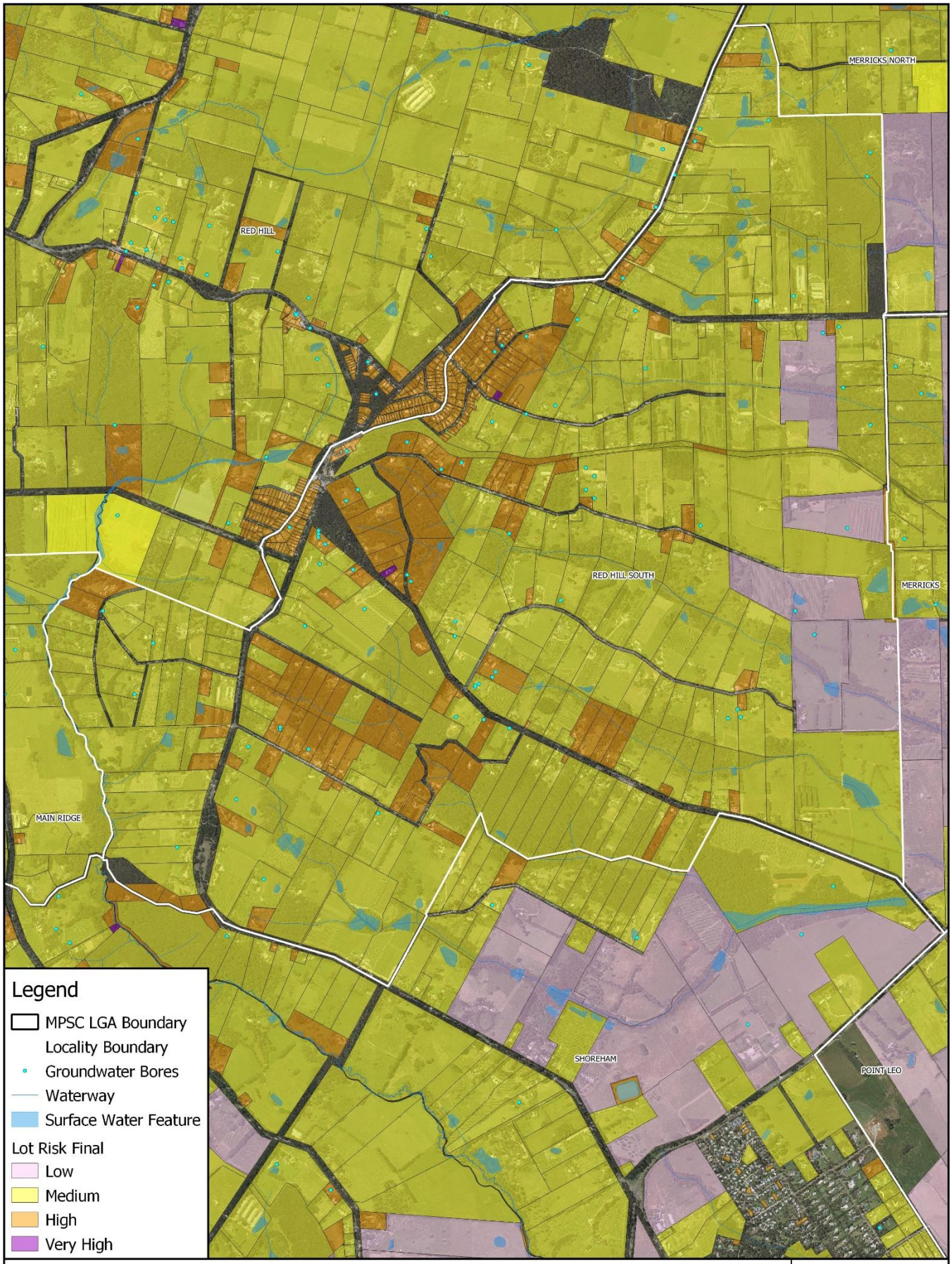


Figure B6: Red Hill South Locality

MPSC OWMP 2025 - 2030

N

Whitehead & Associates
Environmental Consultants

0 1 2 km
(Approx Scale)

Revision	001
Drawn	CM
Approved	MS

G. Rosebud Locality Report

37a. Introduction

Rosebud is a predominately urban locality adjacent the coast, with high density development within the north and rural development in the southeast. The locality has a population of approximately 14,381 residents, with 8,717 private dwellings (ABS Census, 2021). There is approximately 685 unsewered developable lots located in the southeast and southwest of the locality, with a majority of the locality being sewered.

38a. Summary of Constraints to OWM

Characteristic	Description
Climate	Rainfall: 803.9mm/year. Evaporation: 1,260.6mm/year.
Surface waterways	The locality contains a number of waterways draining towards the coast, with a small number of farm dams located in the east of the locality.
Groundwater	Approximately 328 groundwater bores, most significantly within the west of the locality. Shallow groundwater (<5m) identified within the west of the locality, with deeper groundwater (>10m) within the east.
Flooding	Minor flood impacted areas in the west.
Useable lot area	Very High: 620. High: 41. Medium: 11. Low: 13.
Slope	High: 14. Medium: 22. Low: 649.
Geology	Inland dune deposits; Dromana Granite; coastal dune deposits; swamp and lake deposits; alluvium; Mornington Volcanic Group; and Jan Juc Formation.
Soil type	High: 561. Medium: 124. Low: 0. The western areas of the locality consists of sandy (Cat 1 / 2) soils, with lower permeability soils (Cat 5 / 6) in the east.
Risk Analysis Rating	Very High: 5. High: 507. Medium: 164. Low: 9.

39a. Risk Analysis (Maps)

Risk Analysis mapping has been presented a Figure B7.

40a. System Selection

Highly permeable sandy soils (Category 1 / 2) identified within the west, with Category 5 / 6 soils in the east, where conventional are absorption systems are not likely feasible and are discouraged. Table 4-8 of the GOWM (2024) prohibits absorption and LPED systems on Category 1 and 6 soils.

41a. System Sizing Tables

Sizing Tables for Rosebud are provided in the following.

Rosebud - Sizing Tables

1 - 3 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	200		275	340	440	1,120
Conventional Absorption System	N/A[3]		90	305	N/A[4]	
Evapotranspiration-Absorption System			90	215		
LPED Irrigation	N/A[6]		340	440	630	N/A[6]

4 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	250		345	420	550	1,400
Conventional Absorption System	N/A[3]		110	380	N/A[4]	
Evapotranspiration-Absorption System			110	265		
LPED Irrigation	N/A[6]		420	550	790	N/A[5]

>5 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	300		410	505	660	1,680
Conventional Absorption System	N/A[3]		130	455	N/A[4]	
Evapotranspiration-Absorption System			130	320		
LPED Irrigation	N/A[6]		505	660	945	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Likely unsuitable due to open space limitations.

42a. General Conclusion

The lots within Rosebud have been assigned a High or Medium Risk Rating to sustainable OWM. Predominantly Standard LCAs will be required, with the use of System Sizing tables deemed appropriate for Medium Risk lots.

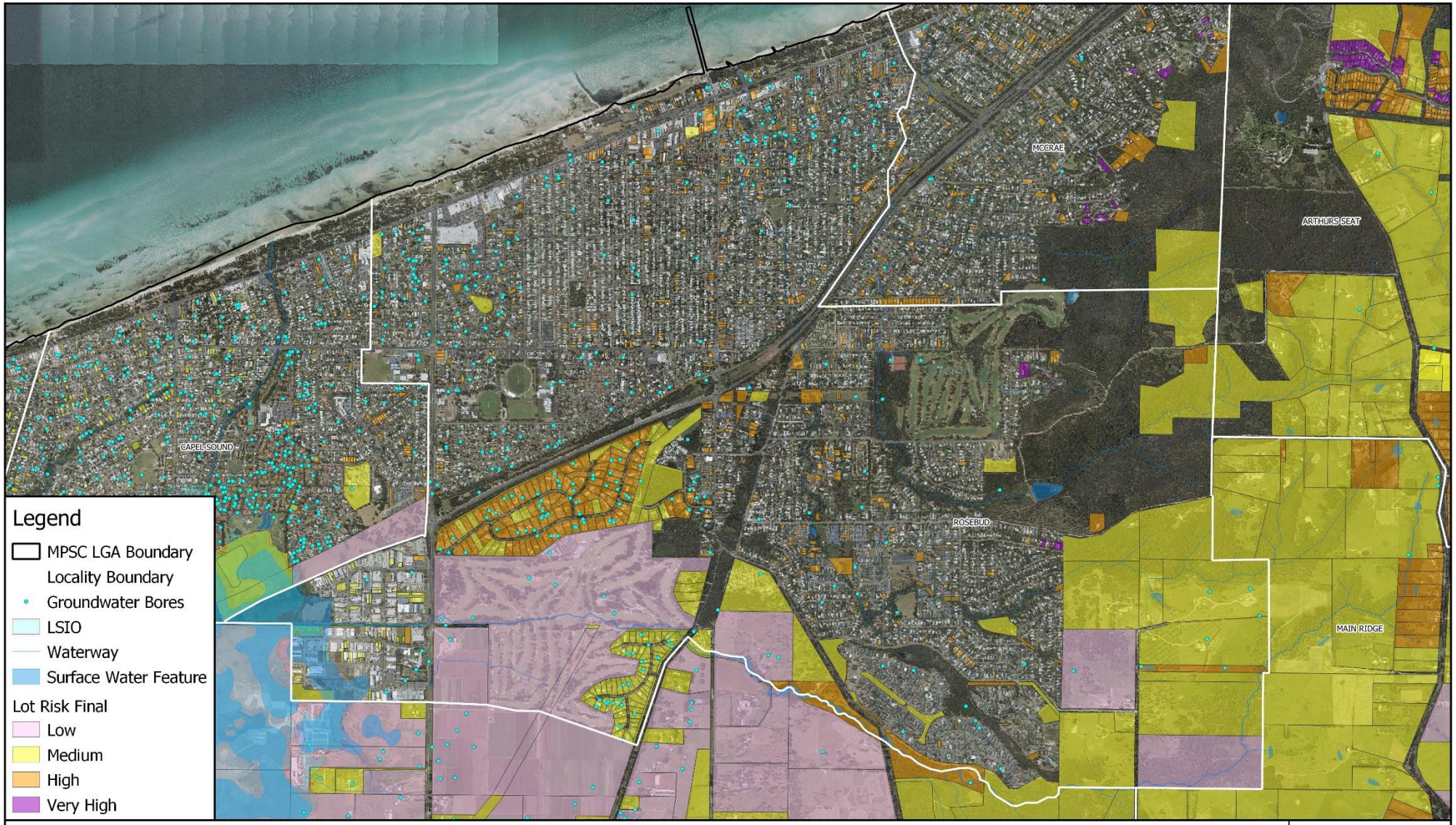


Figure B7: Rosebud Locality

MPSC OWMP 2025 - 2030

N

Whitehead & Associates Environmental Consultants

0 1 2 3 4 5 km

(Approx Scale)

Revision	001
Drawn	CM
Approved	MS

H. Somerville Locality Report

43a. Introduction

Somerville is a predominately urban locality adjacent the coast, and is directly south of Torquay. There is substantial urban development within the west of the locality, with rural development in the east. The locality has a population of approximately 11,767 residents, with 4,661 private dwellings (ABS Census, 2021). There is approximately 1,396 unsewered developable lots within the locality, with significant sewerage in the settlement area.

44a. Summary of Constraints to OWM

Characteristic	Description
Climate	Rainfall: 730.4mm/year. Evaporation: 1,226.0mm/year.
Surface waterways	The locality contains multiple waterways draining to the Western Port Coastal Reserve in the west, with multiple farm dams located throughout large agricultural lots.
Groundwater	Approximately 73 groundwater bores throughout the locality, most significantly within the east. Shallow groundwater identified within the east of the locality.
Flooding	Flood impacted adjacent the Western Port Coastal Reserve within the west of the locality.
Useable lot area	Very High: 537. High: 619. Medium: 193. Low: 47.
Slope	High: 0. Medium: 8. Low: 1,531.
Geology	Red Bluff Sandstone; coastal dune deposits; Murrindindi Supergroup; inland dune deposits; alluvium and colluvium; Brighton Group; and coastal lagoon deposits.
Soil type	High: 1390. Medium: 6. Low: 0. A majority of the locality consists of slowly permeable clays (Category 6), with areas of highly permeable sands (Category 1) in the south and township zone. Small enclaves of clay loams (Category 4) in the centre and east of the locality.
Risk Analysis Rating	Very High: 0. High: 539. Medium: 807. Low: 50.

45a. Risk Analysis (Maps)

Risk Analysis mapping has been presented a Figure B8.

46a. System Selection

A majority of the locality consists of Category 1 and 6 soils throughout, where conventional absorption systems are not likely feasible and are discouraged. Table 4-8 of the GOWM (2024) prohibits absorption and LPED systems on Category 6 soils. Small enclaves of Category 4 soils, where a wide range of EDS systems are applicable.

47a. System Sizing Tables

Sizing Tables for Somerville are provided in the following.

Somerville - Sizing Tables

1 - 3 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	210		300	375	505	1,670
Conventional Absorption System	N/A[3]		90	335	N/A[4]	
Evapotranspiration-Absorption System			90	230		
LPED Irrigation	N/A[6]		375	505	775	N/A[6]

4 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	265		375	470	630	2,085
Conventional Absorption System	N/A[3]		115	420	N/A[4]	
Evapotranspiration-Absorption System			115	285		
LPED Irrigation	N/A[6]		470	630	970	N/A[5]

>5 Bedroom Dwelling						
EDS Method	**Gravels & Sands (1)**	**Sandy Loams (2)**	**Loams (3)**	**Clay Loams (4)**	**Light Clays (5)**	**Medium to Heavy Clays (6)[5]**
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	315		445	560	755	2,500
Conventional Absorption System	N/A[3]		135	500	N/A[4]	
Evapotranspiration-Absorption System			135	345		
LPED Irrigation	N/A[6]		560	755	1,160	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Likely unsuitable due to open space limitations.

48a. General Conclusion

The lots within Somerville have been assigned a High or Medium Risk Rating to sustainable OWM. Predominantly Standard LCAs will be required, with the use of System Sizing tables deemed appropriate for Medium Risk lots.

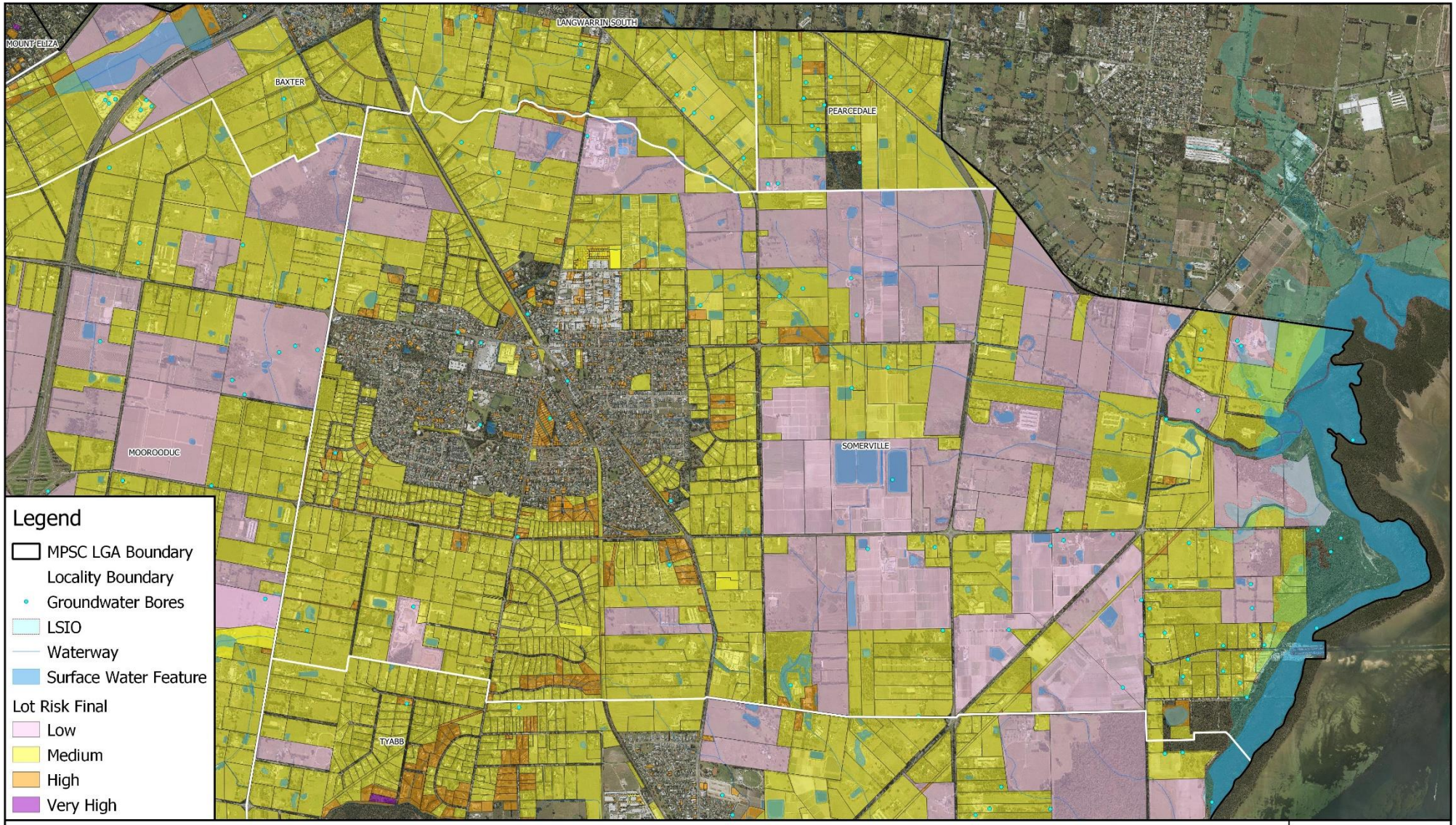


Figure B8: Somerville Locality

MPSC OWMP 2025 - 2030

N

Whitehead & Associates Environmental Consultants

0 2 4 6 km

(Approx Scale)

Revision	001
Drawn	CM
Approved	MS

I. Tyabb Locality Report

49a. Introduction

Tyabb is a predominately urban locality directly south of Somerville. There is substantial urban development within the centre of the locality, with rural development in the east and west. The locality has a population of approximately 3,449 residents, with 1,335 private dwellings (ABS Census, 2021). There is approximately 733 unsewered developable lots within the locality, with reticulated sewer in the centre of the locality.

50a. Summary of Constraints to OWM

Characteristic	Description
Climate	Rainfall: 738.8mm/year. Evaporation: 1,210.7mm/year.
Surface waterways	Multiple waterways throughout the Shire, draining towards the coast and Hastings in the east. A number of farm dams are located in throughout.
Groundwater	Approximately 49 groundwater bores, mostly located within the south and east. Shallow groundwater identified in the east.
Flooding	Minor areas of flood impacted land in the west, adjacent Tyabb Beach.
Useable lot area	Very High: 162. High: 361. Medium: 186. Low: 24.
Slope	High: 1. Medium: 41. Low: 691.
Geology	Red Bluff Sandstone; coastal dune deposits; Murrindindi Supergroup; alluvium; swamp and lake deposits; inland dune deposits; generic coastal lagoon deposits; and Undifferentiated Ordovician/Silurian sedimentary rocks.
Soil type	High: 725. Medium: 8. Low: 0. A majority of the locality is mapped as containing rapidly draining (Category 1) soils and slowly permeable (Category 6) throughout, with two (2) small areas of clay loams (Category 4) in the southwest.
Risk Analysis Rating	Very High: 1. High: 191. Medium: 511. Low: 30.

51a. Risk Analysis (Maps)

Risk Analysis mapping has been presented a Figure B9.

52a. System Selection

Due to the dominance of rapidly draining and heavy-textured soils in the locality, conventional absorption systems are not likely feasible and are discouraged. Table 4-8 of the GOWM (2024) prohibits absorption and LPED systems on Category 1 and 6 soils.

53a. System Sizing Tables

Sizing Tables for Tyabb are provided in the following.

Tyabb - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	210		295	370	500	1,610
Conventional Absorption System	N/A[3]		90	330	N/A[4]	
Evapotranspiration-Absorption System			90	230		
LPED Irrigation	N/A[6]		370	500	760	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	265		370	465	625	2,010
Conventional Absorption System	N/A[3]		110	415	N/A[4]	
Evapotranspiration-Absorption System			110	285		
LPED Irrigation	N/A[6]		465	625	950	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	315		445	555	750	2,410
Conventional Absorption System	N/A[3]		135	495	N/A[4]	
Evapotranspiration-Absorption System			135	340		
LPED Irrigation	N/A[6]		555	750	1,140	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Likely unsuitable due to open space limitations.

54a. General Conclusion

The lots within Tyabb have been assigned a High or Medium Risk Rating to sustainable OWM. Predominantly Standard LCAs will be required, with the use of System Sizing tables deemed appropriate for Medium Risk lots.

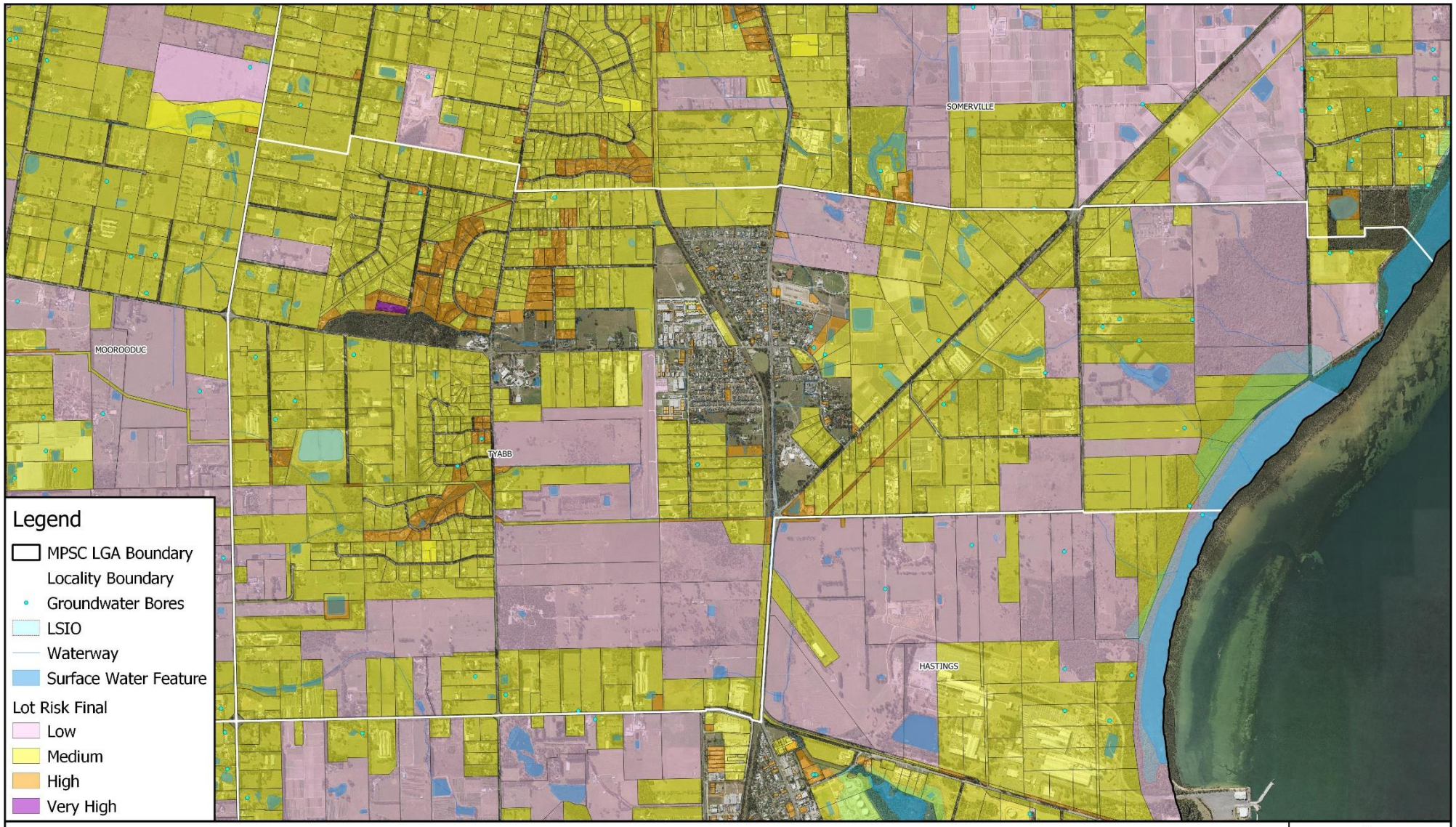


Figure B9: Tyabb Locality

MPSC OWMP 2025 - 2030

Whitehead & Associates Environmental Consultants

0 2 4 6 km

(Approx Scale)

N

Revision	001
Drawn	CM
Approved	MS

Appendix C

Acceptable Crop Factors, Retained Rainfall, and Monthly Climate Data

Table C1: Acceptable Crop Factor Values

Acceptable Crop Factors												
Vegetation Type	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Pasture	0.70	0.70	0.70	0.60	0.50	0.45	0.40	0.45	0.55	0.65	0.70	0.70
Lucerne	0.95	0.90	0.85	0.80	0.70	0.55	0.55	0.65	0.75	0.85	0.95	1.00
Note: As per Table 20 of the EDRS (2024).												

Table C2: Acceptable Retained Rainfall Values

Slope	**Retained Rainfall Value**	
	Sandy Soils (Category 1 – 2)	**Clay Soils (Category 3 – 6)**
<5%	1.0	0.9
5-10%	0.9	0.8
>10%	0.8	0.75
Note: Sandy soils (Category 1 – 2) have been assigned a higher retained rainfall values due to their higher permeability allowing water to infiltrate, with clay soils (Category 3 – 6) allowing less infiltration due to their lower permeability, therefore generating more runoff. Retained rainfall has a negative relationship with slope, as run-off increases with slope. The provided values are based on the assumption that the EDA surface is vegetated (i.e. turf, pasture).		

Table C3: Acceptable Monthly Rainfall Values

LOCALITY	January	February	March	April	May	June	July	August	September	October	November	December	Annual
ARTHURS SEAT	49.4	35.0	50.8	65.9	75.7	95.7	92.2	86.0	75.5	66.6	63.5	61.4	817.6
BALNARRING	46.3	33.3	50.1	63.4	76.1	87.8	84.0	90.7	75.6	72.2	62.7	54.2	796.2
BALNARRING BEACH	38.2	30.8	44.6	55.2	90.1	79.4	79.2	86.7	72.2	69.3	56.3	52.0	842.4
BAXTER	43.5	31.1	44.5	53.1	61.6	75.6	67.4	75.0	67.4	64.0	64.9	53.9	701.9
BITTERN	42.2	35.2	45.5	65.6	66.4	80.8	72.0	81.0	70.4	69.2	56.2	52.3	736.7
BLAIRGOWRIE	34.9	27.3	40.8	53.6	62.2	62.3	67.8	64.0	53.1	52.2	48.3	45.2	611.4
BONEO	42.8	31.3	43.2	63.6	70.6	84.6	74.6	72.8	57.8	59.1	56.2	50.7	707.1
CAPE SCHANCK	32.2	32.5	44.4	51.6	85.0	85.0	69.9	76.6	59.8	65.4	55.9	58.2	845.8
CAPEL SOUND	36.6	31.0	45.0	66.0	78.6	72.0	76.0	80.2	64.7	66.0	54.2	48.4	803.9
CRIB POINT	33.6	30.4	42.4	56.2	64.4	67.6	65.2	72.0	66.0	61.4	51.0	44.2	725.4
DROMANA	42.7	31.4	49.6	70.6	93.0	85.9	86.8	90.6	75.2	73.0	62.0	52.4	884.3
FINGAL	38.4	30.3	41.6	58.4	64.7	69.6	69.9	66.2	53.9	54.8	53.0	44.9	645.7
FLINDERS	48.4	32.9	45.9	63.2	81.2	90.0	84.4	87.3	75.3	72.0	60.4	55.1	795.9
HASTINGS	37.3	31.8	45.6	59.8	82.9	72.4	78.2	82.7	72.6	70.4	59.4	55.8	777.0
HMAS CERBERUS	33.6	30.4	42.4	56.2	64.4	67.6	65.2	72.0	66.0	61.4	51.0	44.2	725.4
LANGWARRIN SOUTH	43.5	31.1	44.5	53.1	61.6	75.6	67.4	75.0	67.4	64.0	64.9	53.9	701.9
MAIN RIDGE	49.5	38.4	51.0	69.2	84.9	99.6	87.6	87.5	72.8	67.9	63.7	59.3	831.3
MCCRAE	36.6	31.0	45.0	66.0	78.6	72.0	76.0	80.2	64.7	66.0	54.2	48.4	803.9
MERRICKS	38.2	30.8	44.6	55.2	90.1	79.4	79.2	86.7	72.2	69.3	56.3	52.0	842.4
MERRICKS BEACH	38.2	30.8	44.6	55.2	90.1	79.4	79.2	86.7	72.2	69.3	56.3	52.0	842.4
MERRICKS NORTH	46.3	33.3	50.1	63.4	76.1	87.8	84.0	90.7	75.6	72.2	62.7	54.2	796.2
MOOROODUC	42.2	33.0	43.2	56.9	66.0	76.7	71.0	78.3	66.1	64.1	64.5	56.9	718.7
MORNINGTON	40.0	33.0	42.2	55.6	64.0	64.8	65.0	71.6	66.5	65.4	58.2	47.0	731.1
MOUNT ELIZA	42.7	34.3	41.5	55.2	60.6	72.7	67.8	72.2	67.0	60.5	61.7	51.4	687.6
MOUNT MARTHA	45.3	32.7	49.3	66.7	67.7	86.7	79.2	84.5	72.3	70.2	60.7	59.0	774.1
PEARCEDALE	45.3	33.6	47.0	63.9	67.8	78.3	63.1	80.4	68.2	64.9	62.2	61.1	735.7
POINT LEO	38.2	30.8	44.6	55.2	90.1	79.4	79.2	86.7	72.2	69.3	56.3	52.0	842.4
PORTSEA	34.5	21.8	36.7	48.2	55.4	54.9	61.5	59.6	52.9	49.8	45.0	43.0	563.1
RED HILL	45.7	34.2	50.5	74.0	76.0	100.3	92.0	86.4	76.4	73.8	66.2	63.4	838.8
RED HILL SOUTH	45.8	33.6	53.4	67.2	90.9	95.2	90.4	97.5	80.3	71.9	63.6	61.5	851.3
ROSEBUD	36.6	31.0	45.0	66.0	78.6	72.0	76.0	80.2	64.7	66.0	54.2	48.4	803.9
RYE	34.9	27.3	40.8	53.6	62.2	62.3	67.8	64.0	53.1	52.2	48.3	45.2	611.4
SAFETY BEACH	44.2	32.1	44.8	67.1	65.5	81.6	78.3	76.1	68.8	66.0	55.6	55.7	735.7
SHOREHAM	44.2	34.7	51.3	58.5	85.4	87.6	86.3	93.4	72.5	70.9	57.4	57.0	799.1
SOMERS	41.4	34.0	47.5	59.4	67.0	80.3	72.9	81.2	66.4	66.4	54.5	48.7	719.4
SOMERVILLE	40.8	34.1	44.3	62.8	65.4	80.6	66.2	78.5	71.6	64.2	62.2	59.9	730.4
SORRENTO	34.5	21.8	36.7	48.2	55.4	54.9	61.5	59.6	52.9	49.8	45.0	43.0	563.1
ST ANDREWS BEACH	38.4	30.3	41.6	58.4	64.7	69.6	69.9	66.2	53.9	54.8	53.0	44.9	645.7
TOOTGAROOK	38.4	30.3	41.6	58.4	64.7	69.6	69.9	66.2	53.9	54.8	53.0	44.9	645.7
TUERONG	44.0	37.7	47.9	59.3	72.0	76.8	77.3	93.8	72.4	69.6	58.0	58.1	889.3
TYABB	43.4	34.1	44.5	57.5	69.0	79.6	72.0	81.4	72.2	65.1	63.8	56.3	738.8

Table C4: Acceptable Monthly Evaporation Values

LOCALITY	January	February	March	April	May	June	July	August	September	October	November	December	Annual
ARTHURS SEAT	174.9	146.4	122.4	74.7	49.7	36.5	42.9	58.5	79.5	111.1	131.8	160.4	1,188.7
BALNARRING	175.9	147.9	123.5	75.5	50.8	37.9	44.5	59.8	80.7	112.0	133.3	161.7	1,203.5
BALNARRING BEACH	178.2	149.6	125.2	77.2	52.3	39.3	45.9	61.5	82.2	113.8	135.4	164.0	1,224.5
BAXTER	178.5	150.1	125.1	76.6	51.2	38.3	44.7	60.4	81.5	113.5	135.0	163.8	1,218.7
BITTERN	177.8	149.4	124.8	76.7	51.8	39.0	45.5	61.1	81.9	113.3	134.9	163.4	1,219.7
BLAIRGOWRIE	184.5	154.1	129.7	80.9	54.6	40.8	47.2	63.6	85.2	118.4	140.1	170.0	1,269.1
BONEO	181.3	151.7	127.5	79.1	53.3	39.8	46.3	62.3	83.6	116.1	137.6	167.0	1,245.5
CAPE SCHANCK	177.2	148.3	124.3	76.4	51.3	38.0	44.6	60.2	81.2	113.0	134.0	162.9	1,211.5
CAPEL SOUND	183.2	153.3	129.0	80.1	54.0	40.5	46.9	63.1	84.6	117.6	139.3	168.9	1,260.6
CRIB POINT	178.8	150.4	125.5	77.4	52.5	39.7	46.2	61.9	82.6	114.1	135.8	164.3	1,229.3
DROMANA	174.2	146.2	122.0	74.3	49.7	36.8	43.3	58.6	79.5	110.6	131.7	160.0	1,186.9
FINGAL	183.7	153.5	129.2	80.4	54.4	40.7	47.2	63.4	84.9	117.9	139.6	169.3	1,264.0
FLINDERS	176.1	147.6	123.5	75.9	51.1	38.0	44.5	60.0	80.9	112.2	133.3	161.9	1,205.1
HASTINGS	179.6	151.1	126.2	77.8	52.6	39.7	46.3	62.0	82.8	114.6	136.5	165.1	1,234.2
HMAS CERBERUS	178.8	150.4	125.5	77.4	52.5	39.7	46.2	61.9	82.6	114.1	135.8	164.3	1,229.3
LANGWARRIN SOUTH	178.5	150.1	125.1	76.6	51.2	38.3	44.7	60.4	81.5	113.5	135.0	163.8	1,218.7
MAIN RIDGE	174.1	145.7	121.7	74.2	49.4	36.4	42.9	58.3	79.2	110.4	131.2	159.6	1,183.1
MCCRAE	183.2	153.3	129.0	80.1	54.0	40.5	46.9	63.1	84.6	117.6	139.3	168.9	1,260.6
MERRICKS	178.2	149.6	125.2	77.2	52.3	39.3	45.9	61.5	82.2	113.8	135.4	164.0	1,224.5
MERRICKS BEACH	178.2	149.6	125.2	77.2	52.3	39.3	45.9	61.5	82.2	113.8	135.4	164.0	1,224.5
MERRICKS NORTH	175.9	147.9	123.5	75.5	50.8	37.9	44.5	59.8	80.7	112.0	133.3	161.7	1,203.5
MOOROODUC	178.4	150.1	125.3	76.8	51.6	38.4	45.0	60.6	81.8	113.6	135.3	164.2	1,221.2
MORNINGTON	180.5	151.6	126.9	78.1	52.5	39.3	45.7	61.5	83.0	115.4	137.1	166.2	1,237.8
MOUNT ELIZA	178.2	149.8	125.0	76.4	51.0	37.9	44.3	60.0	81.3	113.4	134.8	163.7	1,215.8
MOUNT MARTHA	178.1	149.6	125.1	76.8	51.6	38.4	45.0	60.6	81.7	113.6	135.1	163.9	1,219.4
PEARCEDALE	180.9	152.1	126.6	78.1	52.6	39.7	46.1	61.9	83.0	115.1	137.1	165.8	1,239.1
POINT LEO	178.2	149.6	125.2	77.2	52.3	39.3	45.9	61.5	82.2	113.8	135.4	164.0	1,224.5
PORTSEA	186.3	155.4	131.0	81.8	55.2	41.1	47.5	64.1	85.9	119.7	141.5	171.7	1,281.2
RED HILL	175.7	147.3	123.1	75.3	50.3	37.3	43.7	59.2	80.3	111.7	132.8	161.4	1,198.2
RED HILL SOUTH	175.6	147.3	123.1	75.4	50.7	37.8	44.3	59.7	80.5	111.8	132.9	161.3	1,200.4
ROSEBUD	183.2	153.3	129.0	80.1	54.0	40.5	46.9	63.1	84.6	117.6	139.3	168.9	1,260.6
RYE	184.5	154.1	129.7	80.9	54.6	40.8	47.2	63.6	85.2	118.4	140.1	170.0	1,269.1
SAFETY BEACH	179.8	150.9	126.3	77.8	52.3	39.0	45.5	61.3	82.6	114.9	136.4	165.6	1,232.2
SHOREHAM	177.6	149.0	124.8	76.9	52.1	39.0	45.6	61.1	81.9	113.4	134.8	163.4	1,219.7
SOMERS	178.5	150.0	125.5	77.4	52.5	39.7	46.2	61.8	82.6	114.1	135.8	164.3	1,228.6
SOMERVILLE	179.4	150.9	125.7	77.1	51.7	38.8	45.3	61.0	82.0	114.0	135.8	164.5	1,226.0
SORRENTO	186.3	155.4	131.0	81.8	55.2	41.1	47.5	64.1	85.9	119.7	141.5	171.7	1,281.2
ST ANDREWS BEACH	183.7	153.5	129.2	80.4	54.4	40.7	47.2	63.4	84.9	117.9	139.6	169.3	1,264.0
TOOTGAROOK	183.7	153.5	129.2	80.4	54.4	40.7	47.2	63.4	84.9	117.9	139.6	169.3	1,264.0
TUERONG	176.0	148.0	123.5	75.4	50.6	37.7	44.1	59.5	80.5	111.9	133.3	161.8	1,202.3
TYABB	177.2	149.1	124.2	76.0	50.9	38.1	44.5	60.0	81.1	112.7	134.2	162.8	1,210.7

Appendix D

Locality Sizing Tables

Balnarring Beach - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	200		280	345	450	1,195
Conventional Absorption System	N/A[3]		90	310	N/A[4]	
Evapotranspiration-Absorption System			90	220		
LPED Irrigation	N/A[6]		345	450	655	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	250		350	430	565	1,495
Conventional Absorption System	N/A[3]		110	385	N/A[4]	
Evapotranspiration-Absorption System			110	270		
LPED Irrigation	N/A[6]		430	565	820	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	300		415	515	675	1,790
Conventional Absorption System	N/A[3]		130	465	N/A[4]	
Evapotranspiration-Absorption System			130	325		
LPED Irrigation	N/A[6]		515	675	980	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

Balnarring - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	215		310	390	535	2,030
Conventional Absorption System	N/A[3]		90	350	N/A[4]	
Evapotranspiration-Absorption System			90	240		
LPED Irrigation	N/A[6]		390	535	845	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	270		385	490	665	2,535
Conventional Absorption System	N/A[3]		115	440	N/A[4]	
Evapotranspiration-Absorption System			115	295		
LPED Irrigation	N/A[6]		490	665	1,055	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	325		460	585	800	3,045
Conventional Absorption System	N/A[3]		135	525	N/A[4]	
Evapotranspiration-Absorption System			135	355		
LPED Irrigation	N/A[6]		585	800	1,265	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Likely unsitable due to open space limitations

Baxter - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	200		270	330	430	1,055
Conventional Absorption System	N/A[3]		90	300	N/A[4]	
Evapotranspiration-Absorption System			90	210		
LPED Irrigation	N/A[6]		330	430	610	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	245		340	415	535	1,315
Conventional Absorption System	N/A[3]		110	370	N/A[4]	
Evapotranspiration-Absorption System			110	265		
LPED Irrigation	N/A[6]		415	535	760	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	295		405	495	645	1,580
Conventional Absorption System	N/A[3]		130	445	N/A[4]	
Evapotranspiration-Absorption System			130	315		
LPED Irrigation	N/A[6]		495	645	915	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Boneo - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	210		295	365	490	1,520
Conventional Absorption System	N/A[3]		90	330	N/A[4]	
Evapotranspiration-Absorption System			90	230		
LPED Irrigation	N/A[6]		365	490	740	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	260		365	460	615	1,895
Conventional Absorption System	N/A[3]		110	415	N/A[4]	
Evapotranspiration-Absorption System			110	285		
LPED Irrigation	N/A[6]		460	615	925	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	315		440	550	735	2,275
Conventional Absorption System	N/A[3]		135	495	N/A[4]	
Evapotranspiration-Absorption System			135	340		
LPED Irrigation	N/A[6]		550	735	1,110	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Capel Sound - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	190		260	315	400	880
Conventional Absorption System	N/A[3]		85	280	N/A[4]	
Evapotranspiration-Absorption System			85	205		
LPED Irrigation	N/A[6]		315	400	545	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	240		320	390	495	1,095
Conventional Absorption System	N/A[3]		105	350	N/A[4]	
Evapotranspiration-Absorption System			105	255		
LPED Irrigation	N/A[6]		390	495	685	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	285		385	470	595	1,315
Conventional Absorption System	N/A[3]		130	420	N/A[4]	
Evapotranspiration-Absorption System			130	305		
LPED Irrigation	N/A[6]		470	595	820	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Crib Point - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	185		250	300	375	780
Conventional Absorption System	N/A[3]		85	270	N/A[4]	
Evapotranspiration-Absorption System			85	195		
LPED Irrigation	N/A[6]		300	375	510	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	230		310	375	470	975
Conventional Absorption System	N/A[3]		105	335	N/A[4]	
Evapotranspiration-Absorption System			105	245		
LPED Irrigation	N/A[6]		375	470	635	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	280		370	450	565	1,170
Conventional Absorption System	N/A[3]		125	405	N/A[4]	
Evapotranspiration-Absorption System			125	295		
LPED Irrigation	N/A[6]		450	565	760	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Dromana - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	215		305	385	525	1,880
Conventional Absorption System	N/A[3]		90	345	N/A[4]	
Evapotranspiration-Absorption System			90	235		
LPED Irrigation	N/A[6]		385	525	815	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	270		380	480	655	2,350
Conventional Absorption System	N/A[3]		115	430	N/A[4]	
Evapotranspiration-Absorption System			115	295		
LPED Irrigation	N/A[6]		480	655	1,020	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	320		455	575	785	2,820
Conventional Absorption System	N/A[3]		135	515	N/A[4]	
Evapotranspiration-Absorption System			135	350		
LPED Irrigation	N/A[6]		575	785	1,225	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012.*

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Likely unsuitable due to open space limitations

Fingal - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	190		250	305	385	810
Conventional Absorption System	N/A[3]		85	275	N/A[4]	
Evapotranspiration-Absorption System			85	200		
LPED Irrigation	N/A[6]		305	385	520	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	235		315	380	480	1,015
Conventional Absorption System	N/A[3]		105	340	N/A[4]	
Evapotranspiration-Absorption System			105	250		
LPED Irrigation	N/A[6]		380	480	650	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	280		375	455	575	1,215
Conventional Absorption System	N/A[3]		125	410	N/A[4]	
Evapotranspiration-Absorption System			125	300		
LPED Irrigation	N/A[6]		455	575	780	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012.*

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Flinders - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	220		315	405	555	2,415
Conventional Absorption System	N/A[3]		95	365	N/A[4]	
Evapotranspiration-Absorption System			95	245		
LPED Irrigation	N/A[6]		405	555	905	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	275		395	505	695	3,015
Conventional Absorption System	N/A[3]		115	455	N/A[4]	
Evapotranspiration-Absorption System			115	305		
LPED Irrigation	N/A[6]		505	695	1,130	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	330		470	605	835	3,620
Conventional Absorption System	N/A[3]		140	545	N/A[4]	
Evapotranspiration-Absorption System			140	365		
LPED Irrigation	N/A[6]		605	835	1,355	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012.*

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Likely unsuitable due to open space limitations

Hastings - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	195		265	320	410	940
Conventional Absorption System	N/A[3]		85	290	N/A[4]	
Evapotranspiration-Absorption System			85	205		
LPED Irrigation	N/A[6]		320	410	570	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	240		330	400	510	1,175
Conventional Absorption System	N/A[3]		110	360	N/A[4]	
Evapotranspiration-Absorption System			110	260		
LPED Irrigation	N/A[6]		400	510	715	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	290		395	480	615	1,410
Conventional Absorption System	N/A[3]		130	430	N/A[4]	
Evapotranspiration-Absorption System			130	310		
LPED Irrigation	N/A[6]		480	615	855	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012.*

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

HMAS Cerberus - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	185		250	300	375	780
Conventional Absorption System	N/A[3]		85	270	N/A[4]	
Evapotranspiration-Absorption System			85	195		
LPED Irrigation	N/A[6]		300	375	510	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	230		310	375	470	975
Conventional Absorption System	N/A[3]		105	335	N/A[4]	
Evapotranspiration-Absorption System			105	245		
LPED Irrigation	N/A[6]		375	470	635	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	280		370	450	565	1,170
Conventional Absorption System	N/A[3]		125	405	N/A[4]	
Evapotranspiration-Absorption System			125	295		
LPED Irrigation	N/A[6]		450	565	760	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Main Ridge - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	240		360	480	715	N/A
Conventional Absorption System	N/A[3]		95	430	N/A[4]	
Evapotranspiration-Absorption System			95	270		
LPED Irrigation	N/A[6]		480	715	1,405	N/A[6]

4 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	300		450	595	890	N/A
Conventional Absorption System	N/A[3]		120	540	N/A[4]	
Evapotranspiration-Absorption System			120	340		
LPED Irrigation	N/A[6]		595	890	1,755	N/A[5]

>5 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	360		540	715	1,070	N/A
Conventional Absorption System	N/A[3]		145	645	N/A[4]	
Evapotranspiration-Absorption System			145	405		
LPED Irrigation	N/A[6]		715	1,070	2,110	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

McCrae - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	190		260	315	400	880
Conventional Absorption System	N/A[3]		85	280	N/A[4]	
Evapotranspiration-Absorption System			85	205		
LPED Irrigation	N/A[6]		315	400	545	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	240		320	390	495	1,095
Conventional Absorption System	N/A[3]		105	350	N/A[4]	
Evapotranspiration-Absorption System			105	255		
LPED Irrigation	N/A[6]		390	495	685	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	285		385	470	595	1,315
Conventional Absorption System	N/A[3]		130	420	N/A[4]	
Evapotranspiration-Absorption System			130	305		
LPED Irrigation	N/A[6]		470	595	820	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Merricks North - Sizing Tables

1 - 3 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	215		310	390	535	2,030
Conventional Absorption System	N/A[3]		90	350	N/A[4]	
Evapotranspiration-Absorption System			90	240		
LPED Irrigation	N/A[6]		390	535	845	N/A[6]

4 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	270		385	490	665	2,535
Conventional Absorption System	N/A[3]		115	440	N/A[4]	
Evapotranspiration-Absorption System			115	295		
LPED Irrigation	N/A[6]		490	665	1,055	N/A[5]

>5 Bedroom Dwelling

EDS Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDS basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Subsurface Irrigation[1,2]	325		460	585	800	3,045
Conventional Absorption System	N/A[3]		135	525	N/A[4]	
Evapotranspiration-Absorption System			135	355		
LPED Irrigation	N/A[6]		585	800	1,265	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Likely unsuitable due to open space limitations

Moorooduc - Sizing Tables

1 - 3 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	200		275	335	435	1,090
Conventional Absorption System	N/A[3]		90	300	N/A[4]	
Evapotranspiration-Absorption System			90	215		
LPED Irrigation	N/A[6]		335	435	625	N/A[6]

4 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	250		340	420	545	1,365
Conventional Absorption System	N/A[3]		110	375	N/A[4]	
Evapotranspiration-Absorption System			110	265		
LPED Irrigation	N/A[6]		420	545	780	N/A[5]

>5 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	300		410	500	655	1,635
Conventional Absorption System	N/A[3]		130	450	N/A[4]	
Evapotranspiration-Absorption System			130	320		
LPED Irrigation	N/A[6]		500	655	935	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Mornington - Sizing Tables

1 - 3 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	185		245	290	365	730
Conventional Absorption System	N/A[3]		85	260	N/A[4]	
Evapotranspiration-Absorption System			85	195		
LPED Irrigation	N/A[6]		290	365	485	N/A[6]

4 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	230		305	365	455	910
Conventional Absorption System	N/A[3]		105	325	N/A[4]	
Evapotranspiration-Absorption System			105	240		
LPED Irrigation	N/A[6]		365	455	605	N/A[5]

>5 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	275		365	435	545	1,090
Conventional Absorption System	N/A[3]		125	390	N/A[4]	
Evapotranspiration-Absorption System			125	290		
LPED Irrigation	N/A[6]		435	545	725	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Mount Eliza - Sizing Tables

1 - 3 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	195		265	320	410	955
Conventional Absorption System	N/A[3]		85	290	N/A[4]	
Evapotranspiration-Absorption System			85	205		
LPED Irrigation	N/A[6]		320	410	575	N/A[6]

4 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	240		330	400	515	1,190
Conventional Absorption System	N/A[3]		110	360	N/A[4]	
Evapotranspiration-Absorption System			110	260		
LPED Irrigation	N/A[6]		400	515	720	N/A[5]

>5 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	290		395	480	615	1,430
Conventional Absorption System	N/A[3]		130	430	N/A[4]	
Evapotranspiration-Absorption System			130	310		
LPED Irrigation	N/A[6]		480	615	860	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Mount Martha - Sizing Tables

1 - 3 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	215		305	385	520	1,835
Conventional Absorption System	N/A[3]		90	345	N/A[4]	
Evapotranspiration-Absorption System			90	235		
LPED Irrigation	N/A[6]		385	520	810	N/A[6]

4 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	270		380	480	650	2,290
Conventional Absorption System	N/A[3]		115	430	N/A[4]	
Evapotranspiration-Absorption System			115	290		
LPED Irrigation	N/A[6]		480	650	1,010	N/A[5]

>5 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	320		455	575	780	2,750
Conventional Absorption System	N/A[3]		135	515	N/A[4]	
Evapotranspiration-Absorption System			135	350		
LPED Irrigation	N/A[6]		575	780	1,210	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Likely unsuitable due to open space limitations

Pearcedale - Sizing Tables

1 - 3 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	200		275	340	440	1,125
Conventional Absorption System	N/A[3]		90	305	N/A[4]	
Evapotranspiration-Absorption System			90	215		
LPED Irrigation	N/A[6]		340	440	635	N/A[6]

4 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	250		345	425	550	1,405
Conventional Absorption System	N/A[3]		110	380	N/A[4]	
Evapotranspiration-Absorption System			110	270		
LPED Irrigation	N/A[6]		425	550	790	N/A[5]

>5 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	300		410	505	660	1,685
Conventional Absorption System	N/A[3]		130	455	N/A[4]	
Evapotranspiration-Absorption System			130	320		
LPED Irrigation	N/A[6]		505	660	950	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Point Leo - Sizing Tables

1 - 3 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	200		280	345	450	1,195
Conventional Absorption System	N/A[3]		90	310	N/A[4]	
Evapotranspiration-Absorption System			90	220		
LPED Irrigation	N/A[6]		345	450	655	N/A[6]

4 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	250		350	430	565	1,495
Conventional Absorption System	N/A[3]		110	385	N/A[4]	
Evapotranspiration-Absorption System			110	270		
LPED Irrigation	N/A[6]		430	565	820	N/A[5]

>5 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	300		415	515	675	1,790
Conventional Absorption System	N/A[3]		130	465	N/A[4]	
Evapotranspiration-Absorption System			130	325		
LPED Irrigation	N/A[6]		515	675	980	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Safety Beach - Sizing Tables

1 - 3 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	205		285	355	470	1,340
Conventional Absorption System	N/A[3]		90	320	N/A[4]	
Evapotranspiration-Absorption System			90	225		
LPED Irrigation	N/A[6]		355	470	695	N/A[6]

4 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	255		355	445	590	1,675
Conventional Absorption System	N/A[3]		110	400	N/A[4]	
Evapotranspiration-Absorption System			110	280		
LPED Irrigation	N/A[6]		445	590	870	N/A[5]

>5 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	310		430	530	705	2,010
Conventional Absorption System	N/A[3]		135	480	N/A[4]	
Evapotranspiration-Absorption System			135	335		
LPED Irrigation	N/A[6]		530	705	1,045	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Shoreham - Sizing Tables

1 - 3 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	215		305	385	525	1,900
Conventional Absorption System	N/A[3]		90	345	N/A[4]	
Evapotranspiration-Absorption System			90	235		
LPED Irrigation	N/A[6]		385	525	820	N/A[6]

4 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	270		380	480	655	2,370
Conventional Absorption System	N/A[3]		115	435	N/A[4]	
Evapotranspiration-Absorption System			115	295		
LPED Irrigation	N/A[6]		480	655	1,025	N/A[5]

>5 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	320		455	575	785	2,845
Conventional Absorption System	N/A[3]		135	520	N/A[4]	
Evapotranspiration-Absorption System			135	350		
LPED Irrigation	N/A[6]		575	785	1,230	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Likely unsuitable due to open space limitations

Somers - Sizing Tables

1 - 3 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	205		280	350	455	1,230
Conventional Absorption System	N/A[3]		90	315	N/A[4]	
Evapotranspiration-Absorption System			90	220		
LPED Irrigation	N/A[6]		350	455	665	N/A[6]

4 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	255		350	435	570	1,535
Conventional Absorption System	N/A[3]		110	390	N/A[4]	
Evapotranspiration-Absorption System			110	275		
LPED Irrigation	N/A[6]		435	570	830	N/A[5]

>5 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	305		420	520	685	1,845
Conventional Absorption System	N/A[3]		130	470	N/A[4]	
Evapotranspiration-Absorption System			130	330		
LPED Irrigation	N/A[6]		520	685	995	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Tuerong - Sizing Tables

1 - 3 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	200		275	340	440	1,125
Conventional Absorption System	N/A[3]		90	305	N/A[4]	
Evapotranspiration-Absorption System			90	215		
LPED Irrigation	N/A[6]		340	440	635	N/A[6]

4 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	250		345	425	550	1,405
Conventional Absorption System	N/A[3]		110	380	N/A[4]	
Evapotranspiration-Absorption System			110	270		
LPED Irrigation	N/A[6]		425	550	790	N/A[5]

>5 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	300		410	505	660	1,685
Conventional Absorption System	N/A[3]		130	455	N/A[4]	
Evapotranspiration-Absorption System			130	320		
LPED Irrigation	N/A[6]		505	660	950	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

[2] Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Tootgarook - Sizing Tables

1 - 3 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	190		250	305	385	810
Conventional Absorption System	N/A[3]		85	275	N/A[4]	
Evapotranspiration-Absorption System			85	200		
LPED Irrigation	N/A[6]		305	385	520	N/A[6]

4 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	235		315	380	480	1,015
Conventional Absorption System	N/A[3]		105	340	N/A[4]	
Evapotranspiration-Absorption System			105	250		
LPED Irrigation	N/A[6]		380	480	650	N/A[5]

>5 Bedroom Dwelling

EDA Method	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)[5]
	Minimum EDA basal area (m^2) for zero wet weather storage, doesn't include spacing or setbacks					
Drip and Spray Irrigation[1,2]	280		375	455	575	1,215
Conventional Absorption System	N/A[3]		125	410	N/A[4]	
Evapotranspiration-Absorption System			125	300		
LPED Irrigation	N/A[6]		455	575	780	N/A[5]

Note:

[1] Irrigation systems assumed to be installed on slopes of <10%. Reduction in DIR required for slopes exceeding 10%, as per Table M2 of *AS/NZS 1547:2012*.

2 Secondary treatment and disinfection required.

[3] LCA required indicating lack of high perched watertable / high seasonal watertable.

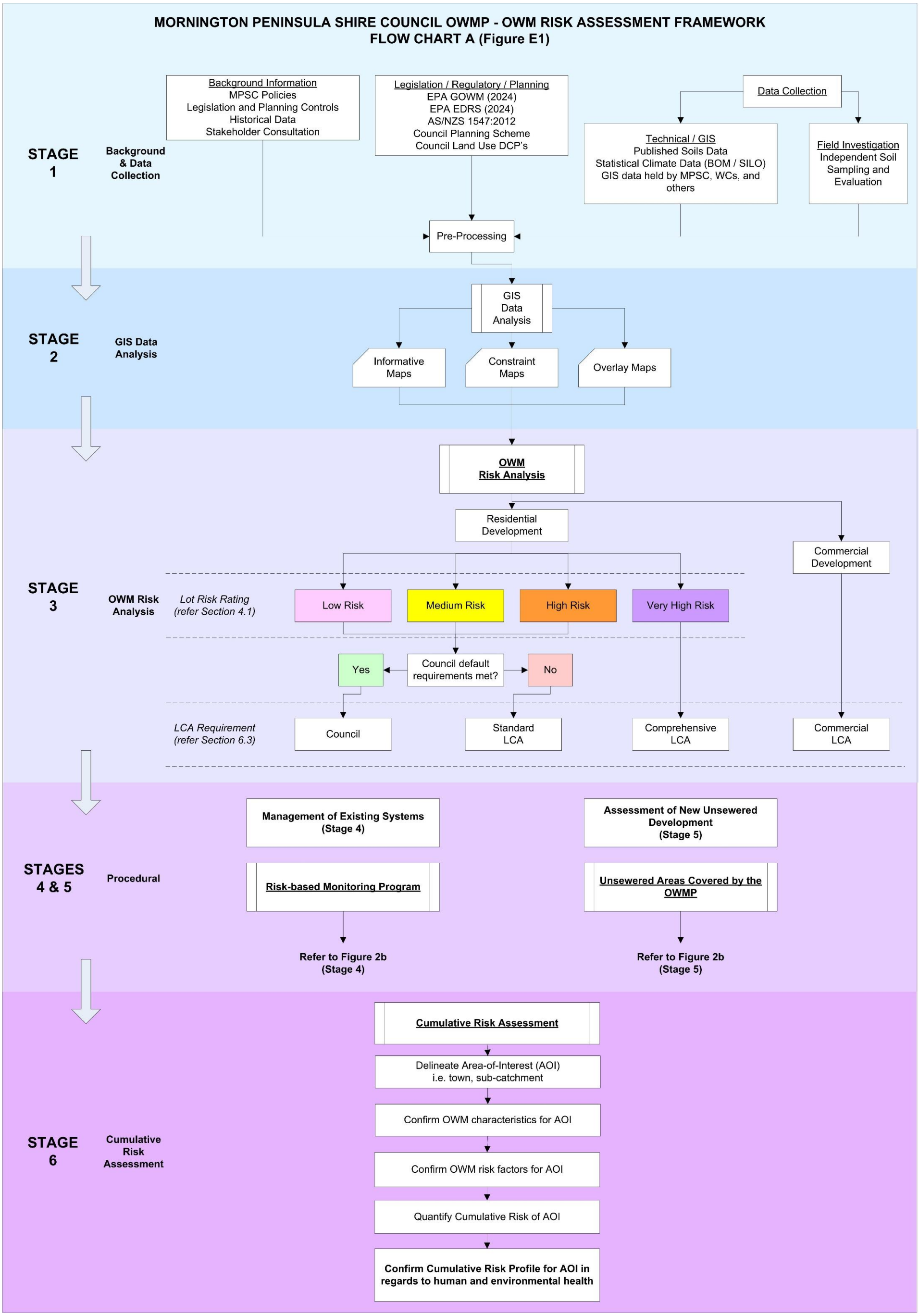
[4] Special design requirements and distribution techniques or soil modification required, refer Notes 2 & 3 in Table L1 of *AS/NZS 1547:2012*.

[5] Secondary treatment required for all systems in Cat 6 soils.

[6] Drip irrigation preferred irrigation method.

Appendix E

Risk Assessment Framework Flow Charts


MORNINGTON PENINSULA SHIRE COUNCIL OWMP - OWM RISK ASSESSMENT FRAMEWORK
FLOW CHART A (Figure E1)
STAGE 1
Background & Data Collection
Background Information
MPSC Policies
Legislation and Planning Controls
Historical Data
Stakeholder Consultation
Legislation / Regulatory / Planning
EPA GOWM (2024)
EPA EDRS (2024)
AS/NZS 1547:2012
Council Planning Scheme
Council Land Use DCP's
Data Collection
Technical / GIS
Published Soils Data
Statistical Climate Data (BOM / SILO)
GIS data held by MPSC, WCs, and others
Field Investigation
Independent Soil Sampling and Evaluation
Pre-Processing
STAGE 2
GIS Data Analysis
GIS Data Analysis
Informative Maps
Constraint Maps
Overlay Maps
OWM Risk Analysis
STAGE 3
OWM Risk Analysis
Lot Risk Rating (refer Section 4.1)
Residential Development
Commercial Development
Low Risk
Medium Risk
High Risk
Very High Risk
Council default requirements met?
Yes
No
LCA Requirement (refer Section 6.3)
Council
Standard LCA
Comprehensive LCA
Commercial LCA
STAGES 4 & 5
Procedural
Management of Existing Systems (Stage 4)
Risk-based Monitoring Program
Refer to Figure 2b (Stage 4)
Assessment of New Unsewered Development (Stage 5)
Unsewered Areas Covered by the OWMP
Refer to Figure 2b (Stage 5)
STAGE 6
Cumulative Risk Assessment
Cumulative Risk Assessment
Delineate Area-of-Interest (AOI) i.e. town, sub-catchment
Confirm OWM characteristics for AOI
Confirm OWM risk factors for AOI
Quantify Cumulative Risk of AOI
Confirm Cumulative Risk Profile for AOI in regards to human and environmental health

MORNINGTON PENINSULA SHIRE OWMP - OWM RISK ASSESSMENT FRAMEWORK FLOW CHART B (Figure E2)