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Land Capability Assessment

110 Gibbons Road, Lara Victoria 3212

Prepared for GD Design

January 2026 Version 2.0

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Limitations

This document was prepared for the purpose as described in the introduction of the report. The conclusion and recommendations of this assessment are based upon evidence obtained through personal interviews, site investigations, representative sampling, data and information supplied by the client, and professional opinion and judgement.

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Land Capability Assessment.
110 Gibbons Road, Lara Victoria 3212

Distribution

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ABBREVIATIONS *(Source: EPA 891.4, July 2016)*	
AS/NZS	Australian Standard/New Zealand Standard
AWA	Australian Water Association
AWTS	Aerated wastewater treatment system
BOD_5	Biochemical oxygen demand (5-day test)
CaLP	Catchment and Land Protection Act
CDO	Council delegated officer
CFU	Colony forming units
DIR	Design irrigation rate
DELWP	Department of Environment, Land, Water and Planning
DLR	Design loading rate
DWMP	Domestic wastewater management plan
DSE	Department of Sustainability and Environment
EC	Electrical conductivity
EHO	Environmental health officer
EPA	Environment Protection Authority
EPAI	Environment Protection Agency, Ireland
ETA	Evapo-transpiration absorption (bed)
EVT	Evapo-transpiration
FOG	Fats, oils and grease
IWRG	Industrial Wastewater Resource Guidelines
LCA	Land capability assessment
LAA	Land application area
LPED	Low-pressure effluent distribution system
MAV	Municipal Association of Victoria
NA	Not allowed/Not applicable
PIA	Planning Institute of Australia
PIC	Plumbing Industry Commission
SAR	Sodium absorption ratio
SEPP (GoV):	State Environment Protection Policy (Groundwaters of Victoria)
SEPP (WoV)	State Environment Protection Policy (Waters of Victoria)
SS	Suspended solids
STED	Septic tank effluent drainage
STEG	Septic tank effluent gravity
STEP	Septic tank effluent pump
TDS	Total dissolved salts
TSS	Total suspended solids
UDT	Urine-diversion toilets
UV	Ultraviolet
VBA	Victorian Building Authority
WELS	Water Efficiency Labelling and Standards

Executive Summary

Edwards Environmental was engaged by GD Design, to undertake an LCA for 110 Gibbons Road, Lara Victoria 3212. The property is number 284302 in the local government area of Greater Geelong City Council, and shown in Appendix 2 *Location Map*. The size of the property is approximately 2.03ha and it is zoned Rural Living Zone (RLZ) under the State Planning Scheme.

The proposal considers the conversion of a 4-bedroom residential building to contain a Place of Worship. Visitors include a maximum of 50 people per day during peak hours and 10-20 people off peak hours – total maximum people per day 70.

The report presents the results of the LCA undertaken during spring, 2024. The results indicate the site is capable of sustainable management of secondary treated wastewater using a land application area of 865 square meters.

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1 Introduction

1.1 Background

Edwards Environmental was engaged by GD Design, to undertake an LCA for 110 Gibbons Road, Lara Victoria 3212. The property is number 284302 in the local government area of Greater Geelong City Council, and shown in Appendix 2 *Location Map*. The size of the property is approximately 2.03ha and it is zoned Rural Living Zone (RLZ) under the State Planning Scheme.

The proposal considers the conversion of a 4-bedroom residential building to contain a Place of Worship. Visitors include a maximum of 50 people per day during peak hours and 10-20 people off peak hours. – total maximum people per day 70.

A detailed irrigation system design (i.e. sizing of pumps and pipework) is beyond the scope of this report. Detailed design for the irrigation system should be undertaken by a qualified professional and submitted for council approval.

1.2 Aims

Residential developments in areas without reticulated sewers require wastewater management to protect human health, amenity, resources and the environment. A Land Capability Assessment (LCA) is undertaken to identify the risks to human health and the environment *(refer EPA Guideline for Onsite Wastewater Management, p24)*.

The aims of the report are to:

- assess the capability of the site to sustainably manage wastewater within the allotment boundaries;
- quantify the wastewater volume and nutrient load due to the development;
- determine the effluent quality the treatment system must achieve having regard to site capability;
- design a land application area (LAA) and layout having regard to site capability;
- provide advice to the landowner/occupier to ensure safe on-site disposal of wastewater into the future.

2 Method

Edwards Environmental follows best practice LCA methodology as per *EPA Guideline for Onsite Wastewater Management May 2024*. Soil samples are collected in accordance with *Edwards Environmental Soil Sampling Procedures*. Chain of custody forms are completed for all samples submitted to laboratories. Refer to Appendices for *Sample Receipt Advice* & *Chain of Custody* documentation.

The land capability assessment criteria are from the *Victorian Land Capability Assessment Framework, 2014* ('the framework') and based on *AS/NZS 1547:2012*. There are two broad sets of criteria: site features, and soil chemical/physical features. The levels of constraint (minor, moderate, major) are defined in the framework.

The quantity of wastewater and the organic loading due to the development is estimated from *Table 4 of EPA Guideline for Onsite Wastewater Management (May 2024)* based on information provided by the client (for example the number of occupants).

The level of wastewater treatment (primary, secondary, tertiary) is determined as a function of site constraints, soil constraints and offsite constraints such as sensitivity of the catchment, density of development in the catchment, location of surface waters and other considerations pertaining to long term acceptance rate (LTAR), such as *Council's Domestic Wastewater Management Action Plan*.

The method of land application (absorption, irrigation etc) is determined by effluent quality, site and soil constraints in an iterative process (refer to *Selection of Land Application System: Appendix K of AS/NZS 1547:2012 On-Site Domestic Wastewater Management)*.

The Design Irrigation Rate or Design Loading Rate are determined based on indicative soil permeability (i.e. based primarily on soil structure characteristics, refer *AS/NZS 1547:2012 On-Site domestic Wastewater Management Tables L1(p145) and M1(p160))*. A conservative estimate of soil permeability is typically the cost-effective approach to design. The client's agreement is required prior to undertaking a soil permeability test as it incurs an additional fee.

The land application area for primary treated effluent systems is calculated from *equation L1 (AS/NZS 1547:2012, p.144)* and assumes that beds and trenches will be designed in accordance with *Table L2 p146 AS/NZS 1547:2012* or the most current version of the Standard.

The land application area for irrigation systems is calculated by the approved method *Nominated Area Water Balance for Zero Storage* (*Victorian Land Capability Assessment Framework, 2014*). The calculations use the following inputs:

- Volume of waste water due to the development
- Design irrigation rate
- Crop factor (based on grasses in Victoria)
- Rainfall runoff factor (function of soil type, slope, cut-off drains etc)
- Rainfall and evaporation data (meteorological station in proximity to site)

The following site details are provided in the report (or appendices to the report):

a. Site address (lot number and street address)
b. Title boundaries
c. Council zoning and significance overlays
d. Type of catchment (potable, special, declared)
e. North direction
f. Location, depth and specified use of groundwater bores in vicinity
g. Contour lines at maximum 10m intervals, direction and degree of slope
h. Location of soil sample sites (Bore holes – BH) or profile pits
i. Infrastructure and utilities (existing or proposed)
j. Depth to groundwater in winter
k. Site features and/or constraints (springs, floodplains, surface waters)
l. Rock outcrops,
m. Shallow bedrock, impervious layers
n. Setback distance to surface waters
o. Drainage lines and springs
p. Flood potential
q. Landslip or erosion potential
r. Location of significant vegetation
s. Relevant set back distances
t. Proposed storm water drains and cut offs
u. Actual and proposed buildings, paths, driveways, paddocks
v. Actual and proposed infrastructure (drains, swimming pools, dams)
w. Adjoining land use features/constraints
x. Location of wastewater treatment plant (dimensions)
y. Proposed land application area (LAA) with dimensions and off sets
z. Duplicate LAA with dimensions and off sets

3 Land Capability Assessment

3.1 Development Proposal

The land capability assessment is for the treatment and disposal on-site of wastewater resulting from the proposed development of the land. The proposal considers the conversion of a 4-bedroom residential building to contain a Place of Worship. Visitors include a maximum of 50 people per day during peak hours and 10-20 people off peak hours – **total maximum people per day 70.**

The design wastewater quantity is estimated to be 1,750L/day.

TABLE 1: HYDRAULIC LOADING

Source	Typical waste water load L/person/day	Maximum No. of Visitors per day	Total Hydraulic Loading (L)
Conference Facilities per seat	25	70	**1,750**
Total hydraulic load			**1,750L/day**

3.2 Site

3.2.1 Site Description

The site investigation was completed on the 29 November 2024 and the following notes were recorded:

- The weather had been dry over the past week
- The proposed effluent field is minimally impacted by stormwater run-on/off
- There is no evidence of a shallow water table
- Rock outcrops were not found on site

TABLE 2: SITE DETAILS			
Address	110 GIBBONS ROAD LARA 3212		
Crown Description	Lot 1 LP80485		
Council Area	Greater Geelong City Council	Property No.	284302
Allotment Size	2.03ha		
Planning Details *(see Appendix 1 Property Planning Report)*			
Planning Zone	RURAL LIVING ZONE (RLZ) SCHEDULE TO THE RURAL LIVING ZONE (RLZ)		
Planning Overlays	ENVIRONMENTAL SIGNIFICANCE OVERLAY (ESO) ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 4 (ESO4)		
Planning Overlays in the vicinity but not directly affecting the land	DESIGN AND DEVELOPMENT OVERLAY (DDO) LAND SUBJECT TO INUNDATION OVERLAY (LSIO)		
Infrastructure			
Domestic Water Supply	Yes ☐ Supplier:		No ☒
Design Wastewater Load	1,750L/day		
Availability of Sewer	Yes ☐		No ☒
Surface Waters			
Declared Water Supply Catchment?	Yes ☐		No ☒

3.2.2 Site Risk Assessment

TABLE 3: RISK ASSESSMENT OF SITE CHARACTERISTICS *(From Victorian Land Capability Assessment Framework, 2014 - Table 3)*				
Characteristic	**Level of Constraint**			**Assessed Level of Constraint for Site**
	Nil or Minor	**Moderate**	**Major**	
Declared Water Supply Catchment	No		Yes	MINOR
Reticulated sewer available			No	MAJOR
Aspect (affects solar radiation received)	North / North-East / North-West	East / West / South-East / South-West	South	MINOR
Climate (difference between annual rainfall and pan evaporation)	Excess of evaporation over rainfall in the wettest months	Rainfall approximates to evaporation	Excess of rainfall over evaporation in the wettest months	MAJOR
Erosion (or potential for erosion)	Nil or minor	Moderate	Severe	MINOR
Exposure to sun and wind	Full sun and/or high wind or minimal shading	Dappled light	Limited patches of light and little wind to heavily shaded all day	MINOR
Fill (imported)	No fill or minimal fill, or fill is good quality topsoil	Moderate coverage and fill is good quality	Extensive poor-quality fill and variable quality fill	MINOR
Flood Frequency (ARI)	Less than 1 in 100 years	Between 100 and 20 years	More than 1 in 20 years	MINOR
Groundwater bores	No bores onsite or on neighbouring properties	Setback distance from bore complies with requirements in EPA Guideline for Onsite Wastewater Management.	Setback distance from bore does not comply with requirements in EPA Guideline for Onsite Wastewater Management.	MINOR
Land area available for LAA	Exceeds LAA and duplicate LAA and buffer distance requirements	Meets LAA and duplicate LAA and buffer distance requirements	Insufficient area for LAA	MINOR
Landslip (or landslip potential)	Nil	Minor to moderate	High or Severe	MINOR
Rock outcrops (% of surface)	<10%	10-20%	>20%	MINOR
Slope Form (affects water shedding ability)	Convex or divergent side-slopes	Straight side-slopes	Concave or convergent side-slopes	MINOR

TABLE 3: RISK ASSESSMENT OF SITE CHARACTERISTICS *(From Victorian Land Capability Assessment Framework, 2014 - Table 3)*

Characteristic	Level of Constraint					Assessed Level of Constraint for Site
	Nil or Minor		Moderate		Major	
Slope gradient % for subsurface irrigation	<10%		10-30%		>30%	MINOR
Soil Drainage (qualitative)	No visible signs or likelihood of dampness, even in wet season		Some signs or likelihood of dampness		Wet soil, moisture-loving plants, standing water in pit; water ponding on surface, soil pit fills with water	MINOR
Stormwater run-on	Low likelihood of stormwater run-on				High likelihood of inundation by stormwater run-on	MINOR
Surface waters - setback distance (m)	Setback distance complies with requirements in EPA Guideline for Onsite Wastewater Management.				Setback distance does not comply with requirements in EPA Guideline for Onsite Wastewater Management.	MINOR
Vegetation coverage over the site	Plentiful vegetation with healthy growth and good potential for nutrient uptake		Limited variety of vegetation		Sparse vegetation or no vegetation	MINOR
Soil Drainage (Field Handbook definitions)	Rapidly drained. Water removed from soil rapidly in relation to supply, excess water flows downward rapidly. No horizon remains wet for more than a few hours after addition	Well drained. Water removed from the soil readily, excess flows downward. Some horizons may remain wet for several days after addition	Moderately well drained. Water removed somewhat slowly in relation to supply, some horizons may remain wet for a week or more after addition	Imperfectly drained. Water removed very slowly in relation to supply, seasonal ponding, all horizons wet for periods of several months, some mottling	Poorly/Very poorly drained. Water remains at or near the surface for most of the year, strong greying. All horizons wet for several months	MINOR

Legend:
Nil or Minor: If all constraints are minor, conventional/standard designs are generally satisfactory.
Moderate: For each moderate constraint an appropriate design modification over and above that of a standard design, should be outlined.
Major: Any major constraint might prove an impediment to successful on-site wastewater management, or alternatively will require in-depth investigation and incorporation of sophisticated mitigation measures in the design to permit compliant onsite wastewater management.

3.3 Soil

3.3.1 Soil Investigation

The complete set of analytical results is provided in Appendix 5. The site map illustrates the location of boreholes and or test pits – Appendix 2, and borelogs are presented in Appendix 4. A summary of the analytical results is presented below in Table 4.

TABLE 4 SOIL ANALYSIS RESULTS

Analytes	Units	BH-01	BH-02
pH	pH units	8.1	7.9
EC@25°C	dS/m	1.056	0.694
Exchangeable Calcium	mg/kg	4470	1390
Exchangeable Magnesium	mg/kg	2600	2092
Exchangeable Potassium	mg/kg	407	479
Exchangeable Sodium	mg/kg	2740	2420
CEC	MEQ%	56.8	36.0
ESP	%	8.1	5.7
Sodicity Rating	----	Strongly Sodic	Sodic
SAR		1.80	2.14
*Emerson Testing – 2 Hours	----	2,2	2,2
*Emerson Testing – 20 Hours	----	1,1	1,1

*Emmerson testing conducted as air dried aggregates/remoulded ped.

The pH of the soils is considered slightly alkaline with low salinity concentrations. The soils are strongly sodic and prone to dispersion. The addition of gypsum will form natural aggregation of soil particles which will lead to good soil structure, and hence improved soil permeability refer to Appendix 10.

3.3.2 Soil Category/ Design Irrigation Rate (DIR)

Brown dry CLAY LOAMS followed by pale brown dry LIGHT CLAY transitioning to pale brown/ white dry strongly structured MEDIUM CLAY observed in both boreholes. Soil lithologies taken during boreholes sampling have been attached refer to Appendix 4.

Soil Category: Strongly Structured Medium Clay (6a)

Design Irrigation Rate: 2mm/day (taken from AS_NZS+1547-2012: TABLE L1).

3.3.3 Soil Risk Assessment

TABLE 5: RISK ASSESSMENT OF SOIL CHARACTERISTICS *(Victorian Land Capability Assessment Framework, 2014 - Tables 2 & 4)*				
Characteristic	**Level of Constraint**			**Assessed Level of Constraint for Site**
	Nil or Minor	**Moderate**	**Major**	
Electrical Conductivity (ECe) (dS/m) as a measure of soil salinity	<0.8	0.8 - 2	>2	MODERATE
	EC test result infers the salinity of the soil and its potential impact on plant growth on the LAA. Refer to Hazelton & Murphy (2007) for interpretation of EC test results. Application of effluent increases salt content of soils over time. Refer to Stevens, D.P., Smolenaars, S. and Kelly, J. (2008). Irrigation of Amenity Horticulture with Recycled Water. Smart Water Fund, Victoria.			
Emerson Aggregate Class (consider in context of sodicity)	4, 5, 6, 8	7	1, 2, 3	MAJOR
	EAC results infer dispersibility (as ped slaking, soil dispersion or both). LAAs should not be installed in soils with moderate or high dispersibility, without adequate mitigation (e.g. addition of gypsum, use of irrigation).			
Gleying (see Munsell Soil Colour Chart)	Nil	Some evidence of greenish grey / black or bluish grey / black soil colours	Predominant greenish grey / black, bluish grey / black colours	MINOR
Mottling (see Munsell Soil Colour Chart)	Very well to well-drained soils generally have uniform brownish or reddish colour	Moderately well to imperfectly drained soils have grey and/or yellow brown mottles and in the mottled areas occur higher in the profile the less well-drained the soil	Poorly drained soils have predominant grey colours with yellow brown or reddish brown mottles located along root channels, large pores and cracks	MODERATE
	Gleyed soils indicate permanent saturation (permanent watertable), while orange, yellow and red mottles indicate seasonal saturation with intermittent periods of drying (perched or seasonal watertable).			
pH (favoured range for plants)	5.5 - 8 is the optimum range for a wide range of plants; 4.5 - 5.5 suitable for many acid-loving plants		<4.5, >8	MAJOR
	Acid soils (pH <5) or alkaline soils (pH >8) may constrain plant growth and should be ameliorated by use of chemical additives (e.g. lime for acidity). pH <4.5 may lead to aluminium or manganese toxicity; pH>8 may reduce availability of trace elements and phosphate and make gypsum ineffective as an amendment to lower sodicity.			

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TABLE 5: RISK ASSESSMENT OF SOIL CHARACTERISTICS *(Victorian Land Capability Assessment Framework, 2014 - Tables 2 & 4)*				
Characteristic	**Level of Constraint**			**Assessed Level of Constraint for Site**
	Nil or Minor	**Moderate**	**Major**	
Rock Fragments (size & volume %)	0 – 10%	10 – 20 %	>20%	MINOR
	Coarse rock fragments displace soil volume and therefore can limit assimilative capacity of soils.			
Sodicity (ESP %)	<6%	6 – 8%	>8%	MAJOR
	The percentage of sodium compounds on cation exchange sites on soil particles. ESP >6% may cause damage to the soil structure. Refer to Hazelton & Murphy (2007). Effluent and greywater contain sodium. A value of ESP = 6% is taken as the threshold between a sodic and non-sodic soil but it depends on the type of clay mineral in the soil. Soils with elevated ESP are often very dispersive and have low permeability.			
Soil Depth to Rock or other impermeable layer (m)	>1.5 m	1.5 – 1 m	<1 m	MINOR
	Deeper soils generally have a greater assimilative capacity for effluent (depending on soil type).			
Soil Structure (pedality)	Highly or Moderately structured	Weakly-structured	Structureless, Massive or hardpan	MINOR
Soil Texture, [6] (Indicative Permeability (K_{sat})(m/d))	Cat. 2b (1.4 - 3.0) Cat. 3a (1.5 – 3.0) Cat. 3b (1.5 – 3.0) Cat. 4a (0.5 – 1.5)	Cat. 4b (0.12 – 0.5) Cat. 4c (0.06 – 0.12) Cat. 5a (0.12 – 0.5)	Cat. 1 & 2a (>3.0) Cat. 5b & 5c (0.06 < 0.06) Cat. 6a, b, c (<0.06 - 0.06)	MAJOR
	Refer to Soil Classification in AS/NZS1547 (Table 5.1 p 39, 2012) and the Design Loading Rates and Design Irrigation Rates in Table 9 of the EPA Guideline for Onsite Wastewater Management. Indicative permeability ranges have been allotted to each texture and structure combination, but these may need to be varied due to other soil factors such as sodicity and dispersibility. Soil permeability can be measured directly using the constant head permeability method outlined in AS/NZS 1547: 2012			
Watertable Depth (m) below the base of the LAA	>2 m	2 – 1.5 m	<1.5 m	MINOR
	The required soil depth to protect groundwater depends on soil type; high permeability soils generally require a greater separation distance (soil depth).			

Legend:
Nil or Minor: If all constraints are minor, conventional/standard designs are generally satisfactory.
Moderate: For each moderate constraint an appropriate design modification over and above that of a standard design, should be outlined.
Major: Any major constraint might prove an impediment to successful on-site wastewater management, or alternatively will require in-depth investigation and incorporation of sophisticated mitigation measures in the design to permit compliant onsite wastewater management.

4 Design Response to Identified Constraints

The Major Constraints (from Tables 3 and 5) are summarised in Table 6 with the recommended controls to reduce the risks and/or mitigate the impacts. The controls are incorporated into the design of the treatment land disposal systems and the long-term management plan. Soil risk factors can be exacerbated by construction activities particularly if undertaken when the soil is wet. Construction traffic should be kept off the land application areas; trenching and installation should be carried out only when the soil moisture content is below field capacity (i.e. not saturated).

TABLE 6: MANAGEMENT TOOLS/OPTIONS – FOR MODERATE & MAJOR CONSTRAINTS

Site/Soil Constraint	Management Tool/Option
Sewer Availability	Wastewater proposed to be treated and disposed of on-site in a sustainable manner.
Climate	A full water balance was undertaken.
Declared Water Supply Catchment	Proposal must meet the effluent quality and set-back distances required by the authorities.
Upslope Seepage	Installation of a cut-off drains or earthen bunds to protect the LAA
Vegetation Cover	Plant suitable vegetation (see Plant List in Appendix).
Electrical Conductivity (EC)	Application of gypsum
pH >8	Gypsum is generally ineffective at lowering sodicity in soils with a pH greater than 8; however, the reported soil pH only marginally exceeds this threshold, with one of two samples recording a pH of 8.1 (0.1 unit above the constraint). Given the minimal exceedance, gypsum is considered effective when implemented as part of an integrated treatment and operational management approach. Acidification of the effluent through the addition of phosphoric acid further supports sodium displacement by enhancing calcium availability and moderating soil pH. The appropriate phosphoric acid dosage is dependent on the effluent's buffering capacity and alkalinity, which require confirmation through water quality testing.
Dispersive Topsoil Soil Texture	To reduce surface crusting and promote establishment of grasses, application of gypsum or lime is recommended (see 'Use of Lime and Gypsum' in Appendix). Application of organic mulch around young plants to moderate fluctuations in soil moisture during summer. Choose low sodium detergents, soaps and washing powders. Maintain solar exposure of the LAA: large trees should NOT be planted where the shade will impinge on the LAA.
Dispersive Sub-Soil/ Emmerson Aggregate Class/ Sodicity (ESP)	Design trench depth to avoid exposing the dispersive sub-soil. Place gypsum at the rate of 1kg/square metre in the bottom of trenches prior to placement of aggregate. Supply additional gypsum to the soil surface at 5 – 10-year internals. See 'Use of Lime and Gypsum' in Appendix for more information.
Stormwater run-on / seepage into LAA	Installation of a cut-off drains or earthen bunds to protect the LAA Collection of roof water to a tank for use on the garden (or other purposes) with tank overflow to discharge to stormwater drains if available.
Water usage	A full water balance was undertaken. Occupiers need to monitor and, if necessary, adjust their water use as the land application area may not be large enough if the design water use is exceeded.
Waste management and system monitoring	Follow the "Advice to home owner / occupier" provided in Section 6.

Treating effluent to a secondary standard and discharge via sub-surface irrigation will provide adequate protection of surface waters, groundwater and the surrounding environment.

5 Wastewater Treatment & Discharge Systems

A detailed irrigation system design (i.e. sizing of pumps and pipework) is beyond the scope of this report. Detailed design for the irrigation system should be undertaken by a qualified professional and submitted for council approval (see Appendices for an overview of the application process).

The following recommendations are in accordance with the *Victorian Land Capability Assessment Framework (2013)*, EPA *Guideline for Onsite Wastewater Management May 2024 and AS/NZS 1547:2012.*

5.1 Wastewater Treatment System

An approved secondary treatment system is recommended. The secondary effluent quality required is:

- BOD <20mg/L
- SS <30mg/L

The EPA website lists approved systems that are available for selection by the owner https://www.epa.vic.gov.au/your-environment/water/onsite-wastewater/onsite-wastewater-systems. 'EPA approved' secondary treatment systems are able to achieve the desired effluent quality when operated and maintained properly. The property owner has the responsibility to select an approved secondary treatment system (for tips on selecting a system see "*Useful factors to consider when selecting …*" in appendices). Details of the selected system should be submitted for approval by Council using the application form: *Septic Tank Permit to Install* available from council websites (for an overview of the process see "*Council Septic Tank Permit Application Process*" in appendices).

5.2 Effluent Discharge: Pressure Compensating Subsurface Irrigation.

Description: Subsurface irrigation comprises a network of drip-irrigation pipes especially designed for use with wastewater. The pipe incorporates pressure compensating emitters (drippers) that employ a biocide to prevent build-up of slimes and inhibit root penetration. The lateral pipes are usually installed at 0.6 to 1.0 m apart and laid parallel with the land contour. Installation depth is 100-150 mm (within the plant root-zone) in accordance with AS/NZS 1547:2012 *Onsite Domestic Wastewater Management*.

Advantages: subsurface irrigation provides even and widespread dispersal of the treated effluent within the root-zone of plants. The plants use up nutrients and transpire water.

It is critical that the irrigation pump be sized properly to ensure adequate pressure and delivery rate to the irrigation network.

5.3 Size of Land Application Area (effluent disposal field)

Using the nominated area method, the LAA required to balance all inputs and outputs is 865m^2 for the Hydraulic load and 581m^2 for the Nitrogen load, therefore the hydraulic capacity determines the minimum size of the effluent field. Copies of the water balance and nitrogen balance calculations are included in the Appendices.

5.4 Buffer Distances and Maintenance Considerations

The Site Map (refer to Appendix 2) shows the dimensioned offset distances from the land application area (LAA). The location of the treatment plant and the LAA achieves the required buffer/setback distances to as per *(EPA Guideline of Onsite Wastewater Management Table: 4-10)* (a copy of "*Setback Distances for Primary and Secondary Treatment Plants*" is included in appendices).

The effluent field must not be subject to high foot traffic. Vehicles and livestock must not have access to the area. The effluent field must be planted with shallow rooting grasses and/or shrubs that tolerate wet conditions and have a high evapotranspiration capacity, see appendices for a list of plants that are suitable. The plantings should be harvested regularly as it will stimulate the evapotranspiration process, for example, regular mowing of grass species and regular pruning of hedges, rushes and shrubs. Clippings should be utilised or disposed of outside the LAA to minimise nutrient build-up.

All buffer distances are achieved.

5.5 Design and Installation of the Effluent System

The design of the septic system shall be completed by an irrigation specialist and constructed by a person registered or licensed with the Victorian Building Association in Plumbing (Drainage) works.

6 Management Plan

6.1 Landowner/occupiers Responsibilities

The landowner or occupier has a responsibility to ensure proper operation, management, maintenance and reporting on the system operation. Table 7 summarises these responsibilities. Further guidance and clarification of these responsibilities are provided in Section 6.2 to 6.5 below. If any terms are not clear please see the "*Glossary*" provided in appendices.

TABLE 7: MANAGEMENT RESPONSIBILITIES	
Task	**Frequency**
Proper system operation	Daily
Conservation of water	Daily
Monitoring	Especially during and after wet weather
Maintenance	As specified by systems manufacturer, and/or in Council Certificate and immediately in the case of malfunction.
Reporting	As required by council or other authorities. Service records should be kept in a safe place and provided to Council upon request.

6.2 Advice to home owner/occupier on use of the system

For the on-site wastewater system to work well, there are some good habits to encourage and some bad habits to avoid:

a) In order to reduce sludge building up in the tank:
   i. Scrape all dishes to remove fats, grease, etc before washing;
   ii. Keep all possible solids out of the system;
   iii. Don't use a garbage grinder unless the system has been specifically designed to carry the extra load;
   iv. Don't put sanitary napkins and other hygiene products into the system.

b) In order to keep the bacteria working in the tank and in the land-application area:
   i. Use biodegradable soaps;
   ii. Use a low-phosphorus detergent;
   iii. Use a low-sodium detergent in dispersive soil areas;
   iv. Use detergents only in the recommended quantities;
   v. Don't use powerful bleaches, whiteners, nappy soakers, spot removers and disinfectants as it may kill the microorganisms;
   vi. Don't put chemicals or paint down the drain.

c) Conservation of water will reduce the volume of effluent requiring disposal to the land-application area; help make the area last longer and improve its performance.

   Conservation measures include:

   i. Installation of water-conservation fittings;
   ii. Taking showers instead of baths;
   iii. Only washing clothes when there is a full load;
   iv. Only using the dishwasher when there is full load.

d) Avoid overloading the system by spacing out water use as evenly as possible.

   Examples: Do not do all the washing on one day. Do not run the washing machine and dishwasher at the same time.

6.3 Advice on maintenance

a) Secondary Treatment Systems must be managed in accordance with manufacturers specifications.

b) All land-application areas need protection as follows:

i. Irrigation areas are not play areas for children and access should be restricted;
ii. Any evapotranspiration areas should be designed to deter pedestrian traffic;
iii. No vehicles or stock should be allowed on trenches or beds;
iv. Deep rooting trees or shrubs should not be grown over absorption trenches or pipes;
v. The surface water diversion drains protecting the land-application area should be kept clear of weeds and tree seedlings so that rain water/storm water can drain away from the LAA;
vi. The baffles or valves in the distribution system should be periodically (monthly or seasonally) changed to direct effluent into alternative trenches or beds, as required by the design.

c) Within LAA, grass and plants should be kept mown/trimmed to maximise uptake of water and nutrients by evapo-transpiration process. Dispose of clippings outside the LAA to minimise nutrient build-up in the soil.

d) Check equipment and:

i. Follow the manufacturer's instructions for maintaining and cleaning pumps, siphons and tank filters;
ii. Clean disc filters or filter screens on irrigation-dosing equipment periodically by rinsing back into the wastewater-treatment unit;
iii. Flush drip irrigation lines periodically to scour out any accumulated sediment.

6.4 Advice on operating problems

Problems can occur with systems which have not been maintained and where the field has become blocked or clogged. The warning signs are obvious:

a) Absorption field is wet or soggy with wastewater ponding on the surface of the ground.
b) There is a smell of "sewage" near the septic tank or absorption area.
c) The drains and toilets run slowly.
d) The grease trap is full or blocked.

6.5 Advice on the consequences of failure

A failed treatment system and land-application system is a serious health and environmental hazard and can lead to:

a) Spread of infectious diseases.
b) Breeding of mosquitos and attraction of flies and rodents.
c) Nuisance and unpleasantness
d) Pollution and infection of waterways, beaches, streams and shellfish beds.
e) Contamination of bores, wells and groundwater.
f) Alteration of the local ecology.

7 Conclusions

From the Land Capability Assessment, it is concluded that sustainable on-site wastewater management is achievable by implementing management options as per Table 6 and the recommendations of this report.

8 Recommendations

I. Installation of a Secondary Treatment System with sub-surface irrigation;

II. Land application of treated effluent on not less than 865 m^2 of sub-surface irrigation;

III. The design of the septic system shall be completed by an irrigation specialist and constructed by a person registered or licensed with the Victorian Building Association in Plumbing (Drainage) works.

IV. Operation and management of the treatment and disposal system in accordance with manufacturer's recommendations, the EPA Certificate of Approval, EPA *Guideline for Onsite Wastewater Management* and this report.

9 References

REFERENCES/BIBLIOGRAPHY

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10 Appendices

Appendix 1

Property Planning Report

PLANNING PROPERTY REPORT

Environment, Land, Water and Planning

From www.planning.vic.gov.au at 09 December 2024 04:24 PM

PROPERTY DETAILS

Address:	**110 GIBBONS ROAD LARA 3212**
Lot and Plan Number:	**Lot 1 LP80485**
Standard Parcel Identifier (SPI):	**1\LP80485**
Local Government Area (Council):	**GREATER GEELONG**
Council Property Number:	**284302**
Planning Scheme:	**Greater Geelong**
Directory Reference:	**Melway 422 D9**

www.geelongaustralia.com.au

Planning Scheme - Greater Geelong

UTILITIES

Rural Water Corporation:	**Southern Rural Water**
Urban Water Corporation:	**Barwon Water**
Melbourne Water:	**Outside drainage boundary**
Power Distributor:	**POWERCOR**

STATE ELECTORATES

Legislative Council:	**WESTERN VICTORIA**
Legislative Assembly:	**LARA**

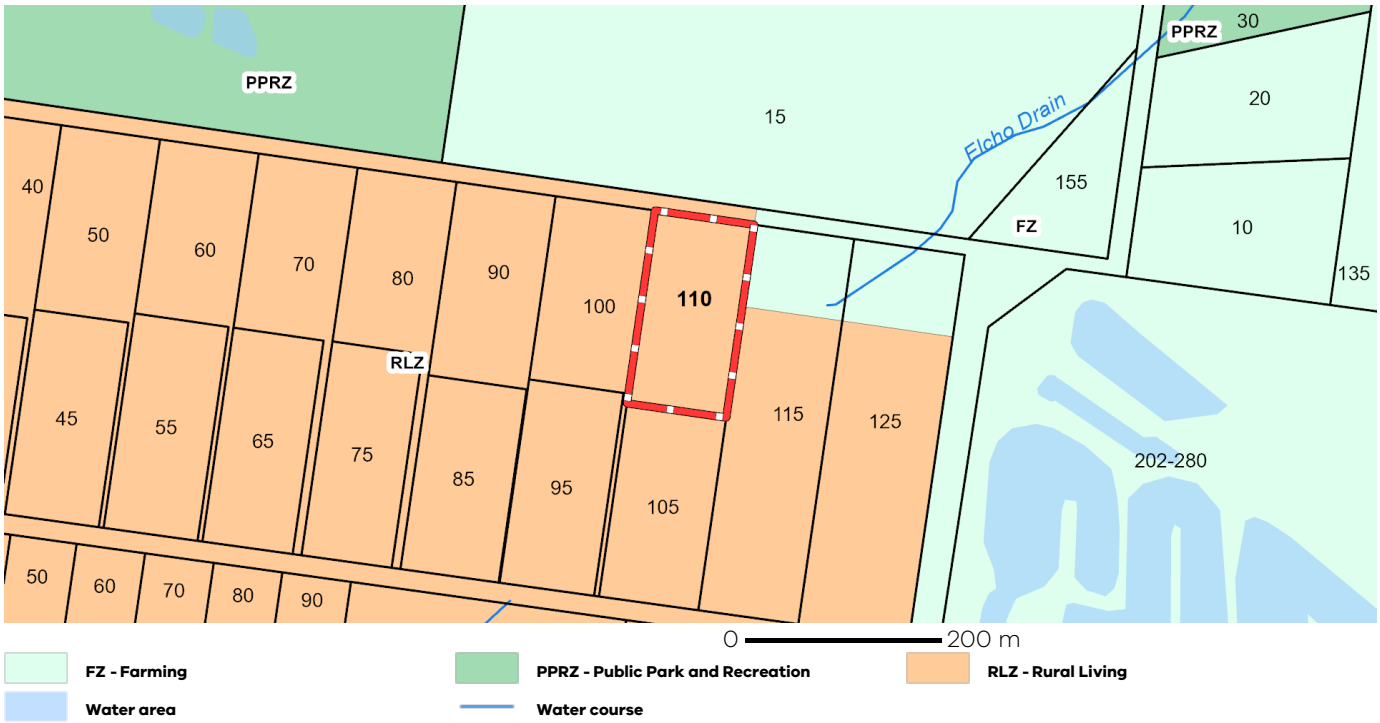
OTHER

Registered Aboriginal Party: **Wadawurrung Traditional Owners Aboriginal Corporation**

View location in VicPlan

Planning Zones

RURAL LIVING ZONE (RLZ)
SCHEDULE TO THE RURAL LIVING ZONE (RLZ)



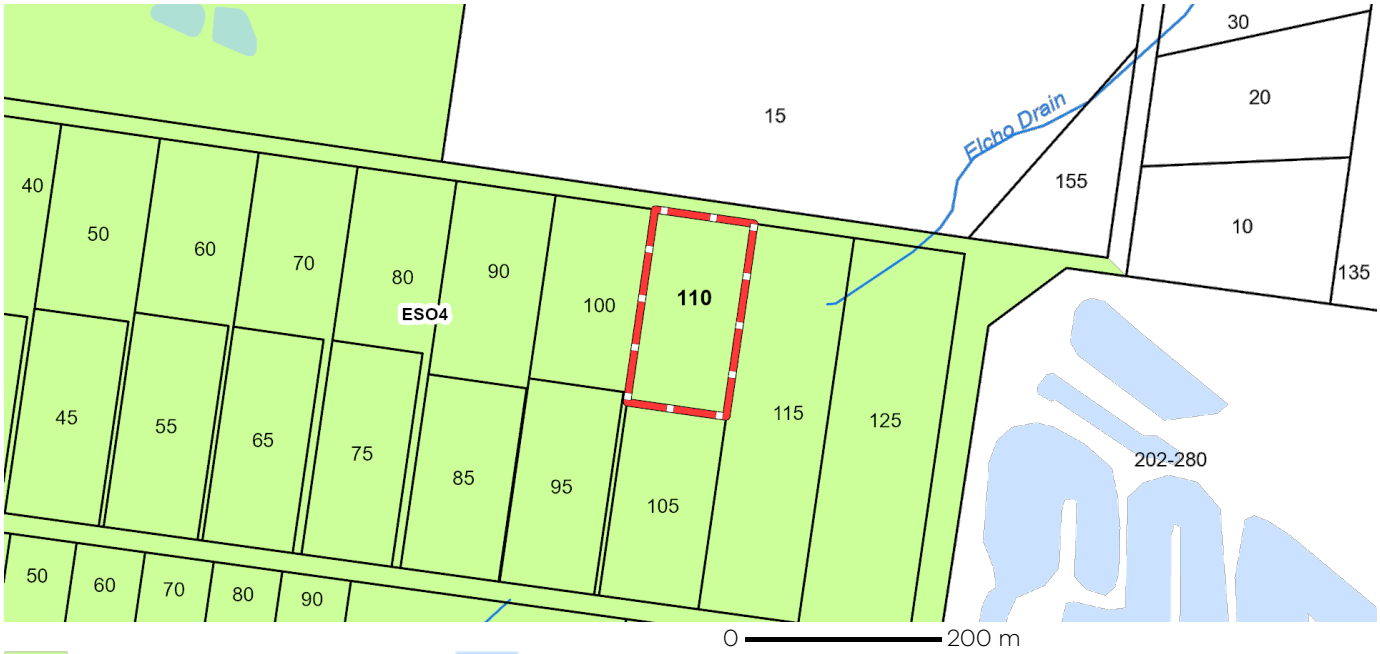
Note: labels for zones may appear outside the actual zone - please compare the labels with the legend.

PLANNING PROPERTY REPORT

Planning Overlays

ENVIRONMENTAL SIGNIFICANCE OVERLAY (ESO)

ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 4 (ESO4)



ESO - Environmental Significance Overlay | Water area | Water course

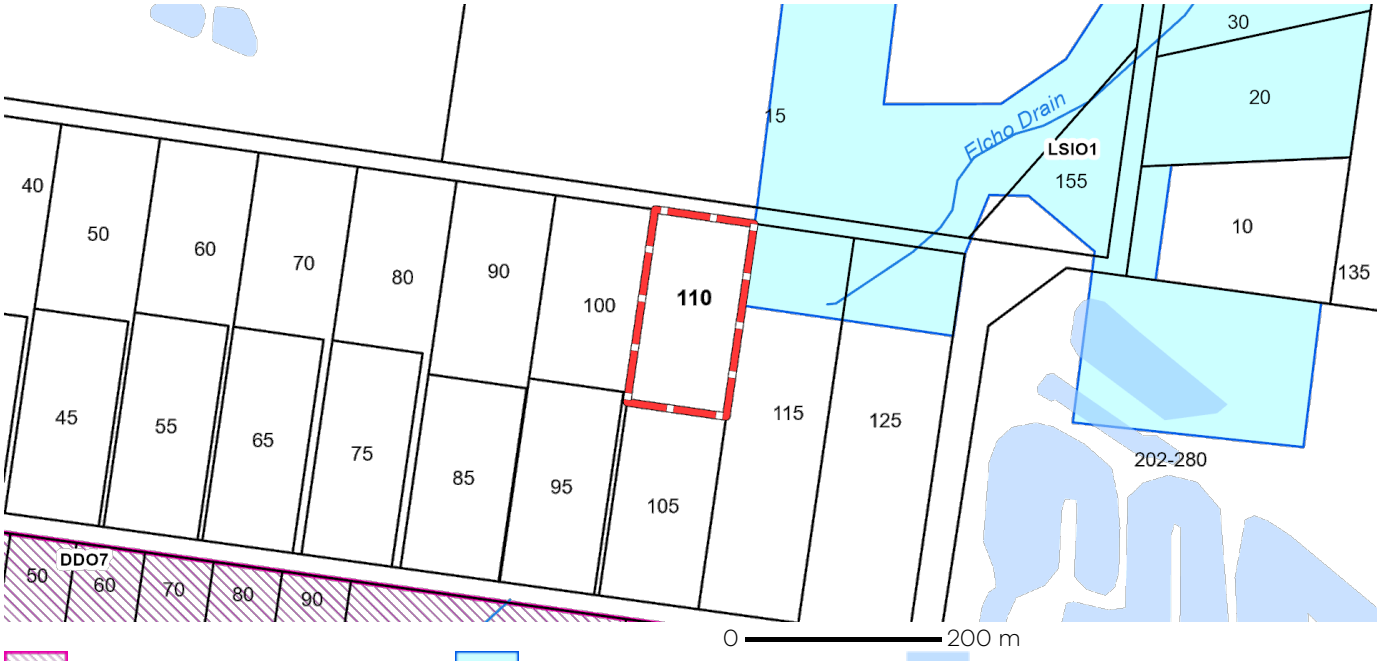
Note: due to overlaps, some overlays may not be visible, and some colours may not match those in the legend

OTHER OVERLAYS

Other overlays in the vicinity not directly affecting this land

DESIGN AND DEVELOPMENT OVERLAY (DDO)

LAND SUBJECT TO INUNDATION OVERLAY (LSIO)



DDO - Design and Development Overlay | LSIO - Land Subject to Inundation Overlay | Water area | Water course

Note: due to overlaps, some overlays may not be visible, and some colours may not match those in the legend

PLANNING PROPERTY REPORT

Further Planning Information

Planning scheme data last updated on 4 December 2024.

A **planning scheme** sets out policies and requirements for the use, development and protection of land.
This report provides information about the zone and overlay provisions that apply to the selected land.
Information about the State and local policy, particular, general and operational provisions of the local planning scheme that may affect the use of this land can be obtained by contacting the local council or by visiting https://www.planning.vic.gov.au

This report is NOT a **Planning Certificate** issued pursuant to Section 199 of the ***Planning and Environment Act 1987.***
It does not include information about exhibited planning scheme amendments, or zonings that may abut the land.
To obtain a Planning Certificate go to Titles and Property Certificates at Landata - https://www.landata.vic.gov.au

For details of surrounding properties, use this service to get the Reports for properties of interest.

To view planning zones, overlay and heritage information in an interactive format visit https://mapshare.maps.vic.gov.au/vicplan

For other information about planning in Victoria visit https://www.planning.vic.gov.au

PLANNING PROPERTY REPORT

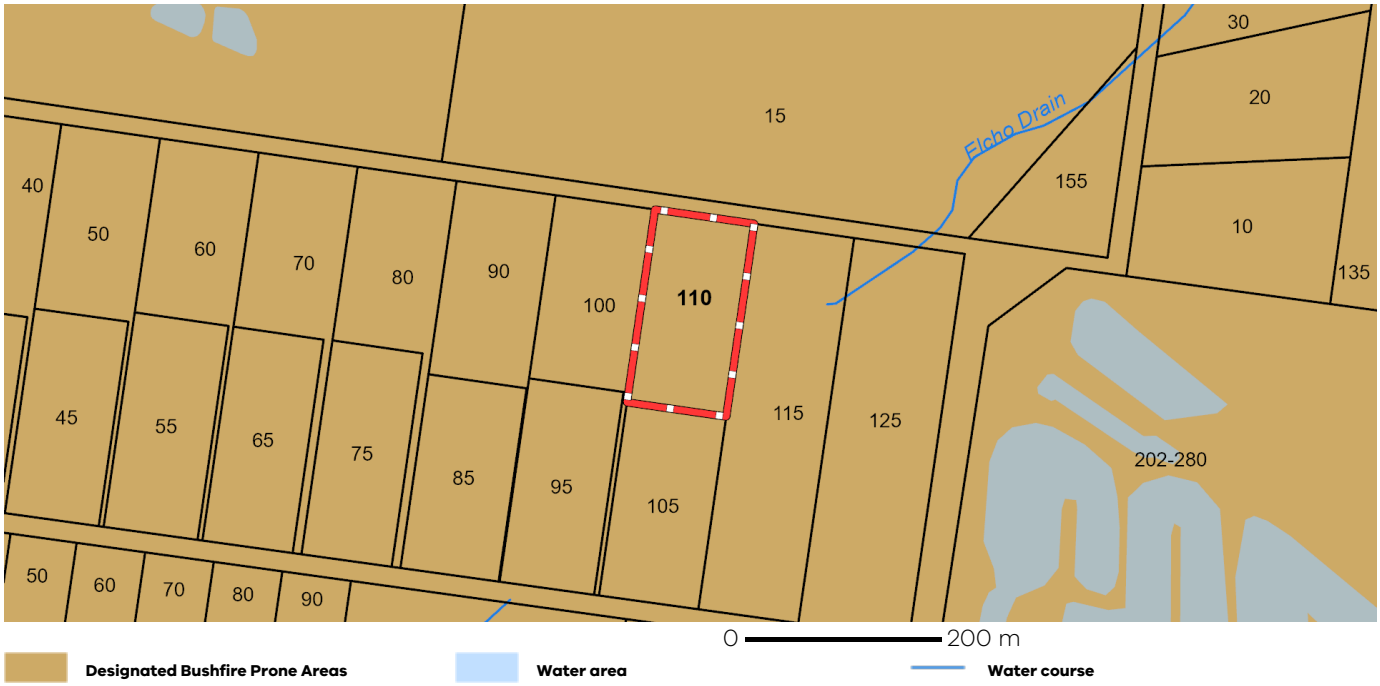
Environment, Land, Water and Planning

Designated Bushfire Prone Areas

This property is in a designated bushfire prone area. Special bushfire construction requirements apply to the part of the property mapped as a designated bushfire prone area (BPA). Planning provisions may apply.

Where part of the property is mapped as BPA, if no part of the building envelope or footprint falls within the BPA area, the BPA construction requirements do not apply.

Note: the relevant building surveyor determines the need for compliance with the bushfire construction requirements.



Designated BPA are determined by the Minister for Planning following a detailed review process. The Building Regulations 2018, through adoption of the Building Code of Australia, apply bushfire protection standards for building works in designated BPA.

Designated BPA maps can be viewed on VicPlan at https://mapshare.vic.gov.au/vicplan/ or at the relevant local council.

Create a BPA definition plan in VicPlan to measure the BPA.

Information for lot owners building in the BPA is available at https://www.planning.vic.gov.au.

Further information about the building control system and building in bushfire prone areas can be found on the Victorian Building Authority website https://www.vba.vic.gov.au. Copies of the Building Act and Building Regulations are available from http://www.legislation.vic.gov.au. For Planning Scheme Provisions in bushfire areas visit https://www.planning.vic.gov.au.

Native Vegetation

Native plants that are indigenous to the region and important for biodiversity might be present on this property. This could include trees, shrubs, herbs, grasses or aquatic plants. There are a range of regulations that may apply including need to obtain a planning permit under Clause 52.17 of the local planning scheme. For more information see Native Vegetation (Clause 52.17) with local variations in Native Vegetation (Clause 52.17) Schedule

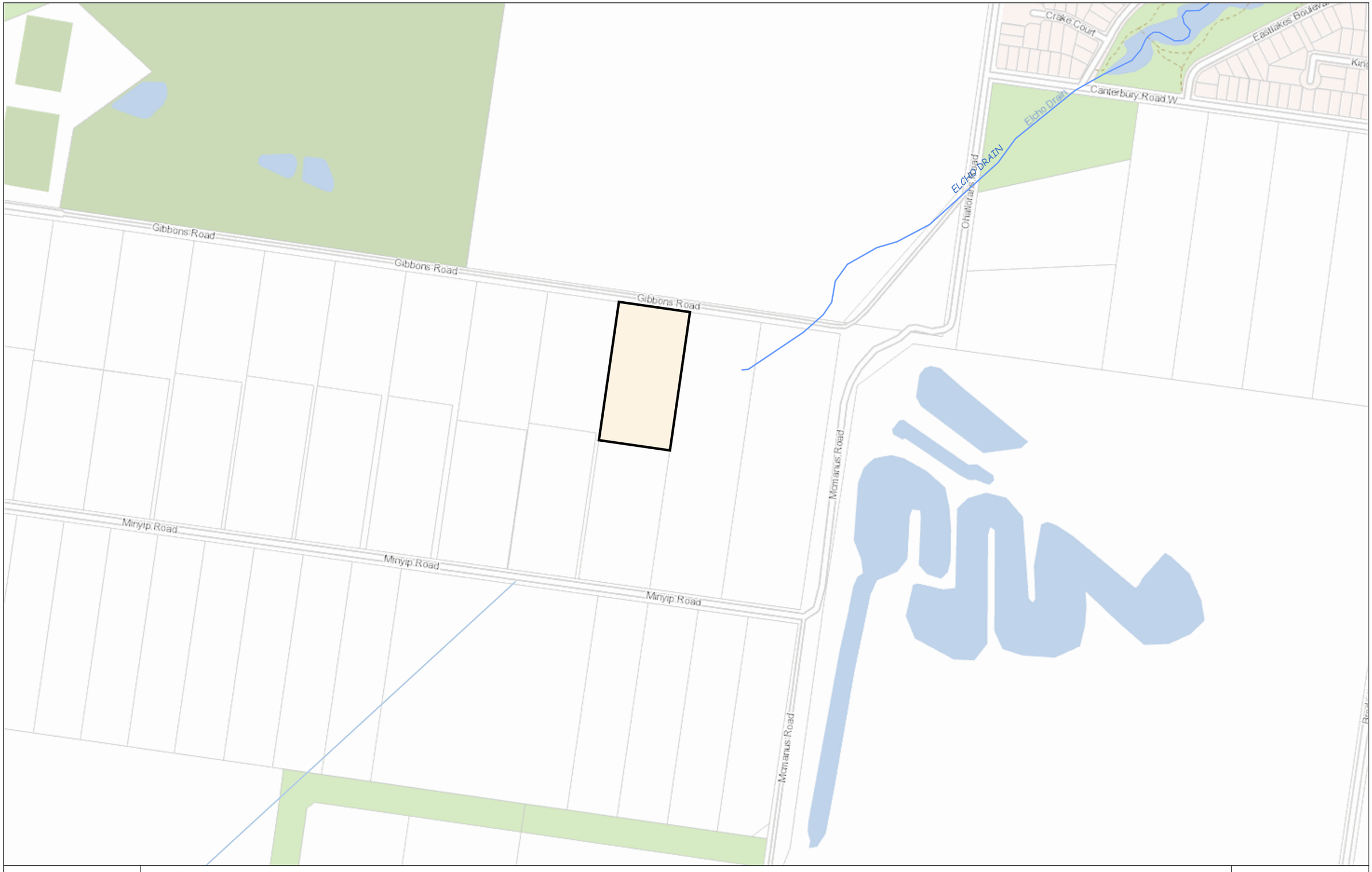
To help identify native vegetation on this property and the application of Clause 52.17 please visit the Native Vegetation Information Management system https://nvim.delwp.vic.gov.au/ and Native vegetation (environment.vic.gov.au) or please contact your relevant council.

You can find out more about the natural values on your property through NatureKit NatureKit (environment.vic.gov.au)

Appendix 2

Site Location Maps & Site Map

Co-ordinates of Plot Corners	Data Source: Vicmap Property	Co-ordinates of Plot Corners
NW 268544,5788832	0 100 200 300 400 500 600 700 800 900 1000m	NE 272421,5788916
SW 268597,5786383	Scale of Metres (1:10,000)	SE 272474,5786467
MGA Zone 55	MGA Zone 55 Melways- 422 H7 (ed.42) Vicroads- 444 D9 (ed.8) Created 04:23 PM on Dec 9, 2024	MGA Zone 55



Co-ordinates of Plot Corners		Data Source: Vicmap Property		Co-ordinates of Plot Corners	
NW	268290,5787469	0 50 100 150 200 250 300 350 400 450 500m	MGA Zone 55	NE	270228,5787511
SW	268316,5786245	Scale of Metres (1:5,000)	Melways- 422 D9 (ed.42) Vicroads- 444 D10 (ed.8)	SE	270255,5786287
MGA Zone 55			Created 04:23 PM on Dec 9, 2024	MGA Zone 55	

KEY:

PARCEL BOUNDARY | PROPOSED LAA | WATERWAY / DAM

BOREHOLE SAMPLE LOCATION | INFRASTRUCTURE | CONTOUR LINE

GENERAL NOTES:

-THE AERIAL MAP IS PROVIDED FOR ILLUSTRATIVE PURPOSE AND MAY NOT REFLECT CURRENT SITE CONDITIONS

-BOUNDARIES, DIMENSIONS AND AREA SHOWN ON THIS PLAN ARE APPROXIMATE ONLY AND SUBJECT TO SURVEY

REV	REVISION	DATE	CHECKED
A		09-12-2024	DE

edwards environmental
11 MATCHETT DRIVE STRATHDALE, VICTORIA, 3550.
(03) 5406 0522 admin@edwardsenvironmental.com.au

Client: **GD DESIGN**

Project: #1135 LCA

Location: 110 GIBBONS ROAD, LARA VICTORIA

Drawing Title: **SITE MAP**

Drawn: LC

Project - Drawing No. #1135 - 12/24

Date: 09-12-2024

Figure No. 1 Rev. A

Appendix 3

Site Photographs

1. Proposed Effluent Field – facing west

2. Proposed Effluent Field – facing south

3. Proposed Effluent Field – facing north

4. Proposed Effluent Field – facing east

5. Soil Sampling – BH01

6. Soil Sampling – BH02

Appendix 4

Soil Bore Logs

SOIL BORE LOG		FIELD ID: BH01	
Client:	GD Design	**Logged by**	
Location:	110 GIBBONS ROAD LARA 3212	**Drilling Method:**	Direct Push
Date:	29 November 2024	**Bore Diameter:**	50mm
Notes:	Refer to Appendix 2 Site Map for Borehole Locations		

Depth (m)	Sample	Mottles	Coarse Fragments	Description: Structure & Colour Moisture
				SILTY CLAY
				Brown dry
				Moderately structured
				CLAY LOAMS/ LIGHT CLAYS
0.25				pale brown/ pale white dry
				strongly structured
	X	No	No	
0.5				
0.75				
				MEDIUM CLAY
1.0				pale brown/ white dry strongly structured
1.25				
1.50				

SOIL BORE LOG		FIELD ID: BH02	
Client:	GD Design	**Logged by**	
Location:	110 GIBBONS ROAD LARA 3212	**Drilling Method:**	Direct Push
Date:	29 November 2024	**Bore Diameter:**	50mm
Notes:	Refer to Appendix 2 Site Map for Borehole Locations		

Depth (m)	Sample	Mottles	Coarse Fragments	Description: Structure & Colour Moisture
				SILTY CLAY Brown dry Moderately structured
0.25				CLAY LOAMS/ LIGHT CLAYS pale brown/ pale white dry strongly structured
	X	No	No	
0.5				
0.75				
1.0				MEDIUM CLAY pale brown/ white dry strongly structured
1.25				
1.50				

Appendix 5

Chain of Custody,

Sample Receipt Advice,

Nata Laboratory Results

Groundswell Laboratories

" A New Force in Analytical Testing"

CERTIFICATE OF ANALYSIS

Client Name :	Edwards Environmental	**Groundswell Batch # :**	GS24836
Client Address :	11 Matchett Drive, East Bendigo VIC	**Project Name :**	LARA
Client Phone # :		**Project # :**	LCA Suite
		Date Samples Received :	3/12/2024
		Sample Matrix :	Soil
E-mail :	reports@edwardsenvironmental.com.au	**Sample # Submitted :**	2
		Groundswell Quote # :	Not Applicable
E-mail :	admin@edwardsenvironmental.com.au	**Date CofA Issued :**	11/12/2024

Groundswell Laboratories Pty Ltd ABN 24 133 248 923
116 Moray Street, South Melbourne, Victoria, 3205 Ph (03) 8669 1450 Fax (03) 8669 1451 E-mail : admin@groundswelllabs.com.au

Groundswell Batch # : GS24836

Soil Analysis Results

Client Sample ID			BH01	BH02	BH02		
Laboratory Sample Number			GS24836-1	GS24836-2	GS24836-2		
Date Sampled			27/11/2024	27/11/2024	27/11/2024		
Analytes	**Units**	**LOR**			**Duplicate**		
pH	pH Units	0.1	8.1	7.9	7.8		
Electrical Conductivity @ 25°C	dS/m	0.005	1.056	0.694	0.650		
Exchangeable Calcium	mg/Kg	1	4470	1390	1270		
Exchangeable Magnesium	mg/Kg	1	2600	2090	1330		
Exchangeable Potassium	mg/Kg	1	407	479	406		
Exchangeable Sodium	mg/Kg	1	2740	2420	1760		
CEC	MEQ%	0.1	56.8	36.0	26.0		
ESP	%	0.1	21.0	29.3	29.5		
Sodicity Rating	---	---	Strongly Sodic	Strongly Sodic	Strongly Sodic		
SAR		0.01	1.80	2.14	1.84		

Comments :

1- pH & electrical conductivity determined & reported on a 1:5 soil:water extraction

2- CEC determined by soil chemical method 15B1 'Exchangeable bases and cation exchange capacity - 1M amonium chloride at pH 7.0, no pre-treatment for soluble salts'

3- ESP, sodicity rating & SAR determined by calculation using the exchangeable cation results

4- Measurement Uncertainty available upon request

Groundswell Batch # : GS24836

Soil Analysis Results

Client Sample ID			BH01	BH01		BH02	BH02
Laboratory Sample Number			GS24836-1	GS24836-1		GS24836-2	GS24836-2
Date Sampled			27/11/2024	27/11/2024		27/11/2024	27/11/2024
Analytes	**Units**	**LOR**					
Sample Type	---	---	Air Dried Aggregates	Re-moulded Ped		Air Dried Aggregates	Re-moulded Ped
Emerson Aggregate Class - 2 Hours	---	---	Slaking / Some Dispersion	Slaking / Some Dispersion		Slaking / Some Dispersion	Slaking / Some Dispersion
Emerson Class Number	---	---	Class 2	Class 2		Class 2	Class 2
Emerson Aggregate Class - 20 Hours	---	---	Slaking / Complete Dispersion	Slaking / Complete Dispersion		Slaking / Complete Dispersion	Slaking / Complete Dispersion
Emerson Class Number	---	---	Class 1	Class 1		Class 1	Class 1
Addition of 1M HCl	---	---	---	---		---	---
1:5 Soil:Water 10 minute extraction	---	---	---	---		---	---
Emerson Class Number	---	---	---	---		---	---

Comments :

1- Classification conducted in accordance with Emmerson 'A classification of soil aggregates based on their coherence in water', 1967 & AS1289.C8.1-1980

Groundswell Batch # : GS24836

Inorganics Quality Control Report

Client Sample ID							
Laboratory Sample Number							
QC Parameter			Method Blank		Laboratory Control Standard (LCS)		
			Method Blank	Within GSL Acceptance Criteria (<LOR) (Pass/Fail)	LCS (%R)	LCS (%R) Acceptance Criteria	Within GSL Acceptance Criteria (Pass/Fail)
Analyte	**Units**	**LOR**					
pH	pH units	0.1	NA	NA	7.12	7.00 ± 0.1 pH Unit	Pass
Conductivity	dS/m	0.005	<0.005	Pass	98%	80-120%	Pass
Exchangeable Calcium	mg/Kg	1	<1	Pass	81%	70-130%	Pass
Exchangeable Magnesium	mg/Kg	1	<1	Pass	96%	70-130%	Pass
Exchangeable Potassium	mg/Kg	1	<1	Pass	112%	70-130%	Pass
Exchangeable Sodium	mg/Kg	1	<1	Pass	101%	70-130%	Pass
CEC	MEQ%	0.1	NA	NA	NA	NA	NA
ESP	%	0.1	NA	NA	NA	NA	NA
SAR	---	0.01	NA	NA	NA	NA	NA

Comments :

1- Exchangeable cations LCS values based on independent water standards

2- NA = Not Applicable

CS24836

Page 1 of 1

CHAIN OF CUSTODY

Reference : AF06.Rev1

Date Issued : 11/3/2011

COC Reference : .....

Groundswell Laboratories
NATA Accreditation # 17067
116 Moray Street
SOUTH MELBOURNE VIC 3205
Ph (03) 8669 1450
Fax (03) 8669 1451
e-mail : admin@groundswelllabs.com.au

CLIENT / PROJECT DETAILS	Groundswell Quote #:
Company Name : EDWARDS ENVIRONMENTAL	Ph : 0429594020
Company Address : 11 Matchett Drive, East Bendigo Vic	Fax :
	Contact E-mail: admin@edwardsenvironmental.com.au
	Project Number :

Lab ID	Sample ID	Sample Date	Sample Type: Soil	Water	Paint, Filter	Other	# Sample Jars / Bottles	Volatile Organic Analytes: vTPH C6-9	BTEX	VOC	VHC	VAC	Semi-Volatile Organic Analytes: svTPH C10-36	SVOC	PAH / Phenols	OCP / OPP / PCB	SVCHC	Metals*: Soil	Water - Filtered	Water - Total	IWRG 621 Screen	SA Waste Screen	Other Analytes		LCA Screen								Comments
CS24836-1	BH01	27.11.24	✓																						✓							
-2	BH02	27.11.24	✓																						✓							

*Metals (circle) : As, Cd, Cr, Cu, Ni, Pb, Zn, Hg (M8) Ag, Mo, Se, Sn, CrVI (EPA 448.3 Metals), Mn, Ca, K, Mg, Na, Be, B, Co, V, Fe

VOC=Volatile Organic Compounds (USEPA 8260) VHC=Volatile Halogenated Compounds VAC=Volatile Aromatic Compounds SVOC=Semi-volatile Organic Compounds (USEPA 8270)

Comments : please send results to reports@edwardsenvironmental.com.au

	Date / Time: 27.11.24 15:27		Date / Time : 2/12/24 2.35pm
Relinquished By :	Date / Time :	Received By :	Date / Time :

Appendix 6

Irrigation Sizing and Nitrogen Balance Calculations

Victorian Land Capability Assessment Framework

Please read the attached notes before using this spreadsheet

Irrigation area sizing using Nominated Area Water Balance for Zero Storage

Site Address:	**110 Gibbons Road, Lara**		
Date:	23rd January 2026	**Assessor:**	LC

INPUT DATA

Design Wastewater Flow	Q	1,750	L/day	Based on maximum potential occupancy and derived from Table 4 in the EPA Code of Practice (2013)
Design Irrigation Rate	DIR	2.0	mm/day	Based on soil texture class/permeability and derived from Table 9 in the EPA Code of Practice (2013)
Nominated Land Application Area	L	865	m^2	[1]
Crop Factor	C	0.6-0.8	unitless	Estimates evapotranspiration as a fraction of pan evaporation; varies with season and crop type[2]
Rainfall Runoff Factor	RF	0.8	untiless	Proportion of rainfall that remains onsite and infiltrates, allowing for any runoff
Mean Monthly Rainfall Data	Avalon Airport (087113)			BoM Station and number
Mean Monthly Pan Evaporation Data	Geelong Moonlap (87023)			BoM Station and number

Parameter	Symbol	Formula	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Days in month	D		days	31	28	31	30	31	30	31	31	30	31	30	31	**365**
Rainfall	R		mm/month	35.1	31	26.5	39.4	36.4	38.5	35.7	40.8	42.8	48.5	52.2	30	**456.9**
Evaporation	E		mm/month	205.1	170.7	146.9	95.8	67.4	49.6	56.7	73.7	97.6	129.9	157.2	186.4	**1437**
Crop Factor	C		unitless	0.80	0.80	0.70	0.70	0.60	0.60	0.60	0.60	0.70	0.80	0.80	0.80	
OUTPUTS																
Evapotranspiration	ET	ExC	mm/month	164	137	103	67	40	30	34	44	68	104	126	149	**1066.09**
Percolation	B	DIRxD	mm/month	62.0	56	62.0	60.0	62.0	60.0	62.0	62.0	60.0	62.0	60.0	62.0	**730.0**
Outputs		ET+B	mm/month	226.1	192.56	164.8	127.1	102.4	89.8	96.0	106.2	128.3	165.9	185.8	211.1	**1796.1**
INPUTS																
Retained Rainfall	RR	RxRF	mm/month	26.4654	23.374	19.981	29.7076	27.4456	29.029	26.9178	30.7632	32.2712	36.569	39.3588	22.62	**344.5026**
Applied Effluent	W	(QxD)/L	mm/month	62.7	56.6	62.7	60.7	62.7	60.7	62.7	62.7	60.7	62.7	60.7	62.7	**738.4**
Inputs		RR+W	mm/month	89.2	80.0	82.7	90.4	90.2	89.7	89.6	93.5	93.0	99.3	100.1	85.3	**1082.9**
STORAGE CALCULATION																
Storage remaining from previous month			mm/month	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Storage for the month	S	(RR+W)-(ET+B)	mm/month	-136.9	-112.5	-82.1	-36.7	-12.3	0.0	-6.4	-12.7	-35.4	-66.6	-85.7	-125.8	
Cumulative Storage	M		mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Maximum Storage for Nominated Area	N		mm	0.00												
	V	NxL	L	0												
LAND AREA REQUIRED FOR ZERO STORAGE			m^2	272	290	375	539	723	864	785	719	547	419	359	288	

MINIMUM AREA REQUIRED FOR ZERO STORAGE: 865.0 m^2

CELLS

	Please enter data in blue cells
XX	Red cells are automatically populated by the spreadsheet
XX	Data in yellow cells is calculated by the spreadsheet, DO NOT ALTER THESE CELLS

NOTES

[1] This value should be the largest of the following: land application area required based on the most limiting nutrient balance or minimum area required for zero storage

[2] Values selected are suitable for pasture grass in Victoria

Victorian Land Capability Assessment Framework

Please read the attached notes before using this spreadsheet

Nitrogen Balance

Site Address:	**110 Gibbons Road, Lara**

SUMMARY - LAND APPLICATION AREA REQUIRED BASED NITROGEN BALANCE	**581**	m^2

INPUT DATA[1]

Wastewater Loading			**Nutrient Crop Uptake**					
Hydraulic Load	1750	L/day	Crop N Uptake	220	kg/ha/yr	which equals	60.27	$mg/m^2/day$
Effluent N Concentration	25	mg/L						
% N Lost to Soil Processes (Geary & Gardner 1996)	0.2	Decimal						
Total N Loss to Soil	8750	mg/day						
Remaining N Load after soil loss	35000	mg/day						

NITROGEN BALANCE BASED ON ANNUAL CROP UPTAKE RATES

Minimum Area required with zero buffer			**Determination of Buffer Zone Size for a Nominated Land Application Area (LAA)**		
Nitrogen	581	m^2	Nominated LAA Size	865	m^2
			Predicted N Export from LAA	-6.26	kg/year
			Minimum Buffer Required for excess nutrient	0	m^2

CELLS

	Please enter data in blue cells
XX	Red cells are automatically populated by the spreadsheet
XX	Data in yellow cells is calculated by the spreadsheet, DO NOT ALTER THESE CELLS

NOTES

[1] Model sensitivity to input parameters will affect the accuracy of the result obtained. Where possible site specific data should be used. Otherwise data should be obtained from a reliable source such as:

- *EPA Guidelines for Effluent Irrigation*
- *Appropriate Peer Reviewed Papers*
- *Environment and Health Protection Guidelines: Onsite Sewage Management for Single Households*
- *USEPA Onsite Systems Manual*

Appendix 7

Glossary

SELECTED GLOSSARY *(Source: EPA Guideline for Onsite Wastewater Management, May 2024)*	
Term	**Meaning**
20/30 standard	Water quality standard indicating an effluent quality of <20 mg/L BOD55 and <30 mg/L suspended solids. Wastewater, including greywater, of this quality may be recycled outdoors via subsurface irrigation.
20/30/10 standard	Water quality standard indicating an effluent quality of <20 mg/L BOD_5, <30 mg/L suspended solids and E. coli <10 cfu/100 mL. Effluent may only be recycled via sub-surface irrigation.
Aerobic	Organisms and processes that require oxygen (i.e. microbiological digestion and assimilation of organic matter by using oxygen).
Aerated Wastewater Treatment System (AWTS)	Air bubbled through wastewater in a tank provides oxygen to microorganisms to facilitate aerobic biological digestion of the organic matter in the wastewater.
Anaerobic	Living or occurring without oxygen (i.e. microbiological digestion and assimilation of organic matter in the absence of oxygen).
Biochemical Oxygen Demand (BOD_5)	The amount of oxygen consumed by chemical processes and micro-organisms to break down organic matter in water over a 5-day period, measured in milligrams per litre (mg/L).
Blackwater	Wastewater from toilets containing faeces and urine.
Declared Water Supply Protection Area	Applicable to groundwater as defined in section 27 of the Water Act (as amended).
Design Loading Rate	The long-term acceptance rate (LTAR) expressed in Litres/m^2/day or mm/day as applied to a land-application area.
Desludging (pump-out)	The removal of biological sludge and inert sediment from a septic tank, including the surface crust (scum) material. A pump-out should not drain tanks dry, because some residual sewage is needed to provide a seed source of digesting microorganisms.
Dispersal field	The distribution of treated effluent through the biologically-active topsoil layer.
Disposal field	The area of land utilised for the disposal of partially treated sewage to ground via a soil absorption trench
E. coli	Escherichia coli: a species of bacteria in the faecal coliform group found in large numbers in the intestines of animals and humans. Its presence in freshwater indicates recent faecal contamination and is measured in 'colony-forming units' (cfu) per 100 mL of water.
Evapo-transpiration	Transfer of water from the soil to the atmosphere through evaporation and plant transpiration.
Greywater	Domestic wastewater from sources other than the toilet, urinal or bidet (e.g. from showers, baths, spas, hand basins, clothes washing machines, laundry troughs, dishwashers and kitchen sinks).
Groundwater	All underground water contained in the void spaces within and between the rocks and soil, excluding water travelling between the ground surface and the water table (Oxford Dictionary of Earth Sciences).
Infiltration	The gradual movement of water into the pore spaces between soil particles.
Irrigation	The artificial supply of water to land and vegetation.
LPED irrigation	Shallow sub-surface irrigation of primary or secondary effluent into high quality loamy topsoil through low pressure effluent distribution (LPED) lines. The pressurised line is a twin construction consisting of a perforated pipe with drilled squirt holes inside a rigid slotted PVC pipe or aggie pipe.
Micro-organism	An organism that is invisible or barely visible to the unaided eye (e.g. bacteria, viruses, protozoa).
Nutrients	Organic and inorganic substances used in an organism's metabolism which must be taken in from the environment (e.g. carbohydrates, fats, such as proteins and vitamins). Nutrients are molecules that include elements such as carbon, nitrogen, phosphorus, potassium, calcium, magnesium and a range of trace elements.
Onsite wastewater management system	Onsite wastewater management system. It is the same as a 'septic tank system' as defined in the Environment Protection Act,1970. It includes an onsite wastewater treatment system (primary or secondary standard) plus the subsequent disposal/recycling system.
Onsite wastewater treatment system	A treatment system that treats up to 5,000 L/day of wastewater on the allotment where it was generated
Pathogen	A disease-causing micro-organism.

SELECTED GLOSSARY *(Source: EPA Guideline for Onsite Wastewater Management, May 2024)*	
Term	**Meaning**
Permeability	The ability of water to move, through soil which depends upon the soil particle sizes, pore space sizes, soil texture, soil structure and water content.
Pollution	Any harmful or undesirable change in the physical, chemical or biological quality of air, water or soil as a result of the release of chemicals, heat, radioactivity or organic matter.
Potable water supply catchment	An area declared as a Special Water Supply Catchment under Schedule 5 of the Catchment and Land Protection Act 1994 and used as a source of drinking water by a Water Corporations.
Recycling	Using treated wastewater for an appropriate use (e.g. 10/10/10 greywater used for toilet flushing or 20/30 effluent used for sub-surface irrigation).
Reserve area	A duplicate land disposal area reserved for use when the original land disposal area needs to be rested.
Reuse	Using a waste product in its present form for another purpose, e.g. diverting (reusing) untreated greywater to water the garden.
Scum	Material that floats on top of the liquid in an anaerobic sewage treatment tank (i.e. septic tank).
Secondary treatment	Biological and/or physical treatment following primary treatment of wastewater. Disinfection to kill pathogens may also occur.
Septic tank	A tank that temporarily holds wastewater. In a septic tank, wastewater is primarily treated through filtration, sedimentation, flocculation and flotation to remove organic and inorganic matter from wastewater in combination with anaerobic microbiological digestion.
Sewage	As defined within the Environment Protection Act 1970 (section 53J) "means any waste containing human excreta or domestic wastewater".
Sludge	The material that rests on the bottom of a septic tank. It can include inert matter (such as sand, glass and plastics) and biosolids (organic material produced by biological processes).
Special Water Supply Catchment	One of the areas listed in Schedule 5 of the Catchment and Land Protection Act 1994.
STEP/STEG	Septic Tank Effluent Pump/Septic Tank Effluent Gravity: an effluent sewer system utilising both gravity and pumps to discharge effluent from septic tanks to a reticulated sewer system.
Sub-surface irrigation	The dispersal of water through a network of pressure-compensating pipes and emitters at a depth of 100 mm to 150 mm below ground surface level (i.e. in the biologically active topsoil layer). The irrigation system also includes a disc or mesh filter, vacuum filters and scour valves. Minimum water quality required for sub-surface irrigation with treated sewage or greywater is 20/30 standard (20 mg/L BOD and 30 mg/L TSS).
Sullage	Household greywater that does not contain human excreta, but may still contain pathogens, nutrients and potentially harmful chemicals.
Suspended solids (SS)	A measure of the solids in water, expressed in milligrams per litre (mg/L).
Surface irrigation	The irrigation of water to the ground surface. It includes the use of low-rise sprinklers, micro-sprayers, and drip systems under mulch, but excludes the use of hand-held hoses for treated sewage. Treated greywater can be connected to purple coloured child-proof taps that have a removable handle. Irrigation spray heads must not spray beyond the property boundary. Minimum water quality required for surface irrigation with treated sewage or greywater is 20/30/10 standard (20 mg/L BOD_5, 30 mg/L SS and 10 cfu E. coli 100 mL).
Sustainable	Able to continue indefinitely without any significant negative impact on the environment or its inhabitants.
Treatment	A process or series of processes that remove contaminants from wastewater, whereby the physical, chemical and biological characteristics of wastewater are altered.
Topsoil	The top layer of the soil, typically containing plant roots, organic material and an active microbiological ecosystem, which is usually more fertile than the underlying layers.
Total suspended solids (TSS)	A measure of the solids in water, expresses in milligrams per litre (mg/L).
Unsewered area	Land where no sewer pipes are adjacent to the allotment boundaries.
Urine-diversion toilet (UDT)	A toilet bowl designed to separate urine from solid excrement. The UDT may be attached to a dry composting toilet chamber or a water-flush blackwater treatment system or sewer system. A 'dam' wall, which extends between the two side of the toilet bowl, creates a front and back well from which the excrement drains or is flushed away.
Watertable	The upper surface of groundwater or the level below which an unconfined aquifer is permanently saturated with water.
Waterway	As defined by the Water Act 1989 (as amended):
WELS	Water Efficiency Labelling and Standards scheme www.waterrating.gov.au

Appendix 8

EPA 891.4 – Application Process

Factors to Consider

Set back Distances

Soil Categories & Recommended Maximum Design Loading/Irrigation Rates (DLR/DIP) For Land Application Systems

Septic tanks

COUNCIL SEPTIC TANK PERMIT APPLICATION PROCESS

Overview of the main steps in applying for a Council Septic Tank Permit:

1.	The property owner contacts the local *Council Planning Department* to determine whether a Planning Permit is required or whether planning conditions apply.
2.	The property owner contacts the local **Council Environmental Health Unit** to collect a **Septic Tank Permit application form**, to determine which documents are required to accompany the application form and what level of detail is required for the land capability assessment (if applicable).
3.	The property owner engages a land capability assessor, wastewater consultant and/or plumber to carry out the required investigations and write a report which will include maps and plans.
4.	The property owner applies for their **Planning Permit**.
5.	The property owner engages a land capability assessor (where applicable) to undertake the land capability assessment (LCA) and create a report for Council. The completed Septic Tank Permit, **LCA report**, any other required documents and the prescribed fee can be submitted to the Environmental Health Unit by the owner, builder or plumber.
6.	The Planning Department refers the Planning Permit application to the relevant Water Corporations, the Environmental Health Unit and other agencies as required under the Planning and Environment Act.
7.	Where the Planning Permit application is satisfactory the Planning Department issues the property owner with a Planning Permit, with the condition that the property owner must apply for a Septic Tank Permit.
8.	**The Planning Permit and LCA report are attached to the Septic Tank Permit application to ensure that all conditions on the Planning Permit are included in the Septic Tank Permit.**
9.	When the Environmental Health Unit is satisfied the application meets all requirements it issues a Septic Tank Permit to Install or Septic Tank Permit to Alter.
10.	When the treatment system and indoor recycling and/or land application system are installed but not buried, **the installer contacts Council to arrange an inspection of the installation.**
11.	When the Council Environmental Health Unit has received:
a.	the **Plumbing Compliance Certificate**
b.	the **'As Laid Plan'**, and
c.	**the commissioning form** from the plumber and is satisfied the system is installed correctly in accordance with the manufacturer's **Installation Manual** and the **Council Permit to Install/Alter**, Council issues a ***Certificate to Use*** to the property owner.

USEFUL FACTORS TO CONSIDER WHEN SELECTING AN EPA-APPROVED ONSITE WASTEWATER TREATMENT SYSTEM
Physical features
Dimensions of the treatment plant
Location of treatment unit – above-ground or below-ground
Number and power of pumps, aerators and other electrical components
Size of effluent storage tank
Type of treatment processes
Type of disinfection used if applicable
Chemicals used
Capital and installation costs
Council Permits – e.g. Permit to Install, Permit to Alter and Certificate to Use
Capital and delivery charge for the treatment system components including the septic tank, sump and sump pump (if applicable) and effluent storage tank
Cost of manoeuvring the treatment unit into the back yard (i.e. is vehicular access or is a crane required or can it be carried by several people?)
Cost of digging the hole and removing the debris (if applicable)
Concrete pad (if required)
Cost of electrician's work to lay power cords to connect the treatment plant to the house, including a dedicated weather-proof power point and any modifications required to the switch board)
For greywater systems – cost of internal plumbing for toilet flushing, washing machine, backflow prevention device and automatic diversion valve to sewer
Cost of the plumber/drainer digging trenches and laying pipes to connect the treatment system to the house
Cost of land application/irrigation system including ancillary equipment (e.g. effluent pump, disc or mesh filter, vacuum breakers, scour valves, soil moisture sensors or rain gauges)
Cost of the audio-visual alarm system and/or remote monitoring system
Performance
Minimum and maximum daily volumes that can be effectively treated
Effluent quality (primary, secondary 10/10/10, 10/10, 20/30/10 or 20/30)
Commissioning time to achieve approved effluent quality
Total pump run time per day
How does the system cope with: large shock loads or surge flows? toxic substances like bleach, oil, paint thinners etc.? 24-hour power failure? 72-hour power failure? being switched off for 1 week, 1 month, 3 months? no inflow for 1 week, 1 month, 3 months?
kWh of electricity per kilogram of BOD removed
Estimated lifetime of the treatment systems and its component parts
Sustainability features of the treatment system
Maintenance
Desludging frequency or what is the fate of the biosolids?
Number of service visits per year
Number of hours of maintenance per year
Expected maintenance tasks during each service call
Qualifications and training of service technicians
Ongoing costs
Electricity usage per day; electricity cost per kL of wastewater; electricity cost per year
Service fees per year (labour and travel costs)
Annual cost of chemicals used
Annual cost of replacing the UV lamp, membranes
Annual cost of testing any backflow prevention devices
Average annual cost of consumables, spare parts, pumps and desludging per year (annualised over 30 years)
Annual effluent monitoring cost
Cost of desludging the system every 3 to 5 years
Total annual cost to run the treatment plant (including annualised spare parts and desludging)

SETBACK DISTANCES

(Source: EPA Guideline for Onsite Wastewater Management (Table 4-10)

Landscape Feature or Structure	Setback distances (m)		
	OWMS with primary treated effluent	OWMS with secondary treated effluent or Level 3 greywater effluent	OWMS with Level 1 and 2 greywater effluent
Building/allotment boundary			
Up-slope of building (See Note 1)	6	3	3
Down-slope of building	3	1.5	1.5
Up-slope of adjacent lot	6	3	1
Down-slope of adjacent lot	3	1.5	0.5
Services			
Water supply pipe	3	1.5	1.5
Up-slope of potable supply channel (stock and domestic)	300	150	150
Down-slope of potable water supply (stock and domestic)	20	10	10
In-ground water tank (See Note 2)	15	7.5	3
Closed stormwater drain	6	3	2
Open stormwater drain	50	30	10
Gas supply pipe	3	1.5	1.5
Recreational areas			
Children's grassed playground (See Note 3)	6	3	2
In-ground swimming pool	6	3	2
Surface waters			
Dam, lake or reservoir (used as source water for drinking or within a special water supply catchment) (See Notes 5, 6)	300	300	150
Waterways (used as a source of water for drinking or within a special water supply catchment) (See Notes 4, 5)	100	100	50
Waterways not used as source of water for drinking or within a special water supply catchment (for example, wetlands (continuous or ephemeral); estuaries (See Note 4)	60	30	30
Ocean beach at high-tide mark; dams, reservoirs or lakes not used as source of water for drinking or within a special water supply catchment (See Note 6)	60	30	30
Dam, lake or reservoir (used as source water for drinking or within a special water supply catchment) (See Notes 5, 6)	300	300	150
Drainage lines (See Note 7)	40	20	20
Up-slope of cutting/escarpment (See Note 8)	15	15	15
Groundwater bores			
Category 1 and 2a soils	NA	50	20
Category 2b to 6 soils	20	20	20
Soil depth (See Note 9)			
Depth to highest seasonal water table (See Note 10)	1.5	1.5	1.5
Depth to hydraulically limiting layer (for example, bedrock)	1.5	1.5	1.5

NOTES: SETBACK DISTANCES FOR PRIMARY & SECONDARY TREATMENT PLANTS & EFFLUENT DISPOSAL/IRRIGATION AREAS IN SEWERED & UNSEWERED AREAS (WHERE APPLICABLE) *(Source: EPA Guideline for Onsite Wastewater Management (Table 4-10)*	
1.	Establishing an OWMS up-slope of a building may have implications for the structural integrity of the building. This should be examined by a building surveyor on a site-by-site basis.
2.	It is recommended that OWMS are installed down-slope of an in-ground water tank.
3.	Means a school, council, community or other children's grassed playground managed by an organisation which may contain play equipment but does not mean a sports field.
4.	Means a waterway as defined in the Water Act 1989.
5.	Applies to land adjacent to a dam, lake, reservoir or waterway that provides source water used for the supply of public drinking water or, which is subject to an environmental significance overlay (ESO) that designates maintenance of water quality as the environment objective to be achieved, or within a special water supply catchment area listed in Schedule 5of the Catchment and Land Protection Act 1994.
6.	Does not apply to dams, lakes or reservoirs located above ground level that cannot receive runoff.
7.	An intermittent stream that is found to be a drainage line (drainage depression) with no defined banks and the bed is not incised. The topography of the drainage line should be demonstrated in writing and photographs in the LCA report.
8.	A cutting/escarpment from which water is likely to emanate.
9.	Depth is measured vertically through the soil profile from the base of absorption/ETA trenches/beds or from the irrigation pipes.
10.	The highest seasonal water table occurs when groundwater is closest to the ground surface. This usually occurs in the wettest months of the year.

SOIL CATEGORIES AND DESIGN LOADING/ IRRIGATION RATES (reproduced from AS1547:2012) **(Source: EPA Guideline for Onsite Wastewater Management (Table 4-8)**

Soil Texture	Soil Structure	Soil Category	Indicative permeability (Ksat) (m/d)	Design Loading Rates and Design Irrigation Rates (DLR / DIR) (mm/day)						
				Absorption trenches/beds (see Table L1 in AS/NZS 1547:2012)			(ETA) Evapotranspiration absorption beds and trenches (see Table L1 in AS/NZS 1547: 2012)	Sub-surface and surface irrigation (see Table M1 in AS/NZS 1547: 2012)	LPED (see Table M1 in AS/NZS 1547: 2012)	Mounds (basal area) (see Table N1 in AS/NZS 1547: 2012)
				Primary effluent Conservative Rate	Primary effluent Maximum Rate	Secondary Treated Effluent				
Gravels and sands	Structureless (massive)	1	>3.0	See Note 1 of Table L1, AS/NZS 1547:2012 for DLR values			See Note 4 of Table L1 AS:NZS1547)	5 (See Note 1 of Table M1, AS/NZS 1547:2012)	See Note 3 of Table M1, AS/NZS154:2012)	32
Sandy loams	Weakly structured	2a	>3.0						4	24
	Massive	2b	1.4 - 3.0	15	25	50			4	24
Loams	High / moderate structured	3a	1.5 – 3.0	15	25	50		4	3.5	24
	Weakly structured or massive	3b	0.5 – 1.5	10	15	30				16
Clay loams	High / moderate structured	4a	0.5 – 1.5	10	15	30	12	3.5	3	16
	Weakly structured	4b	0.12 – 0.5	6	10	20	8			8
	Massive	4c	0.06 – 0.12	4	5	10	5			5 (See Note of Table N1 AS/NZS 1547:2012)
Light clays	Strongly structured	5a	0.12 – 0.5	5	8	12	8	3 (See Note 1 of Table M1, AS/NZS1547:2012)	2.5 (See Note 4 of Table M1, AS/NZS1547:2012)	8
	Moderately structured	5b	0.06 – 0.12	(See Notes 2 and 3)	5	10	5 (see Notes 2 and 3 in Table L1)			5 (See Note of Table N1 AS/NZS 1547:2012)
	Weakly structured or massive	5c	<0.06	(See Notes 2 and 3)		8				
Medium to heavy clays	Strongly structured	6a	0.06 – 0.5	(See Notes 2 and 3 of Table L1 AS/NZS 1547:2012)				2 (See Note 1 of Table M1, AS/NZS1547:2012)	(See Note 3 of Table M1, AS/NZS1547:2012)	
	Moderately structured	6b	<0.06							
	Weakly structured or massive	6c	<0.06							

Notes: Table 4-9: 1. There is elevated risk associated with primary treated effluent being dispersed to trenches and beds in soil categories 1 and 2a. This is due to the high infiltration rate of these soils, which leads to uneven distribution along the base of the trench. These soils have low nutrient retention capacities, often allowing accession of nutrients to groundwater.
2. Use of absorption trenches/beds in category 1 and 2a soils require design by a suitably qualified and experienced person. Where groundwater quality is at risk, secondary treatment is required and consideration should also be given to disinfection, nutrient removal, soil modification or distribution over a large application area.
3. Use of absorption trenches/beds in category 5b, 5c and 6 soils requires special design and distribution techniques or soil modification procedures. In most situations the design will need to rely on more processes than just absorption by the soil.
4. The design irrigation rate for subsurface or surface irrigation may be increased in sandy soils (categories 1 and 2) where secondary treatment is installed with disinfection and nutrient reduction.

NOTES: SETBACK DISTANCES FOR PRIMARY & SECONDARY TREATMENT PLANTS & EFFLUENT DISPOSAL/IRRIGATION AREAS IN SEWERED & UNSEWERED AREAS (WHERE APPLICABLE)	
(Source: Adapted from EPA Guideline for Onsite Wastewater Management (Table 4-10)	
1.	Establishing an OWMS up-slope of a building may have implications for the structural integrity of the building. This should be examined by a building surveyor on a site-by-site basis.
2.	It is recommended that OWMS are installed down-slope of an in-ground water tank.
3.	Means a school, council, community or other children's grassed playground managed by an organisation which may contain play equipment but does not mean a sports field.
4.	Means a waterway as defined in the Water Act 1989.
5.	Applies to land adjacent to a dam, lake, reservoir or waterway that provides source water used for the supply of public drinking water or, which is subject to an environmental significance overlay (ESO) that designates maintenance of water quality as the environment objective to be achieved, or within a special water supply catchment area listed in Schedule 5of the Catchment and Land Protection Act 1994.
6.	Does not apply to dams, lakes or reservoirs located above ground level that cannot receive runoff.
7.	An intermittent stream that is found to be a drainage line (drainage depression) with no defined banks and the bed is not incised. The topography of the drainage line should be demonstrated in writing and photographs in the LCA report.
8.	A cutting/escarpment from which water is likely to emanate.
9.	Depth is measured vertically through the soil profile from the base of absorption/ETA trenches/beds or from the irrigation pipes.
10.	The highest seasonal water table occurs when groundwater is closest to the ground surface. This usually occurs in the wettest months of the year.

SEPTIC TANKS

(Source: Adapted from EPA Guideline for Onsite Wastewater Management (Appendix D: Septic Tanks))

Commissioning

After installation or desludging, and before use, a septic tank must be two-thirds filled with clean water to:

- provide ballast in the tank to prevent groundwater lifting the tank out of the ground
- reduce odours
- enable any subsequent secondary treatment plant to be switched on, commissioned and used immediately.

When domestic wastewater from the dwelling flows into the septic tank it contains sufficient microbiological organisms to start and continue the treatment process. There is no need to 'feed' or dose a new or desludged septic tank with starter material or micro-organisms. If odour occurs after the commissioning of a system, a cup of garden lime can be flushed down the toilet each day until the odour disappears. If the odour persists, the property should seek professional advice from a plumber.

Sludge and scum

As organic matter from the wastewater and inert material, such as sand, settle to the bottom of the tank a layer of sludge forms. This layer contains an active ecosystem of mainly anaerobic micro-organisms which digest the organic matter and reduce the volume of sludge. Scum forms as a mixture of fats, oils, grease and other light material floats on top of the clarified liquid that has separated from the solids. When the clarified liquid flows out of the septic tank it is called 'primary treated effluent'.

It is not necessary or recommended that householders pour commercial products that are reputed to dissolve sludge build-up, down the toilet or sink. A teaspoon of granulated yeast flushed down the toilet once a fortnight may assist with microbial activity, though such a procedure is not an alternative to regular sludge and scum pump-out (Lord 1989).

Desludging septic tanks

Over time, the sludge and scum layers build up and need to be removed for the tank to function properly. The level of solids accumulation in the tank cannot be accurately predicted, and will depend on the waste load to the tank. Therefore, the sludge and scum depth should be checked annually by a contractor. If a septic tank is under a maintenance contract, regular assessment (every 1 to 3 years) of the sludge and scum layers must be part of the maintenance agreement.

The sludge and scum need to be pumped-out with a vacuum suction system when their combined thickness equals 50% of the operational depth of the tank. The frequency of pump-out depends on:

- whether the tank is an adequate size for the daily wastewater flow
- the composition of the household and personal care products
- the amount of organic matter, fat, oil and grease washed down the sinks
- the use of harsh chemicals such as degreasers
- overuse of disinfectants and bleaches
- the use of antibiotics and other drugs, especially dialysis and chemotherapy drugs
- whether any plastic or other non-organic items are flushed into the tank.

A well-functioning septic tank – one that is not overloaded with liquid, organic matter or synthetic material – typically only needs to be desludged once every 3 to 8 years (depending on the size of the tank). A septic tank connected to a home with a frequently used dishwasher will need to be pumped out more frequently (typically every 3 to 4 years) than a home with no dishwasher connected (typically every 5 to 6 years). A holiday home will need to be pumped out less frequently. Large (6,000 L) domestic septic tanks which are common in New Zealand and the USA and have started to be installed in Victoria, have been proven to require desludging only once every 10 to 15 years (Bounds, 1994).

After pump-out, tanks must not be washed out or disinfected. They should be refilled with water to reduce odours and ensure stability of plumbing fixtures. A small residue of sludge will always remain and will assist in the immediate re-establishment
of bacterial action in the tank.

Householders should keep a record of their septic tank pump-outs and notify the local Council that a pump-out was undertaken in accordance with the Council Permit.

Septic tank failure

It is critical that a septic tank is not used as a rubbish receptacle. Septic tanks are designed solely for the treatment of water and organic materials. Items such as sanitary napkins, tampons, disposable nappies, cotton buds, condoms, plastic bags, stockings, clothing and plastic bottles will cause the septic tank to fail and require costly removal of these items. If a tank is contaminated or poisoned by household materials it should be pumped out immediately to enable the microbiological ecosystem to re-start. Without the removal of the scum and sludge, sewage biosolids will increasingly be discharged into the soil absorption
trenches and will eventually cause them to fail. This can force untreated sewage onto the ground surface and cause:

- noxious odours
- a boggy backyard
- a health hazard to the family, pets, visitors and neighbours from the pathogens in the sewage
- environmental degradation of the property, surrounding area and waterways from the nutrients, organic matter and
- other pollutants in the discoloured water, and
- a public health risk to drinking water supplies in potable water supply catchments.

Positive actions a property owner can take to help a septic tank function well:

- Use soapy water (made from natural unscented soap), vinegar and water or bi-carbonate of soda and water to clean toilets and other water fixtures and fittings.
- Read labels to learn which bathroom and laundry products are suitable for septic tanks. Generally plain, noncoloured, unscented and unbleached products will contribute to a well-functioning septic tank.

SEPTIC TANKS

(Source: Adapted from EPA Guideline for Onsite Wastewater Management (Appendix D: Septic Tanks))

- Use detergents with low levels of salts (e.g. liquid detergents), sodium absorption ratio, phosphorus and chlorine (see www.lanfaxlabs.com.au).
- Wipe oils and fats off plates and saucepans with a paper towel and dispose of in the kitchen compost bin.
- Use a sink strainer to restrict food scraps entering the septic system.
- Ensure no structures such as pavements, driveways, patios, sheds or playgrounds are constructed over the tank or absorption trench area.
- Ensure the absorption trench area is not disturbed by vehicles or machinery.
- Engage a service technician to check the sludge and scum levels, pumps and alarms annually.
- Keep a record of the location of the tank and the trenches and all maintenance reports (including the dates of tank pump-outs, tank inspections and access openings) and ensure the service technician sends a copy of the maintenance report to the local Council
- Have the tank desludged when the combined depth of the scum and sludge is equal to the depth of the middle clarified layer.

Indications of failing septic tanks and soil absorption trenches

- Seepage along effluent absorption trench lines in the soil
- Lush green growth down-slope of the soil absorption trench lines
- Lush green growth down-slope of the septic tank
- Inspection pits and/or the soil absorption trenches consistently exhibiting high water levels
- Soil absorption trench lines become waterlogged after storms
- General waterlogging around the land disposal area
- Presence of dead and dying vegetation (often native vegetation) around and down-slope of the land disposal areas
- A noxious odour near the tank and the land disposal area
- Blocked water fixtures inside the house, with sewage overflowing from the relief point
- High sludge levels within the primary tank (within about 150 mm of inlet pipe)
- Flow obstructed and not able to pass the baffle in the tank
- The scum layer blocking the effluent outflow.

Decommissioning treatment systems

Septic tanks

When a septic tank is no longer required it may be removed, rendered unusable or reused to store stormwater. The contents of the tank must first be pumped out by a sewage sludge contractor. The contractor must also hose down all inside surfaces of the tank and extract the resultant wastewater. Where the tank will no longer be used but will remain in the ground, the contractor must first disinfect the tank by spreading (broadcasting) hydrated lime over all internal surfaces in accordance with the WorkSafe safety precautions associated with using lime (i.e. wearing gloves, safety goggles and not using lime on a windy day).

Under no circumstances should anyone enter the tank to spread the lime or for any other reason, as vapours in confined spaces can be toxic.

A licensed plumbing practitioner must disconnect the tank from the premises and from the absorption trench system. The inlet and outlet pipes on the tank must be permanently sealed or plugged. To demolish a tank, the bottom of the tank is broken and then the lid and those parts of the walls that are above ground are collapsed into the tank. The tank is then filled with clean earth or sand.

Before a tank may be used to store stormwater a licensed plumbing practitioner must disconnect it from the premises and the trench system and connect an overflow pipe from the tank to the stormwater legal point of discharge. Before disinfecting the tank, it must be pumped out, the inside walls hosed down and then pumped out again. The tank is to be filled with fresh water and disinfected, generally with 100 mg/L of pool chlorine (calcium hypochlorite or sodium hypochlorite) to provide a resultant minimum 5 mg/L of free residual chlorine after a contact time of 30 minutes. However, advice should be obtained from a chemical supplier about safety precautions, dosage and concentrations to provide adequate disinfection for any tank. The chlorine is not to be neutralised, but be allowed to dissipate naturally for at least 1 week, during which time the water must not be used. Pumps may be installed to connect the tank to the irrigation system. The contents of the tank must not be used for any internal household purposes or to top-up a swimming pool. The water may only be used for garden irrigation. The tank and associated irrigation system must be labelled to indicate the water is unfit for human consumption in accordance with AS/NZS 3500: Plumbing and Drainage (Blue Mountains City Council 2008).

Secondary treatment systems

All treatment systems must be decommissioned by a licensed plumbing practitioner.

Appendix 9

Suitable Plants

SUITABLE INDIGENOUS PLANTS AND GRASSES *(Source: City of Greater Bendigo)*	
Botanical Name	**Common Name**
Large Shrubs	
Acacia dealbata*	Silver Wattle
Acacia mearnii*	Late Black Wattle
Acacia melanoxylon*	Blackwood
Acacia retinodes	Wirilda
Callistemon sieberi	River Bottlebrush
Dodonaea viscosa	Sticky Hop Bush
Hymenanthera dentata	Tree Violet
Melaleuca decussata	Totem Poles
Melaleuca lanceolata	Moonah
Melaleuca parvistamina*	Rough-barked Honey-myrtle
Melaleuca uncinata	Broom Honey-myrtle
Melaleuca wilsonii	Violet Honey-myrtle
Small Shrubs	
Indigofera australis	Austral Indigo
Goodenia varia	Sticky Goodenia
Grasses, Sedges and Rushes	
Carex appressa	Tall Sedge
Carex tereticaulis	Basket Sedge
Dianella longifolia	Smooth Flax-lily
Dianella revoluta	Black-anther Flax-lily
Eleocharis acuta	Common Spike-rush
Juncus pallidus	Pale Rush
Lomandra longifolia	Spiny-headed Mat-rush
Microlaena stipoides	Weeping Grass
Poa labillardierei	Common Tussock-grass

PLANTS AND GRASSESS *(Source: EPA Code of Practice – Septic Tanks (1996))*	
Botanical Name	**Common Name**
Phragmites australis	
Canna x generalis	Canna Lily, Calla Lily, ginger Lily
Acacia Howittii	Sticky Wattle
Callistemon citrinus	Crimson Bottlebrush
Callistemon macropunctatus	Scarlet Bottlebrush
Leptospermum lanigerum	Wooley Tea - tree
Melaleuca decussata	Cross-leaf Honey Myrtle
Melaleuca ericifolia	Swamp Paperbark
Melaleuca halmaturorum	Salt paperbark
Tamarix juniperina	Flowering Tamarisk
Eleocharis acuta	Cannas
	Common spike rush
	Buffalo
	Kikuyu
	Geranium
	Hydrangeas
	Tall wheat grass
	Strawberry clover
	White clover

Appendix 10

Use of Lime or Gypsum

USE OF LIME OR GYPSUM (Source: *Soils their properties and management (1994)* & *AS/NZS1547:2012*.)

Indications

Calcium compounds are used to improve soil structure.

Gypsum is effective at any soil pH < 8 but lime is preferred for soils with pH <5.5 as lime has additional benefits for plant growth.

Lime should not be used with soils of pH >6 as it is no longer soluble (making it ineffective).

Gypsum

A naturally occurring hydrated from of calcium sulphate: $CaSO_4 2H_2O$. It is also available as 'dump gypsum', a by-product of the manufacture of phosphoric acid.

Application rates of up to **5 tonne/hectare = 5kg/10 m² = 0.5kg/1 m²**. Ensure the product has been tested for flocculating potential as quality varies.

AS/NZS 1547:2012 - In dispersive soils, apply **gypsum at the rate of 1kg/m² to the bottom of the trench or bed** (L7.2). It is suggested gypsum will need to be applied again in 5 to 10 years (CL7.2).

Lime

A naturally occurring calcareous material: $CaCO_3$. Processed forms include hydrated lime, $Ca(OH)_2$ and burnt lime, CaO. Lime is used to improve soil structure in soils of pH <5.5 and may reduce soil acidity and associated manganese toxicity, aluminium toxicity, and improve molybdenum availability.

When the primary purpose is to reduce soil acidity a 'Lime Requirement Test' should be performed as the rate of lime required varies greatly depending on the soil type **from as little as 0.5 t/ha to over 10 t/ha**. Use a grade of lime with a fine particle size as it is more 'active' and incorporate lime into the top few centimetres of soil for best effect.