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Land Capability Assessment For Proposed Development

125 - 135 Argyle Street, Little River

March 2026

Version 1

Document Control

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Executive Summary

Our land capability assessment has established that the proposed site is acceptable for effluent disposal. We have judged the proposed allotment size of about 80,442 m² is acceptable under the City of Greater Geelong requirements for domestic wastewater disposal. Our land capability assessment has identified some critical constraints (soil permeability rate, land subject to inundation overlay and sodic / dispersive soils) that will need to be considered to enable safe and sustainable effluent disposal on site.

These constraints do not prevent the satisfactory completion of the proposed development however the effluent system does require appropriate planning and design. Subject to constraints and our recommendations the dispersal of wastewater on the development poses a low and manageable environmental risk.

A key constraint is the extent of inundation potentially affecting the site. We recommend review of 1 in 20 year AEP to determine the extent of inundation potentially affecting the site. With appropriate flood-protection measures and subsurface dispersal design, an OWMS remains feasible subject to approval by the floodplain management authority.

We recommend that the proposed household wastewater receive secondary treatment and that the treated effluent be dispersed by subsurface irrigation.

Secondary treatment is required to ensure that '20/30 standard' (i.e. 20 mg/l Biochemical Oxygen Demand and 30 mg/l Suspended Solids) effluent is produced prior to dispersal on the land by subsurface irrigation. Treatment of household wastewater to '20/30 standard' with treated wastewater dispersion by subsurface irrigation will maximise the potential for evapo-transpiration and minimise the risk of contamination of adjoining sites. This will maximise the likelihood for a safe and sustainable environmental outcome for the site and the surrounding sites.

The slow clay permeability rate can be mitigated by nominating a low design irrigation rate and installing shallow subsurface irrigation. The low irrigation rate will result in a larger capacity irrigation field to enable adequate distribution of waste water. We recommend irrigation lines are installed at a depth of 200mm below the existing surface level (in "A" horizon soil, loam soils).

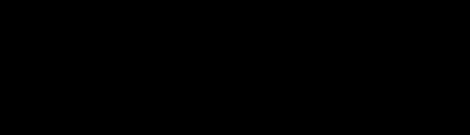
Based on water balance and nutrient balance calculations we recommend a minimum irrigation area of 240 m² be adopted and that the maximum bedroom size is limited to 2 bedrooms.

A rectangular shape (24m 10m) would be suitable to achieve the minimum irrigation area, however, this can be modified provided that the offsets requirements and minimum irrigation area is maintained.

The treated effluent field must be positioned in accordance with offset and siting requirements as outlined in section 6.6 of our report 'Effluent disposal area siting'.

We also recommend adding both lime and gypsum at a rate of 0.5 kg/m² to the base of excavations to assist sodicity, improve soil absorption and shrinkage characteristics of the underlying clay. We recommend re-application to the surface every 2-3 years due to long term leaching effects.

The installation of shallow stormwater cut-off drains around the perimeter of the subsurface irrigation field is recommended, as shown in Appendix E & F, to minimise localised stormwater accumulation and reduce the risk of soil saturation during rainfall events. These drains are intended only to manage minor surface water ponding and protect the hydraulic performance of the irrigation area. In accordance with EPA



Guidelines for Onsite Wastewater Management, the drains must be designed so they do not impede, divert, or modify natural floodplain behaviour within the Land Subject to Inundation Overlay. When designed appropriately, perimeter cut-off drainage can provide additional resilience to the effluent field without compromising floodplain function.

Guidance is given concerning the design and layout of a suitable system.

Final approval is subject to any specific policy requirements or other limiting environmental constraints not previously brought to our attention.

Important information concerning the limitations of our investigation and of this report as well as General Recommendations and Advice is given in section 7.

1. Introduction

[REDACTED] was commissioned by the client [REDACTED] to provide a Land Capability Assessment (LCA) report for the site.

The aims of the assessment were:

1. To assess various features of the site in their present condition in accordance with published standards and guidelines, principally various Septic Tanks Codes published by EPA Victoria and others.
2. Recommend an appropriate and environmentally sustainable treatment and disposal method for domestic wastewater.

2. Practitioner

3. Proposed Development

This report provides recommendations for a two bedroom residence. We expect that local council may require a "study" or other habitable room to be counted as a bedroom. If the building type is changed significantly this report may be inappropriate. Planning report is included in Appendix G.

4. Site Features

The subject site is on the north-west side of the street. The site is virtually flat. The site aspect is good with respect to exposure to sunshine and wind. Surface drainage is considered to be fair to good. The natural soil types comprise clays and weathered rock. Existing vegetation consists mainly of grasses in the proposed effluent disposal area. A satellite view of the site is presented in Figure 1.



Figure 1: Aerial photograph of the site and surrounding area, nearmap.com.

5. Testing Program And Results

5.1. Soil profile and geomorphology

Two (2) boreholes were assessed to investigate predominate soil types across the site. The visual and tactile estimation as outlined in the site and soil evaluation procedure AS1547:2012 was used to identify the relevant soil characteristics. Disturbed soil samples were sampled over the full depth of the soil profile and examined and classified. The soil profiles encountered were compared to soil descriptions in published reports, maps and charts from Department of Primary Industries (DPI) and other sources.

An experienced and qualified geotechnical engineer conducted a thorough geomorphological survey and visual appraisal of the site features the surrounding area to identify any important land features. Slope angles were measured with an inclinometer.

The resulting soil and land description is as follows:

Landform: Plains
Aust. Soil Classification: Grey Sodosol

Geology mapping with contours is presented in Figure 2. A description of the soils typically encountered during our drilling and sampling is presented on the attached sheet in Appendix B. Our testing in the vicinity of the proposed development area revealed minor fill is present at the site.

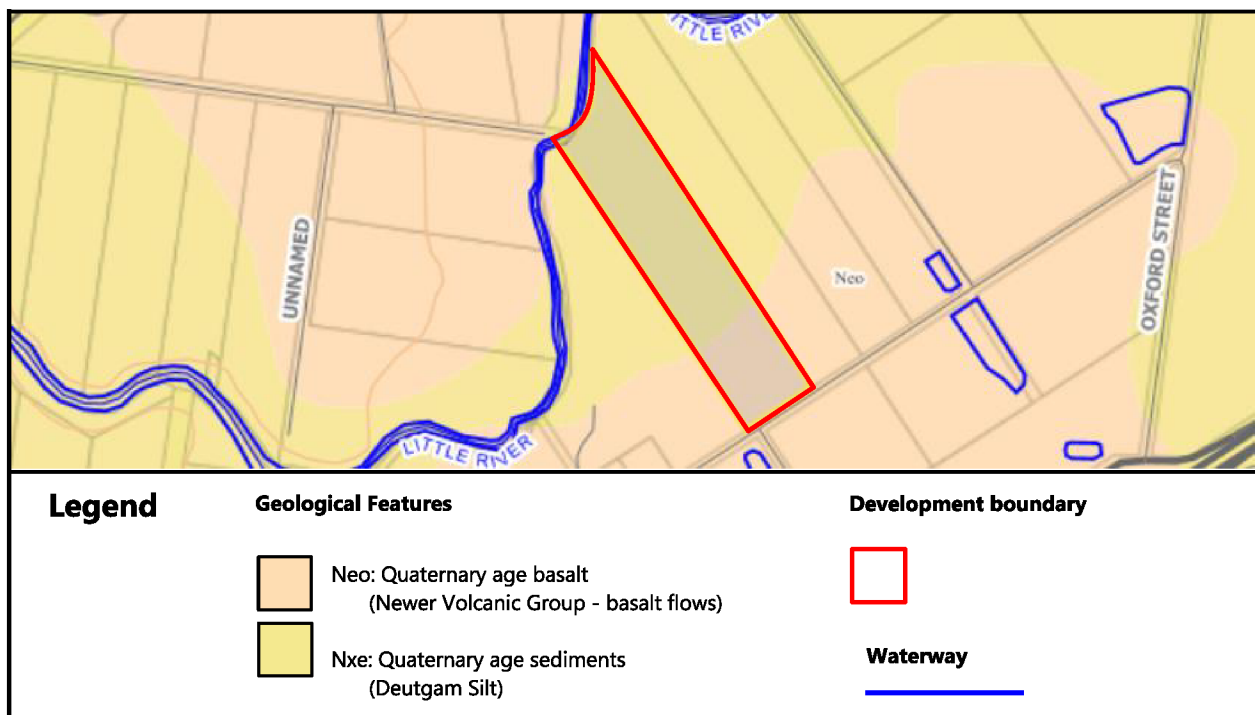


Figure 2: Site geology, source: geovic.vic.gov.au

Geological references indicate that the study area bridges over two differing geologies. The south-eastern portion is in an area of Quaternary age basalt Newer Volcanic Group - basalt flows described as olivine tholeiite, quartz tholeiite, basanite, basaltic icelandite, hawaiite, mugearite, minor scoria and ash. Whereas the north-western portion of the study area is in an area of Quaternary age sediments Deutgam Silt described as silt, minor sand and gravel.

5.2. Water table

There is limited published bore data available on permanent / transient water table for this area of Little River. No permanent or perched water table was encountered during testing however a transient perched water table may develop in very wet conditions above the clay layer. For this reason, it is important upslope and downslope cut-off drains are provided to prevent/reduce transient water flows near the effluent area.

5.3. Land assessment and constraints

Various features of the site were assessed in accordance with the guidelines of the EPA Publications and reported in accordance with constraint levels outlined in VLCA-2nd Ed. Field measurements and observations were made and where necessary, samples were returned to our laboratory for further analysis. The results are shown in Table 1.

Table 1: Land assessment

Land feature	Result	Level of Constraint	Mitigation
Buffer Distances	Buffer distances achievable. Refer to section 6.6 for relevant offset requirements	Nil	Treat to a minimum secondary treatment level '20/30 standard'
Climate	Median rainfall* Little River ~ 472 mm/yr, Median evaporation# Geelong North ~ 1,278 mm/yr	Minor	Evaporation exceeds rainfall in the wettest months. Adopt subsurface irrigation
Drainage	Proposed effluent area well drained	Minor	Use water-loving plants and cut-off drains
Erosion or Landslide Risk	No evidence of previous landslide or erosion on the site	Nil	Not Required
Exposure & Aspect	Good exposure to wind and sun: surrounding area consisting of open grassland	Nil	Not Required
Flooding	Flood overlay noted on site	Major	Position effluent disposal area outside the AEP 1 in 20 year inundation extent
Groundwater	Groundwater not evident above 1.30 m	Nil	Not Required
Imported Fill	Possible imported fill present on site	Minor	Not Required
Site Drainage	The site does not receive run-off and does not provides significant run-on	Minor	Not Required
Slope	<5%	Minor	Install cut-off drains (upslope and downslope) to reduce infiltration in LAA
Landform	A single landform exists on this site. No significant features were noted on/near the site	Nil	Not Required
Vegetation	Good grass cover	Nil	Not Required
Surface Waters	No watercourses / waterbodies within 100m	Nil	Adopt secondary treatment '20/30 standard'
Rock Outcrops	Not present	Nil	Not Required
Lot size	Considering the site constraints and proposed development size the allotment has sufficient area for effluent disposal	Minor	Adopt a maximum 2-bedroom dwelling to limit effluent load

* Closest / longest rainfall recording station record in the area.

Closest / longest evaporation recording station record in the area.

Based on the land assessment criteria, we have judged the land capability of the site is acceptable, provided constraints are addressed with corresponding and appropriate mitigation measures.

5.4. Soil assessment and constraints

An appraisal of the soil was conducted by visual and tactile estimation in accordance with the site and soil evaluation procedure as outlined in AS1547:2012 and reported in accordance with constraint levels outlined in VLCA-2nd Ed.

Based on our analysis we have determined the limiting geological stratum as strongly structured 'heavy clay'. As outlined in AS/NZS1547:2012 we have adopted an indicative permeability (K_{sat}) of 0.12 – 0.5 m/day and a drip irrigation rate of 2 mm/day for sub-surface irrigation.

Testing including pH, Emerson Class No. and salinity were also conducted and results are presented in Table 2.

Table 2: Soil assessment

Land feature	Result	Level of Constraint	Mitigation
Soil Depth	< 1.30 m*	Nil	Not Required
Soil Structure	Topsoil: weakly structured fine sandy loam (soil category 3, AS 1547:2012) Subsoil: strongly structured heavy clay (soil category 6, AS 1547:2012)	Moderate	Adopt a low DIR and shallow subsurface irrigation
Permeability	Limiting layer ~ 0.12 – 0.5 m/d	Moderate	Adopt a low DIR. Adopt shallow subsurface irrigation
Soil Plasticity	High shrink swell potential	Moderate	Consider ameliorate with addition of lime at a rate of 0.5 kg/m ²
Emerson	Topsoil: fine sandy loam (silty sand): N/A Subsoil: heavy clay (silty clay): Class 1, dispersion	Major	Ameliorate with addition of gypsum at a rate of 0.5 kg/m ²
Salinity	< 0.8 dS/m	Nil	Not Required
pH	7.0 (slightly acid)	Nil	Not Required

* Extremely weathered basalt generally evident at about 1.20 m.

Based on the above soil assessment criteria, we have judged the soil capability of the site is acceptable subject to relevant outlined mitigation procedures.

5.5. Wastewater volume

In accordance with the EPA Guidelines for Onsite Wastewater Management May 2024 and Australian Standard AS/NZS1547:2012 On-site Domestic Wastewater Management the following daily wastewater flows can be adopted:

Unlimited water supply with standard water fixtures (where a reticulated water supply is proposed)

Daily flow = (No of bedrooms + 1) x 180 litres per day

Unlimited water supply with full water reduction fixtures (where a reticulated water supply is proposed)

Daily flow = (No of bedrooms + 1) x 150 litres per day

Limited water supply (where water is sourced only from rain water collection from roofs)

Daily flow = (No of bedrooms + 1) x 120 litres per day

Given the location of the site, it is unlikely this site will be supplied with reticulated water supply for the foreseeable future.

We understand the proposed dwelling includes 2 bedrooms and on this basis, we recommend the estimated wastewater volume produced to be 360 L/day.

5.6. Land subject to inundation

We have identified the presence of a Land Subject to Inundation Overlay as a key site constraint. EPA Guidelines for Onsite Wastewater Management require effluent disposal areas to be located outside the 1 in 20-year AEP inundation extent. Based on experience with similar sites, we anticipate that updated AEP 1 in 20-year flood information from the relevant floodplain management authority or a private water engineering assessment may indicate a reduced flood extent across the subject land.

In accordance with EPA requirements, the proposed OWMS must incorporate appropriate flood-protection measures, including watertight AWTS components with sealed access risers, backflow prevention, and electrical controls positioned above the applicable flood protection level. Tanks must also be adequately anchored to prevent flotation during inundation.

Subsurface effluent dispersal remains a feasible option provided the design respects floodplain function, avoids areas of concentrated flood flow, and incorporates stormwater cut-off measures that do not impede natural flood behaviour. Final siting and acceptance of the OWMS should be reviewed and confirmed by the floodplain management authority in accordance with VPP Clause 13.03.

Based on the above considerations, we recommend that updated AEP 1 in 20-year flood data be obtained to confirm the applicable inundation extent for system siting.

6. Conclusions And Recommendations

Our land capability assessment has established that the proposed site is acceptable for effluent disposal. We have judged the proposed allotment size of about 80,442 m² is acceptable under the City of Greater Geelong requirements for domestic wastewater disposal.

We have identified some constraints (soil permeability rate, land subject to inundation overlay and sodic / dispersive soils) which will need to be considered to enable safe and sustainable on site effluent disposal. These constraints do not prevent the satisfactory completion of the proposed development however the effluent system does require appropriate planning and design.

Subject to constraints and our recommendations the dispersal of wastewater on the development poses a low and manageable environmental risk.

We recommend that the proposed household wastewater receive secondary treatment and that the treated effluent be dispersed by pressure compensated sub-surface irrigation. The use of pressure compensation is important for so that a constant flow rate is achieved throughout the effluent disposal area. This also results in better long-term performance of the irrigation lines and disposal field area.

Secondary treatment is required to ensure that '20/30 standard' (i.e. 20 mg/l Biochemical Oxygen Demand and 30 mg/l Suspended Solids) effluent is produced prior to dispersal on the land by subsurface irrigation. Treatment of household wastewater to '20/30 standard' with treated wastewater dispersion by subsurface irrigation will maximise the potential for evapo-transpiration and minimise the risk of contamination of adjoining sites. This will maximise the likelihood for a safe and sustainable environmental outcome for the site and the surrounding sites.

The slow clay permeability rate can be mitigated by nominating a low design irrigation rate and installing shallow subsurface irrigation. The low irrigation rate will result in a larger capacity irrigation field to enable adequate distribution of waste water. We recommend irrigation lines are installed at a depth of 200mm below the existing surface level (in "A" horizon soil, loam soils).

We also recommend adding both lime and gypsum at a rate of 0.5 kg/m² to the base of excavations to assist sodicity, improve soil absorption and reduce shrinkage characteristics of the underlying clay. We recommend re-application every 2-3 years due to long term leaching effects.

The installation of shallow stormwater cut-off drains around the perimeter of the subsurface irrigation field is recommended, as shown in Appendix E & F, to minimise localised stormwater accumulation and reduce the risk of soil saturation during rainfall events. These drains are intended only to manage minor surface water ponding and protect the hydraulic performance of the irrigation area. In accordance with EPA Guidelines for Onsite Wastewater Management, the drains must be designed so they do not impede, divert, or modify natural floodplain behaviour within the Land Subject to Inundation Overlay. When designed appropriately, perimeter cut-off drainage can provide additional resilience to the effluent field without compromising floodplain function.

6.1. Treatment system

Please note that sand filters are no longer accredited in Victoria, therefore '20/30 standard' can be achieved by using a powered aerated water treatment system (AWTS). Various AWTS are available on the market and these are generally the preferred method of treatment, note however that an AWTS may not be suitable where irregular or intermittent flows are likely such as from a holiday house.

All AWTS require a current EPA certificate of approval for operation. Regular maintenance of AWTS is essential to ensure correct performance and it is usually a requirement of the approval certificate that a service contract be maintained for the unit.

6.2. Intermittent Use Considerations

The proposed 2-bedroom dwelling may experience intermittent occupancy, resulting in variable inflows to the AWTS. EPA guidelines note that irregular or surge flows can reduce treatment performance; however, for small dwellings with modest daily flows, these impacts are typically low and can be managed through appropriate system selection and user practices.

A balance (surge) tank is generally only required where high short-term peak loads are expected, which is not anticipated for this development. The selected AWTS must be capable of operating effectively under low-flow and stop/start conditions, with features such as recirculation during non-occupancy. With appropriate sizing, regular maintenance, and sensible household water-use behaviour, the system can reliably accommodate intermittent use without requiring additional flow-balancing infrastructure.

6.3. Water balance model and nutrient balance model

A water balance and nutrient balance was prepared for the site with rainfall and evaporation data from the closest / longest data recording stations (refer Appendix D).

The water balance model was calculated using the following input data:

- Design wastewater flow: 2 bedroom residence – 360 L/day (from AS1547:2012)
- Precipitation – Little River ~ 472 mm/yr
- Evaporation – Geelong North ~ 1,278 mm/yr
- Crop factor – seasonally variable from 0.6 to 0.8
- Coefficient of runoff – 1.00

The nutrient balance model was calculated using the following input data:

- Design wastewater flow: 2 bedroom residence – 360 L/day (from AS1547:2012)
- Effluent Nitrogen Concentration – 25 mg/L
- Crop Nitrogen Uptake – 220 kg/ha/yr

6.4. Land application area for sub-surface irrigation

6.4.1. Disposal area size based on material type

Based on the material type and through interpretation of Table 5.1 & 5.2 in AS/NZS1547:2012 for “heavy clay”, the minimum irrigation area required to successfully disperse treated household wastewater based on the material type on the site is **180 m²**.

Note: these areas may need to be further modified dependant on water balance and nutrient balance calculations shown in section 6.4.2.

6.4.2. Disposal area size based on water balance model & nutrient balance model

Based on the water balance model and nutrient balance model (refer Appendix D) minimum required to successfully disperse treated household wastewater on the site is **235 m²** and **119 m²** respectively.

6.4.3. Minimum design effluent area for combined blackwater/greywater treatment

Based on our tests and calculations and using design irrigation rates from AS/NZS1547:2012 we have determined the following irrigation areas are required to successfully disperse treated household effluent for the proposed residence as shown in Table 3.

Table 3: Design sub-surface irrigation area for 2-bedroom residence

Calculation method	Irrigation area required
DIR from AS/NZS1547	180 m ²
Water balance model	235 m ²
Nutrient balance model	119 m ²

Our calculations have shown the water balance model is the critical factor in determining the irrigation area and on this basis we recommend a minimum irrigation area of **240 m²**.

A rectangular shape (24m 10m) would be suitable to achieve the minimum irrigation area, however, this can be modified provided that the offsets requirements and minimum irrigation area is maintained.

6.5. Effluent disposal system design

It is beyond the scope of this report to provide a detailed design specific layout of the treatment and disposal system. We recommend that an experienced contractor or consultant be engaged to design and install the system. The AWTS manufacturer may be able to provide this service.

Typical subsurface irrigation system layouts and cross sections are shown on Appendix E & F (by way of example only).

Stormwater and roof runoff water must be diverted around the disposal field to an appropriate point of discharge for stormwater.

Uneven effluent distribution is a significant factor in AWTS failure. We recommend that the capacity of the pump is verified prior to installation to select the adequate pump and ensure a uniform irrigation of the effluent.

6.5.1. Sub-surface irrigation

The irrigation system must use pressure compensation and irrigation lines especially designed for wastewater and should incorporate features such as filters to prevent clogging, vacuum breaker valves to prevent air and soil being drawn into the lines, flushing valves to assist in periodic maintenance etc. Trenches for irrigation lines should be properly backfilled and the irrigation area should be left as undisturbed as possible before and after construction and must be protected from traffic by vehicles.

The installation of shallow stormwater cut-off drains around the perimeter of the subsurface irrigation field is recommended to minimise localised stormwater accumulation and reduce the risk of soil saturation during rainfall events. Drains should include lined agriculture drains and backfilled with free draining coarse aggregate.

Sub-surface irrigation drippers must be permanently fixed to distribution lines buried at least 200mm deep.

6.6. Effluent disposal area siting

We have judged there are no specific restrictions on the effluent disposal siting, notwithstanding minimum offset requirements presented below.

The effluent disposal area for secondary treated effluent must be located as follows:

1. In an area not subject to vehicular traffic.
2. No closer than 1.5m on the low side or 3.0m on the high side of a property boundary / building.
3. No closer than 1.5m from a gas or water pipe.
4. No closer than 3.0m from a swimming pool or closed stormwater drain.
5. No closer than 7.5m from an underground tank.
6. No closer than 15m from a cutting or escarpment.
7. No closer than 30m from an open stormwater drain.
8. No closer than 20m from a non-potable groundwater bore.
9. No closer than 30m from a dam, stream or channel (non-potable).
10. No closer than 100m from a stream or river in a potable water supply catchment.

The effluent disposal area must be permanently dedicated and marked with at least two clear warning signs.

Our analysis has shown there is sufficient available land for effluent disposal, as shown in Appendix A.

6.7. Reserve field

The EPA Septic Tanks Code of Practice requires that provision for a "reserve" effluent disposal field in the event that the primary disposal field fails, proves to be inadequate or needs to be rested. The reserve field must be not less than the size of the primary field and must be located on the site in compliance with all the minimum setback distances etc. as described above.

Note that a reserve field is not required for wastewater that has been treated to '20/30 standard', as is proposed for this site.

6.8. Vegetation cover

Efficient effluent disposal assumes good vegetative cover. Therefore, it is recommended to establish and maintain grasses over distribution lines, with suitable trees and shrubs in the spaces between the lines. Such vegetation can significantly assist the overall disposal process by transpiration from leaves and by maintaining soil permeability through fine root channels. Refer to section 7 for additional information and indicative list of suitable plant species.

6.9. Drainage management

Careful attention to drainage is essential to reduce risk of system failure. Surface water must therefore be prevented from ponding anywhere on or near the site.

We recommend installation of upslope cut-off drains above and below the effluent disposal area with run-off directed to the legal point of discharge.

The drains must be positioned and constructed with sufficient fall to discharge completely to prevent water from accumulating in the soil anywhere near the buildings. Any blockages must be cleared and repaired promptly.

Care must also be taken to ensure that all levelled areas (vehicle parking bays, recreation areas etc.) have a slight fall ($\geq 2^\circ$) to prevent surface water from ponding or seeping into the ground and diverted away from the buildings.

6.10. Management, monitoring, care and operation

To ensure the system consistently achieves the minimum '20/30 standard' (i.e. 20 mg/l Biochemical Oxygen Demand and 30 mg/l Suspended Solids), the aerated wastewater treatment system (AWTS) must be operated, monitored, and maintained in accordance with EPA Victoria's Onsite Wastewater Management Framework and the system's Certificate of Approval.

Secondary treatment is required so that '20/30 standard' effluent is finally produced prior to dispersal on the land by subsurface irrigation. Treatment of household wastewater to '20/30 standard' with dispersal of the treated wastewater by subsurface irrigation will maximise the potential for evapo-transpiration and minimise the risk of contamination of adjoining sites. This will ensure a sustainable environmental outcome for the site and the surrounding sites.

The AWTS requires quarterly servicing (every 3 months) by an EPA-accredited service technician, with maintenance records kept and provided to Council upon request. Routine monitoring must confirm that:

- The aeration chamber is functioning effectively, with adequate dissolved oxygen levels and stable aerobic treatment performance.
- The irrigation pump and control floats are operating correctly and free from damage.
- The disinfection unit (e.g., chlorine, UV, or other approved method) is functioning where applicable, with correct dosing and sufficient residual disinfectant (chlorine systems).
- No solids carry-over is occurring from primary to secondary chambers.
- The irrigation field is performing properly with no surface ponding, leakage, odour, or blockage.
- Sludge accumulation is assessed annually and the tank desludged every 3–5 years, or as advised by the service technician.

The following guidelines regarding the care and operation of AWTS as recommend in the EPA Septic Tanks Code of Practice:

- Restrict germicides such as strong detergents, disinfectants, toilet clears with high acid content, nappy sanitisers, bleaches etc. that are likely to kill bacteria and affect the operation of the septic system,
- Use cleaning products, detergents etc. sparingly and check their suitability for septic tank systems,
- Use detergents with low levels of salt, phosphorus and chlorine. Detergents with low phosphorus and sodium are best suited for septic tanks and the environment. For more information regarding detergents we highly recommend visiting Lanfax Laboratories at lanfaxlabs.com.au under "Laundry Products Research" and click the downloadable "laundry brochure".
- Do not flush sanitary napkins, disposable nappies or similar products into the system,
- Minimise the amounts of oil and fat washed into the system,
- Use a sink strainer to restrict food scrapes entering system,
- Do not use garbage disposal units,
- Where odours occur, we recommend flushing approximately one cup of lime each day,
- Grease trap should be checked for blockages and pumped every 6-12 months,
- Do not modify the system without council approval,
- Conserve water.

Consistent with Part 5.7 of the Environment Protection Regulations 2021, new ongoing obligations on a person in management or control of an onsite wastewater management system, including "an obligation to operate the system correctly, maintain it in good working order, and ensure it does not overflow." This includes a duty to keep maintenance records (and provide them to councils when requested), and "a duty to notify a council as soon as practicable if the system poses a risk of harm to human health or the environment or is otherwise not in good working order."

Special attention should be taken to potential failures, especially in older septic systems. New environmental regulations require landowners and occupiers reporting to council any signs of failure and provide details of corrective measures taken to fix the problem. Warning signs of failure may include:

- The irrigation field becoming wet with wastewater pooling on the surface
- Wastewater runoff from the disposal area
- Smell of effluent near or from the system
- Drains or toilets running slowly
- Grease trap being full or blocked
- Alarms or warning lights on the control panel
- Excess sludge or solids in inspection chambers

7. Report Limitations

The purpose of this report is to determine the capability of the site to contain effluent with regard to the soil and land constraints. It is beyond the scope of this report to provide specific effluent system design. Where any variation or anomalies are encountered, we recommend additional investigation and reporting by us to resolve any potential issues.

This report has been prepared by qualified persons and based on current available standards.

Recommendations are based on information regarding the site and development type provided by the [REDACTED]. If information supplied is not accurate or if significant changes are required our report may be inappropriate. We cannot accept responsibility for significant changes and anticipate additional fees should further tests or report update be required.

We have prepared this report for this project at 125 - 135 Argyle Street, Little River in accordance with the scope of works provided by the client. This report has been prepared for the sole use of Marian Magri or authorised agents. Therefore, it should not be used for any other different purpose or used by a non-authorised agent or third party.

Whilst care has been taken to accurately report on the sub-surface conditions across the site it is not possible to anticipate unexpected sub-surface variations given the limited testing performed. Therefore, further testing may be required where significant variations on sub-surface conditions are encountered.

[REDACTED] does not accept responsibility for our report where it has been altered or not reproduced in full, including addendum.

Changes in legislative policy may require report update or additional testing.

7.1. General Comments

Dimensions, slope, test locations are approximate only and must not be used for calculation of positioning.

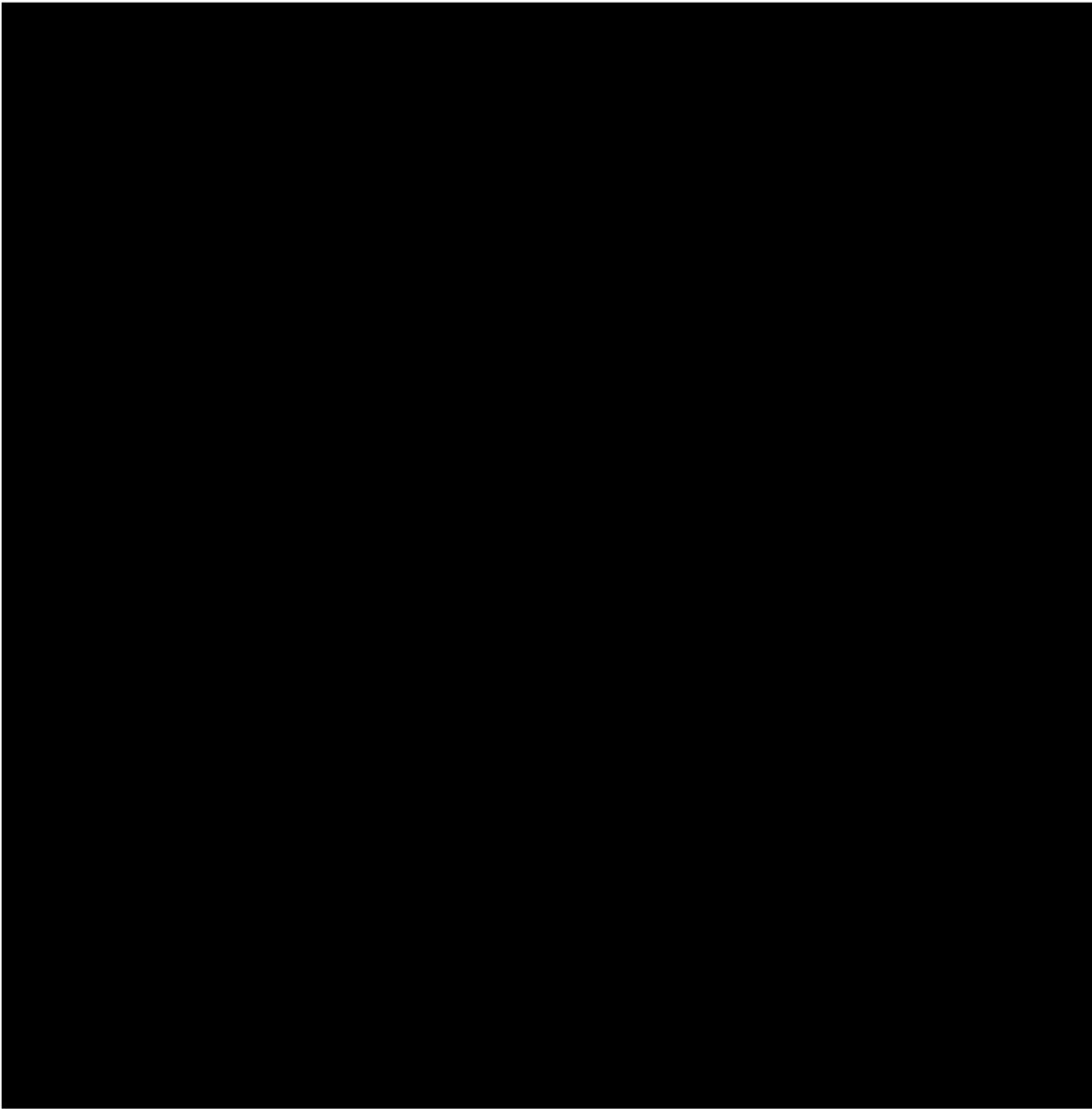
Offset distance to septic tanks or any subsurface excavations must not exceed the minimum angle of repose for the in-situ naturally occurring soil. We estimate the maximum angle of repose for sand is 30 and 45 for clay soils. We do not recommend steeper angles unless competent rock is encountered.

7.2. Vegetation For Transpiration

Good vegetative cover is important to achieve effective transpiration of effluent disposal. It is therefore recommended to establish and maintain good grass cover over distribution areas and suitable shrubs or trees between distribution lines. Where trees are planted near drainage line, difficulties with root invasion can be anticipated. We do not recommend planting crops in disposal area.

The following list includes some suitable water tolerant plants:

Botanical Names	Common Names
<i>Phragmites australis</i>	
<i>Canna x generakis</i>	Canna Lily, Calla Lily, Ginger Lily
<i>Acacia Howittii</i>	Sticky Wattle
<i>Callistemon citrinus</i>	Crimson Bottlebrush
<i>Callistemon macropunctatus</i>	Scarlet Bottlebrush
<i>Leptospermum lanigerum</i>	Wooley Tea-Tree
<i>Melaleuca decussate</i>	Cross Honey Myrtle
<i>Melaleuca ericifolia</i>	Swamp Paperbark
<i>Melaleuca halmaturorum</i>	Salt paperbark
<i>Tamarix juniperina</i>	Flowering Tamarisk
<i>Eleocharis acuta</i>	Cannas
	Common Spike-Rush
	Buffalo / kikuyu
	Geranium
	Hydrangeas
	Tall wheat grass
	Strawberry Clover, White Clover
	Perennial Rye
	Bougainvillea



References

Australian Soil Resource Information System (ASRIS). Accessed Nov 2022 <https://www.asris.csiro.au>

Australian Standard AS/NZS1547:2012 On-site Domestic Wastewater Management, Standards Australia, 2012

Australian Standard AS1726-2017 Geotechnical site investigations, Standards Australia, 2017

City of Greater Geelong Onsite Wastewater Management Plan - 2013 Code of Practice

Environment Protection Act 2017, No. 47/2021, May 2022

EPA Publication Guideline for Onsite Wastewater Management, May 2024

EPA Publication Guideline for Onsite Wastewater Effluent Dispersal and Recycling Systems, May 2024

EPA Publication 891.4 Code of Practice - Onsite Wastewater Management, July 2016

EPA Publication 746.1 Land Capability Assessment for Onsite Domestic Wastewater Management, March 2003

EPA Publication 1976 Guidance for Owners & Occupiers of land with an OWMS $\leq$ 5000 litres on any day (including septic tank systems), May 2021

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Google Earth. Accessed March 2026 <https://earth.google.com/web/>

Nearmap, nearmap.com. Accessed March 2026 <https://au.nearmap.com/>

Victorian Land Capability Assessment Framework, VLCA-2nd Ed, January 2014



Appendix A

Site Plan

Site Plan

- Notes:**
- General**
- 1. Dimensions and areas shown are approximate only.
 - 2. Actual location of boreholes was determined by the presence of underground services, drainage assets, property access and structures present in the site.
 - 3. The envelope location is indicative only.
 - 4. Effluent disposal envelopes must be in accordance with the minimum setbacks in the St Quentin Consulting Land Capability Assessment.
 - 5. Disposal area shape can be modified provided that the offsets requirements and minimum irrigation area is maintained
- Subsurface Irrigation**
- 1. Disposal area shape can be modified provided that the offsets requirements and minimum irrigation area is maintained.



- Legend:**
- Borehole Locations
 - Development Area
 - Site slope
 - Suitable area
 - Min. disposal area
 - Setback distance
 - LSIO
 - Groundwater bh
 - Watercourse / waterbody

Site Plan

Location: 125 - 135 Argyle Street
Little River, Victoria

Source: Nearmap.com - Aug-2025

Project No: 18669G-LCA

Inv. date: 2/09/2025

Drawing No: 1

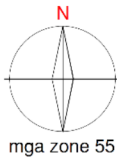
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Drawn by: O.R.

Date: 11/03/2026

Approved by: C.F.

Date: 11/03/2026



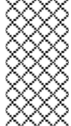


Appendix B

Borehole Logs

Soil and Rock Symbols

Soil and Rock Descriptions

BOREHOLE LOG									
Client: [REDACTED]			Project No.: 18669G-LCA				Sheet: 1 of 1		
Location: 125 - 135 Argyle Street Little River, Victoria			Borehole No: BH 1				Logged by: O.R.		
			Inv. Date: 2/09/2025				Checked by: C.F.		
Depth (metres)	Graphic Log	Material Description Type, Plasticity, Colour, Particle characteristics	Soil Texture	Structure	Consistency / Density	Moisture	Sample / Test	Test Results	Geology and additional observations
0.2		Silty Sand FILL (Fine Sandy Loam) Brown, loose, moist Single grained structure	FSL	We	D	M			Fill
0.3		Silty CLAY (Heavy Clay) Brown mottled orange, some yellow Strongly structured Stiff, slightly moist	HC	Str	St	SM			Quaternary age Basalt Newer Volcanic Group (Neo)
0.6		Becoming grey with depth							
0.8									
0.9		BASALT (Heavy Clay) Light grey Low strength Extremely weathered	HC	Str	H	SM			
1.2		Borehole 1 refused at 1.2m on slightly weathered basalt							
1.4									
1.5									
1.7									
moisture:		Degree of Weathering		Consistency/density:		Structure		Method:	
D Dry		RS Residual Soil		VS very soft		Ma Massive		☐ Hand Auger	
SM Slightly Moist		XW Extremely Weathered Rock		S soft		SG Single grained		☒ Auger Drilling	
M Moist		HW Highly Weathered Rock		F firm		We Weak		☐ Roller/Tricone	
W Wet		MW Moderately Weathered Rock		St stiff		Mo Moderate		☐ Washbore	
Sat Saturated		SW Slightly Weathered Rock		VSt very stiff		Str Strong		☐ Non Destructive Digging	
		FR Fresh Rock		H hard					
				VD very dense					

BOREHOLE LOG



Client: [REDACTED]

Project No.: 18669G-LCA

Sheet: 1 of 1

Location: 125 - 135 Argyle Street

Borehole No: BH 2

Logged by: O.R.

Little River, Victoria

Inv. Date: 2/09/2025

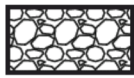
Checked by: C.F.

Depth (metres)	Graphic Log	Material Description Type, Plasticity, Colour, Particle characteristics	Soil Texture	Structure	Consistency / Density	Moisture	Sample / Test	Test Results	Geology and additional observations	
0.2		Silty Sand FILL (Fine Sandy Loam) Brown, loose, moist Single grained structure	FSL	We	D	M			Fill	
0.3		Silty CLAY (Heavy Clay) Brown mottled orange, some yellow Strongly structured Stiff, slightly moist	HC	Str	St	SM			Quaternary age Basalt Newer Volcanic Group (Neo)	
0.5		Becoming grey with depth								
0.6										
0.8										
0.9		BASALT (Heavy Clay) Light grey Low strength Extremely weathered	HC	Str	H	SM				
1.1										
1.2										
1.3										
1.4		Borehole 2 refused at 1.3m on slightly weathered basalt								
1.5										
1.6										
1.7										
moisture:		Degree of Weathering		Consistency/density:			Structure		Method:	
D	Dry	RS	Residual Soil	VS	very soft	Fb	friable	Ma	Massive	☐ Hand Auger
SM	Slightly Moist	XW	Extremely Weathered Rock	S	soft	VL	very loose	SG	Single grained	☒ Auger Drilling
M	Moist	HW	Highly Weathered Rock	F	firm	L	loose	We	Weak	☐ Roller/Tricone
W	Wet	MW	Moderately Weathered Rock	St	stiff	MD	medium dense	Mo	Moderate	☐ Washbore
Sat	Saturated	SW	Slightly Weathered Rock	VSt	very stiff	D	dense	Str	Strong	☐ Non Destructive Digging
		FR	Fresh Rock	H	hard	VD	very dense			

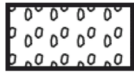
GEOLOGICAL SYMBOLS FOR SOIL AND ROCK



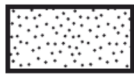
SOILS



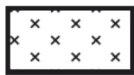
Boulders & Cobbles



Gravel



Sand



Silt



Clay



Peat

FILL



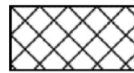
Asphalt / Sprayed Seal



Crushed Rock



Concrete



Fill

METAMORPHIC ROCKS



Coarse grained

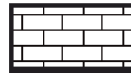


Medium grained

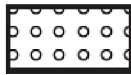


Fine grained

SEDIMENTARY ROCKS



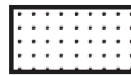
Limestone



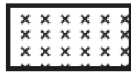
Conglomerate



Breccia



Sandstone



Siltstone



Mudstone



Coal

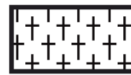


Tuff

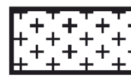


Gypsum

IGNEOUS ROCKS



Coarse grained

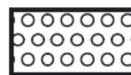


Medium grained



Fine grained

WEATHERED ROCK



Weathered profile

SOIL DESCRIPTIONS - Explanation Sheet (1 of 2)

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726:2017 Geotechnical Site Investigations. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Fraction	Component	Subdivision	Size (mm)
Oversize	Boulders		> 200
	Cobbles		63 - 200
Coarse Grained Soil	Gravel	Coarse	19 - 63
		Medium	6.7 - 19
		Fine	2.36 - 6.7
	Sand	Coarse	0.6 - 2.36
		Medium	0.21 - 0.6
		Fine	0.075 - 0.21
Fine Grained Soil	Silt		0.002 - 0.075
	Clay		< 0.002

Soil Geological Origin

Weathered in place soils:

- Residual soil: Formed from in-situ weathering of the underlying rock, no visible structure or fabric of parent rock;
- Extremely weathered material: Formed directly from in-situ weathering of the underlying rock, visible structure or fabric of parent rock

Transported soil:

- Alluvial soil: River and stream deposits
- Estuarine soil: Tidal river and stream deposits
- Marine soils: Marine deposits
- Lacustrine soil: Freshwater lake deposits
- Aeolian soil: Wind deposits
- Colluvial soil: Soil and rock debris transported down slopes by gravity
- Topsoil: Surface and/or near-surface soil defined by high levels of organic material
- Fill: Any soil moved by man

Moisture Condition

Term	Description
Dry	Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through hands.
Moist	Soil feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	As for moist but with free water forming on hands when handled.

Soil Structure

Term	Description
Zoning	
Layer	Continuous across exposure or sample
Lens	Discontinuous layers of lenticular shape
Pocket	Irregular inclusions of different material
Interbedded	Layers of alternating soil types are too thin to describe individually
Cementing	
Weakly cemented	Easily broken up by hand in air or water.
Moderately cemented	Effort is required to break up the soil by hand in air or water

Fine Grained (Cohesive) Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength terms are defined as follows:

Consistency	Abbreviation	Indicative undrained shear strength (kPa)
Very soft	VS	≤ 12
Soft	S	> 12 and ≤ 25
Firm	F	> 25 and ≤ 50
Stiff	St	> 50 and ≤ 100
Very Stiff	VSt	> 100 and ≤ 200
Hard	H	> 200

Secondary Soil Components

The proportions of secondary constituents of soils are described as:

Designation of components	% Sand/gravel	Terminology
Minor	≤ 15	Add 'trace'
	> 15, ≤ 30	Add 'with sand/gravel'
Secondary	> 30	Prefix soil name as 'sandy' or 'gravelly'

SOIL DESCRIPTIONS - Explanation Sheet (2 of 2)

Plasticity of fine grained soils:

Descriptive term	Range of liquid limit for silt	Range of liquid limit for clay
Non-plastic	Not applicable	Not applicable
Low plasticity	≤ 50	≤ 35
Medium plasticity	Not applicable	> 35 and ≤ 50
High plasticity	> 50	> 50

Coarse Grained (Cohesionless) Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density. The relative density terms are given below:

Density	Abbreviation	Density Index (%)
Very loose	VL	≤ 15
Loose	L	> 15 and ≤ 35
Medium Dense	MD	> 35 and ≤ 65
Dense	D	> 65 and ≤ 85
Very dense	VD	> 85

Secondary Soil Components

The proportions of secondary constituents of soils are described as:

Designation of components	% Fines	Terminology	% Accessory coarse fraction	Terminology
Minor	≤ 5	Add 'trace clay/silt'	≤ 15	Add 'trace clay/silt'
	> 5 , ≤ 12	Add 'with clay/silt'	> 15 , ≤ 30	Add 'with sand/gravel'
Secondary	> 12	Prefix soil name as 'silty' or 'clayey'	> 30	Prefix soil name as 'sandy' or 'gravelly'

Particle characteristics of coarse grained soils:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

ROCK DESCRIPTIONS - Explanation Sheet (1 of 2)

Rock Strength

Rock strength is defined by the Point Load Strength Index ($I_{s(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $I_{s(50)}$ (MPa)	Approximate Unconfined Compressive Strength (MPa)
Very Low Strength	VL	> 0.03 and $\leq$ 0.1	> 0.6 and $\leq$ 2
Low Strength	L	> 0.1 and $\leq$ 0.3	> 2 and $\leq$ 6
Medium Strength	M	> 0.3 and $\leq$ 1	> 6 and $\leq$ 20
High Strength	H	> 1 and $\leq$ 3	> 20 and $\leq$ 60
Very High Strength	VH	> 3 and $\leq$ 10	> 60 and $\leq$ 200
Extremely High Strength	EH	> 10	> 200

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Residual soil	RS	Material has soil properties, i.e. it can be remoulded and classified as a soil. Texture of the original rock is no longer visible.
Extremely weathered	XW	Rock has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still visible.
Highly weathered	HW	Colour and strength of original fresh rock is not recognisable. Porosity and strength may be altered as a result of leaching or deposition of weathering products in pores.
Moderately weathered	MW	Rock is discoloured, usually by iron staining
Slightly weathered	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock
Fresh Rock	FR	Rock shows no signs of decomposition or staining

Guide to Naming Sedimentary Rocks

Grain size (mm)	Deposited rock type		At least 90% of rock is carbonate		Ejected from a volcano
			Low porosity	Porous	
> 2	Conglomerate (rounded grains)		Limestone or Dolomite		Agglomerate (rounded grains)
	Breccia (angular / irregular fragments)			Calcirudite	Volcanic Breccia (angular / irregular fragments)
0.06 - 2	Sandstone			Calcarenite	Tuff
0.002 - 0.06	Mudstone	Siltstone		Calcisiltite	Fine Grained Tuff
< 0.002		Claystone		Calcilutite	

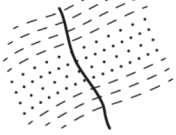
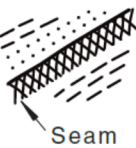
Guide to Naming Igneous Rocks

Grain size (mm)	Massive crystalline		
	Much quartz (felsic)	↔	Little quartz (mafic)
Coarse (> 2)	Granite	Diorite	Gabbro
Medium (0.06 – 2)	Microgranite	Microdiorite	Dolerite
Fine (< 0.06)	Rhyolite	Andesite	Basalt

ROCK DESCRIPTIONS - Explanation Sheet (2 of 2)**Guide to Naming Metamorphic Rocks**

Grain size (mm)	Foliated	Non-foliated
Coarse (> 2)	Gneiss: Well developed but often widely spaced foliation	Marble: Crystalline calcium carbonate
Medium (0.06 – 2)	Schist: Well developed with much mica	Quartzite: Fused quartz grains
Fine (< 0.06)	Phyllite: Slightly undulose foliation Slate: Well developed planar cleavage	Serpentine: Usually grey and green Hornfels: Fine grained rock formed by thermal metamorphism

Rock Defect Types

Type	Sub-type	Definition	Diagram
Parting		A surface or crack across which the rock has little or no tensile strength. Parallel or sub parallel to layering (e.g. bedding) or a planar anisotropy in the rock substance (e.g. cleavage). May be open or closed.	
Joint		A surface or crack with no apparent shear displacement and across which the rock has little or no tensile strength, but which is not parallel or sub-parallel to layering or to planar anisotropy in the rock material. May be open or closed.	
Sheared surface		A near planar, curved or undulating surface which is usually smooth, polished or slickensided and which shows evidence of shear displacement.	
Sheared zone		Zone of rock material with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge-shaped blocks.	
Seams	Sheared	Seam of soil material with roughly parallel almost planar boundaries, composed of soil material with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some defects are usually curved and intersect to divide the mass into lenticular or wedge-shaped blocks.	
	Crushed	Seam of soil material with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock substance which may be more weathered than the host rock. The seam has soil properties.	
	Infilled	Seam of soil material usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint, infilled seams less than 1mm thick may be described as veneer or coating on joint surface.	
	Extremely weathered	Seam of soil material, often with gradational boundaries. Formed by weathering of the rock material in place.	



Appendix C

Site Photographs

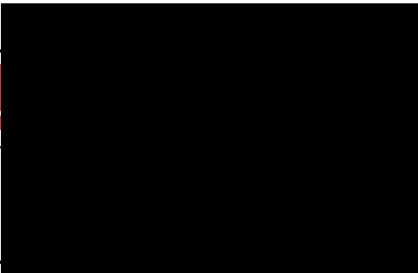
125 - 135 Argyle Street - Photographs



Photo 1: Existing shed and proposed effluent disposal field.



Photo 2: Existing site conditions, view west from borehole 2 location.



Title: Photographs
Locality: 125 - 135 Argyle Street
Little River, Victoria

Project No: 18669G-LCA
Prepared by: O.R.
Date: 11/03/2026

125 - 135 Argyle Street - Photographs



Photo 3: Excavated material from borehole 1.



Photo 4: Excavated material from borehole 2.

	Title: Photographs Locality: 125 - 135 Argyle Street Little River, Victoria	Project No: 18669G-LCA Prepared by: O.R. Date: 11/03/2026
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Appendix D

Water Balance & Nutrient Balance Models

VICTORIAN LAND CAPABILITY ASSESSMENT FRAMEWORK					
WATER BALANCE MODEL - SUBSURFACE IRRIGATION					
		Location: 125 - 135 Argyle Street Little River, Victoria		Project No.: 18669G-LCA Date: 11/03/2026	

IRRIGATION AREA SIZING USING NOMINATED AREA WATER BALANCE FOR ZERO STORAGE		
INPUT DATA		
Number of bedrooms:	2	Actual number of bedrooms of proposed building
Design flow rate:	120 L/person.day	Limited (water sourced only from rain water collection) or unlimited (reticulated water supply proposed)
Design Wastewater Flow (Q):	360 L/day	Based on maximum potential occupancy and derived from Table 4.1 of Guideline for onsite wastewater management, 2024
Design Irrigation Rate (DIR):	2.0 mm/day	Based on soil texture class/permeability and derived from 4.8 of Guideline for onsite wastewater management, 2024
Minimum Irrigation Area:	180 m ²	Based on material type and through interpretation of Table 5.1 & 5.2 of AS/NZS 1547:2012
Crop Factor (C):	0.4-1.0	Estimates evapotranspiration as a fraction of pan evaporation, Table 20 of Guideline for onsite wastewater management, 2024
Rainfall Runoff Factor (RF):	1.00	Proportion of rainfall that remains onsite and infiltrates, allowing for any runoff
Rainfall Data:	Little River (87033)	BoM Station and number or 70th Percentile from Council Specific Data
Pan Evaporation Data:	Geelong North	BoM Station and number or 70th Percentile from Council Specific Data

Parameter	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	27.2	27.3	24.2	33	37.2	33.8	33	38.6	41.8	44.7	39.4	36.2	472
Evaporation (E):		mm/month	198.4	165.2	130.2	84	58.9	45	46.5	58.9	78	108.5	135	182.9	1277.5
Crop Factor (C):		unitless	0.7	0.7	0.7	0.6	0.5	0.45	0.4	0.45	0.55	0.65	0.7	0.7	
OUTPUTS															
Evapotranspiration (ET):	E x C	mm/month	139	116	91	50	29	20	19	27	43	71	95	128	826.82
Percolation (B):	DIR x D	mm/month	62	56	62	60	62	60	62	62	60	62	60	62	730
Outputs:	ET + B	mm/month	200.9	171.6	153.1	110.4	91.5	80.3	80.6	88.5	102.9	132.5	154.5	190.0	1556.8
INPUTS															
Retained Rainfall (RR):	R x RF	mm/month	27.2	27.3	24.2	33	37.2	33.8	33	38.6	41.8	44.7	39.4	36.2	416.4
Applied Effluent (W):	(Q x D) / L	mm/month	46.5	42	46.5	45	46.5	45	46.5	46.5	45	46.5	45	46.5	547.5
Inputs:	RR+W	mm/month	73.7	69.3	70.7	78.0	83.7	78.8	79.5	85.1	86.8	91.2	84.4	82.7	963.9
STORAGE CALCULATION															
Storage remaining from previous month		mm/month	0	0	0	0	0	0	0	0	0	0	0	0	
Storage for the month (S):	(RR+W)-(ET+B)	mm/month	-127.2	-102.3	-82.4	-32.4	-7.8	-1.5	-1.1	-3.4	-16.1	-41.3	-70.1	-107.3	
Cumulative Storage (M):		mm	0	0	0	0	0	0	0	0	0	0	0	0	
Max. Storage for Nominated Area (N):		mm	0												
Max. Volume for Nominated Area (V):	N x L	L	0												
LAND AREA REQUIRED FOR ZERO STORAGE		m ²	64	70	87	140	206	233	234	224	177	127	94	73	
MINIMUM AREA REQUIRED FOR ZERO STORAGE:			235 m²				NOMINATED LAND APPLICATION AREA (L) :				240 m²				

VICTORIAN LAND CAPABILITY ASSESSMENT FRAMEWORK**NUTRIENT BALANCE MODEL - SUBSURFACE IRRIGATION**

Location: 125 - 135 Argyle Street
Little River, Victoria

Project No.: [REDACTED]
Date: 11/03/2026

LAND APPLICATION AREA REQUIRED BASED ON NITROGEN BALANCE**INPUT DATA¹**

Wastewater Loading			Nutrient Crop Uptake					
Hydraulic Load	360	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	1800	mg/day						
Remaining N Load after soil loss	7200	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		119	m ²	Nominated LAA Size from Water Balance	240	m ²
				Predicted N Export from LAA	-2.65	kg/year
				Minimum Buffer Required for excess nutrient	0	m ²

MINIMUM AREA REQUIRED FOR ZERO BUFFER: 119 m²

NOTES

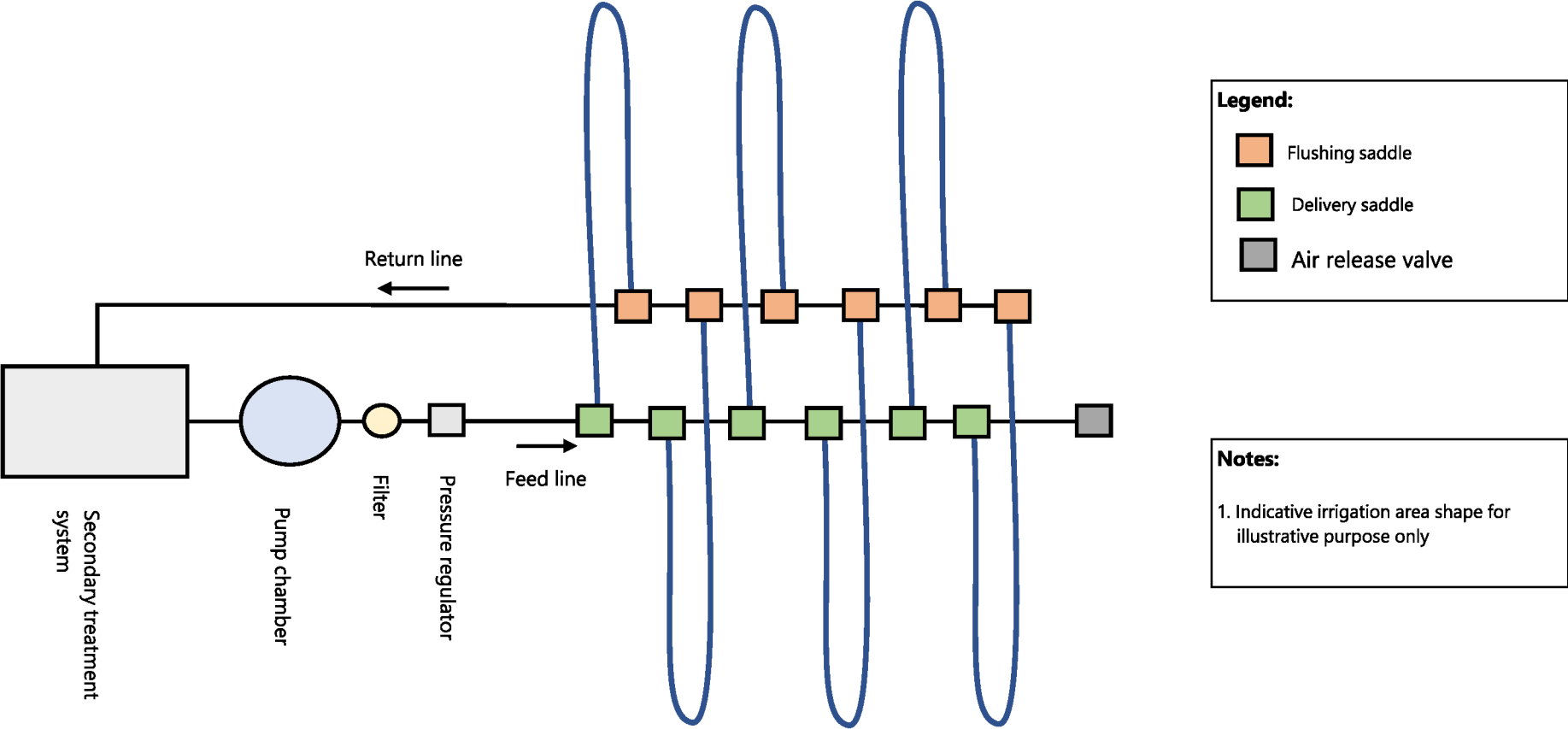
1 Model sensitivity to input parameters will affect the accuracy of the result obtained. Where possible site specific data should be used. Otherwise data should be obtained from a reliable source such as:

- 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 E

Typical System Layout



**Typical Pressure Compensated
Subsurface Drip irrigation Layout**

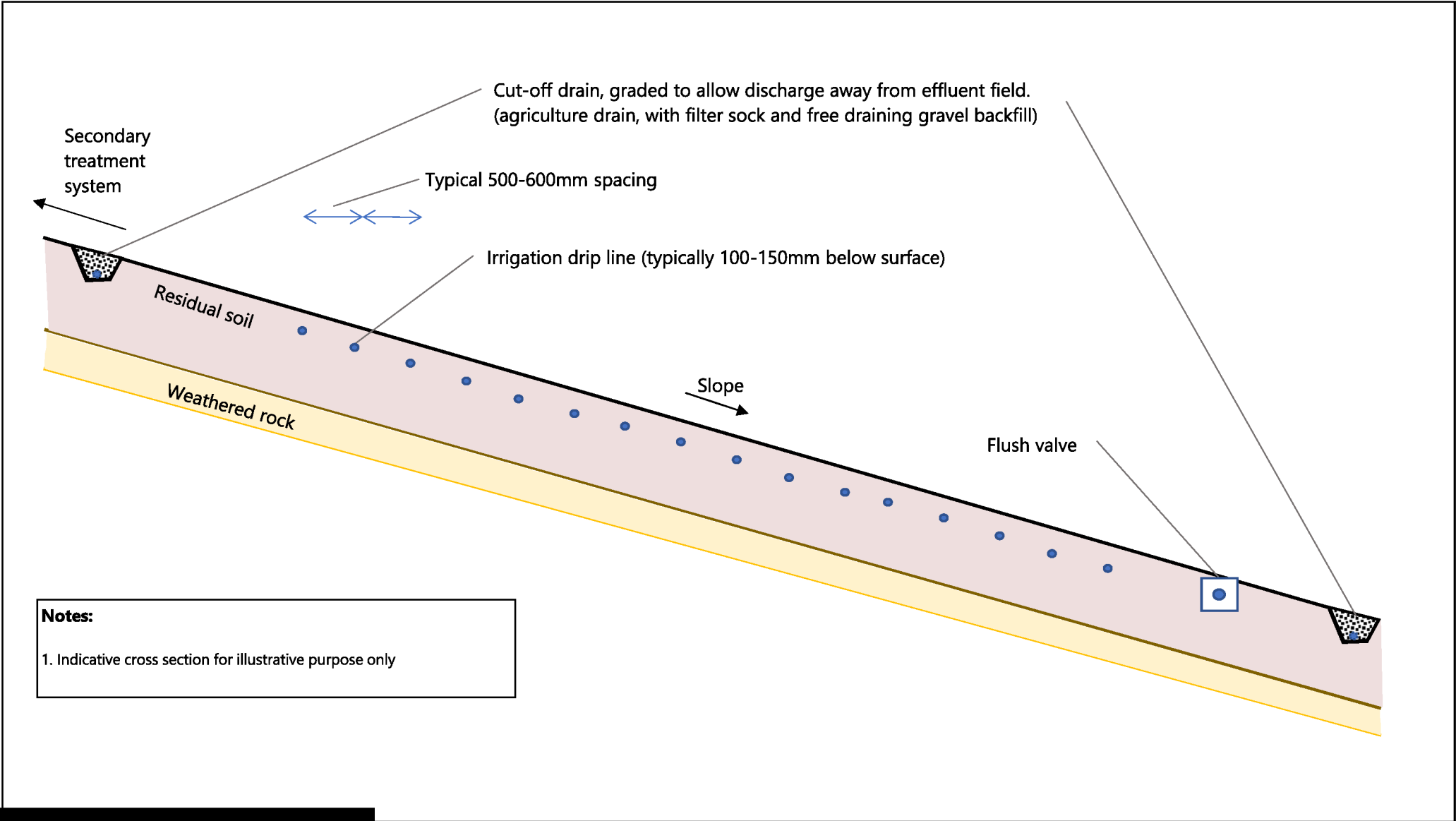
Location: 125 - 135 Argyle Street
Little River, Victoria
Project No: 18669G-LCA
Scale: NOT TO SCALE

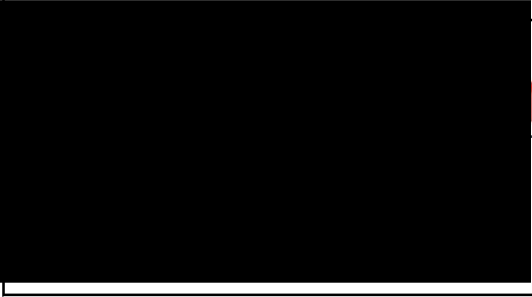
Drawn by: O.R.
Date: 11/03/2026
Approved by: C.F.
Date: 11/03/2026



Appendix F

Typical System Cross Section



	Typical Irrigation Design Cross Section	Location: 125 - 135 Argyle Street	Drawn by: O.R.
		Little River, Victoria	Date: 11/03/2026
		Project No: 18669G-LCA	Approved by: C.F.
		Scale: NOT TO SCALE	Date: 11/03/2026



Appendix G

Planning Report

PLANNING PROPERTY REPORT



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From www.planning.vic.gov.au at 11 March 2026 01:40 PM

PROPERTY DETAILS

Address: **125-135 ARGYLE STREET LITTLE RIVER 3211**

Lot and Plan Number: **Lot 2 PS834239**

Standard Parcel Identifier (SPI): **2\PS834239**

Local Government Area (Council): **GREATER GEELONG**

Council Property Number: **283977**

Planning Scheme: **Greater Geelong**

Directory Reference: **Melway 200 K9**

www.geelongaustralia.com.au

[Planning Scheme - Greater Geelong](#)

UTILITIES

Rural Water Corporation: **Southern Rural Water**

Urban Water Corporation: **Barwon Water**

Melbourne Water: **Inside drainage boundary**

Power Distributor: **POWERCOR**

STATE ELECTORATES

Legislative Council: **WESTERN VICTORIA**

Legislative Assembly: **LARA**

OTHER

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

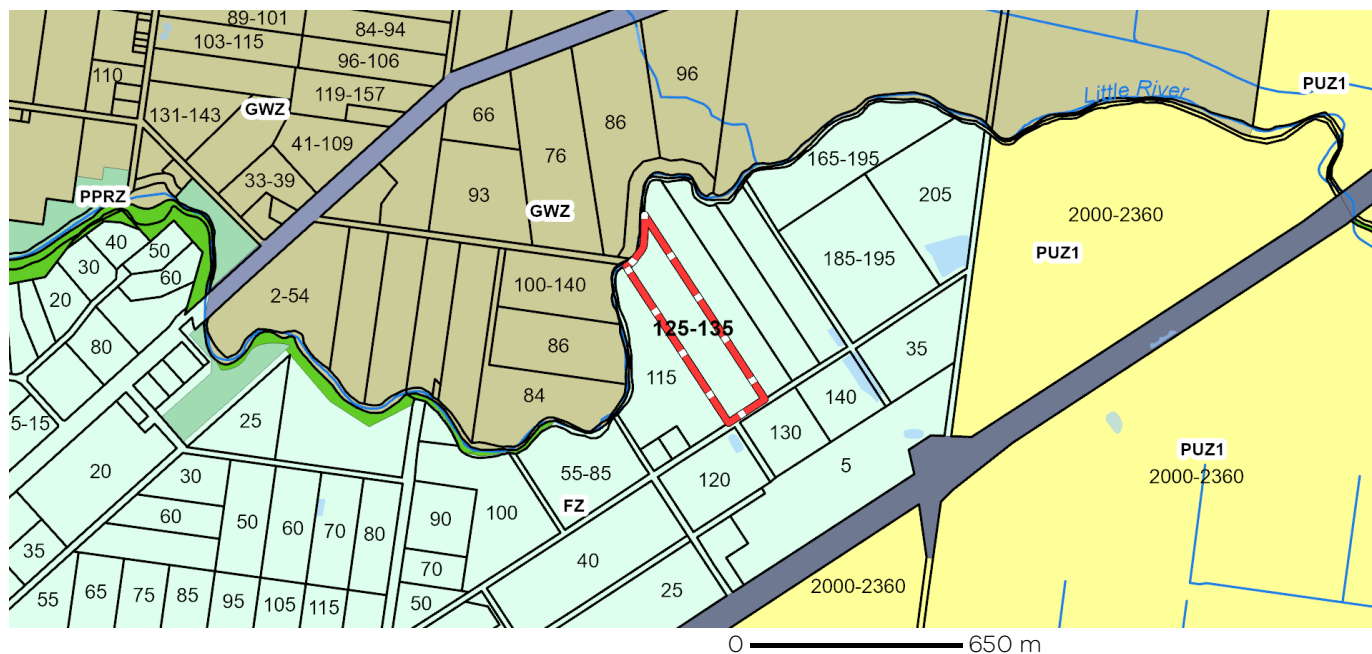
Fire Authority: **Country Fire Authority**

[View location in VicPlan](#)

Planning Zones

[FARMING ZONE \(FZ\) \(GREATER GEELONG\)](#)

[SCHEDULE TO THE FARMING ZONE \(FZ\) \(GREATER GEELONG\)](#)



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

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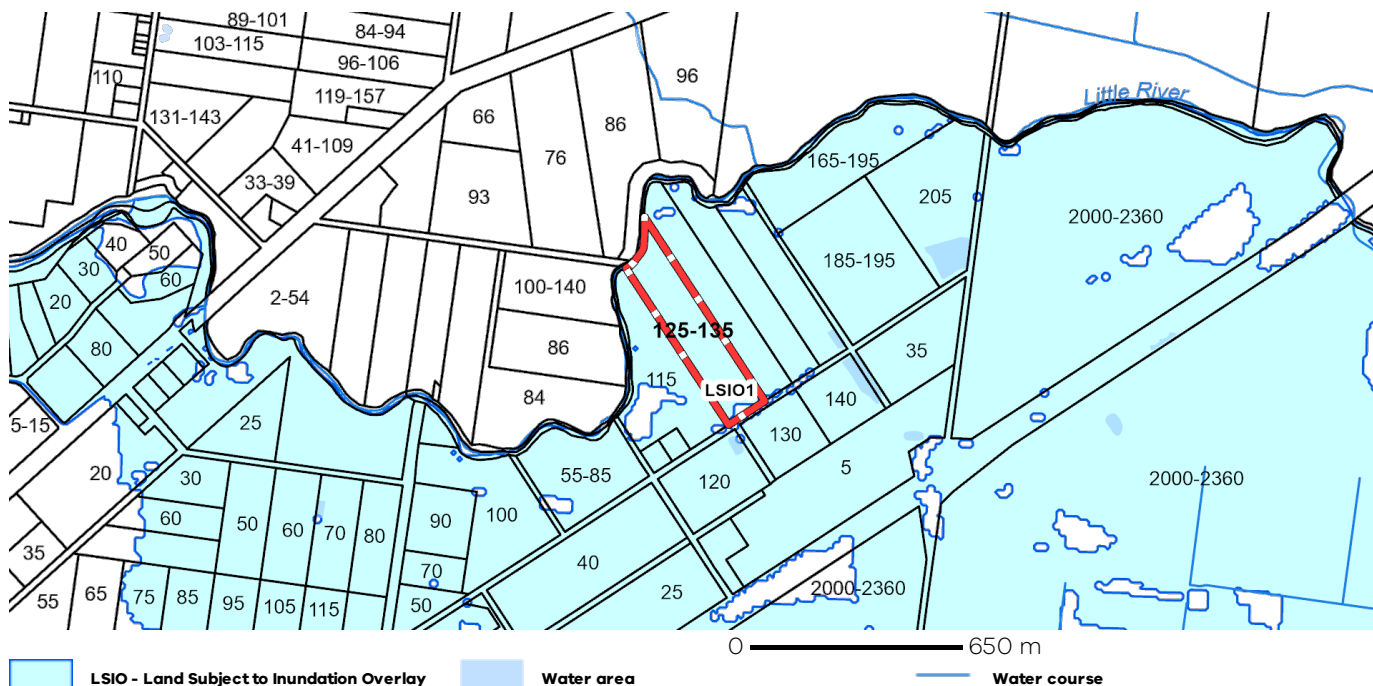


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Planning Overlays

LAND SUBJECT TO INUNDATION OVERLAY (LSIO) (GREATER GEELONG)

LAND SUBJECT TO INUNDATION OVERLAY - SCHEDULE 1 (LSIO1) (GREATER GEELONG)



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

PLANNING PROPERTY REPORT



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OTHER OVERLAYS

Other overlays in the vicinity not directly affecting this land

[ENVIRONMENTAL SIGNIFICANCE OVERLAY \(ESO\) \(GREATER GEELONG\)](#)

[ENVIRONMENTAL SIGNIFICANCE OVERLAY \(ESO\) \(WYNDHAM\)](#)

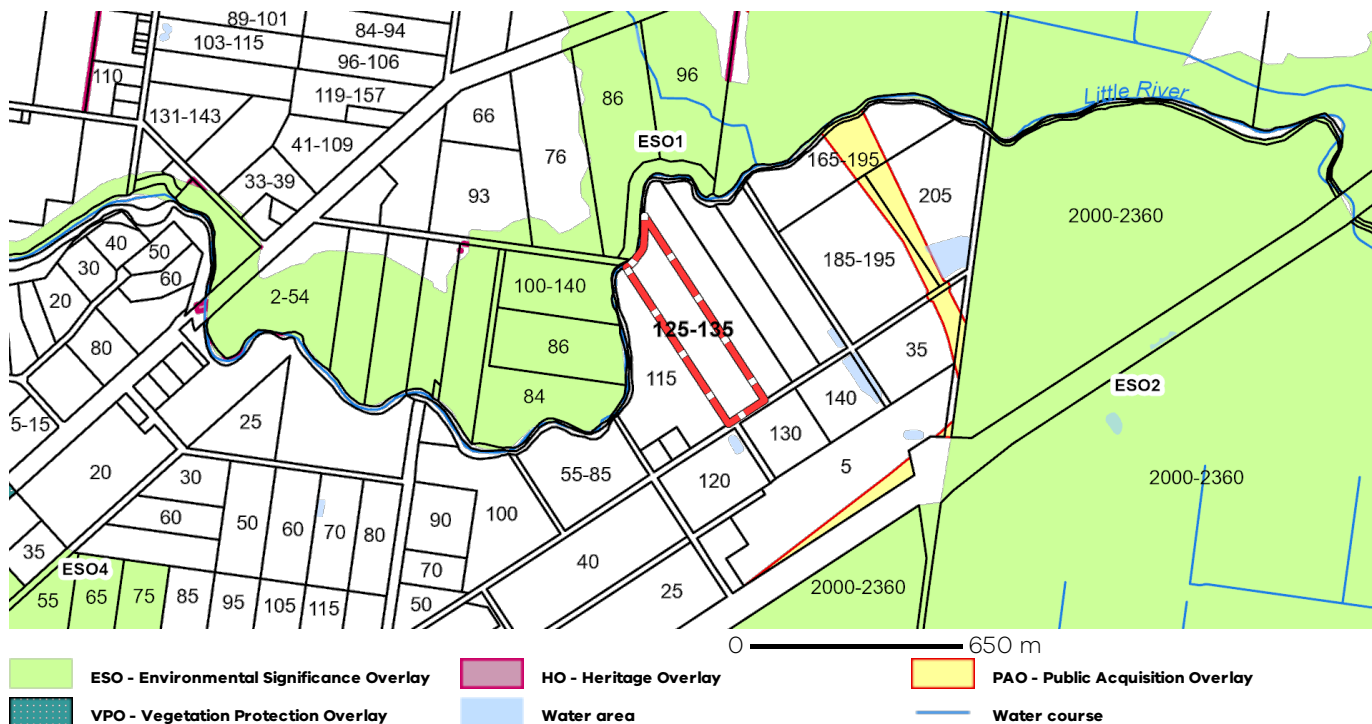
[HERITAGE OVERLAY \(HO\) \(WYNDHAM\)](#)

[HERITAGE OVERLAY \(HO\) \(GREATER GEELONG\)](#)

[PUBLIC ACQUISITION OVERLAY \(PAO\) \(GREATER GEELONG\)](#)

[PUBLIC ACQUISITION OVERLAY \(PAO\) \(WYNDHAM\)](#)

[VEGETATION PROTECTION OVERLAY \(VPO\) \(GREATER GEELONG\)](#)



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

PLANNING PROPERTY REPORT



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Areas of Aboriginal Cultural Heritage Sensitivity

All or part of this property is an 'area of cultural heritage sensitivity'.

'Areas of cultural heritage sensitivity' are defined under the Aboriginal Heritage Regulations 2018, and include registered Aboriginal cultural heritage places and land form types that are generally regarded as more likely to contain Aboriginal cultural heritage.

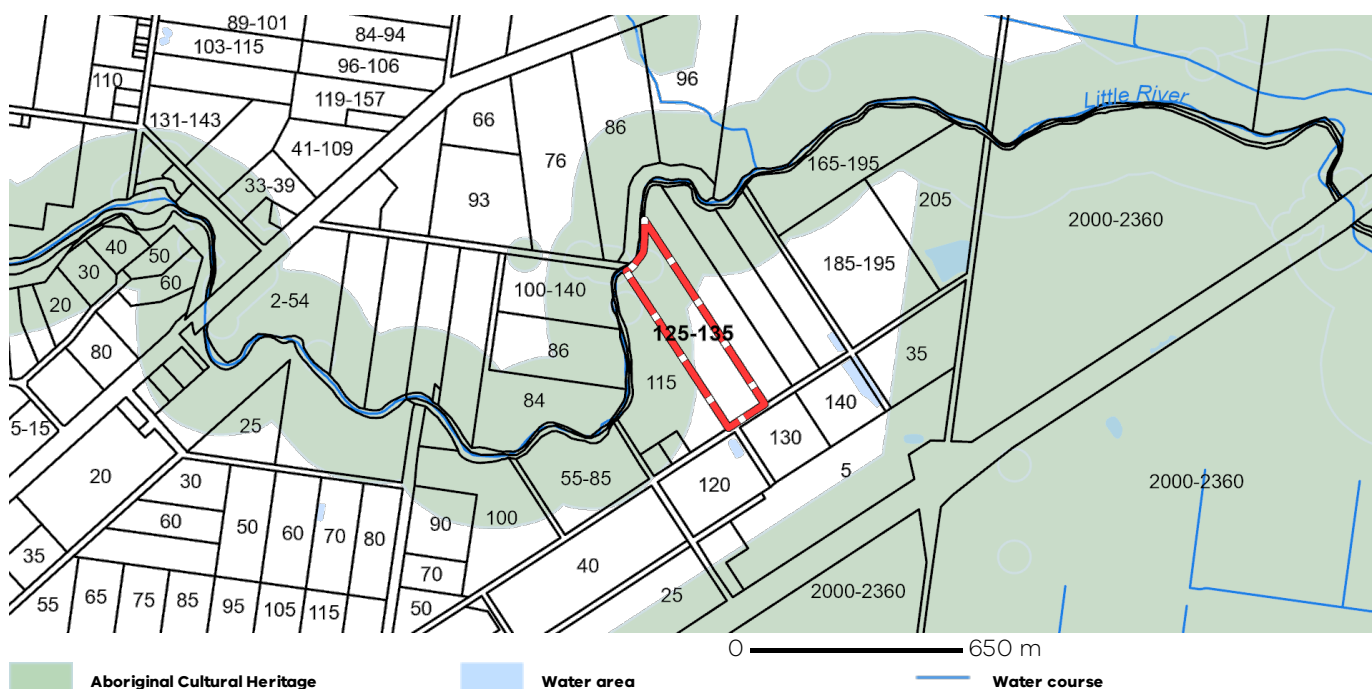
Under the Aboriginal Heritage Regulations 2018, 'areas of cultural heritage sensitivity' are one part of a two part trigger which require a 'cultural heritage management plan' be prepared where a listed 'high impact activity' is proposed.

If a significant land use change is proposed (for example, a subdivision into 3 or more lots), a cultural heritage management plan may be triggered. One or two dwellings, works ancillary to a dwelling, services to a dwelling, alteration of buildings and minor works are examples of works exempt from this requirement.

Under the Aboriginal Heritage Act 2006, where a cultural heritage management plan is required, planning permits, licences and work authorities cannot be issued unless the cultural heritage management plan has been approved for the activity.

For further information about whether a Cultural Heritage Management Plan is required go to <https://heritage.achris.vic.gov.au/aavQuestion1.aspx>

More information, including links to both the Aboriginal Heritage Act 2006 and the Aboriginal Heritage Regulations 2018, can also be found here - <https://www.firstpeoplesrelations.vic.gov.au/aboriginal-heritage-legislation>



PLANNING PROPERTY REPORT



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Further Planning Information

Planning scheme data last updated on 6 March 2026.

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 affect 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.vic.gov.au/vicplan/>

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

PLANNING PROPERTY REPORT



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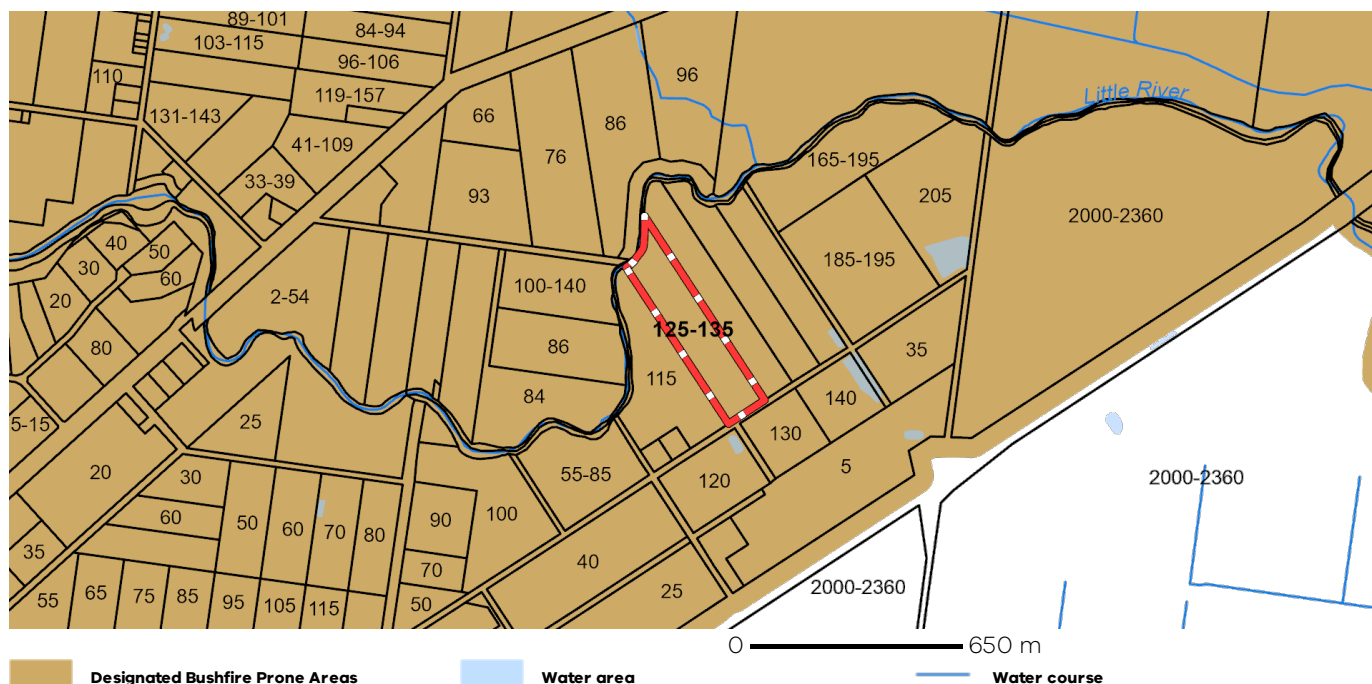
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Designated Bushfire Prone Areas

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 Victoria 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 Regulations Map (NVR Map) <https://mapshare.vic.gov.au/nvr/> and [Native vegetation \(environment.vic.gov.au\)](https://www.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 \(environment.vic.gov.au\)](https://www.environment.vic.gov.au)

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