



APP

Property and Infrastructure Specialists

STATEMENT OF ENVIRONMENTAL EFFECTS PROPOSED SINGLE DWELLING

13-15 Vane Street, Cranebrook
APP Corporation Pty Limited

May 2021

Amendment, Distribution & Authorisation Record

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This report has been prepared in accordance with our quality control system. The report is a preliminary draft unless it is signed below.

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Appendix A - Architectural Plans

Appendix B - Site Survey

Appendix C - Stormwater Management Plan

Appendix D - Wastewater Management Plan

Appendix E - BASIX Certificate

Appendix F - Bushfire Report

Appendix G - Waste Management Plan

1. Introduction

This Statement of Environmental Effects (SEE) is submitted to Penrith City Council (the Council) in support of a Development Application (DA) for construction of a new dwelling house at 13-15 Vane Street, Cranebrook (the site). The proposed development includes construction of a new two-bedroom dwelling house with open plan living and dining rooms, attached triple garage, new driveway and utility service connections.

The site, legally identified as Lot 3 in DP1242079 is 2.084ha and is located on the north-west side of Vane Street, accessed via Church Lane to the west. It is zoned E4 Environmental Living under the Penrith Local Environment Plan 2010 (Penrith LEP 2010). Dwellings houses are permissible with consent and the development is consistent with the objectives for the E4 zone.

This SEE has been prepared by APP Corporation Pty Limited (APP) on behalf of Ms Rebecca Rositano. It is based on Architectural Plans prepared by LYMT at **Appendix A**.

The DA is for Local Development and is made pursuant to Part 4 of the *Environmental Planning and Assessment Act, 1979* (the EP&A Act). This SEE provides an assessment of the proposed development against the relevant environmental planning framework and other matters under Section 4.15 of the EP&A Act including State Environmental Planning Policies, the Penrith LEP 2010 and the Penrith Development Control Plan 2014. The assessment confirms that the proposal is compliant with all relevant standards, controls and objectives.

The proposal will not cause any significant environmental impacts as discussed in Section 5 of this SEE. The site is suitable for the proposed residential development and is in the interest of the public as it provides new housing stock in a manner that is compatible with the zoning and desired future character of the area.

Report Structure

This report is structured as follows:

- Section 1** – Introduction
- Section 2** – Site Analysis
- Section 3** – Description of Proposed Development
- Section 4** – Planning Framework
- Section 5** – Environmental Assessment
- Section 6** – Conclusion

This SEE should be read in conjunction with the following plans and reports:

Table 1 *Supporting Plans and Documentation*

Appendix	Documentation	Prepared by
Appendix A	Architectural Plans	LYMT
Appendix B	Site Survey	Freeburn Surveying
Appendix C	Stormwater Management Plan	C.K. Engineering Services
Appendix D	Wastewater Management Plan	SEEC
Appendix E	BASIX Certificate	Evergreen Energy Consultants Pty Ltd
Appendix F	Bushfire Report	Australian Bushfire Consulting Services
Appendix G	Waste Management Plan	LYMT

2. Site Analysis

2.1 Site Description and Location

The site is located at the eastern end of Vane Street and is accessed via Church Lane to the west (see Figure 1). It is legally described as Lot 3 in DP1242079, 13-15 Vane Street, Cranebrook and is located 174m north-west of the intersection of Church Lane and Cranebrook Road, providing connection to Castlereagh Road. The site has a total area of 2.084ha and is rectangular in shape. It has a 52m frontage to Vane Street and a depth of 382m. It is located within an established E4 Environmental Living zone, characterised by low-impact residential dwellings situated on rural-residential properties. It is located adjacent to an RU4 Primary Production Small Lot zone characterised by hobby farms and low-intensive agricultural operations and rural industries.



Figure 1 Site Location (Source: SIX Maps)

The site is located 2.5km north-west of Cranebrook Village Shopping Mall, which includes supermarkets, food outlets, retail stores and medical services. There are numerous schools and educational services surrounding the site including The Lakes Christian College, St Paul's Grammar School, Henry Fulton Public School and Samuel Terry Public School. It is positioned approximately 5.75km north of Penrith Central Business District (CBD), 31.20km north-west of Parramatta CBD and 50.80km north-west of Sydney CBD. The site and local surrounds are presented in Figure 2 below.

Access into the site is from Vane Street via Church Lane to the south-east. Both Church Lane and Vane Street are sealed local roads providing connection to Cranebrook Road and Castlereagh Road. Directly adjacent to the sites north-west side boundary, land has been subdivided for future use as an access road, identified on the architectural plans as Snow Street. Lands to the south-west across Snow Street are zoned SP2 Infrastructure (Water Supply System) and comprise the local Sydney Water reservoir.

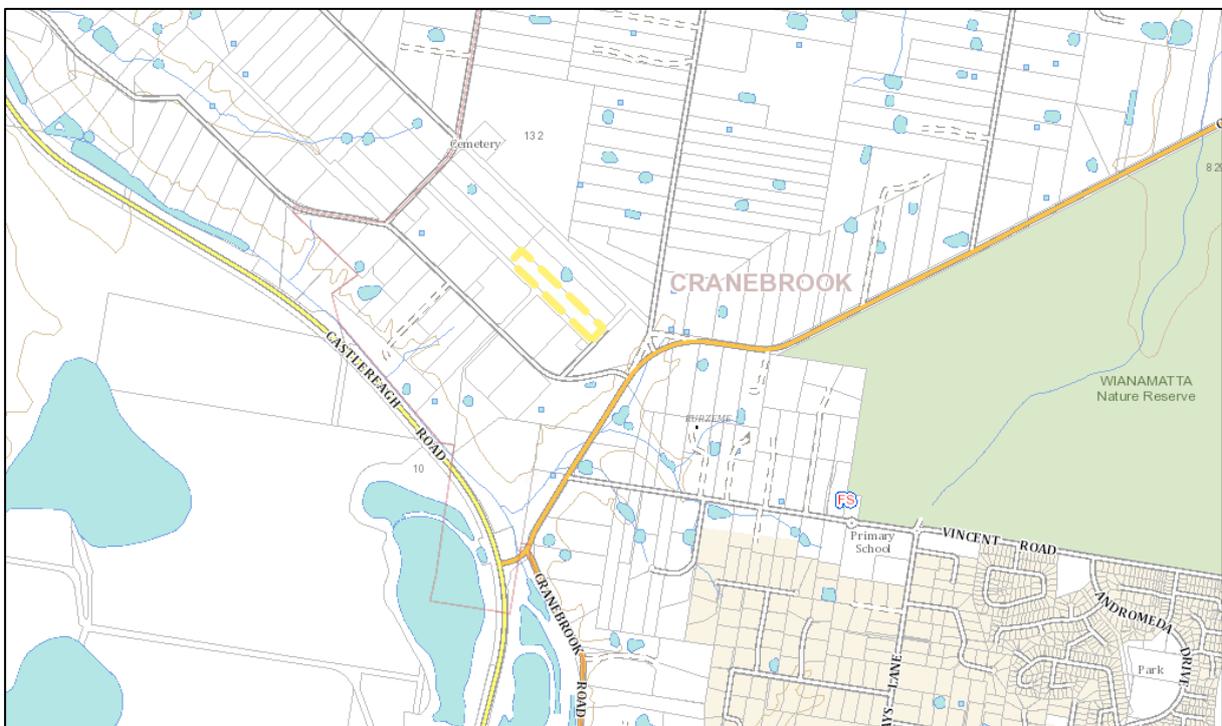


Figure 2 Surrounding Context Map (Source: SIX Maps)

2.2 Existing Development

The existing site is vacant comprising cleared grassland and clusters of vegetation across the north-western end of the site. The south-eastern and central portions are largely clear of any trees or native vegetation. There is a small weatherboard cottage located on the neighbouring site to the east (Lot 2 DP1242079) that abuts the site boundary. The structure is to be demolished to allow for redevelopment of neighbouring sites in the short term.

Existing post and rail fencing align the boundaries of the site.

Views of the property and surrounding sites are provided in Figures 3 – 8 below.

2.4 Services and Infrastructure

Existing utility infrastructure services available to the site include electricity and mains water via a VC water main that runs parallel to the Vane Street Frontage. There is an Effluent Disposal Area (EDA) easement to the rear of the site, where the proposed Aerated Wastewater Treatment System (AWTS) will be located (shown in Figure 9). The proposed new dwelling will be connected to these existing services.

2.5 Site Surrounds

The surrounding area is characterised by a variety of uses including low-impact residential development on large lots, home based industries, nurseries and low-impact rural industries. A Primary Production Small Lots zone is located to the east of the site characterised by hobby farms, small scale agricultural operations and an assortment of rural industries.



Figure 5 Property south of site at 19 Vane Street (Source: Google Maps)

The eastern side of the site adjoins Lot 2 Vane Street which contains an existing single storey dwelling shown in Figure 5. The western side of the site is located adjacent to the future proposed Snow Street. Beyond the subdivided lands to the west of Snow Street exists a Sydney Water reservoir which supplies mains water to the surrounding catchment.



Figure 6 View of the adjacent lot and existing dwelling at Lot 2 Vane Street, Cranebrook (Source: Google Maps)



Figure 7 Sydney Water Reservoir to the west of the site (Source: Google Maps)

The rear boundaries of three properties at 25 Church Lane, 35-47 Church Lane and 51-63 Church Lane adjoin the sites western side boundary and are similarly zoned E4 Environmental Living. These neighbouring properties contain large dwellings with outbuildings, secondary dwellings and the like.



Figure 8 Properties at Church Lane located adjacent to the sites western side boundary (Source: Google Maps)

2.6 Access and Public Transport

There is a bus stop located 1.12km south of the site at Henry Fulton Public School, providing public transport access to local and regional centres including Cranebrook and Penrith. There is another bus stop at the intersection of Church Lane and Cranebrook Road, providing connections north to Richmond.

The site is located 5.76km from the Penrith Train Station, providing access to Greater Sydney and the Blue Mountains, as well as numerous local and regional bus services. It is well serviced by road networks, offering access to various regional connectors, including the Western Motorway, Great Western Motorway, Westlink M7 and the M2 Motorway.

2.7 Native Vegetation

The site is not mapped under the Penrith LEP 2010 as comprising any Native Vegetation Protection Areas however remnant native trees and understorey vegetation exists across the rear of the property. The vegetation comprises Cumberland Plain Woodland, identified as ‘broad-leaved Ironbark – Melaleuca decora shrubby open forest on clay soils’ (source: SEED NSW).

Figure 9 shows the indicative location of vegetation and grasses in relation to the proposed building envelope and EDA.

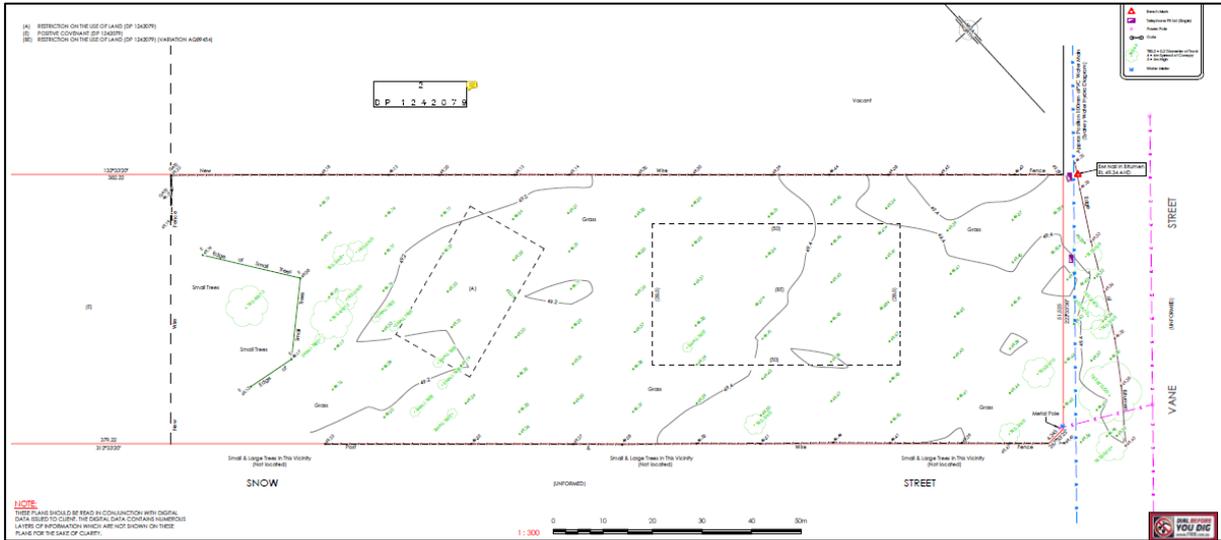


Figure 9 Existing site vegetation and proposed building envelope (Source: Freeburn Surveying)

2.8 Bushfire

The subject site is identified as Bushfire Prone Land (Vegetation Category 1 & 2) under the Penrith LEP 2010. The south-east portion of the site, adjacent to Vane Street, is largely clear of existing site vegetation, aside from several trees planted along the frontage and south-west boundary. The majority of trees are located in the north-west portion of the site, to the rear of the existing and proposed dwelling. The Bushfire Attack Level (BAL) of the development was determined by Australian Bushfire Consulting Services as BAL 29 due to medium risk of building exposure to ember attack, radiant heat and direct flame contact.

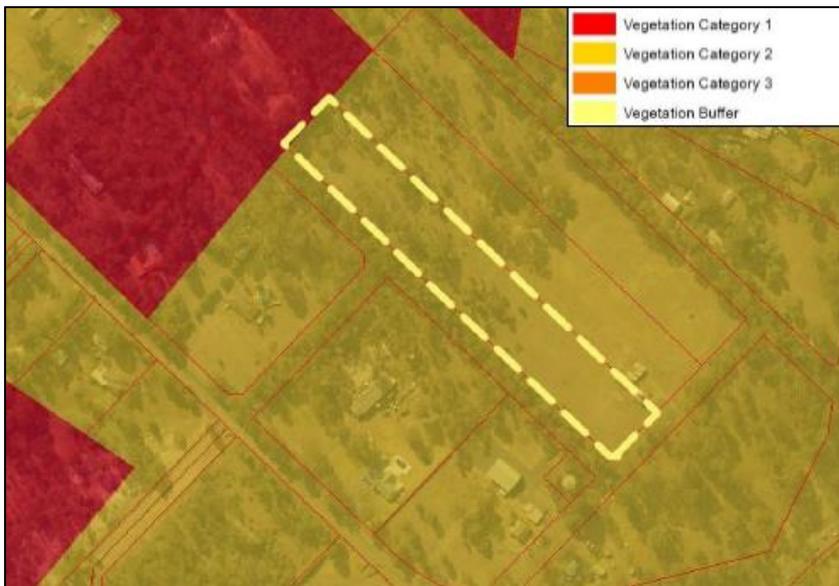


Figure 10 Bushfire Prone Land Map with site highlighted (Source: NSW Government Planning Portal)

3. Description of the Proposed Development

3.1 Description of Proposed Development

This DA seeks approval for the construction of a new dwelling house at 13-15 Vane Street, Cranebrook comprising two bedrooms, open plan living and dining, kitchen, bathroom, laundry, alfresco area and attached triple garage. The proposed development also includes the construction of a new driveway from Vane Street and utilities connections. Details of the dwelling are presented below in Table 2 and shown in Figure 11. Architectural drawings detailing the proposal have been prepared by LYMT at **Appendix A**.

Table 2 Details of Proposed Dwelling

Element	Proposal
Site Area	2.084ha
Gross Floor Area (GFA)	93.91 m ²
Building Footprint	242.39 m ²
Building Height	Roof level = 5.373 metres (RL 49.500 to RL 55.170) Ceiling level = 2.7 metres (RL 49.500 to RL 52.500)
Building Setbacks	Front Setback = 56.705 metres Side Setbacks (south-west) = 16.0 metres Rear Setback = 299.220 metres
Dwelling details	Two (2) bedrooms including master Open plan living and dining Kitchen Bathroom and laundry Covered rear alfresco area Triple car garage

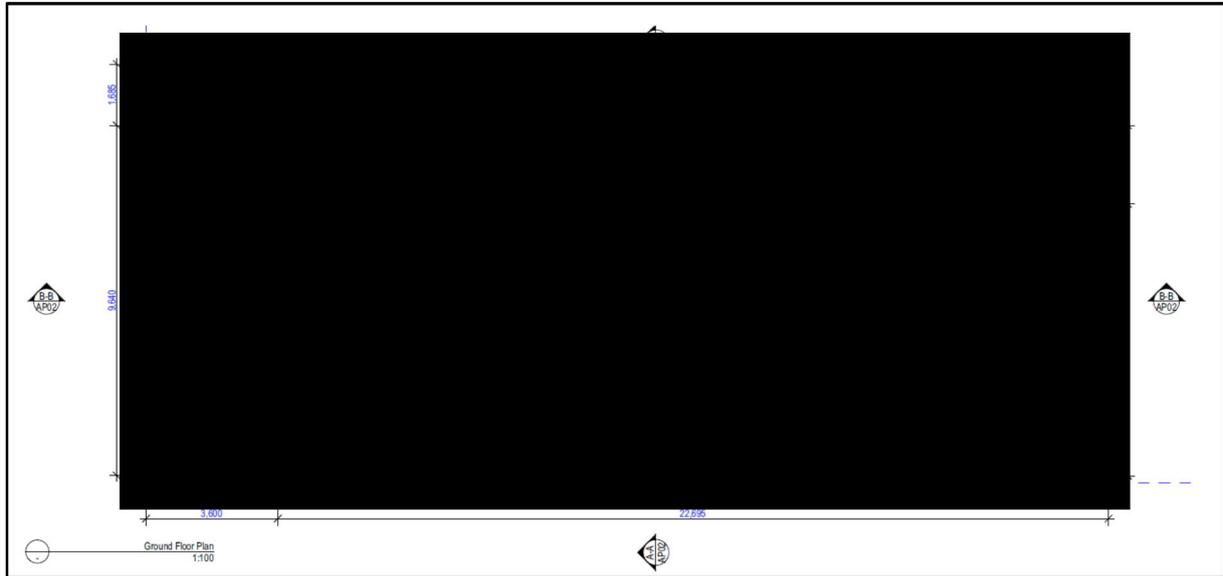


Figure 11 Proposed dwelling ground floor plan (Source: LYMT)

3.2 Materials and Finishes

As shown in Table 3 and Figure 12 below, the proposed new dwelling and triple garage will be constructed of high-quality materials.

Table 3 Schedule of Finishes

Component	Material
01 Colourbond Nail Strip Roof Sheet	Woodland Grey or similar
02 Face Brick	Pale brick colour
03 Panel Lift Roller Door	Woodland Grey or similar
04 Glass Roof	Glass
05 Aluminium Framed Glass Window/Door	Aluminium



Figure 12 Extract of Colours and Materials (Source: LYMT)



Figure 13 Elevations of proposed development (Source: LYMT)

3.3 Stormwater, Wastewater and Civil Works

A Concept Stormwater Management Plan has been prepared by C.K. Engineering Services and is provided at **Appendix C**. The Concept Plan proposes a pit and pipe system, discharging rainwater to the 1,900L above ground rainwater tank and underground stormwater drainage network. The 1% Annual Exceedance Probability (AEP) local overland flow flood level affecting the site is estimated to be RL 49.30 metres. The extent of the 1% AEP local catchment overland flow path does not encroach upon the proposed building footprint or EDA. All overland stormwater flows will be collected and discharged to the main pit at the front of the site, whilst roof water will be collected and stored in the proposed rainwater tank for use of toilets, grey-water (clothes washer) and gardens.

With reference to the Wastewater Management Plan included at **Appendix D**, all site wastewater generated by the proposed dwelling will be treated by an AWTs system. All secondary-treated effluent will run through a buried mains distribution line to the 1,250m² EDA to be disposed of by semi-fixed surface spray irrigation. Minimum three-star plumbing fixtures will be installed to reduce wastewater loads.

Utility service infrastructure including mains water, AWTs sewer and electricity will be augmented and connected to the proposed dwelling.

Owing to the existing flat grades of the site, only minor filling to 200mm will be required as part of the proposed development (RL 49.30 to RL 49.50). The fill will be contained to the extent of the proposed building envelope and will not occur within the setbacks or EDA area.

The proposal includes the construction of a gravel driveway with cobble stone edging, providing connection to the visitor parking and three car garage located on the south-west side of the building from the Vane Street frontage.

3.4 Bushfire

The subject site is identified as Bushfire Prone Land (Vegetation Category 1 & 2) under the Penrith LEP 2010. As such, a Bushfire Report (**Appendix F**) has been prepared by Australian Bushfire Consulting Services in line with *Planning for Bush Fire Protection 2019* (PBP 2019) to address the south-eastern portion of the site, as conditioned by existing site subdivision DA 17/0480.02. As such, the following bushfire planning recommendations are made:

- All land within 180 metres of the south-east (rear) boundary be maintained as an Asset Protection Zone / Inner Protection Area;
- The proposed dwelling and garage are to be constructed in accordance with the relevant sections of AS 3959 – 2018 *Construction of buildings in bushfire prone areas* or NASH Standard (1.7.14 updated) *National Standard Steel Framed Construction in Bushfire Areas 2014* and *Planning for Bush Fire Protection 2019*;
- The proposed access is to comply with relevant controls of *Planning for Bush Fire Protection 2019* including maintenance of a 4 metre vertical and horizontal clearance along the driveway and construction of a turning area suitable for a fire appliance;
- Provision of a 20,000 litre static water supply (SWS);
- The location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of the building; and
- The location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.

Australian Bushfire Consulting Services have deemed the bushfire risk of the development as medium and determined the proposed bushfire protection measures as satisfactory.

3.5 Solar Access

The proposed development considers solar access and natural ventilation, in-line with BASIX requirements. The proposed dwelling is south-east facing and receives consistent sun to the eastern façade from morning to midday. Solar access will be maximised across the eastern façade including open-air alfresco, floor-to-ceiling double glass doors in Bedroom 2 and two sets of double glass doors in the living and dining area. A solar access and natural ventilation diagram prepared by LYMT is included at **Appendix A** and Figure 14 below.

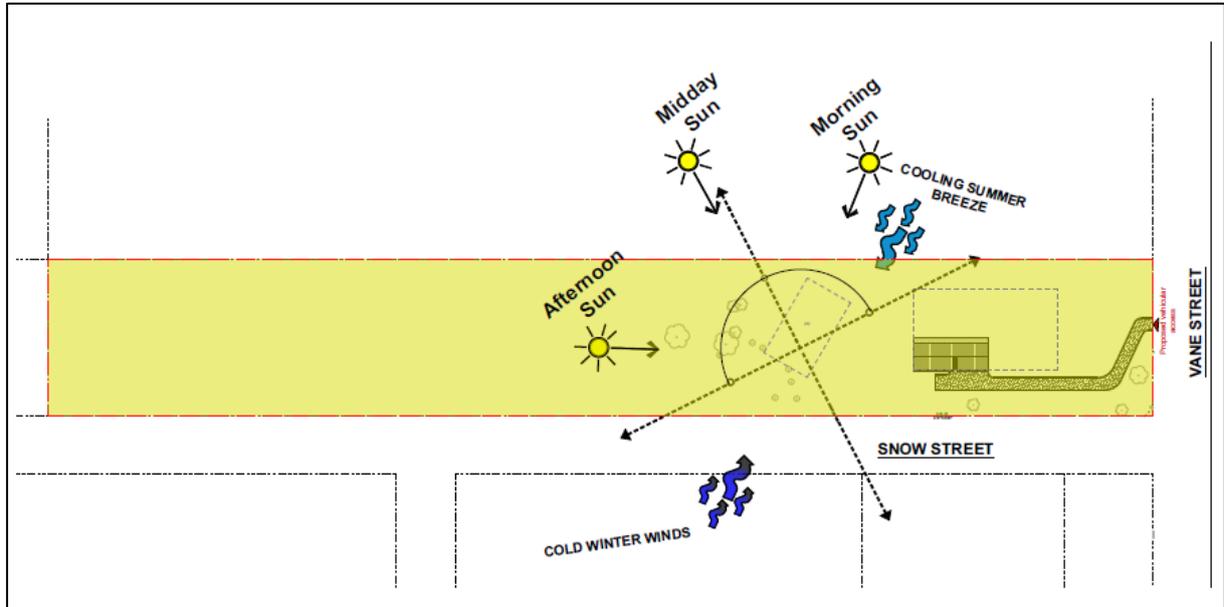


Figure 14 Solar Access and Natural Ventilation Diagram (Source: LYMT)

4. Planning Framework

This section outlines the relevant environmental planning framework applicable to the proposed development. Section 4.15 of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) outlines Council's statutory obligations to consider the likely impacts of development including the impacts on the natural and built environments, as well as social and economic impacts on the locality.

The following environmental planning instruments and development control plans have been considered in the assessment of the proposal:

- State Environmental Planning Policy No. 55 – Remediation of Land
- State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004
- Penrith Local Environmental Plan 2010
- Penrith Development Control Plan 2014

4.1 State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55)

SEPP 55 requires the consent authority to consider the likelihood of contamination of the site; any future impacts to development and land use arising from potential contamination and the need to undertake remediation.

The site has a historical use as grazing / pastoral lands which formed part of the original parcel. It is understood that a contamination assessment of the land was undertaken as part of the underlying three lot subdivision which created the site and that any remediation works identified as being required has subsequently occurred. On this basis, the land has been made suitable for the proposed residential use.

4.2 State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004

State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004 (SEPP BASIX) provides objectives to encourage sustainable residential development. A BASIX Certificate has been prepared in support of this DA and is provided at **Appendix E**. BASIX requires commitments for water saving and re-use initiatives, natural thermal comfort and energy saving measures. The proposed development includes the following initiatives / measures:

- Water saving fixtures including showerheads, toilet flushing systems, kitchen taps and bathroom taps with a minimum rating of 4 stars;
- Installation of a 1,900L rainwater tank to collect room rainwater runoff for use in all toilets, cold water clothes washer taps and outdoor garden tap;
- Installation of a high performing hot water system with a performance of 31 to 35 Small-scale Technology Certificates (STCs) or better;
- No installation of cooling or heating system in any living areas or bedrooms;
- Ventilation systems in minimum one bathroom, kitchen and laundry;
- Installation of fluorescent or light emitting diode (LED) as the primary type of artificial lighting in the bedrooms, living/dining area, kitchen, bathrooms, laundry and hallways;

- Installation of a window / skylight in the kitchen and bathroom; and
- Gas cooktop, electric oven, well ventilated refrigerator space, outdoor clothes drying line and sheltered clothes drying line to be installed.

The development has been designed to comply with the water, thermal comfort and energy requirements of BASIX, as included in **Appendix E**.

4.3 Penrith Local Environmental Plan 2010 (Penrith LEP 2010)

The Penrith LEP 2010 is the relevant local environmental planning instrument containing controls relevant to residential development. The specific provisions relevant to the site and proposal are outlined in this chapter. Under Penrith LEP 2010 the principal planning controls applying to the site and proposal are identified in Table 4 below.

Table 4 Key Planning Controls – Penrith LEP 2010

Planning Standards	Development Control
Land Zoning	E4 Environmental Living
Permitted with Consent	Dwelling Houses
Floor Space Ratio	N/A
Height of Building	N/A
Minimum Lot Size	20,000m ² (2 Ha)
Heritage	Locally significant Archaeological Site (A30 – Site of Castlereagh Township)
Bushfire Prone Land	Vegetation Category 2 and adjacent to Vegetation Category 1

The site is zoned E4 Environmental Living as shown in the following zoning map extract in Figure 15.

The proposal is best defined as a ‘dwelling house’ under the Penrith LEP 2010 due to there being no existing dwellings located on the site.

The objectives of the E4 Environmental Living zone are as follows:

- *To provide for low-impact residential development in areas with special ecological, scientific or aesthetic values;*
- *To ensure that residential development does not have an adverse effect on those values;*
- *To minimise conflict between land uses within the zone and land uses within adjoining zones;*

- To ensure land uses are compatible with the available infrastructure, services and facilities and with the environmental capabilities of the land; and
- To preserve and improve natural resources through appropriate land management practices.

The proposed development is consistent with the E4 Environmental Living Zone objectives. It will provide a low impact residential dwelling on a large allotment, ensuring retention of existing vegetation and protection of the aesthetic values of the area.

The dwelling proposed is of a low scale which is commensurate with the surrounding character and form of dwellings in the area. The proposed development delivers a high standard of liveability for the enjoyment of future residents and will not adversely impact the amenity of neighbouring properties.

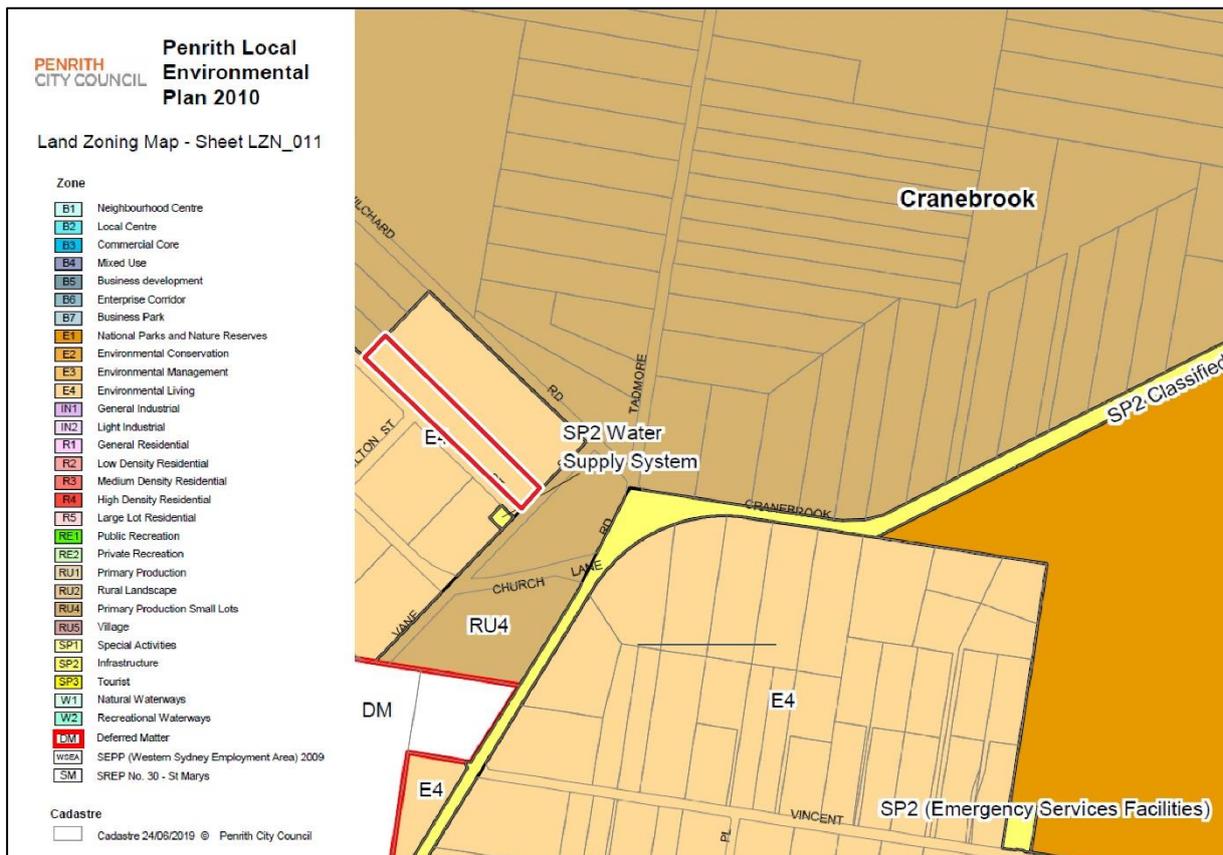


Figure 15 Land Zoning Map Extract (Penrith LEP 2010)

Floor Space Ratio

Under the Penrith LEP 2010, the site is not subject to a maximum FSR. The proposed development contributes a GFA of 93.91m², equivalent to a total FSR of 0.004:1.

Maximum Height of Buildings

The site is not subject to a maximum building height. The proposed dwelling is single storey in form and has a building height of 5.373 metres (RL 49.50 to RL 55.170), measured from natural ground level to the roof level or 2.7 metres (RL 49.50 to 52.50) to ceiling level.

Minimum Lot Size

The development site is subject to a minimum lot size of 20,000m² (2 Ha). No subdivision is proposed and the existing lot size of 2.084Ha aligns with the standard.

Heritage

The site is classified a locally significant Archaeological Site under the Liverpool LEP 2010 and is also identified in the Penrith Heritage Study 2007. With reference to Figure 16, the site falls within A30 – Site of Castlereagh Township, one of five Macquarie towns circa. 1810. The Castlereagh Town reserve is identified as significant due to its demonstration of colonial era land management practise in NSW and is associated with colonial era administrator, Governor Macquarie.

Remnants of heritage elements within the town reserve include the Castlereagh Cemetery located 360m from the rear site boundary. The town reserve also showcases remnants of the original rectangular grid network and planned street alignments, also shown in Figure 16. The town reserve also provides aesthetic significance by maintaining views of distant historic homesteads. As assessed by the NSW Office of Environment and Heritage, the integrity/intactness of the township is classified as low.

The proposed development will have no impact on the heritage significance of the Castlereagh Cemetery due to the separation distance between the two sites. Furthermore, the site will not compromise the existing grid networks of the town reserve, as development is contained within the previously approved building envelope and does not seek to alter site boundaries. Due to the proposed dwellings conformity with building envelope controls, the development will not impede local views and vistas due to its modest scale.

Therefore, the proposed development will have no impact to the local heritage significance of A30 – Site of Castlereagh Township.

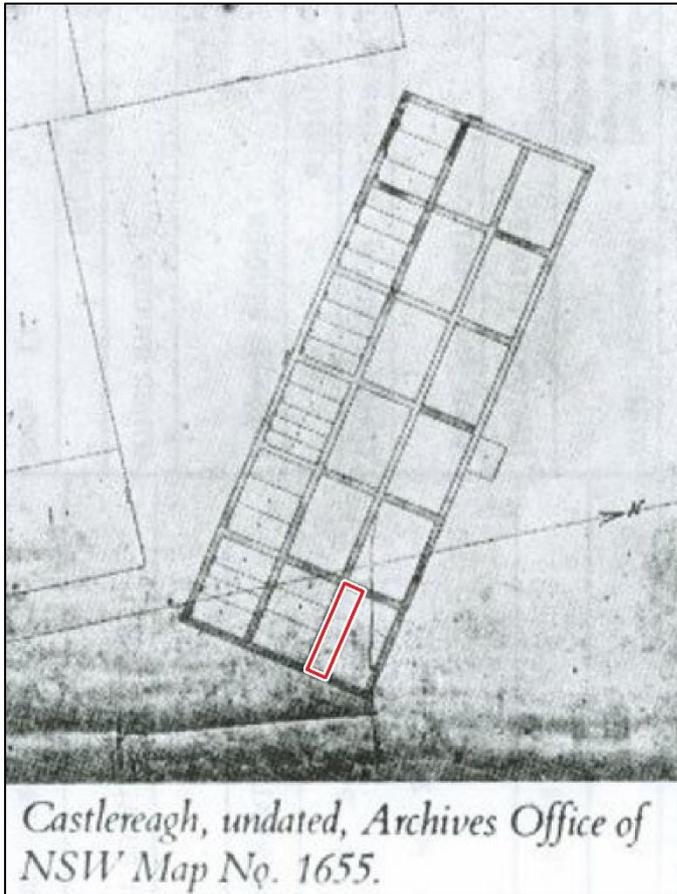


Figure 16 Site of Castlereagh Township with site highlighted (Source: Archives Office of NSW)

4.4 Penrith Development Control Plan 2014

The proposed development has been assessed against the relevant non-statutory controls of the Penrith DCP 2014 (provided in Table 7). The site falls outside of the Cranebrook Rural Residential Key Precinct, and as such is subject to the provisions of Part C City Wide Controls and Part D Residential Land Use Controls of the DCP.

Table 7 Relevant DCP Provisions

Control	Compliance
Part C – City-wide Controls	
<p>C1 – Site Planning and Design Principles</p> <ul style="list-style-type: none"> An applicant must demonstrate how all proposed buildings are consistent with the height, bulk and scale of adjacent buildings and buildings of a similar type and use. 	<p>Yes – The proposed development considers the height, bulk and scale of adjoining buildings on</p>

Control	Compliance
<ul style="list-style-type: none"> The proposed development upholds sustainable development principles and considers solar access, daylight access and thermal heating/cooling. Proposed development upholds CPTED principles including natural surveillance, access control, territorial reinforcement and space management. Dwelling design consistent with Australian Network for Universal Design (ANUHD). 	<p>E4 Environmental Living land.</p> <p>The proposed development is supported by the preparation of BASIX.</p> <p>This DA is supported by a comprehensive site analysis which considers the natural and built environment features of the site and its surrounds.</p>
<p>C2 – Vegetation Management</p> <ul style="list-style-type: none"> Satisfy approval requirements for the removal of any site vegetation. Ensure retention of any vegetation with high biodiversity value and protection of retained trees during construction phase. 	<p>Yes – The proposed development will retain existing trees lining the site frontage, the Snow Street boundary and at the rear of the site.</p> <p>Good vegetation cover will be retained over the EDA area, as recommended by the Wastewater Report.</p>
<p>C3 – Water Management</p> <ul style="list-style-type: none"> Dethatched residential dwelling developments are required to consider water sensitive urban design (WSUD) through BASIX Water Conservation 5(a). 	<p>Yes – The proposed development considers WSUD as part of BASIX compliance and includes use of water saving fixtures and installation of a 1,900L rainwater tank (Appendix E).</p>
<p>C4 – Land Management</p> <ul style="list-style-type: none"> Consent is required for earthworks and when material is imported or removed from a property or relocated on the same property. Any development application that proposes earthworks and therefore changes to the levels of a site, is required to clearly address and justify the location, extent and impacts of this work. 	<p>Yes – Consent is sought as part of this DA for minor earthworks related to the proposed development. Fill of up to 200mm underneath the dwelling proposed.</p>

Control	Compliance
<ul style="list-style-type: none"> All applications for development involving site disturbance require preparation of an Erosion and Sediment Control Plan (ESCP). In determining DAs, Council will fully consider the possibility of land contamination and the implications it has for any proposed future use. 	<p>The site is classified as ‘flat land’.</p> <p>Owing to the general levels of the site, only minor earthworks will be required as part of the proposed development (RL 49.30 to RL 49.50).</p> <p>This DA is supported by an ESCP (Appendix C).</p> <p>Risk of contamination of the site is considered to be very low due to low impact use including residential prior to subdivision and remediation actions undertaken as part of the recent subdivision which created the subject lot.</p>
<p>C5 – Waste Management</p> <ul style="list-style-type: none"> The development must provide a waste bin storage area that is of sufficient size to accommodate all required waste bins; The kitchen of the dwelling should be designed with sufficient space for the interim storage of waste; 	<p>Yes – The proposed development features internal and external waste storage areas in line with the size and position outlined in the DCP.</p> <p>This DA is supported by a waste management plan (Appendix G), outlining management of demolition, construction and operational waste.</p>
<p>C6 – Landscape Design</p> <ul style="list-style-type: none"> The proposed single dwelling house requires Category 1 consideration of landscape design as part of the development requiring a Site Analysis. All development should seek to align to Environmentally Sustainable Design (ESD) principles including minimising soil erosion, avoidance of excavation/fill, considered species 	<p>Yes – The proposed development includes retention of existing site trees as well as soft landscaping around the proposed development.</p>

Control	Compliance
<p>selection (including bushfire resistant species) and protection of high value site vegetation.</p> <ul style="list-style-type: none"> Landscape designs must comply with any relevant requirements of the 'Culture and Heritage' section of this DCP. Trenching of underground utility services should be maximised and overhead cabling should be placed in allocated easements. In areas sewer is not available, developments may need to consider on-site effluent disposal, and in particular, land application areas for the disposal of treated effluent. 	<p>Stormwater and wastewater systems have been designed to be largely concentrated underground.</p> <p>The proposed development includes an AWTS system and planned EDA.</p>
<p>C7 – Culture and Heritage</p> <ul style="list-style-type: none"> Any DA involving an archaeological site is to undertake an archaeological assessment as part of the Heritage Impact Statement or Conservation Management Plan. Where development/disturbance of an archaeological site is proposed, the applicant is to liaise with the Heritage Division of the Office of Environment and Heritage to ensure compliance with the Heritage Act, 1977. If relics are discovered during construction or operation, works should cease immediately and the Heritage Division contacted. 	<p>Yes – Section 4.3 of this SEE addresses Heritage considerations related to the site.</p> <p>The site is classified as part of an archaeological site (A30 – Site of Castlereagh Township) within the Penrith LEP 2010.</p> <p>It is evident that the proposed development is of low-impact form and reduced bulk and scale.</p>
<p>C10 – Transport, Access and Parking</p> <ul style="list-style-type: none"> Vane Street is identified as a rural street and as such requires the following the following: <ul style="list-style-type: none"> No parking lane provision; 7m width of dedicated travel lanes in both directions; 2 x 6.0m verge widths; 19m road reserve; and No concrete pedestrian pathway. Car parking rates for dwelling houses: <ul style="list-style-type: none"> 2 spaces per dwelling – stack or tandem parking acceptable. If on-grade car parking is proposed, the location and adequacy of the parking area must not adversely impact on the amenity of the adjoining neighbourhood. The parking area is to: 	<p>Yes – The proposed development includes construction of a driveway cross over and gravel driveway connecting the dwelling, visitor parking and garage to Vane Street.</p> <p>The proposed development provides 3 internal garage car spaces, as well as an additional 2 external visitor parking spaces on the south-west side boundary.</p> <p>Car parking is not clearly visible from Vane Street</p>

Control	Compliance
<ul style="list-style-type: none"> ○ be located on the side or rear of the site, and is not visible from the street and street frontage; ○ be landscaped or screened so that cars parked in the parking area are not visible from adjoining buildings or the street/ street frontage; and ○ allow safe and direct access to the building entry points. ● Driveways, parking and manoeuvring areas must comply with Australian Standards. ● The road access to the site should provide for safe entry to and exit from the site. ● All driveways (including in rural and environmental zones) are to be sealed from the point of the public road up to and including the hard-stand parking areas. 	<p>and provides safe and direct access to the dwelling.</p> <p>All driveways, parking and manoeuvring areas comply with Australian Standards and DCP Controls.</p>
<p>C13 – Infrastructure and Services</p> <ul style="list-style-type: none"> ● Location of infrastructure (including easements) should be identified and consultation with service providers complete to understand site development constraints; ● Existing and proposed provision of services/utilities addressed in the site analysis. ● Service providers including Sydney Water (water), Endeavour Energy (electricity) and Telstra (telecommunication) should be contacted to make satisfactory arrangements. ● On site sewage management systems (OSSM) used in unsewered areas are aerated wastewater treatment systems (AWTS), pump-out systems and absorption trench disposal systems. ● Installation and operation of OSSM systems require approval, as well as a Wastewater Assessment Report (in line with Council’s On-Site Sewage Management and Greywater Reuse Policy). 	<p>Yes – Existing infrastructure and service easements have been identified to accompany this DA.</p> <p>The proposed development will include an AWTS system and planned EDA.</p> <p>The site will be serviced by a pit and pipe system, discharging rainwater to the rainwater tank and underground stormwater drainage network</p>

Part D – Land Use Controls	
D2 – Residential Development, 2.1 Single Dwellings	
2.1.1 Residential Character	
<ul style="list-style-type: none"> ● The residential character of any neighbourhood is determined by: <ul style="list-style-type: none"> ○ Location and density of development; ○ The local landscape and its configuration; and ○ Predominant patterns of planning and design. 	<p>Yes – The proposed development is consistent with the local Environmental Living residential character.</p> <p>There is a mix of uses surrounding the site,</p>

Control	Compliance
	<p>although the most prevalent is low-impact housing.</p> <p>Due to the diversity of uses allowed in the E4 zone, there are also low-impact commercial and environmental uses within the neighbourhood.</p> <p>The site is largely flat and is well cleared at the front of the site to accommodate a future dwelling.</p> <p>There is no clear pattern of development across the neighbourhood due to the diversity of uses permitted within this zone.</p>
<p>Setbacks and Building Envelope</p> <ul style="list-style-type: none"> • Front setback is 5.5m or the average of the setbacks of adjoining properties (whichever is greater). • Side setbacks to external walls should be a minimum of 900mm. • Minimum rear setback for a single storey building (or any single storey component of a building) is 4m. • Development is to be contained within the building envelope for the site. 	<p>Yes - The proposed development includes the following setbacks:</p> <p>Front setback = 56.705 m</p> <p>Side setback (south-west) = 16.0 m</p> <p>Rear setback = 299.220 m</p>
<p>2.1.5 Building Design/Site Works</p> <ul style="list-style-type: none"> • ‘Articulate’ all building forms and facades including: <ul style="list-style-type: none"> ○ roof forms/pitches; ○ every elevation should incorporate windows; and ○ walls should be overhung by shady verandas, awnings and carports. • Design of dwellings should front the street and display a traditional configuration including: <ul style="list-style-type: none"> ○ The front door and a window to a habitable room facing the street ○ Garages integrated within the building façade 	<p>Yes – The dwelling roof is angled at 29.0°.</p> <p>There is an awning and eaves over the alfresco area, as well as along the north-east side of the building.</p> <p>Vehicular access to the garage, as well as main pedestrian access to the dwelling are located</p>

Control	Compliance
<ul style="list-style-type: none"> ○ The size of driveways minimised, retaining sufficient area for landscaping of front gardens ● Garages: <ul style="list-style-type: none"> ○ Must be setback at least 1m behind the building line of the dwelling ○ The total width of all garage doors facing a primary or secondary road frontage must not exceed; <ul style="list-style-type: none"> ▪ If the lot has a width of more than 15m measured at the building line – 6m 	<p>adjacent to the south-west side boundary.</p> <p>The garage is well integrated into the building façade and the future construction of Snow Street, provides additional street frontage.</p> <p>With reference to the Bushfire Report (Appendix F) the proposed driveway and visitor parking area provide essential access to emergency service vehicles.</p> <p>No – The proposed development does not adopt a traditional garage configuration.</p> <p>The vehicular entry is located 16m from the Snow Street frontage, as well as a pedestrian door and window located 56.705m from the Vane Street frontage.</p> <p>The width of the 11.035m, three car garage door located adjacent to the future proposed Snow Street frontage, exceeds the relevant control.</p> <p>The garage door is not setback 1m from the building line. This configuration is typical of environmental living dwellings.</p> <p>The garage door will not be directly viewed from</p>

Control

Compliance

Snow Street due to adjacent cover of boundary fencing and site landscaping, including an existing tree.

Due to the sites 16.0m side setback to Snow Street, non-compliance with this control will have minimal impact to the visual amenity of the site and surrounds.

2.1.6 Solar Planning

- Demonstrate that dwellings meet acceptable solar standards and that existing neighbouring and proposed private open spaces receive adequate solar access:
 - maximise potential for solar gain by placing windows in all exterior walls that are exposed to northern sun;
 - ensure that the proposed development provides a minimum of 3 hours sunlight between 9am and 3pm on 21 June, to living zones of the dwelling, and the living zones of any adjoining dwellings;
 - ensure that the proposed development provides a minimum of 3 hours sunlight between 9am and 3pm on 21 June, to 40% of the main private open spaces of the dwelling and main private open spaces of any adjoining dwellings,
 - where existing overshadowing by buildings and fences reduces sunlight to less than this, sunlight is not further reduced by more than 20%.

Yes – This DA is supported by a solar access and natural ventilation diagram prepared by LYMT (**Appendix A**).

The proposed development receives consistent sun to the eastern façade from morning to midday throughout the year.

Solar access will be maximised across the eastern façade including open-air alfresco, floor-to-ceiling double glass doors in Bedroom 2 and two sets of double glass doors in the living and dining area.

5. Environmental and Planning Assessment

This section of the report relies on the attached Architectural Plans prepared by LYMT. It examines the suitability of the proposed development, having regard to the proposal's potential environmental impacts.

5.1 Any Environmental Planning Instruments

Consideration and assessment of the proposed development with regards to the relevant environmental planning instruments has been provided in Section 4 of this SEE.

5.2 Any Proposed Instrument

There are no proposed or draft environmental planning instruments relevant to the proposed development site.

5.3 Any Development Control Plan

The proposed development has been assessed against the relevant development controls and objectives under the Penrith DCP 2014 in Table 7 of Section 4.4. The proposed development is largely consistent with the DCP as it relates to City-wide and residential development controls. Minor variation to development controls as they relate to building design and site works have been suitably justified.

5.4 The Regulations

There are no relevant provisions of the Regulations which apply to the proposed development of the subject site.

5.5 Likely Impacts of the Development

The proposed new single dwelling will have minimal adverse impact on the surrounding locality in relation to visual bulk or building scale. The proposal includes a single storey dwelling with attached garage. The form of the dwelling is considered modest, not exceeding any built form controls outlined in the Penrith LEP 2014 including building height or FSR. There are no overshadowing or privacy impacts to neighbouring properties as a result of the proposed development.

The development does not require removal of any site trees or significant modification of existing ground levels, ensuring that site soils and vegetation are preserved in perpetuity. Retention of site vegetation will ensure that the character of the E4 Environmental Living zone is maintained. The proposed development will not impact on any significant views or vistas. Infrastructure, including wastewater and stormwater, has been planned to ensure an appropriate level of service for the dwelling without impacting on capacities in the surrounding neighbourhood.

5.5.1 Submissions

Any submissions made during public notification of the development application are to be duly considered by Council as part of their assessment.

5.6 Site Suitability and Public Interest

This SEE, and all supporting plans and documentation have comprehensively demonstrated that the subject site is suitable for the proposed development. The proposal is capable of being undertaken without causing any significant detrimental impacts to the surrounding environment or neighbouring properties. It provides suitable residential development and contributes to local housing stock, whilst retaining the ecological, scientific and aesthetic value of the E4 Environmental living zone.

The proposed development is in the public interest as it:

- Contributes to housing supply in the local area;
- Is consistent with the objectives of the E4 zone;
- Maintains the land within 180m of the rear boundary as an Asset Protection Zone / Inner Protection Area;
- Results in the development of a dwelling that is compliant with minimum lot size, building height and FSR standards under the Penrith LEP 2010;
- Provides dwelling product that is generally compliant with the objectives and controls set out in the Penrith DCP 2020; and
- Will not have any significant detrimental impacts on the environment or surrounding properties.

6. Conclusion

The proposed new residential development is permissible with consent and is compliant with the relevant statutory standards in the Penrith LEP 2010. The assessment provided in Sections 4 and 5 of this SEE has demonstrated the proposal's general compliance with relevant controls and objectives in the Penrith DCP 2020. The proposed development showcases sensitivity to local heritage and environment conditions.

Overall, the proposal is unlikely to adversely impact the environment or surrounding properties by way of bulk, scale, densities, overshadowing, traffic, noise or privacy. All potential environmental impacts associated with the future construction works have been considered and are capable of being sufficiently mitigated in accordance with Council's standard conditions of consent. Bushfire Protection principles have been considered and mitigation measures adopted through application of an asset protection zone, commitment to relevant construction requirements, provision of satisfactory access and adequate water supply.

The overall design of the dwelling is well suited to the location, optimising existing vegetation, solar access and natural ventilation in the building design. The style and design of the dwelling is understated yet contemporary, complimenting the semi-rural character of the area. The dwelling achieves relevant efficiency and sustainability targets set by BASIX as they relate to water, thermal comfort and energy.

The minor deviations sought to the traditional building configuration and location of the garage are outlined in 2.1.5 of the DCP. The variation proposed is considered to be well founded due to the 16.0m setback adopted to Snow Street and the visual protection provided by the boundary fence, site landscaping and existing tree.

In light of the merits of the proposal and the absence of any unreasonable environmental effects, the proposal is considered worthy of Council's support.



Appendices



APP

Property and Infrastructure Specialists

Appendix A – Architectural Plans



Property and Infrastructure Specialists

Appendix B – Site Survey



APP

Property and Infrastructure Specialists

Appendix C – Stormwater Management Plan



Property and Infrastructure Specialists

Appendix D – Wastewater Management Plan



APP

Property and Infrastructure Specialists

Appendix E – BASIX Certificate



Property and Infrastructure Specialists

Appendix F – Bushfire Report



APP

Property and Infrastructure Specialists

Appendix G – Waste Management Plan



Adelaide

61 8 8409 4280

Level 1
151 South Terrace
Adelaide SA 5000

Brisbane

61 7 3238 0400

Ground Floor
143 Coronation Drive
Milton QLD 4064

Canberra

61 2 9957 6211

Level 9
121 Marcus Clarke Street
Canberra ACT 2600

Melbourne

61 3 8866 0200

Level 7
420 St Kilda Road
Melbourne VIC 3004

Newcastle

61 2 4928 7600

Level 2
426 King Street
Newcastle NSW 2300

Perth

61 8 9224 6300

Level 4
181 Adelaide Terrace
Perth WA 6004

Sydney

61 2 9957 6211

Level 7
116 Miller Street
North Sydney NSW 2060

Tamworth

61 421 959 484

Suite 6
493 Peel Street
Tamworth NSW 2340

Wollongong

61 2 4220 6300

Suite 3, Level 1
6-8 Regent Street
Wollongong NSW 2500

PROPOSED DWELLING

LOT 3 DP 1242079
13-15 Vane St, CRANE BROOK

DRAWING LIST

Drawing No:	Description	Rev.
AP01	Cover Sheet	03
AP02	Plan / Sections	04
AP03	Elevations	02
AP04	Site Analysis Plan	03
AP05	Notification Plans	01
AP06	BASIX Plans	01

DEVELOPMENT DATA

SITE AREA: 2.084Ha
PROPOSED GFA: 93.91sqm
PROPOSED BUILDING FOOTPRINT: 242.39sqm

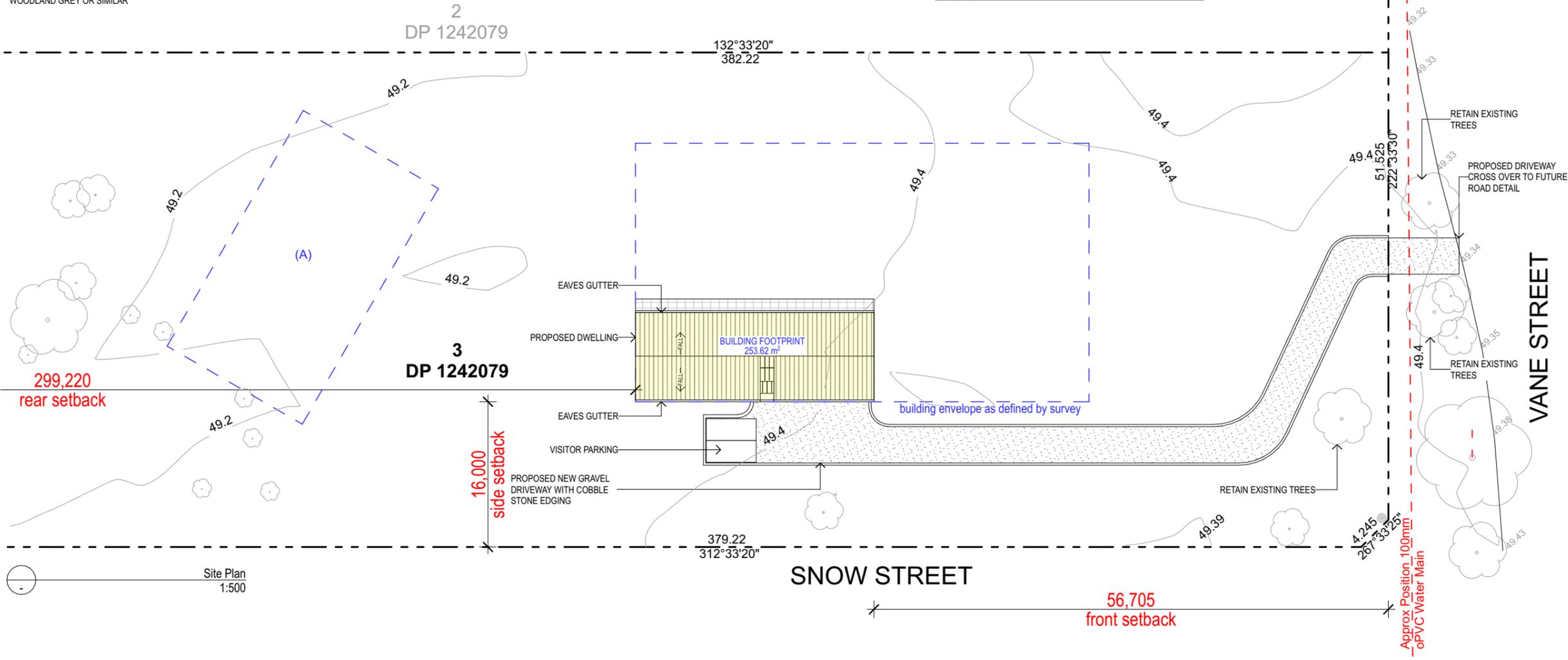
SCHEDULE OF FINISHES



BASIX REQUIREMENTS

Thermal Performance Specifications		Insulation	Colour (Solar Absorbance)	Detail
External Wall Construction				
Brick Veneer	Anti-glare foil with bulk no gap R2.5	Medium		
Internal Wall Construction				
Cavity wall, direct fix plasterboard, single gap	None			
Brick Veneer	Bulk insulation R2.5	Internal walls adjoining garage		
Ceiling Construction				
Plasterboard with Timber	Bulk insulation R4.0	Raked ceilings		
Roof Construction				
Corrugated Iron	Bulk, reflective side down, air gap above R1.3	Medium	29° pitch	
Floor Construction				
175mm Waffle Pod Slab	None	Timber, Ties and Bare		
Windows				
GJA-070-25 A Aluminium framed 6EA Sliding Doors Single Glazed	4.41	0.60		
GJA-001-22 A Aluminium framed 6EA Awning Windows Single Glazed	4.78	0.52		
GJA-011-21 A Aluminium framed 6EA Fixed Windows Single Glazed	3.91	0.66		
Roof Window - Velux U-Value 2.60, SHGC 0.24				

13-15 Vane Street, Cranebrook			
SUMMARY OF BASIX COMMITMENTS			
This is a summary of the BASIX Commitments as detailed in the BASIX Certificate. Refer to the CURRENT BASIX Certificate for Complete details.			
WATER COMMITMENTS			
Fixtures			
Alternative Water – Rainwater Tank Size 1,900(L) Tank Connected To:			
One Outdoor Tap	All Toilets	Washing Machine cold tap	
Fixtures			
4 Star Shower Heads	4 Star Toilet	4 Star Kitchen Taps	4 Star Basin Taps
THERMAL COMFORT COMMITMENTS - Refer to TPA Specification on plans			
ENERGY COMMITMENTS			
Hot Water	Solar (electric boosted) 31 to 35 STCs or better		
Cooling System	Living	None	
	Bedrooms	None	
Heating System	Living	None	
	Bedrooms	None	
Ventilation	Bathrooms	Fan ducted to roof/façade	Manual on/off
	Kitchen	Fan ducted to roof/façade	Manual on/off
	Laundry	Fan ducted to roof/façade	Manual on/off
Natural Lighting	Window/Skylight in Kitchen		As Drawn
	Window/Skylight in Bathrooms/Toilets		As Drawn
Artificial Lighting (Primarily lit by fluoro or LED)	Number of bedrooms	2	Dedicated Yes
	Number of Living/Dining rooms	1	Dedicated Yes
	Kitchen	Yes	Dedicated Yes
	All Bathrooms/Toilets	Yes	Dedicated Yes
	Laundry	Yes	Dedicated Yes
All Hallways	Yes	Dedicated Yes	
OTHER COMMITMENTS			
Outdoor clothes line	Yes	Indoor or sheltered clothes drying line Yes	
Stove/Oven	Gas cooktop, Electric oven		
Other	"Well ventilated" refrigerator space		



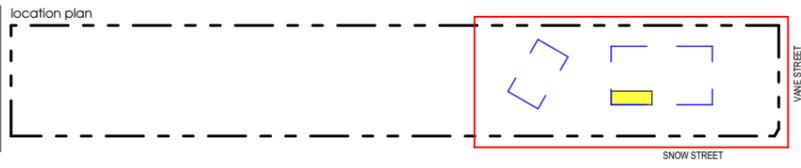
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Version: 1, Version Date: 04/05/2021

amendments

Revision	Description	By	Date
01	Preliminary for Client Review	JM	27.11.20
02	Preliminary for Coordination	JM	29.03.21
03	DA Submission	JM	28.04.21

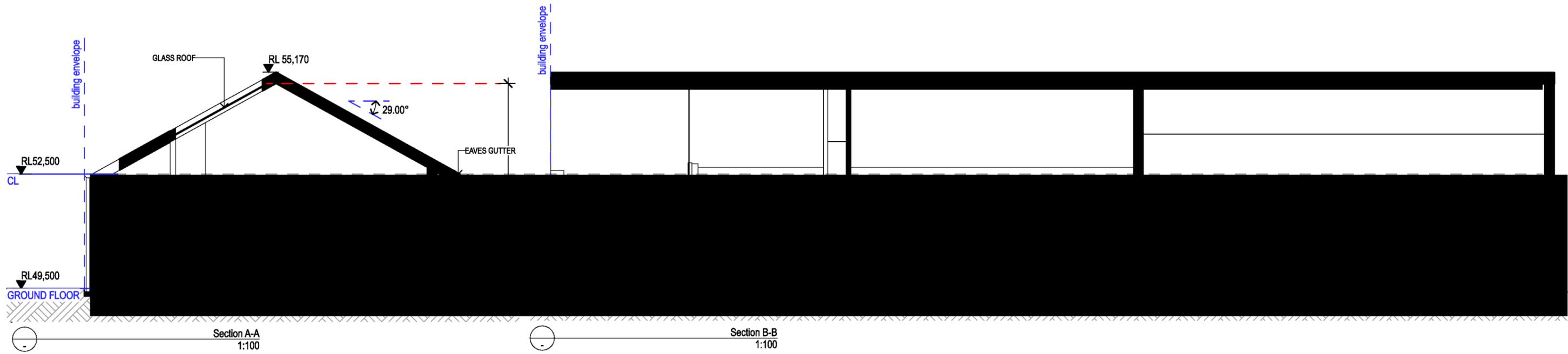


client
MR & MRS ROSITANO

project
20014 - Proposed Dwelling
13-15 Vane St, CRANE BROOK

drawing
Cover Sheet
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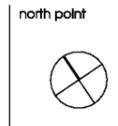




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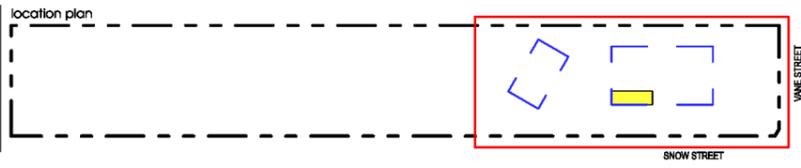
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04	DA Submission	JM	28.04.21



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drawing
 Plan / Sections
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north point

Revision	Description	By	Date
01	Preliminary for Coordination	JM	29.03.21
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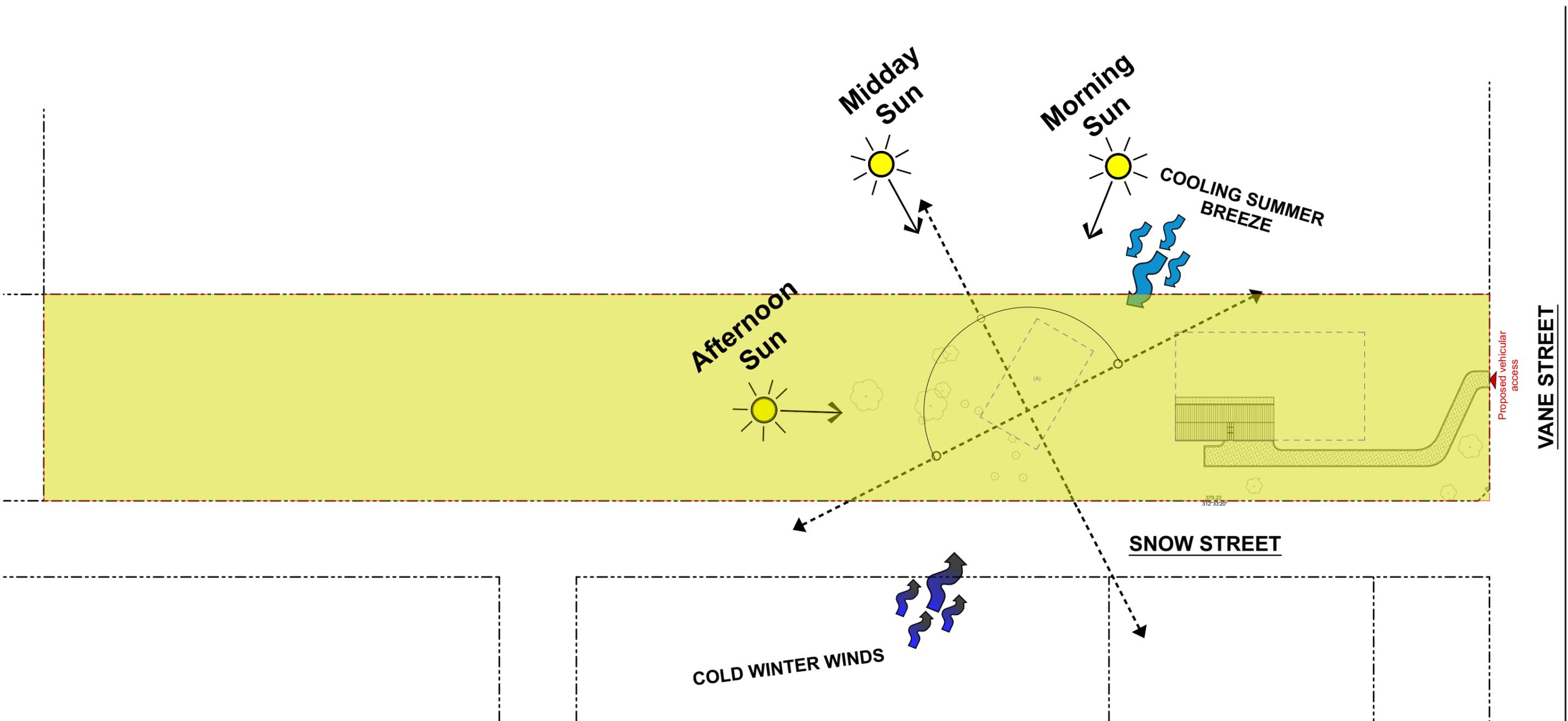
SCHEDULE OF FINISHES	
01.	COLORBOND ROOF SHEET
02.	FACEBRICK
03.	PANEL LIFT ROLLER DOOR
04.	ALUMINIUM FRAMED GLASS ROOF
05.	ALUMINIUM FRAMED GLASS WINDOW/DOOR

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project
20014 - Proposed Dwelling
13-15 Vane St, CRANE BROOK

drawing
Elevations
1:100 @ A3 \ drawing no. \ AP03 02

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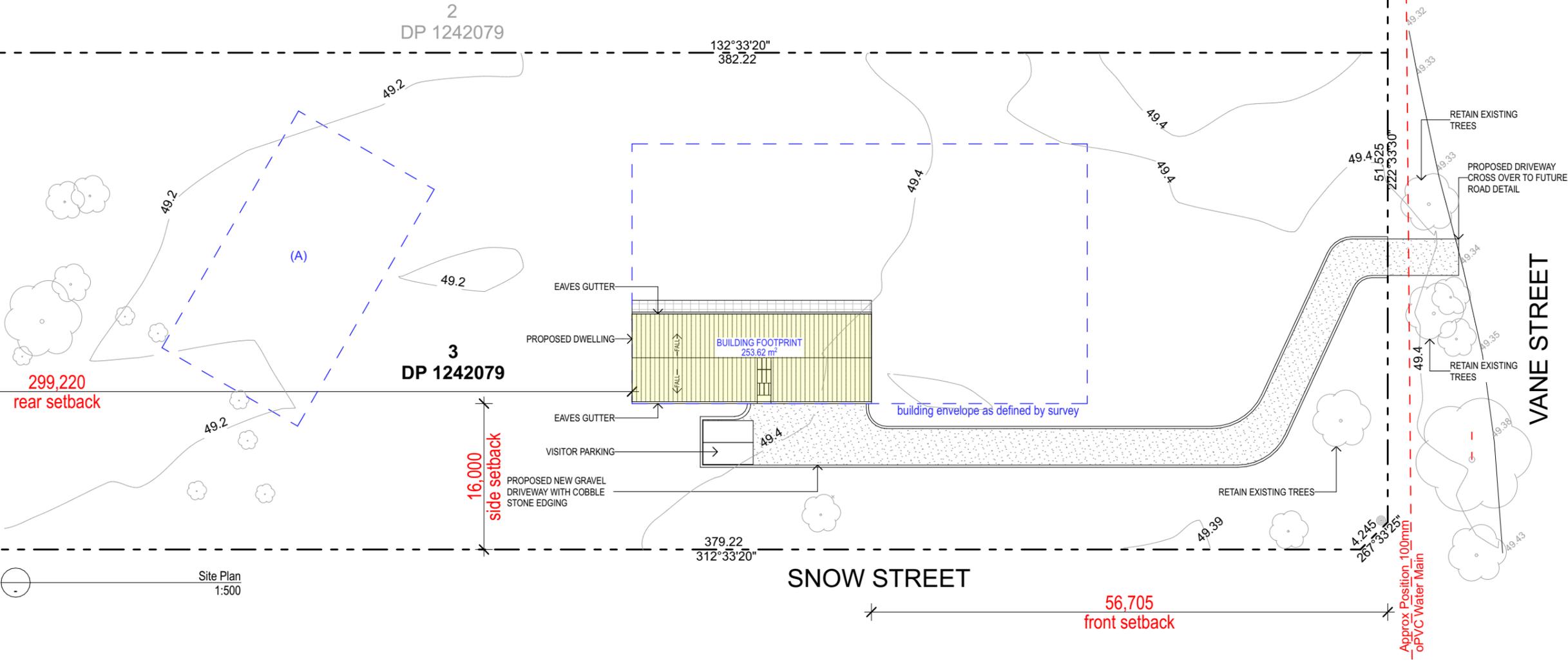
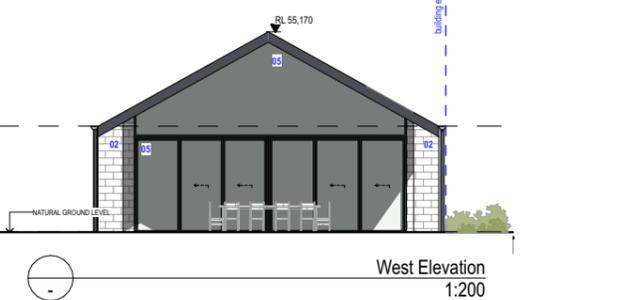
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project
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 13-15 Vane St, CRANE BROOK

drawing
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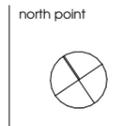




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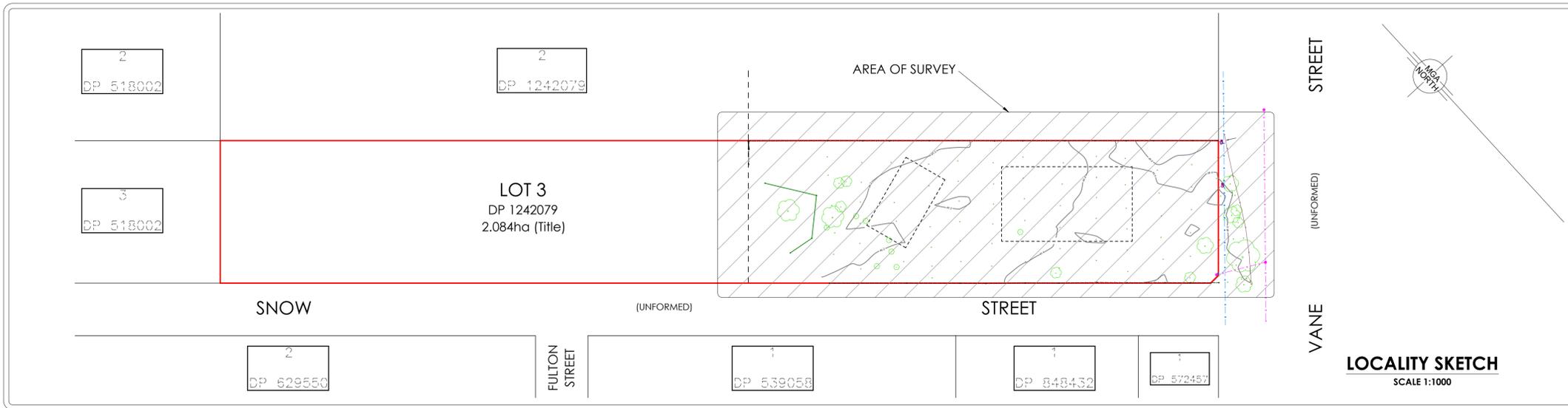
- notes
- 01 COLORBOND NAIL STRIP ROOF SHEET WOODLAND GREY OR SIMILAR
 - 02 FACE BRICK PALE BRICK COLOUR
 - 03 PANEL LIFT ROLLER DOOR WOODLAND GREY OR SIMILAR
 - 04 GLASS ROOF
 - 05 ALUMINIUM FRAMED GLASS WINDOW/DOOR

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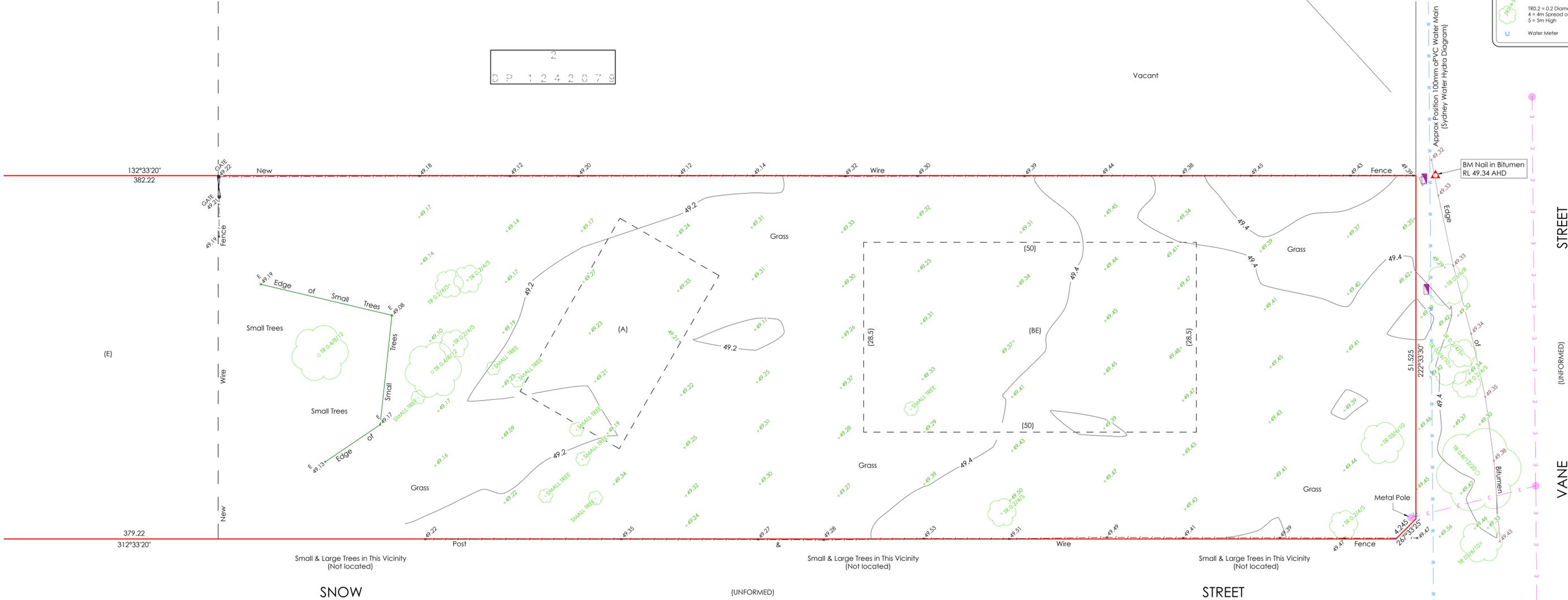
drawing
 Notification Plans
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- NOTES:
- * BEARINGS & DISTANCES SHOWN ARE BY TITLE ONLY. NO BOUNDARY INVESTIGATION OR DEFINITION HAS BEEN CARRIED OUT.
 - * THE POSITION OF THE BUILDINGS, IMPROVEMENTS, FENCES & WALLS SHOWN IN RELATION TO THE BOUNDARIES ARE APPROXIMATE AND DIAGRAMMATIC ONLY. IF THE POSITION OF THESE STRUCTURES ARE CRITICAL TO DESIGN OR FINANCIAL DECISIONS, FREEBURN SURVEYING RECOMMEND A BOUNDARY SURVEY OVERSEEN BY A REGISTERED SURVEYOR.
 - * DO NOT SCALE OFF THIS PLAN.
 - * SERVICES SHOWN HEREON HAVE BEEN LOCATED WHERE POSSIBLE BY FIELD SURVEY. THE POSITION OF ANY UNDERGROUND SERVICES, INCLUDING FIBRE OPTIC CABLES HAVE NOT BEEN DETERMINED. PRIOR TO ANY EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITY SHOULD BE CONTACTED FOR POSSIBLE LOCATION OF ANY OTHER SERVICES INCLUDING THOSE WHICH MAY BE UNDERGROUND. "DIAL BEFORE YOU DIG" (www.1100.com.au)
 - * * * INDICATES EXISTING SURFACE LEVEL.
 - * CONTOURS SHOWN DEPICT THE GENERAL TOPOGRAPHY. THEY DO NOT REPRESENT EXACT LEVELS OTHER THAN AT SPOT LEVELS SHOWN.
 - * THE TREE SIZES ARE APPROXIMATE ONLY. FURTHER FIELD INSPECTION SHOULD BE CARRIED OUT WHERE TREE DETAILS ARE CONSIDERED TO CRITICALLY AFFECT DESIGN.
 - * ORIGIN OF LEVELS: SSM 16344 RL 38.001 AHD (SCIMS 04-12-2020)

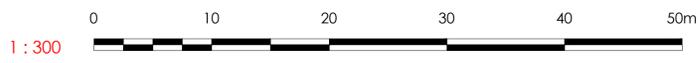
- (A) RESTRICTION ON THE USE OF LAND (DP 1242079)
 (E) POSITIVE COVENANT (DP 1242079)
 (BE) RESTRICTION ON THE USE OF LAND (DP 1242079) (VARIATION AQ89454)



LEGEND

- ▲ Bench Mark
- ⊠ Telephone Pit Lid (Single)
- ⊠ Power Pole
- ⊠ Gate
- TR 0.2 = 0.2 Diameter of Trunk
4 = 4m Spread of Canopy
5 = 5m High
- ⊠ Water Meter

NOTE:
 THESE PLANS SHOULD BE READ IN CONJUNCTION WITH DIGITAL DATA ISSUED TO CLIENT. THE DIGITAL DATA CONTAINS NUMEROUS LAYERS OF INFORMATION WHICH ARE NOT SHOWN ON THESE PLANS FOR THE SAKE OF CLARITY.



Client: LYMT HOLDINGS	Project: PLAN OF DETAIL, LEVELS AND CONTOURS OVER PART OF LOT 3 IN DP 1242079 13-15 VANE STREET, CRANE BROOK	 FREEBURN LAND, ENGINEERING & MINING SURVEYOR SUITE 2, FIRST FLOOR, "SURVEYOR HOUSE" 2 CASTLEREAGH STREET PENRITH 2750	Telephone 02 4721 2289 Fax 02 4721 5646 email l.mcgrann@freeburnsurveyors.com or matthew@freeburnsurveyors.com	Scale 1:300	Datum: AHD	Contour: 0.2m
				Surveyor: CP/DM	Drawn By: LJMc	Checked: MF
				Date of Survey: 04/12/2020	Sheet 1 of 1	
				AUTOCAD	REVISION 00	08-12-20
				37 475 DETAIL		

STORMWATER MANAGEMENT PLAN

13 VANE STREET CRANE BROOK



Con Katsoulas
BE (Civil), MIEAust, CPEng No. 449924

NOTES:

- ALL PROPOSED PITS TO BE 450 x 450 CAST IN-SITU OR PRECAST PITS UNLESS SHOWN OTHERWISE.
- ALL CHARGED LINE PIPES TO BE 100Ø uPVC SEWER CLASS UNLESS SHOWN OTHERWISE
- ALL DOWNPIPES TO BE 90Ø uPVC OR 100 x 50 UNLESS OTHERWISE SHOWN
- ALL NON-PRESSURE STORMWATER PIPES TO BE 100Ø uPVC UNLESS SHOWN OTHERWISE
- ALL GRATED DRAINS TO BE MINIMUM 150 WIDE GALVANIZED HEAVY DUTY GRATES.
- ALL NON-TRAFFICABLE PITS TO BE LIGHT DUTY. PITS IN TRAFFICABLE AREAS TO BE HEAVY DUTY.
- ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH COUNCILS SPECIFICATIONS.
- ALL PITS GREATER THAN 1.2m DEPTH SHALL INCLUDE STEP IRONS AND HAVE MINIMUM CLEAR DIMENSIONS OF 600 x 600.
- ALL PITS ARE TO BE BENCHED TO ALLOW SMOOTH FLOW OF WATER THROUGH PITS
- ALL DOWNPIPES SHALL CONFORM TO AS/NZS 1866 FOR ALUMINIUM PIPES AND AS 1254, AS/NZS 1260, AS 1273, AS/NZS 1477, AS/NZS 2179.2 AND AS 2032 FOR uPVC PIPES.
- ALL BOX GUTTERS SHALL COMPLY WITH AS/NZS 2179.1
- ALL BOX GUTTERS SHALL BE CONSTRUCTED WITH A MINIMUM 1:200 GRADE TO SUMP/DOWNPIPES
- ALL DRAINAGE WORKS SHALL BE IN ACCORDANCE WITH AS 3500.3.2

SHEET INDEX:

SHEET No.	TITLE	AMMENDMENT No.
1	INDEX SHEET	0
2	STORMWATER DETAIL PLAN	0
3	GROUND FLOOR PLAN	0
4	ROOF PLAN	0
5	EROSION AND SEDIMENT CONTROL PLAN	0

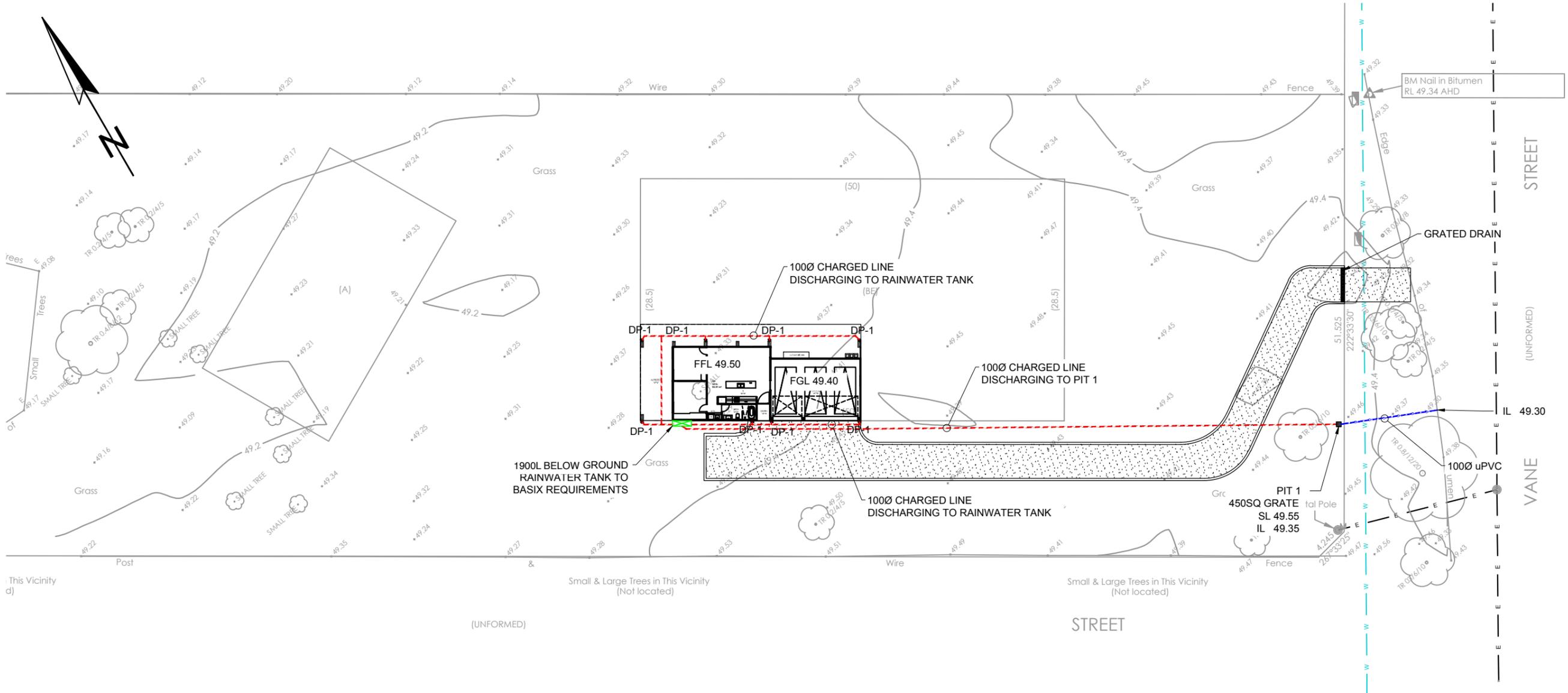
LEGEND

	FLOWPATH	IL 0.00	PIT/PIPE INVERT LEVEL
	FLOOR WASTE	TK 0.00	TOP OF KERB LEVEL
	FLOW SPREADER AND DOWNPIPE TYPE 1		GRATED DRAIN
	PROPOSED GRATED PIT	+ 00.00	EXISTING SURFACE LEVEL
	PROPOSED SEALED WATER TIGHT PIT	+	PROPOSED SURFACE LEVEL
	RAINHEAD	• IP	SEALED INSPECTION OPENING
	SUMP OVERFLOW	• DP-1	DOWNPIPE - TYPE 1
	PROPOSED STORMWATER PIPE - GRAVITY		HIP ROOF
	PROPOSED V-DRAIN		FLAT ROOF
	PROPOSED STORMWATER PIPE - CHARGED		TERRACE/BALCONY
	PROPOSED RISING MAIN (PRESSURE PIPE)		BASIX ROOF AREA DRAINING TO RAINWATER TANK
	PROPOSED SUBSOIL DRAIN		AREA BYPASSING ON-SITE DETENTION TANK
	PROPOSED BUILDING - GROUND FLOOR		
	PROPOSED BUILDING - FIRST FLOOR		
	PROPOSED CONTOURS		

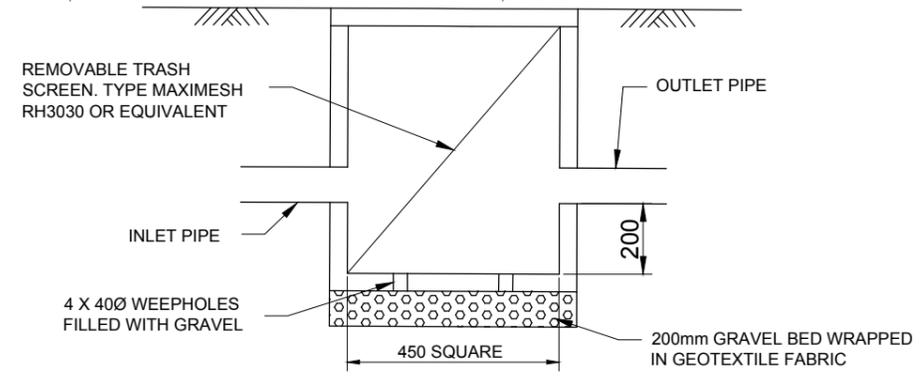
DOWNPIPE TYPE	DOWNPIPE SIZES	
	ROUND	RECTANGULAR
1	90Ø	100 X 75
2	100Ø	100 X 75
3	125Ø	100 X 100
4	150Ø	150 X 150

FOR CONSTRUCTION

SURVEYOR MATTHEW FREEBURN	0	DA ISSUE	01/05/21					C.K. ENGINEERING SERVICES ABN 67 115 216 496 49 FLORA ST ROSELANDS, NSW 2196 MOB: 0403 329 327 EMAIL: ckatsoulas@gmail.com	CLIENT: LYMT	DRAWING TITLE: INDEX	DRAWN: S.C. DESIGNED: C.K. CHECKED: C.K.	SIGNED:	DATE: MAY 2021 SCALE: AS SHOWN DATUM: AHD
ARCHITECT LYMT									PROJECT: 13 VANE STREET, CRANE BROOK				
CONSULTANT	No.	AMMENDMENT	DATE	No.	AMMENDMENT	DATE							JOB & DRAWING No: 211404 No. IN SET: 1 OF 5 ISSUE: 0



SITE PLAN
SCALE: 1:500



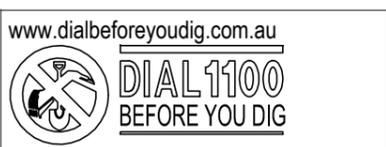
SILT ARRESTOR PIT 1 TYPICAL DETAIL
SCALE: 1:20

ALL PIPES TO BE 100Ø uPVC UNLESS OTHERWISE SHOWN

ALL GUTTERS TO HAVE MIN. 8500mm² X-SECT AREA.

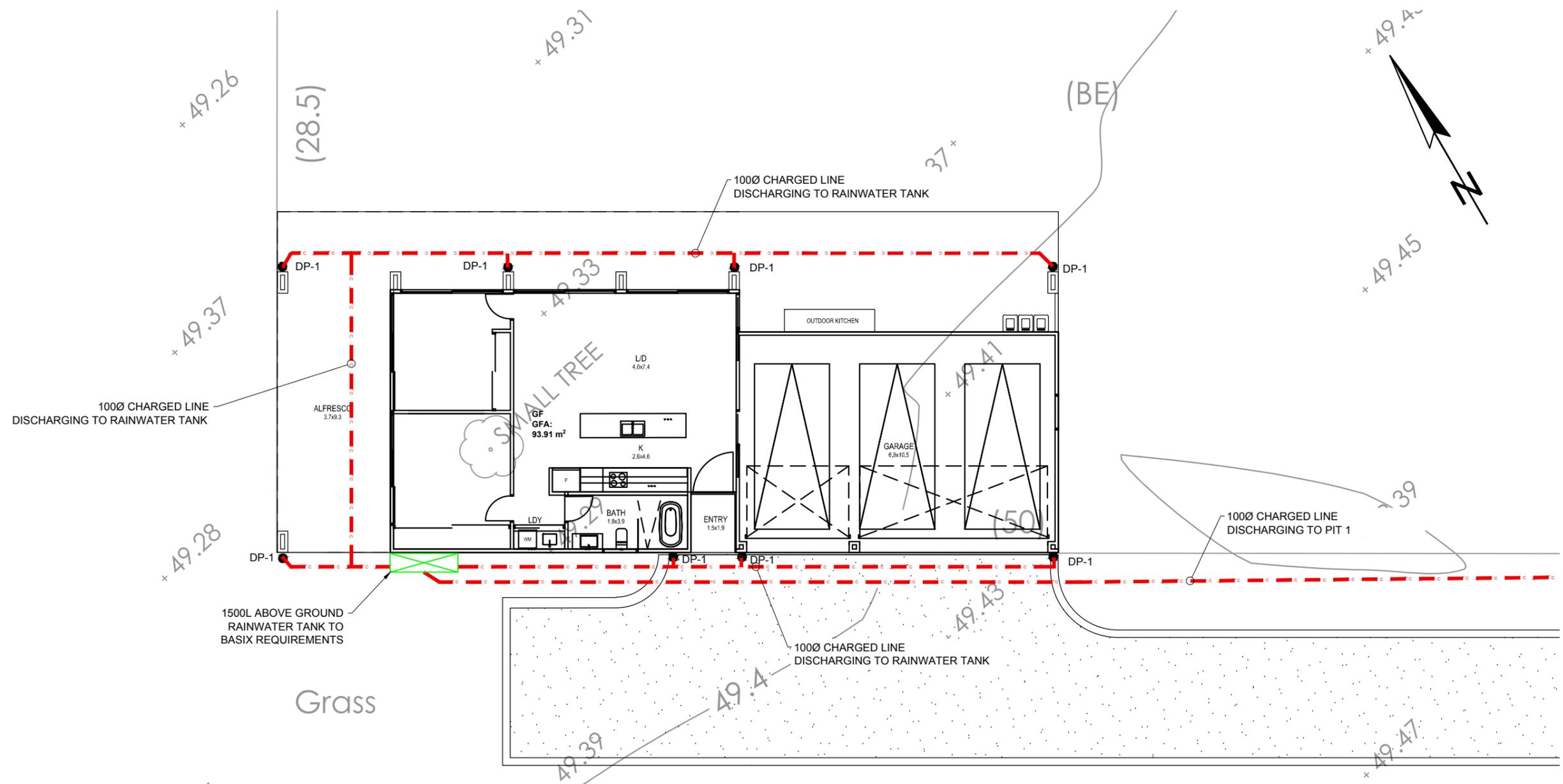


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FOR CONSTRUCTION

SURVEYOR MATTHEW FREEBURN	0	DA ISSUE	01/05/21			C.K. ENGINEERING SERVICES ABN 67 115 216 496 49 FLORA ST ROSELANDS, NSW 2196 MOB: 0403 329 327 EMAIL: ckatsoulas@gmail.com	CLIENT: LYMT	DRAWING TITLE: STORMWATER DETAIL PLAN	DRAWN: S.C.	SIGNED:	DATE: MAY 2021	
	ARCHITECT LYMT						PROJECT: 13 VANE STREET, CRANE BROOK		DESIGNED: C.K.		SCALE: AS SHOWN	
CONSULTANT	No.	AMMENDMENT	DATE	No.	AMMENDMENT	DATE			CHECKED: C.K.		DATUM: AHD	
						DO NOT SCALE			JOB & DRAWING No:	211404	No. IN SET: 2 OF 5	ISSUE: 0



GROUND FLOOR PLAN
SCALE: 1:150

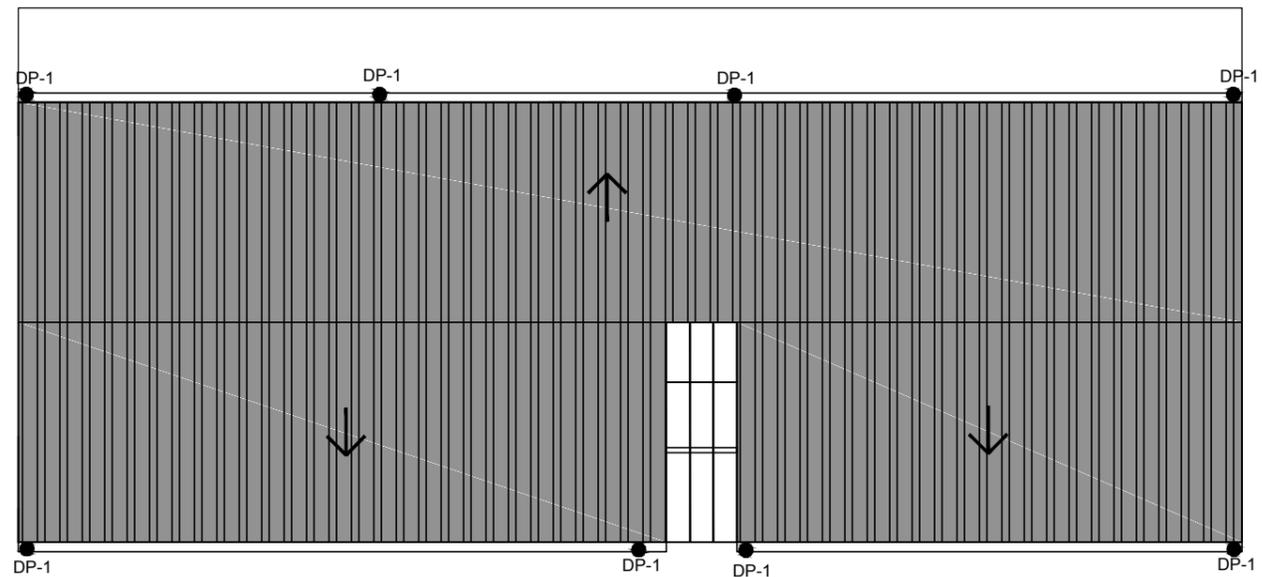


Con Katsoulas
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FOR CONSTRUCTION

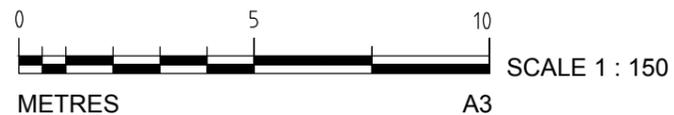
SURVEYOR MATTHEW FREEBURN	0	DA ISSUE	01/05/21			C.K. ENGINEERING SERVICES ABN 67 115 216 496 49 FLORA ST ROSELANDS, NSW 2196 MOB: 0403 329 327 EMAIL: ckatsoulas@gmail.com	CLIENT: LYMT PROJECT: 13 VANE STREET, CRANE BROOK	DRAWING TITLE: GROUND FLOOR PLAN	DRAWN: S.C.	SIGNED:	DATE: MAY 2021	
	ARCHITECT LYMT				DESIGNED: C.K.				SCALE: AS SHOWN			
CONSULTANT	No.	AMMENDMENT	DATE	No.	AMMENDMENT	DATE			CHECKED: C.K.		DATUM: AHD	
						DO NOT SCALE			JOB & DRAWING No:	211404	No. IN SET: 3 OF 5	ISSUE: 0



ROOF PLAN
SCALE: 1:150



Con Katsoulas
BE (Civil), MIEAust, CPEng No. 449924



FOR CONSTRUCTION

SURVEYOR MATTHEW FREEBURN	0	DA ISSUE	01/05/21			C.K. ENGINEERING SERVICES ABN 67 115 216 496 49 FLORA ST ROSELANDS, NSW 2196 MOB: 0403 329 327 EMAIL: ckatsoulas@gmail.com	CLIENT: LYMT	DRAWING TITLE: ROOF PLAN	DRAWN: S.C.	SIGNED:	DATE: MAY 2021	
	ARCHITECT LYMT						PROJECT: 13 VANE STREET, CRANE BROOK		DESIGNED: C.K.		SCALE: AS SHOWN	
CONSULTANT	No.	AMMENDMENT	DATE	No.	AMMENDMENT	DATE			CHECKED: C.K.		DATUM: AHD	
						DO NOT SCALE			JOB & DRAWING No: 211404		No. IN SET: 4 OF 5	ISSUE: 0

 **C.K. ENGINEERING SERVICES**

A B N 6 7 1 1 5 2 1 6 4 9 6

49 Flora Street,
Roselands NSW 2196

Mob: 0403 329 327

e-mail: ckatsoulas@gmail.com

LYMT

01 May 2021

RE: 13 VANE STREET CRANE BROOK – HYDRAULIC SERVICES FOR PROPOSED SECONDARY DWELLING

Dear Rebecca,

I hereby certify that the stormwater drainage design prepared by C.K.Engineering Services Drawing No 211404 Revision 0 dated 01 May 2021 is in accordance with:

- Penrith City Council's Guidelines and Specifications
- AS/NZS 3500.3 – 2018 - Plumbing and Drainage – Stormwater Drainage
- BASIX Certificate

I hold appropriate qualifications and relevant experience to issue this certification.

Should you require any further information regarding the above, please contact me on 0403 329 327.

Sincerely,



Con Katsoulas

BE (Civil) MIEAust CPEng NER



SEEC

Wastewater Management: Site & Soil Evaluation & Disposal System Design

For Proposed Residential Development at:
Lot 3 DP 124079 No. 13-15 Vane Street,
Cranebrook

Prepared by:

Ciaran Bromhead

Strategic Environmental and Engineering Consulting (SEEC) Pty Ltd
PO Box 1098, Bowral NSW 2576

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SEEC Reference: 21000176

26 April 2021



SEEC

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Project Reference: 21000176-WW-01
Date of Assessment: 26/04/2021

Signed: [REDACTED]

Document Certification

This report has been developed based on agreed requirements as understood by SEEC at the time of investigation. It applies only to a specific task on the nominated lands. Other interpretations must not be made, including changes in scale or application to other projects. The contents of this report are based on a professional appraisal of the conditions that existed at the time of our investigation. Where subsurface investigations have been done the results are only applicable to the specific sampling or testing locations and only to the depth(s) investigated. Because of natural geological variability, and/or because of possible anthropogenic influences, the subsurface conditions reported can change abruptly. Such changes can also occur after the site investigation. The accuracy of the conditions provided in this report is limited by these possible variations and influences and/or is limited by budget constraints imposed by others and/or by adequate accessibility.

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Document Issue Table

Version	Date	Author	Reviewed	Notes
Draft A	21/04/2021	CB	LO	
01 Final	26/04/2021	CB	Client	

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1 EXECUTIVE SUMMARY

1.1 Scope of Work

Strategic Environmental and Engineering Consulting (SEEC) has been commissioned by Rebecca Rositano, the property owner, to provide this wastewater site assessment. It is required to accompany an application for a proposed two-bedroom dwelling at Lot 3 DP 124079 No. 13-15 Vane Street, Cranebrook. As part of a future Development Application (DA) the owner will propose to build a separate dwelling with five potential bedrooms on this site (Figure 1). Therefore, this assessment is required to show how treated wastewater generated from the proposed dwelling (and future dwelling with five potential bedrooms) can be sustainably managed onsite.

1.2 Site Description

Lot 3 DP 124079 is a 2.1 ha (approx.) rural lot located on the north-western side of Vane Street, Cranebrook (Figure 1). The proposed dwelling is to be located on the south-eastern portion of the lot. The proposed Effluent Disposal Area (EDA) will be located to the north-west of the proposed dwelling where the site grades at 1% to the north-west (Figure 1). There are no drainage depressions or dams within prescribed buffers to the EDA. A search of WaterNSW's ground water map did not identify any bores used for potable water within 250 m of the proposed EDA.

According to Penrith City Council's flood information for this site, the EMA is more than 0.5m above the 1% Average Exceedance Probability (AEP) flood height and the corresponding overland flow path (Appendix 1).

Soil investigations revealed 300 mm of pedal dark brown silty clay loam topsoil over moderately pedal light brown medium clay down to 1,000+ mm in Test Pit 1. Test Pit 2 revealed 300 mm of strongly pedal brown sandy clay loam topsoil over strongly pedal light brown light clay down to 1,000+ mm. Soil chemistry testing revealed the soils are non-acidic but show minor dispersion potential. Ground disturbance must be minimised to only what is required for the safe and efficient installation of the onsite wastewater management system to minimise the risk of erosion.

1.3 Proposed Wastewater Management System

It is proposed to install a NSW Health approved Aerated Wastewater Treatment System (AWTS) to secondary-treat all wastewater generated by the proposed dwelling and future dwelling with five potential bedrooms. Secondary-treated effluent will then be disposed of by semi-fixed surface spray irrigation. The size of the EDA was determined as 1,250 m². This was calculated by using a two-bedroom dwelling (417 m²) and five-bedroom dwelling (833 m²) with access to reticulated water on clay subsoils from 'Table 2' of Penrith City Council's 'On-site Sewage Management and Greywater Reuse Policy (2014)'.

Secondary-treated effluent generated in the AWTS will run through a buried mains distribution line through the EDA. Quick Coupling Valves (QCVs) (or similar) will be connected to the mains distribution line. The exact number of QCVs required is directly

related to the size of the EDA. The total number of QCVs must be sufficient to ensure even coverage of irrigated effluent over the entire EDA. A length of movable hose will attach to the QCVs. The length of each hose must not exceed 10 m. Each length of hose will have a minimum of two sprinklers attached to it. The sprinklers will throw a coarse droplet for a diameter of no more than 6m to ensure even distribution of effluent over the entire EDA. Refer to Figure 2 for typical details.

1.4 Conclusions and Recommendations

We conclude the site is suited to dispose secondary-treated effluent by semi-fixed surface spray irrigation. Specifically, our recommendations are:

1. To install a NSW Health approved AWTS to secondary-treat all wastewater by the proposed dwelling, and future dwelling with five potential bedrooms;
2. To install at least “three-star” plumbing fixtures, or better, in the proposed dwelling, and future dwelling with five potential bedrooms, to reduce wastewater loads;
3. To ensure that no other structures (existing or planned) are connected to the proposed AWTS unless the proper approval is granted from the Council;
4. To install 1,250 m² of semi-fixed surface spray irrigation built to the requirements of AS/NZS1547:2012 (in the area shown in Figure 1, following the details in Figure 2) to dispose treated wastewater from the AWTS;
5. To minimise the amount of ground disturbance to only what is required for safe and efficient installation of the proposed onsite wastewater management system;
6. To maintain a good cover of vegetation (preferably improved pasture grass) over the entire EDA;
7. To protect the EDA from vehicle and stock access (fence off if necessary);
8. To erect a minimum of two Warning Signs along the edge of the EDA. Refer to Section 5.7;
9. To preferentially select low phosphorus, liquid detergents; and
10. To install and manage the wastewater system according to the details of this report, its appendices and the manufacturer’s recommendations.

Note: This system design might be altered slightly by the Conditions of Consent. It is the responsibility of the owner/builder to check the conditions of consent prior to commencing works.



Figure 1 - Site map and Effluent Management Area. This Figure must be read in conjunction with the accompanying report by SEEC.

2 SITE DETAILS

Table 1 Site details.

Site Address	Lot 3 DP 124079 No. 13-15 Vane Street, Cranebrook
GPS Reading	N. -33.714128 E. 150.755386
Owner	Rebecca Rositano
Owner Address	7 Gray Street, Leppington
Owner Phone	-
Developer	As above
Developer Address	As above
Developer Phone	As above
Allotment Size	2.1 ha (approx.)
Proposed Development	Two-bedroom dwelling and dwelling with five potential bedrooms (subject to future DA)
Water Supply	Town
Number of Potential Bedrooms	7
Local Government Authority	Penrith City Council

Table 2 Design wastewater loading calculations (for a dwelling) (AS/NZS 1547:2012)

Source	Typical wastewater design flows (L/person/day)	
Residential premises	On-site roof tank supply	Reticulated water supply
	120	150

2.1 Design Wastewater Loading

AS/NZS 1547:2012, Table H1 gives a per person loading of 120L/day or 150L/day for tank water or town water supply respectively. This assumes that at least three-star rated plumbing appliances are fitted.

It is proposed to build a new two-bedroom dwelling at this site. In addition to the proposed dwelling the owner proposes to build a future dwelling with five potential bedrooms as part of a separate DA. Therefore, the Design Wastewater Loading Rate is 1,350 L/day based on a maximum occupancy of nine people. This assumes each dwelling has one master bedroom (Penrith Council, 2014).

3 PHYSICAL SITE ASSESSMENT

The site and soil evaluation has been undertaken following AS/NZS 1547:2012: *On-site Domestic Wastewater Management*, Sections 2.1 & 2.2 of the WaterNSW's *Designing and Installing On-Site Wastewater Systems* (2019) and Appendix 2 of the Environment & Health Protection Guidelines: *On-site Sewage Management for Single Households* (the 'Silver Book', Department of Local Government, 1998).

3.1 Climate

Climate is an important factor in onsite wastewater management. It is particularly important when designing irrigation areas as the dual parameters of incidental rainfall and evaporation have a direct effect on the required size. Areas that have high evaporation and low rainfall are better suited to effluent management by irrigation than those with a cold and/or wet climate. In particularly wet and/or cold areas, wet weather storage might be required, especially during the winter months. We have found the site is in an area where evaporation exceeds rainfall for most, if not all of, the year.

3.2 Flood Potential

It is required to locate all effluent management areas (EDAs) above the 1:20 ARI flood level. This is to reduce the risk of effluent being transported off the site. In addition all electrical components, vents and inspection holes must be located above the 1:100 ARI flood level. This might involve locating the electrical components remote from the tanks, e.g. on a wall or similar. According to Penrith City Council's flood information for this site, the EDA is more than 0.5m above the 1% AEP (equivalent to the 100-year ARI) flood height and corresponding overland flow path (Appendix 1).

3.3 Exposure

Sun and wind exposure on the EDA must be maximised to help with evaporation. Factors that affect this are local topography, vegetation and the built environment. Improper location of an EDA in the shade can reduce evaporation by up to 30 percent. We have found that the proposed EDA is well exposed to sun and wind.

3.4 Slope Gradient

Slope is an important parameter affecting the choice of effluent management systems. Excessive slope increases the risk of effluent leaving the site, particularly during wet weather. The design irrigation rates are adjusted to account for slope. We have found that slopes in the proposed EDA are between 0 and 10%.

3.5 Landform

Different landforms pose different limitations to effluent management. The risk of run-on and hence the risk of runoff from an EDA is directly related to the type of landform and the position of the EDA on it. We have found that the proposed EDA is either on a crest or an upper side slope. Therefore, the risk of effluent runoff is considered low.

3.6 Run on and Seepage

Surface stormwater run-on must not be permitted onto an EMA. This is because it could transport effluent offsite and into receiving waters. In addition regular run-on might inhibit vegetative growth. We have found that there is either no risk, or a minimal risk, of stormwater running onto the proposed EDA.

3.7 Erosion Potential

Sites where there is active erosion must be avoided for effluent management. We have found that there are no signs of erosion at this well vegetated site.

3.8 Site Drainage

An EDA must not be placed in wet or damp areas. This is to reduce the risk of effluent leaving the site by either surface waters or groundwater. The type of vegetation and the condition of the soils give good indications of the site's drainage. We have found that there are no signs of moisture tolerant vegetation such as sedges, ferns or *Juncus* sp. In addition there are no signs of grey mottling in the subsoils within 500 mm of the surface.

3.9 Fill

The presence of fill might affect the choice of an effluent management system, particularly if very high or very low permeability soils have been imported. Fill might also be prone to settlement and might also be detrimental to the establishment of good vegetative cover. We have found that there are no signs of fill in close proximity to the EDA.

3.10 Surface Rock

The presence of frequent rock outcrops is usually an indication of shallow and variable soils and/or erosion. In such conditions it might be necessary to import soil to enable the establishment of a good vegetative cover suitable for irrigation. We have found the site has less than 10 percent rock outcrops.

3.11 Groundwater Use

The NSW Department of Health recommends that EMAs are not located within 250 m of bores that are used for domestic potable water. A search of WaterNSW's groundwater map did not identify a bore within proximity to the EDA.

3.12 Biodiversity

Treated effluent has the potential to cause adverse harm to sensitive terrestrial biodiversity. According to the Department of Planning, Industry and Environment (DPIE) Biodiversity Values Map and Threshold tool (accessed, 2020) this site is affected by threatened species or communities with potential for serious and irreversible impacts. This vegetation is fenced off and located approximate 50 m to the north east of the proposed EDA.

3.13 Vegetation

The suitability of the existing vegetation (if any) must be considered. The most common, and one of the most suitable, types of vegetation for effluent management is turf. Turf efficiently covers large areas and provides a good opportunity for evapotranspiration and nutrient uptake (particularly nitrogen). Some native vegetation, particularly that which has developed on poor sandy soils, will not respond well to nutrient-rich wastewater and, if possible, must be avoided or replaced with more suitable species. We have found the existing vegetation onsite is unmanaged lawn where the proposed EDA has a moderate cover of grasses.

3.14 Proximity to Watercourses

The proximity of natural watercourses or dams is one of the most important factors in the selection of an EDA. It will be necessary to maintain buffers anywhere from 40 m to 150 m between the EDA and a watercourse or dam.

A 40 m buffer is required between an EDA and a drainage depression or a dam, a 100 m buffer is required from a watercourses named by NSW Spatial Services.

Section 5.4 provides further information on buffer distances.

We have found that there are no watercourses or dams within prescribed buffer distances from the proposed EDA.

3.15 Land Availability

After summarising all of the above, particularly regarding buffer distances, land that is suitable for effluent management on site has been identified. We have found that more than enough land is suitable for effluent management. Figure 1 identifies the area(s) suitable for the effluent management system adopted. Effluent must not be applied outside of those areas, unless at the discretion of the supervising authority.

3.16 Stock Present

Stock can cause damage to irrigation systems and must be kept out of the EDA by fencing or other physical barrier. During the site inspection no stock were observed onsite. Considering this is a rural property stock may be introduced onsite in the future. If this occurs the EDA must be fully fenced from stock.

3.17 Risk of Frost

Frost can affect the irrigation system. All distribution pipes must be well buried to protect them. All irrigation pipes must drain after pumping. There is low risk of frost on this site.

4 SOIL ASSESSMENT

The site and soil evaluation has been undertaken following AS/NZS 1547:2012: *On-site Domestic Wastewater Management* and Appendix 2 of the 'Environment & Health Protection Guidelines: *On-site Sewage Management for Single Households* (the 'Silver Book', Department of Local Government, 1998).

4.1 Geology and Soil Landscape

The eSPADE, 2020 mapping identifies the site to be on the Berkshire Soil Landscape.

4.2 Soil Description

4.2.1 Soil Profile Descriptions

Test Pit 1

Layer 1	0	to	300	Pedal dark brown silty clay loam topsoil. 40 mm ribbon. 5% coarse fragments.
Layer 2	300	to	1,000+	Moderately pedal light brown medium clay. 75+ mm ribbon. 10% coarse fragments.

Test Pit 2

Layer 1	0	to	300	Strongly pedal brown sandy clay loam topsoil. 30-45 mm ribbon.
Layer 3	300	to	1,000+	Strongly pedal light brown light clay. 60 mm ribbon.

4.2.2 Soil Classification and Design Irrigation Rate

Table 3 Selected soil classification and corresponding design Irrigation rate.

Soil Category	Soil Texture	Structure	Indicative Permeability	Design Irrigation Rate (DIR) (mm/day) (AS/NZS 1547:2012)	
					Spray Irrigation
1	Gravels & Sands	Massive	>3.0		
2	Sandy Loams	Weak	>3.0		
		Massive	1.4 - 3.0		
3	Loams	High/ Moderate	1.5 - 3.0		
		Weak or Massive	0.5 - 1.5		
4	Clay Loams	High/ Moderate	0.5 - 1.5		
		Weak	0.12 - 0.5		
		Massive	0.06 - 0.12		
5	Light Clays	Strong	0.12 - 0.5		
		Moderate	0.06 - 0.12		
		Weak/ Massive	< 0.06		
6	Medium to Heavy Clays	Strong	0.06 - 0.5		
		Moderate	< 0.06	x	2
		Weak/ Massive	< 0.06		

4.3 Soil Constraints

4.3.1 Soil Depth to a Limiting Layer (e.g. bedrock or watertable)

Soil depth is an important factor in choosing a suitable effluent disposal method. The depth of soil is measured to a limiting layer - i.e. bedrock or a periodically high watertable (shown by grey mottling in the soils). Generally, soil is a very good medium for providing treatment to effluent. As the effluent passes through soil it is filtered and there is adsorption of chemicals (particularly phosphorous) onto the soil particles. In addition, this allows time for viruses to die (as they are usually outside of their preferred environment). At least 500 mm of soil is required to provide treatment in an irrigation area. We have found that the soil depth is more than 1.0 m. This is considered a minor limitation

4.3.2 Coarse Fragments

Coarse fragments are those over 2 mm in diameter. They can pose limitations to vegetative growth by lowering the soil's ability to supply water and nutrients. We have found that there are less than 20 percent coarse fragments present.

4.3.3 pH of Soils

The pH of a soil influences its ability to supply nutrients to vegetation. If the soil is too acidic vegetative growth would be inhibited. We have found that the pH of the soil is more than 6.0. This is unlikely to inhibit vegetative growth.

4.3.4 *Electrical Conductivity*

The electrical conductivity of the soil relates to the amount of salts present. A high salt concentration would inhibit vegetative growth. Electrical conductivity has been measured in deci Semens per metre (dS/m). We have found the electrical conductivity of the soil is less than 4 dS/m. This is unlikely to inhibit vegetative growth.

4.3.5 *Emerson Aggregate Test (EAT)*

The Emerson Aggregate Test (EAT) is a measure of soil dispersibility and susceptibility to erosion. It assesses the physical changes that occur to a single ped of soil when immersed in water - specifically whether it slakes and falls apart or disperses and clouds the water. We have classed the soil as Class 2 which means that the soils show minor dispersion potential but the land is well vegetated and this will minimise excessive erosion if the vegetation is maintained.

4.3.6 *Phosphorus Sorption*

The capacity of a soil to adsorb phosphorus is expressed as its phosphorus sorption capacity. Soils with a high capacity to sorb phosphorous are preferred and can result in smaller application areas. The phosphorous sorption capacity is used in the nutrient balance. Phosphorous sorption values were sourced from WaterNSW, 2019

TOPSOIL Estimated P-Sorp (mg/kg) = 400

SUBSOIL Estimated P-Sorp (mg/kg) = 600

5 RECOMMENDATIONS

Note: This system design might be altered slightly by the Conditions of Consent. It is the responsibility of the owner/builder to check the conditions of consent prior to commencing works.

5.1 Wastewater System

The following disposal method has been chosen by the client and/or is considered the most suitable:

Semi-fixed surface spray irrigation following treatment in a NSW Health approved AWTS.

5.2 Sizing of the Disposal System

Hydraulic and nutrient balance modelling has been undertaken to determine the require irrigation area. The design irrigation rate (DIR) given in Section 4.2.2 has been adopted in the hydraulic balance.

The size of the EDA was determined as 1,250 m². This was calculated by using a two-bedroom dwelling (417 m²) and five-bedroom dwelling (833 m²) with access to reticulated water on clay subsoils from 'Table 2' of Penrith City Council's 'On-site Sewage Management and Greywater Reuse Policy (2014)'.

5.3 Professional Construction

A typical irrigation design is given in Figure 2, however, a licensed irrigation contractor or plumber must be used to install the irrigation system. Council (or an approved certifier) will be responsible for monitoring the installation and ensuring it is done to the requirements of this document.

The irrigation system must incorporate a flushing line connected to either the settling chamber of the AWTS or to a small absorption trench/pit.

The effluent distribution pipe from the AWTS to the EDA must be buried at a minimum depth of 300 mm (or 500 mm when crossing an access way), and laid to maximise protection against mechanical damage or deformation.

The distribution laterals in the EDA must be buried at a minimum depth of 100 mm (or 250 mm for Category 6 subsoils).

The installer must provide a pump of sufficient capacity to ensure even distribution of effluent throughout the EDA. If required an Auto/Manual Zone Sequencing Valve must be installed to ensure the even distribution of effluent over multiple irrigation fields. The licensed contractor will submit a certificate of installation that will clearly refer to this wastewater design. The certificate will be presented to Council.

5.4 Buffer Distances

DLG (1998) (The Silver Book) requires buffers to be maintained from an effluent management area to different land application areas. These are outlined in Table 4.

Table 4 Specified Buffer Distances.

All Systems	100 m to permanent waters (rivers and lakes) 40 m to intermittent water features (watercourses, depressions and dams) 250 m to potable water bores
Spray Irrigation	6 m if area upslope and 3 m if area downslope of property boundaries and driveways 15 m to dwellings 3 m to walkways and paths 6 m to swimming pools
Subsurface and Drip Irrigation	6 m if area upslope and 3 m if area downslope of swimming pools, boundaries driveways and buildings

Refer to Figure 1 for the recommended positioning of the EDA.

5.5 Detergent Use

Liquid detergents must be used in the household as powders contain elevated concentrations of salt which could alter the soil's chemistry and reduce its ability to percolate water. All cleaning products must be "Septic Friendly".

5.6 Water Saving Fixtures

This design assumes at least three-star rated plumbing fixtures are used in any new home.

5.7 Signs

A minimum of two Warning Signs must be installed along the edge of the EDA. The signs shall read "WARNING: RECLAIMED EFFLUENT/RECYCLED WATER, DO NOT DRINK, AVOID CONTACT" or similar. Lettering must be clearly visible from three meters away.

5.8 Summary of Recommendations

We conclude the site is suited to dispose secondary-treated effluent by semi-fixed surface spray irrigation. Specifically, our recommendations are:

1. To install a NSW Health approved AWTS to secondary-treat all wastewater by the proposed dwelling, and future dwelling with five potential bedrooms;
2. To install at least "three-star" plumbing fixtures, or better, in the proposed dwelling, and future dwelling with five potential bedrooms, to reduce wastewater loads;
3. To ensure that no other structures (existing or planned) are connected to the proposed AWTS unless the proper approval is granted from the Council;

4. To install 1,250 m² of semi-fixed surface spray irrigation built to the requirements of AS/NZS1547:2012 (in the area shown in Figure 1, following the details in Figure 2) to dispose treated wastewater from the AWTS;
5. To minimise the amount of ground disturbance to only what is required for safe and efficient installation of the proposed onsite wastewater management system;
6. To establish and maintain a good cover of vegetation (preferably improved pasture grass) over the entire EDA;
7. To protect the EDA from vehicle and stock access (fence off if necessary);
8. To erect a minimum of two Warning Signs along the edge of the EDA. Refer to Section 5.7;
9. To preferentially select low phosphorus, liquid detergents; and
10. To install and manage the wastewater system according to the details of this report, its appendices and the manufacturer's recommendations.

6 SYSTEM DESIGN

Note: This system design might be altered slightly by the Conditions of Consent. It is the responsibility of the owner/builder to check the conditions of consent prior to commencing works.

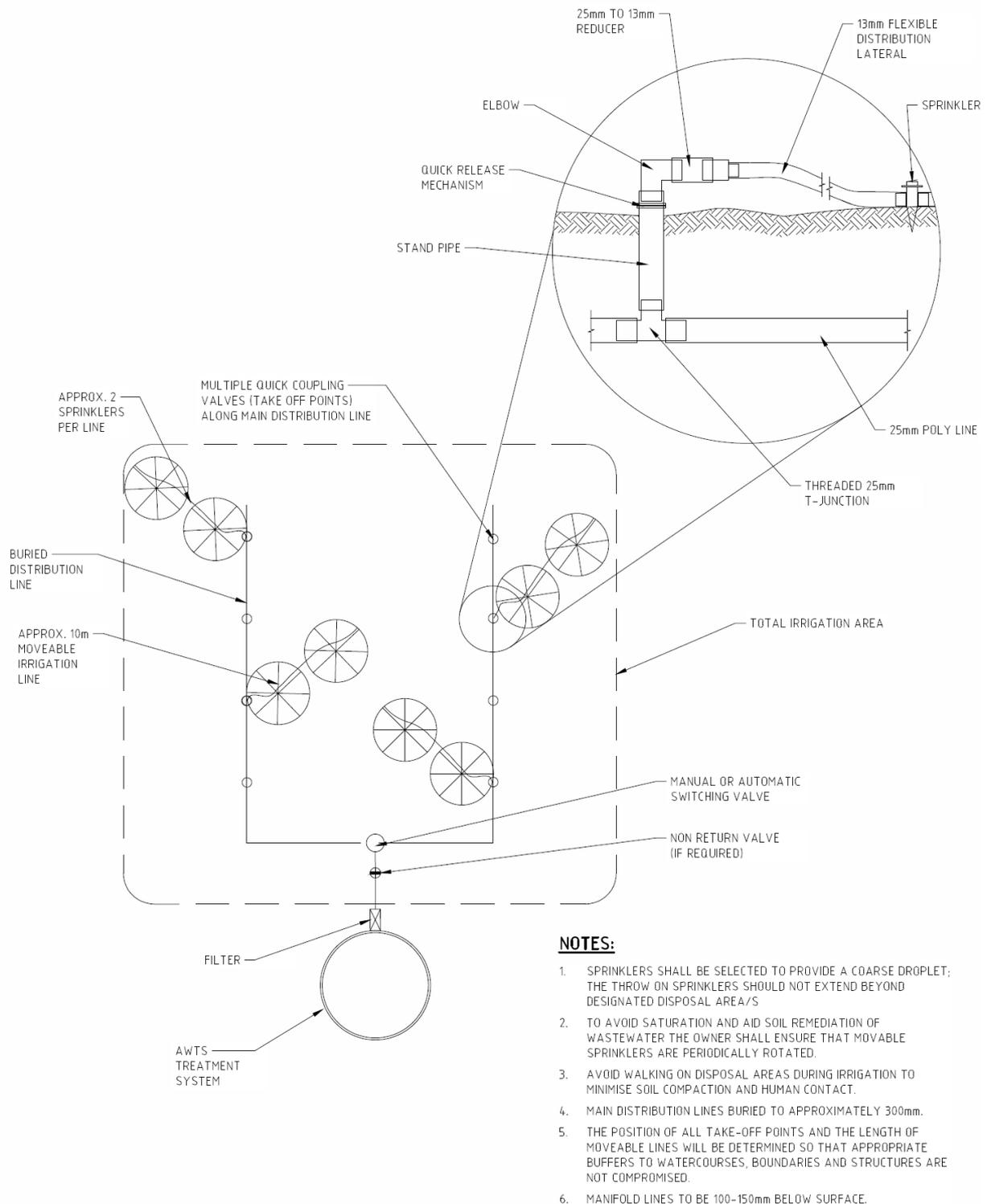
This design assumes a certain design wastewater load. It will be invalidated if that load were to significantly increase (>10 percent): This might occur due to (but not limited to):

- If a spa bath or in-sink food grinder were installed.
- If a home is occupied by more than 2 persons per bedroom.
- If water fixtures are not at least three-star rated.
- If plumbing leaks are not attended to.

The design is warranted to meet the required design guidelines and standards at the time of writing. However, that does not preclude the requirement of the land owner to satisfactorily use and maintain the system to the requirements of the manufacturers and to the generic guidelines given in the following Appendix. In particular there are requirements to:

- Ensure that only “septic-friendly” substances are disposed into the system (materials and chemicals).
- Periodically (once per 3-5 years) clean out the septic tank or septic chamber of the AWTS.
- Regularly (once per three months) clean the septic outlet filter or the in-line filter.
- Regularly (once per three months) manually flush the system.
- Periodically (one per year) check the disposal area for signs of seepage.
- Periodically (one per year) check the upslope diversion drain (if applicable) to ensure stormwater is adequately diverted.

Your system will be inspected as required by Council. The Wastewater Contractor must inspect both the treatment system and the disposal area following the checklist given in Appendix 2 and submit the results to Council. Should there be a problem with your system you must initially consult the licensed contractors who installed the system and/or your regular maintenance contractor.



- NOTES:**
1. SPRINKLERS SHALL BE SELECTED TO PROVIDE A COARSE DROPLET; THE THROW ON SPRINKLERS SHOULD NOT EXTEND BEYOND DESIGNATED DISPOSAL AREA/S
 2. TO AVOID SATURATION AND AID SOIL REMEDIATION OF WASTEWATER THE OWNER SHALL ENSURE THAT MOVABLE SPRINKLERS ARE PERIODICALLY ROTATED.
 3. AVOID WALKING ON DISPOSAL AREAS DURING IRRIGATION TO MINIMISE SOIL COMPACTION AND HUMAN CONTACT.
 4. MAIN DISTRIBUTION LINES BURIED TO APPROXIMATELY 300mm.
 5. THE POSITION OF ALL TAKE-OFF POINTS AND THE LENGTH OF MOVABLE LINES WILL BE DETERMINED SO THAT APPROPRIATE BUFFERS TO WATERCOURSES, BOUNDARIES AND STRUCTURES ARE NOT COMPROMISED.
 6. MANIFOLD LINES TO BE 100-150mm BELOW SURFACE.

**TYPICAL SEMI-FIXED SPRAY
IRRIGATION DESIGN**

Figure 2 - Proposed Disposal System (Typical details). This Figure must be read in conjunction with the accompanying report by SEEC.

7 REFERENCES

Department of Local Government (1998). Environment and Health Protection Guidelines: *Onsite Sewage Management for Single Household*.

eSPADE (2020). NSW Office of Environment and Heritage.

Penrith City Council (2014) '*On-site Sewage Management and Greywater Reuse Policy*'.

Standards Australia / Standards New Zealand (2012). AS/NZS 1547:2012 *On-site Domestic Wastewater Management*.

WaterNSW (2019), *Designing and Installing On-Site Wastewater Systems. A WaterNSW Current Recommended Practice*.

8 APPENDICES

8.1 Appendix 1 – Penrith City Council Flood Report

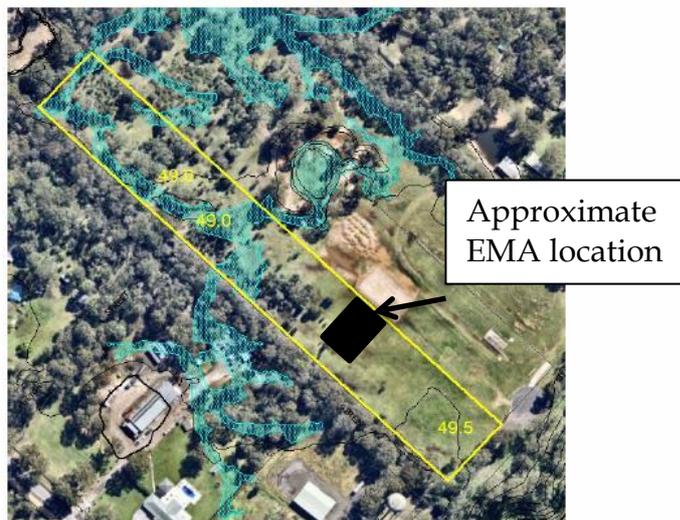


Flood Information Lot 3 DP 124079 - No. 13-15 Vane Street Cranebrook

Date of issue: 20 April 2021

The 1% AEP local overland flow flood level affecting the above property is estimated to be RL49.3m AHD.

Property less than 0.5m above the 1% AEP flood level is subject to Penrith Development Control Plan 2014 Section C3.5 Flood Planning. The Penrith Development Control Plan 2014 is available from Council's website www.penrithcity.nsw.gov.au.



Definitions

AEP – Annual Exceedance Probability – the chance of a flood of this size occurring in any one year.

AHD – Australian Height Datum – A standard level datum used throughout Australia, approximately equivalent to mean sea level.

Legend

Extent of 1% AEP local catchment overland flow path. Generally depths less than 150mm is not shown.

Notes:

1. The contours shown above in yellow numbering are at 0.5m intervals and are based on Aerial Laser Scanning (ALS) Survey undertaken in 2002. The contour levels are approximate and for general information only. Accurate ground levels should be obtained by a Registered Surveyor.
2. The flood level is based on current information available to Council at the date of issue. The flood level may change in the future if new information becomes available. The 1% AEP flood is the flood adopted by Council for planning controls. Rarer and more extreme flood events will have a greater effect on the property.
3. You are strongly advised if you propose to carry out development upon the property, that you retain the assistance of an experienced flooding engineer and have carried out a detailed investigation.
4. Council accepts no liability for the accuracy of the flood levels (or any other data) contained in this certificate, having regard to the information disclosed in Notes "1", "2". As such you should carry out and rely upon your own investigations.

Dr Elias Ishak
Senior Engineer – Floodplain Management

Penrith City Council
PO Box 60, Penrith
NSW 2751 Australia
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F 4732 7958
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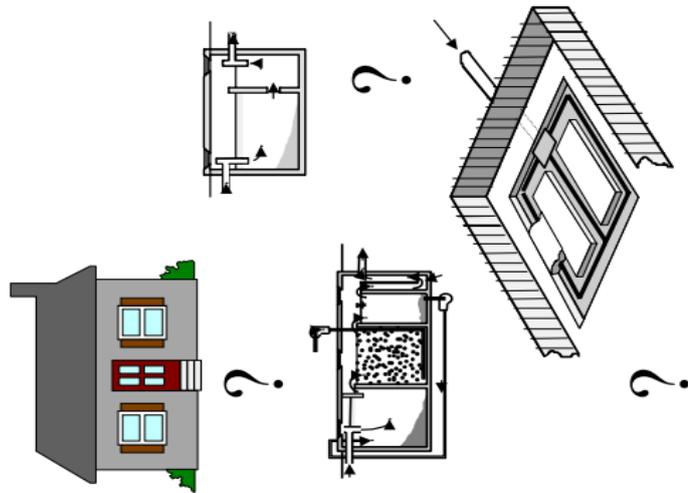
PENRITH
CITY COUNCIL

8.2 Appendix 1 – Annual Checklist for Owners

Checklist 13.2 Operation inspection ⁽¹⁾ of land application area for use by service agents, Council inspectors and system owners		
Does the system owner have a set of plans of the irrigation system and an Operational and Maintenance Manual?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Land Application Area		
Is there evidence of irrigation area damage by vehicle, livestock or domestic animal activities?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Comment:
Is a good vegetation cover established over the effluent irrigation area?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Comment:
Are there any green or boggy areas or surface ponding of effluent liquid in the irrigation area?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Comment:
Are there dry areas or areas lacking vegetation in the irrigation area?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Comment:
Is the effluent irrigation area associated with an unpleasant smell that would suggest untreated or poorly treated effluent is being used to irrigate?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Comment:
Has the effluent irrigation area been mown to maintain the grass short?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Treatment and Irrigation System		
Is any stormwater run-on effectively diverted around the irrigation area?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Is the irrigation pump working?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Is the irrigation system working without leaks?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Has the effluent irrigation area been back flushed?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Have the irrigation filters been checked and cleaned?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Does the system require air bleeding?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
If an automatic sequencing valve is fitted, does it appear to switch between the different fields sequentially?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
If a manual valve is fitted, has it been switched between the different fields?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Is the irrigation area still adequately protected from livestock, vehicles, children etc through the use of fencing, or shrub barriers etc.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Is there any inappropriate use of the irrigation area eg vegetable growing?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Note, if as a system owner, you answered 'No' to any of the above questions, or there are any other problems, you should contact your service provider immediately.		
Service provider:		
Contact number:		

8.3 Appendix 2 – Fact Sheets for Owners

Managing Wastewater In Your Backyard



Reducing water usage

Reducing water usage will lessen the likelihood of problems such as overloading with your septic system. Overloading may result in wastewater backing up into your house, contamination of your yard with improperly treated effluent, and effluent from your system contaminating groundwater or a nearby waterway.

Your sewage management system is also unable to cope with large volumes of water such as several showers or loads of washing over a short period of time. You should try to avoid these 'shock loads' by ensuring water use is spread more evenly throughout the day and week.

HELP PROTECT YOUR HEALTH AND THE ENVIRONMENT

Poorly maintained sewage management systems are a serious source of water pollution and may present health risks, cause odours and attract vermin and insects.

By looking after your management system you can do your part in helping to protect the environment and the health of you and your community.

For more information please contact:

DO

- ✓ Learn how your sewage management system works and its operational and maintenance requirements.
- ✓ Learn the location and layout of your sewage management system.
- ✓ Have your AWTs (if installed) inspected and serviced four times per year by an approved contractor. Other systems should be inspected at least once every year. Assessment should be applicable to the system design.
- ✓ Keep a record of desludgings, inspections, and other maintenance.
- ✓ Have your septic tank or AWTs desludged every three years to prevent sludge build up, which may 'clog' the pipes.
- ✓ Conserve water. Conservative water use around the house will reduce the amount of wastewater which is produced and needs to be treated.
- ✓ Discuss with your local council the adequacy of your existing sewage management system if you are considering house extensions for increased occupancy.

DON'T

- ✗ Don't let children or pets play on land application areas.
- ✗ Don't water fruit and vegetables with effluent.
- ✗ Don't extract untreated groundwater for cooking and drinking.
- ✗ Don't put large quantities of bleaches, disinfectants, whiteners, nappy soakers and spot removers into your system via the sink, washing machine or toilet.
- ✗ Don't allow any foreign materials such as nappies, sanitary napkins, condoms and other hygiene products to enter the system.
- ✗ Don't put fats and oils down the drain and keep food waste out of your system.
- ✗ Don't install or use a garbage grinder or spa bath if your system is not designed for it.

ON-SITE SEWAGE MANAGEMENT SYSTEMS

If you live in or rent a house that is not connected to the main sewer then chances are that your yard contains an on-site sewage management system. If this is the case then you have a special responsibility to ensure that it is working as well as it can.

The aim of this pamphlet is to introduce you to some of the most popular types of on-site sewage management systems and provide some general information to help you maintain your system effectively. You should find out what type of system you have and how it works.

More information can be obtained from the pamphlets:

- Your Septic System
- Your Aerated Wastewater Treatment System
- Your Composting Toilet
- Your Land Application Area

You can get a copy of these pamphlets from your local council or the address marked on the back of this pamphlet.

It is important to keep in mind that maintenance needs to be performed properly and regularly. Poorly maintained on-site sewage management systems can significantly affect you and your family's health as well as the local environment.

What is an on-site sewage management system?

A domestic on-site sewage management system is made up of various components which - if properly designed, installed and maintained - allow the treatment and utilisation of wastewater from a house, completely within the boundary of the property.

Wastewater may be blackwater (toilet waste), or greywater (water from showers, sinks, and washing machines), or a combination of both.

Partial on-site systems - eg. pump out and common effluent systems (CES) - also exist. These usually involve the preliminary on-site treatment of wastewater in a septic tank, followed by collection and transport of the treated wastewater to an off-site management facility. Pump out systems use road tankers to transport the effluent, and CES use a network of small diameter pipes.

How does an on-site sewage management system work?

For complete on-site systems there are two main processes:

1. treatment of wastewater to a certain standard
2. its application to a dedicated area of land.

The type of application permitted depends on the quality of treatment, although you should try to avoid contact with all treated and untreated wastewater, and thoroughly wash affected areas if contact does occur.

Treatment and application can be carried out using various methods:

Septic Tank

Septic tanks treat both greywater and blackwater, but they provide only limited treatment through the settling of solids and the flotation of fats and greases. Bacteria in the tank break down the solids over a period of time. Wastewater that has been treated in a septic tank can only be applied to land through a covered soil absorption system, as the effluent is still too contaminated for above ground or near surface irrigation.

AWTS

Aerated wastewater treatment systems (AWTS) treat all household wastewater and have several treatment compartments. The first is like a septic tank, but in the second compartment air is mixed with the wastewater to assist bacteria to break down solids. A third compartment allows settling of more solids and a final chlorination contact chamber allows disinfection. Some AWTS are constructed with all the compartments inside a single tank. The effluent produced may be surface or sub-surface irrigated in a dedicated area.

Composting Toilets

Composting toilets collect and treat toilet waste only. Water from the shower, sinks and the washing machine needs to be treated separately (for example in a septic tank or AWTS as above). The compost produced by a composting toilet has special requirements but is usually buried on-site.

These are just some of the treatment and application methods available, and there are many other types such as sand filter beds, wetlands, and amended earth mounds. Your local council or the NSW Department of Health have more information on these systems if you need it.

Regulations and recommendations

The NSW Department of Health determines the design and structural requirements for treatment systems for single households. Local councils are primarily responsible for approving the installation of smaller domestic septic tank systems, composting toilets and AWTSs in their area, and are also responsible for approving land application areas. The NSW Environment Protection Authority approves larger systems.

The design and installation of on-site sewage management systems, including plumbing and drainage, should only be carried out by suitably qualified or experienced people. Care is needed to ensure correct sizing of the treatment system and application area.

Heavy fines may be imposed under the Clean Waters Act if wastewater is not managed properly.

Keeping your on-site sewage management system operating well

What you put down your drains and toilets has a lot to do with how well your system performs. Maintenance of your sewage management system also needs to be done well and on-time. The following is a guide to the types of things you should and should not do with your system.

Reducing water usage
 Reducing water usage will lessen the likelihood of problems such as overloading with your AWTS. Overloading may result in wastewater backing up into your house, contamination of your yard with improperly treated effluent, and effluent from your system entering a nearby river, creek or dam.

Conservative water use around the house will reduce the amount of wastewater which is produced and needs to be treated.

Your AWTS is also unable to cope with large volumes of water such as several showers or loads of washing over a short period of time. You should try to avoid these 'shock loads' by ensuring water use is spread more evenly throughout the day and week.

Warning signs

You can look out for a few warning signs that signal to you that there are troubles with your AWTS. Ensure that these problems are attended to immediately to protect your health and the environment.

Look out for the following warning signs:

- ⚠ Water that drains too slowly.
- ⚠ Drain pipes that gurgle or make noises when air bubbles are forced back through the system.
- ⚠ Sewage smells, this indicates a serious problem.
- ⚠ Water backing up into your sink which may indicate that your system is already failing.
- ⚠ Wastewater pooling over the land application area.
- ⚠ Black coloured effluent in the aerated tank.
- ⚠ Excess noise from the blower or pumping equipment
- ⚠ Poor vegetation growth in irrigated area.

Odour problems from a vent on the AWTS can be a result of slow or inadequate breakdown of solids. Call a technician to service the system.

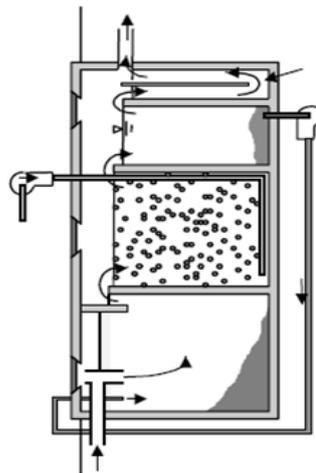
HELP PROTECT YOUR HEALTH AND THE ENVIRONMENT

Poorly maintained AWTSs are a serious source of water pollution and may present health risks, cause odours and attract vermin and insects.

By looking after your treatment system you can do your part in helping to protect the environment and the health of you and your family.

If you would like more information please contact:

Your Aerated Wastewater Treatment System



Aerated Wastewater Treatment Systems (AWTS)

In unsewered areas, the proper treatment and utilisation of household wastewater on-site is critical in preserving the health of the public and the environment. AWTS have been developed as a way of achieving this.

What is an AWTS?

An AWTS is a purpose built system used for the treatment of sewage and liquid wastes from a single household or multiple dwellings.

It consists of a series of treatment chambers combined with an irrigation system. An AWTS enables people living in unsewered areas to treat and utilise their wastewater.

How does an AWTS work?

Wastewater from a household is treated in stages in several separate chambers. The first chamber is similar to a conventional septic tank. The wastewater enters the chamber where the solids settle to the bottom and are retained in the tank forming a sludge layer. Scum collects at the top, and the partially clarified wastewater flows into a second chamber. Here the wastewater is mixed with air

to assist bacteria to further treat it. A third chamber allows additional clarification through the settling of solids, which are returned for further treatment to either the septic chamber (as shown) or to the aeration chamber. The clarified effluent is disinfected in another chamber (usually by chlorination) before irrigation can take place.

Bacteria in the first chamber break down the solid matter in the sludge and scum layers. Material that cannot be fully broken down gradually builds up in the chamber and must be pumped out periodically.

Regulations and recommendations

Local councils are primarily responsible for approving the smaller, domestic AWTSs in their area. The Environment Protection Authority (EPA) approves larger units, whilst the NSW Department of Health determines the design and structural requirements for all AWTSs.

At present AWTSs need to be serviced quarterly by an approved contractor at a cost to the owner. Local councils should also maintain a register of the servicing of each system within their area.

AWTSs should be fitted with an alarm having visual and audible components to indicate mechanical and electrical equipment malfunctions. The alarm should provide a signal adjacent to the alarm and at a relevant position inside the house. The alarm should incorporate a warning lamp which may only be reset by the service agent.

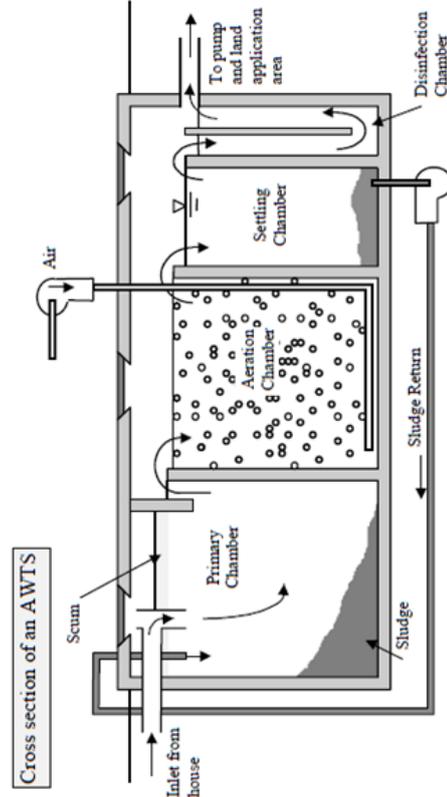
Maintaining your AWTS

The effectiveness of the system will, in part, depend on how it is used and maintained. The following is a guide on good maintenance procedures that you should follow:

- DO**
- ✓ Have your AWTS inspected and serviced four times per year by an approved contractor. Assessment should be applicable to the system design.
 - ✓ Have your system service include assessment of sludge and scum levels in all tanks, and performance of irrigation areas.
 - ✓ Have all your tanks desludged at least every three years.
 - ✓ Have your disinfection chamber inspected and tested quarterly to ensure correct disinfectant levels.
 - ✓ Have your grease trap (if installed) cleaned out at least every two months.
 - ✓ Keep a record of pumping, inspections, and other maintenance.
 - ✓ Learn the location and layout of your AWTS and land application area.
 - ✓ Use biodegradable liquid detergents such as concentrates with low sodium and phosphorous levels.
 - ✓ Conserve water.

DON'T

- ✗ Don't put bleaches, disinfectants, whiteners, nappy soakers and spot removers in large quantities into your AWTS via the sink, washing machine or toilet.
- ✗ Don't allow any foreign materials such as nappies, sanitary napkins, condoms and other hygiene products to enter the system.
- ✗ Don't use more than the recommended amounts of detergents.
- ✗ Don't put fats and oils down the drain and keep food waste out of your system.
- ✗ Don't switch off power to the AWTS, even if you are going on holidays



Maintaining your land application area

The effectiveness of the application area is governed by the activities of the owner.

- DO**
- ✓ Construct and maintain diversion drains around the top side of the application area to divert surface water.
- ✓ Ensure that your application area is kept level by filling any depressions with good quality top soil (not clay).
- ✓ Keep the grass regularly mowed and plant small trees around the perimeter to aid absorption and transpiration of the effluent.
- ✓ Ensure that any run off from the roof, driveway and other impermeable surfaces is directed away from the application area.
- ✓ Fence irrigation areas.
- ✓ Ensure appropriate warning signs are visible at all times in the vicinity of a spray irrigation area.
- ✓ Have your irrigation system checked by the service agent when they are carrying out service on the treatment system.

DON'T

- ✗ Don't erect any structures, construct paths, graze animals or drive over the land application area.
- ✗ Don't plant large trees that shade the land application area, as the area needs sunlight to aid in the evaporation and transpiration of the effluent.
- ✗ Don't plant trees or shrubs near or on house drains.
- ✗ Don't alter stormwater lines to discharge into or near the land application area.
- ✗ Don't flood the land application area through the use of hoses or sprinklers.
- ✗ Don't let children or pets play on land application areas.
- ✗ Don't water fruit and vegetables with the effluent.
- ✗ Don't extract untreated groundwater for potable use.

Warning signs

Regular visual checking of the system will ensure that problems are located and fixed early.

The visual signs of system failure include:

- ⚠ surface ponding and run-off of treated wastewater
- ⚠ soil quality deterioration
- ⚠ poor vegetation growth
- ⚠ unusual odours

Volume of water

Land application areas and systems for on-site application are designed and constructed in anticipation of the volume of waste to be discharged. Uncontrolled use of water may lead to poorly treated effluent being released from the system.

If the land application area is waterlogged and soggy the following are possible reasons:

- ⚠ Overloading the treatment system with wastewater.
- ⚠ The clogging of the trench with solids not trapped by the septic tank. The tank may require desludging.
- ⚠ The application area has been poorly designed.
- ⚠ Stormwater is running onto the area.

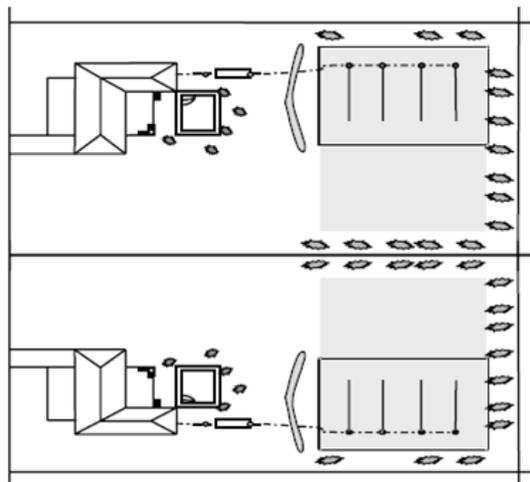
HELP PROTECT YOUR HEALTH AND THE ENVIRONMENT

Poorly maintained land application areas are a serious source of water pollution and may present health risks, cause odours and attract vermin and insects.

By looking after your sewage management system you can do your part in helping to protect the environment and the health of you and your family.

For more information please contact:

Your Land Application Area



LAND APPLICATION AREAS

The reuse of domestic wastewater on-site can be an economical and environmentally sound use of resources.

What are land application areas?

These are areas that allow treated domestic wastewater to be managed entirely on-site. The area must be able to utilise the wastewater and treat any organic matter and wastes it may contain. The wastewater is rich in nutrients, and can provide excellent nourishment for flower gardens, lawns, certain shrubs and trees. The vegetation should be suitably tolerant of high water and nutrient loads.

How does a land application area work?

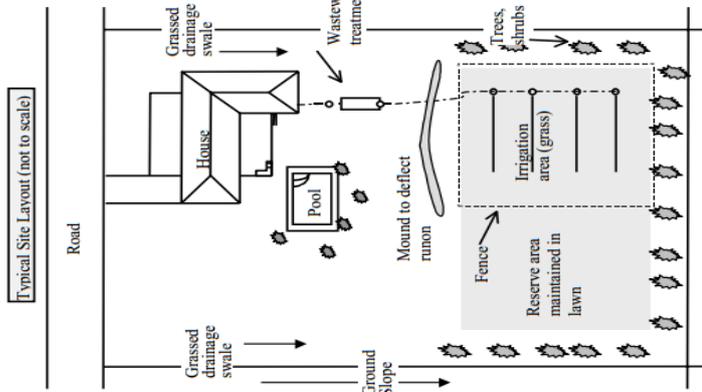
Treated wastewater applied to a land application area may be utilised or simply disposed, depending on the type of application system that is used. The application of the wastewater can be through a soil absorption system (based on disposal) or through an irrigation system (based on utilisation).

Soil absorption systems do not require highly treated effluent, and wastewater treated by a septic tank is reasonable as the solids content in the effluent has been reduced. Absorption systems release the effluent into the soil at a depth that cannot be reached by the roots of most small shrubs and grasses. They rely mainly on the processes of soil treatment and then transmission to the water table, with minimal evaporation and up-take by plants. **These systems are not recommended in sensitive areas as they may lead to contamination of surface water and groundwater.**

Irrigation systems may be classed as either subsurface or surface irrigation. If an irrigation system is to be used, wastewater needs to be pre-treated to at least the quality produced by an aerated wastewater treatment system (AWTS).

Subsurface irrigation requires highly treated effluent that is introduced into the soil close to the surface. The effluent is utilised mainly by plants and evaporation.

Surface irrigation requires highly treated effluent that has undergone aeration and disinfection treatments, so as to reduce the possibility of bacteria and virus contamination.



The effluent is then applied to the land area through a series of drip, trickle, or spray points which are designed to eliminate airborne drift and run-off into neighbouring properties.

There are some public health and environmental concerns about surface irrigation. There is the risk of contact with treated effluent and the potential for surface run-off. Given these problems, subsurface irrigation is arguably the safest, most efficient and effective method of effluent utilisation.

Regulations and recommendations

The design and installation of land application areas should only be carried out by suitably qualified or experienced people, and only after a site and soil evaluation is done by a soil scientist. Care should be

taken to ensure correct buffer distances are left between the application area and bores, waterways, buildings, and neighbouring properties.

Heavy fines may be imposed under the Clean Waters Act if effluent is managed improperly.

At least two warning signs should be installed along the boundary of a land application area. The signs should comprise of 20mm high Series C lettering in black or white on a green background with the words:



Depending on the requirements of your local council, wet weather storage and soil moisture sensors may need to be installed to ensure that effluent is only irrigated when the soil is not saturated.

Regular checks should be undertaken of any mechanical equipment to ensure that it is operating correctly. Local councils may require periodic analysis of soil or groundwater characteristics

Humans and animals should be excluded from land application areas during and immediately after the application of treated wastewater. The longer the period of exclusion from an area, the lower the risk to public health.

The householder is required to enter into a service contract with the installation company, its agent or the manufacturer of their sewage management system, this will ensure that the system operates efficiently.

Location of the application area

Treated wastewater has the potential to have negative impacts on public health and the environment. For this reason the application area must be located in accordance with the results of a site evaluation, and approved landscaping must be completed prior to occupation of the building. Sandy soil and dayey soils may present special problems.

The system must allow even distribution of treated wastewater over the land application area.