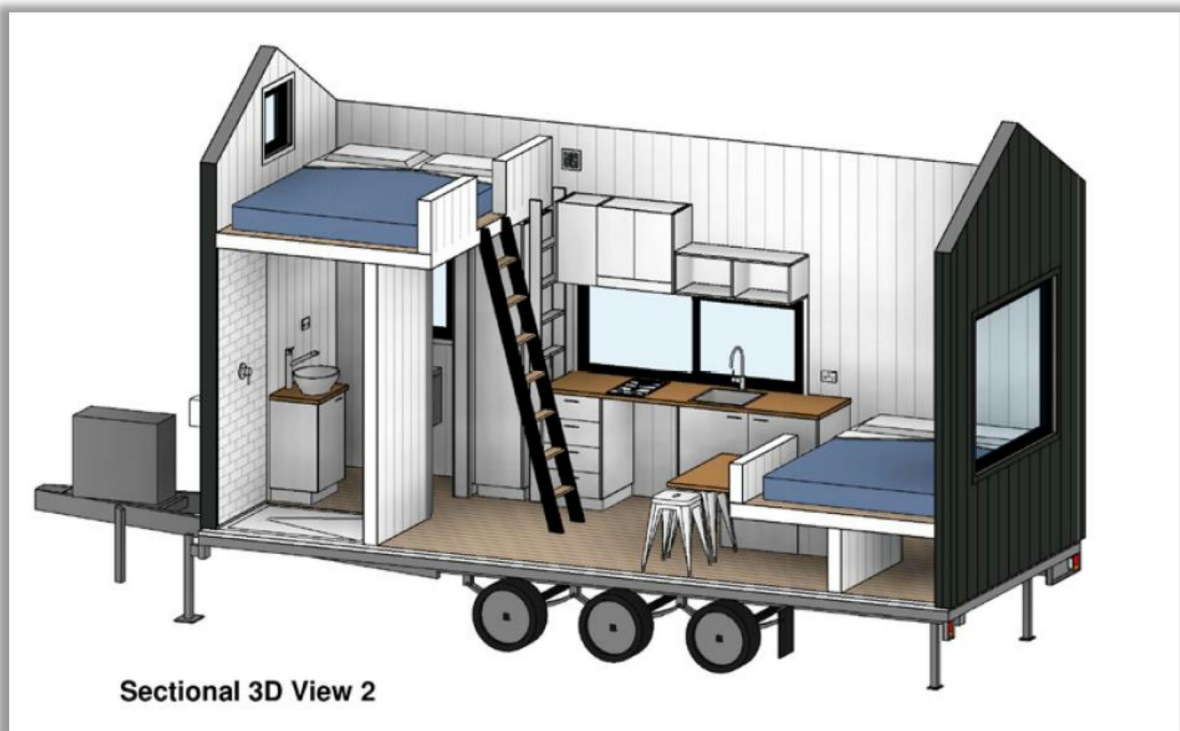


Statement of Environmental Effects In Support of a Development Application

Proposal	Dwelling - Installation of a New Aussie Tiny Home (Manufactured Mobile Dwelling) – 1 Bedroom with Verandah to frontage Shed – Erection of a 24m x 6m shed with 3m awning - 5 berth 3 rollerdoors
Subject Land Address	Lot 436 DP 754605
	No 41 Wirrimah Rd BENDICK MURRELL 2803
Applicant/Owners	Mr Drew Murfitt [REDACTED]
SEE Prepared By	DA Busters – Development Assistance Services Ph 0466 722 869 Email: Craig@DAbusters.com
LGA	Hilltops Council – former Young Council area



Brochure Schematic from Door Side

SEE completion assisted by:



© February 2025

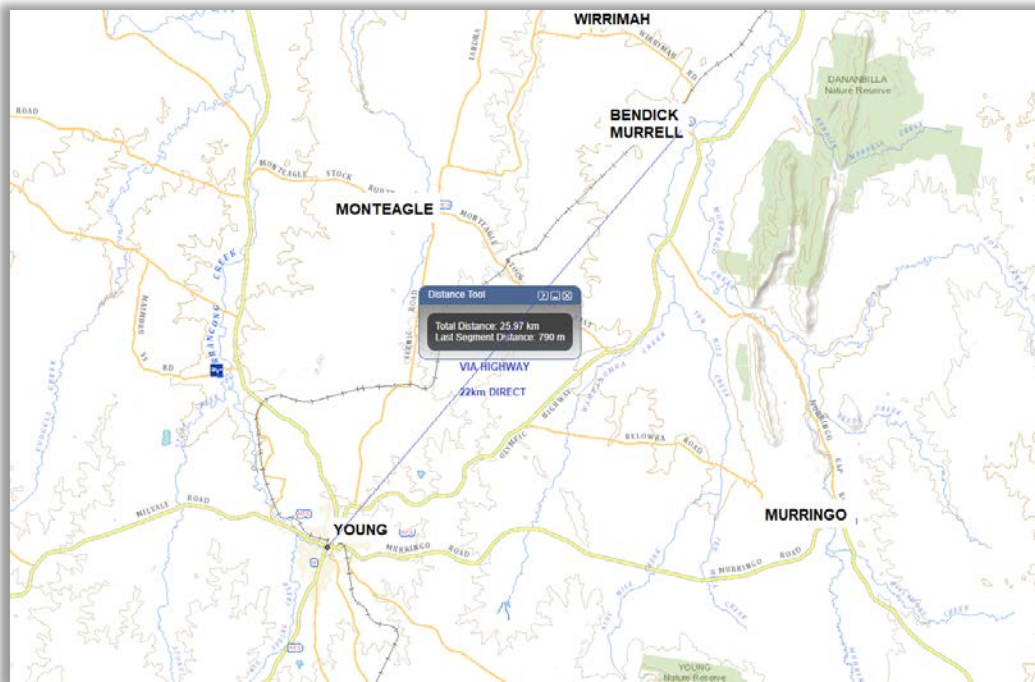
rev 01 - 3/3/2025

The Site and Area

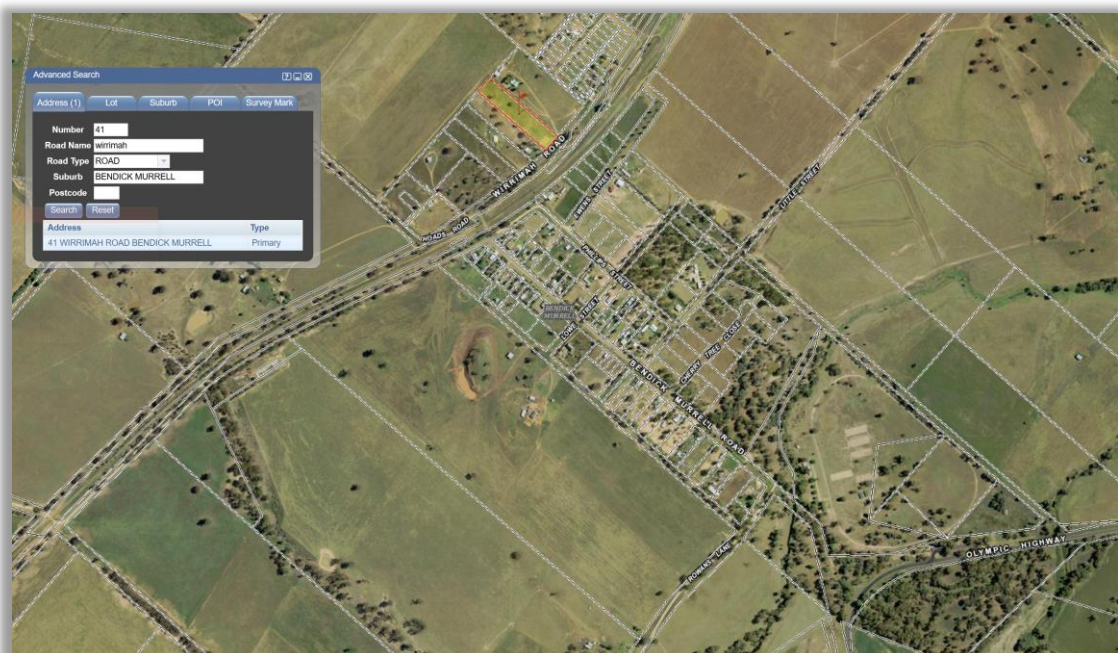
The Site

The proposed development site (Lot 436 DP 754605) is a vacant allotment excised in 1934 within the edge of the wider Village of Bendick Murrell, north of Young in NSW. The locality in the Village NW of Rail line is within a cluster of 3 – 4 acre blocks (1 – 1.5 ha) but within Town blocks of quarter acre blocks. The site is within Bendick Murrell Village, some 22km North East of Young.

The site has a total area of 12,140 sq.m (1.2014ha) and has a few trees to rear corner and side with a sole tree in the centre mid rear of lot. No work on any trees is proposed. The current site has a width of 46m average, with a depth of 265.5m average. The Crown plan extract is shown below yet is reproduced in full in the appendices.



Broader locality map



Locality in Bendick Murrell

roadside V table drains and access gates. This allotment is unencumbered and enjoys a larger area than mot town blocks with a long standing dam adjacent the front of site from former rural use.

The Site Context

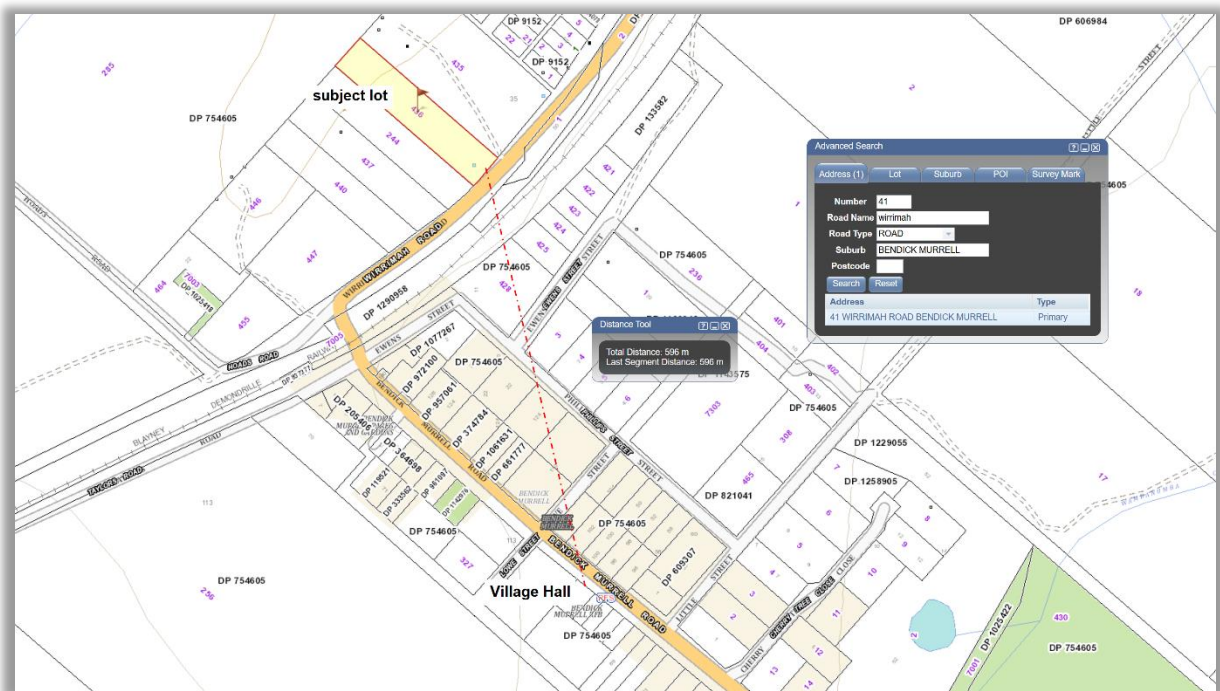
The site is set to the NW of the Village and is approximately 596 from the Village Hall and RFS Shed. It is in main Village serviced lands, (water, sealed roads, power) and is just away from the main street across the older disused rail line,being Bendick Murrell Rd which leads to Wirrimah, via this road adjacent.

The neighbouring land uses and proximity of neighbours (approximately):

SouthWest: main Village beyond rail lines	Northeast: Village smaller lots beyond localised site of this lot
Northwest: Rural lands beyond this and adjoining lots. Adjoining houses less than 20m from farmed lands, this proposal (residential component) exceeds 120m from farmed land at rear.	SouthEast: main Village beyond rail lines



Wider aerial & analysis of neighbourhood

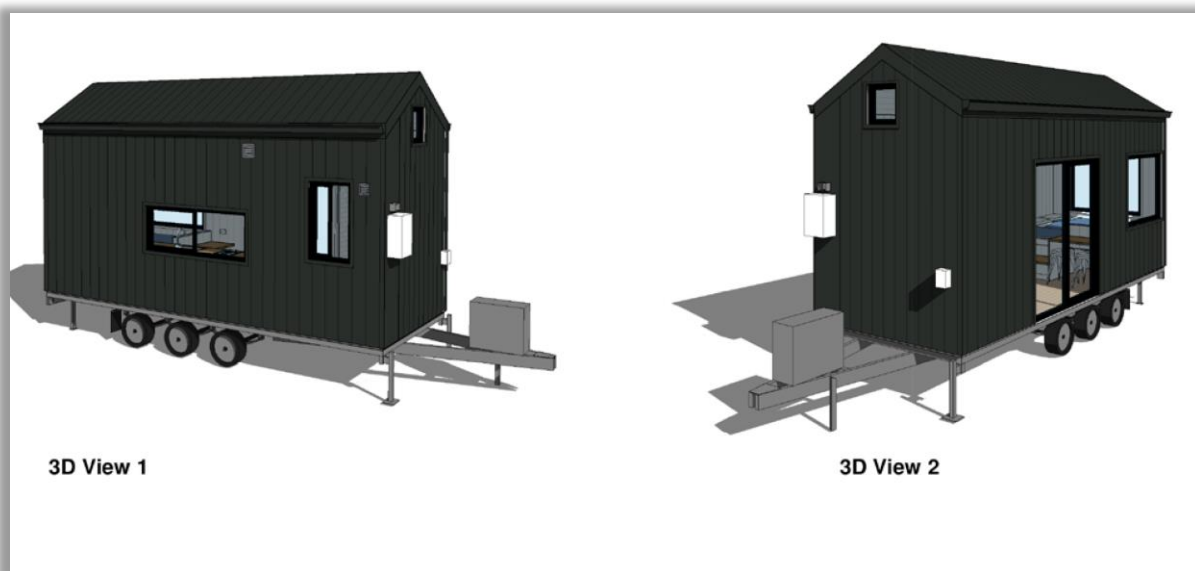


Locality Map
Site is 596m from Village Hall

A. The Proposed Development

Upon the land is proposed to be situated a new Aussie Tiny Home of a newer contemporary styling pre-manufactured with cedar wall cladding & and set off with colorbond trim and roof.in colorbond.

The construction materials and colour scheme proposed include a darker colour type with a monument colorbond roof.



Once established on site the wheels are propped up and become optional to leave on.

Landscaping

Landscaping of the proposal will be gradual after settlement.

Vehicle, access and parking

Vehicle, access and parking provision will be by way of a detached garage/shed with awning, with an ability to store equipment and materials ancillary to the dwelling, at the rear of the lot – see plans attached. As well, 2 wheel drive access will be afforded via a driveway proposed to adjacent vthe front of the home and to the shed/garage.

Other Approvals

The development will not require referral or general terms of approval in the following regards;

- | | |
|--|---|
| An Integrated Development application? | N |
| - Concurrence or referral to another state authority? | N |
| - Assessment under the Threatened Species Legislation? | N |

An OSM and P&D section 68 Application will be made to Council in concert with the Construction Certificate Application.

Demolition

No demolition is required as the land to be developed is vacant.

Trees

There are no trees to be removed as the land is cleared, grassed and vacant within the nominal envelopes.

Heights & Extent of Proposal

The proposed dwelling will be single storey (with storage mezzanine) on a mild sloping site, yet the tiny home will be settled and propped on site when landed. The maximum wall height and roof height of the dwelling measured from existing ground level will be approximately:

<i>Home Wall height: 2.575m max</i>	<i>Home Roof Height: 3.125m max with 500mm chassis to floor height (3.625m overall)</i>
<i>Shed Wall Height; 3m to eave & 2.738m to awning outer eavem</i>	<i>Shed Roof Height: 3.583m to upper ridge</i>

The gross floor area (GFA) of the new dwelling be 14.4sq.m. This includes the living areas, bearing in mind the bed is lofted over the sanitary fixtures. The GFA of the shed/garaport will be 144 sq.m (shed area) and 72 sq.m (awning).

The setbacks of the new Dwelling & Shed from site boundaries is detailed on the plans and due to various measurements for each, the nearest will be described in each case below

<i>North East: side 24m (to dwelling), 2m to shed</i>	<i>South West: side 15m to dwelling, 34m to shed</i>
<i>South East: front 128m to dwelling, 196m to shed</i>	<i>North West: rear 131m to dwelling, 45m to shed</i>

Access/Parking

Vehicle access is from the road to shed at rear of site, parking with parking adjacent the home planned also.

Earthworks

The shed will be sited on some more level ground at the at the saddle on the site $\frac{3}{4}$ up the block. The home will be placed at approximately mid lot across the contour on a basic shaped level area. Even at rear shed, expected cut fill is in the range of 750mm cut and 750mm fill balanced with batters laid out greater than 3:1 with plans to grass and revegetate.

Subdivision

No subdivision proposed at this time.

B. Compliance with Planning Controls

Hilltops Local Environmental Plan 2022 (HLEP)

The zoning of the subject land is RU5 Village. This has been verified by an extract of Planning information from the NSW Planning Portal (copy in appendices). An extract from the LEP being the Land Use Table for RU5 is reproduced now:

Zone RU5 Village

1 Objectives of zone

- To provide for a range of land uses, services and facilities that are associated with a rural village.
- To ensure that development is sustainable and does not unreasonably increase the demand for public services or public facilities.
- To promote and encourage development that will strengthen the character and economies of Hilltops villages.
- To enable a range of development, including diverse housing forms and complementary business uses taking into account the distinct character of each village.

2 Permitted without consent

Environmental protection works; Home occupations

3 Permitted with consent

Centre-based child care facilities; Community facilities; **Dwelling houses**; Light industries; Liquid fuel depots; Neighbourhood shops; Oyster aquaculture; Places of public worship; Recreation areas; Recreation facilities (indoor); Recreation facilities (outdoor); Respite day care centres; Roads; Schools; Sewage reticulation systems; Tank-based aquaculture; Any other development not specified in item 2 or 4

4 Prohibited

Agriculture; Air transport facilities; Airstrips; Animal boarding or training establishments; Boat building and repair facilities; Boat launching ramps; Charter and tourism boating facilities; Co-living housing; Correctional centres; Creative industries; Crematoria; Eco-tourist facilities; Electricity generating works; Extractive industries; Farm buildings; Forestry; Garden centres; Hardware and building supplies; Heavy industrial storage establishments; Helipads; High technology industries; Home occupations (sex services); Industrial retail outlets; Industrial training facilities; Industries; Jetties; Landscaping material supplies; Local distribution premises; Marinas; Mooring pens; Moorings; Multi dwelling housing; Open cut mining; Residential flat buildings; Restricted premises; Rural industries; Rural workers' dwellings; Sewerage systems; Sex services premises; Specialised retail premises; Timber yards; Warehouse or distribution centres; Water recreation structures

The proposal meets the definition of “dwelling house” -

dwelling means a room or suite of rooms occupied or used or so constructed or adapted as to be capable of being occupied or used as a separate domicile.

dwelling house means a building containing only one dwelling.

Note - Dwelling houses are a type of **residential accommodation**—see the definition of that term in this Dictionary.

Having regard to the land use table above for RU5 zoned land, this falls within the “permissible with consent” land uses. By virtue of this, the use is permissible with consent.

Does the proposal satisfy the objectives of the zone ?: Yes – see assessment below

Objective	Response
To provide for a range of land uses, services and facilities that are associated with a rural village.	Not inconsistent – provision of as dwelling house
To ensure that development is sustainable and does not unreasonably increase the demand for public services or public facilities.	Consistent - Dwelling upon land zoned for the purpose and within pre-considered restrictions and parameters
To promote and encourage development that will strengthen the character and economies of Hilltops villages.	Consistent – new Dwelling in a Village and recent subdivision
To enable a range of development, including diverse housing forms and complementary business uses taking into account the distinct character of each village.	Not applicable

Is the development permissible within the zone? : Yes as it fits the definition of dwelling house and use as a dwelling plus ancillary shed.

The relevant sections of the LEP Compliance Table are now addressed below.

Clause	Complies	Comments
1.2 Aims of plan	Yes	The development is consistent with the following aims of the LEP: (b) to provide for the lifestyles sought by current and future residents of Hilltops, including by providing for the following— (i) the rural lifestyle and liveability of Hilltops communities, (ii) connected, safe and accessible communities, (iii) diverse and affordable housing options, (iv) timely and efficient provision of infrastructure, (v) sustainable building design and energy efficiency, (c) to build and sustain healthy, diverse and empowered communities that actively participate in planning and managing their future, including by providing for the following— (i) social infrastructure that is appropriately planned and located in response to demand and demographic change, (ii) the protection and enhancement of cultural heritage values, (iii) land management practices that support sustainable outcomes, including water efficiency, (iv) the siting and arrangement of land uses for development in response to climate change, (v) the planning of development to manage emissions, (vi) planning decisions that recognise the basic needs and expectations of diverse community members, (e) to recognise and sustain the diverse natural environment and natural resources that support the liveability and economic productivity of Hilltops, including by providing for the following—

Clause	Complies	Comments
		(i) the avoidance of further development in areas with a high exposure to natural hazards, (ii) the minimisation of alterations to natural systems, including natural flow regimes and floodplain connectivity, through effective management of riparian environments, (iii) the retention and protection of remnant vegetation, (iv) the revegetation of endemic vegetation to sustain natural resource values, reduce the impact of invasive weeds and increase biodiversity, (v) buffers and setbacks to minimise the impact of conflicting land uses and environmental values, including potential impacts on noise, water, biosecurity and air quality, (vi) the management of water on a sustainable and total water cycle basis to provide sufficient quantity and quality of water for consumption, while protecting biodiversity and the health of ecosystems The remainder of the aims are not relevant to this proposal, or are not impacted by the proposal.
1.4 Definitions	N/A	The proposed development is defined as a <i>dwelling house</i> which means, <i>a building containing only one dwelling.</i>
1.9A Suspension of covenants, agreements and instruments	Yes	Nil apply
2.2 Zoning	N/A	The site is zoned RU5 Village
2.3 Zone objectives and land use table	Yes	The development is permitted with consent, in accordance with the land use table, and it is consistent with the objectives of the zone as stated above.
2.7 Demolition	N/A	No demolition proposed.
2.8 Temporary use of land	N/A	The application is not for the temporary use of land.
4.1 Min Subdiv Lot Size	Complies	2000 sq.m – exceeded so - ok
4.1A Dual Occupancy Lot sizes	N/A	n/a
4.6 Exceptions to development standards	N/A	Development permissible so no variation sought
5.10 Heritage Conservation	N/A	The allotment, its buildings, nor Adjacent land nor buildings in locality listed as Heritage nor in a HCA
5.16 Subdivision of, or dwellings on, land in certain rural, residential or environment protection zones	N/A	RU5 not a listed zone in this part
6.1 Earthworks	OK	Minor cut/fill. Sedimentation and erosion control measures shall be put in place during construction.
6.2 Essential Services	Complies	Development consent must not be granted to development unless the consent authority is satisfied the following services that are essential

Clause	Complies	Comments
		for the development are available or that adequate arrangements have been made to make them available when required— (a) the supply of water, <i>available at front of site on application to Cowra Shire</i> (b) the supply of electricity, <i>available at front of site on application to Essential Energy</i> (c) the disposal and management of sewage, <i>to be disposed of per EHO design provided in line with Geotech for OSM - see appendices. Note – OSM system deliberately oversized for 3 bed home in future years.</i> (d) stormwater drainage or on-site conservation, <i>dam available at front of site for stormwater intervention</i> (e) suitable road access <i>Sealed road at frontage – entry provided at subdivision</i>
6.3 Terrestrial Biodiversity	OK	Not affected by this overlay
6.4 Water - Riparian	N/A	Not mapped as affected
6.5 Water – Groundwater Vulnerability	N/A	Not mapped as affected
6.6 Salinity	N/A	Not mapped as affected
6.7 Highly Erodible Soils	N/A	Not mapped as affected
6.8 Drinking Water Catchments	N/A	N/A
6.9 Development along Lachlan & Boorowa Rivers & Lake Wyangla	N/A	N/A
6.10 Development on Carinya Estate	N/A	N/A
6.11 DCP for Urban Release Areas	N/A	Does not exist

Young Development Control Plan 2011 (YDCP)

Whilst not applying to this LEP, an assessment of the proposal against the YDCP 2011 relevant sections is included in the Compliance Table below.

Young Development Control Plan –			
<u>Performance outcome</u>	<u>Acceptable Solution</u>	<u>Complies</u>	<u>Comment</u>
PV1 Residential building placement, scale and form on lots wholly or partially within RU5 zones is sympathetic to the surrounding neighbourhood character;	AV1.1 Residential building setbacks are at least 10 metres to the front boundary line and 4 metres to the side boundaries;	☐ Yes	Compliant – see attached site plan
	AV1.2 All residential dwellings are single storey or appear as such from the street frontage;	☐ Yes	Compliant – see plans
	AV1.3 Residential dwellings avoid fibrous cement (unless painted) and metal cladding of walls (unless as an architectural feature);	☐ Yes	Compliant – see plans
PV2 Commercial or industrial developments respect neighbourhood character and provide adequate facilities appropriate to the proposed use;	AV2.1 Commercial or industrial uses are constructed with pre-painted metal with unpainted metal type finishes avoided. <i>Note: This is a minimum requirement and other finishes are considered acceptable;</i>	☐ N/A	Not commercial development
	AV2.2 All-weather parking areas (not necessarily sealed) are provided for commercial and industrial uses;	☐ N/A	Not commercial development
PV3 Where no reticulated water or sewer is available, roof areas, tank capacities and lot areas are large enough to enable the effective capture, storage, treatment and disposal of water	AV3.1 Where there is no sewer available, the development is to comply with Council's Policy with respect to the On- Site Management of waste disposal. Properties with an area of less than 1ha provide specific geotechnical investigation demonstrating the feasibility of on-site management;	☐ Yes	See Geotechnical report attached in appendices for larger development proposal. Design for larger development deliberate for future potential larger dwelling.

in quantities appropriate to the development, without any negative impact on adjoining properties.	AV3.2 Where no reticulated water supply is available, roof areas and tanks are provided according to the guidelines in Appendix E including a firefighting reserve of 20,000 L fitted with a Stortz fitting, such reserve to be over and above BASIX requirements (or as otherwise specified by Planning for Bushfire Protection).	☐ Yes	Town Water (Cowra Scheme available) may need a slow feed tank also in conjunction. Sec 68 LGA Appn as pre-manufactured so BASIX does not apply.
--	--	------------------------------	--

D. Assessment of Likely Impacts of Development

Construction Impacts

The proposal will have no impact upon any trees, or have any impact on the soil or site drainage patterns during construction. The construction of both dwelling works and also civil works appears to be quite contemporary and will be easily managed through sedimentation and erosion control practises common in the industry around cut and fill.

Construction noise and rubbish removal will be managed during construction via working to the acceptable consent hours for all tradesmen, and waste will be managed via a commercial skip placed on-site.?

Privacy

This proposal will not result in the loss of visual or acoustic privacy to any neighbours or respective adjacent land uses.

Views

The mild sloping aspect of this property will not see this development causing any loss of views or amenity.

Overshadowing

The proposal will not result in any additional overshadowing to any neighbouring land uses. The setbacks and the dividing fences will afford reasonable shielding from these impacts.

Economic and Social Impacts

There are no social and economic impacts anticipated from this development except for positive. Spacious land available in Bendick such as this lot, and with a reasonable use of the land it will appear for all intents and purposes as a private residential development.

Drainage

The proposed methods of disposing stormwater from the site are to the dam with occasional overflow of same to street table drain system.

Access and Traffic

As stated previously, the access is existing, yet may need a minor upgrade onto Wirrimah Rd.

~~~~~

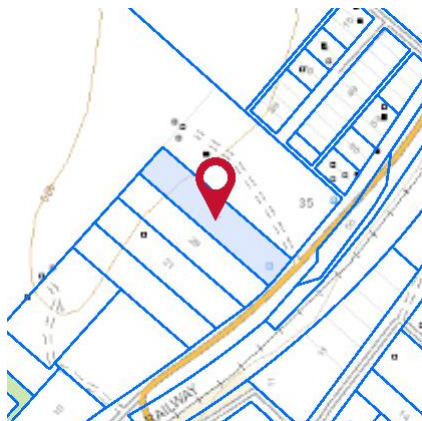
# **APPENDIX # 1**

## **eSPATIAL PLANNING REPORT**



# Property Report

41 WIRRIMAH ROAD BENDICK MURRELL 2803



## Property Details

Address: 41 WIRRIMAH ROAD BENDICK MURRELL 2803  
Lot/Section /Plan No: 436/-/DP754605  
Council: HILLTOPS COUNCIL

## Summary of planning controls

Planning controls held within the Planning Database are summarised below. The property may be affected by additional planning controls not outlined in this report. Please contact your council for more information.

|                              |                                                          |
|------------------------------|----------------------------------------------------------|
| Local Environmental Plans    | Hilltops Local Environmental Plan 2022 (pub. 23-12-2022) |
| Land Zoning                  | RU5 - Village: (pub. 23-12-2022)                         |
| Height Of Building           | NA                                                       |
| Floor Space Ratio            | NA                                                       |
| Minimum Lot Size             | 2000 m <sup>2</sup>                                      |
| Heritage                     | NA                                                       |
| Land Reservation Acquisition | NA                                                       |
| Foreshore Building Line      | NA                                                       |

## Detailed planning information

### State Environmental Planning Policies which apply to this property

State Environmental Planning Policies can specify planning controls for certain areas and/or types of development. They can also identify the development assessment system that applies and the type of environmental assessment that is required.

This report provides general information only and does not replace a Section 10.7 Certificate (formerly Section 149)



# Property Report

41 WIRRIMAH ROAD BENDICK MURRELL 2803

- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Allowable Clearing Area (pub. 21-10-2022)
- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Exempt and Complying Development Codes) 2008: Land Application (pub. 12-12-2008)
- State Environmental Planning Policy (Housing) 2021: Land Application (pub. 26-11-2021)
- State Environmental Planning Policy (Industry and Employment) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Planning Systems) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Primary Production) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Resilience and Hazards) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Resources and Energy) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Sustainable Buildings) 2022: Land Application (pub. 29-8-2022)
- State Environmental Planning Policy (Transport and Infrastructure) 2021: Land Application (pub. 2-12-2021)

## Other matters affecting the property

Information held in the Planning Database about other matters affecting the property appears below. The property may also be affected by additional planning controls not outlined in this report. Please speak to your council for more information

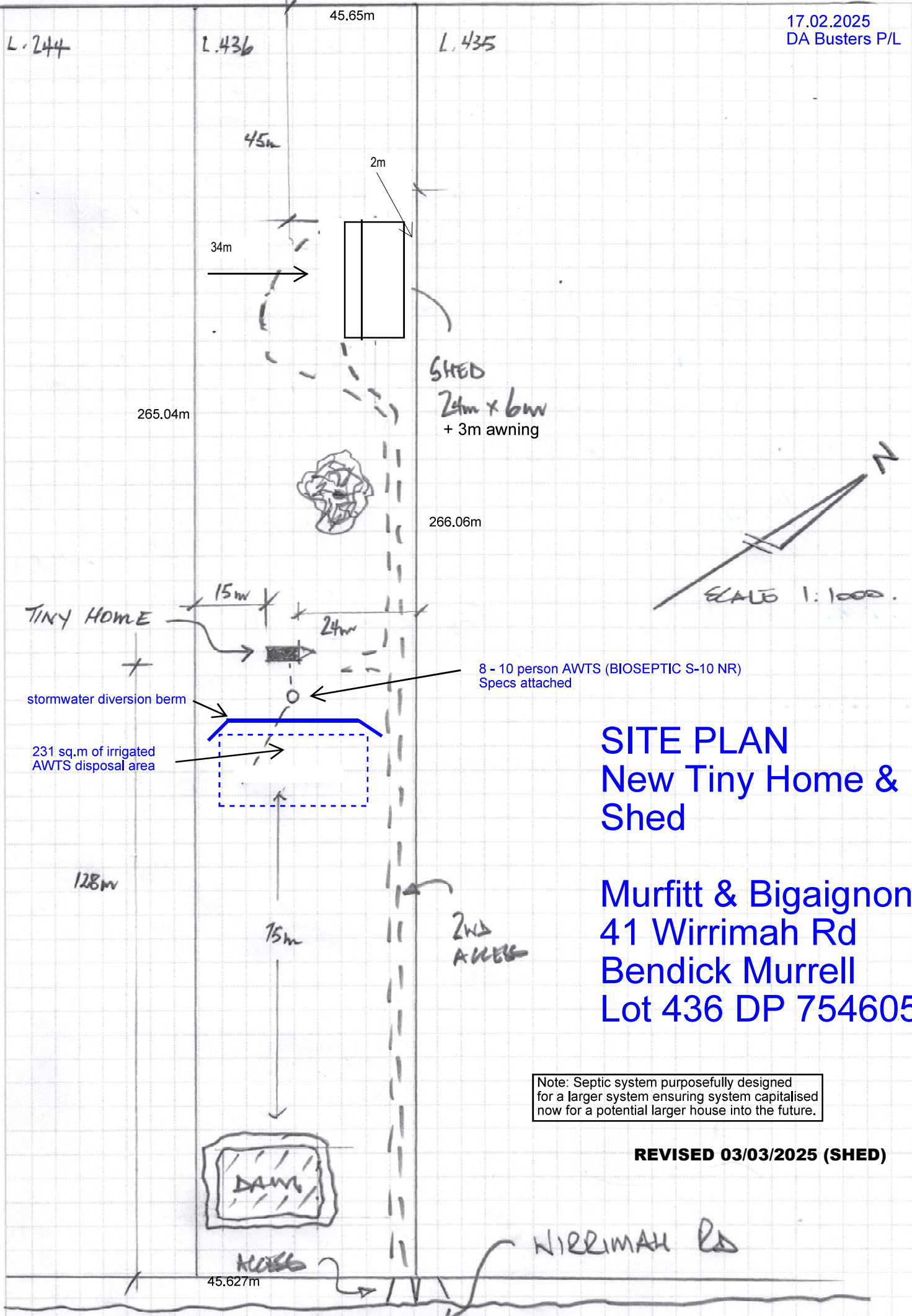
|                                     |                                                                                                                                                                                                                         |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Land near Electrical Infrastructure | This property may be located near electrical infrastructure and could be subject to requirements listed under Transport and Infrastructure SEPP 2021 Clause 2.48. Please contact Essential Energy for more information. |
| Local Aboriginal Land Council       | COWRA                                                                                                                                                                                                                   |
| Regional Plan Boundary              | South East and Tablelands                                                                                                                                                                                               |

This report provides general information only and does not replace a Section 10.7 Certificate (formerly Section 149)

## **APPENDIX # 2**

### **PLANS FOR NEW DWELLING**

### **PLANS FOR NEW SHED**



## SITE PLAN New Tiny Home & Shed

Murfitt & Bigaignon  
41 Wirrimah Rd  
Bendick Murrell  
Lot 436 DP 754605

Note: Septic system purposefully designed for a larger system ensuring system capitalised now for a potential larger house into the future.

REVISED 03/03/2025 (SHED)



# Design Drawings

Gunnamatta 6.0 - Gable Roof

-----



Sleeps 1 - 2



Trailer - 6.0 x 2.4



Features

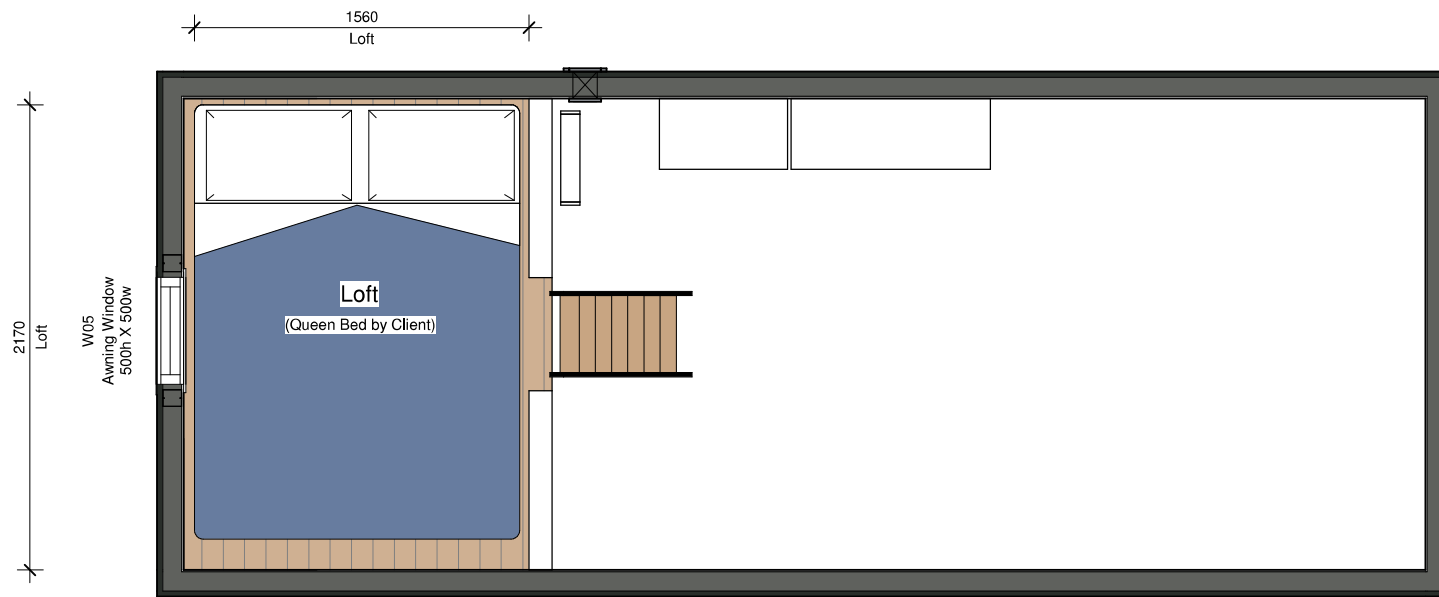
Single Level  
Gable Roof  
Raked Ceilings  
Bathroom  
Kitchen / Living / Bed

Design  
Drawings

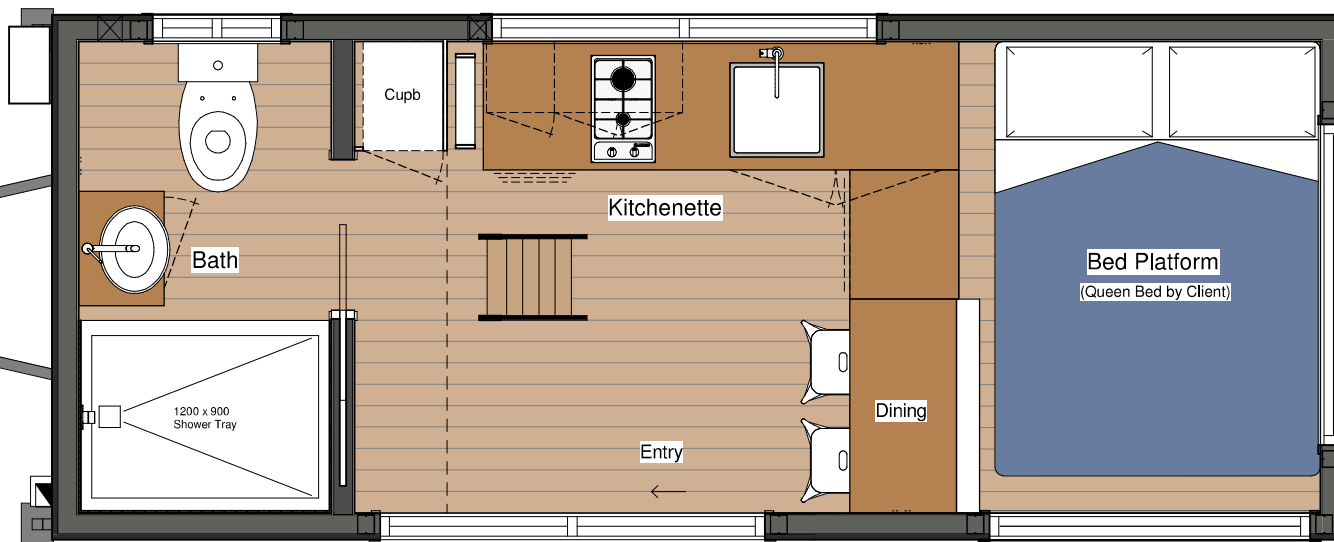
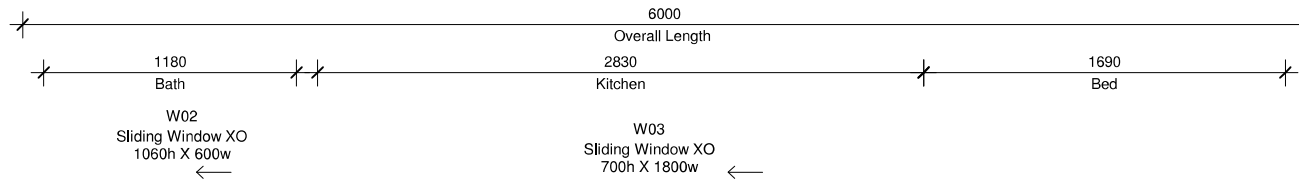
(Rev A)



AUSSIE TINY HOUSES



**2 Loft Level**  
1 : 25

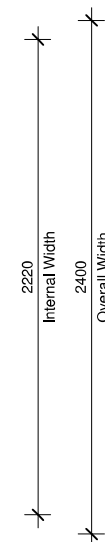


**1 Floor Plan**  
1 : 25

D01  
Sliding Door OX LH  
2100h X 1800w

W01  
Fixed Glass  
1200h X 1500w

W04  
Fixed Glass  
1200h X 1500w



Model:

## Gunnamatta 6.0

### Gable Roof

Client N°: --

Destination: --

Client:

--



**AUSSIE TINY HOUSES**

Address: 10-12 Link Crescent, Coolum Beach 4573  
Phone: 07 5324 2499  
Email: info@aussietinyhouses.com.au  
ABN: 20658090139 QBCC: 15058053

#### CLIENT PLEASE NOTE:

These Designs are for indicative purposes only, any works listed on "SCOPE OF WORKS" take precedence. Any discrepancies need to be raised prior to the commencement of works.

#### COPYRIGHT:

These Designs are copyright & remain the property of Richard K Smith & can not be reproduced, copied, used or altered without the written permission of Richard K Smith.

## Design Drawings

(Rev A)

Project No: --

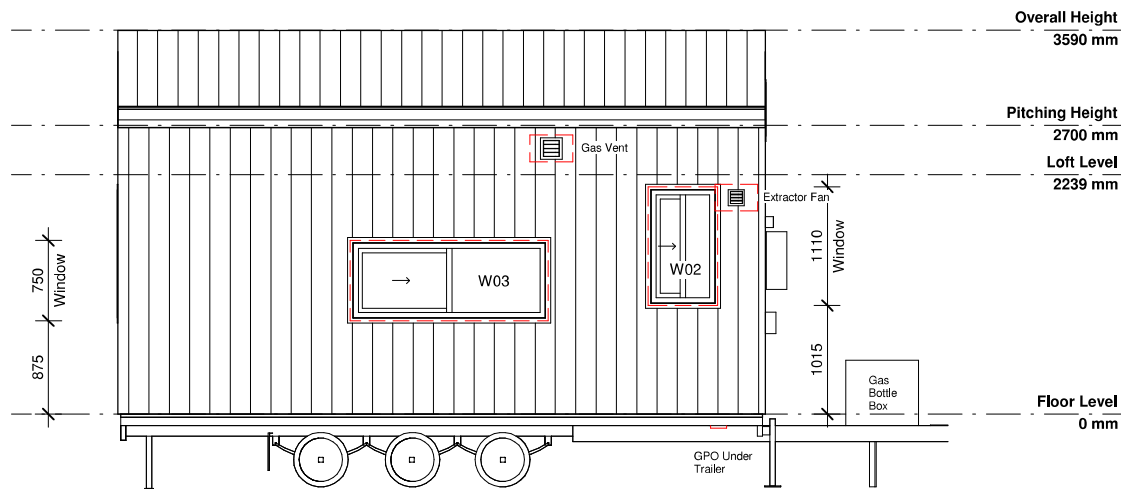
Date: Jan 2023

Drawn by: RS

Scale: 1 : 25

## FLOOR PLANS

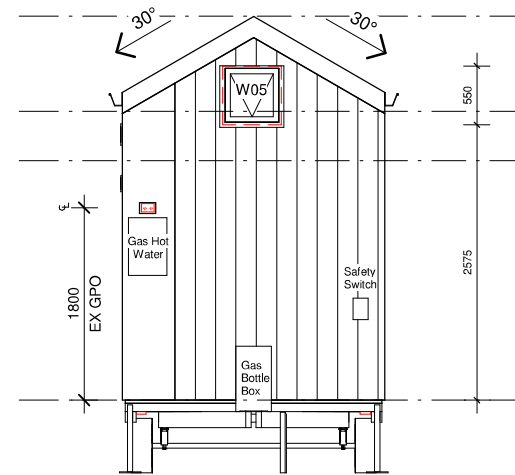
Sheet No: A1.1



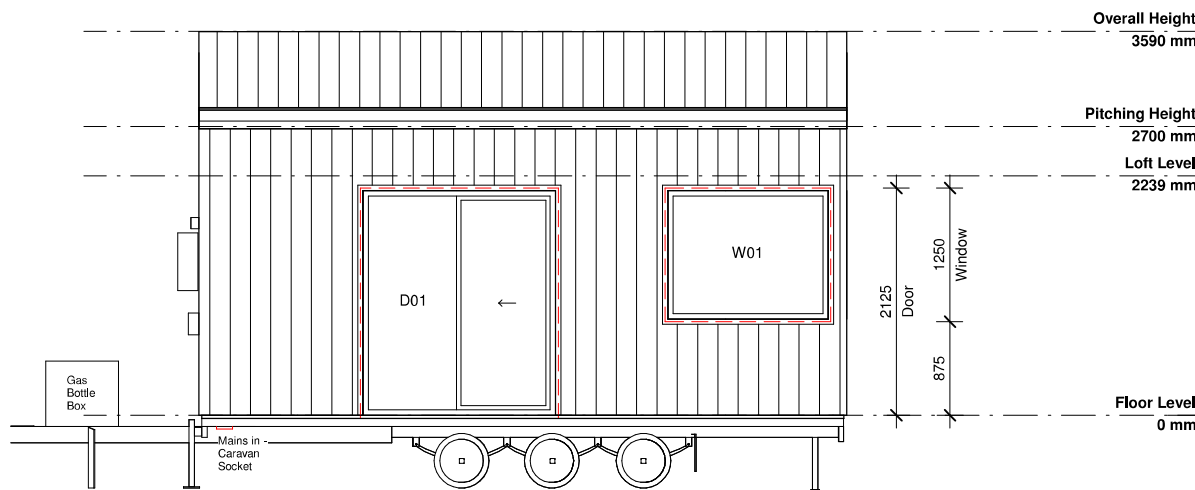
**1 Elevation 1**  
**1 : 50**

Wall Cladding - Trimdek (Vertical)  
Colour : Monument Matt  
Window & Door Trims : Monument Matt  
All other Trims: Monument Matt

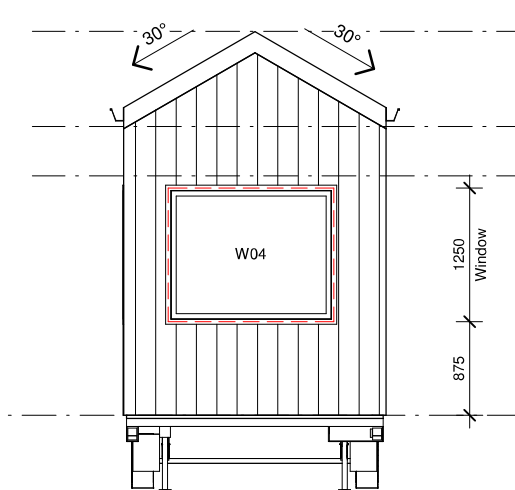
Roof Cladding - Trimdek  
Colour : Monument Matt  
Roof Flashings - Monument Matt



**2 Elevation 2**  
**1 : 50**



**3 Elevation 3**  
**1 : 50**



**4 Elevation 4**  
**1 : 50**

Model:

## Gunnamatta 6.0 Gable Roof

Client N°: --

Destination: --

Client:

--



**AUSSIE TINY HOUSES**

Address: 10-12 Link Crescent, Coolool Beach 4573  
Phone: 07 5324 2499  
Email: [info@aussietinyhouses.com.au](mailto:info@aussietinyhouses.com.au)  
ABN: 20658090139 QBCC: 15058053

### CLIENT PLEASE NOTE:

These Designs are for indicative purposes only, any works listed on "SCOPE OF WORKS" take precedence. Any discrepancies need to be raised prior to the commencement of works.

### COPYRIGHT:

These Designs are copyright & remain the property of Richard K Smith & can not be reproduced, copied, used or altered without the written permission of Richard K Smith.

## Design Drawings (Rev A)

Project No: --  
Date: Jan 2023  
Drawn by: RS  
Scale: 1 : 50

## ELEVATIONS

Sheet No: **A2.1**

Model:

Gunnamatta 6.0

Gable Roof

Client N°: --

Destination: --

Client:

--



3D View 1



3D View 2



3D View 3



3D View 4



AUSSIE TINY HOUSES

Address: 10-12 Link Crescent, Coolumb Beach 4573  
Phone: 07 5324 2499  
Email: info@aussietinyhouses.com.au  
ABN: 20658090139 QBCC: 15058053

CLIENT PLEASE NOTE:

These Designs are for indicative purposes only, any works listed on "SCOPE OF WORKS" take precedence. Any discrepancies need to be raised prior to the commencement of works.

COPYRIGHT:

These Designs are copyright & remain the property of Richard K Smith & can not be reproduced, copied, used or altered without the written permission of Richard K Smith.

Design  
Drawings

(Rev A)

Project No: --

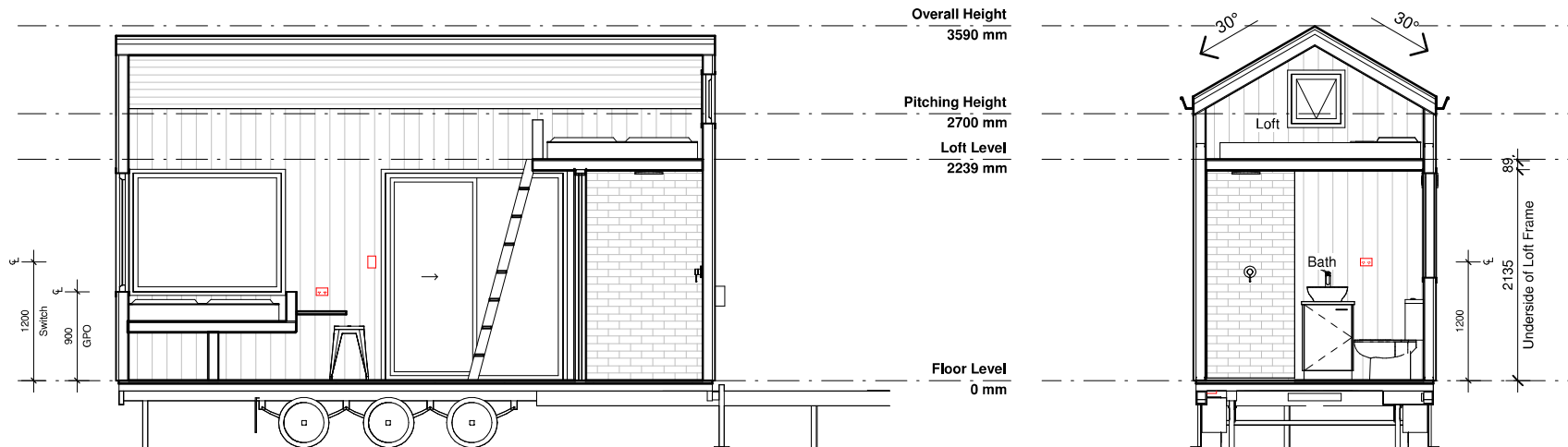
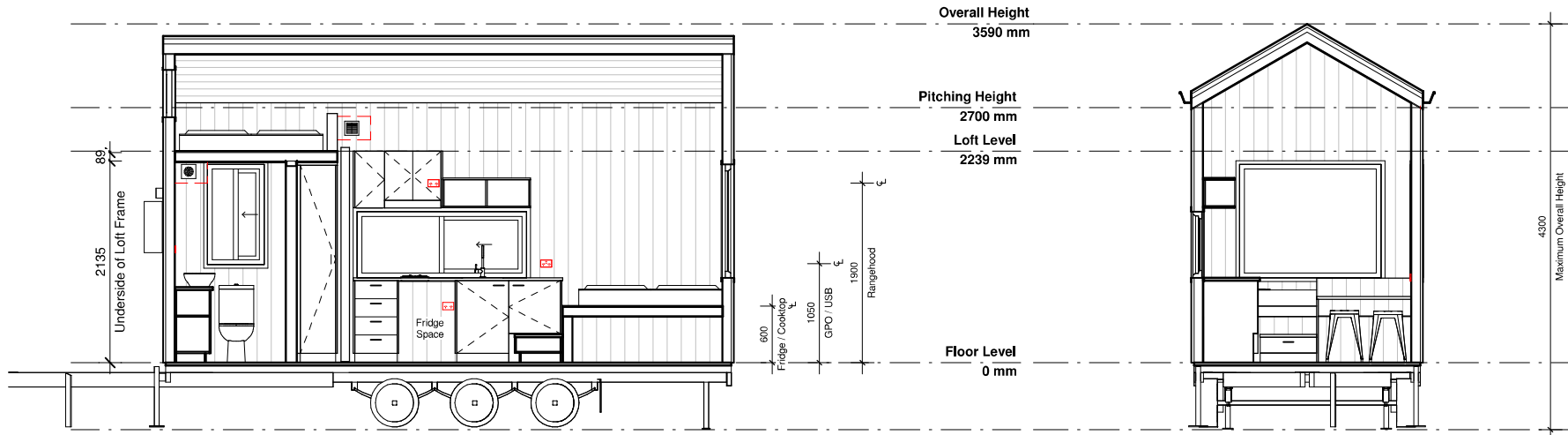
Date: Jan 2023

Drawn by: RS

Scale:

EXTERNAL 3D  
VIEWS

Sheet No: A2.2



Model:

**Gunnamatta 6.0**

**Gable Roof**

Client N°: --

Destination: --

Client:

--



**AUSSIE TINY HOUSES**

Address: 10-12 Link Crescent, Coolum Beach 4573  
Phone: 07 5324 2499  
Email: info@aussietinyhouses.com.au  
ABN: 20658090139 QBCC: 15058053

CLIENT PLEASE NOTE:

These Designs are for indicative purposes only, any works listed on "SCOPE OF WORKS" take precedence. Any discrepancies need to be raised prior to the commencement of works.

COPYRIGHT:

These Designs are copyright & remain the property of Richard K Smith & can not be reproduced, copied, used or altered without the written permission of Richard K Smith.

**Design  
Drawings**  
(Rev A)

Project No: --

Date: Jan 2023

Drawn by: RS

Scale: 1 : 50

**SECTIONS**

Sheet No: **A3.1**



Sectional 3D View 1



Sectional 3D View 2

Model:

**Gunnamatta 6.0**

**Gable Roof**

Client N°: --

Destination: --

Client:

--



**AUSSIE TINY HOUSES**

Address: 10-12 Link Crescent, Coolum Beach 4573  
Phone: 07 5324 2499  
Email: info@aussietinyhouses.com.au  
ABN: 20658090139 QBCC: 15058053

CLIENT PLEASE NOTE:

These Designs are for indicative purposes only, any works listed on "SCOPE OF WORKS" take precedence. Any discrepancies need to be raised prior to the commencement of works.

COPYRIGHT:

These Designs are copyright & remain the property of Richard K Smith & can not be reproduced, copied, used or altered without the written permission of Richard K Smith.

**Design  
Drawings**  
(Rev A)

Project No: --

Date: Jan 2023

Drawn by: RS

Scale:

**SECTIONAL 3D  
VIEWS**

Sheet No: **A3.2**



**Kitchen / Living - 3D View**



**Living / Kitchen - 3D View**

Model:

**Gunnamatta 6.0**

**Gable Roof**

Client N°: --

Destination: --

Client:

--



**AUSSIE TINY HOUSES**

Address: 10-12 Link Crescent, Coolum Beach 4573  
Phone: 07 5324 2499  
Email: info@aussietinyhouses.com.au  
ABN: 20658090139 QBCC: 15058053

**CLIENT PLEASE NOTE:**

These Designs are for indicative purposes only, any works listed on "SCOPE OF WORKS" take precedence. Any discrepancies need to be raised prior to the commencement of works.

**COPYRIGHT:**

These Designs are copyright & remain the property of Richard K Smith & can not be reproduced, copied, used or altered without the written permission of Richard K Smith.

**Design  
Drawings**  
(Rev A)

Project No: --

Date: Jan 2023

Drawn by: RS

Scale:

**INTERIOR - 3D  
VIEWS**

Sheet No: **A7.1**

**These pictures are illustrative only.**  
Deck not supplied by Aussie Tiny Houses, but to be built by others on site once Tiny House is positioned



Model:

**Gunnamatta 6.0**

**Gable Roof**

Client N°: --

Destination: --

Client:

--



**AUSSIE TINY HOUSES**

Address: 10-12 Link Crescent, Coolum Beach 4573  
Phone: 07 5324 2499  
Email: info@aussietinyhouses.com.au  
ABN: 20658090139 QBCC: 15058053

**CLIENT PLEASE NOTE:**

These Designs are for indicative purposes only, any works listed on "SCOPE OF WORKS" take precedence. Any discrepancies need to be raised prior to the commencement of works.

**COPYRIGHT:**

These Designs are copyright & remain the property of Richard K Smith & can not be reproduced, copied, used or altered without the written permission of Richard K Smith.

**Design  
Drawings**  
(Rev A)

Project No: --

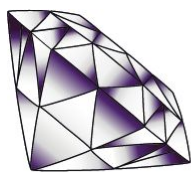
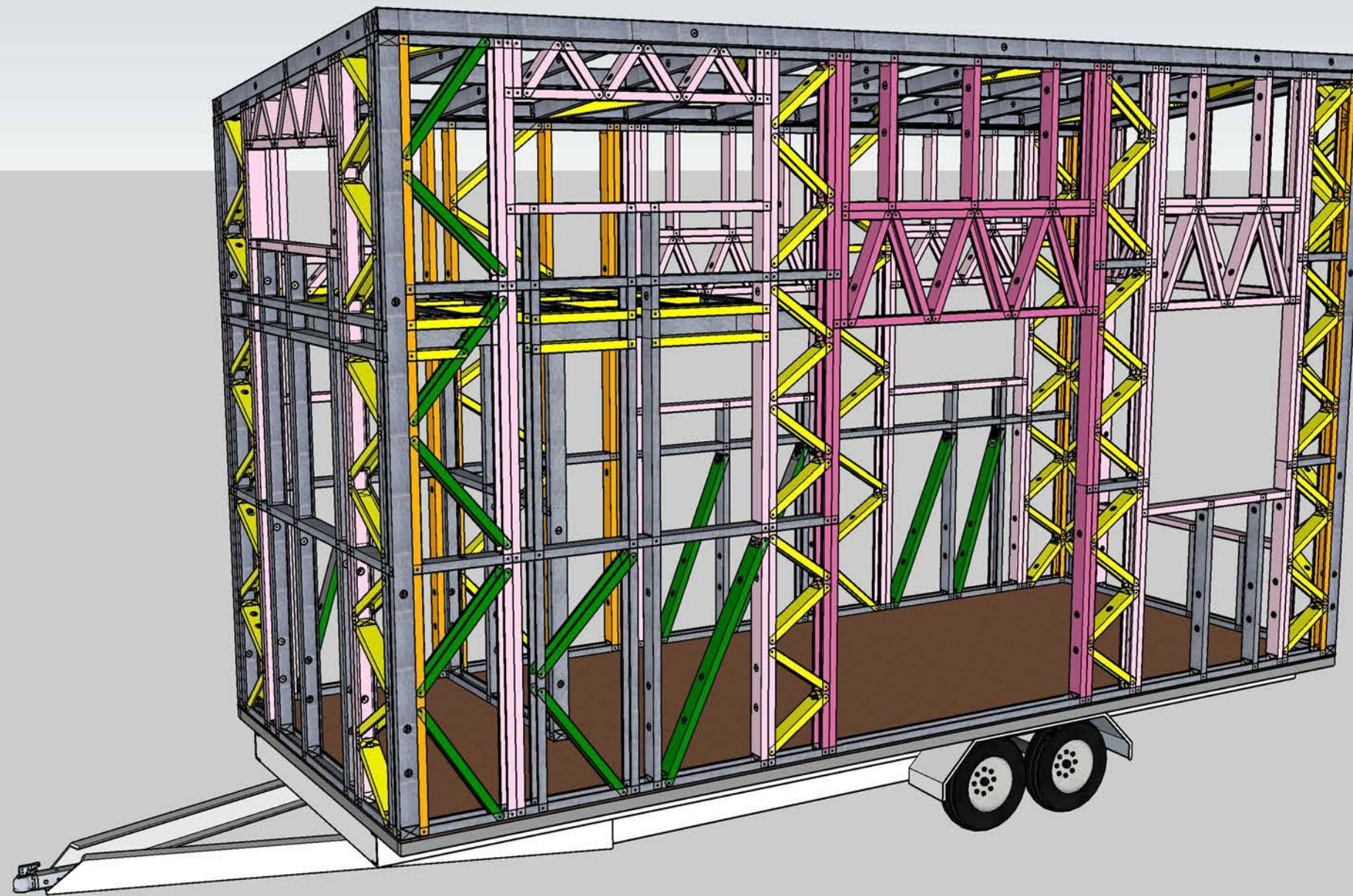
Date: Jan 2023

Drawn by: RS

Scale:

**DECK  
(BY CLIENT)**

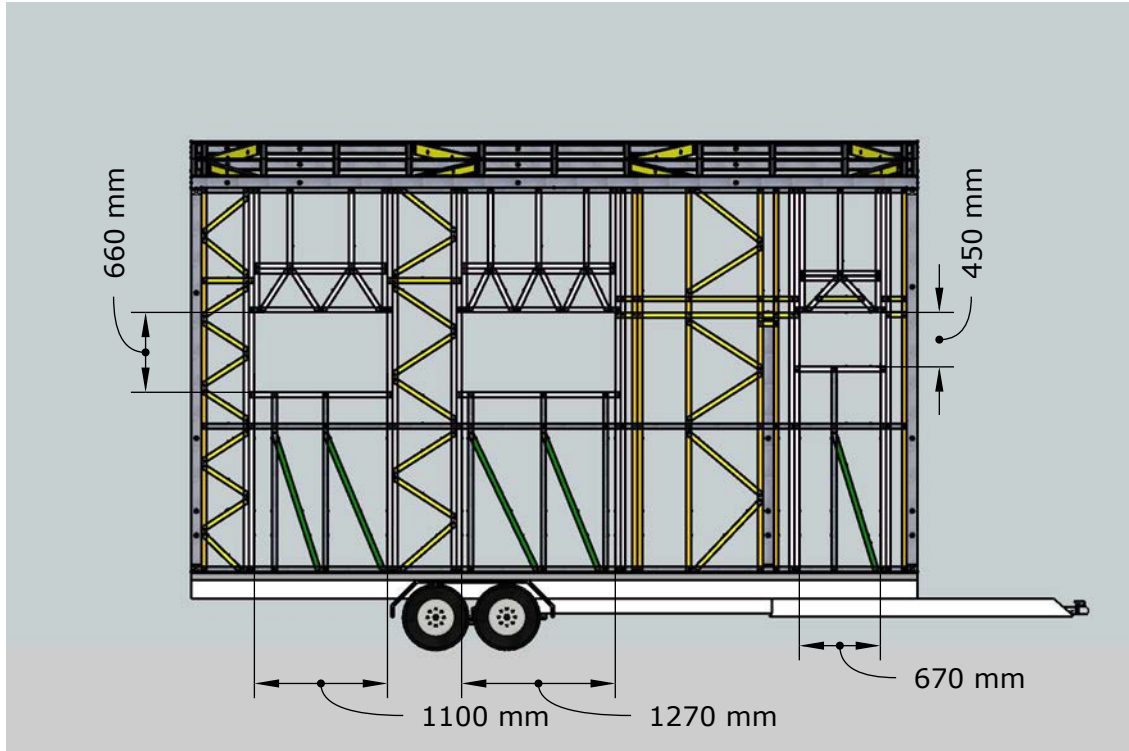
Sheet No: **A7.3**



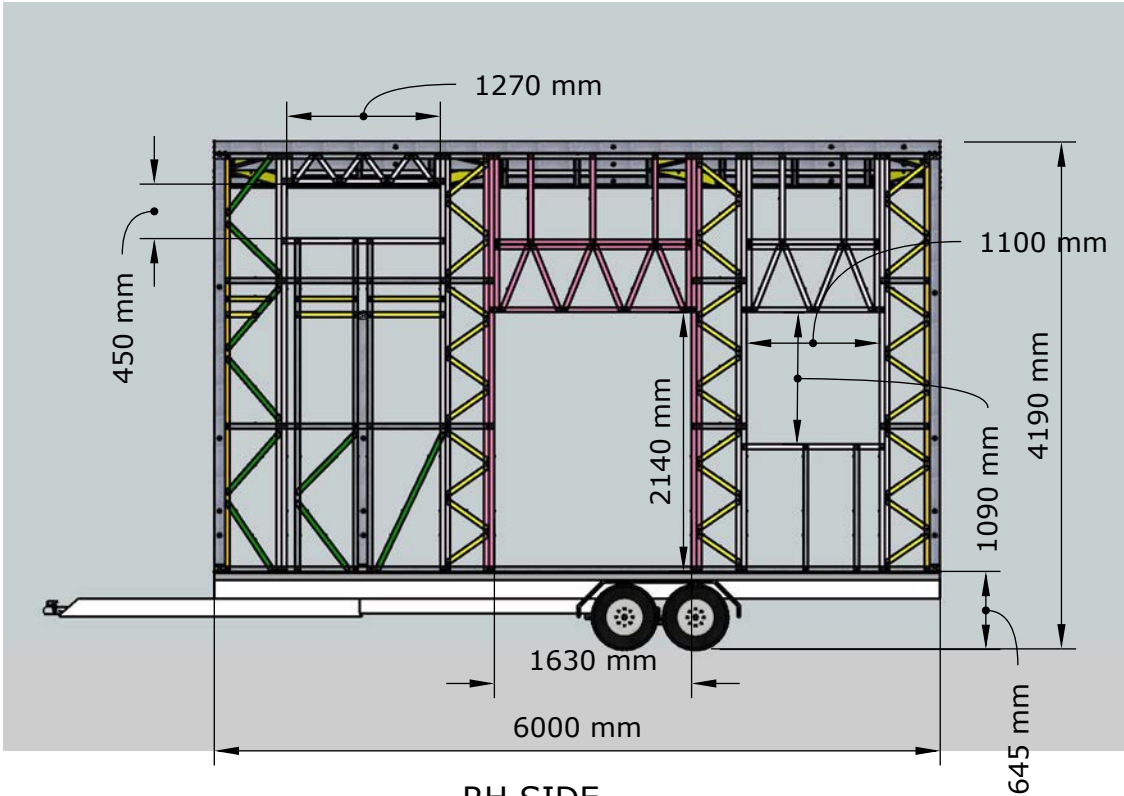
**DIAMONDSTEEL**  
FRAMING SYSTEMS

## DIAMONDSTEEL 6m Tiny Home

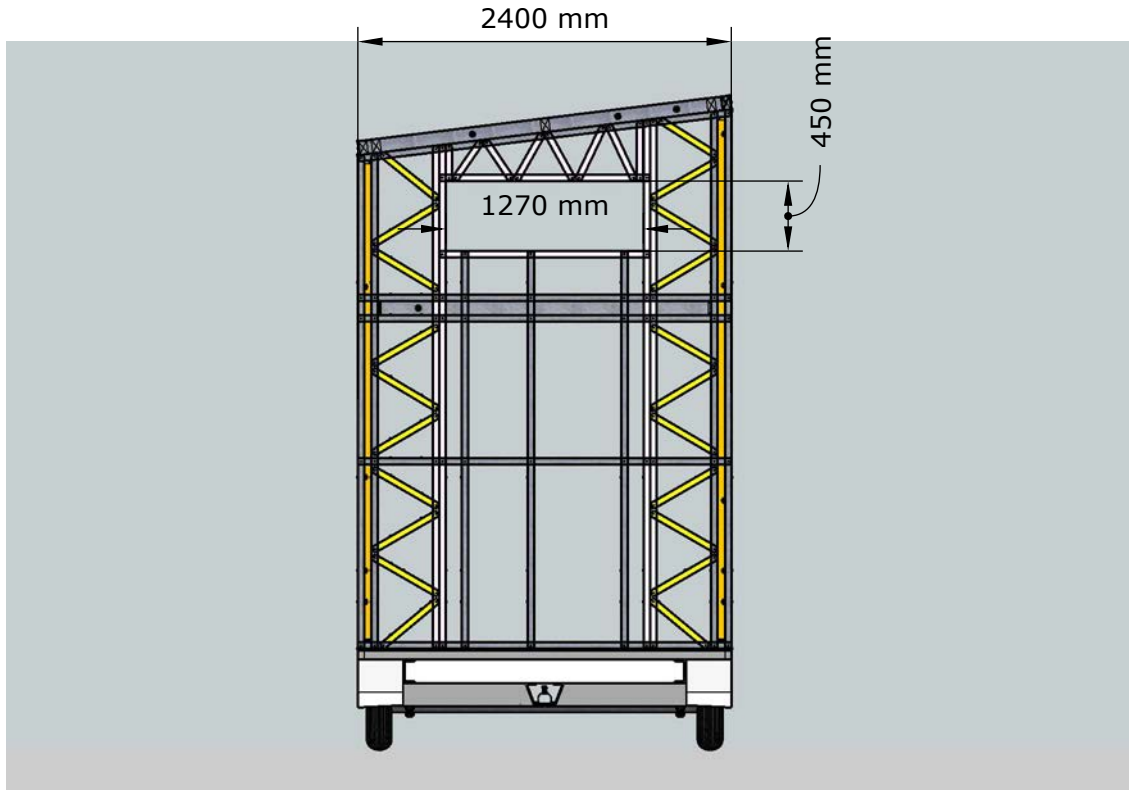
REV-0  
07/12/2024



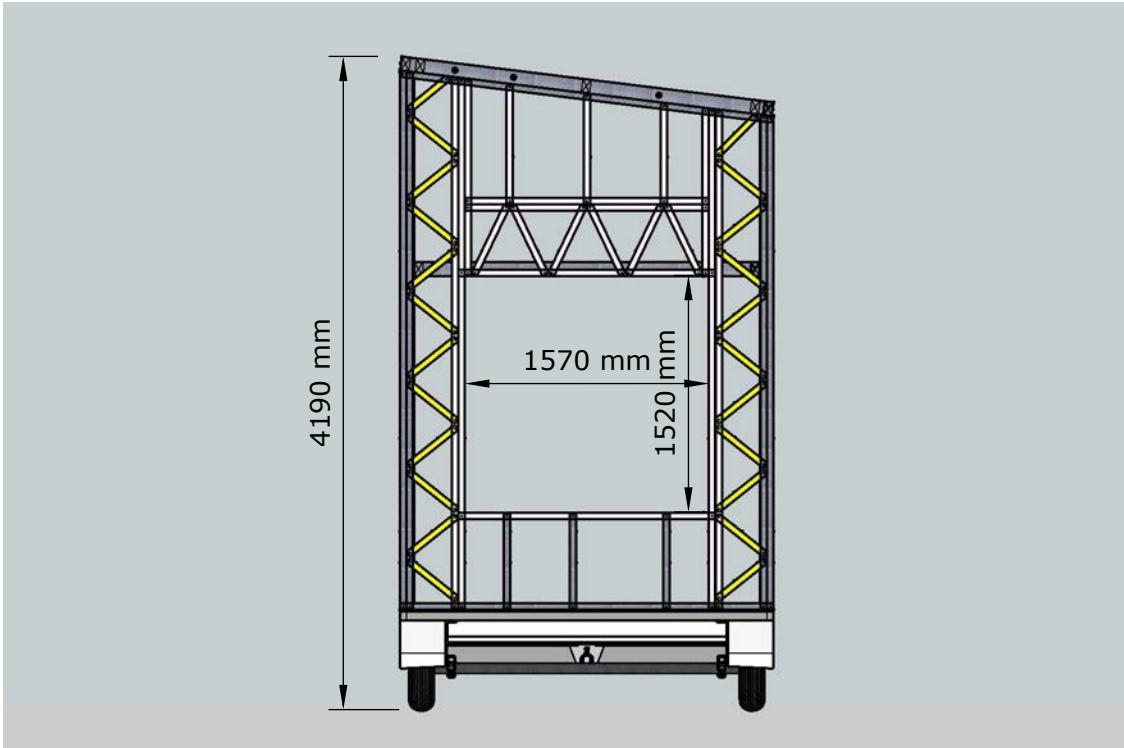
LH SIDE



RH SIDE



FRONT



BACK



**DIAMONDSTEEL**  
FRAMING SYSTEMS

19 Corporation Ave  
Robin Hill, NSW 2795  
0400 317 774

[sales@diamondsteelframes.com.au](mailto:sales@diamondsteelframes.com.au)

Project Name

**DIAMONDSTEEL 6m Tiny Home**

Sales Order No. (If Applicable)

**N/A**

**Revisions**

| Revision No. | Revision Date | Change By |
|--------------|---------------|-----------|
|              |               |           |
| Revision No. | Revision Date | Change By |
|              |               |           |
| Revision No. | Revision Date | Change By |
|              |               |           |

| Drawn By     | Current Revision |
|--------------|------------------|
| J Brooke     | REV-0            |
| Date Created | Sheet No.        |
| 07/12/2024   | 2 of 2           |

Copywrite Information

© This Drawing is issued on the understanding that it is Copyright and is to be regarded as confidential property of Con-form Group Pty Ltd. It must not be reproduced without the consent of Con-form Group.

**A3**



## Gunnamatta 6.0

A family-friendly luxurious retreat with a raised daybed platform and a queen-size loft.



AUSSIE TINY HOUSES



### **Gunnamatta 6.0**

BnB cabin style ground-level bedroom model with a deck trailer



## SLEEPS 1-2



- 1x Queen size ground level daybed
- 1x Queen size bed loft

## DIMENSIONS



- 6.0m Length
- 2.4m Width
- 3.9m Height

## FEATURES



- Luxurious Family style cabin
- Raised Queen size bed platform with built-in step
- Panoramic bedroom views
- Holiday stay kitchenette
- Built-in mini bar kitchen space
- Large 1200x900mm shower space
- Gable roof

## TURN-KEY\*



Complete home from

**\$104,900\***

\*Pricing information on this brochure is indicative only, subject to change without prior notice due to building material prices and/or unforeseen economic circumstances and does not constitute an offer or contract.

# About Gunnamatta 6.0

**Aussie** Tiny Houses

Introducing the Gunnamatta 6.0: Your Family Retreat in a Cabin-Style Tiny House.

The Gunnamatta 6.0 is the epitome of family-friendly luxury. This exquisite tiny house combines style and functionality, offering property owners the perfect opportunity to create an unforgettable family retreat.

Designed as a luxurious family-style cabin, the Gunnamatta 6.0 provides an inviting escape for families of up to four. Its unique layout seamlessly blends open living areas with semi-private spaces, allowing you to accommodate guests with ease.

Inside, you'll find a raised Queen-size bed platform with a built-in drawer step, offering both comfort and panoramic views. In addition, a secondary loft sleeping space accessed by a ladder ensures that everyone has their own slice of paradise.

The holiday stay kitchenette features a dual burner cooktop and built-in mini bar space, while the bathroom boasts a spacious 1200x900mm shower area, providing both convenience and relaxation during your stay. The gable roof and panoramic bedroom views not only create a sense of spaciousness but also fill the interior with natural light, fostering an atmosphere of tranquillity.

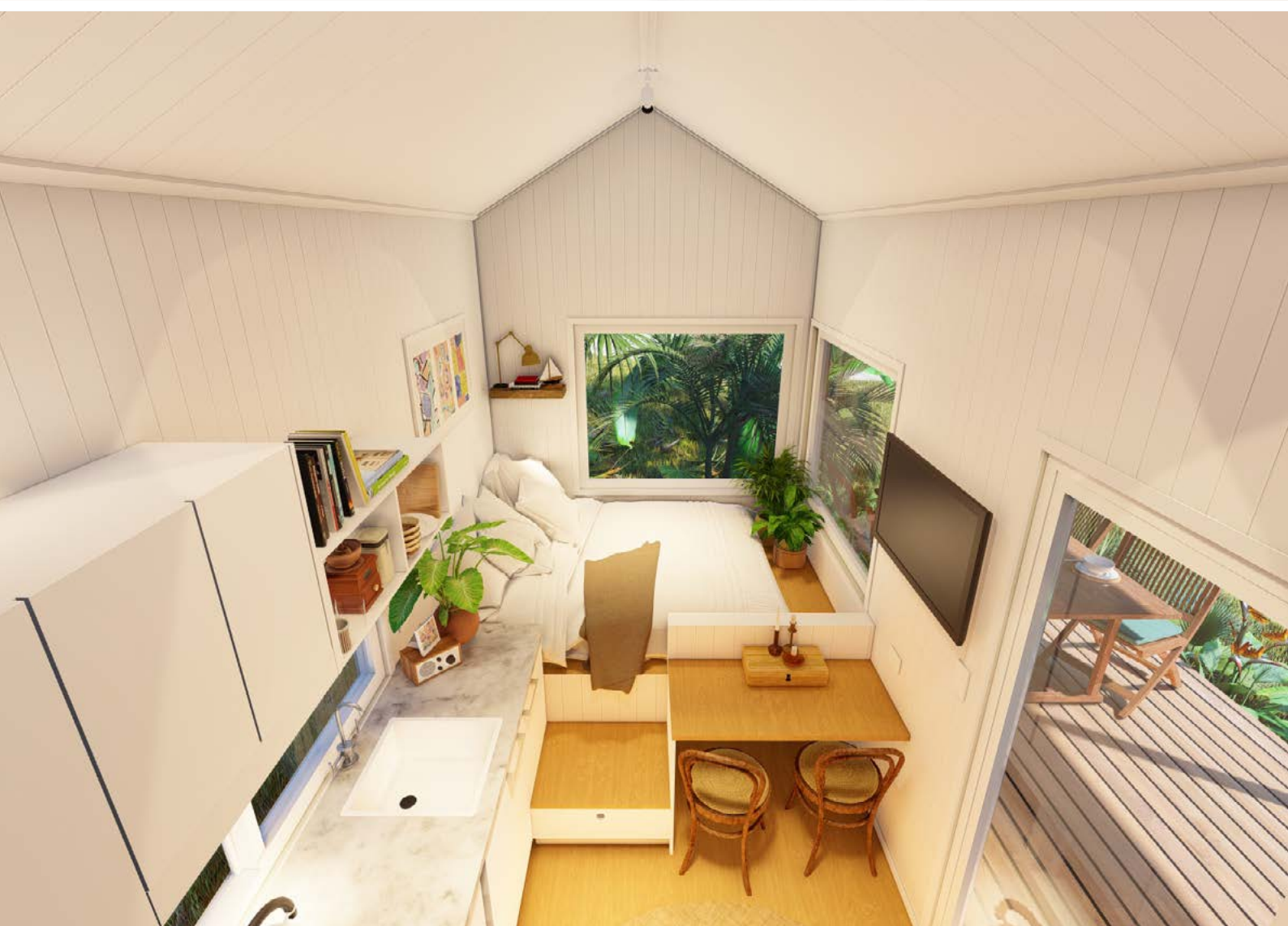
The Gunnamatta 6.0 is perfect for family retreats, whether it's enjoying breakfast at the brekky bar or taking in the scenic views of your property. It promises to create cherished memories that will last a lifetime for your guests.

Elevate your property's appeal and offer families a chance to escape the ordinary. Invest in the Gunnamatta 6.0 cabin-style Tiny House and unlock the potential for unforgettable family getaways, taking advantage of the growing trend of families seeking unique holiday experiences.

\*The photos published for this model may have had some Upgrades added. Please get in touch to get Standard Inclusions information.

\*\*All deckings and other external structures for our standard models are not included in the price and were either built by the client or a local builder arranged by the customer after delivery.







# Inclusions

## TRAILER

TRI AXLE TRAILER RATED TO 4.5TON

VIN (VEHICLE IDENTIFICATION NUMBER)

ELECTRIC BRAKES ON ALL WHEELS

BREAK AWAY SYSTEM

HAND BRAKE SYSTEM

4X STABILIZING LEGS

TRAILER FULLY PAINTED FOR EXTRA PROTECTION

## LIVING ROOM

### WINDOWS AND DOORS

1X SLIDING DOOR 2100H X 1800W + FLY SCREEN

### ELECTRICAL

1x LED CEILING DOWNLIGHT

1X DOUBLE POWER POINT

## BEDROOM

### FEATURES

PLATFORM SUITABLE FOR QUEEN SIZE DAYBED

### WINDOWS AND DOORS

2X FIX GLASS WINDOW 1200H X 1500W + FLY SCREEN

### ELECTRICAL

1X LED CEILING DOWNLIGHT

## LOFT BEDROOM

### FEATURES

SUITABLE FOR QUEEN SIZE BED

### WINDOWS AND DOORS

AWNING WINDOW 500H X 500W + FLY SCREEN

### ELECTRICAL

1X LED CEILING DOWNLIGHT

1X DOUBLE POWER POINT

1X 2 WAY LIGHT SWITCH

# Inclusions

| KITCHEN                                              |
|------------------------------------------------------|
| WINDOWS AND DOORS                                    |
| 1X SLIDING WINDOW 700H X 1800W + FLY SCREEN          |
| ELECTRICAL                                           |
| 2X DOUBLE POWER POINTS                               |
| 1X DOUBLE POWER POINT WITH USB                       |
| SMOKE ALARM                                          |
| FITTINGS                                             |
| STANDARD CHROME OR BLACK KITCHEN TAP                 |
| STANDARD CHROME OR CHARCOAL STAINLESS STEEL SINK     |
| APPLIANCES                                           |
| STAINLESS STEEL GAS COOKTOP 2 BURNERS                |
| CABINETRY                                            |
| KITCHEN CABINETS (AS PER DESIGN)                     |
| SOFT TOUCH CLOSE TO DOORS AND DRAWERS WHERE SUITABLE |

| BATHROOM                                              |
|-------------------------------------------------------|
| WINDOWS AND DOORS                                     |
| 1X DOUBLE HUNG WINDOW 920H X 600W + FLY SCREEN        |
| 1X CAVITY SLIDING DOOR 2040H X 720W WITH PRIVACY LOCK |
| ELECTRICAL                                            |
| 1x LED CEILING DOWNLIGHT                              |
| 1x DOUBLE POWER POINTS                                |
| EXTRACTOR FAN                                         |
| FITTINGS                                              |
| STANDARD CHROME OR BLACK SHOWER HEAD                  |
| STANDARD CHROME OR BLACK SHOWER MIXER                 |
| WHITE CERAMIC OVAL TOP MOUNT SINK                     |
| STANDARD CHROME OR BLACK BASIN MIXER                  |
| WALL HUNG VANITY                                      |
| TOILET / SHOWER                                       |
| STANDARD FLUSH TOILET                                 |
| SHOWER 1200MM X 900MM                                 |
| TOUGHENED GLASS SEMI FRAMELESS SHOWER SCREEN          |

## INTERNAL / STRUCTURE

LOFT ACCESS LADDER

WATERPROOF ENGINEERED FLOOR BOARDS

INSULATION BATTS EARTHWOOL R 2.5

INSULATED SUBFLOOR R 1.4

ENGINEERED STEEL FRAME

FULLY PAINTED - 1X COLOUR OPTION

## EXTERIOR

SAFETY SWITCH BOARD

2x EXTERNAL DOUBLE POWER POINT

20 AMP POWER INLET WITH 20 AMP EXTENSION LEAD

COLORBOND STEEL ROOF AND WALL CLADDING

EXTERNAL LED PORCH LIGHT

WATER INLET

DUAL GAS REGULATOR

GAS HOT WATER SYSTEM

GAS ALUMINIUM STORAGE BOX

# Upgrades

## KITCHEN APPLIANCES

|                                            |          |
|--------------------------------------------|----------|
| 125L WHITE OR STAINLESS STEEL BAR FRIDGE   | \$500.00 |
| DUAL BURNER ELECTRIC COOKTOP               | \$280.00 |
| DUAL BURNER GAS COOKTOP BLACK GLASS FINISH | \$280.00 |
| EXTERNAL DUCTING KIT (RANGEHOOD)           | \$500.00 |

\* Fridge size may vary slightly depending on availability.

## SKYLIGHTS AND WINDOWS

|                                                            |            |
|------------------------------------------------------------|------------|
| AWNING WINDOW LIVING ROOM / BEDROOM 1200H X 1500W          | \$300.00   |
| LOUVRE WINDOW BATHROOM 920H X 600W + FLY SCREEN            | \$300.00   |
| BLINDS TO ALL WINDOWS AND DOORS (EXCLUDING KITCHEN WINDOW) | \$1,500.00 |

## HEATING AND COOLING

|                                              |            |
|----------------------------------------------|------------|
| AIR CONDITIONING 2.5KW (HEATING AND COOLING) | \$2,650.00 |
| CEILING FAN WITH LIGHT AND REMOTE CONTROL    | \$450.00   |

## BATHROOM

|                                         |          |
|-----------------------------------------|----------|
| SHAVING CABINET SINGLE DOOR WITH MIRROR | \$250.00 |
|-----------------------------------------|----------|

### COMPOSTING TOILETS

|                                           |            |
|-------------------------------------------|------------|
| NL ALECTURA COMPOSTING TOILET             | \$2,300.00 |
| 2X NL ALECTURA HEAT PAD                   | \$220.00   |
| CINDERELLA INCINERATION TOILET - ELECTRIC | \$8,200.00 |

### EXTERNAL / INTERNAL

|                                                     |                  |
|-----------------------------------------------------|------------------|
| EXTERNAL CEDAR CLADDING FEATURE WALL                | \$3,450.00       |
| BATHROOM CEDAR FEATURE CEILING                      | \$1,900.00       |
| GABLE ROOF WITH EXPOSED RAFTERS - CATHEDRAL CEILING | Price on request |
| MAPEI SEALANT AND ECO FRIENDLY PAINT                | \$670.00         |

### DECK TRAILERS

|                                                         |             |
|---------------------------------------------------------|-------------|
| 6.0M COMPOSITE DECK TRAILER WITH PERGOLA                | \$25,900.00 |
| 6.0M COMPOSITE DECK TRAILER WITH POD AND PERGOLA        | \$52,900.00 |
| AIR CONDITIONING 2.5KW (HEATING AND COOLING) - POD ROOM | \$2,650.00  |
| BLINDS TO ALL WINDOWS AND DOORS - POD ROOM              | \$550.00    |

\* All Deck Trailers in the range available from 6 m to 10 m in length.

### WATER

|                                   |            |
|-----------------------------------|------------|
| 2500L SLIMLINE PVC WATER TANK     | \$1,700.00 |
| 5000L SLIMLINE PVC WATER TANK     | \$2,500.00 |
| 3000L ROUND PVC WATER TANK        | \$1,250.00 |
| 5000L ROUND PVC WATER TANK        | \$1,500.00 |
| WATER PUMP                        | \$600.00   |
| EZGREY GREYWATER DIVERSION SYSTEM | \$1,350.00 |
| GREASE TRAP                       | \$450.00   |

| SOLAR SYSTEM OPTIONS                              |             |
|---------------------------------------------------|-------------|
| SOLAR SYSTEM MEDIUM BM-8.2KW WITH 6 PANELS        | \$19,300.00 |
| SOLAR SYSTEM HEAVY BM-12.3KW WITH 8 PANELS        | \$24,300.00 |
| SOLAR TRAILER MEDIUM BM-8.2KW WITH 6 PANELS       | \$26,000.00 |
| SOLAR TRAILER HEAVY BM-12.3KW WITH 8 PANELS       | \$31,800.00 |
| AUTO-STARTER PETROL WESTINGHOUSE GENERATOR 8500W  | \$2,750.00  |
| EXTRA 4.1 KW BATTERY MODULE (MEDIUM SYSTEMS ONLY) | \$3,900.00  |
| WIRING FOR SOLAR                                  | \$1,000.00  |

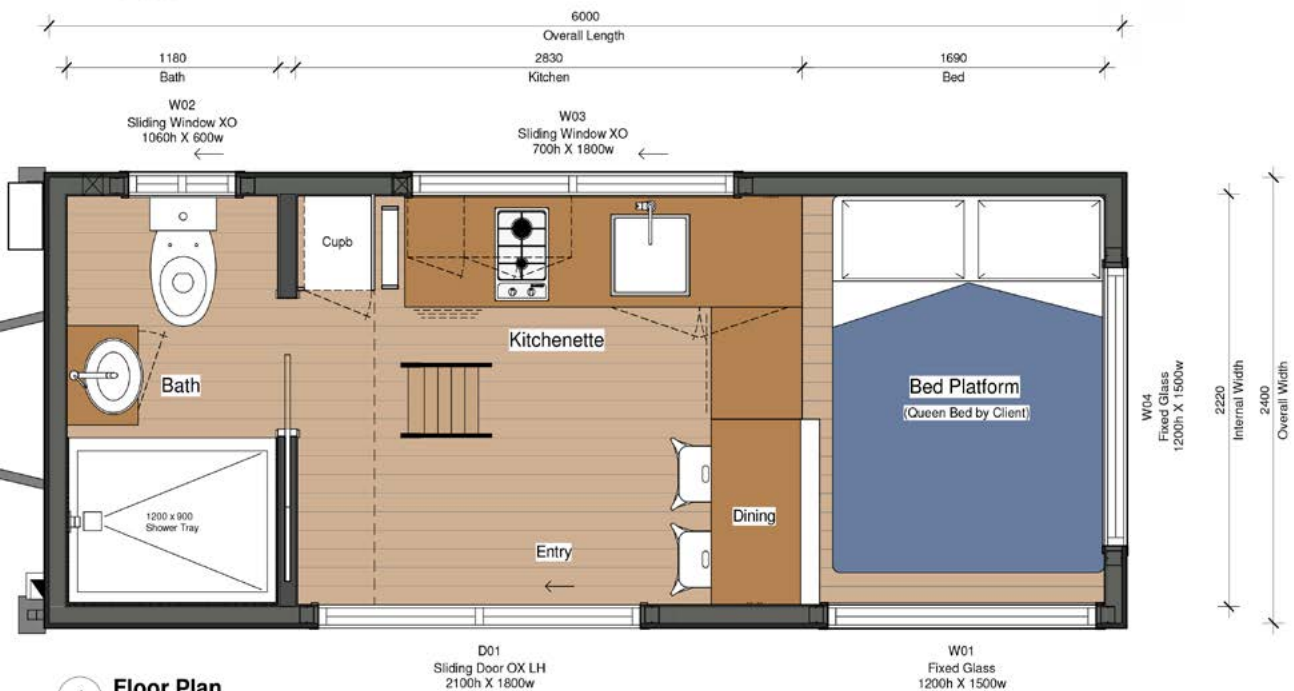
\*All upgrades include GST

\*\*Pricing information on this brochure is indicative only, subject to change without prior notice due to supplier prices and/or unforeseen economic circumstances and does not constitute an offer or contract.

# Standard Plans



**2 Loft Level**  
1 : 25



**1 Floor Plan**  
1 : 25

**GUNNAMATTA 2.4 X 6.0**  
STANDARD DESIGN



## CLIENT PLEASE NOTE:

These Designs are for indicative purposes only, any works listed on "SCOPE OF WORKS" take precedence. Any discrepancies need to be raised prior to the commencement of works.

## COPYRIGHT:

These Designs are copyright and remain the property of Entire Design Solutions & can not be reproduced, copied, used or altered without the written permission of Entire Design Solutions.

## FLOOR PLAN

**DRAWN BY:**  
Richard Smith

# Standard Plans



3D View 1



3D View 2



3D View 3



3D View 4

## GUNNAMATTA 2.4 X 6.0 STANDARD DESIGN



### CLIENT PLEASE NOTE:

These Designs are for indicative purposes only, any works listed on "SCOPE OF WORKS" take precedence.  
Any discrepancies need to be raised prior to the commencement of works.

### COPYRIGHT:

These Designs are copyright and remain the property of Entire Design Solutions & can not be reproduced, copied, used or altered without the written permission of Entire Design Solutions.

### FLOOR PLAN

**DRAWN BY:**  
Richard Smith

# Standard Plans



**Sectional 3D View 1**



**Sectional 3D View 2**

## GUNNAMATTA 2.4 X 6.0 STANDARD DESIGN



### CLIENT PLEASE NOTE:

These Designs are for indicative purposes only, any works listed on "SCOPE OF WORKS" take precedence.  
Any discrepancies need to be raised prior to the commencement of works.

### COPYRIGHT:

These Designs are copyright and remain the property of Entire Design Solutions & can not be reproduced, copied, used or altered without the written permission of Entire Design Solutions.

### FLOOR PLAN

**DRAWN BY:**  
Richard Smith

# How to buy a Tiny House

---

We'll guide you every step of the tiny house buying process from start to finish.

---



## Select Design Models

Choose your model from our standard range of designs.



## Choose Your Upgrades

Choose your upgrades from our Upgrades and Packages list.



## Get a Quote

Receive a quote and have any changes adjusted to your requirements.



## Contract and Deposit

Sign the contract and pay a 20% deposit once you receive your deposit invoice.

## Request a Quote

Request any further information you might be after and get a quote. One of our Sales Consultants will guide you through the next steps.



**AUSSIETINYHOUSES.COM.AU**

(07) 5324 2499

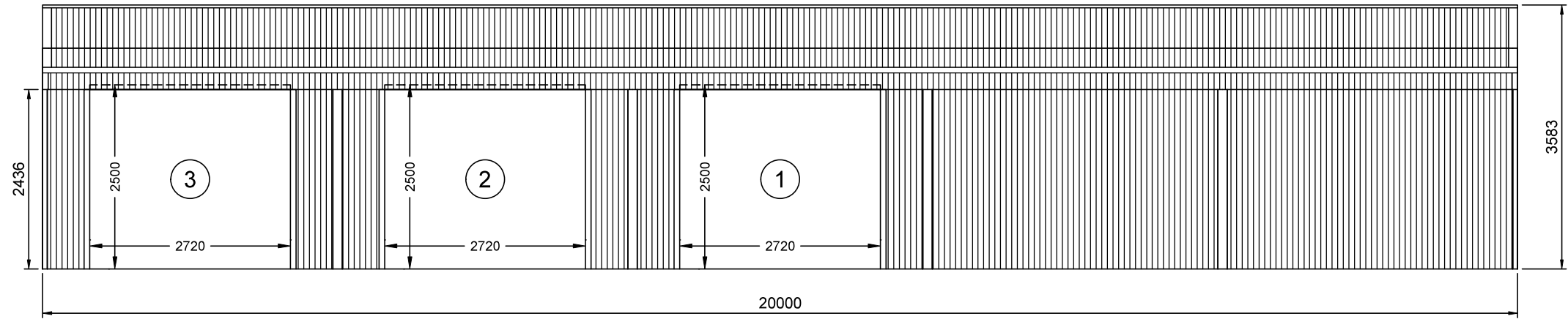
info@aussietinyhouses.com.au

blog.aussietinyhouses.com.au

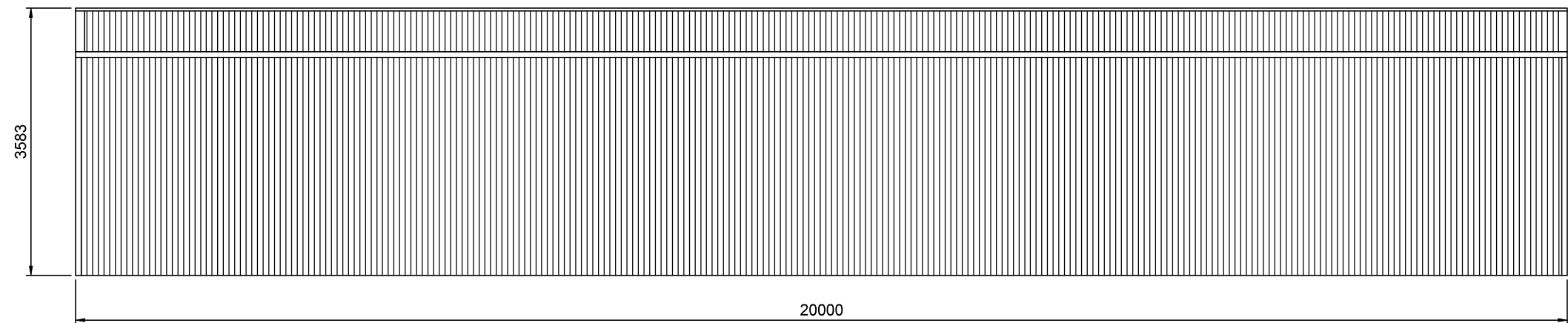
follow us: @aussietinyhouses

Coolum Beach - QLD - 4573

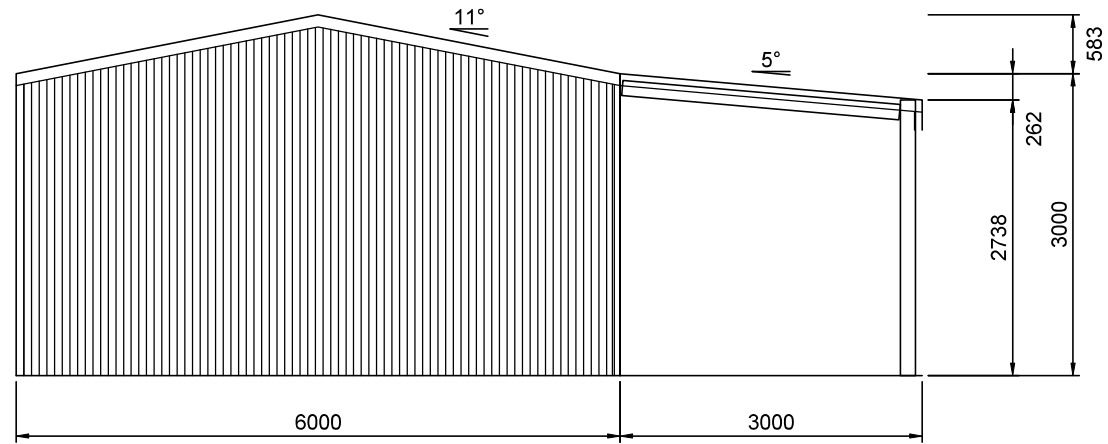




2 LEFT ELEVATION  
2 SCALE: 1:75



1 RIGHT ELEVATION  
2 SCALE: 1:75

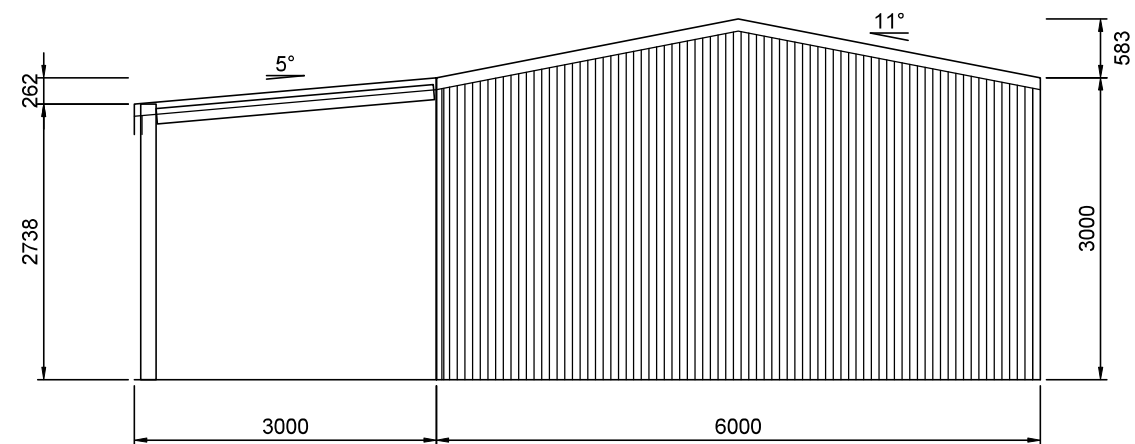


1  
3

REAR ELEVATION

SCALE: 1:75

FRAME #6



2  
3

FRONT ELEVATION

SCALE: 1:75

FRAME #1

## **APPENDIX # 3**

### **GEOTECH OSM DESIGN**

### **GEOTECH SITE CLASSIFICATION**

**Services completed for this site**☒ Lot Classifications☐ Contamination Report☐ Wastewater Management Report**LOT CLASSIFICATION REPORT**

**Prepared for:** TANYA BIGAIGNON  
**Site Address:** LOT 436 DP 754605 41 WIRRIMAH ROAD BENDICK  
MURRELL NSW 2803

Revision: 01/07/2021  
Site Test: 20/11/2024  
Lab Test: 03/12/2024  
Customer Job: B41WB  
Job Number: 24166  
Technician: JM

**Site Classification****A****Soil Classification****A**

Ys 0-10 mm

**Standards**

Test results completed in this report are in accordance with the following standards:

- AS 2870-2011 Residential slabs and footings
- AS 1726-1993 Geotechnical site investigations
- AS 3798-2007 Guidelines on earthworks for commercial and residential developments
- AS 1289.6.3.2-1997 Dynamic Cone Penetrometer
- ASNZS 1547-2012 On-Site Domestic Wastewater Management

**1.0 BACKGROUND**

Site is the BE for a new 3BR shed house on a 1.3 ha rural residential lot, 600 m NNW of the Bendick Murrell centre. Geology is dacic ignimbrite to siltstone. Soil depth at the BE is shallow, around 300 mm. Slope is near level at the BE and an average of 7% toward the SE. Site and soil classification is 'A' with a net vertical ground movement of 10 mm.

## 2.0 SITE ANALYSIS

Is there current evidence of the following that would likely affect this site?

NB: \* denotes relevant to PROBLEM SITE

|      |                                                                                                    |    |
|------|----------------------------------------------------------------------------------------------------|----|
| 2.1* | Existing fill (>400 mm onsite)                                                                     | No |
| 2.2* | Fill containing wood, metal, plastic, or other deleterious materials                               | No |
| 2.3* | Residential allotment (<1000 m <sup>2</sup> ) with over 1.6 m fill                                 | No |
| 2.4* | Rural allotment (>1000 m <sup>2</sup> ) with over 2.4 m fill                                       | No |
| 2.5* | Soft or collapsing soils                                                                           | No |
| 2.6* | Are there any trees (or removed trees) on site or adjoining site?<br>If yes, show locations at 6.0 | No |
| 2.7  | Is the project a knock down re-build?                                                              | No |
| 2.8  | Floating boulders                                                                                  | No |
| 2.9  | Rock (difficult excavation)                                                                        | No |
| 2.10 | Underground flowing water and/or seepage evidence                                                  | No |
| 2.11 | Marine environment or other risk of corrosion (within 1km from water with surf)                    | No |
| 2.12 | Erosion                                                                                            | No |

## 3.0 INSPECTION OF SITE

|     |                                                                                                |    |
|-----|------------------------------------------------------------------------------------------------|----|
| 3.1 | Site status - platform slope is:<br><b>Slope:</b> 6 Degrees <b>Fall direction:</b> W           |    |
| 3.2 | Slope stability assessment recommended (> 11 Degrees)                                          | No |
| 3.3 | Are there any Retaining Walls supporting this site?<br>(if yes, see attached plan drawing 6.0) | No |

## 4.0 VISUAL OBSERVATION OF NEIGHBOURHOOD

|     |                                                                                                                                                                    |    |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 4.1 | Presence of rock<br>Is near-surface rock visible on this site? or on adjoining lots? in nearby excavations?                                                        | No |
| 4.2 | Existing masonry buildings<br>Is there significant cracking of existing masonry walls?<br>Building Type:                                                           | No |
| 4.3 | Indicators of movement in the following:<br>Roads, Kerbs, Pavements, Masonry Fences, and/or Ground Surfaces.<br>Is there significant movement in any of the above? | No |

# 5.1 FIELD LOG

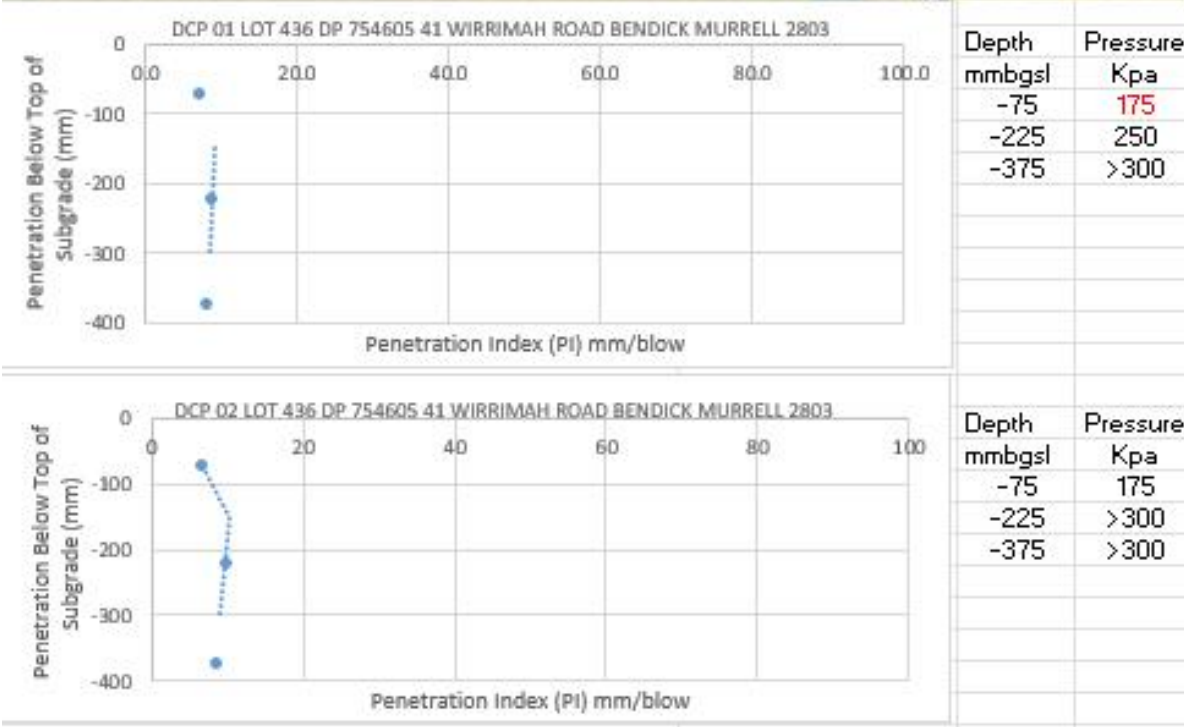
**Clayey gravelly silt,**  
**Customer Job:** B41WB  
**Job Number:** 24166  
**Site Address:** LOT 436 DP 754605 41 WIRRIMAH  
 ROAD BENDICK MURRELL NSW 2803

20/11/2024

**Borehole:** DCP3BH1  
**Surface RL:** 437.7  
**Latitude:** 34°15.592  
**Longitude:** 148°44.544

| Water                                               | Depth (m) | DCP (blows)   | PP (kPa)                     | Sample                       | Classification Code                               | Material Description                                 | Moisture                            | Linear Shrinkage (%)                                                                                           | Liquid Limit (%) | Density Consistency     | Fill |
|-----------------------------------------------------|-----------|---------------|------------------------------|------------------------------|---------------------------------------------------|------------------------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------|------------------|-------------------------|------|
|                                                     | 0.15      | 10bb          |                              |                              |                                                   | Clayey gravelly sand, yellowish brown, co.ag. 1-6 mm | Dy                                  |                                                                                                                |                  | VSt                     |      |
|                                                     | 0.30      | 15bb          |                              |                              |                                                   | Clayey sandy gravel, dusky red, co.ag. 1-15 mm 70%   | Dy 6.8                              | 4.0                                                                                                            | 24               | H                       |      |
|                                                     | 0.45      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 0.60      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 0.75      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 0.9       |               |                              |                              |                                                   | End of borehole 0.9 m bgs                            |                                     |                                                                                                                |                  |                         |      |
|                                                     | 1.05      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 1.20      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 1.35      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 1.50      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 1.65      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 1.80      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 1.95      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 2.10      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 2.25      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 2.40      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 2.55      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 2.70      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 2.85      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 3.00      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 3.15      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 3.30      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 3.45      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 3.60      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 3.75      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 3.90      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 4.05      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 4.20      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 4.35      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     | 4.50      |               |                              |                              |                                                   |                                                      |                                     |                                                                                                                |                  |                         |      |
|                                                     |           |               | WT – Water Table             |                              | UTP – Unable to penetrate                         |                                                      | DCP – 9kg Dynamic Cone Penetrometer |                                                                                                                |                  | PP- Pocket Penetrometer |      |
| AND – Density Index vs Approx. Penetrometer results |           |               |                              |                              | SILTS & CLAY – Cu vs Approx. Penetrometer results |                                                      |                                     |                                                                                                                |                  | MOISTURE                |      |
| DENSITY                                             |           | Density Index | DCP Blow Count (blows/100mm) | CONSISTENCY                  | Undrained Shear Strength (kPa)                    | DCP Blow Count (blows/100mm)                         | PP Dial Indicator                   |                                                                                                                |                  |                         |      |
| VL - Very Loose                                     |           | < 15 %        | < 1                          | VS – Very Soft               | 0 – 12                                            | < 1                                                  | 0 - 0.2                             | D – Dry<br>Da- Damp<br>M – Moist<br>W – Wet<br>W <sub>P</sub> - Plastic Limit<br>W <sub>L</sub> – Liquid Limit |                  |                         |      |
| L – Loose                                           |           | 15 – 35 %     | 1 – 3                        | S – Soft                     | 12 - 25                                           | 1 - 2                                                | 0.2 - 0.5                           |                                                                                                                |                  |                         |      |
| MD – Medium Dense                                   |           | 35 – 65 %     | 3 – 9                        | F – Firm                     | 25 – 50                                           | 2 – 3                                                | 0.5 - 1.0                           |                                                                                                                |                  |                         |      |
| D – Dense                                           |           | 65 – 85 %     | 9 – 15                       | St – Stiff                   | 50 - 100                                          | 3 – 5                                                | 1.0 - 2.0                           |                                                                                                                |                  |                         |      |
| VD - Very Dense                                     |           | > 65 – 85 %   | > 15                         | VSt – Very Stiff<br>H – Hard | 100 – 200<br>> 200                                | 5 – 8<br>> 8                                         | 3.0 - 4.0<br>> 4.0                  |                                                                                                                |                  |                         |      |

6.0 LOCATION SKETCH



7.0 COMMENTS & RECOMMENDATIONS

Soil was tested first at mid-slope on an existing pad. Then the hilltop pad site was examined and both have near surface rock eliciting a site and soil classification of 'A' with a net vertical movement of 10 mm. The depth to 100 kPa is in the range of 200-300 mm bgsl. Soil is minimal and unreactive. Midway between the midslope pad and the hilltop pad the soil is deeper and more suitable for effluent absorption.

## 8.0 CERTIFICATION

The attachment of the signature below is to certify that this report has been compiled in accordance with Australian Standards AS2870-2011, AS1726-1993 and AS3798-2007.

## 9.0 REPORT CONDITIONS & LIMITATIONS

### CONDITIONS OF THE RECOMMENDATIONS

- This is a site classification report generally in accordance with AS-2870-2011 and should be sufficient for a qualified person to design footings for structures covered under the scope of this standard.
- This site classification was completed by an experienced soil technician and does not make any allowance for any possible mine subsidence within the building envelope.
- The advice given in this report assumes that the test results are representative of the overall subsurface conditions. However, it should be noted that actual conditions in some parts of the building site may differ from those found in the boreholes. If excavations reveal soil conditions significantly different from those shown in our attached Borehole Log(s), Enviroseer must be consulted, and excavations stopped immediately.
- Any sketches in this report should be considered as only approximate pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions or slope information should not be used for any building cost calculations and/or positioning of the building. Dimensions on logs are correct.

### REPORT LIMITATIONS

The investigations addressed in this report are not intended nor designed to locate all possible ground conditions on the site. It is not possible to identify all possible ground conditions. Further, one site may have a variety of ground conditions and, the ground conditions identified by the testing articulated in this report may change, even over noticeably short periods of time.

The advice and recommendations contained in this report are based on the test results obtained from the samples tested, and on the assumption that those test results are representative of the overall ground conditions of the entire site. The actual conditions in some parts of the site might differ from those tested. If excavation reveals ground conditions that vary from those outlined in our findings in this report and the advice contained in this report may differ significantly and must be revisited. If this occurs, Enviroseer must be consulted before any further work is carried out on the site, Enviroseer should be engaged for a supplementary report and updated recommendations.

The scope and relevance of the advice provided in the report is subject to restrictions and limitations. Enviroseer did not perform a complete assessment of all possible conditions or circumstances that may exist on the site. If a service is not expressly indicated that means it has not been provided, and the reader should not assume that it has been. If a matter is not specifically addressed then Enviroseer has not decided in relation to it, and the reader should not assume that it has.

Where data and information has been supplied by the client or a third party, the accuracy of the advice and recommendations in this report is dependent upon the accuracy of that data and information. Enviroseer is not responsible for verifying the accuracy of data or information provided to it by third parties. Enviroseer is not liable nor responsible for inaccurate advice provided upon reliance of incomplete or inaccurate data supplied by third parties.

# Foundation Maintenance and Footing Performance: A Homeowner's Guide



CSIRO

**BTF 18**  
replaces  
Information  
Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

## Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

## Causes of Movement

### Settlement due to construction

There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

### Erosion

All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

### Saturation

This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

### Seasonal swelling and shrinkage of soil

All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

### Shear failure

This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

## GENERAL DEFINITIONS OF SITE CLASSES

| Class  | Foundation                                                                                                                                                                                                                                            |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A      | Most sand and rock sites with little or no ground movement from moisture changes                                                                                                                                                                      |
| S      | Slightly reactive clay sites with only slight ground movement from moisture changes                                                                                                                                                                   |
| M      | Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes                                                                                                                                           |
| H      | Highly reactive clay sites, which can experience high ground movement from moisture changes                                                                                                                                                           |
| E      | Extremely reactive sites, which can experience extreme ground movement from moisture changes                                                                                                                                                          |
| A to P | Filled sites                                                                                                                                                                                                                                          |
| P      | Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise |

### Tree root growth

Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

## Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

## Effects of Uneven Soil Movement on Structures

### Erosion and saturation

Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpendes).

Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

### Seasonal swelling/shrinkage in clay

Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will be temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

### Trees can cause shrinkage and damage



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

### Movement caused by tree roots

In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

### Complications caused by the structure itself

Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

### Effects on full masonry structures

Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

#### Effects on framed structures

Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

#### Effects on brick veneer structures

Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

### Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.

Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.

- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

### Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

### Prevention/Cure

#### Plumbing

Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

#### Ground drainage

In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

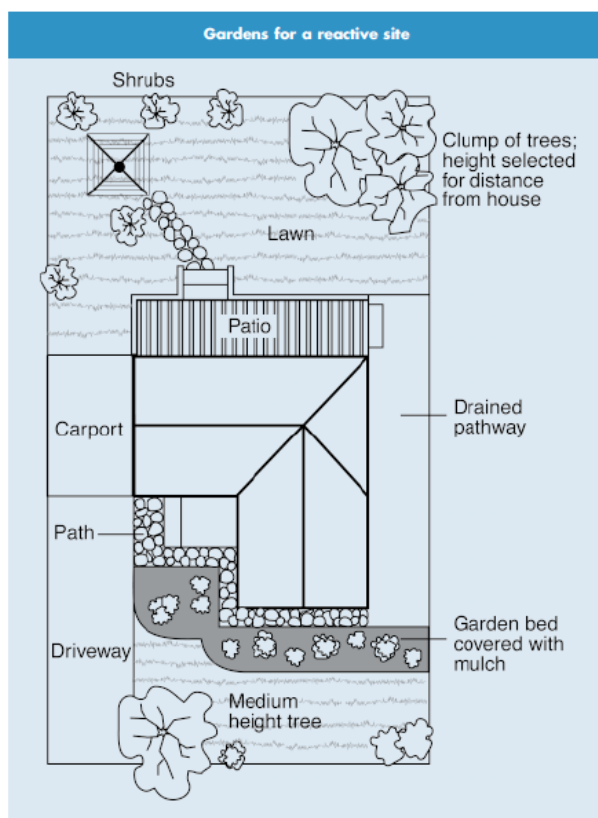
#### Protection of the building perimeter

It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

### CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

| Description of typical damage and required repair                                                                                                                                                                                       | Approximate crack width limit (see Note 3)                | Damage category |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-----------------|
| Hairline cracks                                                                                                                                                                                                                         | <0.1 mm                                                   | 0               |
| Fine cracks which do not need repair                                                                                                                                                                                                    | <1 mm                                                     | 1               |
| Cracks noticeable but easily filled. Doors and windows stick slightly                                                                                                                                                                   | <5 mm                                                     | 2               |
| Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired                                                               | 5–15 mm (or a number of cracks 3 mm or more in one group) | 3               |
| Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted | 15–25 mm but also depend on number of cracks              | 4               |



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

#### Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

**Warning:** Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

#### The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

#### Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

#### Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

#### Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

### Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

**This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.**

The information in this and other issues in the series was derived from various sources and was believed to be correct when published.

The information is advisory. It is provided in good faith and not claimed to be an exhaustive treatment of the relevant subject.

Further professional advice needs to be obtained before taking any action based on the information provided.

Distributed by

**CSIRO PUBLISHING** PO Box 1139, Collingwood 3066, Australia

Freecall 1800 645 051 Tel (03) 9662 7666 Fax (03) 9662 7555 www.publish.csiro.au

Email: publishing.sales@csiro.au

© CSIRO 2003. Unauthorised copying of this Building Technology file is prohibited

### Services completed for this site

☐ Lot Classifications

☐ Site Contamination Report

☒ Wastewater Management Report

## DOMESTIC WASTEWATER REPORT

**Prepared for:** TANYA BIGAIGNON  
LOT 436 DP 754605 41 WIRRIMAH ROAD  
**Site Address:** BENDICK MURRELL NSW 2803

Revision: 01/07/2021  
Site Test: 20/11/2024  
Lab Test: 03/12/2024  
Customer Job: B41WB  
Job Number: 24167  
Technician: JM



**STD**  
ASNZS 1547 2011

**Ksat**  
0.67 m/d

**3BR House**

**DLR**  
Wide Bed 12  
Trench 12  
ETA 8

**DIR**  
AGI 4  
SSI 3.5

### 1.0 SUMMARY

Permeability is good. The profile is sandy gravelly clay. Coarse aggregate content is higher than optimal but acceptable at 1-12 mm 20%-30%. Primary effluent treatment for a 3BR house can be directed to a 3 kL septic tank, then to three 1.3 m x 20 m double arch trenches, provided an upslope sub-surface drain or berm directs runoff away from the trenches and provided the trenches are laid with the contour, ideally with minor cut to ensure that the local slope is <5%.

Alternatively effluent can be directed to a 6-10 person AWTS and then to six above-ground-sprinkler lines of six or five roses; each rose delivering a spray radius of 1.5 m. A total of 33 roses will achieve the 231 m<sup>2</sup> total coverage required.

2.0 SITE LOCATION

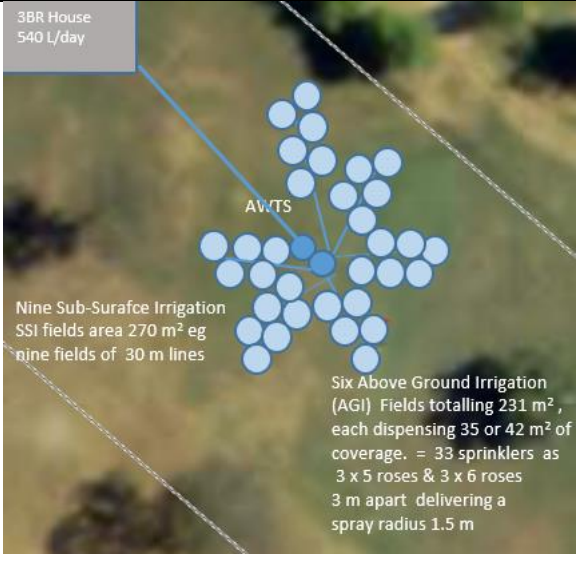
|                              |                                                                                    |
|------------------------------|------------------------------------------------------------------------------------|
| REGION<br>Bendick<br>Murrell |  |
| 41<br>Wirrimah<br>Road       |  |

3.0 SITE ANALYSIS

| Geology & Water        | Geology is like rhyodacite. Surface water in the form of Wambanumba Creek lies 1 km SE of the Drain Field. There is one registered bore within 0.5 km of the drain field. Depth to groundwater is 19 m bgsl.                                                                                                                                                                                                                                                                                               |                        |                  |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------------------|-----------|------------|------------|----|-----------|-----------|-------------------------------------|--------|-------|-----|-----------------|-----------------|-----------------------------|------------------|------------------|------------------------|------------------------|------------------------|
| Constraints            | The key constraints for the drain-field area W of the proposed residence are: 1) slopes exceeding 5%; 2) much of the property with near surface rock 3) Coarse aggregate >20% at depth                                                                                                                                                                                                                                                                                                                     |                        |                  |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |
| Advantages             | The key advantages are: 1) adequate available area; 2) good evaporation; 3) moderately low coarse aggregate                                                                                                                                                                                                                                                                                                                                                                                                |                        |                  |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |
| Soil Physico-chemistry | Average pH for the area is 6.3 ECe is <0.1 dS/m which is non saline. Emmerson Aggregate yielded slaking without dispersion.                                                                                                                                                                                                                                                                                                                                                                                |                        |                  |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |
|                        | <table><tr><th>Parameter</th><th>B1 0-0.7 m</th><th>B3 0-0.8 m</th></tr><tr><td>pH</td><td>6.3 ± 0.1</td><td>6.3 ± 0.1</td></tr><tr><td>Electrical Conductivity uS/cm (ppm)</td><td>95 ± 0</td><td>47± 1</td></tr><tr><td>ECe</td><td>non-saline 1.28</td><td>non-saline 0.62</td></tr><tr><td>Phosphorus Absorption mg/kg</td><td>Estimated : &gt;400</td><td>Estimated : &gt;400</td></tr><tr><td>Emerson Aggregate Test</td><td>slakes, non dispersive</td><td>slakes, non dispersive</td></tr></table> |                        |                  | Parameter | B1 0-0.7 m | B3 0-0.8 m | pH | 6.3 ± 0.1 | 6.3 ± 0.1 | Electrical Conductivity uS/cm (ppm) | 95 ± 0 | 47± 1 | ECe | non-saline 1.28 | non-saline 0.62 | Phosphorus Absorption mg/kg | Estimated : >400 | Estimated : >400 | Emerson Aggregate Test | slakes, non dispersive | slakes, non dispersive |
|                        | Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | B1 0-0.7 m             | B3 0-0.8 m       |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |
|                        | pH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6.3 ± 0.1              | 6.3 ± 0.1        |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |
|                        | Electrical Conductivity uS/cm (ppm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 95 ± 0                 | 47± 1            |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |
|                        | ECe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | non-saline 1.28        | non-saline 0.62  |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |
|                        | Phosphorus Absorption mg/kg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Estimated : >400       | Estimated : >400 |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |
| Emerson Aggregate Test | slakes, non dispersive                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | slakes, non dispersive |                  |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |
|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |                  |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |
|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |                  |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |
|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |                  |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |
|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |                  |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |
|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |                  |           |            |            |    |           |           |                                     |        |       |     |                 |                 |                             |                  |                  |                        |                        |                        |

4.0 RESULTS

| PRIMARY SYSTEMS                                                                                  | <table><tr><th>Primary Effluent</th><th>Wide Bed</th><th>Trench</th><th>ETA Bed</th></tr><tr><td>Number (#)</td><td>2</td><td>3</td><td>3</td></tr><tr><td>Width (m)</td><td>4.0</td><td>1.3</td><td>1.5</td></tr><tr><td>Length (m)</td><td>10</td><td>20</td><td>18</td></tr><tr><td>Topsoil (m)</td><td>0.3</td><td>0.4</td><td>0.1</td></tr><tr><td>Aggregate (m)</td><td>0.2</td><td>0.1</td><td>0.2</td></tr><tr><td>Sand (m)</td><td>0.0</td><td>0.0</td><td>0.3</td></tr><tr><td>Total depth</td><td>0.40</td><td>0.40</td><td>0.55</td></tr><tr><td>Topsoil (m3)</td><td>19.7</td><td>27.6</td><td>7.9</td></tr><tr><td>Aggregate (m3)</td><td>11.8</td><td>3.9</td><td>15.8</td></tr><tr><td>Sand (m3)</td><td>0.0</td><td>0.0</td><td>19.7</td></tr><tr><td>Judgement</td><td>igneus gravel near</td><td>low aggregate</td><td>Slopes &gt; 5%</td></tr></table> | Primary Effluent                                                                                                                                                                                                                                                                                                                        | Wide Bed     | Trench      | ETA Bed | Number (#)              | 2    | 3            | 3 | Width (m) | 4.0             | 1.3      | 1.5 | Length (m)                | 10     | 20 | 18                 | Topsoil (m)               | 0.3 | 0.4       | 0.1                                | Aggregate (m)                                             | 0.2 | 0.1 | 0.2 | Sand (m) | 0.0 | 0.0 | 0.3 | Total depth | 0.40 | 0.40 | 0.55 | Topsoil (m3) | 19.7 | 27.6 | 7.9 | Aggregate (m3) | 11.8 | 3.9 | 15.8 | Sand (m3) | 0.0 | 0.0 | 19.7 | Judgement | igneus gravel near | low aggregate | Slopes > 5% |  |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------|---------|-------------------------|------|--------------|---|-----------|-----------------|----------|-----|---------------------------|--------|----|--------------------|---------------------------|-----|-----------|------------------------------------|-----------------------------------------------------------|-----|-----|-----|----------|-----|-----|-----|-------------|------|------|------|--------------|------|------|-----|----------------|------|-----|------|-----------|-----|-----|------|-----------|--------------------|---------------|-------------|--|
|                                                                                                  | Primary Effluent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Wide Bed                                                                                                                                                                                                                                                                                                                                | Trench       | ETA Bed     |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
|                                                                                                  | Number (#)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 2                                                                                                                                                                                                                                                                                                                                       | 3            | 3           |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
|                                                                                                  | Width (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 4.0                                                                                                                                                                                                                                                                                                                                     | 1.3          | 1.5         |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
|                                                                                                  | Length (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 10                                                                                                                                                                                                                                                                                                                                      | 20           | 18          |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
|                                                                                                  | Topsoil (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.3                                                                                                                                                                                                                                                                                                                                     | 0.4          | 0.1         |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
|                                                                                                  | Aggregate (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.2                                                                                                                                                                                                                                                                                                                                     | 0.1          | 0.2         |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
|                                                                                                  | Sand (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.0                                                                                                                                                                                                                                                                                                                                     | 0.0          | 0.3         |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
|                                                                                                  | Total depth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.40                                                                                                                                                                                                                                                                                                                                    | 0.40         | 0.55        |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
|                                                                                                  | Topsoil (m3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 19.7                                                                                                                                                                                                                                                                                                                                    | 27.6         | 7.9         |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| Aggregate (m3)                                                                                   | 11.8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 3.9                                                                                                                                                                                                                                                                                                                                     | 15.8         |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| Sand (m3)                                                                                        | 0.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.0                                                                                                                                                                                                                                                                                                                                     | 19.7         |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| Judgement                                                                                        | igneus gravel near                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | low aggregate                                                                                                                                                                                                                                                                                                                           | Slopes > 5%  |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                         |              |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| NOTE: LPED lines can be used instead of distribution pipes when dose loading effluent into beds. | NOTE: An LPED line can be used to dose load the ETA/ETS bed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                         |              |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| FIGURE L5 CONVENTIONAL BED                                                                       | FIGURE L6 ETA/ETS BED DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                         |              |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| Wide Bed<br>Trench<br>ETA Bed                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p>Trench and bed configurations are sub-surface and can use primary (septic tank) effluent. Trench, double width uses least aggregate. Wide bed uses least space but requires more aggregate than trench. ETA beds usually occupy a slope &gt;5% requiring as much aggregate as wide bed and 20% more sand than aggregate as well.</p> |              |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| Recommendation                                                                                   | Three 1.3 m x 20 m double arch trenches                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                         |              |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| SECONDARY                                                                                        | <table><tr><th>Secondary Effluent</th><th>Above Ground</th><th>Sub-surface</th></tr><tr><td>Example</td><td>Large droplet Sprinkler</td><td>LPED</td></tr><tr><td>Field Number</td><td>6</td><td>9</td></tr><tr><td>Area (m2)/field</td><td>35 or 42</td><td>30</td></tr><tr><td>Sprinklers or lines/field</td><td>5 or 6</td><td>1</td></tr><tr><td>Field Size Example</td><td>33 roses @ radius = 1.5 m</td><td>30</td></tr><tr><td>Judgement</td><td>Ample buffer setback, Avoid mowers</td><td>Use oversize 40 mm lines, filters 38 mm, and flush valves</td></tr></table>                                                                                                                                                                                                                                                                                             | Secondary Effluent                                                                                                                                                                                                                                                                                                                      | Above Ground | Sub-surface | Example | Large droplet Sprinkler | LPED | Field Number | 6 | 9         | Area (m2)/field | 35 or 42 | 30  | Sprinklers or lines/field | 5 or 6 | 1  | Field Size Example | 33 roses @ radius = 1.5 m | 30  | Judgement | Ample buffer setback, Avoid mowers | Use oversize 40 mm lines, filters 38 mm, and flush valves |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| Secondary Effluent                                                                               | Above Ground                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Sub-surface                                                                                                                                                                                                                                                                                                                             |              |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| Example                                                                                          | Large droplet Sprinkler                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | LPED                                                                                                                                                                                                                                                                                                                                    |              |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| Field Number                                                                                     | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 9                                                                                                                                                                                                                                                                                                                                       |              |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| Area (m2)/field                                                                                  | 35 or 42                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 30                                                                                                                                                                                                                                                                                                                                      |              |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| Sprinklers or lines/field                                                                        | 5 or 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1                                                                                                                                                                                                                                                                                                                                       |              |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| Field Size Example                                                                               | 33 roses @ radius = 1.5 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 30                                                                                                                                                                                                                                                                                                                                      |              |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| Judgement                                                                                        | Ample buffer setback, Avoid mowers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Use oversize 40 mm lines, filters 38 mm, and flush valves                                                                                                                                                                                                                                                                               |              |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                         |              |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |
| IRRIGATION:<br>ABOVE-GROUND AGI<br>& SUB-SURFACE SSI                                             | <p>Secondary treatment is typically by aerated wastewater treatment system AWTS. AWTS disposal to bed and trench effectively halves the area required by septic tank in moderately low <math>K_{sat}</math> environments. AWTS is usual when wastewater is irrigated either Above-Ground for flexibility of watering or Sub-Surface if regular watering of tree lots is proposed. A split system can mine phosphorus from blackwater and/or utilizes moisture from greywater, without the employ of AWTS and the requisite chlorination. Composting toilets provide conditions where enteric pathogens are outcompeted by less harmful soil microflora. Product is compost.</p>                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                         |              |             |         |                         |      |              |   |           |                 |          |     |                           |        |    |                    |                           |     |           |                                    |                                                           |     |     |     |          |     |     |     |             |      |      |      |              |      |      |     |                |      |     |      |           |     |     |      |           |                    |               |             |  |

| <p><b>Above Ground Irrigation or Sub-Surface Irrigation</b></p> |  <p>3BR House<br/>540 L/day</p> <p>AWTS</p> <p>Nine Sub-Surface Irrigation<br/>SSI fields area 270 m² eg<br/>nine fields of 30 m lines</p> <p>Six Above Ground Irrigation<br/>(AGI) Fields totalling 231 m²,<br/>each dispensing 35 or 42 m² of<br/>coverage. = 33 sprinklers as<br/>3 x 5 roses &amp; 3 x 6 roses<br/>3 m apart delivering a<br/>spray radius 1.5 m</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>Secondary effluent treatment to above ground irrigation, is a good use of water in summer. In winter, rainfall run-off can be problematic. Large droplet sprinkler minimizes drift. Secondary treated effluent to sub-surface Irrigation (SSI) removes drift risk, while directing water to tree lots and orchard and garden. Stock and vehicular movements can damage pipes and compact the soil. AGI is movable and accessible. SSI is harder to troubleshoot.</p> |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|-----------------|-----|-------|--------------------|------|-----------|-------------------|----------|-----------|---------------------|---------|------------------|------------------------|-------|------|-----|---------------|---------------|-------------------------------------------|--|--|----------------------|--------|-------------------------|----------------------|--------|---|-----------------------|-----------|-------------------------|-----------------------|---------|-------------|-------------------------|-----------------|-----|-----------------------------------|----|-----|-----------------------------------|----|-----|---------------------------------|-----------|---------|------------------------------------------|--|--|----------------------|--------|---|-------------------------|--------|---|-------|-----------|--------|----------------|----|----------|----------------------|---|---|-------------|---|-----|-----------------|----|---|-----------------------|-----------|-----------------|----------------|--------------------|------|--|
| <p><b>Recommendation</b></p>                                    | <p>AWTS secondary treated wastewater to above-ground irrigation comprising six lines of 6 or 5 rose sprinklers of 1.5 m spray radius Total sprinklers 33. Total spray area 230 m²</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
|                                                                 | <table border="1"> <thead> <tr> <th colspan="3">DESIGN CALCULATIONS</th> </tr> </thead> <tbody> <tr> <td>Annual Rainfall</td> <td>637</td> <td>Cowra</td> </tr> <tr> <td>Annual Evaporation</td> <td>1520</td> <td>Estimated</td> </tr> <tr> <td>Hydraulic Loading</td> <td>900L/day</td> <td>Rainwater</td> </tr> <tr> <td>Soil Classification</td> <td>Average</td> <td>Subsoil class 3b</td> </tr> <tr> <td>Permeability <math>K_{sat}</math></td> <td>m/day</td> <td>0.67</td> </tr> <tr> <td>DIR</td> <td>litres mm/day</td> <td>3.5 AGI 3 SSI</td> </tr> </tbody> </table><br><table border="1"> <thead> <tr> <th colspan="3">RECOMMENDATION Primary Effluent to Trench</th> </tr> </thead> <tbody> <tr> <td>Design Load Rate DLR</td> <td>mm/day</td> <td>12 primary 24 secondary</td> </tr> <tr> <td>Double arch trenches</td> <td>Number</td> <td>3</td> </tr> <tr> <td>Trench Dimensions (m)</td> <td>L x W x D</td> <td>13 m double arch x 20 m</td> </tr> <tr> <td>Minimum Input Quality</td> <td>Primary</td> <td>septic tank</td> </tr> <tr> <td>Tank Size (kL) Table J1</td> <td>4 day residence</td> <td>3.5</td> </tr> <tr> <td>Design Irrigation Area : Meterol.</td> <td>m²</td> <td>150</td> </tr> <tr> <td>Design Irrigation Area : Nutrient</td> <td>m²</td> <td>331</td> </tr> <tr> <td>Design Irrigation Area : Hydrau</td> <td>SSiAGI m²</td> <td>270/231</td> </tr> </tbody> </table><br><table border="1"> <thead> <tr> <th colspan="3">RECOMMENDATION Secondary Effluent to AGI</th> </tr> </thead> <tbody> <tr> <td>Design Load Rate DIR</td> <td>mm/day</td> <td>4</td> </tr> <tr> <td>Above-ground Irrigation</td> <td>Fields</td> <td>6</td> </tr> <tr> <td>Roses</td> <td>No./field</td> <td>5 or 6</td> </tr> <tr> <td>Area per field</td> <td>m²</td> <td>35 or 42</td> </tr> <tr> <td>Length between roses</td> <td>m</td> <td>3</td> </tr> <tr> <td>Rose radius</td> <td>m</td> <td>1.5</td> </tr> <tr> <td>Rose spray area</td> <td>m²</td> <td>7</td> </tr> <tr> <td>Minimum Input Quality</td> <td>Secondary</td> <td>AWTS - 6 person</td> </tr> <tr> <td>Tank Size (kL)</td> <td>2.4 days residence</td> <td>2500</td> </tr> </tbody> </table> | DESIGN CALCULATIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  | Annual Rainfall | 637 | Cowra | Annual Evaporation | 1520 | Estimated | Hydraulic Loading | 900L/day | Rainwater | Soil Classification | Average | Subsoil class 3b | Permeability $K_{sat}$ | m/day | 0.67 | DIR | litres mm/day | 3.5 AGI 3 SSI | RECOMMENDATION Primary Effluent to Trench |  |  | Design Load Rate DLR | mm/day | 12 primary 24 secondary | Double arch trenches | Number | 3 | Trench Dimensions (m) | L x W x D | 13 m double arch x 20 m | Minimum Input Quality | Primary | septic tank | Tank Size (kL) Table J1 | 4 day residence | 3.5 | Design Irrigation Area : Meterol. | m² | 150 | Design Irrigation Area : Nutrient | m² | 331 | Design Irrigation Area : Hydrau | SSiAGI m² | 270/231 | RECOMMENDATION Secondary Effluent to AGI |  |  | Design Load Rate DIR | mm/day | 4 | Above-ground Irrigation | Fields | 6 | Roses | No./field | 5 or 6 | Area per field | m² | 35 or 42 | Length between roses | m | 3 | Rose radius | m | 1.5 | Rose spray area | m² | 7 | Minimum Input Quality | Secondary | AWTS - 6 person | Tank Size (kL) | 2.4 days residence | 2500 |  |
| DESIGN CALCULATIONS                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Annual Rainfall                                                 | 637                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Cowra                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Annual Evaporation                                              | 1520                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Estimated                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Hydraulic Loading                                               | 900L/day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Rainwater                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Soil Classification                                             | Average                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Subsoil class 3b                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Permeability $K_{sat}$                                          | m/day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.67                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| DIR                                                             | litres mm/day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3.5 AGI 3 SSI                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| RECOMMENDATION Primary Effluent to Trench                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Design Load Rate DLR                                            | mm/day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 12 primary 24 secondary                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Double arch trenches                                            | Number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Trench Dimensions (m)                                           | L x W x D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 13 m double arch x 20 m                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Minimum Input Quality                                           | Primary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | septic tank                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Tank Size (kL) Table J1                                         | 4 day residence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Design Irrigation Area : Meterol.                               | m²                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 150                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Design Irrigation Area : Nutrient                               | m²                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 331                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Design Irrigation Area : Hydrau                                 | SSiAGI m²                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 270/231                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| RECOMMENDATION Secondary Effluent to AGI                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Design Load Rate DIR                                            | mm/day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Above-ground Irrigation                                         | Fields                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Roses                                                           | No./field                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 5 or 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Area per field                                                  | m²                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 35 or 42                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Length between roses                                            | m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Rose radius                                                     | m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Rose spray area                                                 | m²                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Minimum Input Quality                                           | Secondary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | AWTS - 6 person                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |
| Tank Size (kL)                                                  | 2.4 days residence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2500                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |                 |     |       |                    |      |           |                   |          |           |                     |         |                  |                        |       |      |     |               |               |                                           |  |  |                      |        |                         |                      |        |   |                       |           |                         |                       |         |             |                         |                 |     |                                   |    |     |                                   |    |     |                                 |           |         |                                          |  |  |                      |        |   |                         |        |   |       |           |        |                |    |          |                      |   |   |             |   |     |                 |    |   |                       |           |                 |                |                    |      |  |

## 5.0 CONCLUSION & RECOMMENDATIONS

Primary treatment from a 3BR house to 3 kL septic tank then to either three 20 m x 1.3 m wide double arch trenches, is achievable provided an upslope berm of sub-surface drain directs runoff to the N and S of the drain field and provided the trenches are laid along the contour, with minor cut and fill to ensure slope is less than 5%.

**Date:** 20/11/2024  
**Customer Job:** B41WB  
**Job Number:** 23167  
**Site Address:** LOT 436 DP 754605 41 WIRRIMAH ROAD BENDICK MURRELL NSW 2803

**Borehole:** BE3  
**Surface RL:** 437.0  
**Latitude:** -34°15.608  
**Longitude:** 148°44.570

## 5.1 FIELD LOG

| Water                                                                             | Depth (m)                                                                                                             | DCP (blows per 150 mm)                                       | PP (kPa)                                | Sample                                                                               | Classification Code                                            | Material Description                                                                                                                                                                                                                       | Moisture                                                             | Linear Shrinkage (%)                                                                   | Liquid Limit (%) | Density Consistency | Fill |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------|---------------------|------|
|                                                                                   | 0.15<br>0.30<br>0.45<br>0.60<br>0.75                                                                                  |                                                              |                                         |                                                                                      |                                                                | Silty gravelly sand, dark brown, co.ag. 1-6 mm < 20%<br>Clayey gravelly sand, dark yellowish brown, co.ag. 1-6 mm 20%<br><br>Gravelly clayey sand , strong brown, co.ag. 1-12 mm 30%<br>Sandy clay, rolls 1 m x 100 mm rod, reddish yellow | Dy<br><br><br>Da 7.1                                                 | 2.5                                                                                    | 20               | St<br><br><br>St    |      |
|                                                                                   | 0.9<br>1.05<br>1.20<br>1.35<br>1.50                                                                                   |                                                              |                                         |                                                                                      |                                                                | Gravelly sandy clay, yellowish red, co.ag. 1-12 mm 30%<br>Yellowish red, grey,                                                                                                                                                             | M                                                                    |                                                                                        |                  | St                  |      |
|                                                                                   | 1.65<br>1.80<br>1.95<br>2.10<br>2.25                                                                                  |                                                              |                                         |                                                                                      |                                                                | End of bore hole 1.65 m bgsl                                                                                                                                                                                                               |                                                                      |                                                                                        |                  |                     |      |
|                                                                                   | 2.40<br>2.55<br>2.70<br>2.85<br>3.00                                                                                  |                                                              |                                         |                                                                                      |                                                                |                                                                                                                                                                                                                                            |                                                                      |                                                                                        |                  |                     |      |
|                                                                                   | 3.15<br>3.30<br>3.45<br>3.60<br>3.75                                                                                  |                                                              |                                         |                                                                                      |                                                                |                                                                                                                                                                                                                                            |                                                                      |                                                                                        |                  |                     |      |
|                                                                                   | 3.90<br>4.05<br>4.20<br>4.35<br>4.50                                                                                  |                                                              |                                         |                                                                                      |                                                                |                                                                                                                                                                                                                                            |                                                                      |                                                                                        |                  |                     |      |
|                                                                                   | WT – Water Table      UTP – Unable to penetrate      DCP – 9kg Dynamic Cone Penetrometer      PP- Pocket Penetrometer |                                                              |                                         |                                                                                      |                                                                |                                                                                                                                                                                                                                            |                                                                      |                                                                                        |                  |                     |      |
| AND – Density Index vs Approx. Penetrometer results                               |                                                                                                                       |                                                              |                                         |                                                                                      | SILTS & CLAY – Cu vs Approx. Penetrometer results              |                                                                                                                                                                                                                                            |                                                                      |                                                                                        |                  | MOISTURE            |      |
| DENSITY                                                                           |                                                                                                                       | Density Index                                                | DCP Blow Count (bloAS/100mm)            | CONSISTENCY                                                                          | Undrained Shear Strength (kPa)                                 | DCP Blow Count (bloAS/100mm)                                                                                                                                                                                                               | PP Dial Indicator                                                    |                                                                                        |                  |                     |      |
| VL - Very Loose<br>L – Loose<br>MD – Medium Dense<br>D – Dense<br>VD - Very Dense |                                                                                                                       | < 15 %<br>15 – 35 %<br>35 – 65 %<br>65 – 85 %<br>> 65 – 85 % | < 1<br>1 – 3<br>3 – 9<br>9 – 15<br>> 15 | VS – Very Soft<br>S – Soft<br>F – Firm<br>St – Stiff<br>VSt – Very Stiff<br>H – Hard | 0 – 12<br>12 - 25<br>25 – 50<br>50 - 100<br>100 – 200<br>> 200 | < 1<br>1 - 2<br>2 – 3<br>3 – 5<br>5 – 8<br>> 8                                                                                                                                                                                             | 0 - 0.2<br>0.2 - 0.5<br>0.5 - 1.0<br>1.0 - 2.0<br>3.0 - 4.0<br>> 4.0 | D – Dry<br>Da- Damp<br>M – Moist<br>W – Wet<br>Wp - PlASTic Limit<br>WL – Liquid Limit |                  |                     |      |

**Date:** 20/11/2024  
**Customer Job:** B41WB  
**Job Number:** 23167  
**Site Address:** LOT 436 DP 754605 41 WIRRIMAH  
ROAD BENDICK MURRELL NSW  
2803

**Borehole:** BE1  
**Surface RL:** 431.1  
**Latitude:** -34°15.642  
**Longitude:** 148°44.628

## 5.1 FIELD LOG

| Water                                                                             | Depth (m)                            | DCP (blows per 150 mm)                                                                                                | PP (kPa)                                | Sample                                                                               | Classification Code                                            | Material Description                                                                                              | Moisture                                                             | Linear Shrinkage (%)                                                                  | Liquid Limit (%) | Density Consistency | Fill |
|-----------------------------------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------|---------------------|------|
|                                                                                   | 0.15<br>0.30<br>0.45<br>0.60<br>0.75 | 10<br><br>15bb                                                                                                        |                                         |                                                                                      |                                                                | Clayey gravelly sand, dark brown, co.ag. 1-12 mm <20%<br>Gravelly clayey sand, yellowish brown co.ag. 1-12 mm 40% | Dy                                                                   |                                                                                       |                  | St                  |      |
|                                                                                   | 0.9<br>1.05<br>1.20<br>1.35<br>1.50  |                                                                                                                       |                                         |                                                                                      |                                                                |                                                                                                                   |                                                                      |                                                                                       |                  |                     |      |
|                                                                                   | 1.65<br>1.80<br>1.95<br>2.10<br>2.25 |                                                                                                                       |                                         |                                                                                      |                                                                |                                                                                                                   |                                                                      |                                                                                       |                  |                     |      |
|                                                                                   | 2.40<br>2.55<br>2.70<br>2.85<br>3.00 |                                                                                                                       |                                         |                                                                                      |                                                                |                                                                                                                   |                                                                      |                                                                                       |                  |                     |      |
|                                                                                   | 3.15<br>3.30<br>3.45<br>3.60<br>3.75 |                                                                                                                       |                                         |                                                                                      |                                                                |                                                                                                                   |                                                                      |                                                                                       |                  |                     |      |
|                                                                                   | 3.90<br>4.05<br>4.20<br>4.35<br>4.50 |                                                                                                                       |                                         |                                                                                      |                                                                |                                                                                                                   |                                                                      |                                                                                       |                  |                     |      |
|                                                                                   |                                      | WT – Water Table      UTP – Unable to peritrate      DCP – 9kg Dynamic Cone Penetrometer      PP- Pocket Penetrometer |                                         |                                                                                      |                                                                |                                                                                                                   |                                                                      |                                                                                       |                  |                     |      |
| AND – Density Index vs Approx. Penetrometer results                               |                                      |                                                                                                                       |                                         |                                                                                      | SILTS & CLAY – Cu vs Approx. Penetrometer results              |                                                                                                                   |                                                                      |                                                                                       | MOISTURE         |                     |      |
| DENSITY                                                                           |                                      | Density Index                                                                                                         | DCP Blow Count (bloAS/100mm)            | CONSISTENCY                                                                          | Undrained Shear Strength (kPa)                                 | DCP Blow Count (bloAS/100mm)                                                                                      | PP Dial Indicator                                                    |                                                                                       |                  |                     |      |
| VL - Very Loose<br>L – Loose<br>MD – Medium Dense<br>D – Dense<br>VD - Very Dense |                                      | < 15 %<br>15 – 35 %<br>35 – 65 %<br>65 – 85 %<br>> 65 – 85 %                                                          | < 1<br>1 – 3<br>3 – 9<br>9 – 15<br>> 15 | VS – Very Soft<br>S – Soft<br>F – Firm<br>St – Stiff<br>VSt – Very Stiff<br>H – Hard | 0 – 12<br>12 - 25<br>25 – 50<br>50 - 100<br>100 – 200<br>> 200 | < 1<br>1 - 2<br>2 – 3<br>3 – 5<br>5 – 8<br>> 8                                                                    | 0 - 0.2<br>0.2 - 0.5<br>0.5 - 1.0<br>1.0 - 2.0<br>3.0 - 4.0<br>> 4.0 | D – Dry<br>Da- Damp<br>M – Moist<br>W – Wet<br>Wp- PIAstic Limit<br>WL – Liquid Limit |                  |                     |      |

## CONDITIONS OF THE RECOMMENDATIONS

- This on-site domestic wastewater report generally in accordance with AS NZS 1547 2012 guidance on and should be sufficient for a qualified person to ascertain the consequence of its findings.
- This domestic wastewater report was completed by an experienced soil technician and does not make any allowance for the lot outside of the proposed drainage field situated near the BE.
- The advice given in this report assumes that the test results are representative of the overall subsurface conditions. However, it should be noted that actual conditions in some parts of the site may differ from those found in the boreholes. If excavations reveal soil conditions significantly different from those shown in our attached Borehole Log(s), enviroseer should be consulted and excavations stopped immediately.
- Any sketches in this report should be considered AS only approximate pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions or slope information should not be used for any building cost calculations and/or positioning of the building. Dimensions on logs are correct.

## REPORT LIMITATIONS

The investigations addressed in this report are the minimum required to facilitate both regulatory oversight and effective trade installation for a designated area. They are not intended nor designed to locate all possible ground conditions on the site. It is not possible to identify all possible ground conditions. Further, while anomalies are usually detected by site visit and historical searches, the potential for undisclosed hotspots of CoPC arising from undisclosed spillage or dumping cannot be entirely removed.

The advice and recommendations contained in this report are based on analyses obtained from the samples tested, and on the assumption that those test results are representative of the overall ground conditions of the entire building envelope and house yard. The actual conditions in some parts of the site might differ from those tested.

The scope and relevance of the advice provided in the report is subject to restrictions and limitations. enviroseer did not perform a complete assessment of all possible conditions, contaminants or circumstances that may exist on the site. If a service is not expressly indicated that means it has not been provided, and the reader should not assume that it has been. If a matter is not specifically addressed then enviroseer has not decided in relation to it, and the reader should not assume that it has.

Where data and information has been supplied by the client or a third party, the accuracy of the advice and recommendations in this report is dependent upon the accuracy of that data and information. enviroseer is not responsible for verifying the accuracy of data or information provided to it by third parties. enviroseer is not liable nor responsible for inaccurate advice provided upon reliance of incomplete or inaccurate data supplied by third parties.

## **APPENDIX # 4**

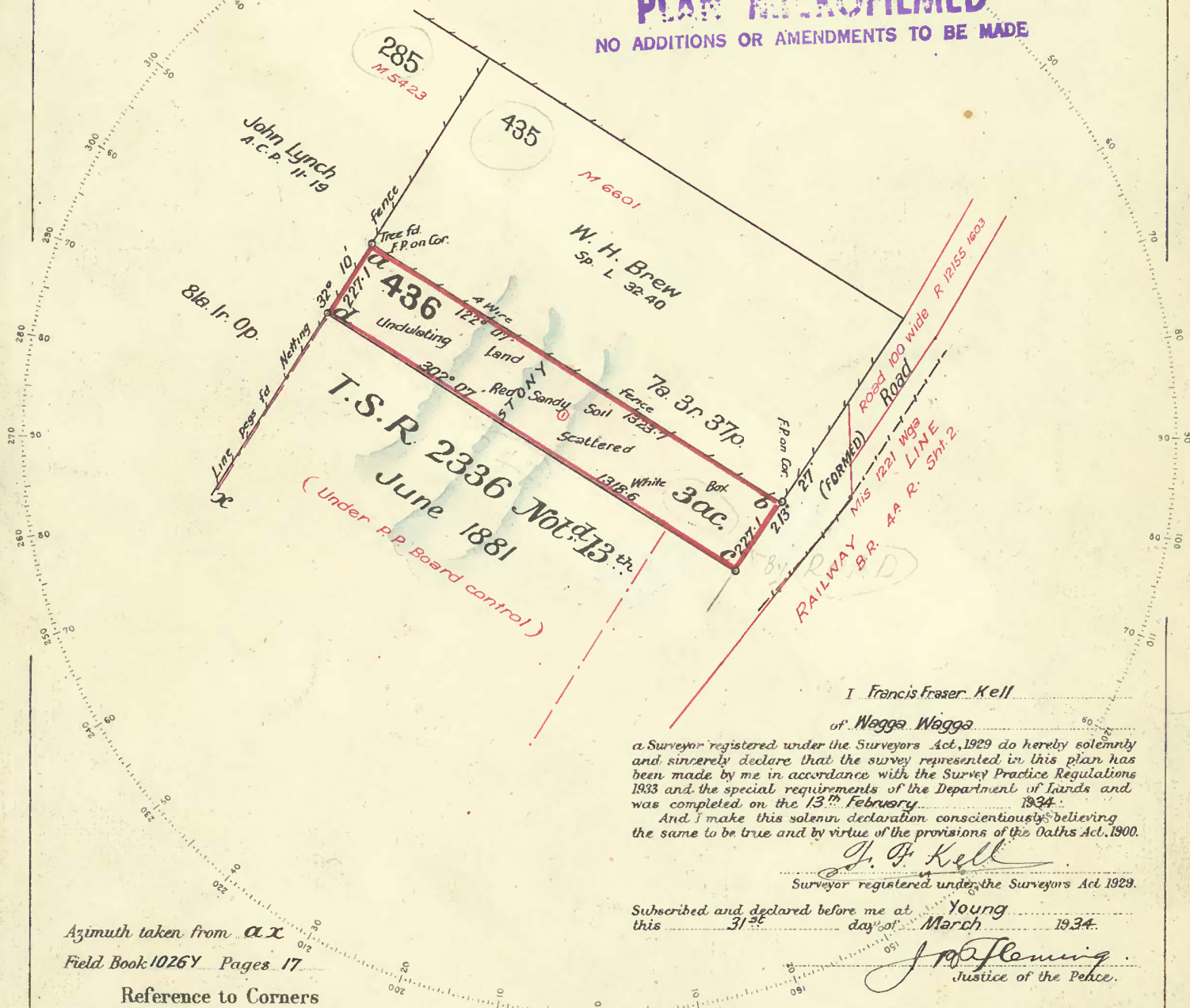
### **TITLE DEPOSITED PLAN 88B INSTRUMENT**



BURRANGONG SHIRE

Sale completed. Ten. 65-60.

NO ADDITIONS OR AMENDMENTS TO BE MADE



Field Book 1026Y Pages 17

| Corner   | Bearing        | From | Links | N <sup>o</sup> on Trac. |
|----------|----------------|------|-------|-------------------------|
| <i>a</i> | 339° 20'       | Box  | 66.4  | 435 436<br>↑            |
| <i>b</i> | F. P. numbered |      |       | 435 436                 |
| <i>c</i> | 234° 48'       | Box  | 38.25 | 435                     |
| <i>d</i> | 225° 48'       | Box  | 87.0  | 436                     |

[illegible]

I, Francis Fraser Kell  
of Wagga Wagga,  
a Surveyor registered under the Surveyors Act, 1929 do hereby solemnly  
and sincerely declare that the survey represented in this plan has  
been made by me in accordance with the Survey Practice Regulations  
1933 and the special requirements of the Department of Lands and  
was completed on the 13<sup>th</sup> February 1934.  
And I make this solemn declaration conscientiously believing  
the same to be true and by virtue of the provisions of the Oaths Act, 1900.

*J. F. Kell*  
Surveyor registered under the Surveyors Act 1929

Subscribed and declared before me at Young  
this 31<sup>st</sup> day of March 1934.

I hereby certify that I in person made and completed the survey represented on this plan and lengths of the lines measured by me has been executed in accordance with the Ordinance of Licensed Surveyors and the practice.

Transmitted to the District Surveyor with my letter of 31<sup>st</sup> March No 34.25

Calculation Book No ~ Folio ~ Area by inspection  
Checked and Charted *E. D. Huwain* 17.4.34  
Examined *E. D. Huwain* 18.4.34  
Plan approved *E. D. Huwain* color

Officer in Charge  
18th April 1934

Standard prepd

At Kilminster 21/5/34  
JHR 3/5/34

Lithographed & Printed at the Department of Lands Sydney N.S.W.  
Cat N<sup>o</sup> M 6602 1780

### ENG PLANS SHED

ENGINEERING SCHEDULE

CERTIFIED STEEL PORTAL FRAME SHED DESIGN IN ACCORDANCE WITH NCC 2022 FOR SITE WIND SPEED "40.93m/s", WIND REGION "A0", TERRAIN CATEGORY "2", IMPORTANCE LEVEL "2"

Internal Pressure: 0.5  
Design Snow Load: 0.00 KPa, Roof Snow Load: 0.00 KPa

Customer: Drew Murfitt  
Site Address: 41 Wirimah road, bendick murrell NSW 2803

Main Building: Span: 6, Length: 20, Height: 3, Roof Pitch: 11 degrees  
The length being comprised of 5 bays, the largest bay is 4m bays.  
Left LeanTo: Span: 3, Length: 20, Eave Height: 2.738, Roof Pitch: 5 degrees, Open  
Right LeanTo: NA

Total Kit Weight: 3586.6kg

| INTERNAL PORTALS                                                                                                                       | END PORTALS                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Column: 2C15015<br>Rafter: 2C15015<br>Knee Brace: 2C10010<br>Knee Brace Length: 1500<br>Apex Brace: 2C10010<br>Apex Brace Length: 2900 | Column: C15015<br>Rafter: C15015<br>Knee Brace: NA<br>Knee Brace Length: NA<br>Apex Brace: NA<br>Apex Brace Length: NA<br>Endwall Mullion: C15015 |

| LEFT LEAN TO PORTALS                                                                                                                        | RIGHT LEAN TO PORTALS                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Internal Column: 2C15015<br>Internal Rafter: 2C15015<br>End Column: C15015<br>End Rafter: C15015<br>Knee Brace: NA<br>Knee Brace Length: NA | Internal Column: NA<br>Internal Rafter: NA<br>End Column: NA<br>End Rafter: NA<br>Knee Brace: NA<br>Knee Brace Length: NA |

NOTE: All unclad intermediate columns are always back to back (refer to drawing: Floor Plan).

| PURLINS AND GIRTS                                                                                                                         |                                                                                  |                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------|
| Eave Purlin: C10010<br>Side Wall Girts: TH64100<br>Front End Wall Girts: TH64100<br>Back End Wall Girts: TH64100<br>Roof Purlins: TH64100 | Max Spacing: 1250<br>Max Spacing: 1250<br>Max Spacing: 1250<br>Max Spacing: 1000 | Overlap: 10%<br>Overlap: 10%<br>Overlap: 10%<br>Overlap: 10% |

NOTE: Girt spacing will vary to a maximum 1.25m where window/s are located.

| FASTENERS                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sleeve Anchor Bolts: M12x75 Sleeve Anchor Yellow Zinc<br>Frame Bolts: M12x30 Purlin Assembly Zinc (Mild)<br>Frame Screws: Frame Screw 14x14x22<br>Cross Bracing Strap: 32mm x 1.2 strap<br>Open Bay Header Height: NA |

| COLOUR SCHEDULE                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------|
| Roof Sheets: Monolith<br>External Wall Sheets: Monolith<br>Roller Doors: Monolith<br>Flashings: Monolith<br>PA Doors: NA<br>Windows: NA |

DOMESTIC & LIGHT INDUSTRIAL STEEL PORTAL FRAME SHED STRUCTURES

This structure is designed in compliance with AS4600, AS3600 and AS1170 1 to 4 as Importance Level 2 with a Live Load of 0.25kPa as "Air Leaky Structures" providing stability when openings are prevalent.

The structures are clad with corrugated pre-painted finish, 0.42mm walls and 0.42mm roof (compliant with AS1562.1 Metal) over cold formed 450 to 550mPa galvanized steel C sections primary frames.

Primary framing is fastened together with 4.6 Class galvanized bolts adequately tensioned on ground prior to erection.

Secondary framing steel bracing, with purlins and girts lapped, are all tek fastened to primary steel with a minimum of two (2) teks per connection as specified in details.

All rainwater products are compliant with AS2179.1 (Metal).

ENGINEERING

The undersigning engineer has checked that the design of the structure complies with relevant current Australian Standards as stated above and the following i.e AS4671- 2001 Steel Reinforcing materials, AS3600 - Concrete structures. However, he will not be present during construction, neither will he conduct inspections nor construction supervision.

The class 10a buildings are designed for erection on pad footings or slab based on soil of classification "A"-"P" with minimum bearing capacity 100kPa (i.e. organic soil is to be removed to a suitable material below natural surface).

Where (suitable) fill is required to level the site, it should be placed and compacted in layers of 150mm maximum.

Concrete pad footings and slab supply and placement is to be in compliance with AS2870-2011 Residential Slabs & Footings, AS3600-2009 Concrete Structures for A2 and B2 exposure (i.e. 25mPa strength @ 28 days strength) with recommended slump 75 to 80mm for light pneumatic tyred traffic all trafficable floors.

25mm deep concrete saw cut, to be made into the surface of the concrete slab every 6m in width or length as crack control joints.

For sites where these conditions are considered to be inadequate, a customized foundation design for the structure can be supplied to suit a specific purpose.

CONSTRUCTION

Erection of the structure is to be in compliance with local and state ordinances,

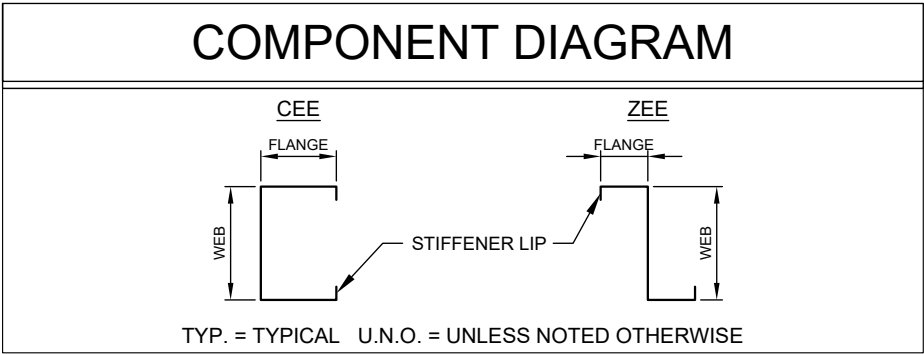
Occupational Health and Safety Regulations and with plans provided.

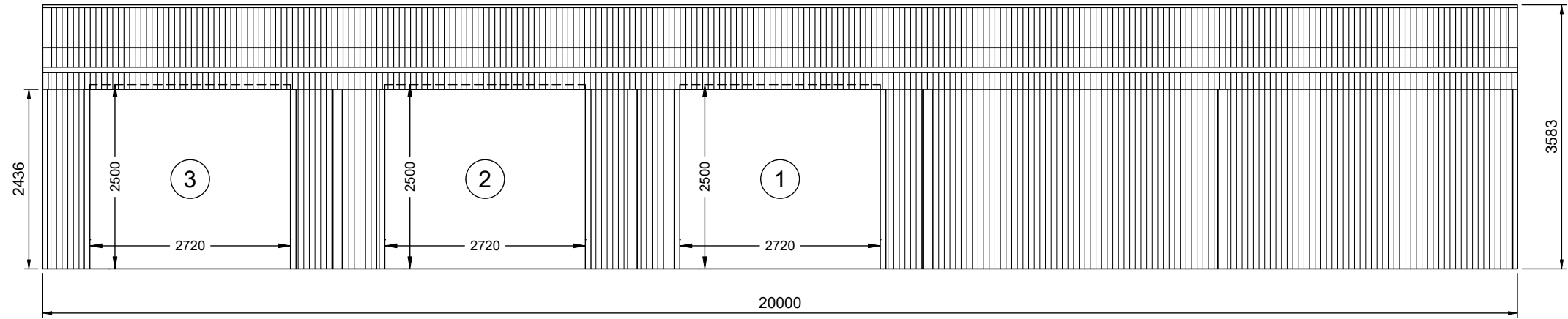
GENERAL

The designs as portrayed on the drawings remain the intellectual property of Best Sheds Pty Ltd and are provided for building approval and construction purposes only.

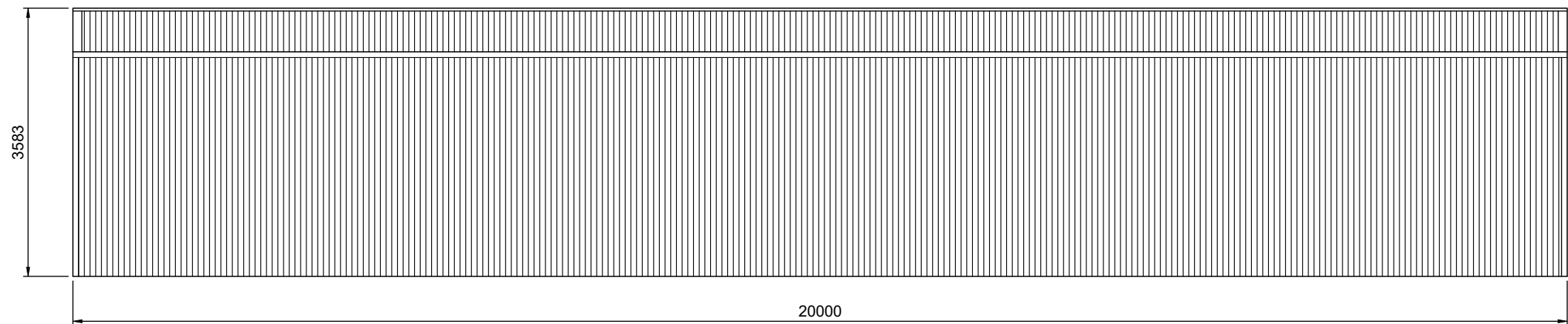
SNOW LOAD

Following conditions only apply to buildings with snow loading:  
No maintenance or roof traffic permitted on the roof while there is snow present.  
No other structure to be erected within 500mm of the gutters of this building.

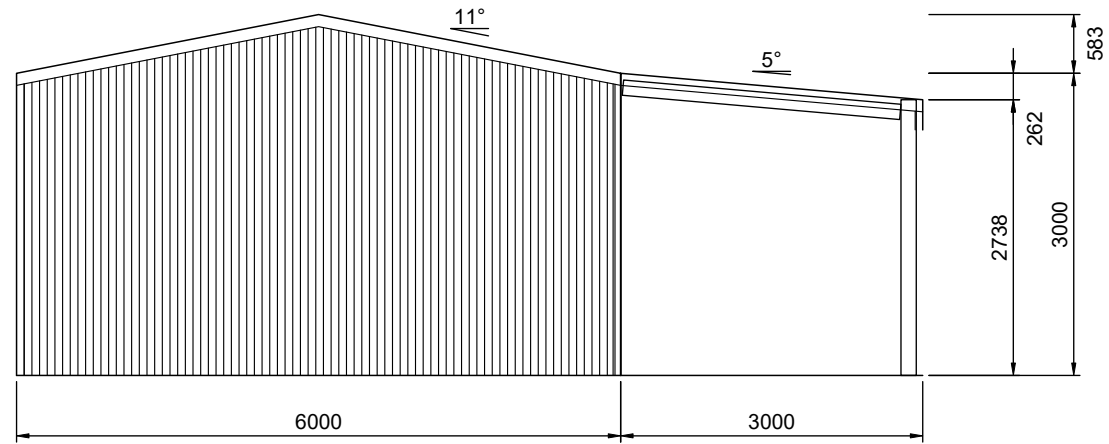




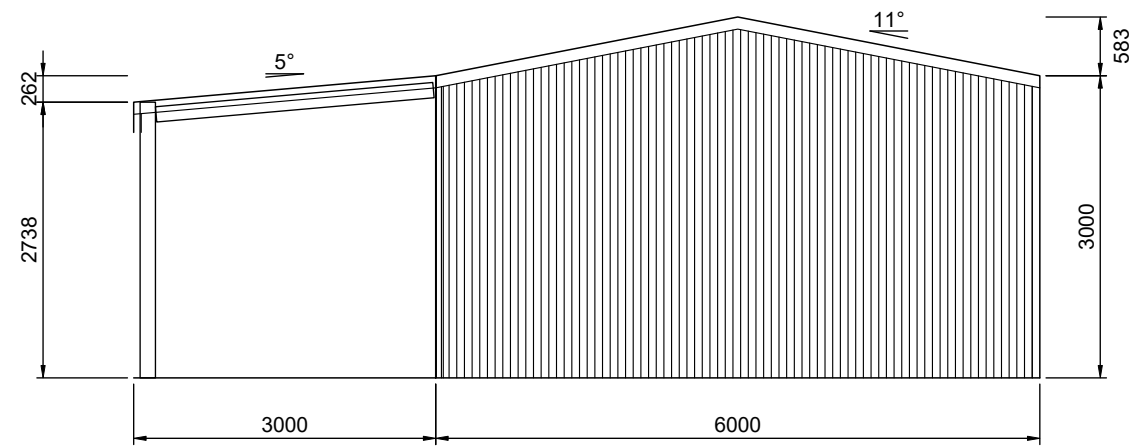
2 LEFT ELEVATION  
2 SCALE: 1:75



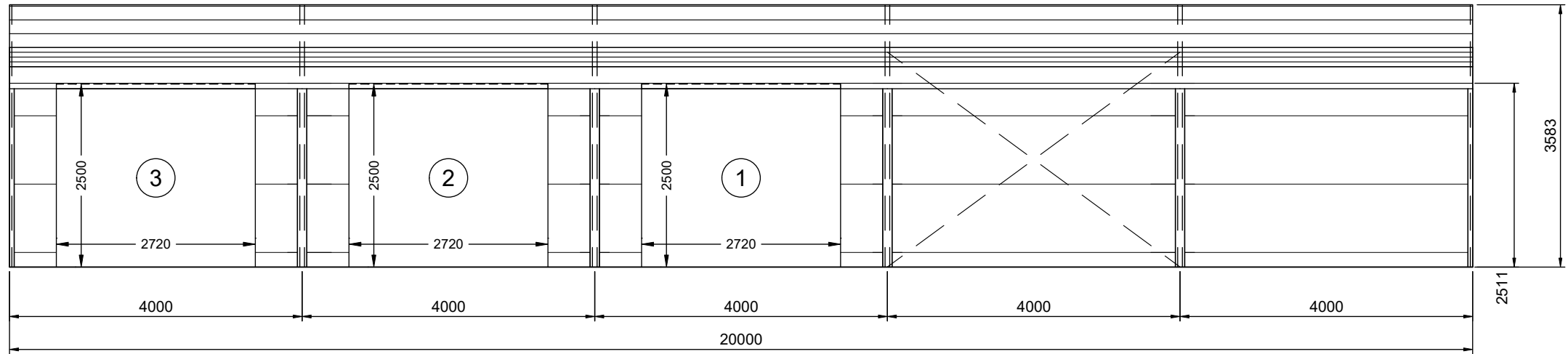
1 RIGHT ELEVATION  
2 SCALE: 1:75



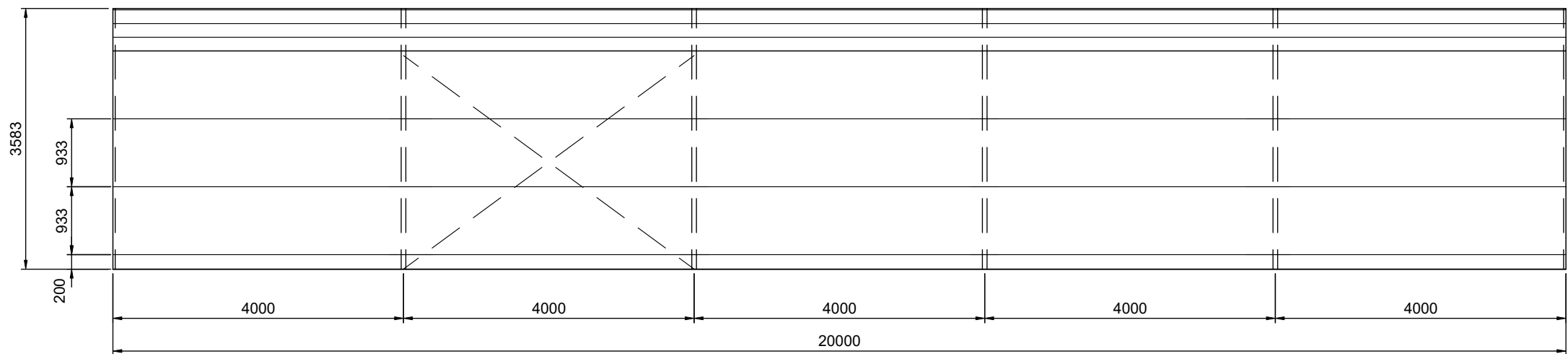
1 REAR ELEVATION  
3 SCALE: 1:75 FRAME #6



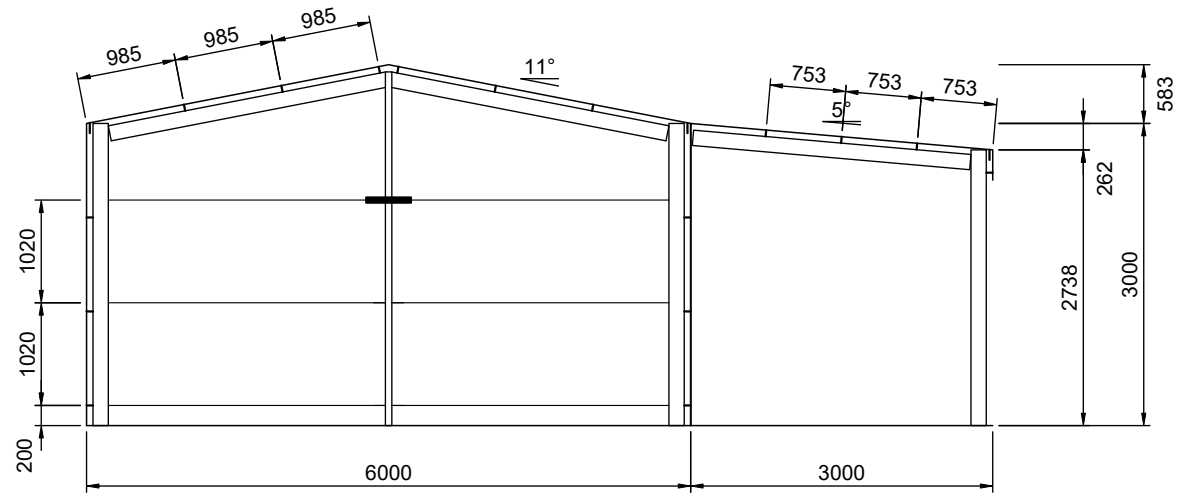
2 FRONT ELEVATION  
3 SCALE: 1:75 FRAME #1



2 LEFT ELEVATION  
4 SCALE: 1:75



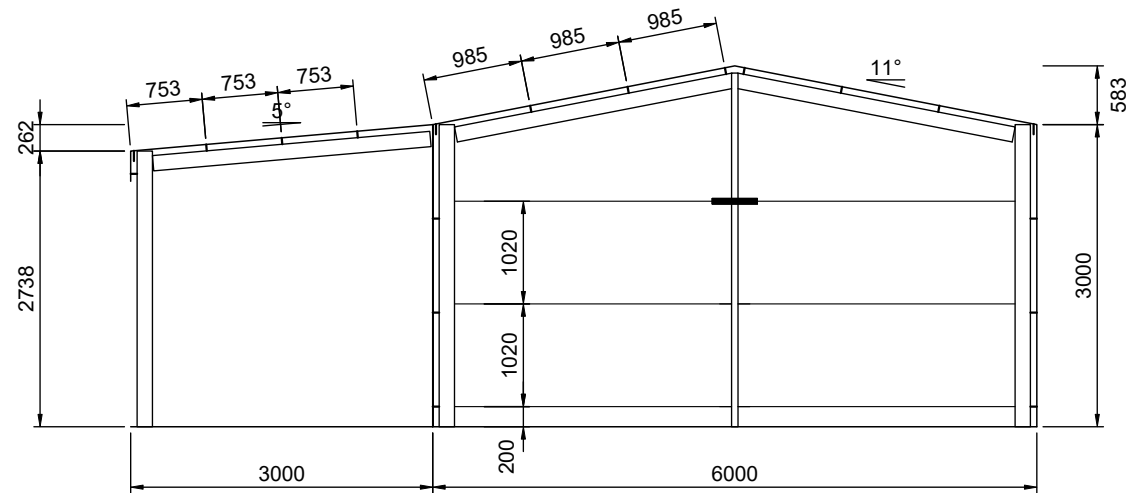
1 RIGHT ELEVATION  
4 SCALE: 1:75



1  
5 REAR ELEVATION

SCALE: 1:75

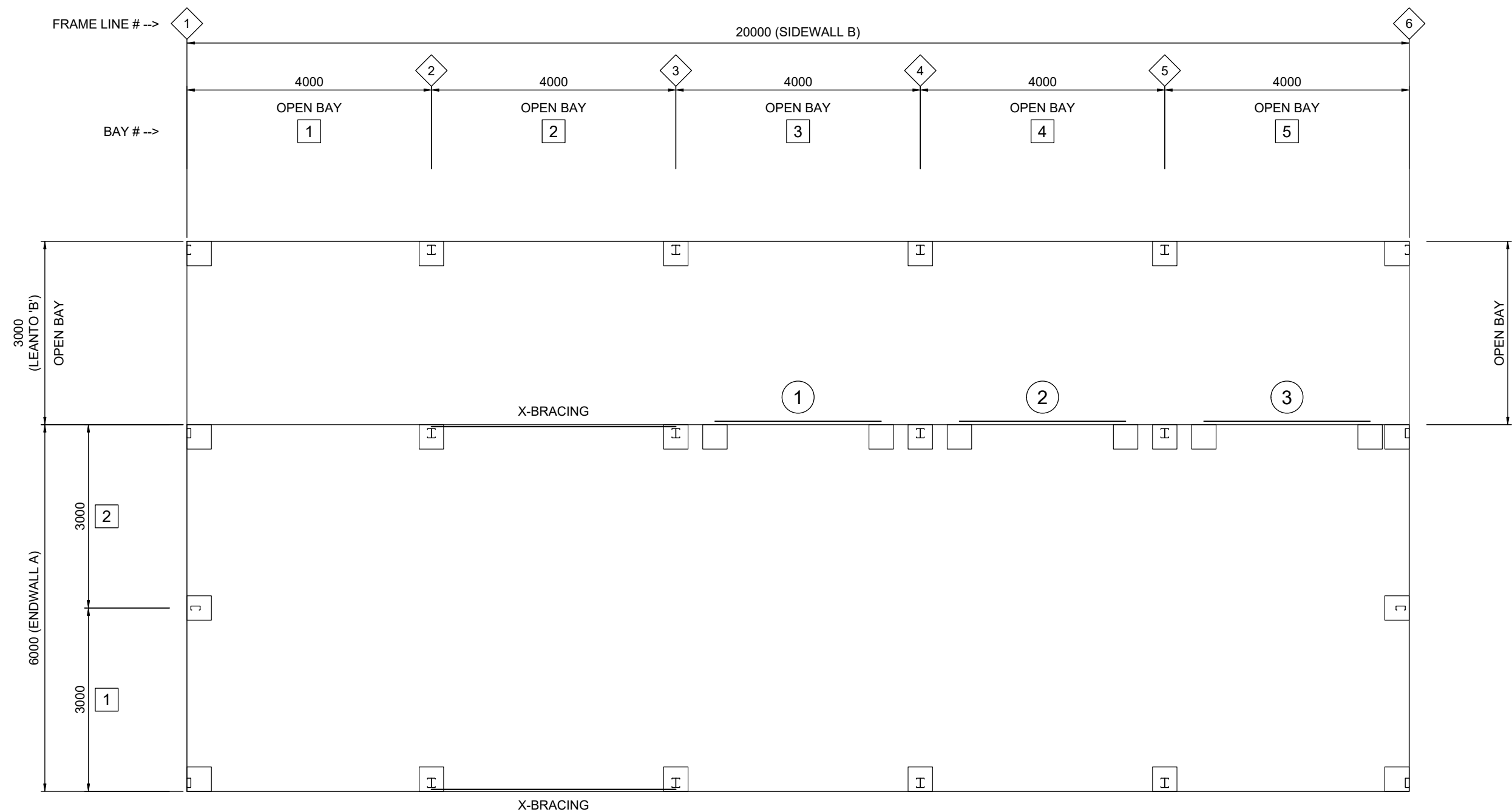
FRAME #6



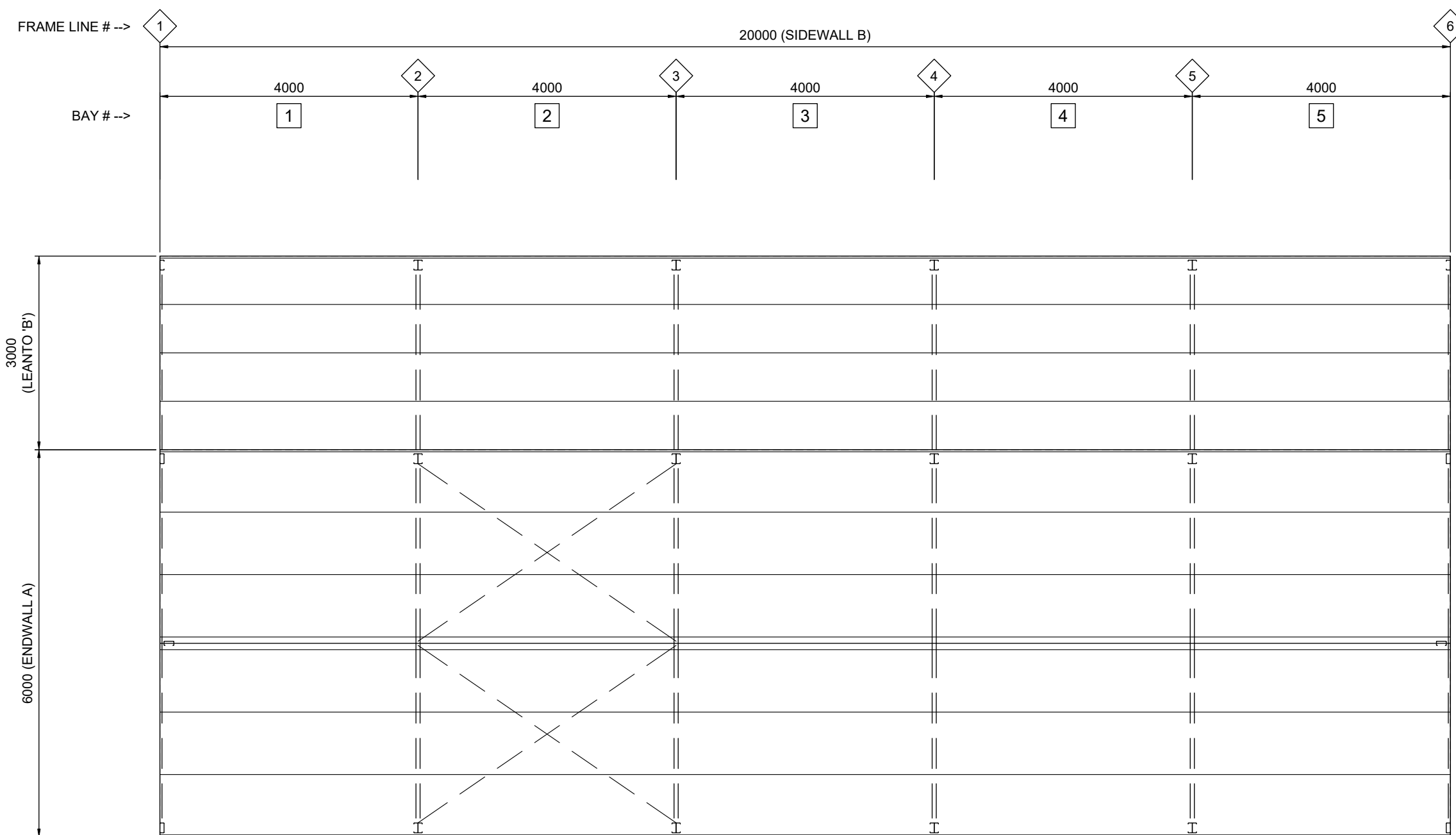
2  
5 FRONT ELEVATION

SCALE: 1:75

FRAME #1



1 FLOOR PLAN  
6 SCALE: 1:75



# 1 7

## ROOF FRAMING PLAN

SCALE: 1:75

Signature: 

Date: 06.02.2025

SLAB FOUNDATIONS DOMESTIC / LIGHT INDUSTRIAL  
(100mm MINIMUM CONCRETE SLAB INCLUDED)

| SOIL CLASSIFICATION<br>(COMPACTED)                                                     | REINFORCING IN SLAB | EDGE BEAM   | PIER      | EDGE BEAM<br>(slab thickness not included) |       |
|----------------------------------------------------------------------------------------|---------------------|-------------|-----------|--------------------------------------------|-------|
|                                                                                        | MESH REINFORCING    | TRENCH MESH | ø x DEPTH | DEPTH                                      | WIDTH |
| A, S, & M                                                                              | SL72                | ---         | 450 x 400 | ---                                        | ---   |
| M - D                                                                                  | SL82                | L11TM3      | ---       | 300                                        | 300   |
| H TO H - D                                                                             | SL82                | L11TM3      | ---       | 400                                        | 300   |
| E TO E - D                                                                             | SL82                | L11TM4      | ---       | 400                                        | 400   |
| P (DROP EDGE BEAM OR STANDARD EDGE BEAM WITH PIERS UNDER COLUMNS 300 INTO FIRM GROUND) | SL82                | L11TM4      | 450ø      | 400                                        | 400   |

THICKNESS: 100MM WITH MINIMUM 30MM COVER. REFER TO SLAB FOUNDATION TABLE FOR REINFORCING SPECIFICATION

STRENGTH: 25mPa

2 x M12 BOLTS

2 X 12MM DIA SLEEVE ANCHORS, 10MM DIA INTERNAL ROD-MIN 75MM LONG

REFER TO SLAB TABLE FOR MESH TYPE - 30MM COVER

POLYTHENE WATERPROOF MEMBRANE ON CONSOLIDATED SUB-BASE SHOWN DASHED

DEPTH

WIDTH

100

2C15015 LEANTO COLUMN

NOTE: ENSURE EARTH/SOIL IS KEPT CLEAR OF WALL CLADDING AT ALL TIMES.

600

450

FLAT PLATE CONNECTION WITH 12 X 14G TEK SCREWS

C15015 LEANTO RAFTER

DBL. MAIN BUILDING FRAME RAFTER

2782 mm TO TOP OF CONCRETE FOUNDATION

SGL. MAIN BUILDING FRAME COLUMN

NOTE: ALL DOUBLE COMPONENTS SHALL BE SINGLE AT ENDWALLS.

2C15015 LEANTO RAFTER

12 X 14G TEK SCREWS

FLAT PLATE WITH 12 X 14G TEK SCREWS

2C15015 LEANTO COLUMN

Z

ALTERNATE PIER DETAIL

10G X 16MM SHEETING SCREW, REFER TO SCREW SPACING DIAGRAM FOR FREQUENCY

2 X 14G TEK SCREWS

TOPHAT 64 WALL GIRT WITH 10%MM MINIMUM OVERLAP

2C15015 COLUMN

Q

LEANTO RAFTER CONNECTION  
LEANTO SWB

2 x 14G TEK SCREWS ABOVE & BELOW IN SIDE OF PURLIN - UNDERSIDE SCREW NOT VISIBLE IN DETAIL

2 x 14G TEK SCREWS PER COLUMN - UNDERSIDE SCREW NOT VISIBLE IN DETAIL

R

LEANTO HAUNCH CONNECTION

12G X 35MM SHEETING SCREW, REFER TO SCREW SPACING DIAGRAM FOR FREQUENCY

10G X 16MM SHEETING SCREW, REFER TO SCREW SPACING DIAGRAM FOR FREQUENCY

2 x 14G TEK SCREWS

SHEETING

C10010

C15015 COLUMN

Y

SLAB DETAIL

INDICATES 12 mmø GRADE 4.6 BOLT

2C15015 FRAME RAFTER

4 X 14G TEK SCREWS

2C15015 FRAME COLUMN

DBL. 1.9mm 11" HAUNCH BRACKET (SAME DEPTH AS MEMBERS)

2372 mm TO TOP OF CONCRETE FOUNDATION

2C10010 KNEE BRACE, 1500 mm LONG (OMIT AT ENDWALLS)

(2) 12 mmø GRADE 4.6 BOLTS AT EACH END OF KNEE BRACE

NOTE: ALL DOUBLE COMPONENTS SHALL BE SINGLE AT ENDWALLS.

F

GIRT CONNECTION

2C15015 FRAME RAFTER

DBL. 1.9mm 11" APEX BRACKET, WITH (8) 12 mmø GRADE 4.6 BOLTS PER BRACKET

4 X 14G TEK SCREWS

1400 mm

(2) 12 mmø GRADE 4.6 BOLTS AT EACH END OF APEX BRACE

2C10010 APEX BRACE (OMIT AT ENDWALLS), 2900 mm LONG

NOTE: ALL DOUBLE COMPONENTS SHALL BE SINGLE AT ENDWALLS.

G

TOP HAT CONNECTION

ATTACH OUTSIDE FLANGE OF ENDWALL MULLION TO APEX BRACKET WITH 5 X 14G TEK SCREWS

C15015 (OPEN SIDE OF CEE MAY FACE EITHER DIRECTION, U.N.O.)

C15015 ENDWALL RAFTER

NOTE: SEE DETAIL M/9 FOR ENDWALL MULLION BASE CONNECTION

H

EAVE CONNECTION

12G X 35MM SHEETING SCREW, REFER TO SCREW SPACING DIAGRAM FOR FREQUENCY

TOPHAT 64 ROOF PURLIN WITH 10% MINIMUM OVERLAP

C15015 RAFTER

4 X 14G TEK SCREW

A

HAUNCH CONNECTION

B

APEX CONNECTION

C

ENDWALL MULLION TO RAFTER  
PEAK CONDITION

E

PURLIN CONNECTION



best  
sheds

Value & Quality Direct to You

151 Smeaton Grange Road,  
Smeaton Grange, NSW, 2567  
Phone: 02 4648 7777  
Fax: 02 4648 7700  
Email: sales@bestsheds.com.au



EMERALD

DESIGN & CONSTRUCTION

CIVIL & STRUCTURAL ENGINEERS

COMMERCIAL - INDUSTRIAL - RESIDENTIAL - FORENSIC - STEEL DETAILING

CAMILO PINEDA MORENO

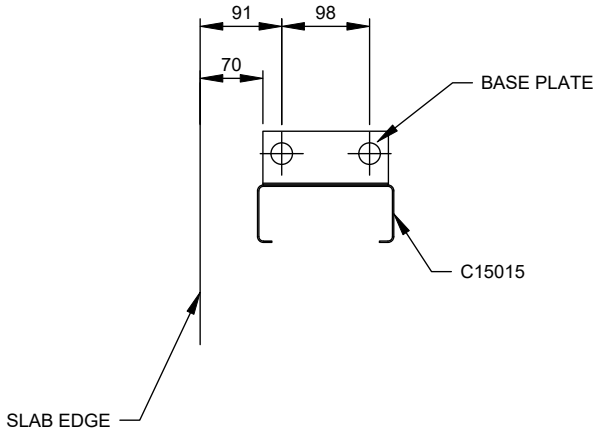
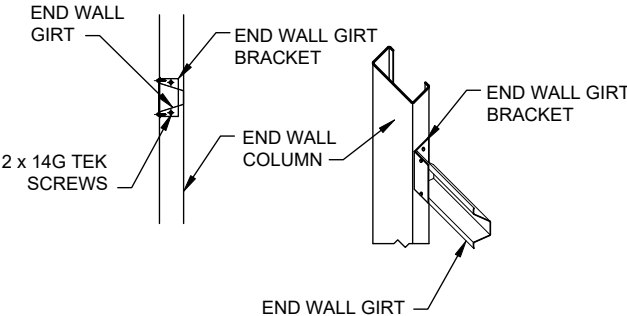
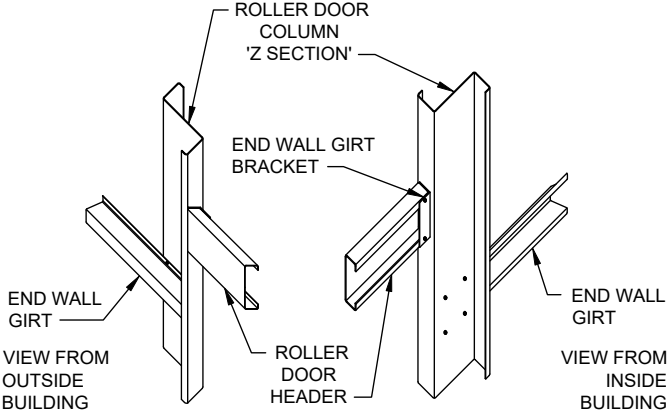
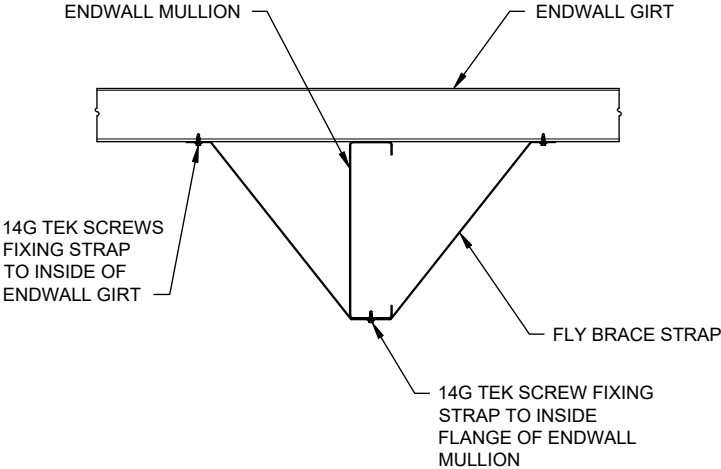
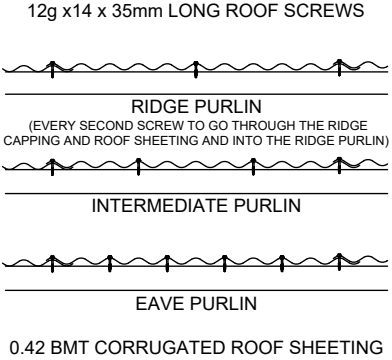
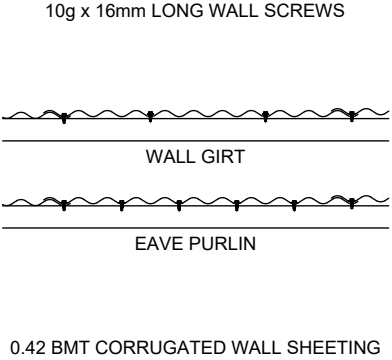
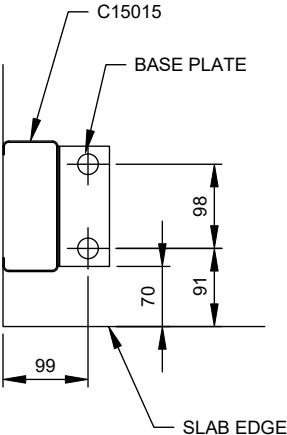
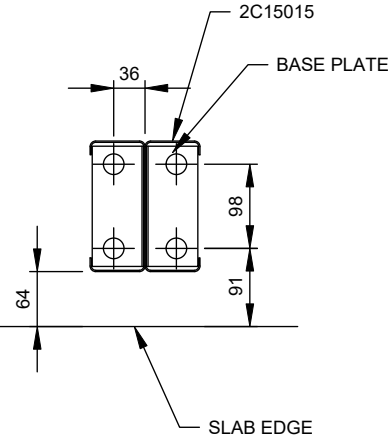
Bend MIEAust RPEng  
RPEQ 15562 TBP PE003976 (VIC)

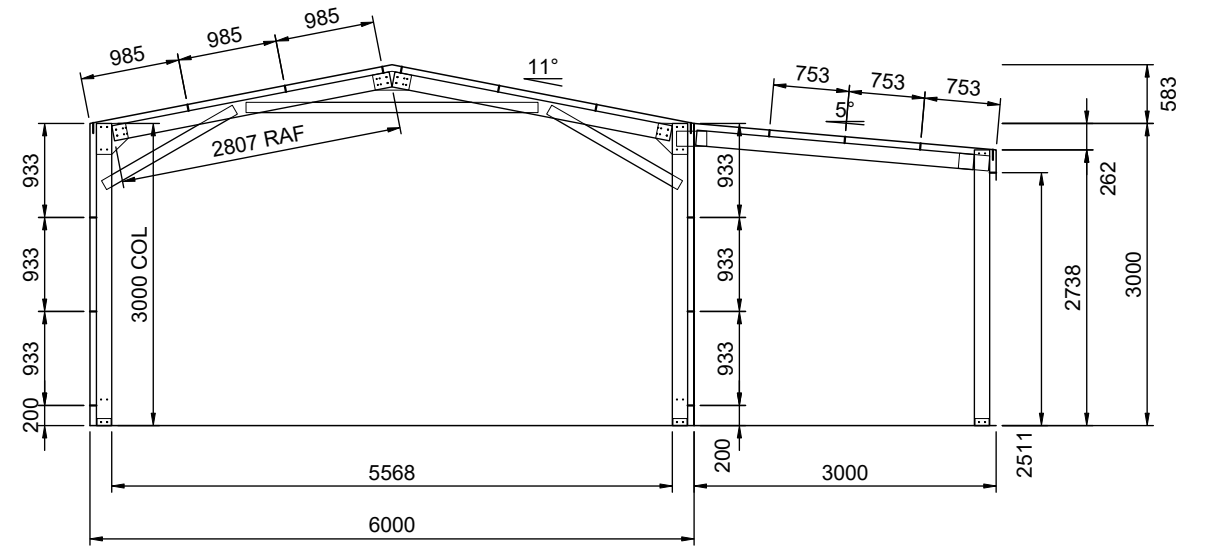
Signature: 

Date: 06.02.2025

Customer Name: Drew Murfitt  
Site Address: 41 Wirimah road  
bendick murrell,  
NSW, 2803

DATE 06-02-2025  
JOB NO. 0727563826  
SHEET 8 of 10

|                                                                                     |                      |                                                                                      |                      |                                                                                       |                           |                                                                                       |                      |
|-------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------|---------------------------|---------------------------------------------------------------------------------------|----------------------|
|   |                      |   |                      |   |                           |   |                      |
| <b>M</b>                                                                            | ENDWALL MULLION BASE | <b>N</b>                                                                             | ENDWALL GIRT BRACKET | <b>O</b>                                                                              | SIDE DOOR HEADER AND JAMB | <b>P</b>                                                                              | FLYBRACE             |
|  |                      |  |                      |  |                           |  |                      |
| <b>I</b>                                                                            | ROOF SHEETING        | <b>J</b>                                                                             | WALL SHEETING        | <b>K</b>                                                                              | CORNER COLUMN BASE        | <b>L</b>                                                                              | INTERNAL COLUMN BASE |



1  
10 TYP. FRAME CROSS-SECTION

SCALE: 1:75

FRAMES 2-5

### BMAT REPORT

## Biodiversity Values Map and Threshold Report

This report is generated using the Biodiversity Values Map and Threshold (BMAT) tool. The BMAT tool is used by proponents to supply evidence to your local council to determine whether or not a Biodiversity Development Assessment Report (BDAR) is required under [the Biodiversity Conservation Regulation 2017 \(Cl. 7.2 & 7.3\)](#).

The report provides results for the proposed development footprint area identified by the user and displayed within the blue boundary on the map.

There are two pathways for determining whether a BDAR is required for the proposed development:

1. Is there Biodiversity Values Mapping?
2. Is the 'clearing of native vegetation area threshold' exceeded?

| Biodiversity Values Map and Threshold Report                                                                           |                                                                                                                                                         |                    |
|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Date of Report Generation                                                                                              |                                                                                                                                                         | 17/02/2025 7:44 AM |
| 1. Biodiversity Values (BV) Map - Results Summary (Biodiversity Conservation Regulation Section 7.3)                   |                                                                                                                                                         |                    |
| 1.1                                                                                                                    | <b>Does the development Footprint intersect with BV mapping?</b>                                                                                        | no                 |
| 1.2                                                                                                                    | Was <u>ALL</u> BV Mapping within the development footprint added in the last 90 days? (dark purple mapping only, no light purple mapping present)       | no                 |
| 1.3                                                                                                                    | <b>Date of expiry of dark purple 90 day mapping</b>                                                                                                     | N/A                |
| 1.4                                                                                                                    | <b>Is the Biodiversity Values Map threshold exceeded?</b>                                                                                               | no                 |
| 2. Area Clearing Threshold - Results Summary (Biodiversity Conservation Regulation Section 7.2)                        |                                                                                                                                                         |                    |
| 2.1                                                                                                                    | <b>Size of the development or clearing footprint</b>                                                                                                    | 1,292.3 sqm        |
| 2.2                                                                                                                    | <b>Native Vegetation Area Clearing Estimate (NVACE)</b><br>(within development/clearing footprint)                                                      | 0.0 sqm            |
| 2.3                                                                                                                    | <b>Method for determining Minimum Lot Size</b>                                                                                                          | LEP                |
| 2.4                                                                                                                    | <b>Minimum Lot Size</b> (10,000sqm = 1ha)                                                                                                               | 2,000 sqm          |
| 2.5                                                                                                                    | <b>Area Clearing Threshold</b> (10,000sqm = 1ha)                                                                                                        | 2,500 sqm          |
| 2.6                                                                                                                    | <b>Does the estimate exceed the Area Clearing Threshold?</b><br>(NVACE results are an estimate and can be reviewed using the <a href="#">Guidance</a> ) | no                 |
| REPORT RESULT: Is the Biodiversity Offset Scheme (BOS) Threshold exceeded for the proposed development footprint area? |                                                                                                                                                         | <b>no</b>          |
| (Your local council will determine if a BDAR is required)                                                              |                                                                                                                                                         |                    |

## What do I do with this report?

- If the result above indicates the BOS Threshold has been exceeded, your local council may require a Biodiversity Development Assessment Report with your development application. Seek further advice from Council. An accredited assessor can apply the Biodiversity Assessment Method and prepare a BDAR for you. For a list of accredited assessors go to: <https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor>.
- If the result above indicates the BOS Threshold has not been exceeded, you may not require a Biodiversity Development Assessment Report. This BMAT report can be provided to Council to support your development application. Council can advise how the area clearing threshold results should be considered. Council will review these results and make a determination if a BDAR is required. Council may ask you to review the area clearing threshold results. You may also be required to assess whether the development is “likely to significantly affect threatened species” as determined under the test in Section 7.3 of the *Biodiversity Conservation Act 2016*.
- If a BDAR is not required by Council, you may still require a permit to clear vegetation from your local council.
- If all Biodiversity Values mapping within your development footprint was less than 90 days old, i.e. areas are displayed as dark purple on the BV map, a BDAR may not be required if your Development Application is submitted within that 90 day period. Any BV mapping less than 90 days old on this report will expire on the date provided in Line item 1.3 above.

For more detailed advice about actions required, refer to the Interpreting the evaluation report section of the [Biodiversity Values Map Threshold Tool User Guide](#) .

## Review Options:

- If you believe the Biodiversity Values mapping is incorrect please refer to our [BV Map Review webpage](#) for further information.
- If you or Council disagree with the area clearing threshold estimate results from the NVACE in Line Item 2.6 above (i.e. area of Native Vegetation within the Development footprint proposed to be cleared), review the results using the [Guide for reviewing area clearing threshold results from the BMAT Tool](#).

## Acknowledgement

I, as the applicant for this development, submit that I have correctly depicted the area that will be impacted or likely to be impacted as a result of the proposed development.

Signature: \_\_\_\_\_

(Typing your name in the signature field will be considered as your signature for the purposes of this form)

Date: \_\_\_\_\_

17/02/2025 07:44 AM

## Biodiversity Values Map and Threshold Tool

The Biodiversity Values (BV) Map and Threshold Tool identifies land with high biodiversity value, particularly sensitive to impacts from development and clearing.

The BV map forms part of the Biodiversity Offsets Scheme threshold, which is one of the factors for determining whether the Scheme applies to a clearing or development proposal. You have used the Threshold Tool in the map viewer to generate this BV Threshold Report for your nominated area. This report calculates results for your proposed development footprint and indicates whether Council may require you to engage an accredited assessor to prepare a Biodiversity Development Assessment Report (BDAR) for your development.

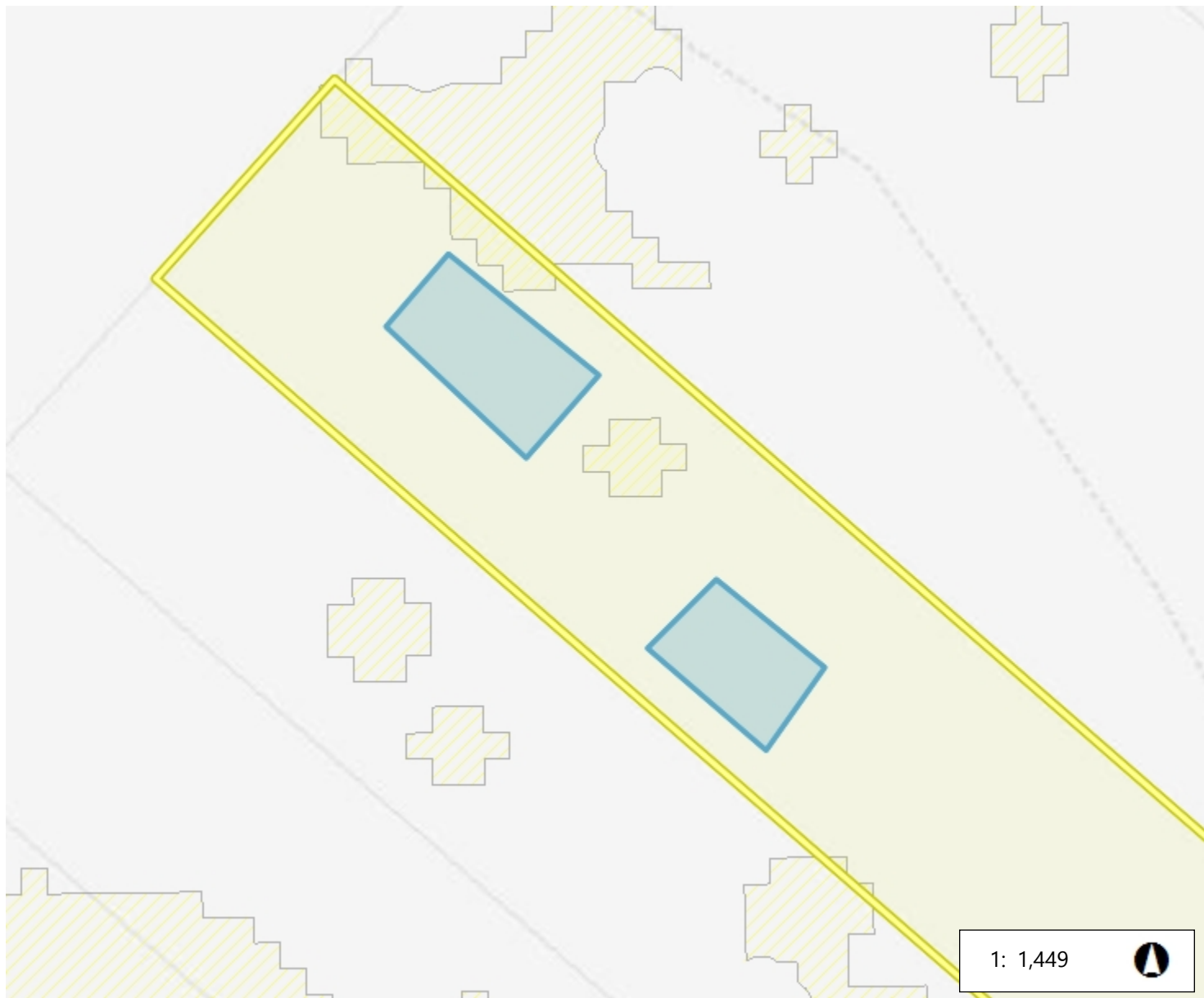
This report may be used as evidence for development applications submitted to councils. You may also use this report when considering native vegetation clearing under the State Environmental Planning Policy (Biodiversity and Conservation) 2021 - Chapter 2 vegetation in non-rural areas.

What's new? For more information about the latest updates to the Biodiversity Values Map and Threshold Tool go to the updates section on the [Biodiversity Values Map webpage](#).

Map Review: Landholders can request a review of the BV Map where they consider there is an error in the mapping on their property. For more information about the map review process and an application form for a review go to the [Biodiversity Values Map Review webpage](#).

If you need help using this map tool see our [Biodiversity Values Map and Threshold Tool User Guide](#) or contact the Map Review Team at [map.review@environment.nsw.gov.au](mailto:map.review@environment.nsw.gov.au) or on 1800 001 490.

# Biodiversity Values Map



73.6 0 36.80 73.6 Metres

WGS\_1984\_Web\_Mercator\_Auxiliary\_Sphere

Legend

-  Biodiversity Values that have been mapped for more than 90 days
-  Biodiversity Values added within last 90 days
-  Native Vegetation Area Clearing Estimate (NVACE)
-  Development area selected by proponent

17/02/2025 07:44 AM

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

Imagery © Airbus DS/Spot Image 2016  
© NSW Department of Customer Service, Basemaps 2019  
© NSW Department of Planning and Environment

The results provided in this tool are generated using the best available mapping and knowledge of species habitat requirements.

This map is valid as at the date the report was generated. Checking the [Biodiversity Values Map viewer](#) for mapping updates is recommended.

### AHIMS SEARCH

Kenneth Filmer

Date: 17 February 2025

18 Pineview Cct 91 Boorowa Street Young  
Young New South Wales 2594

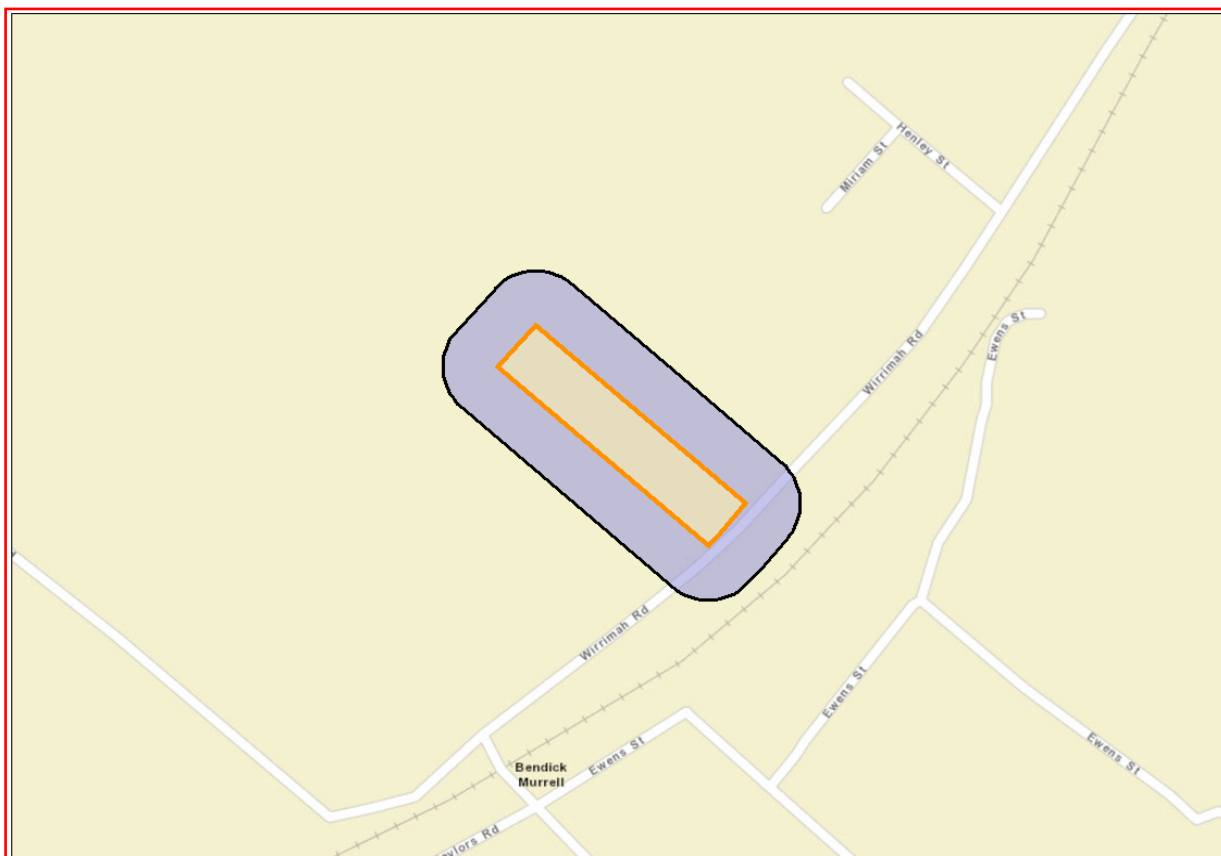
Attention: Kenneth Filmer

Email: craig@dabusters.com

Dear Sir or Madam:

**AHIMS Web Service search for the following area at Lot : 436, DP:DP754605, Section : - with a Buffer of 50 meters, conducted by Kenneth Filmer on 17 February 2025.**

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

|   |                                                                       |
|---|-----------------------------------------------------------------------|
| 0 | Aboriginal sites are recorded in or near the above location.          |
| 0 | Aboriginal places have been declared in or near the above location. * |

**If your search shows Aboriginal sites or places what should you do?**

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(https://www.legislation.nsw.gov.au/gazette\)](https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

**Important information about your AHIMS search**

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.