ONSITE WASTEWATER REPORT

PROPOSED DWELLING AND SHED AT 63 BLACK ROCK ROAD, MARTINS CREEK

GSL Environmental
Authored by: Simon Doberer B.Sc. (ENV)
Job Reference #: 143824 - A1
Date: 13th December 2024

GSL Environmental
Environmental Consultants

Limitations

This report has been developed based on agreed requirements between the client and GSL Environmental as understood by GSL Environmental at the time of investigation. This report only applies to the subject scope of works undertaken at the subject site. Other interpretations should not be made, including changes of scope or application to other projects. The contents of this report are based on a professional appraisal of the conditions that existed onsite at the time of this investigation. Where a subsurface soil investigation has been undertaken the results are only applicable to the specific sampling locations and the depths undertaken. Because of natural geological variability and possible anthropogenic influences, the subsurface conditions reported can change abruptly. Such changes can also occur after the site investigation has been undertaken. The accuracy of the results provided in this assessment is limited by these possible variations along with limitations by budget constraints imposed by others and by inadequate site accessibility.

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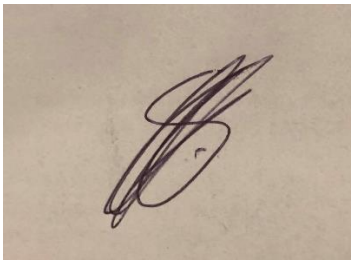

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Contents

1. Introduction

GSL Environmental has been commissioned by Trent Masin to assess the suitability of an on-site sewage management system for the proposed dwelling and shed at 63 Black Rock Road, MARTINS CREEK NSW. This report will be submitted to Dungog Council in accordance with the relevant details in the 'Dungog Council Onsite Sewage DAF 2015'. Other guiding documents include,

- Australian Standard AS1547: 2012"On-site Domestic Wastewater Management"
- Dept. Local Government 1998, On-site Sewage Management for Single Households
- Water NSW, "Designing and Installing Onsite Wastewater Systems", 2019

This assessment is required to show that treated wastewater generated by the approved dwelling and shed can be sustainably managed on the site.

2. Site Description

The subject allotment is an irregular shaped allotment and is approximately 2.85 Ha in size. The proposed dwelling, shed and subject EDA is located within the middle southern portion of the site. The proposed EDA is within a very gently inclined waning mid slope area. The closest significant water body, Martins Creek meanders along and through the northern property boundary of the site. There is an overland flowpath traversing the eastern portion of the site.

According to the Dungog 1:100 000 Soil Map the proposed dispersal area onsite is underlain by "Brecon" residual soils. The Brecon Soil Landscape areas generally consists of undulating rises to low hills on Carboniferous sediments and ignimbrites of the Paterson Mountains and Clarencetown Hills regions. Slope gradients are generally between 2 - 10%. Underlying soils mostly consist of brown sandy loams traversing to brown clays.

The proposed dwelling is a four bedroom dwelling, plans within appendix B.

Figure 1: Subject Site, care of six maps showing property boundaries and associated landmarks.

3. Site Information

Site Address: 63 Black Rock Road, MARTINS CREEK

Water Supply: Town

Proposed Development: Proposed dwelling and shed

Equivalent Population: Up to 6 persons/day – 4 bedroom dwelling

Wastewater Flow Allowance: 150L per person per day

Design Flowrate: 900L per day

Proposed Effluent Dispersal Type: Pressure Dosed Absorption

System Design: Aerated Wastewater Treatment System

Most restrictive Soil Texture: brown clays

Minimum Dispersal Area: 90m2

Buffer Distances: All required buffer distances with AS1547:2012 can be achieved.

4. Physical Site Assessment

A site inspection was undertaken on the 25th September 2024. The fieldwork included an assessment of the site's physical parameters as well as hand excavation of boreholes to determine the underlying soil structures. This was undertaken to delineate the most suitable location for the proposed dispersal area. Potential onsite limitations have been investigated and are discussed below.

4.1 Landform

Varying landforms pose differing potential limitations to an effluent dispersal area. Risk of run-on and runoff may be enhanced dependent on the site's landform.

The proposed EDA is within a very gently inclined waning mid slope area. To limit any potential runoff, spray irrigation has been ruled out.

Limitation: **LOW**

4.2 Slope Gradient

Excessive slope within an EDA can potentially lead to effluent leaching away from the EDA.

The proposed EDA is within a very gently inclined waning mid slope area. The slope within the proposed EDA is approximately 3%. To limit any potential runoff, spray irrigation has been ruled out.

Limitation: **LOW**

4.3 Exposure

Providing the EDA with maximum wind and sun exposure is preferable. This will enhance the evapotranspiration properties of the EDA and should add to the life of the EDA.

The proposed EDA is within an open area with high levels of exposure.

Limitation: **LOW**

4.4 Flood Potential

All effluent dispersal areas are to be above the 1:20 flood level. In addition all electrical components, vents and inspection holes form the treatment system should be located above the 1:100-year flood

level. Effluent dispersal areas being inundated via flood waters can become a public health issue during times of high rain.

The proposed EDA has been located within the highest portion of the site.

Limitation: **LOW**

4.5 Vegetation

All effluent dispersal areas should be covered with vegetation or mulch-based covers. A vegetated EDA provides the possibility of that area in enhancing nutrient uptake and evapotranspiration. Low vegetation cover can cause effluent runoff and low nutrient and evapotranspiration uptake rates.

A moderate cover of grassland vegetation is currently within the proposed EDA. A dense grassland is to be established once the EDA is constructed. The proposed EDA should be regularly mowed and maintained.

Limitation: **MODERATE**

4.6 Stormwater Run-on

Stormwater runoff through the EDA has the potential to transport effluent away from the EDA to more sensitive receivers.

There were no visible signs of stormwater entering the proposed EDA. The proposed EDA is within a very gently inclined waning mid slope area. The slope within the proposed EDA is approximately 3%. To limit any potential runoff, spray irrigation has been ruled out.

Limitation: **LOW**

4.7 Site Drainage

Damp and wet areas should be avoided for EDAs. These areas indicate seepage of waters and could become a transport option for effluent if placed in these areas.

Site appears to be well drained with semi-permeable soils. No visible signs of wet/damp areas in the proposed EDA. The soil profile did not show evidence of water logging.

Limitation: **LOW**

4.8 Erosion Potential

Areas of visible soil movement and erosion should be avoided.

No visible signs of erosion within the EDA. Proposed EDA area is a very gently inclined landform however moderately vegetated. A dense grassland is to be established once the EDA is constructed.

Limitation: **MODERATE**

4.9 Evidence of Fill

No evidence of fill was seen onsite or in the excavated boreholes. Soil logs are consistent of the description for underlying soils within the Brecon Soil Areas.

Limitation: **LOW**

4.10 Groundwater Depth

Groundwater not observed in bore holes.

Limitation: **LOW**

4.11 Surface Rock

No surface boulders or rock outcrops were observed within the proposed EDA. Whilst depth was found in boreholes excavated within the proposed EDA, if during installation a “floater” is found it is to be removed from the proposed EDA.

Limitation: **LOW**

4.12 Groundwater Bores

A search of Water’s all groundwater mapping was undertaken to determine the proximity of any bores to the EDA. There are no domestic registered bores within 250m of the proposed EDA

Limitation: **LOW**

4.13 Watercourse Proximity

The closest significant water body, Martins Creek meanders along and through the northern property boundary of the site. There is an overland flowpath traversing the eastern portion of the site. Not all recommended setbacks can be adhered to.

Limitation: **MODERATE**

4.14 Stock Present

Stock can cause damage to irrigation systems and must be kept out of the EDA by fencing or other physical barrier.

4.15 Buffer Distances

All required buffer distances within AS1547:2012 can be achieved. Not all required buffer distances within the Dungog Council Onsite Sewage DAF 2015 can be met.

Table 6-8 Minimum Buffer Distances for On-site System Land Application Systems

System / Land Application Type	Limiting Factor	Minimum Buffer Distance (m)
All Land Application Systems	Permanent surface waters such as: Lakes, rivers, creeks and streams	➢ 100m
	Domestic groundwater wells and bores	➢ 250m
	Other waters such as: Farm dams, intermittent waterways and drainage channels	➢ 40m
	Retaining wall, embankments, escarpments and cuttings.	➢ 15
Surface Spray Irrigation (Standard Spray Heads)	Driveways and property boundaries	➢ 6m if area up gradient ➢ 3m if area down gradient
	Dwellings and buildings	➢ 15m
	Paths and walkways	➢ 3m
	Swimming pools	➢ 6m
	Retaining wall, embankments, escarpments and cuttings.	➢ 12m if area up gradient ➢ 3m if down gradient
Surface Drip and Trickle Irrigation	Dwellings and buildings, swimming pools, property boundaries and driveways. Retaining wall, embankments, escarpments and cuttings.	➢ 6m if area up gradient ➢ 3m if area down gradient
Subsurface Irrigation	Dwellings and buildings, swimming pools, property boundaries and driveways Retaining wall, embankments, escarpments and cuttings.	➢ 6m if area up gradient[1] ➢ 3m if area down gradient[1]
	Depth to Hardpan or Bedrock	➢ 0.6m below level of pipework[2]
Absorption System	*Property boundary* *Retaining wall, embankments, escarpments and cuttings.*	➢ 12m if area up gradient ➢ 6m if area down gradient
	Dwellings and buildings, swimming pools and driveways	➢ 6m if area up gradient ➢ 3m if area down gradient
	Depth to Hardpan or Bedrock	➢ 0.6m below base of trench/bed

Permanent Watercourse: *Any river, creek, stream or chain of ponds, whether artificially modified or not, in which water usually flows, either continuously or intermittently, in a defined bed or channel*
Intermittent Watercourse: *A low point with no or little defined bed or channel that carries water during rainfall events, but dries out quickly when rainfall stops. A gully or incised drainage depression is considered to be an intermittent watercourse.*

Limitation: **MODERATE**

Martins Creek setback: 81m

As per table R1 of AS1547:2012 a risk assessment utilizing table R2 AS1547:2012 is to be undertaken for reduced setback proposals. For surface water site constraint items of specific concern from table R2 – A, B, D, E, F, G, J were discussed.

The following is the discussion utilizing Table R2 from AS1547:2012.

Item	Site/system Feature	Comment	Constraint Rating
A	Microbial Quality of effluent	Secondary Effluent	**LOW**
B	Surface Water	Martins Creek 81m away	**MODERATE**
D	Slope	Very Gently Inclined	**LOW**
E	Position of land Application	Best position onsite in regards to all onsite wastewater parameters as a whole	**LOW**
F	Drainage	Category 1 and 2 soils within the topsoil's	**LOW**
G	Flood Potential	Above the 1:20 Flood Level	**LOW**
J	Application Method	Subsurface Absorption	**LOW**

With the majority of the constraints being on the lower end the R2 table suggests that the proposed subsurface irrigation in the proposed area is in a Low constraint area.

The proposed EDA has been located to provide the maximum possible setbacks to onsite waterbodies within the highest portion of the site.

Figure 2: Proposed EDA

5. Onsite Soil Assessment

During the site inspection 2 boreholes were hand excavated with a 100mm auger within the proposed EDA. The following are the results from the excavation. The auger holes were used to determine the underlying soil properties. No groundwater was observed in the excavated boreholes.

According to the Dungog 1:100 000 Soil Map the proposed dispersal area onsite is underlain by "Brecon" residual soils. The Brecon Soil Landscape areas generally consists of undulating rises to low hills on Carboniferous sediments and ignimbrites of the Paterson Mountains and Clarencetown Hills regions. Slope gradients are generally between 2 - 10%. Underlying soils mostly consist of brown sandy loams traversing to brown clays.

Borehole 1

0 – 350mm – brown sandy loams
350 – 1000mm – Moderately structured reddish brown clays

Figure 3: Borehole 1 excavated onsite

Borehole 2

0 – 300mm – brown sandy loams
300 – 1000mm – Moderately structured reddish brown clays

An insitu probe, tested the soil layers for pH and EC, results as below.

Ph and EC

Borehole 1

Depth	pH	EC_e (µS/cm)
0 – 350mm	5.8	1258
350 – 1000mm	5.6	1418

Borehole 2

Depth	pH	EC_e (µS/cm)
0 – 300mm	5.7	841
300 – 1000mm	5.3	1387

The pH of a soil influences its ability to supply nutrients to vegetation. If the soil is too acidic vegetative growth is inhibited. The electrical conductivity of the soil relates to the amount of salts present. A high salt concentration inhibits vegetative growth.

The electrical conductivity of the soils is less than 4 dS/m. This will not inhibit vegetative growth. The pH of the soil is between 5.3 and 5.8. A regular application of lime and gypsum is recommended to maintain healthy vegetation growth.

A Sample was sent to ALS Australia, a NATA accredited laboratory to determine the insitu reliability as well as the testing of further parameters. Results below and in appendix.

The sample tested at the laboratory was from borehole 1, 0-350mm.

Coarse fragments

Coarse fragments are those over 2 mm in diameter. They can pose limitations to vegetative growth by lowering the soil's ability to supply water and nutrients.

<10% course fragment was observed within the excavated soils onsite. There were some peds which could be crushed easily using fingers.

Limitation: **LOW**

Exchangeable Sodium Percentage

The exchangeable sodium percentage (ESP) measures the proportion of cation exchange sites occupied by sodium. Soils are considered sodic when the ESP is greater than 6, and highly sodic when the ESP is greater than 15.

ESP 3.3%, suggesting non sodic soils within the proposed EDA.

Cation Exchange Capacity

Cation exchange capacity (CEC) is a measure of the soil's ability to hold positively charged ions. It is a very important soil property influencing soil structure stability, nutrient availability, soil pH and the soil's reaction to fertilisers and other ameliorants. A figure above 15 meq/100g is preferred for plant production. You can improve CEC in weathered soils by adding lime and raising the pH.

CEC = 14.6 meq/100g

Once EDA is installed an annual maintenance application rate of the following is to be implemented.

Lime 0.5kg/m2 – Subject site calculation = A minimum 45kg across the proposed 90m2 EDAs.
Gypsum 0.5kg/m2 – Subject site calculation = A Minimum 45kg across the proposed 90m2 EDAs.

Phosphorus Sorption Index

The capacity of a soil to adsorb phosphorus is expressed as its phosphorus sorption capacity.

P sorb = 1860mg P sorbed/kg - laboratory
P sorb = 400mg P sorbed/kg – given figure within literature for clay loam soils

For nutrient balance calculations the lesser of value above is to be utilized

Emerson Aggregate Test

The combination of slaking and dispersion caused a reduction in macroporosity and, therefore, lower infiltration rates and hydraulic conductivities as well as an increase in soil strength and other undesirable soil physical properties. This test classifies the behavior of soil aggregates, when immersed, on their coherence in water. This test was competed inhouse. Soils are divided into seven

classes on the basis of their coherence in water, with one further class being distinguished by the presence of calcium-rich minerals.

EAT Class = 2(2). Some slight dispersion potential within underlying soils.

6. System Design/Selection

Effluent should be treated to a secondary level followed by subsurface dispersal. A number of dispersal options could be considered, subsurface irrigation, pressure dosed absorption bed and mounds. Pressure dosed absorption was the dispersal method recommended and designed. Subsurface absorption reduces the chance of human contact with the effluent and significantly reduces any potential public health risk.

Proposed Treatment Node

The proposal is to install a NSW Health accredited AWTS system onsite. An Aerated Wastewater Treatment System (AWTS) uses aerobic treatment to promote oxidation and microbiological consumption of organic matter by bacteria through facilitated biological processes.

Proposed Effluent Dispersal

The proposed effluent dispersal is to be via pressure-dosed absorption beds. Absorption beds can be used to manage secondary treated effluent, in which case higher loading rates are acceptable, as outlined in 'AS/NZS 1547:2012 On-site Domestic Wastewater Management'. Absorption trenches or beds used together with secondary treated effluent are generally small footprint systems. They are often used where there is limited space available for effluent disposal or a small effluent footprint is desired.

Moderately Structured Clay: flowrate of 10mm/day, AS1547:2012

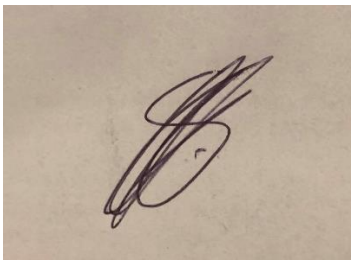
Total flowrate dispersing into adsorption beds 900L/day.

Area of bed(s): 900/10 = 90m2

Installation of a 90m2 pressure dosed bed(s) as per AS1547:2012 and the Water NSW schematic within appendix E.

7. Recommendations

- Installation of a NSW Health Accredited AWTS system onsite to treat the calculated flowrate of 900L/day.
- Installation of a 90m2 pressure dosed bed(s) as per AS1547:2012 and the Water NSW schematic within appendix E.
- Establish a dense grassland within the EDA once installed.
- Stock must be kept out of the EDA by fencing or other physical barrier.
- This design assumes at least three-star rated plumbing fixtures are used in any new development.



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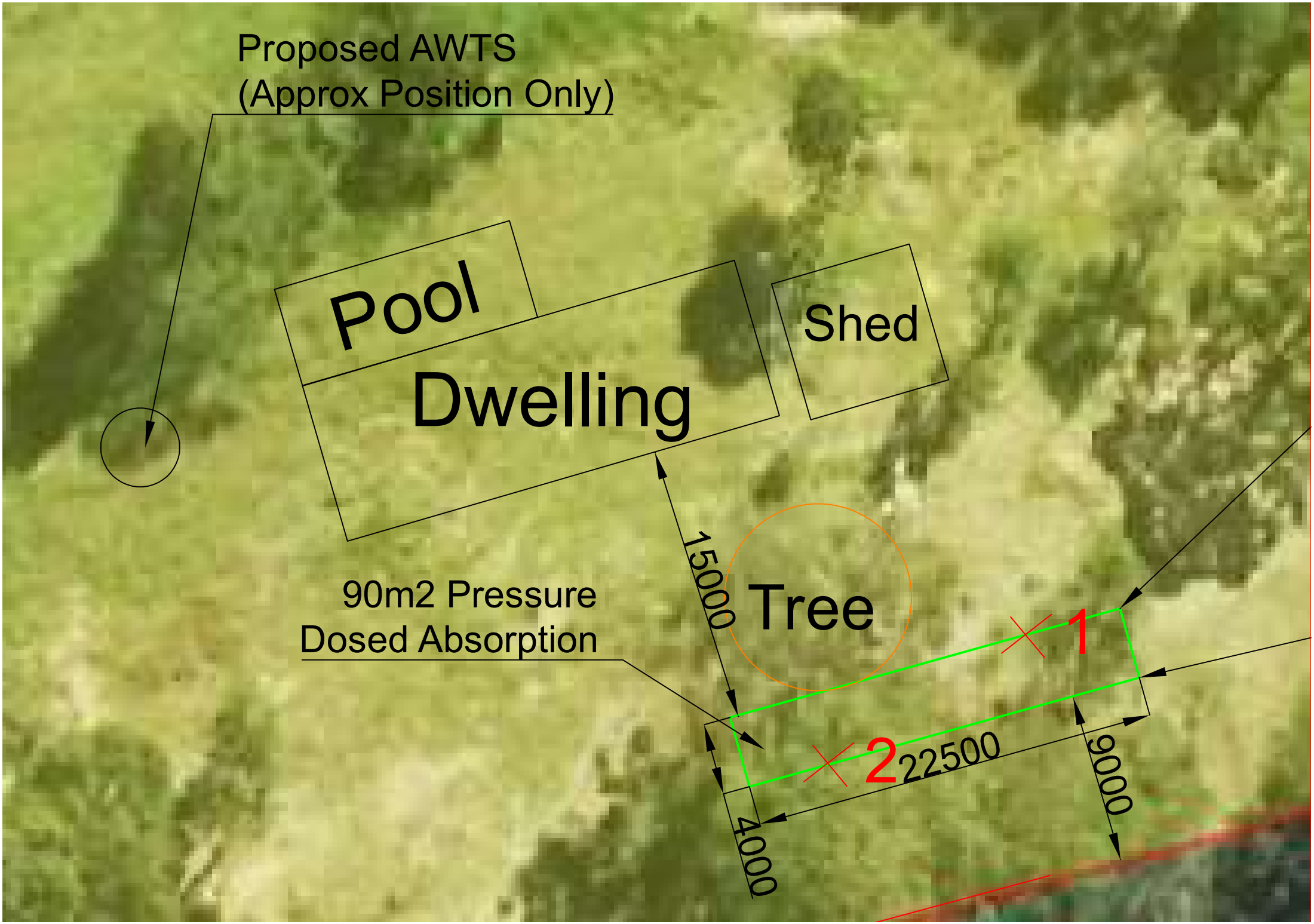
Appendix A – Site Plans


Martins Creek
Martins Creek
Martins Creek
Overland Flowpath
Proposed AWTS (Approx Position Only)
Pool
Dwelling
Shed
Tree
90m2 Pressure Dosed Absorption
81000
53000
15000
22500
9000
2000
1
2


Proposed AWTS
(Approx Position Only)
Pool
Dwelling
Shed
15000
Tree
90m2 Pressure
Dosed Absorption
1
2
22500
9000
4000

Appendix B – Proposed Plans

GENERAL NOTES

1 ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF COUNCIL, THE BUILDING CODE OF AUSTRALIA AND CURRENT AUSTRALIAN STANDARDS.

2 ALL DIMENSIONS AND LEVELS TO BE CONFIRMED PRIOR TO CONSTRUCTION.

3 REPORT ANY DISCREPANCIES TO THE DESIGNER.

4 DO NOT SCALE OFF THESE DRAWINGS.

5 THESE PLANS ARE TO BE READ TOGETHER WITH THE ENGINEERS DRAWINGS AND SPECIFICATIONS.

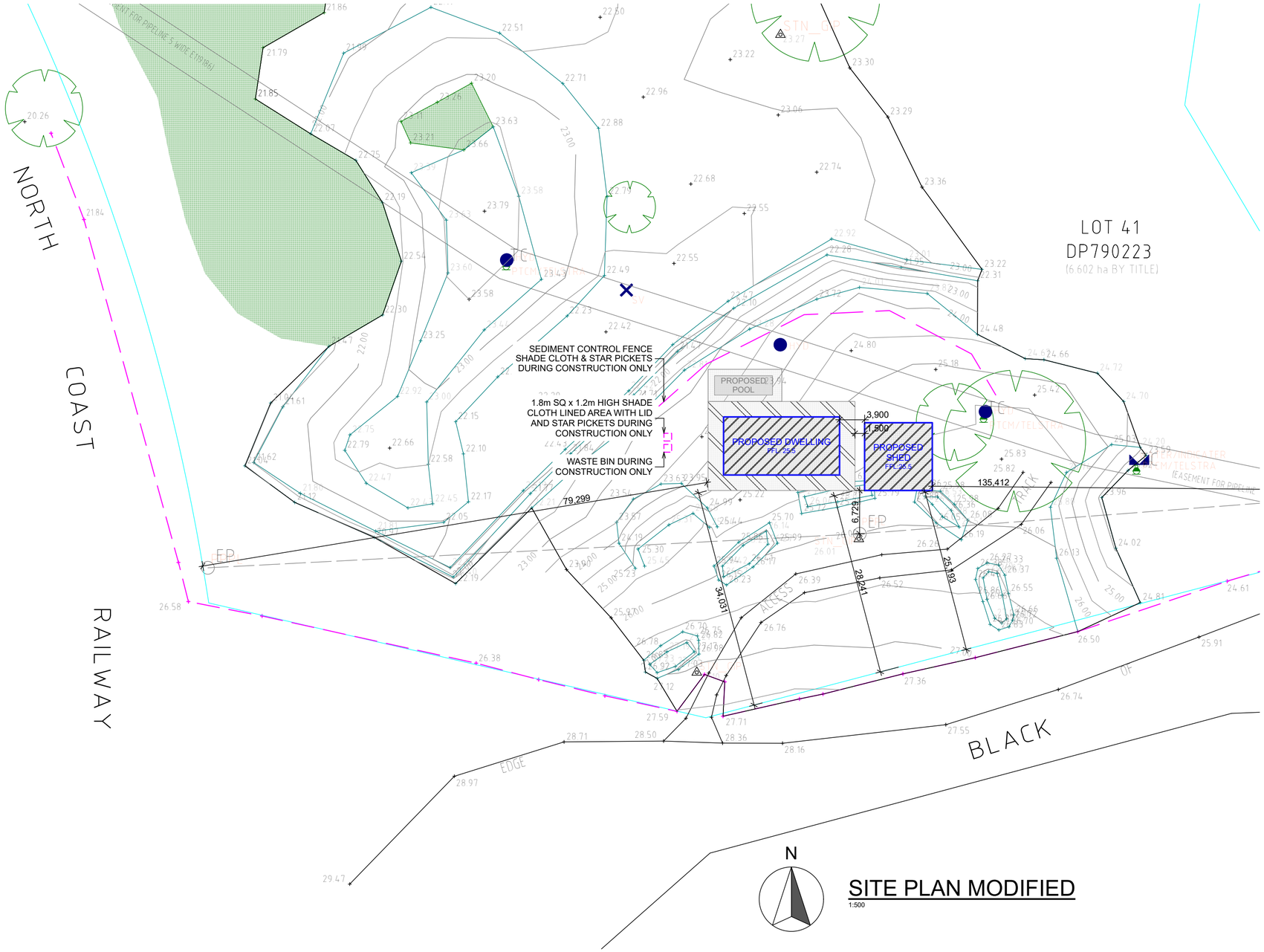
6 SCALES APPLY TO SHEET SIZE SHOWN IN THE TITLE.

7 THE BUILDER IS TO CHECK ALL FLOOR, CEILING AND ROOF LEVELS TO ENSURE THAT THE FINISHED ROOF HEIGHT DOES NOT EXCEED THE DA APPROVED RL & HEIGHT LIMIT.

8 A REGISTERED SURVEYOR IS TO SET OUT THE BUILDINGS, & CONFIRM ALL LEVELS.

LEGEND

AW	AWNING WINDOW
BFD	BI-FOLD DOOR
DH	DOUBLE-HUNG WINDOW
DP	DOWNPIPE
CONC	CONCRETE
CPT	CARPET
CW	CASEMENT WINDOW
CSD	CAVITY SLIDING DOOR
FG	FIXED GLASS
f.w.	FLOOR WASTE
GB	GLASS BLOCKS
HWS	HOT WATER SYSTEM
LV	LOUVRE WINDOW
PLD	PANEL LIFT DOOR
REF	REFRIGERATOR
RD	ROLLER DOOR
SH	SHOWER
SD	SLIDING DOOR
SW	SLIDING WINDOW
S.D.	SMOKE DETECTOR
VA	VANITY BASIN
WM	WASHING MACHINE
WC	WATER CLOSET



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SITE PLAN MODIFIED

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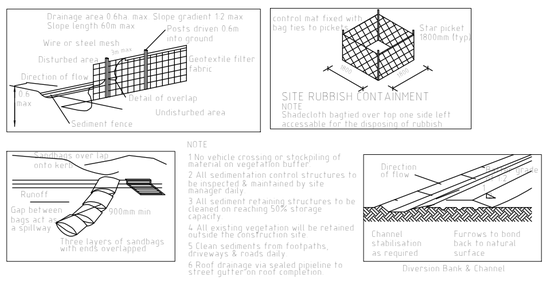

NOTE
1 No vehicle crossing or stockpiling of material on vegetation buffer
2 All sedimentation control structures to be inspected & maintained by site manager daily
3 All sediment retaining structures to be cleaned on reaching 50% storage capacity
4 All existing vegetation will be retained outside the construction site
5 Clean sediments from footpaths, driveways & roads daily
6 Roof drainage via sealed pipeline to street gutter on roof completion

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CLIENT: MASON

TITLE: SITE PLAN

FILE: 2403660 DATE: 12/12/2024 SHEET: 1 OF 8

A2

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LOCATION PLAN

1:2000

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A2

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GROUND FLOOR PLAN

1:100

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CLIENT: MASON

TITLE: FLOOR PLAN

FILE: 2403660 DATE: 12/12/2024 SHEET: 4 OF 8

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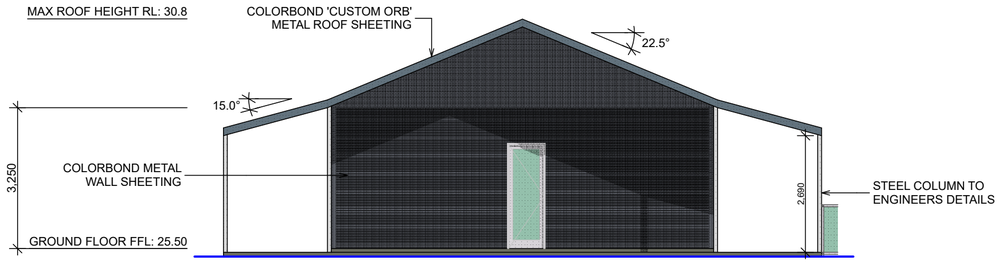

EAST ELEVATION
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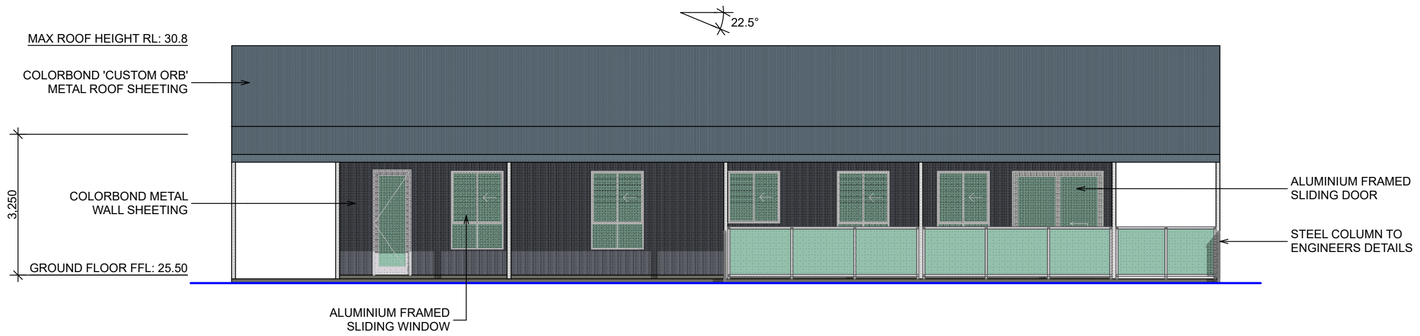

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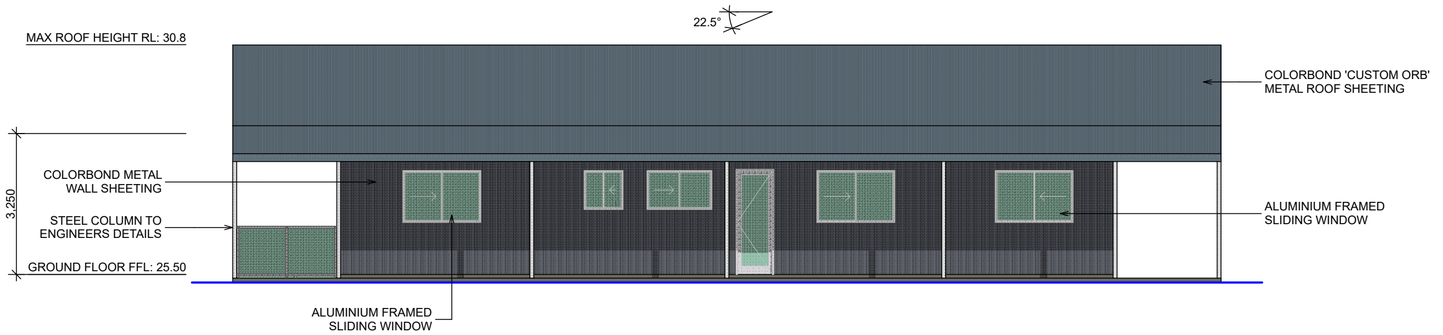

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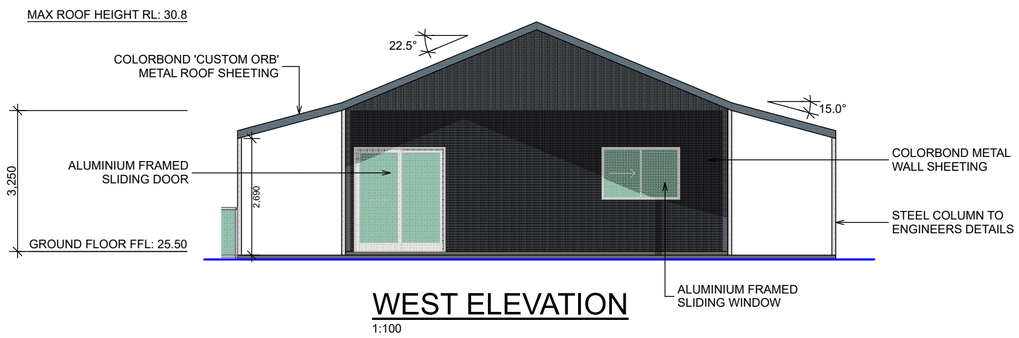

WEST ELEVATION
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CLIENT: **MASON**

TITLE: **ELEVATIONS**

FILE: **2403660** DATE: **12/12/2024** SHEET: **5 OF 8**

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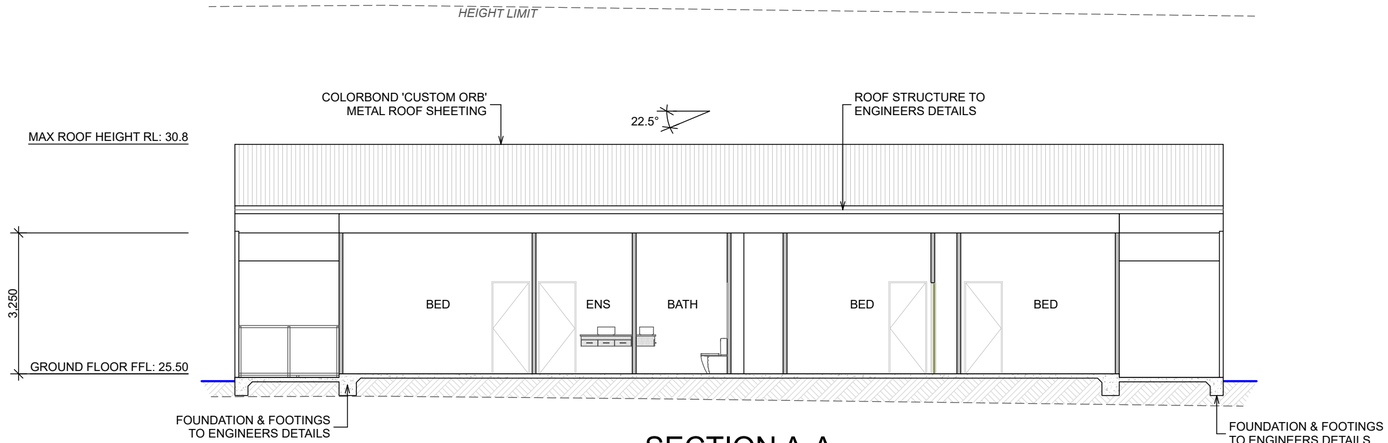

SECTION A-A

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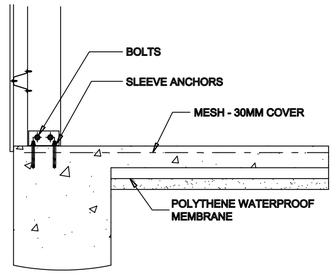

PORTAL FRAME SLAB DETAIL

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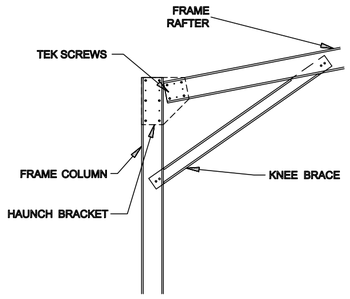

PORTAL FRAME HAUNCH DETAIL

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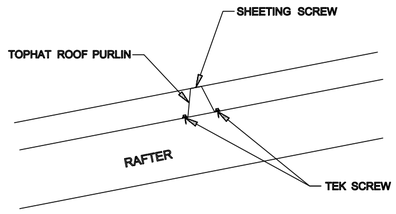

PORTAL FRAME PURLIN DETAIL

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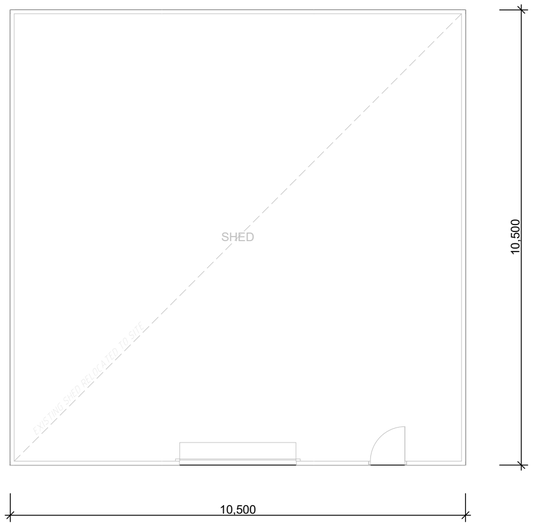
PROJECT: PROPOSED SINGLE STOREY DWELLING AT 63 BLACK ROCK ROAD, MARTINS CREEK

CLIENT: MASON

TITLE: SECTIONS

FILE: 2403660 DATE: 12/12/2024 SHEET: 6 OF 8

A2



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RELOCATED SHED PLAN
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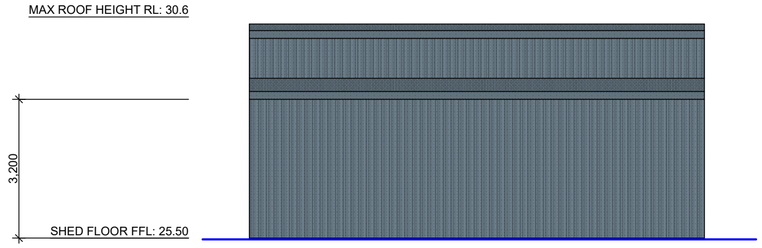

EAST ELEVATION
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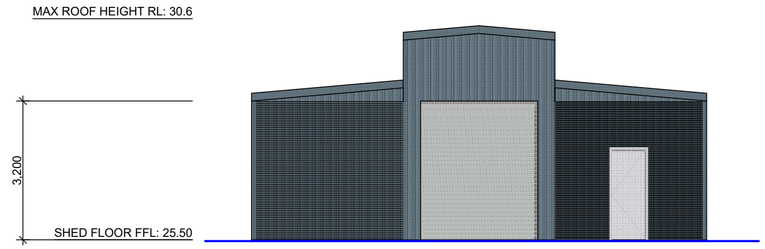
RELOCATED SHED



SOUTH ELEVATION
1:100
RELOCATED SHED

WEST ELEVATION
1:100
RELOCATED SHED

NORTH ELEVATION
1:100
RELOCATED SHED

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PROJECT: **PROPOSED SINGLE STOREY DWELLING AT 63 BLACK ROCK ROAD, MARTINS CREEK**

CLIENT: **MASON**

TITLE: **RELOCATED SHED PLANS**

FILE: **2403660** DATE: **12/12/2024** SHEET: **7 OF 8**

A2

BUSHFIRE ATTACK LEVEL REQUIREMENTS BAL 12.5 AS PER AS3959 & PLANNING FOR BUSHFIRE PROTECTION

GENERAL:

5.1 - General
A building assessed in Section 2 as being BAL-12.5 shall comply with Section 3 and Clauses 5.2 to 5.6.
Any element of construction or system that satisfies the test criteria of AS 1530.8.1 may be used in lieu of the applicable requirements contained in Clauses 5.2 to 5.8 (see Clause 3.8).
NOTE: BAL-12.5 is primarily concerned with protection from ember attack and radiant heat up to 12.5 kW/m² where the site is less than 100 m from the source of bushfire attack.

SUB FLOOR:

5.2 – Subfloor supports
(NSW Variation PFBP):-
7.2 - Subfloor supports
This Standard does not provide construction requirements for subfloor supports where the subfloor space is enclosed with:-
(a) a wall that complies with Clause 7.4, except that sarking is not required where specified in Clause 7.4.1(c); or
(b) a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium; or
(c) a combination of Items (a) and (b).
Where the subfloor space is unenclosed, the support posts, columns, stumps, piers and poles shall be:-
(i) of non-combustible material; or
(ii) of bushfire-resisting timber (see Appendix F); or
(iii) a combination of Items (i) and (ii).
NOTE: This requirement applies to the principal building only and not to verandas, decks, steps, ramps and landings (see Clause 7.7).
Combustible materials should not be stored in the subfloor space as these may be ignited by embers and cause an additional impact to the building.

FLOORS:

5.3.1 General
This Standard does not provide construction requirements for concrete slabs on the ground.

5.3.2 Elevated floors

5.3.2.1 Enclosed subfloor space
This Standard does not provide construction requirements for elevated floors, including bearers, joists and flooring, where the subfloor space is enclosed with:-
(a) a wall that conforms with Clause 5.4; or
(b) a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion resistant steel, bronze or Aluminium; or
(c) A combination of Items (a) and (b).

5.3.2.2 Unenclosed subfloor space
Where the subfloor space is unenclosed, the bearers, joists and flooring, less than 400 mm above finished ground level, shall be one of the following:-
(a) Material that conform with the following:-
(i) Bearers and joists shall be:-
(A) non-combustible; or
(B) bushfire-resistant timber (see Appendix F); or
(C) a combination of Items (A) and (B).
(ii) Flooring shall be:-
(A) non-combustible; or
(B) bushfire-resistant timber (see Appendix F); or
(C) timber (other than bushfire-resisting timber), particleboard or plywood flooring where the underside is lined with sarking-type material or mineral wool insulation; or
(D) a combination of Items (A), (B) or (C).
or
(b) be a system comforms with AS 1530.8.1
This Standard does not provide construction requirements for elements of elevated floors, including bearers, joists and flooring, if the underside of the element is 400 mm or more above finished ground level.

EXTERNAL WALLS:

(NSW Variation PFBP):-
7.4.1 GENERAL
The exposed components of external walls shall be as follows:-
(a) Non-combustible material including the following provided the minimum thickness is 90 mm:-
(i) Full masonry or masonry veneer walls with an outer leaf of clay, concrete, calcium silicate or natural stone.
(ii) Precast or in situ walls of concrete or aerated concrete.
(iii) Earth wall including mud brick.
or
(b) Timber logs of a species with a density of 680 kg/m³ or greater at a 12% moisture content; of a minimum nominal overall thickness of 90 mm and a minimum thickness of 70 mm (see Clause 3.11); and gauge planed;
or
(c) Cladding that is fixed externally to a timber-framed or a steel-framed wall and is sarked on the outside of the frame, and is:-
(i) fibre-cement a minimum of 6 mm in thickness; or
(ii) steel sheeting; or
(iii) bushfire-resisting timber (see Appendix F); or
(iv)a combination of any of Items (i), (ii) or (iii).
or
(d) a combination of any of Items (a), (b) or (c).

7.4.2 Joints
All joints in the external surface material of walls shall be covered, sealed, overlapped, backed or butt-jointed.

7.4.3 Vents and weepholes
Except for exclusions provided in Clause 3.6, vents and weepholes in external walls shall be screened with a mesh made of corrosion-resistant steel, bronze or aluminium.

EXTERNAL GLAZED ELEMENTS, ASSEMBLIES AND DOORS:

5.5.1 Bushfire shutters
Where fitted, bushfire shutters shall comply with Clause 3.7 and be made from:-
(a) non-combustible material; or
(b) a timber species as specified in Parsgraph E1, Appendix E; or
(c) bushfire-resisting timber (see Appendix F); or
(d) a combination of any of Items (a), (b) or (c).

5.5.2 Screens for windows and doors
Where fitted, screens for windows and doors shall have a mesh or perforated sheet made of corrosion-resistant steel, bronze or aluminium.
The frame supporting the mesh or perforated sheet shall be made from:-
(a) metal; or
(b) bushfire-resisting timber (see Appendix F); or
(b) a timber species as specified in Parsgraph E2, Appendix E; or

5.5.3 Windows and sidelights
Window assemblies shall:-
(a) be completely protected by a bushfire shutter that conforms with Clause 3.7 and Clause 5.5.1; or
(b) be completely protected by a bushfire shutter that conforms with Clause 3.6 and Clause 5.5.2; or
C5.5.3(A) For Clause 5.5.3(b), the screening needs to be applies to cover the entire assembly, that is including the framing, glazing, sash, sill and hardware.
or
(c) conform with the following:-
(i) Frame material - For window assemblies less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less tha 18 degrees to the horizontal and extending more than 110 mm in width from the window frame (see Figure D3, Appendix D), window frames and window joinery, shall be made from one of the following:-
(A) Bushfire-resisting timber (see Appendix F); or
(B) A timber species as specified in Parsgraph E2, Appendix E; or
(B) Metal; or
(C) Metal-reinforced uPVC and the reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel.
There are no specific restrictions on Frame material for all other windows.
(ii) Hardware - There are no specific restrictions on hardware for windows.
(iii) Glazing - Where glazing is less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the window frame (see Figure D3, Appendix D), this glazing shall be Grade A safety glass a minimum of 4 mm in thickness or glass blocks with no restriction on glazing methods.
NOTE: Where double glazed assemblies are used above, the requirements apply to the external pane of the glazed assembly only. For all other glazing, annealed glass may be used in accordance with AS1288.
(iv) Seals and weaather strips - There are no specific requirements for seals and weather strips at this BAL level.
(v) Screens - The openable portions of windows shall be screened internally or externally with screens that conform with Clause 3.6 and Clause 5.52.

C5.5.3 (B) Screening of openable portions of all windows is required in all BALs to prevent the entry of embers to the building when the window is open.

5.5.4 Doors-Side-hung external doors (including French doors, panel fold and bi-fold doors)
Side-hung external doors, including French doors, panel fold and bi-fold doors, shall:-
(a) be completely protected by bushfire shutters that comply with Clause 3.7 and Clause 5.5.1; or
(b) be completely protected externally by screens that comply with Clause 3.6 and Clause 5.5.2; or
(c) conform with the following:
(i) Door panel material - Material shall be-
(A) non-combustible; or
(B) a solid timber, laminated timber or reconstituted timber door, having a minimum thickness of 35 mm for the first 400 mm above the threshold; or
(C) hollow core door, solid timber or reconstituted timber with a non-combustible kickplate on the outside for the first 400 mm above the threshold; or
(D) hollow core door, solid timber or reconstituted timber protected externally by a screen that conforms with Clause 5.5.2; or
(E) for fully framed glazed door panels, the framing shall be made from metal or bushfire resisting timber (see Appendix F) or from a timber species as specified in Paragraph E2, Appendix E or uPVC.
(ii) Door frame material - shall be-
(A) bushfire resisting timber (see Appendix F); or
(B) a timber species as specified in Paragraph E2, Appendix E; or
(C) metal; or
(D) metal-reinforced uPVC. The reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel.
(iii) Hardware - There are no specific requirements for hardware at the BAL level.
(iv) Glazing - Where doors incorporate glazing, the glazing shall be Grade A safety glass a minimum of 4 mm in thickness, or glass blocks with no restriciton on glazing methods.
NOTE: Where double glazed units are used the above requirements apply to the external face of the window assembly only.
(v) Seals and weather strips - Weather strips, draught excluders or draught seals shall be installed.
(vi) Screens - There is no requirement to screen the openable part of the door at this BAL level.
(vii) Doors shall be tight fitting to the door frame and to an abutting door, if applicable.

5.5.5 Doors-Sliding doors
Sliding doors shall:-
(a) be completely protected by a bushfire shutter that conforms with Clause 3.7 and Clause 5.5.1; or
(b) be completely protected externally by screens that conform with Clause 3.6 and 5.5.2; or
(c) conform with the following:
(i) Frame material - The material of the door frames, including fully framed glazed doors, shall be:-
(A) bushfire-resisting timber (see Appendix F); or
(B) a timber species as specified in Paragraph E2, Appendix E. or
(C) metal or
(D) metal-reinforced uPVC and the reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel.
(ii) Hardware - There are no specfic requirements for hardware at this BAL level.
(iii) Glazing - Where the doors incorporate glazing, the glazing shall be Grade A safety glass a minimum of 4 mm in thickness.
(iv) Seals and weather strips - there are no specific requirements for seals and weather strips at this BAL level.
(v) Screens - There is no requirement to screen the openable part of the sliding door.
(vi) Sliding panels shall be tight-fitting in the frames.

5.5.6 Doors-Vehicle access doors (garage doors)
The following applies to vehicle access doors:-
(a) The lower portion of a vehicle access door that is within 400 mm of the ground when the door is closed (see Figure D4, Appendix D) shall be made from-
(i) non-combustible material; or
(ii) bushfire-resisting timber (see Appendix F); or
(iii) fibre-cement sheet a minimum of 6 mm in thickness; or
(iv) a timber species as specified in Paragraph E1, Appendix E; or
(v) a combination of any of Items (i), (ii), (iii) or (iv).
(b) All vehicle access doors shall be protected with suitable weather strips, draught excluders, draught seals or brushes. Door assemblies fitted with guide tracks do not need edge gap protection.
NOTES:
1. Refer to AS/NZS 4505 for door types.
2. Gaps of door edges or building elements should be protected as per Section 3.
C5.5.6(b) *These guide tracks do not provide a direct passage for embers into the building.*
(c) Vehicle access doors with ventilation slots shall be protected in accordance with Clause 3.6.

ROOFS (Including - penetrations, eaves, fascias & gables, and gutters & downpipes):

5.6.1 General
The following apply to all types of roofs and roofing systems:-
(a) Roof tiles, roof sheets and roof-covering accessories shall be non-combustible.
(b) The roof/wall and roof/roof junction shall be sealed, or otherwise protected in accordance with Clause 3.6.
(c) Roof ventilation openings, such as gable and roof vents, shall be fitted with ember guards made of non-combustible material or a mesh or perforated sheet that conforms with Clause 3.6 and, made of corrosion-resistant steel, bronze or aluminium.
(d) Only evaporative coolers manufactured in accordance with AS/NZS 60335.2.98 shall be used. Evaporative coolers with an internal damper to prevent entry of embers into the roof space need not be screened externally.

5.6.2 Tiled roofs
Tiled roofs shall be fully sarked. The sarking shall:-
(a) be located on top of the roof framing, except that the roof battens may be fixed above the sarking;
(b) cover the entire roof area including ridges and hips; and
(c) extend into gutters and valleys.

5.6.3 Sheet roofs
Sheet roofs shall:-
(a) be fully sarked in accordance with Clause 5.6.2, except that foil-backed insulation blankets may be installed over the battens; or
(b) have any gaps sealed at the fascia or wall line, hips and ridges by-
(i) a mesh or perforated sheet that conforms with Clause 3.6 and is made of corrosion-resistant steel, bronze or aluminium; or
(ii) mineral wool; or
(iii) other non-combustible material; or
(iv) a combination of any of Items (i), (ii), or (iii).
C5.6.3 Sarking is used as a secondary form of ember protection for the rof space to account for minor gaps that my develop in sheet roofing.

5.6.4 Veranda, carport and awning roof
The following applies to veranda, carport and awning roofs:-
(a) A veranda, carport or awning roof forming part of the main roof space [see Figure D1(a), Appendix D] shall meet all the requirements for the main roof, as specified in Clauses 5.6.1 to 5.6.6.
(b) A veranda, carport or awning roof separated from the main roof space by an external wall [see Figures D1(b) and D1(c), Appendix D] complying with Clause 5.4 shall have a non-combustible roof covering, except where the roof covering is translucent or transparent material.
NOTE: There is no requirement to line the underside of a veranda, carport or awning roof that is separated from the main roof space.

5.6.5 Roof penetrations
The following applies to roof penetrations:-
(a) Roof penetrations, including roof lights, roof ventilators, roof-mounted evaporative cooling units, aerials, vent pipes and supports for solar collectors or the like, shall conform with Clause 3.6 and be made of corrosio-resistant steel, bronze or aluminium.
(b) Openings in vented roof lights, roof ventilators or vent pipes shall conform with Clause 3.6 (be fitted with ember guards made from a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium). This requirement does not apply to a room sealed gas appliance.
NOTE:- A gas appliance designed such that air for combustion does not enter from, or combustion products enter into, the room in which the appliance is located.
In the case of gas appliance flues, ember guards shall not be fitted.
NOTE:- AS/NZS 5601 contains requirements for gas appliance flue systems and cowls. Advice can be obtained from manufacturers and State and Territory gas technical regulators.
(c) All overhead glazing shall be Grade A safety glass complying with AS 1288.
(d) Glazed elements in roof lights and skylights may be of polymer, provided a Grade A safety glass diffuser, that conforms with AS 1288, is installed under the glazing. Where glazing is an insulating glazing unit (IGU), Grade A toughened safety glass of minimum 4 mm in thickness shall be used in the outer pane of the IGU.
(e) Flashing elements of tubular skylights may be of a fire-retardant material, provided the roof integrity is maintained by an under-flashing of a material having a flammability index not greater than 5.
(f) Evaporative cooling units shall be fitted with non-combustible butterfly closers as practicable to the roof level, or the unit shall be fitted with non-combustible covers with a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.
(g) Vent pipes can be made from PVC are permitted.
(h) Eaves lighting shall be adequately sealed and not compromise the performance of the element.

5.6.6 Eaves linings, fascias and gables
The following applies to eaves linings, fascias and gables:-
(a) Gables shall comply with Clause 5.4.
(b) Eaves penetrations shall be protected as for roof penetrations, as specified in Clause 5.6.5.
(c) Eaves ventilation openings shall be fitted with ember guards in accordance with Clause 3.6 and made of corrosion-resistant steel, bronze or aluminium.
(d) Joints in eaves linings, fascias and gables may be sealed with plastic joining strips or timber storm moulds.
This Standard does not provide construction requirements for fascias, bargeboards and eaves linings.

5.6.7 Gutters and downpipes
This Standard does not provide material requirements for:-
(a) gutters, with the exception of box gutters; and
(b) downpipes.
If installed, gutter and valley leaf guards shall be non-combustible.
Box gutters shall be non-combustible and flashed at the junction with the roof with non-combustible material.

VERANDAS, DECKS, STEPS AND LANDINGS:

5.7.1 General
Decking may be spaced.
There is no requirement to enclose the subfloor spaces of verandas, decks, steps, ramps or landings.
C5.7.1 Spaced decking is nominally spaced at 3 mm (in accordance with standard industry practice); however, due to the nature of timber decking with seasonal changes in moisture content, that spacing may range from 0-5 mm during service. It should be noted that recent research studies have shown that gaps at 5 mm spacing afford opportunity for embers to become lodged in between timbers, which may contribute to a fire. Larger gap spacing of 10 mm may preclude this from happening but such a spacing regime may not be practical for a timber deck.

5.7.2 Enclosed subfloor spaces of verandas, decks, steps, ramps and landings

5.7.2.1 Materials to enclose a subfloor space
This Standard does not provide construction requirements for the material used to enclose a subfloor space except where those materials are less than 400 mm from the ground.
Where the material used to enclose a subfloor space are less than 400 mm from the ground, they shall comform with Clause 5.4.

5.7.2.2 Supports
This Standard does not provide construction requirements for support posts, columns, stumps, stringers, piers and poles.

5.7.2.3 Framing
This Standard does not provide construction requirements for the framing of verandas, pergolas, decks, ramps or landings (i.e., bearers and joists).

5.7.2.4 Decking, stair treads and the trafficable surfaces of ramps and landings
This Standard does not provide construction requirements for decking, stair treads and the trafficable surfaces of ramps and landings that are more than 300 mm from a glazed element.
Decking, stair treads and the trafficable surfaces of ramps and landings less than 300 mm (measured horizontally at the deck level) from glazed elements that are less than 400 mm (measured vertically) from the surface of the deck (see Figure D2, Appendix D) shall be made from:-
(a) of non-combustible material; or
(b) of bushfire-resisting timber (see Appendix F); or
(c) a timber species as specified in paragraph E1, Appendix E; or
(d) uPVC; or
(e) a combination of Items (a), (b), (c) or (d).

5.7.3 Unenclosed subfloor spaces of verandas, decks, steps, ramps and landings

5.7.3.1 Supports
This Standard does not provide construction requirements for support posts, columns, stumps, stringers, piers and poles.

5.7.3.2 Framing
This Standard does not provide construction requirements for the framing of verandas, decks, ramps or landings (i.e., bearers and joists).

5.7.3.3 Decking, stair treads and the trafficable surfaces of ramps and landings
This Standard does not provide construction requirements for decking, stair treads and the trafficable surfaces of ramps and landings that are more than 300 mm from a glazed element.
Decking, stair treads and the trafficable surfaces of ramps and landings less than 300mm (measured horizontally at the deck level) from glazed elements that are less than 400 mm (measured vertically) from the surface of the deck (see Figure D2, Appendix D) shall be made from:-
(a) a non-combustible material; or
(b) a bushfire-resisting timber (see Appendix F); or
(c) a timber species as specified in Paragraph E1, Appendix E; or
(d) a combination of Items (a), (b) or (c).

5.7.4 Balustrades, handrails or other barriers
This Standard does not provide construction requirements for balustrades, handrails and other barriers.

5.7.5 Veranda posts
Veranda posts:-
(a) Shall be timber mounted on galvanized mounted shoes or stirrups with a clearance of not less than 75 mm above the adjacent finished ground level; or
(b) less than 400 mm (measured vertically) from the surface of the deck or ground (see Figure D2, Appendix D) shall be made from:-
(i) a non-combustible material; or
(ii) a bushfire-resisting timber (see Appendix F); or
(iii) a timber species as specified in Paragraph E1, Appendix E; or
(iv) a combination of Items (i), (ii) and (iii) above.

WATER AND GAS SUPPLIES:

5.8 WATER AND GAS SUPPLY PIPES
Above-ground, exposed water and gas supply pipes shall be metal.
External gas pipes and fittings above ground shall be of steel or copper construction having a minium wall thickness in accordance with gas regulations or 0.9 mm whichever is the greater. The metal pipe shall extend a minimum o 400 mm within the building and 100 mm below ground.
NOTE:- Refer to State and Territory gas regulations, AS/NZS 5601.1 and AS/NZS 4645.1
C5.8 Concern is raised for the protection of bottled gas installations. Location, sheilding and venting of the gas bottles needs to be considered.

3.2 CONSTRUCTION REQUIREMENTS FOR SPECIFIC STRUCTURES:

3.2.1 Attached structures and structures sharing a common roof space
Where any part of a garage, carport, veranda, cabana, studio, storeage area or similar roofed structure is attached to, or shares a common roof space with, a building required to conform with this Standard, the entire garage, carport, veranda or similar roofed structure shall conform with the construction requirements of this Standard, as applicable to the subject building.
Alternatively, the structure shall be separated from the subject building by a wall that extends to the underside of a non-combustible roof covering, and that conforms with one of the following:-
(a) The wall shall have an FRL of not less than 60/60/60 for loadbearing walls and -/60/60 for non-loadbearing walls when tested from the attached structure side and shall have openings protected as follows:-
(i) Doorways-by self-closing fire doors with an FRL of -/60/30, that conforms with AS1905.1 and tested in accordance with AS 1530.4.
(ii) Windows-by fire windows with an FRL of -/60/- when tested in accordance with AS 1530.4 and permanently fixed in the closed position.
(iii) Other openings-by construction with an FRL of not less than -/60/- when tesed in accordance with AS 1530.4.
NOTE: Control and construction joints, subfloor vents, weepholes and penetrations for pipes and conduits need not comply with [Item (iii)].
or
(b) The wall shall be of masonry, earth wall or masonry-veneer construction with the masonry leaf of not less than 90 mm in thickness and shall have openings protected as follows:-
(i) Doorways-by self-closing fire doors with an FRL of -/60/30, that conforms with AS1905.1 and tested in accordance with AS 1530.4.
(ii) Windows-by fire windows with an FRL of -/60/- when tested in accordance with AS 1530.4 and permanently fixed in the closed position.
(iii) Other openings-by construction with an FRL of not less than -/60/- when tesed in accordance with AS 1530.4.
NOTE: Control and construction joints, subfloor vents, weepholes and penetrations for pipes and conduits need not comply with [Item (iii)].

3.2.2 Garages and carports below the subject building
Where a garage or carport is below a building required to comply with this Standard, it shall conform with the construction requirements of this Standard, as applicable to the subject building.
Alternatively, any construction separating the garage or carport (including walls and flooring systems) from the remainder of the building shall comply with one of the following:-
(a) The separating construction shall have an FRL of not less than 60/60/60 for loadbearing construction and -/60/60 for non-loadbearing construction when tested from the garage or carport side and shall have openings protected in accordance with the following:-
(i) Doorways-by self-closing fire doors with an FRL of -/60/30, that conforms with AS1905.1 and tested in accordance with AS 1530.4.
(ii) Windows-by fire windows with an FRL of -/60/- when tested in accordance with AS 1530.4 and permanently fixed in the closed position.
(iii) Other openings-by construction with an FRL of not less than -/60/- when tesed in accordance with AS 1530.4.
NOTE: Control and construction joints, subfloor vents, weepholes and penetrations for pipes and conduits need not comply with [Item (iii)].
or
(b) Where part of or all of the separating construction is a wall, the wall need not conform with Item (a) above, provided the wall is of masonry, earth or masonry-veneer construction with the masonry leaf of not less than 90 mm in thickness and the wall has openings protected in accordance with the following:-
(i) Doorways-by self-closing fire doors with an FRL of -/60/30, that conforms with AS1905.1 and tested in accordance with AS 1530.4.
(ii) Windows-by fire windows with an FRL of -/60/- when tested in accordance with AS 1530.4 and permanently fixed in the closed position.
(iii) Other openings-by construction with an FRL of not less than -/60/- when tesed in accordance with AS 1530.4.
NOTE: Control and construction joints, subfloor vents, weepholes and penetrations for pipes and conduits need not comply with [Item (iii)].

3.2.3 Adjacent structures on the subject allotment
Where any garage, carport, or similar roofed structure on the subject allotment is not attached to a building required to conform with this Standard, that structure shall conform with the construction requirements of this Standard.
Alternatively, the adjacent structure shall be separated from the subject building by one of the following:-
(a) A distance of not less than 6 m from the building required to comply with this Standard. This distance is measured as any horizontal straight lines from the adjacent structure to the subject building. or
(b) A wall of the building required to conform that extends to the underside of a non-combustible roof covering and has an FRL of not less than 60/60/60 for loadbearing walls and -/60/60 for non-loadbearing walls when tested from the outside. Any openings in the wall shall be protected in accordance with the following:-
(i) Doorways-by self-closing fire doors with an FRL of -/60/30, that conforms with AS1905.1 and tested in accordance with AS 1530.4.
(ii) Windows-by fire windows with an FRL of -/60/- when tested in accordance with AS 1530.4 and permanently fixed in the closed position.
(iii) Other openings-by construction with an FRL of not less than -/60/- when tesed in accordance with AS 1530.4.
NOTE: Control and construction joints, subfloor vents, weepholes and penetrations for pipes and conduits need not comply with [Item (iii)].
or
(c) A wall of the building required to conform that extends to the underside of a non-combustible roof covering and is of masonry, earth or masonry-veneer construction with the masonry leaf of not less than 90 mm in thickness. Any openings in the wall shall be protected in accordance with the following:-
(i) Doorways-by self-closing fire doors with an FRL of -/60/30, that conforms with AS1905.1 and tested in accordance with AS 1530.4.
(ii) Windows-by fire windows with an FRL of -/60/- when tested in accordance with AS 1530.4 and permanently fixed in the closed position.
(iii) Other openings-by construction with an FRL of not less than -/60/- when tesed in accordance with AS 1530.4.
NOTE: Control and construction joints, subfloor vents, weepholes and penetrations for pipes and conduits need not comply with [Item (iii)].

3.3 EXTERNAL MOULDINGS
Unless otherwise required in Clause 3.6.1 and Sections 5 to 9, combustible external mouldings, jointing strips, trims and sealants may be used for decorative purposes or to cover joints between sheeting material.

3.4 HIGHER LEVELS OF CONSTRUCTION
Construction requirements specified for a particular BAL shall be acceptable for a lower level.
NOTE: For example, if the site has been assessed at BAL-12.5, BAL-12.5 construction is required; however any element or combination of elements contained BAL-19, BAL-29, BAL-40 and BAL-FZ levels of construction may be used to satisfy this Standard.

3.5 REDUCTION IN CONSTRUCTION REQUIREMENTS DUE TO SHIELDING
Where an elevation is not exposed to the source of bushfire attack, then the construction requirements for that elevation can reduce to the next lower BAL. However it shall not reduce below BAL-12.5.
An elevation is deemed to be not exposed to the source of bushfire attack if all of the straight lines between that elevation and the source of bushfire attack are obstructed by another part of the same building (see Figure 3.1). However it shall not reduce below BAL-12.5.
The shielding of an elevation shall apply to all the elements of the wall, including openings, but shall not apply to subfloors or roofs.

3.6 VENTS, WEEPHOLES, GAPS AND SCREENING MATERIAL
3.6.1 Vents, weepholes, joints and the like
All gaps including vents, weepholes and the like shall be screened, except for weepholes to the sils of windows and doors.
All joints shall be suitably backed with a breathable sarking or mesh, except as permitted by Clause 3.3.
The maximum allowable aperture size of any mesh or perforated material used as a screen shall be 2 mm.

C3.6.1 Weephole in sills of windows and doors and those gaps between doors and door jambs, heads or sills (thresholds) are exempt from screening because they do not provide a direct passage for embers to the interior of the building or building cavity.

3.6.2 Gaps to door and window openings
Where screens are fitted to door openings for ember protection, they shall have a maximum aperture of 2.0 mm and be tight fitting to the frame in the closed position.
Gaps between doors including jambs, heads or sills (thresholds) shall be protected using draught seals and excluders or the like (see Figure 3.2)
Windows conformant with AS 2047 will satisfy the requirements for gap protection.
Screens fitted to window openings shall have a maximum aperture of 2.0 mm and these shall be tight fitting to the frames.

C3.6.2 There is no requirement to screen the openable parts of doors for ember protection at the lower BALs, however in many circumstances it may be desireable to screen the opening for insect protection. In such circumstances, where the insect screen is fitted internally, such screens may be considered as a door furnishing and the use of non-metallic mesh would be permissible, provided the screening system is fitted internally and wholly protected by the closed door.

3.7 BUSHFIRE SHUTTERS
Bushfire shutters shall-
(a) protect the entire window assembly including framing, glazing, sash and sill;
(b) protect the entire door assembly including framing, glazing, sill and hardware;
(c) consist of materials specified in Clauses 5.5.1, 6.5.1, 7.5.1, 8.5.1 and 9.5.1 for the relevant BAL;
(d) be fixed to the building and be non-removable;
(e) be capable of being closed manually from either inside or outside or motorised shutter systems, where they are not reliant on mains power to close;
NOTE: If power-assisted shutter systems are used then that system is powered with continuous back-up energy such as a battery system.
(f) when in the closed position, have no gap greater than 2mm between the shutter and the wall, frame or sill; and
(g) where perforated, have uniformly distributed perforations with a maximum aperture of 2 mm and a perforated area no greater than 20% of the shutter.

If bushfire shutters are fitted to all external doors then at least one of those shutters shall be operable from the inside to facilitate safe egress from the building.

3.8 TESTING OF MATERIAL, ELEMENTS OF CONSTRUCTION AND SYSTEMS TO THE AS 1530.8 SERIES
Unless otherwise specified, elements of construction and systems satisfy this Standard when tested in accordance with the AS 1530.8 series for the relevant BAL and Crib Class as follow:-

1	Criteria Tests to AS 1530.8.1	BAL-12.5 to BAL-40	Crib Class AA
2	Criteria Tests to AS 1530.8.2	BAL-FZ	Crib Class N/A

Elements of construction or systems tested in accordance with AS 1530.8-2007 with Crib Classes A, B and C prior to the issue of this standard are acceptable.
Where any element of construction or system satisfies the test criteria of the AS 1530.8. series without screening for ember protection, the requirements of this Standard for screening of openable parts of windows shall still apply.
Where a window protected with a shutter satifies the test criteria of the AS 1530.8 series, the additional requirements of this Standard for screening of openable parts of windows do not apply.
NOTE: The ember protection function of tested shutter has been verified by the testing

3.9 GLAZING
Glazing requirements shall be in accordance with Sections 5 to 9 of this Standard.
NOTES:
1 Where double-glazed units are used, the glazing requirements provided in this Standard apply to the external face of the window assembly only.
2 Refer to AS 1288 for an explanation of the terminologies used to describe various types of glass in this Standard.

3.10 SARKING
~~Where sarking is required in Sections 5 to 9, it shall have a flammability index of not greater than 5 when tested to AS 1530.2.~~
C3.10 Sarking material is a principle component used to control condensation and is used for energy efficiency purposes under the NCC. It may be vapour permeable or impermeable dependant on its location within the structure. Seek independent advice regarding selection of sarking prior to installation.

(NSW Variation PFBP)
Where sarking is required in Sections 5 to 9, shall be as follows:-
(a) be non-combustible; or
(b) comply with AS/NZS 4200.1, be installed on the outside of the frame and have a flammability index of not more than 5 as determined by AS 1530.2.

3.11 TIMBER LOG WALLS
Where the thickness of a timber log wall is specified in Sections 5, 6 and 7, two criteria are nominated, as follows:
(a) The nominal overall thickness is the overall thickness of the wall.
(b) The minimum thickness is the thickness of the wall at the interface of two logs in the wall.
For most log profiles, the thickness of the log at the interface with an adjacent log is less than the overall thickness of the wall.

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PROJECT: PROPOSED SINGLE STOREY DWELLING AT 63 BLACK ROCK ROAD, MARTINS CREEK
CLIENT: MASON
TITLE: BAL 12.5 NOTES
FILE: 2403660 DATE: 12/12/2024 SHEET: 8 OF 8

A2

Appendix C – Operation and Maintenance Guideline

ON-SITE SEWAGE MANAGEMENT SYSTEMS

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

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

More information can be obtained from the pamphlets:

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

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

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

What is an on-site sewage management system?

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

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

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

How does an on-site sewage management system work?

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

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

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

Treatment and application can be carried out using various methods:

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

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

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

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

Regulations and recommendations

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

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

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

Keeping your on-site sewage management system operating well

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

DO

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

DON'T

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

Reducing water usage

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

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

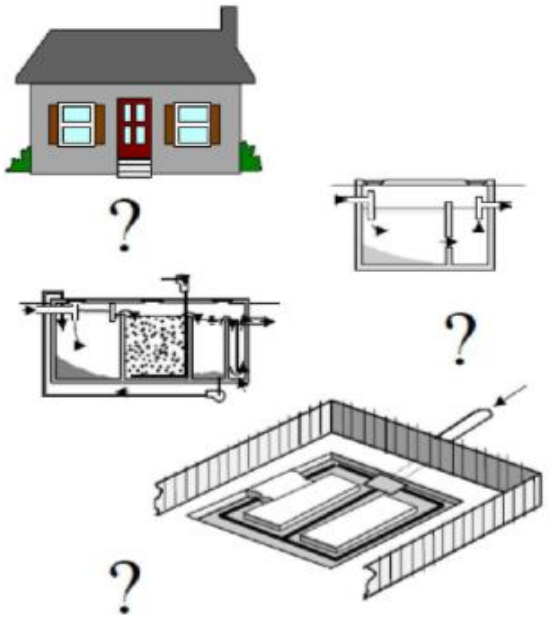
HELP PROTECT YOUR HEALTH AND THE ENVIRONMENT

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

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

For more information please contact:

Managing Wastewater In Your Backyard



Aerated Wastewater Treatment Systems (AWTS)

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

What is an AWTS?

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

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

How does an AWTS work?

Wastewater from a household is treated in stages in several separate chambers. The first chamber is similar to a conventional septic tank. The wastewater enters the chamber where the solids settle to the bottom and are retained in the tank forming a sludge layer. Scum collects at the top, and the partially clarified wastewater flows into a second chamber. Here the wastewater is mixed with air to assist bacteria to further treat it. A third chamber allows additional clarification through the settling of solids, which are returned for further treatment to either the septic chamber (as shown) or to the aeration chamber. The clarified effluent is disinfected in another chamber (usually by chlorination) before irrigation can take place.

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

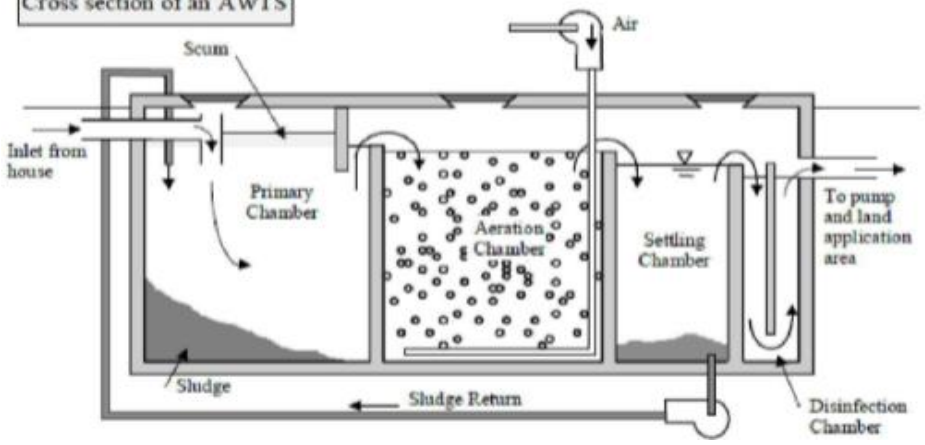
Regulations and recommendations

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

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

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

Cross section of an AWTS



Maintaining your AWTS

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

DO

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

DON'T

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

Reducing water usage

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

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

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

Warning signs

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

Look out for the following warning signs:

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

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

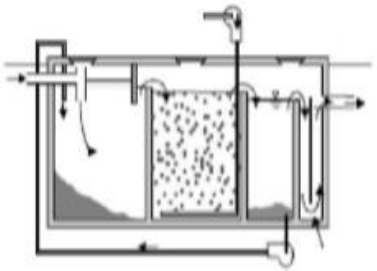
HELP PROTECT YOUR HEALTH AND THE ENVIRONMENT

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

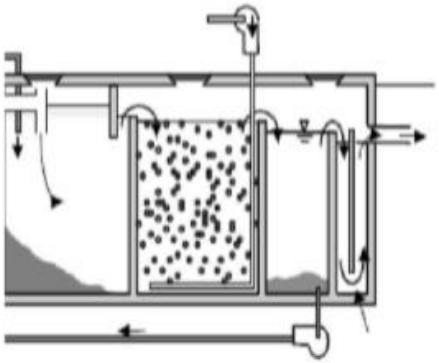
By looking after your treatment system you can do your part in helping to protect the environment and the health of you and your family.

If you would like more information please contact:

Your Aerated Wastewater Treatment System



Your Aerated Wastewater Treatment System



- Black coloured effluent in the aerated tank.
- Excess noise from the blower or pumping equipment
- Poor vegetation growth in irrigated area.

LAND APPLICATION AREAS

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

What are land application areas?

These are areas that allow treated domestic wastewater to be managed entirely on-site.

The area must be able to utilise the wastewater and treat any organic matter and wastes it may contain. The wastewater is rich in nutrients, and can provide excellent nourishment for flower gardens, lawns, certain shrubs and trees. The vegetation should be suitably tolerant of high water and nutrient loads.

How does a land application area work?

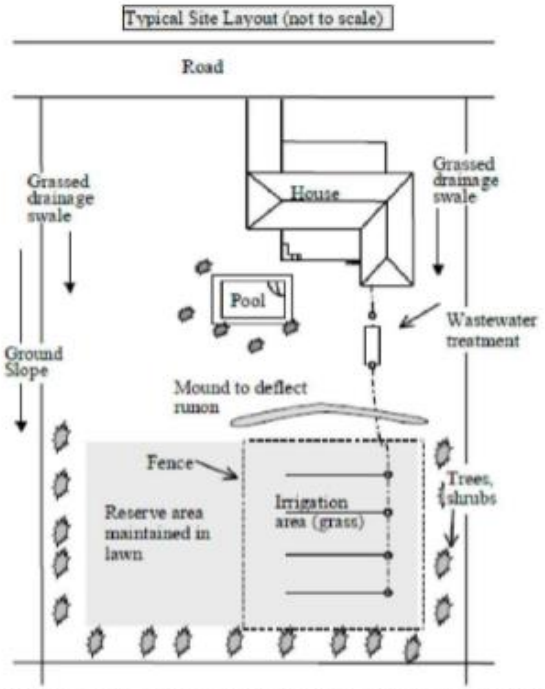
Treated wastewater applied to a land application area may be utilised or simply disposed, depending on the type of application system that is used. The application of the wastewater can be through a soil absorption system (based on disposal) or through an irrigation system (based on utilisation).

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

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

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

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



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

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

Regulations and recommendations

The design and installation of land application areas should only be carried out by suitably qualified or experienced people, and only after a site and soil evaluation is done by a soil scientist. Care should be taken to ensure correct buffer distances are left between the application area and bores, waterways, buildings, and neighbouring properties.

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

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

RECLAIMED EFFLUENT
NOT FOR DRINKING
AVOID CONTACT

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

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

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

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

Location of the application area

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

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

Maintaining your land application area

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

DO

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

DON'T

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

Warning signs

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

The visual signs of system failure include:

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

Volume of water

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

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

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

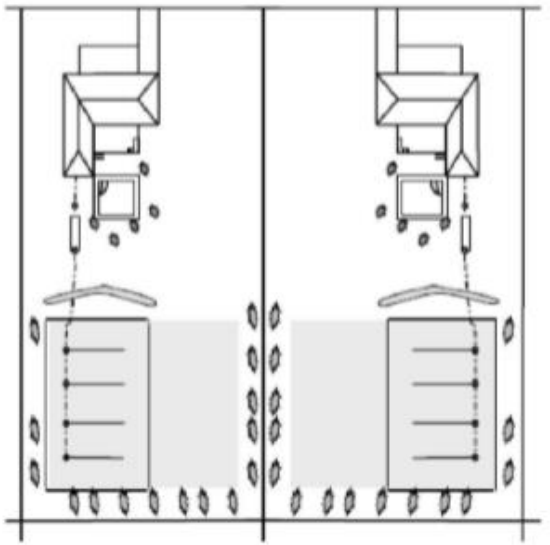
HELP PROTECT YOUR HEALTH AND THE ENVIRONMENT

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

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

For more information please contact:

Your Land Application Area



Appendix D – Laboratory Results

CERTIFICATE OF ANALYSIS

Work Order	: **EW2404430**	Page	: 1 of 3
Client	: **GSL Environmental**	Laboratory	: Environmental Division NSW South Coast
Contact	: Simon Doberer	Contact	: Mechelle Sahyoun
Address	: 71 Moona Creek Road Vincentia	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: 02 42253125
Project	: Black Rock Road, MARTINS CREEK	Date Samples Received	: 26-Sep-2024 15:47
Order number	: 143824	Date Analysis Commenced	: 02-Oct-2024
C-O-C number	: ----	Issue Date	: 08-Oct-2024 15:27
Sampler	: Client - S Doberer		
Site	: ----		
Quote number	: EW23GSLENV0001		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP1	----	----	----	----
			Sampling date / time	25-Sep-2024 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2404430-001	--------	--------	--------	--------
				Result	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**5.7**	----	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**74**	----	----	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**9.6**	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**3.9**	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	**0.6**	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	**0.5**	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**14.6**	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	**3.3**	----	----	----	----
EK072: Phosphate Sorption Capacity								
Phosphate Sorption Capacity	----	250	mg P sorbed/kg	**1860**	----	----	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry / Biology).

(SOIL) EA010: Conductivity (1:5)

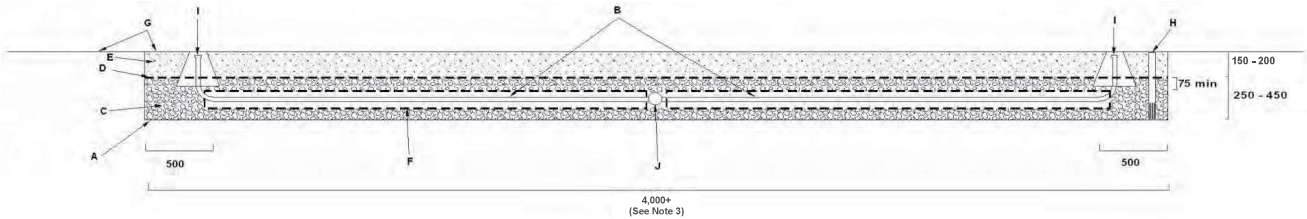
(SOIL) EA002: pH 1:5 (Soils)

(SOIL) EK072: Phosphate Sorption Capacity

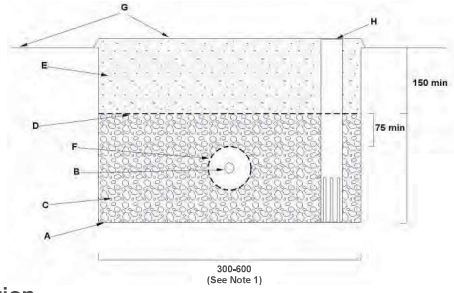
(SOIL) ED007: Exchangeable Cations

Appendix E – Pressure Dosed Bed Schematics

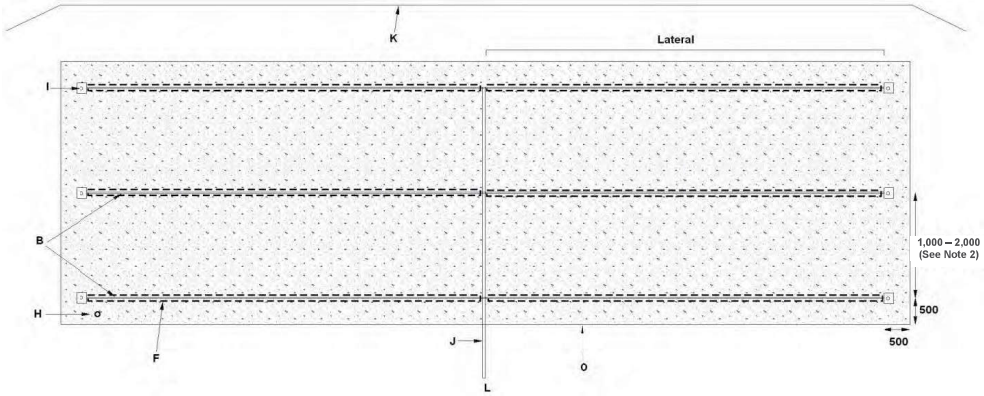
Cross Section: Pressure-dosed Bed



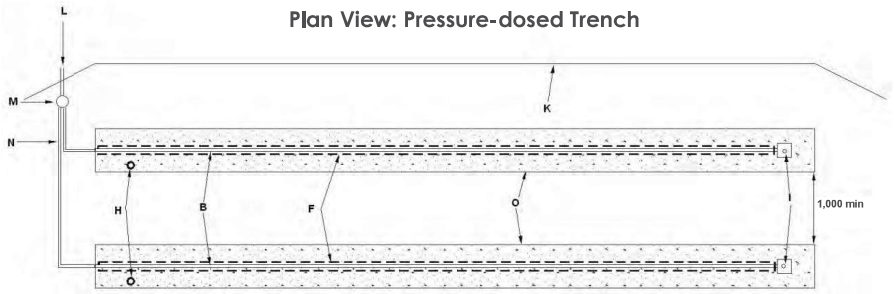
Cross Section: Pressure-dosed Trench



Plan View: Pressure-dosed Bed



Plan View: Pressure-dosed Trench



Pressure-dosed Trench / Bed Construction

A The base of the trench / bed must be level to ensure even distribution of effluent. Base levels should be checked with a dumpy / laser level.

B Pressure-dosing manifold consisting of 25mm PVC pipe with 3mm holes drilled (deburred) at 400mm centres facing upwards. Where a dosing device is used in place of a pump, holes will need to be 4-5mm depending on flow rate achieved. The total number and length of laterals will be determined by the required bed size (m^2) and the lateral spacings shown in this drawing.

C 20-40mm distribution aggregate.

D Geotextile filter cloth.

E Clean local or imported topsoil (sandy loam to clay loam).

F 90mm slotted PVC or agricultural pipe over manifold laterals.

G Grass must be established across the construction area as soon as possible. Trench / bed surface should be level or slightly mounded.

H Inspection port on downhill side of trench / bed. Made from 50mm PVC pipe with perforations in the aggregate level of the trench / bed.

I Individual flush points for each lateral. May be a screw cap fitting on a 90 degree elbow level with the bed surface or a pressure controlled flush valve (such as those used for subsurface irrigation systems) inside an irrigation control box. Manual flushing should be carried out at least every 12 months.

J 40mm PVC dosing manifold. Larger systems may require different pipe sizes and orifice reducers at lateral connection points.

K Upslope stormwater diversion drain (see Standard Drawing 9A for design detail). Sub-soil drainage may be necessary on particular sites.

L Pump dosed effluent from treatment system. The pump must be capable of delivering the total flow rate required for all laterals whilst providing a 1.5m residual head (i.e. squirt height) at the highest orifice (with no more than 10% variation in squirt height across the whole bed). For beds with individual laterals no more than 10m long, it is acceptable to adopt a flow rate of 3.5-4L/min/lineal metre. Total dynamic head (including friction loss) will need to be determined on a site-specific basis.

M Hydraulically operated indexing valve that delivers effluent to a different trench / bed or set of laterals at each pump cut-in.

N 25mm polyethylene or PVC dosing manifold.

O Trench / bed dimensions are an example only. The basal area of the land application area must be determined according to the procedures in AS/NZS 1547:2012 and this Manual. A minimum bed length to width ratio of 3:1 must be adopted when developing individual designs and beds must be installed parallel to the site contours. The location and orientation of the area should be based on a site and soil assessment by a suitably qualified person. The system may comprise a single trench / bed or multiple smaller trenches / beds.

Notes

1. Trenches should optimally be 600mm wide. Optimum width will balance storage requirements against footprint and required trench length.
2. Nominal lateral spacing of 2,000mm for clay loams to light clays. 1,000mm for sandy loams to sands.
3. Consideration should be given to ensuring all beds have a level base when determining an appropriate width. The distribution manifold must also be level. Beds longer than 30m will require specialist hydraulic design.
4. WaterNSW notes that drilling holes within PVC pipe makes them non-compliant with the AS/NZS 3500, as it impacts the structural integrity of the pipe.

Standard Drawing 10C – Pressure-dosed Bed / Trench

(not to scale)