CALARE CIVIL
CONSULTING ENGINEERS

20220749
07 July, 2022

Peter Collett
3 Mustang Road
Rylstone Airpark NSW 2849

Attention: Peter Collett

Dear Peter

RE: Effluent Disposal Investigation - Lot 11, 3 Mustang Road, Rylstone Airpark NSW 2849

INTRODUCTION

At your request we have carried out a Geotechnical investigation for the above project. The objectives of this work were to i) identify the subsoils generally underlying the area, and assess subsoil reactivity, ii) Design a method of on-site effluent disposal for the site in accordance with the following Current Recommended Practice (CRP) documents:

- AS/NZS 1547:2012 On-site Domestic Wastewater Management (Standards Australia 2012)
- On-site Sewage Management for Single Households (Office of Local Government 1998)
- Designing & Installing On-Site Wastewater Systems (Sydney Catchment Authority 2019)
- The New South Wales Feedlot Manual (NSW DPI / Agriculture 1998)
- Septic Tank and Collection Well Accreditation Guideline (NSW Health 2001)

LOCATION

The site is located on a small residential lot along Mustang Road, in Rylstone. The lot is approximately 1680m in size, and the proposed dwelling site is not near any permanent surface waters.

SUBSURFACE CONDITIONS

One soil-observation pit was dug at the site using an excavator. The site stratigraphy at the proposed disposal site as revealed by the soil pit comprised typically of the following:

0mm-200mm: Brown, slightly moist, sandy silt, with very few fine to coarse gravels, moderately structured
200mm-1000mm: Brown orange, slightly moist, silty clay, with very few fine gravels, strongly structured
EOP 1000mm

Groundwater was not encountered during the fieldwork.

CIVIL • STRUCTURAL

Calare Civil Pty Ltd
ABN 41 050 057 933
170 Rankin Street
Bathurst NSW 2795

Tel: 02 6332 3343
Fax: 02 6331 8210
Email: bathurst@calare-civil.com.au
Web: www.calare-civil.com.au

Image 1: Subsoil investigation at the proposed development site

DISPOSAL OF EFFLUENT

General

For the subject development, on-site disposal of primary treated effluent from a septic tank using conventional absorption beds is considered appropriate. Neutral effects on groundwater are predicted due to moderate percolation rates and large buffer zones.

Restrictive Site and Soil Features

In accordance with OSMSH the most limiting site or soil feature determines the capability of the subject site for land application of effluent, or the modifications to the site required to allow land application.

Relevant sections of the CRP documents have been reviewed with respect to the subject site and reveal that the limiting feature for absorption disposal is **soil permeability, imposing minor limitation.**

Potential restrictive site & soil features located relative to the proposed disposal site are:

- Proposed dwelling approximately 7m NE. Minor limitation.
- No intermittent waterway within 500m of site. Minor limitation.
- No bore within 500m of site. Minor limitation.
- Closest property boundary approximately 2m W. Minor limitation.
- Strongly structured Category 4 Clay Loam soil. Minor limitation.

The following buffer distances should be adhered to: the following buffer distances are advised as per AS/NZS 1547:2012 Appendix R:

- 1.5-50m from property boundaries
- 2->6m from buildings/houses
- 40m from intermittent water course or dam
- 100m from permanent surface waters (eg rivers)

Due to the size constraints of Lot 11, it is recommended that the boundary and building buffers be reduced to the minimum buffer distances in accordance with AS/NZS 1547:2012 Appendix R. The lot will be leveled during construction, minimizing the impact of slope on the surrounding lots. It is not anticipated that there will be any adverse effects from the reduced buffer distances.

Design Effluent Flow

The proposed development comprises of a 3-bedroom dwelling and is to be supplied by tank water.

Potential Bedrooms	Reticulated/Bore Water	Tank Water
1-2 potential bedrooms	600 L/d	400 L/d
3 potential bedrooms	900 L/d	600 L/d
4 potential bedrooms	1200 L/d	800 L/d
More than 4 potential bedrooms	1200 + 150 L/d per additional bedroom	800 + 100 L/d per additional bedroom

Qd = 3 bedrooms = 600 L/d (average daily flow for dwelling)

Soil Properties

The methods used to determine absorptive characteristics of site soils in this study were:
1) Visual/tactile assessment of site soil profile
2) Assessment of soil landscape sheets.

In accordance with Table L1, we have identified the underlying soils as Category 4 (Clay Loam). Taking into account visual and tactile assessment of soils, in conjunction with documented soil landscape data, we conclude that on site disposal of effluent at the development is possible using conventional absorption beds. We have adopted an indicative permeability (k_{sat}) of 1.5m/d with an associated Design Loading Rate (DLR) of 8 mm/d.

Sizing of Bed

In accordance with AS/NZS 1547:2012 (Appendix Q), the disposal area required is calculated using a water balance analysis. Rainfall and evaporation data from local gauging stations is used in the calculations.

The spreadsheets below summarise calculations. It can be seen that a design disposal area of **69.3m²** is required, with a maximum effluent depth of **236mm**.

Month	E mm	ET mm	R mm	Rr mm	DLR/mth mm	Disposal Rate mm	Effluent Applied per month (L)	Size of area m2
January	204.60	153	73.80	55	248	346	18600	54
February	162.40	122	73.90	55	224	290	16800	58
March	139.50	105	47.60	36	248	317	18600	59
April	84.00	63	32.80	25	240	278	18000	65
May	49.60	37	40.00	30	248	255	18600	73
June	33.00	25	41.40	31	240	234	18000	77
July	37.20	28	43.20	32	248	244	18600	76
August	55.80	42	38.30	29	248	261	18600	71
September	78.00	59	48.80	37	240	262	18000	69
October	120.90	91	56.40	42	248	296	18600	63
November	156.00	117	76.00	57	240	300	18000	60
December	204.60	153	69.60	52	248	349	18600	53

DEPTH OF STORED EFFLUENT
DLR 8 mm/d

Month	First trial m2	Application Rate	Disposal Rate	AR-DR (mm)	Increase in depth of stored effluent	Depth of effluent for month	Increase in depth of effluent	Design depth per mth (mm)
December	69.34							
January		268	346	-78	-259	0	-259	0
February		242	290	-48	-160	0	-160	0
March		268	317	-49	-162	0	-162	0
April		260	278	-19	-63	0	-63	0
May		268	255	13	44	0	44	44
June		260	234	26	86	44	86	130
July		268	244	25	83	130	83	212
August		268	261	7	24	212	24	236
September		260	262	-2	-8	236	-8	228
October		268	296	-28	-94	228	-94	135
November		260	300	-40	-135	135	-135	0
December		268	349	-81	-270	0	-270	0

From AS1547:2012, the total required bed length is calculated as follows:

$L = A_e/B_e$

Where A_e = 69.34m^2 (required area)
B_e = 2.4m (wetted base of 2.4m wide bed)
n.b. a nominal depth of bed of 0.45m is adopted from 0.236m + 0.05m freeboard, rounded up to 0.45m.

Then: L = 69.34/2.4

= 28.9m (say 29.0m)

In summary, for the dwelling, adopt **two beds each 14.5m long x 2.4m wide x 0.45m deep**, adjacent to each other and 2.0m spacing between the beds side wall to side wall (see attached sketch).

With reference to AS/NZ 1547:2012 section L6, individual bed lengths should be limited to around 20m. A longer bed is possible if the installer can guarantee a level bottom over the entire length.

Effluent delivery to all beds should be even via a distribution box or similar and preferably delivered into the centre of the beds through the top of the self-supporting arches (see attached sketch).

The septic tank shall be a minimum 3000L. Make and model of septic tank is to be selected by installer and must be NSW Health approved (a full list of approved tanks is available on the NSW Health website). Final location of septic tank is to be determined by the installer with consideration given to the drainage plan of the house and site limitations to ensure all plumbing meets the required minimum grades specified in AS3500.2.

If site conditions (ie slope restrictions) are greater than 10% then a 1200mm wide bed can be utilised ensuring that the same Required Area (A_e) is achieved (i.e. halving the width will double the required length of the bed) or regrade the site to achieve the required grade of 10%.

PREPARATION AND MAINTENANCE OF DISPOSAL AREAS

General

We note that the bed should not be constructed in an area subject to stormwater run-off or ground water concentrations. The upstream flow of stormwater run-off should be diverted from the disposal area. The disposal area is to be stock and vehicle free.

Excavation Techniques

The following excavation techniques recommended in AS1547:2012 shall be observed so as to minimize the risk of damage to the soil.

- Plan to excavate only when the weather is fine.
- During wet seasons or when construction cannot be delayed until the weather becomes fine, smeared soil surfaces may be raked to reinstate a more natural soil surface, taking care to use fine tines and only at the surface.

In particular for absorption beds:

- If rain is forecast then cover any open beds, to protect them from rain damage.
- Excavate perpendicular to the line of fall or parallel to the contour of sloping ground.
- Ensure that the inverts are horizontal.

Disposal Site Cover

It is recommended that a fescue/fescue blend (Temperate and Mediterranean blend varieties) or similar be planted on the disposal area, which has year-round active growth, enhancing nutrient uptake (Ref. NSW Feedlot Manual 1998, NSW Department of Agriculture). Other recommended species providing similar data include Ryegrass. Also small trees with non-intrusive root systems planted below the disposal area will improve transpiration and uptake of nutrients (plants suitable for growing in wet soils can be recommended by local nurseries)

Dispersive Soil

After identifying the subsoil generally underlying the area as moderately reactive clay loam, we recommend that during construction gypsum be applied according to AS1547:2012 at 1kg/m^2 to the base of the trench or bed to prevent the clay dispersing.
The trench shall be closed in as soon as possible to protect the gypsum from raindrop impact.
It has been estimated that the gypsum should be effective for about 10 years at this application rate, and the need for the gypsum to be replenished would be indicated by soil analysis.

Further Considerations

The implementation of wastewater and nutrient reduction initiatives such as the following will further improve the performance of the system:

- Use of low phosphate/low SAR detergents, and low quantities where practicable.
- Water saving shower heads, taps and appliances.
- Consideration of 3/4.5 litre dual flush toilets.
- Avoid placing fats, oils or food waste into the system.
- Reducing peak hydraulic loading by reducing shower time and washing laundry over several days as opposed to completing multiple cycles in one day

REACTIVITY CLASSIFICATION TO AS2870

One soil-observation pit was dug at the proposed dwelling site using an excavator. The site stratigraphy at the proposed dwelling site as revealed by the soil pit comprised typically of the following:

0mm-200mm: Brown, sandy silt topsoil, with few gravels
200mm-1000mm: Brown orange yellow, slightly moist, light clay
EOP 1000mm

Samples retrieved from site were assessed for reactivity by laboratory analysis and visual/tactile methods.

The following linear shrinkage value was obtained for the underlying subsoil profile:

- 0.6-1.0m – LS=10.0%
  1.0-1.2m – LS=8.0%

These results indicate subsoil has moderate potential for shrink/swell behaviour. Taking into account the depth and distribution of clay within the profile, we have therefore classified the site as CLASS 'M' (Moderately Reactive, Ys=20mm) in accordance with AS2870.2011. (The Code specification reflects minimum requirements based on all site treatment being properly attended throughout, i.e drainage etc.)

Site preparation
Remove all grass, vegetation and root fibre from the site. Filling used in the construction of the slab shall be placed and compacted in accordance with Section 6 of AS2870-2011.

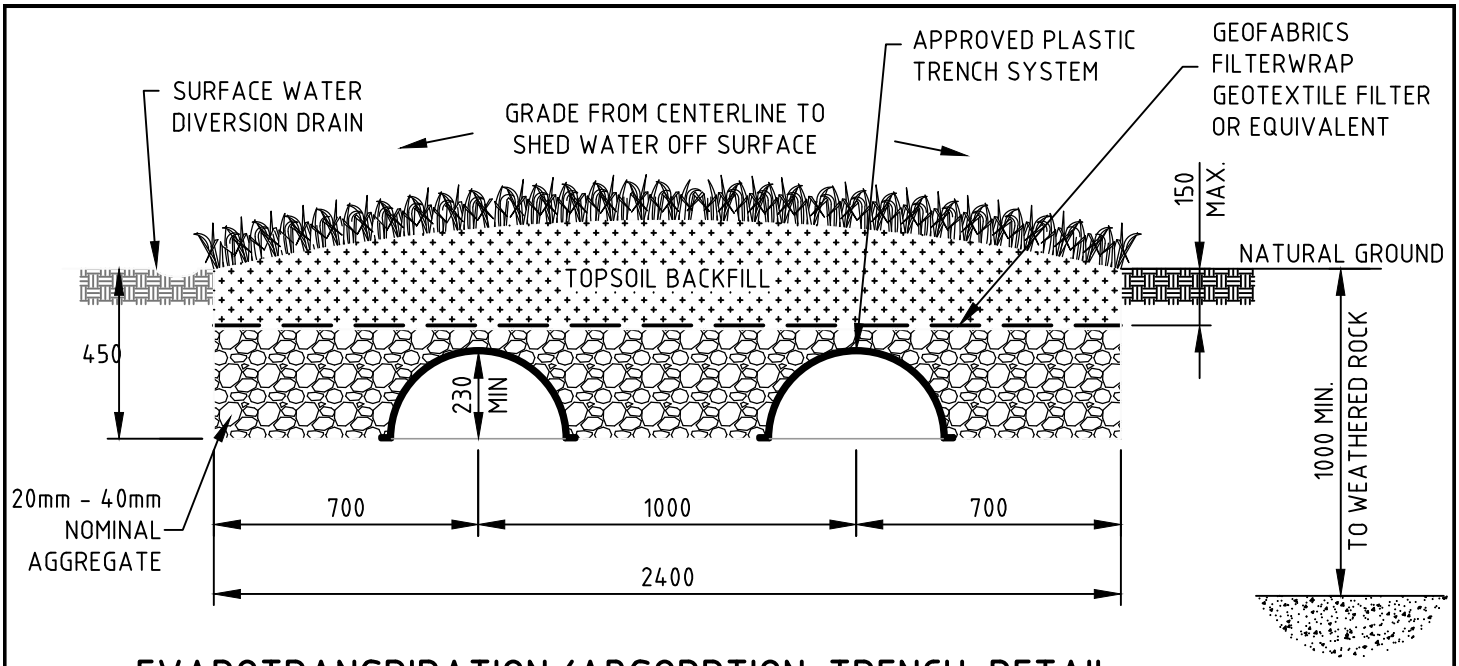
Site and building management
The building site must be carefully managed to minimise moisture changes by proper attention to tree planting, drainage, and garden watering. The following advisory notes make recommendations that must be followed by the owner/occupier of the building:

- Trees should be planted at least the mature height away from the building and consider the installation of a root barrier to prevent roots impacting moisture conditions under slabs and footings and prevent roots heaving or lifting slabs and footings
- Avoid garden beds adjacent to footings as this will cause shrink/swell behaviour from irrigation and evapotranspiration of water in the soil adjacent to the footings
- The site should drain away from footings on all sides and dish or grate drains should be installed if necessary
- Installation of apron slabs to the building will help regulate the moisture content of the soil adjacent to the footings and therefore reduce shrink and swell behaviour of the soil. All apron slabs should be dowelled to the footings to prevent movement of the slab away from the building
- Moisture conditions should be consistent around the footings, presence of paved surfaces on some sides of the building and garden beds directly adjacent to footings will cause differential movement from varying moisture contents of the soil.

We trust that this information meets your requirements. Please do not hesitate to contact the undersigned should you require any further information.

Yours faithfully,
CALARE CIVIL PTY LTD

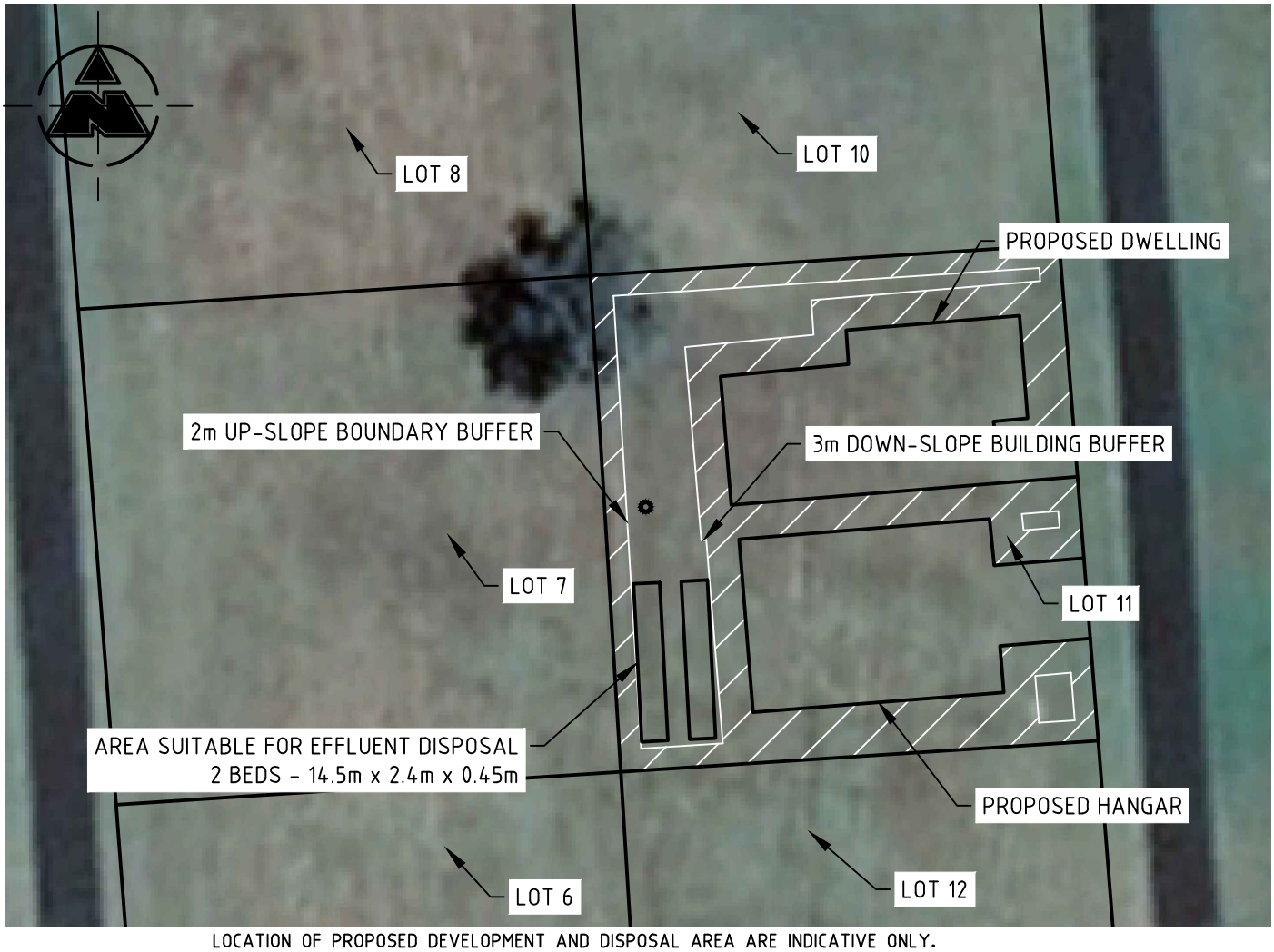
Sean Johnson
BE MIEAust.



EVAPOTRANSPIRATION/ABSORPTION TRENCH DETAIL

NOT TO SCALE

SUITABLE FOR LEVEL SITE TO SLOPING SITE LESS THAN 10%



LOCATION OF PROPOSED DEVELOPMENT AND DISPOSAL AREA ARE INDICATIVE ONLY.
FINAL LOCATION DETERMINED BY INSTALLER PENDING SUITABILITY.

REFERENCE

TEST HOLE LOCATION

SITE PLAN

SCALE 1:1000

DWG. No.: E1 Rev. A	Drawn: DB	EFFLUENT DISPOSAL REPORT 3 MUSTANG ROAD RYLESTONE NSW 2849 PETER COLLETT	CALARE CIVIL CONSULTING ENGINEERS 170 RANKIN STREET, BATHURST, N.S.W. 2795 Tel: (02) 63323343 Fax: (02) 63318210
JOB No.: 22.0749	Date: 07-07-22		
	Scales: AS SHOWN		
	Approved: S.J.		