CALARE CIVIL
CONSULTING ENGINEERS

20221576
19 April, 2023

Ludwig Mlcek
1164 Coxs Creek Road
Coxs Creek NSW 2849

Attention: Ludwig Mlcek

Dear Ludwig

RE: Effluent Disposal Investigation - Rylstone Region Community Hub, Rylstone 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 large rural lot along Coxs Creek Road, within the locality of Rylstone. The lot is approximately 1.19ha in size, and the proposed development site is within 75m of Coxs Creek.

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-300mm: Brown, dry, silt, with very few fine gravels, moderately structured
300mm-1200mm: Brown orange, dry, silty sand, with few fine to coarse gravels and cobbles, weakly structured
EOP 1200mm

Groundwater was not encountered during the fieldwork.

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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 major limitation.**

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

- Proposed development approximately 30m SE. Minor limitation.
- Closest dam approximately 460m SE. Minor limitation.
- Drainage depression approximately 101m SE. Minor limitation.
- Coxs Creek approximately 76m N. Minor limitation.
- No bores within 500m of site. Minor limitation.
- Closest property boundary approximately 8m W. Minor limitation.
- Weakly structured Category 2 Sandy Loam soil. Major limitation.

The following buffer distances should be adhered to:

- 6m from building or property boundary at higher elevation
- 12m from building or property boundary at lower elevation
- 40m from intermittent water course or dam
- 100m from permanent surface waters (eg rivers)

Design Effluent Flow

In accordance with recommendations of Water NSW, the design effluent generation for non-habitable developments will reference 'Septic Tank and Collection Well Accreditation Guideline', (NSW Health, 2001).

TYPE OF PREMISES	WASTES	DAILY FLOW Litres/Person/Day	CALCULATION OF DAILY FLOW RATE	REMARKS
Clubs Unlicensed	WC, urinal, basin, shower, kitchen	25	Persons x 25	Dishwasher/glassware allowance = 1550L/100 persons

With reference to Annexure 3 of the above document, the facility will be designed for the design flow rate specified under Commercial Installations as listed below:

– Clubs Unlicensed: **25 L/day/person when considering the proposed facilities mentioned above.**

The client has indicated that there will be an event every other week and that a maximum of 30 people will attend each event.

$Q_{d\ event}$ = 30 persons x 25 L/person/event + 465 (0.3 x 1550) L/100 persons = 1215 (say 1200) L/event

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 2 (Sandy 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 3.0m/d with an associated Design Loading Rate (DLR) of 20 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 **58.1m²** 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	620	718	37200	52
February	162.40	122	73.90	55	560	626	33600	54
March	139.50	105	47.60	36	620	689	37200	54
April	84.00	63	32.80	25	600	638	36000	56
May	49.60	37	40.00	30	620	627	37200	59
June	33.00	25	41.40	31	600	594	36000	61
July	37.20	28	43.20	32	620	616	37200	60
August	55.80	42	38.30	29	620	633	37200	59
September	78.00	59	48.80	37	600	622	36000	58
October	120.90	91	56.40	42	620	668	37200	56
November	156.00	117	76.00	57	600	660	36000	55
December	204.60	153	69.60	52	620	721	37200	52

DEPTH OF STORED EFFLUENT
DLR 20 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	58.10							
January		640	718	-78	-259	0	-259	0
February		578	626	-48	-160	0	-160	0
March		640	689	-49	-162	0	-162	0
April		620	638	-19	-63	0	-63	0
May		640	627	13	44	0	44	44
June		620	594	26	86	44	86	130
July		640	616	25	83	130	83	212
August		640	633	7	24	212	24	236
September		620	622	-2	-8	236	-8	228
October		640	668	-28	-94	228	-94	135
November		620	660	-40	-135	135	-135	0
December		640	721	-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 = 58.10m^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 = 58.10/2.4

= 24.2m (say 24.0m)

In summary, for the community facility, adopt **two beds each 12.0m 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)

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 development site using an excavator. The site stratigraphy at the proposed development site as revealed by the soil pit comprised typically of the following:

0mm-100mm: Brown, dry, silt topsoil
100mm-500mm: Brown, dry, silty sand, many gravels
EOP 500mm Refusal

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:

- 0.1-0.5m – LS=1.0%

These results indicate subsoil has slight 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 'S' (Slightly Reactive, Ys=10mm) 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

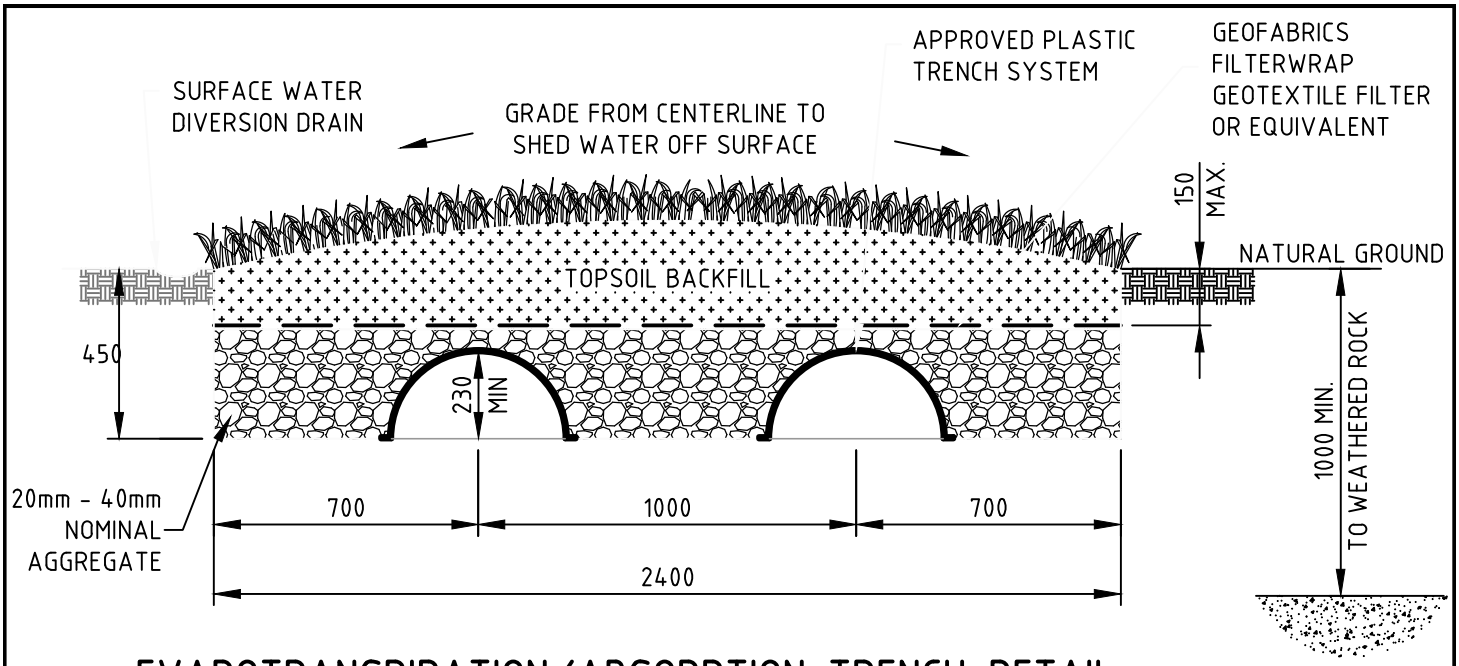
The building site must be carefully managed to minimise moisture changes by proper attention to tree planting, drainage, and garden watering. The following advisory notes make recommendations that must be followed by the owner/occupier of the building:

- 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

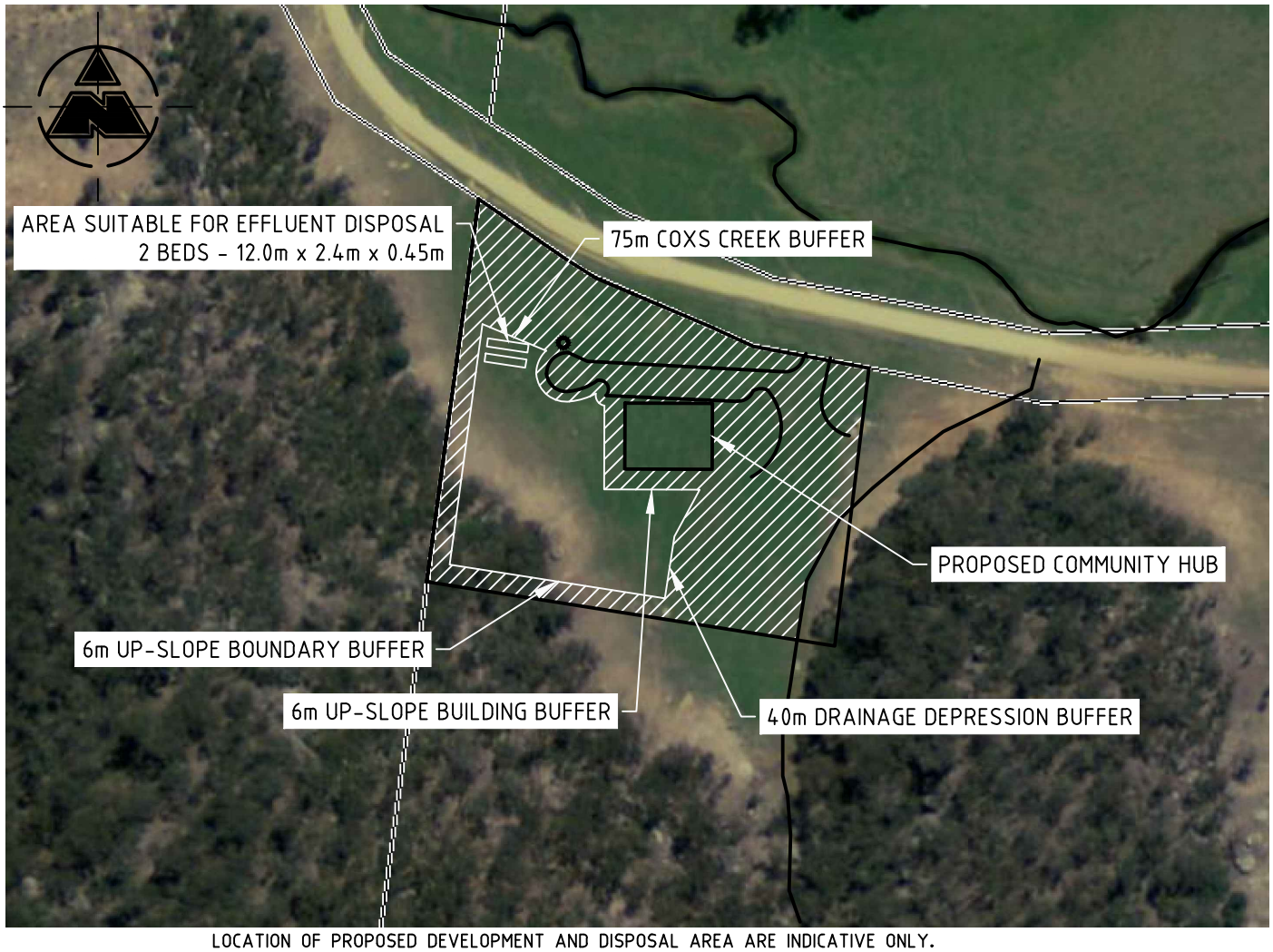
Sean Johnson
BE MIEAust.



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 1:2000

DWG. No.: E1 Rev. A	Drawn: DB	EFFLUENT DISPOSAL REPORT 1164 COXS CREEK ROAD COXS CREEK NSW 2849 LUDWIG MLCEK	CALARE CIVIL CONSULTING ENGINEERS 170 RANKIN STREET, BATHURST, N.S.W. 2795 Tel: (02) 63323343 Fax: (02) 63318210
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	Approved: S.J.		