



ON-SITE WASTEWATER MANAGEMENT ASSESSMENT

**Alterations and additions to an existing dual
occupancy dwelling**

Lot 8 DP 825255

134 Springvale Road, Eureka

For:	Vicki Brooke
Report no:	24141_ww.docx
Date:	7-Dec-23



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1. INTRODUCTION

Greg Alderson and Associates have been commissioned by Vicki Brooke to provide an On-Site Wastewater Management Report for alterations and additions to an existing dual occupancy dwelling at Lot 8 DP 825255, 134 Springvale Road, Eureka. The dwelling contained three-bedrooms but sustained damage from a large falling fig-tree branch, and the damaged part of the dwelling has been demolished. The remaining part of the dwelling contains 2 bedrooms and a bathroom.

Alterations and additions to the dual occupancy dwelling include the rebuilding of the damaged parts of the building, which include the addition of a kitchen, living area, bedroom, ensuite and decks, resulting in a 3-bedroom dwelling.

1.1. Proposed On-site Sewage Management System:

The main dwelling on the property is serviced by a separate existing OSMS which was observed by staff of this office to be in good working condition.

An existing OSMS services the dual occupancy dwelling, which consists of a grease trap, 3000L septic tank, and an absorption trench of which the location is known but the dimensions are not. This system is undersized for a 3-bedroom dwelling and requires upgrading. The proposed OSMS for the dual occupancy dwelling is as follows:

- Utilise the existing 3000L Septic tank, but add an effluent filter on outlet;
- Install two Grahams concrete or equivalent wetland cells;
- Install a distribution box with 2 outlet pipes;
- Construct two ETA beds at 12.38 m L, 2 m W, 0.45 D.

2. SITE DESCRIPTION

Staff of this office investigated the subject property and the proposed wastewater management system location which is accessed by driveway from Springvale Road.

The property is shown within its immediate locality on **Exhibit No. 1**.

2.1.1. Land Area

The approximate land area of the allotment is 1.9 ha. Suitable land area is available to have a gravity fed OSMS that achieves all the required setbacks to property boundaries, buildings, drainage lines etc.

The main dwelling, located in the center of the property, is serviced by an existing separate OSMS. There is sufficient area available for the new treatment system in addition to a reserve area for the main dwelling should it ever need upgrading. The disposal areas are shown on **Exhibit No. 2**.

2.2. Vegetation

Vegetation within the area for the proposed upgrade to the OSMS consists of mowed lawn. There are trees in proximity to the proposed OSMS location, however none are proposed to be removed for the installation of the OSMS. Some shading is expected from the trees however it is not considered to be detrimental to the function of the wastewater management system.

Table 2: Soil Assessment for Wastewater Disposal in accordance to EHPG (1998).

SOIL FEATURE	COMMENT	LIMITATION RATING		
		Minor	Moderate	Major
DEPTH OF SOIL	Soil depth is estimated to be greater than 2000mm in depth	✓		
DEPTH TO HIGH EPISODIC/ SEASONAL WATERTABLE	The water table was not intersected during borehole tests and no springs or other water discharges were observed. An allowance of 3.0 m to the water table was used in order to size the disposal area based of phosphorous movements	✓		
SOIL PERMEABILITY	The sites soils were clay loams which have an acceptable permeability.	✓		
COARSE FRAGMENTS	None observed in soil borehole	✓		
pH	Soil pH is generally acidic (4.5-5), and will require lime to be incorporated into the disposal area.	✓		
ELECTRICAL CONDUCTIVITY (dS/m)	Morand (1994) states that the Wollongbar soil landscape has a very low electrical conductivity, there was no evidence of vegetation being affected by salt	✓		
PHOSPHOROUS SORPTION (kg/ha)	Morand (1994) states that the Wollongbar soil landscape has a moderate to high phosphorous sorption rate of greater than 600mg/kg which is equivalent to greater than 10000kg/ha/year. 10000kg/ha/year was used for the design of the disposal area	✓		
MODIFIED EMERSON AGGREGATE TEST	Morand (1994) states that the Wollongbar soil landscape has a low dispersive percentage, there were no signs of dispersiveness when soil at site was examined	✓		

Overall, the EHPG (1998) would class the soil as being a minor limitation for disposal of wastewater.

2.4.1. Improvements to Soil

Increased acidity affects cation exchange capacity and can lead to deficiencies in calcium and magnesium while mobilising aluminium, which is toxic to plant growth. Lime can be added to the soil profile when preparing the area for disposal to increase the pH to a range between 6.5 – 8.5, which will enable plants to take up nutrients, which will be within the wastewater.

Gypsum will be added to the soil during construction at the rate of 0.5 kg/m² to prevent the soil from degrading from sodium application, which is contained in the wastewater.

2.4.2. Environment & Health Risk Assessment

The following (Table 3) is an environment and health risk assessment in accordance with Council's *Design Guidelines for On-Site Sewage Management Systems* (Byron Shire Council, 2004).

Table 3. Environment and Health Risk Assessment for Proposed Disposal Area

SITE FEATURE	LIMITATION		REASONING
	NONE	MAJOR	
FLOOD POTENTIAL	✓		The land of the proposed disposal areas is not subject to flooding.
SOIL TYPE	✓		Clay loams which have adequate permeability
EXPOSURE		✓	Some shade due to neighbouring trees but is considered adequate.
SLOPE %	✓		Approximately 5%.
LANDFORM	✓		The property is located on a gentle grade.
EROSION POTENTIAL	✓		No signs of erosion present in disposal areas.
SUBSOIL DRAINAGE	✓		No visible signs of subsoil dampness in the proposed disposal area.
SURFACE DRAINAGE	✓		Catch drains can be installed and stormwater runoff can be diverted from the disposal area.
LAND FILLING	✓		No fill observed in the proposed disposal area.
LAND AVAILABLE FOR APPLICATION AREA AND BUFFERS	✓		There is in excess of 2000m ² available, which is suitable for on-site wastewater treatment and disposal.
ROCKS AND ROCK OUTCROPS	✓		None observed in disposal area.
TREATMENT SYSTEM	✓		Septic tank and wetlands (Secondary Treatment)
BUFFERS	✓		All prescribed buffers are met. There is a groundwater bore on the property approximately 90m south-west of the proposed disposal area. Byron council requires a setback of 50m from upstream groundwater bores, therefore the required buffer is met as the bore is located on a southern aspect and the proposed wastewater is located in a northern aspect, separated by a minor ridge.

2.5. Site Constraints

Tables 2 & 3 presented site constraints that may occur following the BSC Design Guidelines for On-Site Sewage Management Policy (2004) and the Environment and Health Protection Guideline On-site Sewage Management for Single Households (1998). It can be seen that the site is generally not restrictive to wastewater treatment and disposal. The proposed disposal area has been positioned so as to not be limited by the buffer to the groundwater bore on the property. The groundwater bore is approximately 90m south-west of the proposed disposal area. Byron Council Design Guidelines for On-Site Sewage Management for Single Households states that a minimum buffer of 50m is required from upstream groundwater wells, and this is achieved on this site.

3. WASTEWATER CHARACTERISATION

The existing septic tank servicing the existing dual occupancy dwelling is 3000L and will be utilised for primary treatment of all wastewater, with the addition of an effluent filter on outlet. Wastewater will gravity flow to Subsurface Wetlands for secondary treatment. All treated wastewater after the subsurface wetlands will flow to Evapotranspiration/Absorption beds for disposal.

3.1.1. Predicted Hydraulic Loading

The predicted hydraulic loading is based on that given in Council's design model. Within this model a base line 115 L/day is given for a single person utilizing bathroom, kitchen, laundry & toilet amenities and having the water sourced from a tank system with standard water saving devices.

The hydraulic loading is calculated as:

$$3\text{-bedroom} \times 1.5 \text{ people} \times 115\text{L} = 517.8 \text{ L/day}$$

3.1.2. Predicted Nutrient Loading

The predicted nutrient loads are based on the BSC Policy (December, 2004) with partial secondary treatment. Nutrients were not found to be a critical factor for the sizing of either of the OSMS due to the size of the subject property and the low loading. A TN reduction rate of 62.3% was used for sizing the reed bed area as this corresponds to a single prefabricated concrete wetland cell available from Graham's Precast concrete or CMW tanks.

3.1.3. Disposal Area Required

This section investigates the disposal area required based on the predicted nutrient & hydraulic loading from the use of the proposed dual occ, and environmental factors which influence the area design. In order to ascertain the size of the disposal area, the model within the Byron Shire Council Design Guidelines for On-site Sewage Management for Single Households was used with the following parameters for:

- 3 bedrooms;
- Land area of 9452 m² allowing for half of the area;
- 115L/person/day for roof water harvesting;
- Light clays, strong structure;
- Secondary treatment via septic tank & reed bed (14.4m² reed bed area);
- Evapotranspiration/absorption beds for land application;
- 62% nitrogen reduction;
- No phosphorus reduction calculated;
- Ground water/bedrock depth of 3m;

The disposal area required for the hydraulic and nutrient loadings is as follows:

Hydraulics: 55 m² (Capped at 68m²).

Nitrogen: 0 m²

Phosphorus: 53 m²

The required hydraulic disposal area of 68 m² requires two ETA beds each 12.38m long x 2 m wide to achieve this area.

Copies of Council's design models are attached as Appendix A.

4. DESIGN OF OSMS

4.1.1. Septic Tank

The existing 3000L Septic tank will be utilised for primary treatment of all wastewater from the dual occupancy dwelling. An outlet filter is to be installed in the septic tank to further increase primary treatment.

4.1.2. Subsurface Flow Wetland

The wetland is used to reduce nutrients (predominantly nitrogen and some phosphorous) and reduce BOD and pathogens in the system.

A surface area of 14.4 m² of wetland treatment area has been used for the modelling of the wastewater management system, being **two** wetland cells.

4.1.3. Construction of Subsurface flow wetland

A wetland treatment area of 14.4 m² has been used for the modelling of the wastewater management system and it is recommended that two concrete wetland cells providing 14.4 m² in area to provide the required wetland treatment area. Both Grahams Precast and CMW tanks fabricate a concrete wetland cell being 3m x 2.4m x 0.8m each. Construction of the wetland is to be in line with the following:

- In general, blue metal aggregate will be placed within the wetland to a height of 0.65m and the inlet will be set at a height of 520mm, and outlet of 500mm;
- The inlet area should contain coarse gravel/cobble with a diameter of 40mm to 50mm, the remainder of the bed should consist of gravel or aggregate of between 10 - 20mm in diameter. The gravel will create a substrate for plants and will provide for filtering of wastewater before entering the disposal field.
- The media should be washed before placing in the wetland cell to dispose of any fines that may cause components of the trough to clog.
- The wetlands are to be planted with soft tissue macrophytes such as *Phragmites australis* (common reed) and sedges or similar species, a species list is contained in **Exhibit No. 3**.
- Both inlet and outlets are to be fitted with PVC mesh to allow cleaning and prevent stones entering the pipes. The inlet and outlets will both be of 100mm PVC or polyethylene.
- The required fall of the Subsurface Flow Wetland was determined through Manning's Equation as less than 0.01% slope. It is proposed that the slope of the bottom of the bed will be **0.1%**.

4.1.4. Evaporation/Absorption Beds

The treated wastewater from the wetland cells will gravity flow for disposal via ETA beds. It is proposed to have **two** evapo-transpiration/absorption beds total, at **12.38** in length, **2 m** in width, and **0.45 m** in depth.

4.1.5. Construction of ETA Beds

The ETA beds are to be constructed in accordance with AS1547:2012 with the construction described as follows:

- Construction of the bed will involve the excavation of the natural soil to a depth of 450mm (on lower slope). Soil will be scarified and sand placed on this interface for a covering of about 50mm thick. Aggregate of 6-25mm diameter is placed on this to a depth of 200mm;
- A single slotted distribution pipe (PVC not ag pipe) 100 mm in diameter is placed centrally on this bed;

- Topsoil consisting of clay loam is to cover the aggregate to a depth of 200mm, and the final finish is a mound appearance however at this site due to the slope the finish will match the natural land surface;
- Geotextile fabric is to be placed between the aggregate and the topsoil;
- An inspection point of (being slotted and capped PVC pipe) will be installed in the bed;
- A small catch drain shall be installed upslope of the disposal area to redirect overland flow away from the disposal area.

Exhibit No. 5 shows a typical cross section of the disposal bed. The proposed layout is presented in Exhibit No. 2.

5. EXISTING SYSTEM FOR EXISTING DWELLING AND RESERVE AREA

The existing dwelling is serviced by a septic tank and trenches to the south of the sheds near the dwelling. It is not proposed that these will be upgraded as part of the DA for the dual occupancy alterations and additions, as the system will not be impacted by the proposal.

There is adequate area available for the reserve area for both the existing dwelling and dual occupancy dwellings and this is shown on Exhibit No. 2.

6. MAINTENANCE PLANS

The following is a maintenance checklist for both OSMS' to be undertaken by the client.

6.1. Septic Tank & Effluent Filter

The septic tank should be regularly checked and is to be pumped every 3 to 5 years or as required, with wastes being removed by a licensed septic pumping company. The effluent filter should also be cleaned out at this time.

6.2. Subsurface Flow Wetland Plan of Management

It is proposed that the system be checked regularly for adequate plant growth, that plants have no signs of disease and there is a full vegetated cover in the system. Revegetation of wetland cells is required if vegetation dieback occurs. Plants should be cutback at least every quarter of the year. Up to 1/3 of the plant material can be removed which will encourage new plant growth which will in turn encourage additional uptake of water and nutrients.

Checking for blockages near the inlet and outlet of the system should be undertaken regularly, such as every three months. Gravel around the inlet and outlet can become clogged over time leading to surface ponding and surcharging from the wetland cells. If this occurs gravel will require replacement or removal and washing before being reinstated. Gloves should be worn when cleaning the system.

6.3. ETA Beds

The disposal system is designed in a manner that will allow the system to be maintained and repaired quickly if part of the system happens to fail.

- Bleach, bleach-based products, whiteners, nappy soakers and spot removers shall not be disposed of into the on-site system. They shall be disposed of on a disused area of a garden, well away from the disposal area.

- Hygiene products, condoms, tampons, sanitary napkins, disposable nappies and cotton buds shall not be disposed of via the on-site disposal system. They should be disposed of into garbage bins in sealed plastic bags.
- Only the recommended amounts of disinfectants should be used. Biodegradable products for septic systems are recommended. Runoff diversion banks to be inspected annually and maintenance as required undertaken to ensure that surface runoff is diverted around each of the disposal areas;
- No vehicular, stock or regular pedestrian access should be made across the disposal field.
- Vegetation will be harvested frequently up to 2 times a year can be undertaken, this will encourage regrowth and in turn will increase uptake of nutrients and water;
- Plant clippings shall be removed from the site to decrease amount of nutrients returning to the wastewater system;
- Effluent from disposal system should not be discharged to the stormwater system or over the ground;
- The effluent distribution pipes are to be inspected for blockage etc. when the aggregate is cleaned and flush cleaned or replaced as required.

Some signs of the disposal system failure are listed below, if any of these occur contact the plumber who installed the system and arrange for immediate pump out of the septic tank to relieve the need for effluent disposal to the disposal area.

- Surface ponding and run-off of treated wastewater;
- degradation of soil structure - eg. sheet and rill erosion, surface crusts, or hard surfaces are evident;
- poor vegetation growth;
- unusual odours.

7. CONCLUSION

A wastewater management system has been designed for the dual occupancy dwelling at Lot 8 DP 825255, 134 Springvale Road, Eureka. It is determined that on-site wastewater management can be achieved at the subject site conforming to the environmental and health objectives of BSC Policy (December, 2004), provided the following is undertaken:

- Utilise the existing 3000L **septic tank** for wastewater collection and primary treatment of all wastewater from the dual occupancy dwelling and install an **effluent filter**;
- Construct **two** prefabricated Subsurface Flow Wetland cells from Grahams Precast or CMW tanks at **3m x 2.4m x 0.8m**, to create a minimum total surface area of at least **14.4 m²**,
- The wetland cells will treat all wastewater following treatment in the septic tank;
- A distribution box on concrete plinth with two outlet pipes will be installed;
- Wastewater will gravity flow from the subsurface wetland to **two** evapotranspiration/absorption beds at **12.38 m x 2 m x 0.45 m** which will achieve the requirement for the hydraulic and nutrient loads;
- Install a catch drain upslope of the disposal area to direct stormwater around the disposal area;
- A maintenance program listed in Section 5.0 will be undertaken by the householder.

8. REFERENCES

Australian Standard AS 1547 - 2012 *On-Site Domestic-Wastewater Management*.

Byron Shire Council (December, 2004). *Design Guidelines for On-site Sewage Management for Single Households*. Protecting the Environment and Health of Byron Shire. Technical Guidelines for System Designers.

Environment Protection Authority, Dept. of Local Government, Department of Land & Water Conservation and NSW Department of Health (Feb 1998). *Environment and Health Protection Guidelines - On-Site Sewage Management Systems for Single Households*.

Morand, D.T. (1994). *Soil Landscapes of the Lismore-Ballina 1:100,000 Sheet* Report, Soil Conservation Service of NSW, Sydney.

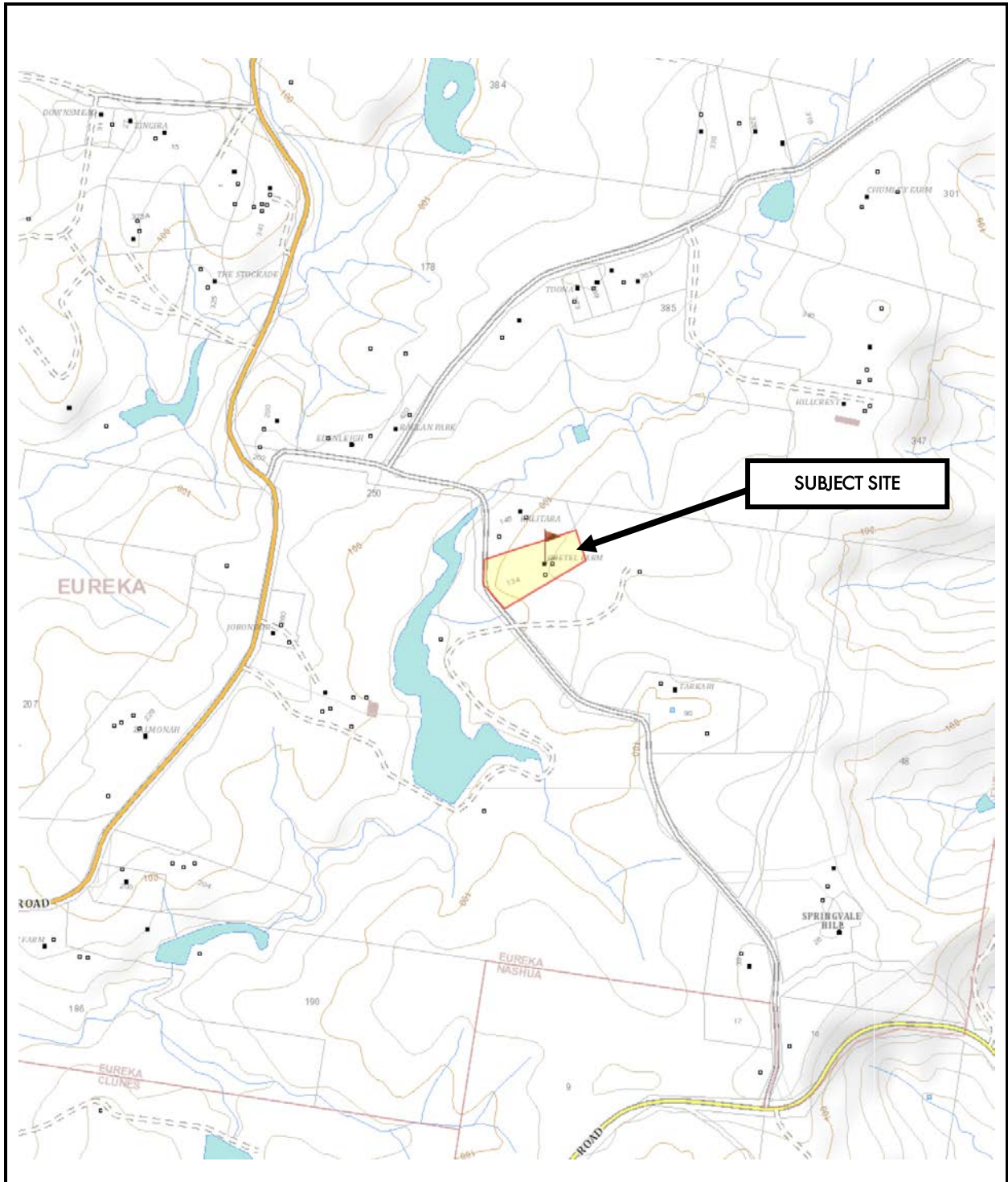
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Greg Alderson & Associates

Chartered Professional Engineers

9. APPENDIX A – COUNCIL OSMS DESIGN MODEL

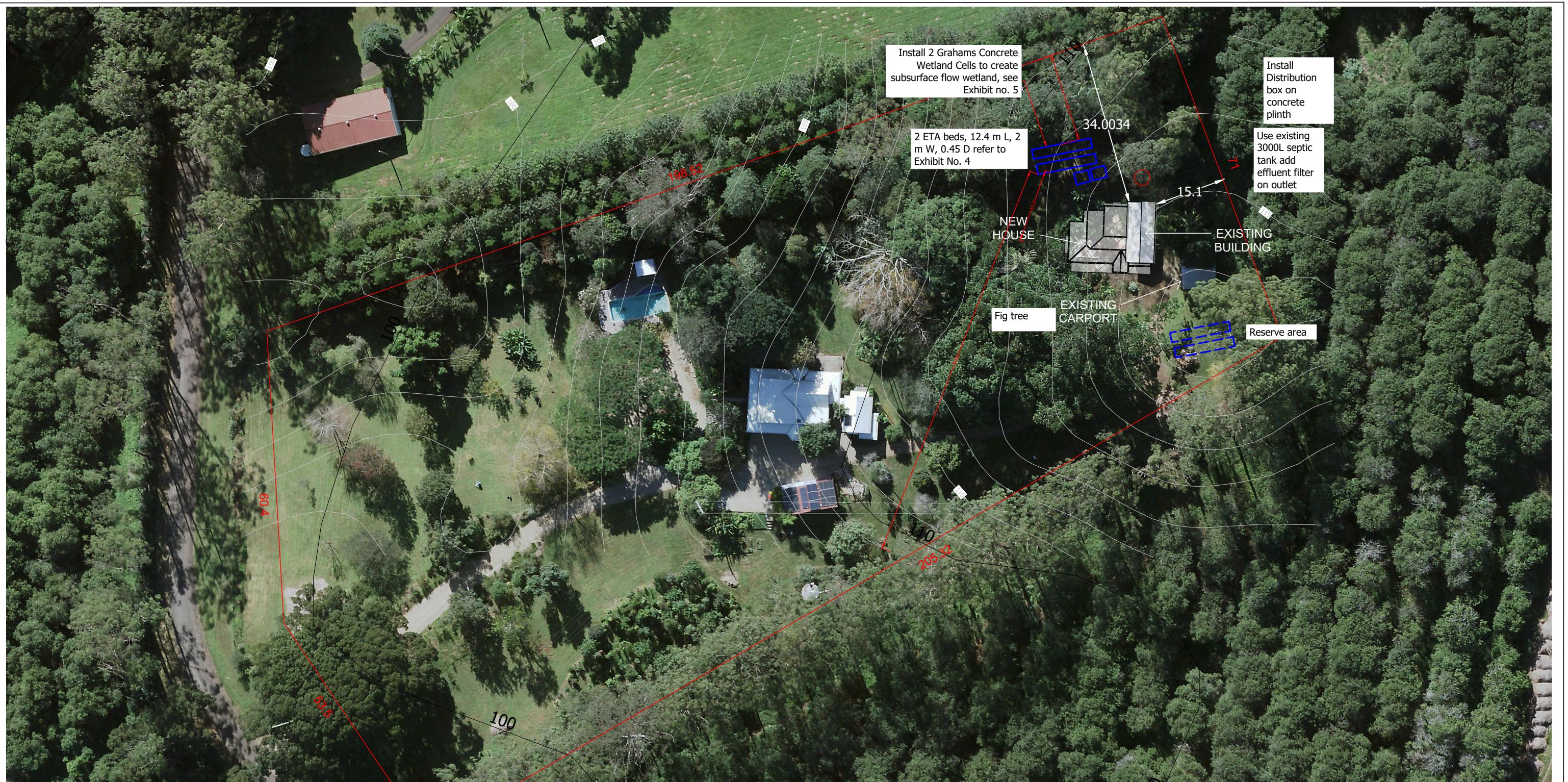




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Date December 7, 2023
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Scale: NTS

GREG ALDERSON AND ASSOCIATES
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Exhibit No. 1.
SITE LOCATION
Lot 8 DP 825255 134 Springvale Road
Eureka



- Wastewater Notes- :**
1. The proposed On-Site sewage Management System (OSMS) is designed to service the proposed 3 bedroom dwelling;
 2. Utilise existing 3000 L septic tank. The septic tank will be fitted with an **effluent filter**;
 3. Wastewater to flow to two Graham's Concrete Wetland Cells (each 3 m x 2.4 m) for secondary treatment. See Exhibit No. 4 for construction details;
 4. Construct **two** evapotranspiration/absorption beds (ETA) for disposal of wastewater after the subsurface flow wetlands. See Exhibit No. 5 for construction details;
 5. The ETA beds are to be 12.38m x 2m x 0.45 and installed in accordance with AS 1547-2012;
 6. A catch drain is to be installed above the ETA beds to direct overland run-off around the disposal area;
 7. Stormwater components to be placed away from the wastewater treatment system;
 8. Final location of wetland cells to be determined onsite.

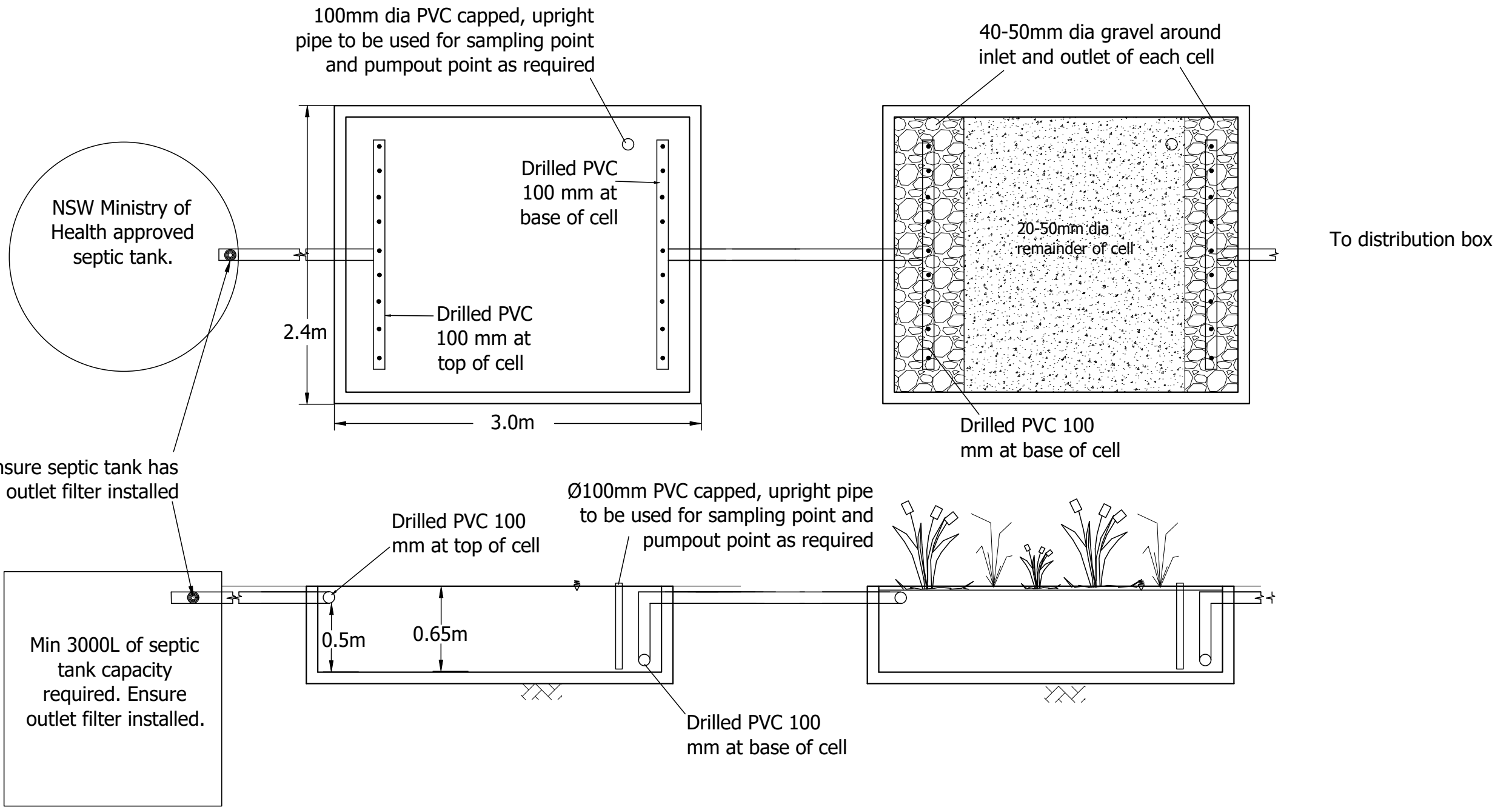


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		V. Brooke	Drawn:	Source:	EXHIBIT NO:	Date:
		Site address:	WA	CEILIA BROOK DESIGN, METRO MAPS	2	18/10/23
		Lot 8 DP 825255 134 Springvale Road Eureka	Scale:	Original Size:	Project:	Revision:
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			Job Number:			
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Exhibit No. 3

Species suitable for wetland cells

Grasses /Reeds/Groundcovers	
<i>Alocasia brisbanensis</i>	Cunjevoi
<i>Baumea acuta</i>	Sedge
<i>B. articulata</i>	Sedge
<i>B. juncea</i>	Sedge
<i>B. nuda</i>	Sedge
<i>B. rubignosa</i>	Sedge
<i>B. teretifolia</i>	Sedge
<i>Brachyscome diversifolia</i>	Native Daisy
<i>Carex appressa.</i>	Tussock Sedge
<i>Cyprus spp.</i>	Sedge
<i>Juncus articulatus</i>	Jointed rush
<i>J. polyanthemos</i>	Sedge
<i>J. prismatocarpus</i>	Sedge
<i>J. usitatus</i>	Common rush
<i>Lomandra longifolia</i>	Lomandra
<i>Phragmites australis</i>	Bull Rushes
<i>Schoenoplectus spp.</i>	Sedge



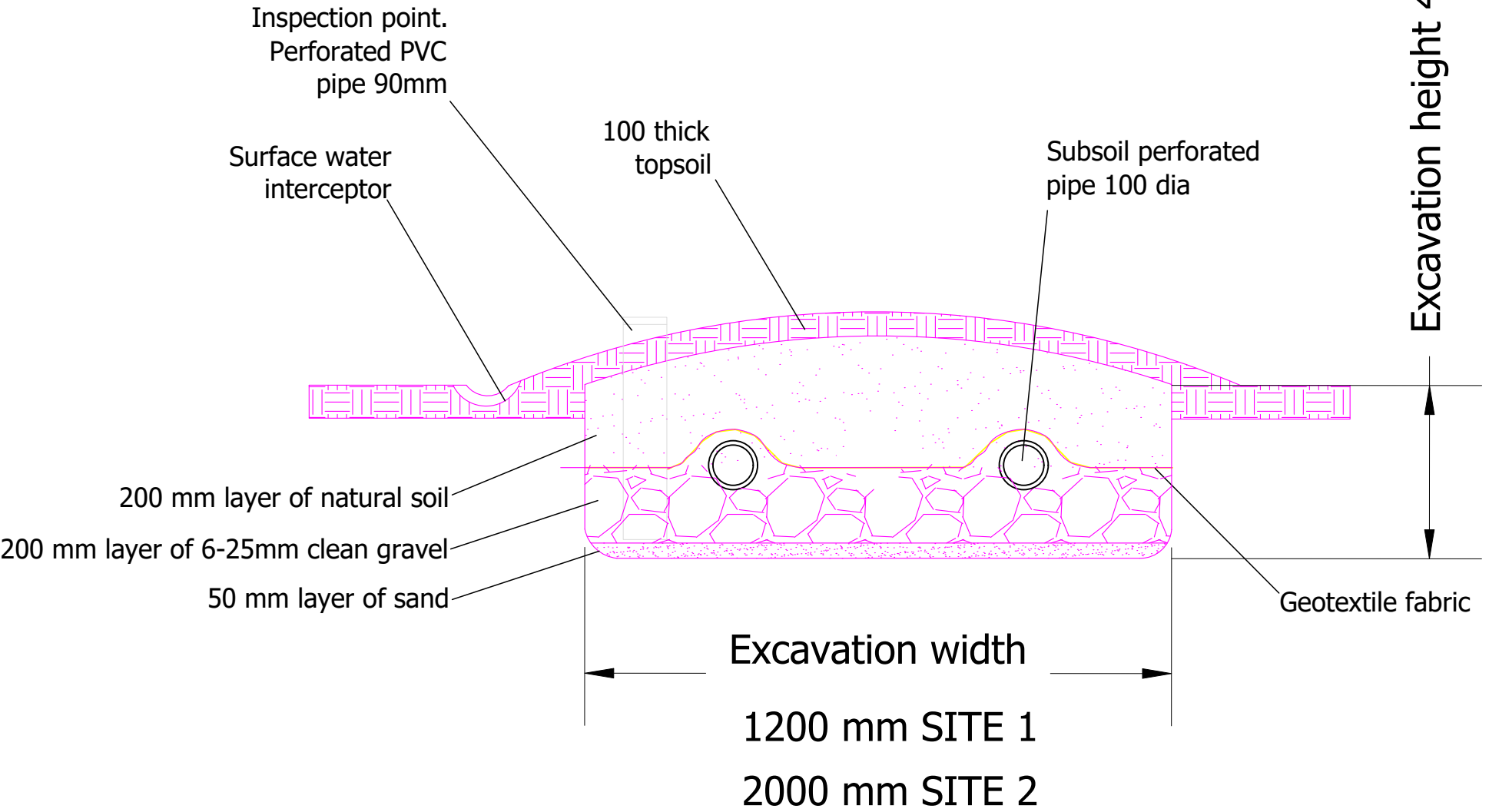
Reedbed Notes:


1. Prefabricated concrete cells to be positioned with fall of less than 0.1% from inlet to outlet of each cell
2. Each cell to be positioned 50mm below previous cell
3. Distribution of wastewater at top of bed using slotted Ø100mm PVC pipe
4. Concrete prefabricated cells recommended and depicted in drawing shown.
5. Pump out of wetlands when required through PVC inspection points in each bed

For Site 1, connect new wetland cell in line with existing cells, to be connected to new distribution box

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		<p>Site address: Lot 8 DP 825255 134 Springvale Road Eureka</p>		<p>Drawn: WA</p>	<p>Source:</p>	<p>EXHIBIT NO: 4</p>	<p>Date: 18/11/23</p>		
<p>Z:\JOBS\24\24141 - Celia Brooke - 134 Springvale Rd, Eureka\ENVIRONMENTAL\WW\24141-wwplan.dwg</p>	<p>Scale: NTS</p>	<p>Original Size: A3</p>	<p>Project: ALTERATIONS/ADDITIONS TO A DWELLING</p>	<p>Revision:</p>	<p>Job Number: 24141</p>				

Note, it is recommended that the ETA beds be mounded to allow some settlement of soil. This should provide run-off of stormwater



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		<p>Site address: Lot 8 DP 825255 134 Springvale Road Eureka</p>		<p>Drawn: WA</p>	<p>Source:</p>	<p>EXHIBIT NO: 5</p>		<p>Date: 18/11/23</p>	
<p>Z:\JOBS\24\24141 - Celia Brooke - 134 Springvale Rd, Eureka\ENVIRONMENTAL\24\24141-wwplan.dwg</p>	<p>43 Main Street, CLUNES NSW 2480 PO Box 12344, CLUNES NSW 2480 P:(02) 6629 1552 E:office@aldersonassociates.com.au ABN 58 594 160 789</p>	<p>Scale: NTS</p>		<p>Original Size: A3</p>		<p>Project: ALTERATIONS/ADDITIONS TO A DWELLING</p>		<p>Revision:</p>	
		<p>Job Number: 24.14.1</p>							

Byron OSMS Design Model

Version: WW CALCS.xlsm

Set Defaults

STEP 1 bedrooms persons

bedrooms (Grp 1) **3**

bedrooms (Grp 2) **100**

STEP 2 Buffer to permanent water

STEP 3 Buffer to intermittent water

STEP 4 Block size (m2) **9000**

STEP 5 Daily effluent flow accord. water supply type

Reticulated supply (bore, spring, creek) 180L/p.d

Reticulated + std. water saving devices 145L/p.d

Roof water harvesting 140L/p.d

[Roof water harvesting + std. water sav. 115L/p.d

Grp1 Toilet Bathroom Laundry

Grp 2 Toilet Bathroom Laundry

STEP 6 Wastewater stream

Kitchen Kitchen

STEP 7 Treatment system

Septic (primary treatment only)

AWTS

Septic + single pass sandfilter (SPF)

Septic + SPF, 25% septic return flow

Septic + recirculating sandfilter

Septic + reedbed

STEP 8 P soil sorption accord. soil type

"Alluvial" Soils 1 (dp, mu, my, te) 10,000 kg/ha/m

"Alluvial" Soils 2 (cr) 2,000 kg/ha/m

Red Basaltic Soils (bg, ca, co, el, ew, mb, ro, wo) 10,000 kg/ha/m

Duplex Soils (ba, bi, bu, mi, ni) 8,000 kg/ha/m

Podzol Soils (ab, bo, br, eb, fh, ki, ku, oq, po, ty, wy) 1,000 kg/ha/m

STEP 9 Soil texture & structure beneath system

Gravels, Sands Ksat > 3.0m/d

Sandy loams - weakly structured Ksat > 3.0m/d

Sandy loams - massive Ksat 1.4 - 3.0m/d

Loams - high/moderate structured Ksat 1.5 - 3.0m/d

Loams - weakly structured or massive Ksat 0.5 - 1.5m/d

Clay loams - high/mod structured Ksat 0.5 - 1.5m/d

Clay loams - weakly structured Ksat 0.12 - 0.5m/d

Clay loams - massive structured Ksat 0.06 - 0.12m/d

Light clays - strongly structured Ksat 0.12 - 0.5m/d

Light clays - moderately structured Ksat 0.06 - 0.12m/d

Light clays - weak. structured or massive Ksat < 0.06m/d

Med. to heavy clays - strong. struct. Ksat 0.06-0.5m/d

Med. to hvy clays - weak. struct. or massive Ksat < 0.06m/d

DISPERSIVE soil (Modified Emerson Aqqreagte test)

STEP 10 Water Table/ Bedrock Depth (m) **3.00**

Buffer to Water Table (Bwt) (m) **0.5**

Time for accumulation of P (years) **50**

STEP 11 % Effective Rainfall

Mounded bed

Level bed with grass

STEP 12 Soil texture in root zone

Coarse Sand

Fine sand, Sandy loams

Loams, Clay loams, Silt

Clay (light, med, heavy)

STEP 13 Land Application Type

SSI

ETA

Lateral seepage width (m) **0.300**

STEP 14 Calculate (or Cntl- q)

STEP 15 ETA trench separation **2.00**

Current Inlet BOD conc. ~ 250 mg/L

Current Outlet BOD conc. ~ 28 mg/L

Wetted depth(m) **0.50**

TN% removal **62.3%**

Reed bed area (m2) **14.4**

BOD target of 20mg/L is equiv. to ~68.0% TN

Current Outlet BOD conc. ~ 28 mg/L

total ETA trench area **49.52**

ETA trench length (m) **12.38**

number of ETA beds **2**

beds total plus separating spaces: X Y dimensions = 13.0m x 6.6m Area = 86 m2

Avail. Water Capacity (AWC) of root zone **0.13**

Default AWC of bluemetall in trench below root zone **0.00**

Soil Moisture Holding Capacity: saturation & AWC (mm) **111.90** **24.69**

Permissible percentile exceedence **5.00%**

ETA trench width (m) **2.00**

ETA bed separation **2.00**

Minimum effluent application (mm/day/m²) **7.67**

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2



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