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THE GENERAL MANAGER
BYRON SHIRE COUNCIL

# ON-SITE WASTEWATER MANAGEMENT LAND CAPABILITY ASSESSMENT

FOR

**PROPOSED DWELLING ENTITLEMENT**

AT

**LOT 10 DP: 586360**
**114 STEWARTS ROAD**
**CLUNES**

OWNER
John Stewart

SITE INVESTIGATION

**TRINE SOLUTIONS**

DATE
**10th November 2020**

Report No: TS21430

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List of Attachments

1. Illustration 1: Subject Site – Balanced Systems Planning Consultants
2. Byron OSMS Design Model spread sheets

## 1.0 INTRODUCTION

Trine Solutions Pty Ltd has been commissioned by the applicant to prepare an On-site Wastewater Management Land Capability Assessment Report for a proposed Dwelling Entitlement at Lot 10 DP: 586360 / 114 Stewarts Road Clunes.

The site is not connected to a centralised sewerage treatment system and will require approval for an on-site wastewater treatment system to service the proposed Dwelling Entitlement. The site contains an existing dwelling building that then will be subject to a future Development Application and Building Certificate.

The assessment will be based on calculations required for an assumed three (3) bedroom dwelling.

The report describes the site conditions as they effect the land application of effluent, presents the results of field testing, provides advice and recommendations on the available options for on-site wastewater management. Calculations for sizing of land area requirements are based on the methods set out in AS/NZ 1547:2012 – Appendix L - Land Application Methods and Byron Shire Council – Design Guidelines for On-site Sewage Management for Single Households – 1 December 2004.

## 2.0 THE SITE AND SURROUNDING ENVIRONMENT

The site and the surrounding environment are as depicted within Photo Plates 1, 2 and 3.

The physical attributes of the lot with an area of approximately 2.9ha are more closely associated with the Rosebank landscape, rolling low hills and hills on Lismore Basalts. Relief 70-100m, slopes 20-40%.

Ridges and crests are convex and moderately broad (100-300m). Ridge slopes, side slopes and isolated hills are common. Extensively cleared closed native forest, now predominately sod grassland with large areas of closed camphor laurel forest.

The lot sits on a broad ridgeline with ample area for wastewater application with slopes varying from 0-10% all with good wind and sun exposure. The lot has been extensively landscaped with varied plantings and grassed areas.

There are no major site constraints for wastewater application, a creek line traverses the valley floor approximately 40m off the centre of the western boundary, then just crosses the north-western corner of the lot. There is ample area on the lot that achieves a ≥100m buffer to the creek.

## 3.0 DESIGN PRINCIPLES OF WASTEWATER MANAGEMENT

The design principles adopted for effective wastewater management for the proposed development are:

- Cost effective
- Sustainable for the life of the development
- Reuse of resources where possible

## 4.0 SITE ASSESSMENT

The Site

Plate 1

Plate 2

Plate 3

## 5.0 SOIL ASSESSMENT

The soil classification and profile description is consistent with published works by Morand titled 'Soil Landscapes of the Lismore - Ballina 1:100 000 Sheet'

| **Soil description** | |
|---|---|
| Soil Landscape | Erosional – rolling low hills and hills on Lismore Basalts |
| Grouping | ro – Rosebank |
| Description | Moderately deep to deep (>100cm) Krasnozems and brownish red well drained Krasnozems |
| Limitations | High aluminium toxicity potential with localised rock outcrops |

Morand states that the soils are not limited for the application of effluent and a percolation rate in the order of 0.3m-1m/day can be achieved.

The complete results of the site assessment have been summarized in the table below.

| ***TABLE OF SITE CHARACTERISTICS:*** | |
|---|---|
| Soil: | Clay Loam |
| Land area: | Not limited - 2.9ha |
| Flood Potential: | Nil |
| Exposure | Good wind & sun exposure |
| Slope % | 5-10% |
| Landform | **The sub-soils are moderately well drained** |
| Run-on and up-slope seepage | Nil |
| Erosion potential | Nil |
| Site drainage | Good |
| Buffer distance | All buffers met |
| Depth to bedrock | >3m |
| Geology/regolith | **The underlying stratum provides good internal drainage** |
| Exchangeable Sodium Percentage | **Not limiting** |
| Permeability (Ksat) | 0.3m/day |
| Emerson Aggregate Test | Dispersive class - 5 or 6 |

## 6.0 WASTEWATER MANAGEMENT OPTIONS

### Treatment standard

The minimum treatment standard considered appropriate for the site is Secondary Treatment. This will ensure the bacterial and nutrient quality will not compromise the soil structure. To achieve this standard, it is recommended a passive system be installed such as a septic tank with minimum capacity as per the current Standard AS/NZS 1547:2012. The most appropriate method for achieving a passive secondary treatment is sand filters or constructed wetlands.

### Land Application Method

No limitation exists for applying effluent to the land as ample land areas suitable are available as evident in the photo plates

The recommendation considered appropriate to comply with design principles is constructed wetlands discharging to ETA beds

The typical land area requirements are detailed below. It should be noted that the hydraulic load generated from the proposed dwelling entitlement will be based on an assumed (say) 3-bedroom dwelling (roof harvest water supply – 517.5L/day / 4.5 persons @ 115L/per person/day).

## 7.0 SIZING OF CONSTRUCTED WETLANDS

It is proposed to incorporate sub-surface flow constructed wetlands to achieve secondary treatment of all effluent generated from the proposed development.

The above parameters have been factored into the **Byron OSMS Design Model** with a constructed wetland as the nominated method for achieving Secondary Treatment at this site.

**Constructed Wetland Area required = 10.2m$^2$**

## 8.0 SIZING OF APPLICATION BEDS

The above parameters have been factored into the **Byron OSMS Design Model** with a constructed wetland as the nominated method for achieving Secondary Treatment at this site.

**ETA Bed Area required = 68m$^2$ or 2 x 18.15 x 1.2m ETA beds.**

***Byron OSMS spread sheets attached**

## 9.0 SUMMARY AND CONCLUSIONS

The site and soil assessment demonstrates that appropriate sustainable arrangements can be made for on-site sewage management for all wastewater generated from the proposed dwelling entitlement at this site. This is based on the following observations and recommendations:

- ✓ Site is not constrained by land area available
- ✓ Suitable soils for wastewater application
- ✓ Secondary Treatment via Constructed Wetlands recommended
- ✓ Passive energy efficient treatment system
- ✓ Sustainable for the life of the development

## 10.0 REFERENCES

Australian Standard AS/NZS 1547:2012 - On-Site Domestic-Wastewater Management.

Plumbing Code of Australia – NCC 2019 – Volume Three

Byron Shire Council - Design Guidelines for On-Site Sewage Management Systems for Single Households. (1 December, 2004)

Crites – Tchobanoglous (1998) - Small and Decentralized Wastewater Management Systems

Metcalf & Eddy – Wastewater Engineering - Third Edition

G. Swarbrick – Short Course in Waste Management – University N.S.W. 1996

Department of Land and Water Conservation NSW - The Constructed Wetlands Manual Volume 2

Ratcliff (1983) Published Paper

W Cromer, E Gardner & P Beavers - Published Paper - On-site '01 Armidale, 2001

Metcalf & Eddy (1991) Wastewater Engineering 3rd Edition

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

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

***End of Report***

Bradford Nicholson
***Trine Solutions P/L***

| **John Stewart - 114 Stewarts Road Clunes** | Printed 30 Apr '21 03:21 PM |
|---|---|
| Head count by (1) bedrooms / (2) persons | 1 |
| Bedrooms (gp1) | 3 |
| Bedrooms (gp2) | 0 |
| Persons (grp 1) | 5 |
| Persons (grp 2) | 0 |
| Block size (ha) | 29000 |
| Setback type listbox | 1 |
| Setback distance (m) | 100 |
| Daily Effluent Flow per person (L/day) | 115 |
| Daily effluent water supply type listbox | 4 |
| toilet g1 tickbox | TRUE |
| bath g1 tickbox | TRUE |
| laundry g1 tickbox | TRUE |
| kitchen g1 tickbox | TRUE |
| toilet g2 tickbox | FALSE |
| bath g2 tickbox | FALSE |
| laundry g2 tickbox | FALSE |
| kitchen g2 tickbox | FALSE |
| Treatment system listbox | 6 |
| % black to total wastewater in a full system: Water | 32% |
| N production per person per year (kg/person/yr) | 4.2 |
| % black to total wastewater in a full system: TN | 70% |
| N loss in treatment system (% reduction) | 50% |
| N loss in disposal bed (% reduction) | 40% |
| N Plant Uptake rate (kg/ha/year) | 200 |
| P production per person per year (kg/person/yr) | 0.6 |
| % black to total wastewater in a full system: TP | 40% |
| P uptake by plants (Hp) (kg/ha/yr) | 10 |
| P soil sorption (Ps) (kg/ha/m depth) | 10000 |
| P soil sorption according to soil type listbox | 3 |
| Water Table Depth (Wtd) (m) | 3 |
| Buffer to Water Table (Bwt) (m) | 0.5 |
| Time for accumulation of P(years) | 50 |
| Crop factor(grass = 0.74) | 1 |
| Crop coefficient (TRUE) / crop factor (FALSE) tickbox | TRUE |
| % Effective Rainfall | 65% |
| Effective Rainfall listbox | 1 |
| Percolation (mm/day) | 27.36632336 |
| Soil texture and structure beneath system listbox | 6 |
| Depth of root zone (m) | 0.15 |
| Effective porosity of root zone | 0.37 |
| Avail.Water of root zone | 0.15 |
| Soil texture in rootzone listbox | 3 |
| Depth of trench below root zone (m) | 0.15 |
| Effective porosity of trench below root zone | 0.43 |
| Avail.Water of trench below root zone | 0 |
| Permissable percentile exceedence | 5.0000% |
| Trench width (m) | 1.2 |
| Lateral seepage width (m) | 0.3 |
| Disposal Type SSI (1) / ETA (2) listbox | 2 |
| Number of trenches (spinner button) | 2 |
| Hydraulic area (m2) | 22.68 |
| Nitrogen area (m2) | 0.00 |
| Phosphorus area (m2) | 52.94 |
| Water balance area (m2) - Cntl-q (see text) | 67.50 |
| **Final area (m2)** | 67.50 |

Proposed Dwelling Entitlement
114 Stewarts Road Clunes

***Byron OSMS Design Model*** *Version:* Copy of OSMS_Design_Model_70 (Autosaved).xls

Set Defaults

bedrooms / persons — STEP 1

| | | |
|---|---|---|
| **# bedrooms (Grp 1)** | 3 | STEP 2 |
| # bedrooms (Grp 2) | | |
| Total Daily Flow (L/day) * | 517.5 | |
| TN production per year (kg/year) | 18.90 | |
| TN reduced by all N loss (kg/year) * | 5.67 | |
| N Plant Uptake rate (kg/ha/year) | 200 | |
| Phosphorus in effluent (Ip) (kg/yr) * | 2.70 | |
| P uptake by plants (Hp) (kg/ha/yr) | 10 | |
| P soil sorption (Ps) (kg/ha/m depth) | 10000 | |
| Water Table/ Bedrock Depth (m) | 3.00 | STEP 10 |
| Buffer to Water Table (Bwt) (m) | 0.5 | |
| Time for accumulation of P(years) | 50 | |
| **Final area ($m^2$)** | **68** | |
| **Phosphorus area ($m^2$)** | **53** | |
| **Water balance area ($m^2$)** | 68 | |
| ☑ Specific Crop Coeff.(grass=1.00) | 1.00 | |
| % Effective Rainfall | 65% | |
| Percolation (mm/d) | 27 | |

STEP 3: Buffer to permanent water / Buffer to intermittant water

STEP 4 — Block size (m2): 29000 / 100

| | | |
|---|---|---|
| Daily Effluent Flow per person (L/day) | 115 | |
| N prod. per capita (kg/person/yr) | 4.20 | |
| N loss in treatment system (% reduction) | 50% | |
| P prod. per person per yr (kg/person/yr) | 0.60 | |

**Nitrogen Report**

| | |
|---|---|
| N plant uptake (kg/yr) | 1.35 |
| N load exceedence | 0.00 |
| N load percolated (kg/yr) | 4.32 |
| N released (perc+exceed.) (kg/yr) | 4.32 |
| **Enviro.N limit (kg/yr)** | 9.45 |
| Nitrogen area ($m^2$) | 0 |
| Capped H area 68m2. Hydraulic area (m2) | 23 |
| total ETA trench area | 43.56 |
| ETA trench length (m) | 18.15 |
| number of ETA beds | 2 |
| beds total plus separating spaces: X Y dimensions = 18.8m x 4.5m | Area =84 m2 |

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

STEP 6 — **Wastewater stream**

| Grp1 | Grp 2 |
|---|---|
| ☑ Toilet | ☐ Toilet |
| ☑ Bathroom | ☐ Bathroom |
| ☑ Laundry | ☐ Laundry |
| ☑ Kitchen | ☐ Kitchen |

| | | |
|---|---|---|
| % black to tot WW in a full system | 32% | |
| % black to tot WW in a full system: TN | 70% | |
| N loss in disposal bed (% reduction) | 40% | |
| wastewater in a full system: TP | 40% | |

STEP 7 — **Treatment system**

- Septic (primary teatment only)
- AWTS
- Septic + single pass sandfilter (SPF)
- Septic + SPF, 25% septic return flow
- Septic + recirculating sandfilter
- Septic + reedbed

Current Inlet BOD conc. ~ 250 mg/L

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,og,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 heavy clays - mod. structured Ksat <0.06m/d
- Med. to hvy clays - weak. struct. or massive Ksat<0.06m/d
- DISPERSIVE soil (Modified Emerson Aggregate test)

| | |
|---|---|
| Wetted depth(m) | 0.50 |
| TN% removal | 50.0% |
| **Reed bed area (m2)** | **10.2** |
| BOD target of 20mg/L is equiv. to ~68.0% TN | Current Outlet BOD conc. ~ 50 mg/L. |

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)

| | | | | |
|---|---|---|---|---|
| Avg depth of root zone (m) | 0.15 | Effective porosity of root zone | 0.37 | Avail.Water Capacity (AWC) of root zone: 0.15 |
| Avg depth bluemetal (etc) in trench below root zone (m) | 0.15 | Effective porosity of bluemetal in trench below root zone | 0.43 | Default AWC of bluemetal in trench below root zone: 0.00 |
| Soil Moisture Holding Capacity: saturation & AWC (mm) | 116.81 | 30.48 | | |
| Permissible percentile exceedence | 5.00% | ETA trench width (m) | 1.20 | |
| Minimum effluent application (mm/day/$m^2$) | 7.67 | | | |
| Exceedence (L) | 0.00000 | | | |

**Trench under root zone** <-

**Land Application Type**

STEP 13 → SSI / ETA

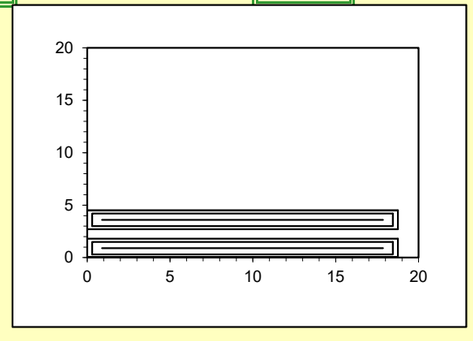
STEP 14 — Calculate (or Cntl- q)

Lateral seepage width (m): 0.300

ETA trench separation: 2

STEP 15 — 1.50

ETA bed separation 0.90




**Lot 10 DP 586360**
**114 Stewarts Road**
**Clunes**

Planning Proposal:
Dwelling Entitlement

**Illustration 1:**
**Subject Site**

## Legend

- Subject Site
- Lot
- Contour (10m)
- Watercourse

Scale: A3
Datum: GDA94
Projection: MGA Zone 56

Date: 01/11/2020

Version 1.0

LGA: Byron

Parish: Bexhill

Data Source:
Cadastral,Topographic Data: LPI NSW 2020
LiDAR Data: NSW Spatial Services
Imagery: Nearmap 2020

1:1,000

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