On-site Sewage Management Design Report
Proposed Dwelling, Proposed Cabin & Amenities in Existing Shed

Location:

Lot 1 DP 258921
32 Grays Lane
Tyagarah NSW 2481

Byron Shire Council

Prepared for:

Sam & Anne Shomali

Report No:

2020.123

As Revised October 2020

HMC environmental consulting pty ltd

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RE: Lot 1 DP 258921, 32 Grays Lane, Tyagarah, NSW, 2481.

HMC Environmental Consulting Pty Ltd is pleased to present our report for On-site Sewage Management Design for the abovementioned site.

We trust this report meets with your requirements. If you require further information please contact HMC Environmental Consulting directly on the numbers provided.

Yours sincerely

Helen Tunks
(B.Env.Sc.)

Document Control Summary			
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Title:	On-site Sewage Management Assessment		
Job No:	2020.123		
Client:	S & A Shomali		

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ABBREVIATIONS

AWTS	Aerated Wastewater Treatment System
BOD_5	Biochemical oxygen demand over 5 day period
CFU	Colony forming unit
DIR	Design irrigation rate
DLR	Design loading rate
LAA	Land application area
LTAR	Long term acceptance rate
SDI	Sub-surface drip irrigation
TN	Total nitrogen
TP	Total phosphorus
TSS	Total suspended solids

1 INTRODUCTION

HMC Environmental Consulting Pty Ltd has been commissioned to prepare on-site sewage management (OSSM) assessment for a proposed 1-bedroom dwelling & proposed cabin with amenities on an existing developed property located at Lot 1 DP 258921, 32 Grays Lane, Tyagarah, within the Byron Shire Council. The applicant is also seeking approval to use the existing unapproved amenities in the existing shed.

This report recommends the installation of a new secondary treatment OSSM facility and a raised sub-surface drip irrigation area of 400m2 comprising native sand. The site lies within the Tyagarah flood plain and 100m setback can be achieved from Simpsons Creek.

A site inspection was carried out by H. Tunks & T. Richards of HMC on the 5th June 2020 and 13th October 2020. During the site inspection the condition and design of the existing unapproved OSSM facility contained in the existing shed were assessed. The existing OSSM facility comprises a 3000L poly septic tank in good condition and an absorption trench of unknown size. The location of the existing absorption trench is within close proximity to a watercourse.

It is proposed to decommission the existing OSSM facility and install a Taylex ABS Tall 400 AWTS to treat all wastewater produced in the existing shed, proposed dwelling and proposed cabin. Effluent land application will be distributed evenly within a 400m2 raised subsurface drip irrigation (SDI) field to achieve elevation of 6.3m RL AHD, above the 20-year ARI. The report provides recommendations for on-site sewage treatment and methods of effluent disposal to land application area (LAA) based on a site and soil assessment.

2 PROPOSAL

Proposal	Proposed OSSM Facility
Property	Lot 1 DP 258921 32 Grays Lane, Tyagarah NSW 2481
Council Area/Approvals Improvements	Byron Shire Council Existing shed approved; existing amenities not approved.
Design Daily Hydraulic Load	Combined 495.6L/day Proposed Cabin (no laundry) & Proposed Dwelling (full amenities) Based on 140L/p/day BSC OSMS Design Model Assumed total 4 persons occupancy
Water Supply	Non-reticulated roof catchment water supply
Soil Type	Sandy Loams to 1000mm + Groundwater@ approximately 1.5m, based on existing water level in dams.
Existing OSSM Facility for shed	• 1 x ~3000L poly septic tank • 1 x absorption trench of unknown size. Condition of existing trench was not suitable to retain.
Summary of proposed OSSM system	• Decommission existing septic tank and cap off existing absorption trench • Install a Taylex ABS Tall 400 AWTS immediately downslope of existing septic tank • Connect existing shed amenities drainage line to new AWTS • Install 100mm DWV sewer pipe to connect proposed dwelling and cabin to new AWTS • Construct raised land application area using on-site native sand/sandy loam to 300mm height about above ground level. • Install 400m2 subsurface drip irrigation field with 400 lineal metres of pressure compensating sub-surface dripperline @150mm depth within filled LAA

3 CHANGES TO BYRON SHIRE COUNCIL DESIGN MODEL

Byron Shire Council OSSM Design Model Default	Change Displayed on Design Model	Justification
• 107m2 Hydraulic sizing • DIR 4.63mm/day	• Oversized to 400m2 • DIR 1.24mm/day	• Reduced DIR to mitigate flood liability. • Raised irrigation area to mitigate flood liability and to improve drainage and ability of LAA to recover following temporary inundation.

4 LAND CAPABILITY – SITE & SOIL ASSESSMENT

4.1 Site Information

Should conditions vary from those described during any stage of installation HMC is to be notified to ensure the recommendations of this report remain valid or alternative recommendations be made. The following information relates to the general site but more specifically to the proposed effluent land application area (LAA).

Inspected by	Helen Tunks & Taylah Richards
Date & Time of Inspection	5th June 2020 (See Appendix 10 for photos)
Environmentally Sensitive Areas & Adjacent Land Uses:	Large rural/residential properties are located within the local catchment surrounding the subject site. Numerous waterbodies (dams) are located within the property boundary. Due to the proximity of watercourses and the flood prone land, it is proposed to construct a raised irrigation area.
Site Conditions	Weather – fine at the time of inspection. Minimal rainfall recorded in the fortnight preceding site inspection totaling 10.4mm. Rainfall recorded for the month preceding site inspection totaling approximately 192.6mm according to BOM Stn 58007 Byron Bay (Jacaranda Drive).
Site Constraints	Flood inundation Proximity to spring fed watercourse High water table High volume, seasonal rainfall.
SITE FEATURES	
Size of property	~4 ha
Exposure & Aspect of LAA	Proposed LAA faces predominantly NE Minimal shading expected from nearby mature trees
Boulders /Rock Outcrops	None observed in vicinity of LAA.
Run-on/Seepage	Minimal expected
Run-off	Minimal expected
Flooding Potential	Nil on raised irrigation field
Site Drainage	Imperfectly drained sandy loam soil to 1m.
Surface Condition/Vegetation	Well grassed surface 100% coverage
Erosion/mass movement	None observed in vicinity
Depth to Water Table	Expected >1.5m based on

Local Elevation of LAA	~6m AHD
Landscape element	Flood plain
Estimated Phosphorus sorption	10000 kg P sorption/ha (Based on soil texture and assessment, Morand, 1994)
Climate	Warm-temperate and high volume, seasonal rainfall typical of region.
Permeability	Indicative K_{sat} 1.4 – 3.0 m/day based on sandy loam soil

4.2 Site Compliance

SITE CONSTRAINTS		**COMPLYING ?**
Setback to Boundary	>6m from property boundary.	YES
Setback to Watercourse	Approximately 20m upslope to spring fed dam	NO
Setback to Water Bore	None registered within 500m	YES
Reserve LAA	100% available, immediately SE	YES
Slope Gradient	3%, generally level	YES
Flood Liability	Expected on ground level	NO

5 LAND APPLICATION AREA SIZING AND DESIGN

5.1 Design Model Inputs – Recommended Minimum

Model Used – Byron Shire Council Design Model 2008 – Daily Time Step		
Climate Data	Alstonville. Mean annual rainfall 1485mm.	
Design Occupancy	Proposed 1-bedroom dwelling (2 persons) Proposed cabin (2 persons) Existing shed with amenities Total 4 persons occupancy assumed	
Wastewater Design Flow Allowance	140L/person /day Table H2 AS1547:2012	
Wastewater Design Hydraulic Load	495.6L/day Reduced due to absence of laundry in proposed cabin	
Total Nitrogen (TN)	4.2 kg/person/year (BSC OSSM Design Model)	
(TN) System Nutrient Reduction	Expected 53% reduction achieved in Taylex ABS	
Vegetation Removal	Kikuyu up to 520kg/ha/year (NSW Agriculture 1997) Conservative rate of (200 kg/ha/year)	
Total Phosphorus (TP)	0.6 kg/year (BSC OSSM Design Model)	
Vegetation Removal	10 kg/ha/year	
(TP) System Nutrient Reduction	Expected 84% reduction achieved in Taylex ABS	
Phosphorus Adsorption	~10000 kg/ha/ based on field texture and work carried out by Morand, 1994	
Design Irrigation Rate (DIR)	4.63mm/day/m2	400m2 = 1.24mm/day/m2
Long Term Acceptance Rate BSC Design Model	8mm/day	

5.2 Design Model Sizing – Hydraulic and Nutrient Balance – BSC OSSM Design Model

See Appendix 3 for modelling calculations and results.

Analyte	Minimum Recommended Land Application Area (LAA)	
	Proposed 1-bedroom dwelling	Proposed System
Hydraulic Area	107m2	Construct a 400m^2 raised (~185m^3 natural topsoil) subsurface drip irrigation field (DIR 1.24mm/day)
Nitrogen (TN)	23m2	
Phosphorus (TP)	38m2	
DIR	4.63mm/day	

No permeability tests were undertaken in the field. To provide a realistic assessment of permeability multiple tests are required. It is considered that the conservative loading rates based on soil texture (AS/NZS 1547:2012) are adequate for design inputs in this case for a domestic situation.

Further reduction of nutrient loads through the encouragement of usage of low phosphorous cleaning agents and other operation and maintenance activities are recommended.

6 SETBACK DISTANCE RISK ASSESSMENT

The setbacks from the proposed on-site sewage management system for this residential development were adopted from the recommendations within the following guidelines:

- Byron Shire Council – Design Guidelines for On-site Sewage Management for Single Households (BSC,2004)
- AS/NZS1547: 2012

The property is located within the Brunswick Catchment on the coastal flood plain of Tyagarah. Several large dams are located within close proximity to the existing and proposed land application area. The dams are spring fed by groundwater. The proposed LAA is to be located a minimum 20m downslope from the existing watercourse.

A setback distance risk assessment was performed to assess the risk of surface water contamination and is detailed within Appendix 6. The risk assessment concluded that the proposed LAA poses a low risk to surface water contamination.

Further design mitigations to reduce the risk to surface water include the following:

- Reduced DIR to 1.24mm/day. Overdesigned LAA to 400m^2 Subsurface drip irrigation field is raised by 300mm to reduce the risk of flooding. The soil is to be sourced from within the property (natural topsoil) for the raised irrigation area and is to be of a sandy loam structure.

7 OVERALL EVALUATION

The existing unapproved OSSM facility for the existing shed with amenities did not comply with the recommended setback distances to surface water and posed a health and safety risk. All wastewater produced by the existing shed with amenities, proposed 1-bedroom dwelling and proposed cabin is to be treated to a secondary quality within a new Taylex ABS Tall 400 AWTS.

The proposed raised effluent land application area above the surrounding flood plain will improve drainage and the ability of the LAA soils to recover following temporary inundation.

8 RECOMMENDATIONS

Based on the information presented in this report, it is considered that the recommendations listed below and detailed in this report, are sufficient to attain an acceptable level of environmental impact from the wastewater generated by the occupation of the proposed dwelling and proposed cabin on the subject site, and the use of the shed amenities by householders only.

DESIGN HYDRAULIC LOADING

- Proposed 1-bedroom dwelling
- Proposed 1-bedroom cabin
- Use of existing amenities in shed
- 4 persons total occupancy assumed
- 495.6L/day
- Shed to be rendered uninhabitable. Proposed use by householders only.

RECOMMENDED ON-SITE SEWAGE MANAGEMENT SYSTEM

Refer to Site Plan & Irrigation Detail (S.6.1 and S.6.2) on following pages

- Decommission existing septic tank and absorption trench
- Install a Taylex ABS Tall 400 AWTS immediately downslope of existing septic tank
- Connect existing shed amenities drainage line to proposed AWTS
- Use 100mm DWV sewer pipe to connect proposed dwelling and cabin to AWTS
- Construct raised land application area using on-site native sand/sandy loam to 300mm height about above ground level. Existing grassed surface is to be scraped to remove vegetation prior to placing the sandy fill material sourced from the site.
- Use 32mm pumped poly pipe to proposed AWTS to proposed SDI field
- Install 400m2 subsurface drip irrigation field with 400 lineal meters of pressure compensating sub-surface dripperline @150mm depth within filled LAA

Raised irrigation field is to be created from on-site native soil of a sand/sandy loam texture. Pressure compensating Netafim non-drain dripperline is to be buried ~100mm below top of field surface during construction of the raised irrigation field, and secured in place. A minimum 1m distance should be maintained from the dripperline to the top of side batter (See section 7.2). The surface is to be sown with grass or turfed post installation of dripperline.

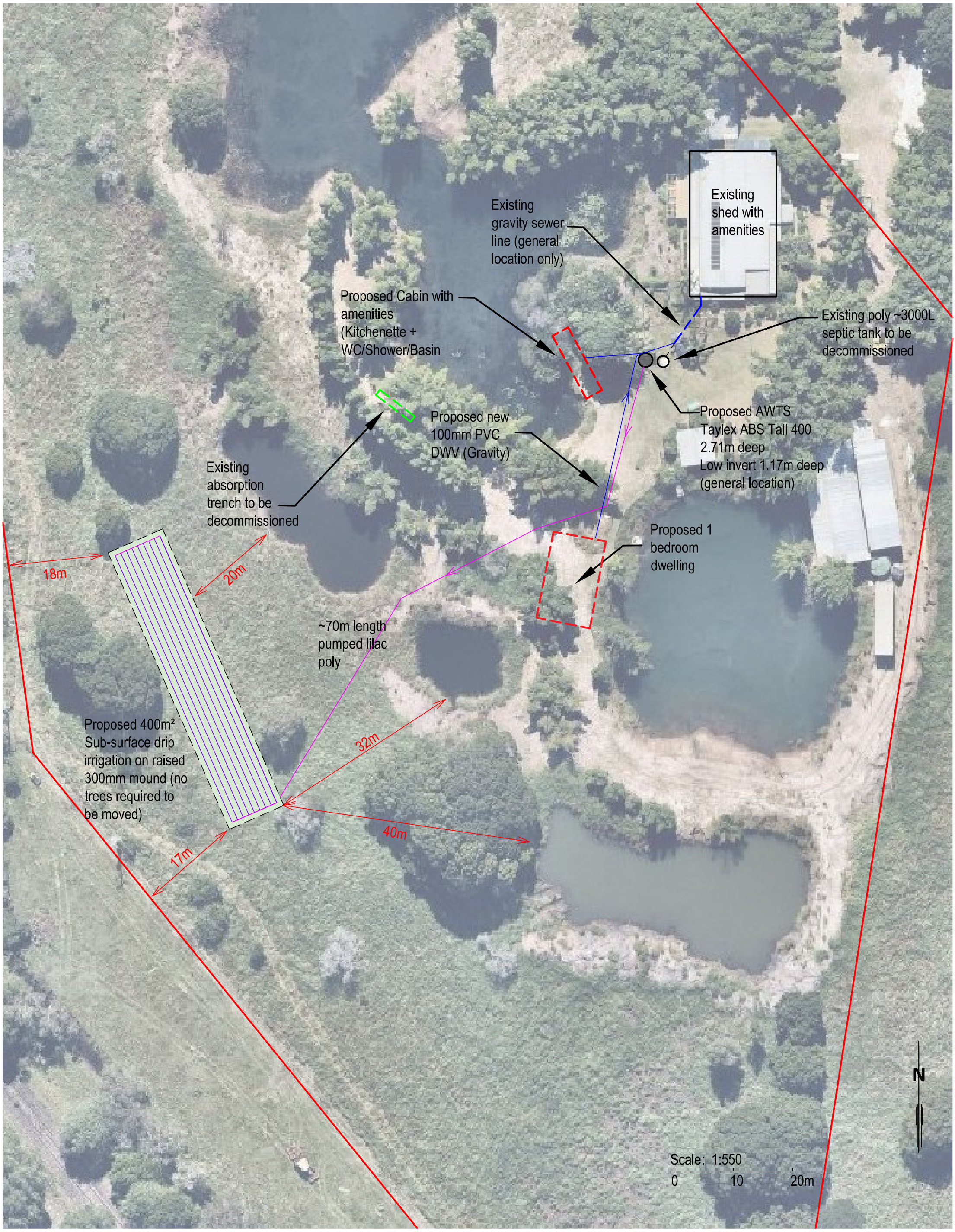
OPERATION & MAINTENANCE

A contract with an authorised AWTS service agent for quarterly service inspections is to be current and remain current always during the operation of the system.

- **DO NOT DISPOSE OF DOWN THE DRAINS**: Bleach, bleach-based products, whiteners, nappy soakers and spot removers. Dispose of in the garden in an unused location.
- **DO NOT FLUSH DOWN THE DRAINS**: Hygiene products, condoms, tampons, sanitary napkins, disposable nappies and cotton buds.
- **DO PRACTICE WATER CONSERVATION**.
- **DO USE** only the recommended amounts of disinfectants and cleaners. Biodegradable products for septic systems are recommended.
- **DO MOW & TOPDRESS** the subsurface drip irrigation field regularly to ensure that the surface is smooth with no depressions, and that a surface grade is maintained to shed rainfall.

8.1 Site Plan - Proposed Layout of On-Site Sewage Management System

SEE NEXT PAGE



On-Site Sewage Management Design - Land Application Area OPTIONS

Lot 1 DP 258921
32 Grays Lane Tyagarah

Base Drawing Source: BSC Mappping HMC Ref: HMCDWG2020.123

Job No: 2020.123

Date: June 2020
Revision Date: 28/9/20
14/10/2020

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8.2 Section – Raised Subsurface Drip Irrigation Field Construction Detail.

SEE NEXT PAGE

Disk Filter

Tech Filter

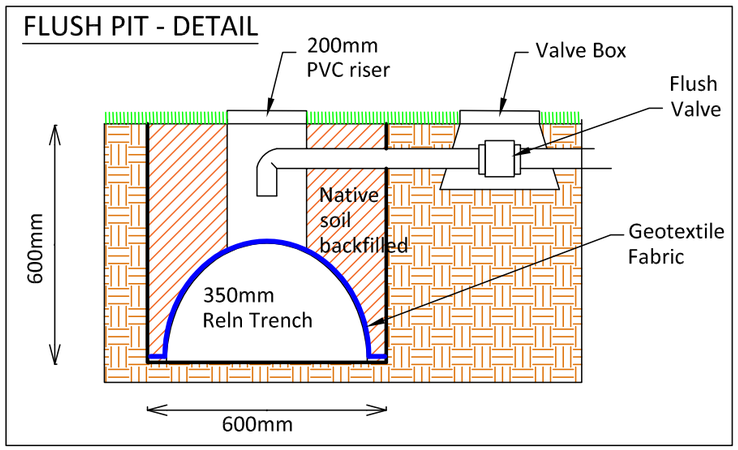
Air Release/vacuum breaker

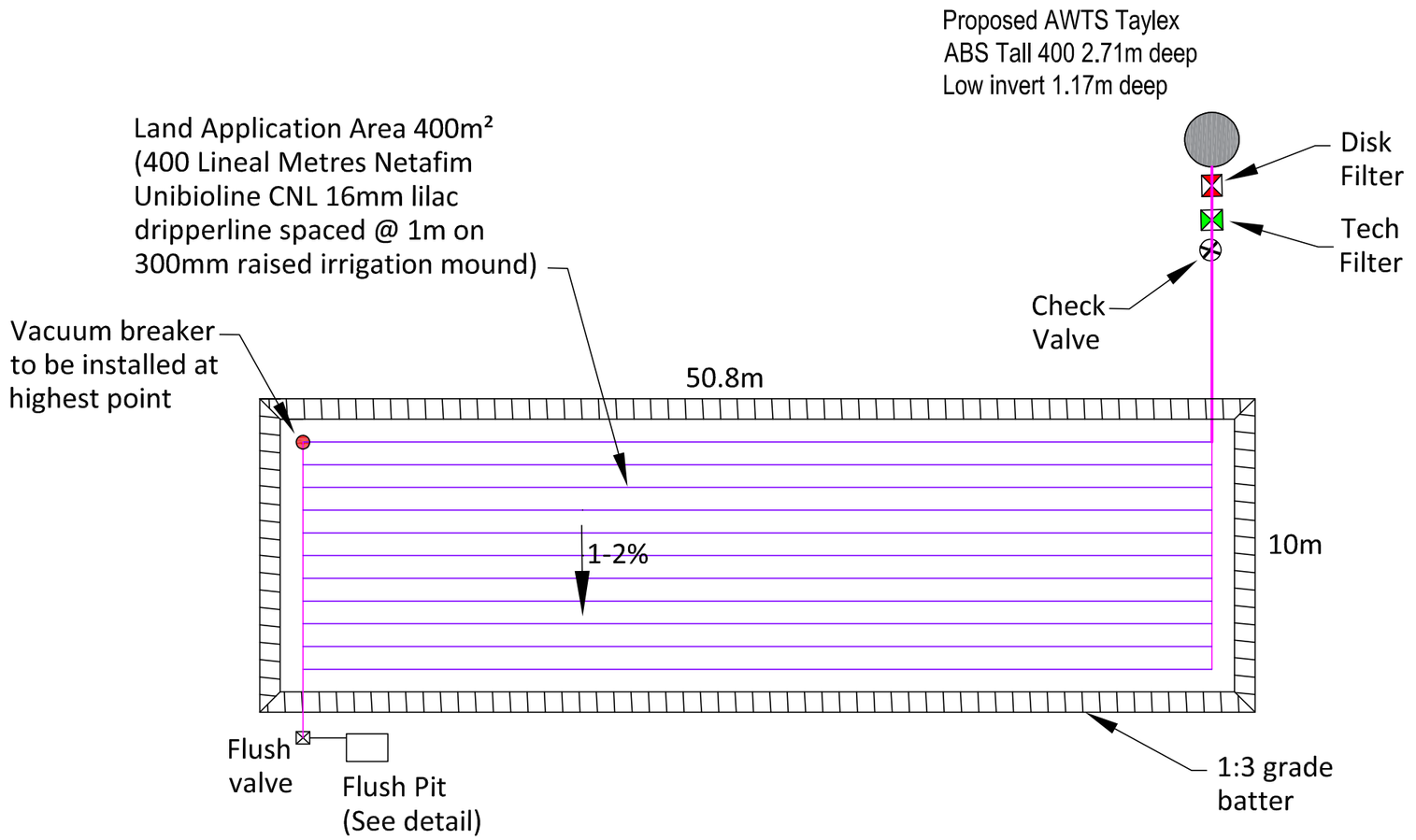
Flush Valve

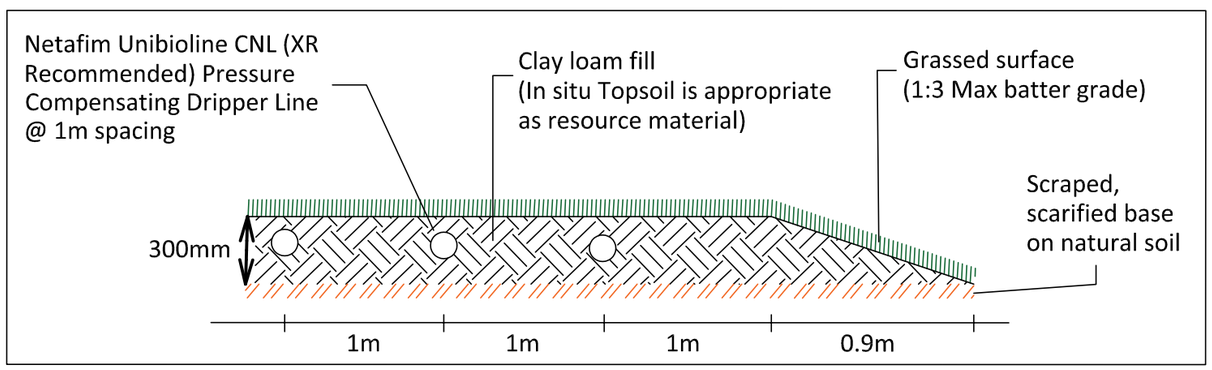
Netafim DNL check valve

25mm Ø lilac LDPE

16mm Netafim Unibioline CNL dripperline
1.6L/hr emitters @ 0.4m spacing







ONSITE SEWAGE MANAGEMENT & SUB-SURFACE DRIP IRRIGATION LAYOUT & SECTION DETAIL

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Lot 1 DP 582921
32 Grays Lane Tyagarah

HMC Ref: HMCDWG2020.123

Job No: 2020.123
Date: October 2020
Revision Date:

9 REFERENCES

- Australian/New Zealand Standard AS 1547: 2012 - *On-site domestic wastewater management*, February 2012
- Byron Shire Council, "*On-site Sewage Management Strategy*", 2001.
- Byron Shire Council, " Design Guidelines for On-site Sewage Management for Single Households". 2004
- Byron Shire Council, "Information and Assessment Guide for owners of On-site Sewage Systems", 2006
- Morand, D.T., *Soil Landscapes of the Lismore-Ballina 1:100 000 Sheet*, 1994
- Munsell Soil Color Charts, GretagMacbeth, New Windsor, NY, USA, 2000.
- NSW Department of Local Government, EPA (NSW), NSW Health, Land and Water Conservation and Department of Urban Affairs and Planning, *Environment & Health Protection Guidelines – On-site Sewage Management for Single Household*", February 1998
- Rous Water Regional Water Supply, "Rous Water Onsite Wastewater Management Guidelines", June 2008;
- WaterNSW, "Designing and Installing On-site Wastewater Systems. A WaterNSW Recommended Practice", WNSW, 2019.

10 LIMITATIONS

The information within this document is and shall remain the property of HMC Environmental Consulting Pty Ltd. This document was prepared for the sole use of client and the regulatory agencies that are directly involved in this project, the only intended beneficiaries of our work. No other party should rely on the information contained herein without the prior written consent of HMC Environmental Pty Ltd and client. The report and conclusions are based on the information obtained at the time of the assessment. Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary.

Because a report is based on conditions which existed at the time of the subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time, natural processes and the activities of man. Changes to the subsurface, site or adjacent site conditions may occur subsequent to the investigation described herein, through natural processes or through the intentional or accidental addition of imported material, and these conditions may change with space and time.

The findings of this report are based on the objectives and scope of work outlined within. HMC performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environment assessment profession. No warranties or guarantees, expressed or implied, are made. Subject to the scope of work, HMC's assessment is limited strictly to identifying typical environmental conditions associated with the subject property, and does not include evaluation of any other issues. This report does not comment on any regulatory obligations based on the findings, for which a legal opinion should be sought. This report relates only to the objectives and scope of the work stated, and does not relate to any other works undertaken for the Client. All conclusions regarding the property area are the professional opinions of the HMC personnel involved with the project, subject to the qualifications made above.

While normal assessments of data reliability have been made by HMC, HMC assume no responsibility or liability for errors in any data obtained from regulatory agencies, or information from sources outside HMC's control, or developments resulting from situations outside the scope of this project.

11 APPENDICES

APPENDIX 1 Site Location

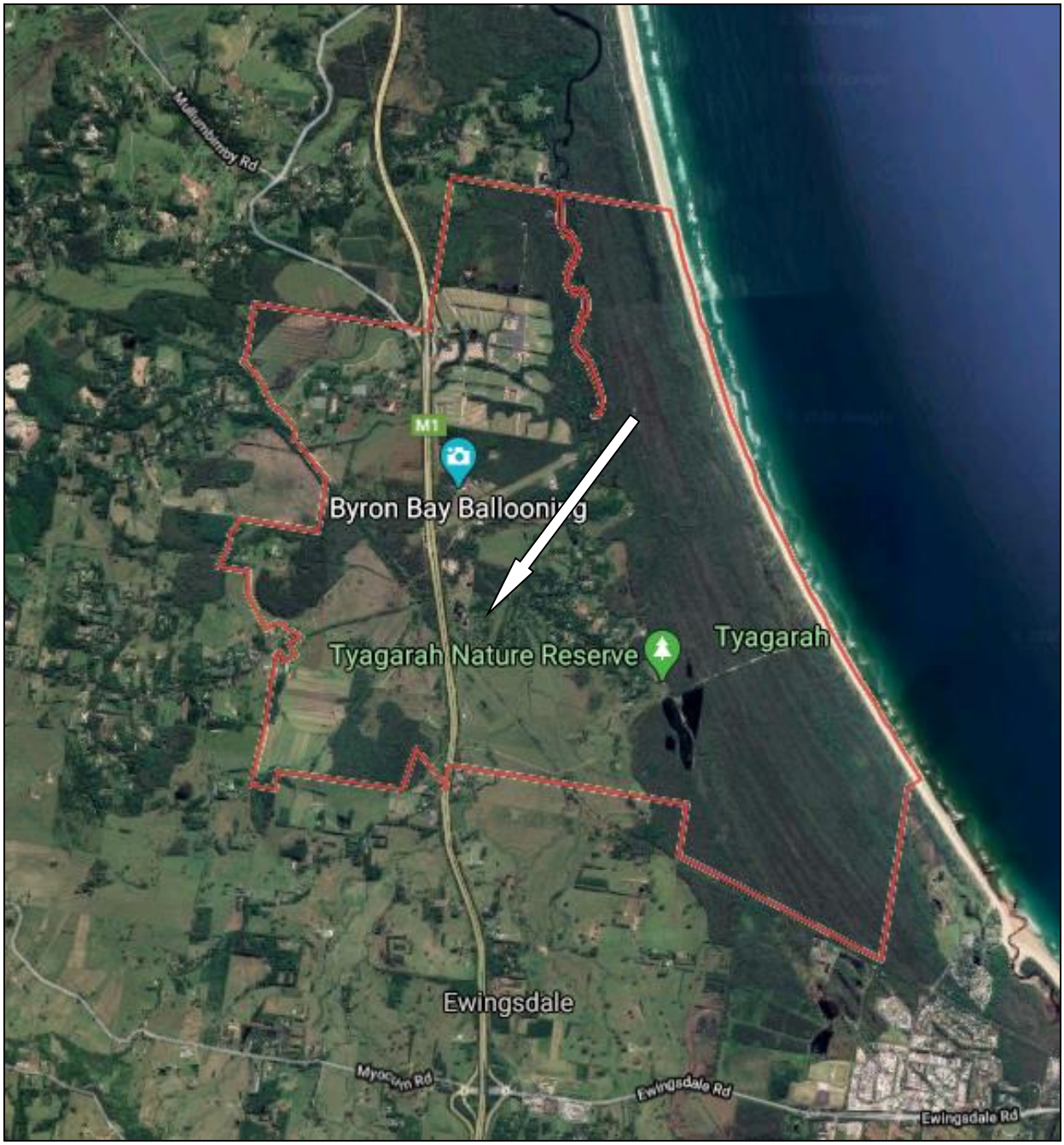


Figure 1 – Site Location (Google Maps)

APPENDIX 2 Property Boundary

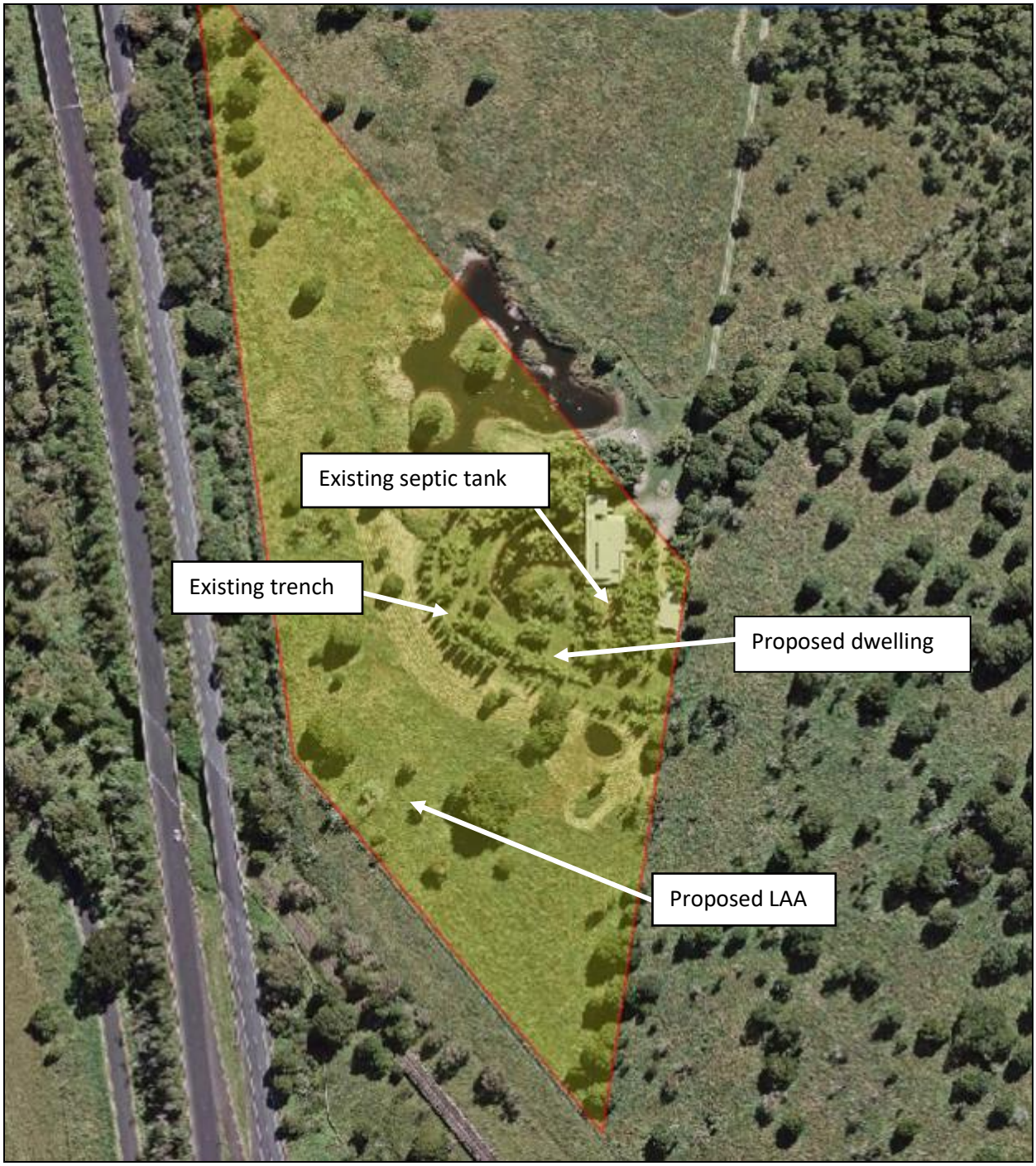
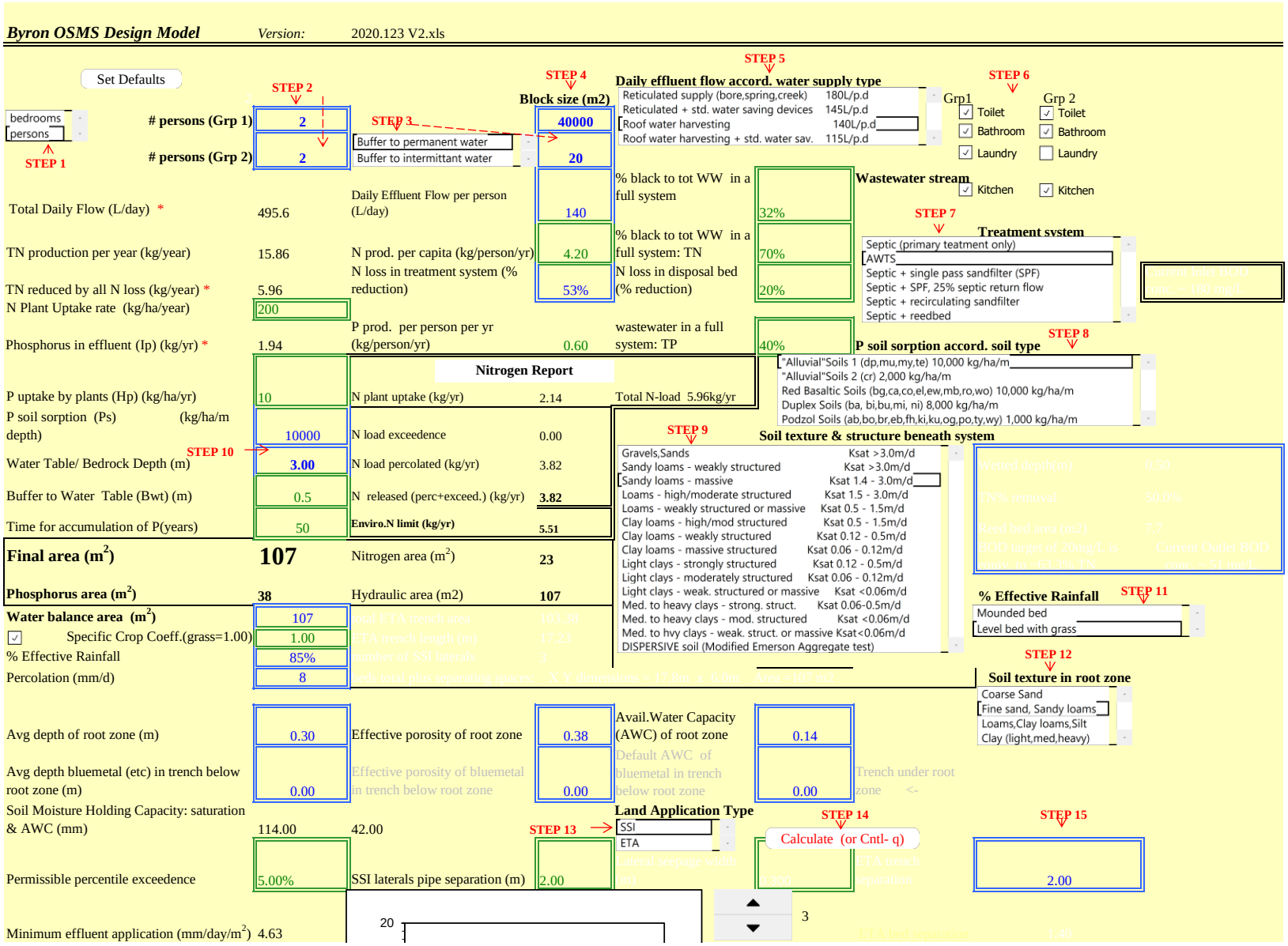


Figure 2 – Property Boundary (https://maps.six.nsw.gov.au/)

APPENDIX 3 LAA Modelling

SEE NEXT PAGE

Byron OSMS Design Model - version 2020.123 V2.xls	Printed 16 Oct '20 12:16 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)	10000
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	FALSE
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)	20%
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	85%
Effective Rainfall listbox	2
Percolation (mm/day)	5
Soil texture and structure beneath system listbox	6
Depth of root zone (m)	0.3
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
Effective porosity of trench below root zone	0
Avail.Water of trench below root zone	0
Permissable percentile exceedence	5.0000%
Trench width (m)	0.6
Lateral seepage width (m)	0.3
Disposal Type SSI (1) / ETA (2) listbox	1
Number of trenches (spinner button)	13
Hydraulic area (m2)	144.35
Nitrogen area (m2)	0.00
Phosphorus area (m2)	31.76
Water balance area (m2) - Cntl-q (see text)	144.35
Final area (m2)	144.35


Byron OSMS Design Model
Version: 2020.123 V2.xls
Set Defaults
STEP 1
bedrooms
persons
STEP 2
persons (Grp 1) 2
persons (Grp 2) 2
STEP 3
Buffer to permanent water
Buffer to intermittant water
STEP 4
Block size (m2) 40000
20
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
Grp1
Grp 2
Toilet
Bathroom
Laundry
Kitchen
Wastewater stream
Total Daily Flow (L/day) * 495.6
Daily Effluent Flow per person (L/day) 140
% black to tot WW in a full system 32%
TN production per year (kg/year) 15.86
N prod. per capita (kg/person/yr) 4.20
% black to tot WW in a full system: TN 70%
TN reduced by all N loss (kg/year) * 5.96
N loss in treatment system (% reduction) 53%
N loss in disposal bed (% reduction) 20%
N Plant Uptake rate (kg/ha/year) 200
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. > 180 mg/L
Phosphorus in effluent (Ip) (kg/yr) * 1.94
P prod. per person per yr (kg/person/yr) 0.60
wastewater in a full system: TP 40%
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
Nitrogen Report
P uptake by plants (Hp) (kg/ha/yr) 10
N plant uptake (kg/yr) 2.14
Total N-load 5.96kg/yr
P soil sorption (Ps) (kg/ha/m depth) 10000
N load exceedence 0.00
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)
STEP 10
Water Table/ Bedrock Depth (m) 3.00
N load percolated (kg/yr) 3.82
Buffer to Water Table (Bwt) (m) 0.5
N released (perc+exceed.) (kg/yr) 3.82
Time for accumulation of P(years) 50
Enviro.N limit (kg/yr) 5.51
Final area (m2) 107
Nitrogen area (m2) 23
Phosphorus area (m2) 38
Hydraulic area (m2) 107
Water balance area (m2) 107
Specific Crop Coeff.(grass=1.00) 1.00
% Effective Rainfall 85%
Percolation (mm/d) 8
Vetted depth(m) 0.50
N% removal 50.0%
Reed bed area (m2) 7.7
BOD target of 20mg/L is Current Outlet BOD
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) 0.30
Effective porosity of root zone 0.38
Avail.Water Capacity (AWC) of root zone 0.14
Avg depth bluemetal (etc) in trench below root zone (m) 0.00
Effective porosity of bluemetal in trench below root zone 0.00
Default AWC of bluemetal in trench below root zone 0.00
Trench under root zone <-
Soil Moisture Holding Capacity: saturation & AWC (mm) 114.00 42.00
Land Application Type
SSI
ETA
STEP 13
STEP 14
Calculate (or Cntl- q)
STEP 15
Permissible percentile exceedence 5.00%
SSI laterals pipe separation (m) 2.00
Lateral seepage width (m) 1.000
ETA trench separation 2.00
Minimum effluent application (mm/day/m2) 4.63
20
3
ETA bed separation 1.40

APPENDIX 4 Soil Assessment

NSW DLWC 1:100,000 Soil Landscape Map (Morand, 1994)	Myocum (my) soil landscape (Expected) Poorly drained Dense Clays and Grey Clays
Geology	Quaternary alluvium: alluvium, sand, clay. Predominantly fine-grained sediments from the Lismore Basalts, though sediments of Nimbin Rhyolites and Neranleigh-Fernvale Group also contribute.

Soil profile – exposed by cuttings

Bore Hole No.	Approx. Depth (mm)	Field Texture Determination (AS1547 Soil Category)	Structure	Colour Moist (MUNSELL)	pH	Coarse Fragments	Modified Emmerson Aggregate Test (BSC, 2004)
1	0-1000	Sandy Loam	Single grained	Very Dark Greyish Brown 10YR 3/2	6.0	Nil	Class 3
2	0-1000	Sandy Loam	Single grained	Very Dark Greyish Brown 10YR 3/2	6.0	Nil	Class 3

Top dressing of the disposal area may be required, especially for the first 6-12 months due to settling of the soil.
Topsoil should be of a loam to sandy loam texture with a neutral pH.
See Appendix 10 for photo of soil profile.

APPENDIX 5 Modified Emersion Aggregate Test

As described within the *Design Guidelines for On-site Sewage Management for Single Households* (BSC, 2004).

Soil Class	Description
Class 1	Material disperses completely
Class 2	Aggregates disperse (clouds solution appreciably)
Class 3	Aggregates slake - smaller aggregates/particles fall off the original aggregate
Class 4:	No change to aggregate, therefore non-dispersive

APPENDIX 6 Setback Distance Risk Assessment

Table 1 Site Features Not Achieving Maximum Setback Distances

Site Feature	Horizontal Setback Distance Range	Site Constraint Items
Surface Water	15-100m	A B D E F G J

Table 2 Site Constraint Risk Assessment

Item	Site/system feature	Constraint Scale Factors		Risk Level of Constraint
		Lower ⟷ Higher		
A	Microbial quality of effluent [3]	Secondary treatment	Primary treatment	Low-Secondary treatment
B	Surface water	Category 1-3 soils >100m setback Low rainfall Low resource value	Category 4-6 soils <50m to surface water High rainfall High resource value	Low-Category 2 soils Medium-~20m upslope to surface water High High resource value
D	Slope	<10% Subsurface application	>30% subsurface application	Low-generally level
E	Position of land application area in landscape	Downgradient of surface water, boundary	Upgradient of surface water, boundary	Low – upslope to surface water
F	Drainage	Category 1 and 2 soils, gently sloping	Category 6 soils, seepage, low lying area	Low – Category 2 soils
G	Flood potential	> 1 in 20 year contour	<1 in 20 year flood contour	Low - <1 in 20 year
J	Application method	Drip irrigation or subsurface application of effluent.	Surface/above ground application of effluent.	Low-subsurface application in raised irrigation field
AVERAGE RISK LEVEL				
Surface Water				**LOW**

APPENDIX 7 Setback Guidelines

Table R1 – AS/NZS 1547:2012 Guidelines for Horizontal and Vertical Setback Distances (to be used in conjunction with Table R2)		
Site Feature	**Setback Distance range (m)1**	**Site constraint items of specific concern (from table R2)1**
	Horizontal Setback Distance (m)	
Property Boundary	1.5-502	A, D, J
Buildings/houses	2.0->63	A, D, J
Surface Water4	15-100	A, B, D, E, F, G, J
Bore, Well5	15-50	A, C, H, J
Recreational areas (Children's play areas, swimming pools and so on)7	3-158,9	A, E, J
In-Ground water tank	4-1510	A, E, J
Retaining wall and Embankments, escarpments, cuttings11	3.0m or 45o angle from toe of wall (whichever is greatest)	D, G, H
	Vertical Setback Distance (m)	
Groundwater 5,6,12	0.6->1.5	A, C, F, H, I, J
Hardpan or bedrock	0.5->1.5	A, C, J

Notes:

The overall setback distance should be commensurate with the level of risk to public health and the environment. For example, the maximum setback distance should be adopted where site/system features are on the high end of the constrain scale. The setback distance should be based on an evaluation of the constraint items and corresponding sensitive features in Table R2 and how these interact to provide a pathway or barrier for wastewater movement.

Subject to local regulatory rules and design by a suitably qualified and experienced person, the separation of a drip line system from an upslope boundary, for slopes greater than 5%, may be reduced to 0.5m.

Setback distances of less than 3m from houses are appropriate only where a drip irrigation land application system is being used with low design irrigation rates, where shallow subsurface systems are being used with equivalent low areal loading rates, where the risk of reducing the bearing capacity of the foundation or damaging the structure is low, or where tan effective barrier (designed by a suitably qualified and experienced person) can be installed. This may require consent from the regulatory authority.

Setback distance from surface water is defined as the areal edge of the land application system to the edge of the water. Where land application areas are planned in a water supply catchment, advice on adequate buffer distances should be sought from the relevant water authority and hydrogeologist. Surface water, in this case, refers to any fresh water or geothermal water in a river, lake, stream, or wetland that may be permanently or intermittently flowing. Surface water also includes water in the coastal marine area and water in man-made drains, channels, and dams unless these are to specifically divert surface water away from the land application area. Surface water excludes any water in a pipe or tank.

Highly permeable stony soils and gravel aquifers potentially allow microorganisms to be readily transported up to hundreds of metres down the gradient of an on-site system (see R3, Table 1 in Pang et al. 2005). Maximum

setback distances are recommended where site constraints are identified at the high scale for items A, C and H. For reading and guidance on setback distances in highly permeable soils and coarse-grained aquifers see R2. As microbial removal is not linear with distance, data extrapolation of experiments should not be relied upon unless the data has been verified in the field. Advice on adequate buffer distances should be sought from the relevant water authority and a hydrogeologist.

Setback distances from water supply bores should be reviewed on a case-by-case basis. Distances can depend on may factors including soil type, rainfall, depth and casing of bore, direction of groundwater flow, type of microorganisms, existing quality of receiving waters, and resource value of waters.

Where effluent is applied to the surface by covered drip or spray irrigation, the maximum value is recommended.

In the case of subsurface application of primary treated effluent by LPED irrigation, the upper value is recommended.

In the case of surface spray, the setback distances are based on a spray plume with a diameter not exceeding 2m or a plume height not exceeding 0.5m above finished surface level. The potential for aerosols being carried by the wind also needs to be taken into account.

It is recommended that land application of primary treated effluent be down gradient of in-ground water tanks.

When determining minimum distances from retaining walls, embankments, or cut slopes, the type of land application system, soil types, and soil layering should also be taken into account to avoid wastewater collecting in the subsoil drains or seepage through cuts and embankments. Where these situations occur setback clearances may need to be increased. In areas where slope stability is of concern, advice from a suitably qualified and experienced person may be required.

Groundwater setback distance (depth) assumes unsaturated flow and is defined as the vertical distance from the base of the land application systems to the highest seasonal water table level. To minimise potential for adverse impacts on groundwater quality, minimum setback distances should ensure unsaturated, aerobic conditions in the soil. These minimum depths will vary depending on the scale of the site constraints identified in Table R2. Where groundwater setback is insufficient, the ground level can be raised by importing suitable topsoil and improving effluent treatment. The regulatory authority should make the final decision in this instance. (See also the guidance on soil depth and groundwater clearance in Tables K1 and K2.

Table R2 - AS/NZS 1547:2012
Site Constraint Scale for Development of Setback Distances
(used as a guide in determining appropriate setback distances from ranges given in Table R1)

Item	**Site/system feature**	**Constraint Scale 1** **Lower ⟷ Higher** **Examples of constraint factors2**		**Sensitive features**
A	Microbial quality of effluent 3	Effluent quality consistently producing ≤106 cfu/100mL E.coli (for example, primary treated effluent)	Effluent quality consistently producing ≥106 cfu/100mL E.coli (for example, primary treated effluent)	Groundwater and surface pollution hazard, public health hazard
B	Surface water 4	Category 1 to 3 soils 5 no surface water down	Category 4 to 6 soils, permanent surface	Surface water pollution hazard for low permeable

		gradient within > 100m, low rainfall area	water <50m down gradient, high rainfall area, high resource/environmental value6	soils, low lying or poorly draining areas
C	Groundwater	Category 5 & 6 soils, low resource/environmental value	Category 1 and 2 soils, gravel aquifers, high resource/environmental value	Groundwater pollution hazard
D	Slope	0-6% (surface effluent application)	>10% (surface effluent application), >30% subsurface effluent application	Off-site export of effluent erosion
E	Position of land application area in landscape 6	Downgradient of surface water, property boundary, recreational area	Upgradient of surface water, property boundary, recreational area	Surface water pollution hazard, off-site export of effluent
F	Drainage	Category 1 and 2 soils, gently sloping area	Category 6 soils, sites with visible seepage, moisture tolerant vegetation, low lying area	Groundwater pollution hazard
G	Flood potential	Above 1 in 20 year flood contour	Below 1 in 20 year flood contour	Off-site export of effluent, system failure, mechanical faults
H	Geology and Soils	Category 3 and 4 soils, low porous regolith, deep, uniform soils	Category 1 and 6 soils, fractured rock, gravel aquifers, high porous regolith	Groundwater pollution hazard for porous regolith and permeable soils
I	Landform	Hill crests, convex side slopes and plains	Drainage plains and incise channels	Groundwater pollution hazard, resurfacing hazard
J	Application method	Drip irrigation or subsurface application of effluent	Surface/above ground application of effluent	Off-site export of effluent, surface water pollution

NOTES:

Scale shows the level of constraint to sitting on an on-site system due to the constraints identified by SSE evaluator or regulatory authority. See Figures R1 and R2 for examples of on-site system design boundaries and possible site constraints

Examples of typical siting constraint factors that may be identified either by SSE evaluator or regulatory authority. Site constraints are not limited to this table. Other site constraints may be identified and taken into consideration when determining setback distances.

The level of microbial removal for any on-site treatment system needs to be determined and it should be assumed that unless disinfection is reliably used then the microbial concentrations will be similar to primary treatment. Low risk microbial quality value is based on the values given in ARC (2004), ANZECC and ARMCANZ

(2000), and EPA Victoria (Guidelines for environmental management: Use of reclaimed water 2003)
Surface water, in this case, refers to any fresh water or geothermal water in a river, lake, stream, or wetland that may be permanently or intermittently flowing. Surface water also includes water in the coastal marine area and water in man-made drains, channels, and dams unless these are to specifically divert surface water away from the land application area. Surface water excludes any water in a pipe or tank.
The soil categories 1 to 6 are described in Table 5.1 Surface water or groundwater that has high resource value may include potable (human or animal) water supplies, bores, wells, and water used for recreational purposes. Surface water or groundwater of high environmental value include undisturbed or slightly disturbed aquatic ecosystems as described in ANZECC and ARMCANZ (2000).
The regulatory authority may reduce or increase setback distance at their discretion based on the distances of the land application up or downgradient of sensitive receptors.

Table 3 Guidelines for Horizontal and Vertical Setback Distances (DLG, 1998)

System	Recommended Buffer Distances
All land application systems	100 metres to permanent surface waters (eg. River, streams, lakes etc) 250 metres to domestic groundwater well 40 metres to other waters (eg. Farm dams, intermittent waterways and drainage channels, etc)
Surface spray irrigation	6 metres if area up-gradient and 3 metres if area down-gradient of driveways and property boundaries 15 metres to dwellings 3 metres to paths and walkways 6 metres to swimming pools
Surface drip and trickle irrigation	6 metres if area up-gradient and 3 metres if area down-gradient of swimming pools, property boundaries, driveways and buildings
Subsurface irrigation	6 metres if area up-gradient and 3 metres if area down-gradient of swimming pools, property boundaries, driveways and buildings
Absorption System	12 metres if area up-gradient and 6 metres if area down-gradient of property boundary 6 metres if area up-gradient and 3 metres if area down-gradient of swimming pools, driveways and buildings

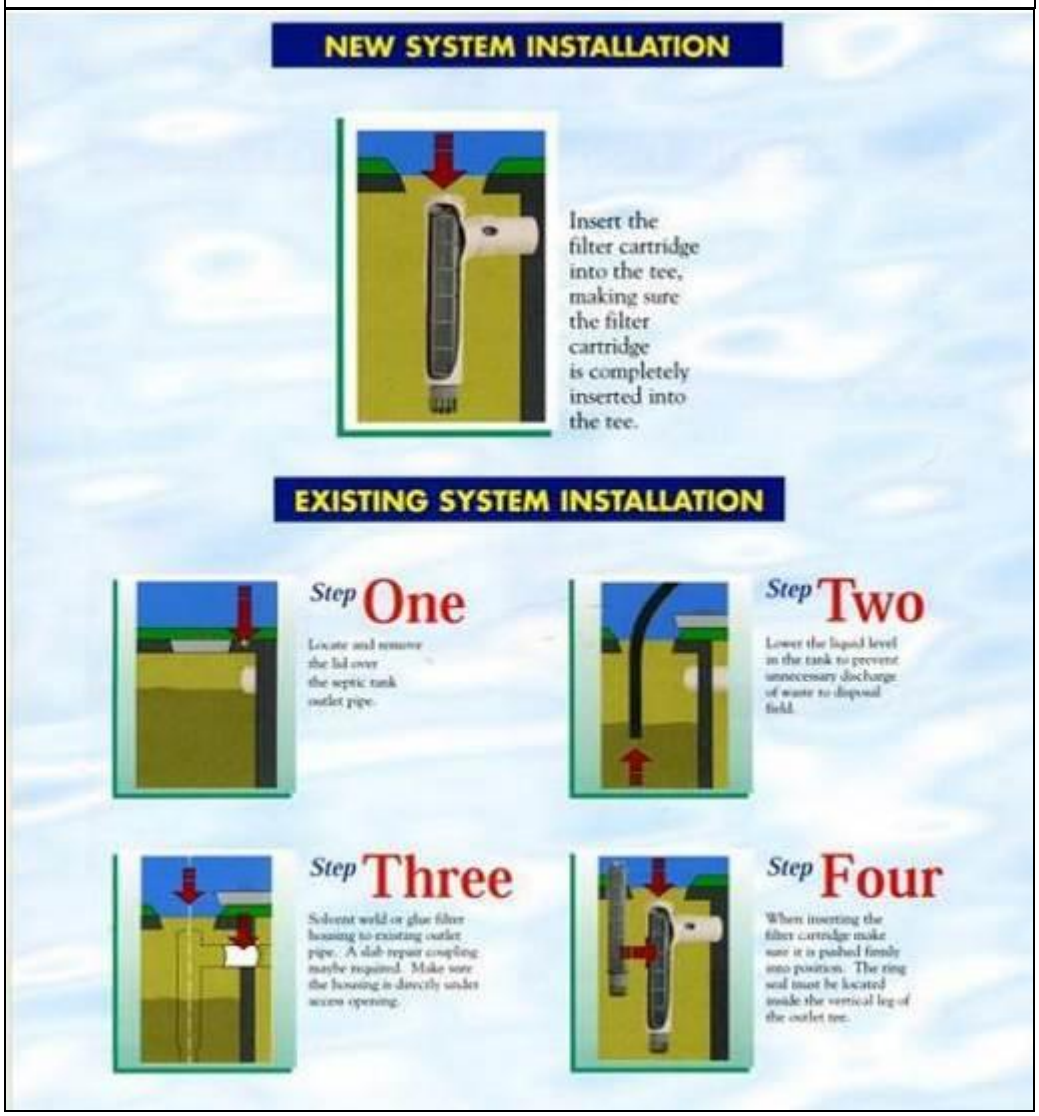
APPENDIX 8 Biological Effluent Filter – Installation & Operation

The TFR (Taylex Filter Residential)

This filter has ben designed to fit into existing septic tanks to extend the trench and irrigation fields life span.

This filter fits down the outlet inspection pipe.

Taylex Filter Residential (TFR)



APPENDIX 9 Decommissioning of Septic Tank – NSW Health Guide

SEE FOLLOWING PAGES

Advisory Note 3 — Revised January 2017

Destruction, Removal or Reuse of Septic Tanks, Collection Wells, Aerated Wastewater Treatment Systems (AWTS) and other Sewage Management Facilities (SMF)

This advisory note has been developed to assist local councils when dealing with applications to reuse septic tanks, collection wells and or aerated wastewater treatment systems (AWTS). It should be read in conjunction with the Local Government (General) Regulation 2005.

UNDER NO CIRCUMSTANCES ARE SEPTIC TANKS, COLLECTION WELLS, AWTS, ETC TO BE REUSED AS VESSELS FOR HOLDING WATER FOR DRINKING PURPOSES, OR FOR ANY INTERNAL HOUSEHOLD DOMESTIC PURPOSE.

Existing septic tanks, collection wells and AWTS become redundant where reticulated sewerage progresses through an area and premises connect. Questions are asked periodically by the public about the fate of the redundant SMF. These onsite SMF may be demolished or potentially reused onsite as a storm water storage vessel. There is also potential for these systems to be sold second hand and reinstalled. The existing septic tank, where suitable, potentially may also be used when the premises is upgraded to an AWTS installation.

Where it is feasible to reuse a septic tank, collection well, or AWTS there are several precautions that need to be observed to ensure that public health risk is minimised. The reuse and/or removal of a septic tank, collection well or AWTS shall only be carried out after the premises are connected to sewer or to an alternative form of SMF.

During times of water restrictions the water supply authority should be contacted to determine if it is a permissible use of water to hose out a SMF prior to its reuse or relocation.

This guideline considers the following circumstances.

1. Septic Tanks / Collection Wells
1.1 Demolition
1.2 Reuse for Stormwater Storage
1.3 Upgrade to AWTS
1.4 Removed and Relocated

2. AWTS
2.1 Demolition
2.2 Used as Domestic Greywater Treatment System
2.3 Removed and Relocated

If reuse of a different type of SMF is under consideration then the intent of these guidelines should be met.

1. Septic Tank / Collection Well:

1.1 Demolition On-Site

1.1.1 The contents of the septic tank / collection well are to be removed by a method acceptable to the local council, either by tanker removal to an appropriate authorised site or pumped into the existing disposal trench if of sufficient capacity and which then should be sealed. The contents of a septic tank or collection well must not be broadcast or discharged above ground.

1.1.2 The sides, lid, baffle or partition (if fitted) and square junctions of the tank should be hosed down as the waste is being removed.

1.1.3 The tank is to be treated by liberally broadcasting “Builders' (hydrated) Lime” over the exposed surfaces. It is advisable to wear personal protective equipment.

1.1.4 Several holes should be punched or drilled into the base of the tank. The lid and those parts of the walls baffle and square junctions above the ground should be demolished and collapsed into the tank and the tank filled with clean soil or rubble and topped with clean soil. This should be performed to ensure that voids cannot develop which would allow collapse and injury in the future.

1.2 Reused On Site as a Storm Water Storage and Irrigation Tank

1.2.1 The water from such a stormwater or irrigation tank may be used for garden purposes but not for topping up swimming pools. Nor should the water be used for internal household purposes such

as for toilet flushing, or in laundry tubs, washing machines, bathrooms or kitchen.

1.2.2 For reuse on site as a non-domestic water containing vessel the contents are to be removed either to a site acceptable to the local council or pumped into the existing disposal trench if of sufficient capacity which then should be sealed. The contents of a septic tank or collection well must not be broadcast or discharged above ground.

1.2.3 The sides, lid, baffle or partition (if fitted) and square junctions of the tank should be hosed down as the waste is being removed.

1.2.4 The tank should be filled with fresh water and disinfected to a minimum level of 5 mg/L of free residual chlorine with a half hour contact time. The chlorine should be allowed to dissipate naturally at least overnight and not be neutralised.

1.2.5 The inlet(s) and outlet(s) of the vessel should be sealed. Pumps and other accessories may then be installed and connected to an irrigation system. The tank is to be mosquito proofed and fitted with a strainer or first flush device to prevent the introduction of coarse particles and materials.

1.2.6 The tank is to be labelled as containing water unfit for human consumption.

1.2.7 Pipes, fittings or fixtures in accordance with the water supply authority requirements may only be used. No cross connection is to be made with any potable water supply, nor should the vessel be likely to contaminate any potable water supply. Backflow prevention devices may need to be installed in accordance with the water supply authority directions.

1.2.8 Any overflow is to be directed to the storm water discharge or as specified by the local council.

1.3 Upgrading to AWTS

An existing septic tank may be used in conjunction with an AWTS on the same site provided:

1.3.1 The existing septic tank is of at least the same size and capacity of the septic tank of the accredited AWTS and the existing septic tank is not to be relocated elsewhere on the same site;

1.3.2 The contents of the septic tank are to be removed either to a site acceptable to the local council or pumped into the existing disposal trench if of sufficient capacity which then should be sealed. The contents of a septic tank or collection well must not be broadcast or discharged above ground.

1.3.3 The septic tank when inspected by a competent person such as the installer of the AWTS or a plumber / drainer is found to be in a suitable condition and in conformity with AS/NZS 1546.1:2008.

1.3.4 Written approval under section 68 of the Local Government Act from the local council to alter the SMF must be obtained prior to the upgrade and the approval to operate must be reassessed.

1.4 Removed and Relocated

1.4.1 Septic tanks and collection wells may only be removed, relocated and reused as such where the septic tank or collection well is subject to a current "Certificate of Accreditation" issued by the NSW Ministry of Health.

1.4.2 The contents of the septic tank and/or collection well are to be removed either to a site acceptable to the local authority or pumped into the existing disposal trench if of sufficient capacity which then should be sealed. The contents of a septic tank or collection well must not be broadcast or discharged above ground.

1.4.3 The sides, lid, baffle or partition (if fitted) and square junctions of the tank should be hosed down as the waste is being removed.

1.4.4 The inlets and outlets should be plugged and the tank should then be filled with clean water and disinfected to a minimum level of 5 mg/L of free residual chlorine, with a minimum one half hour contact time. The lid should be exposed to the chlorine solution. The chlorine should be allowed to dissipate naturally at least overnight and not be neutralised.

1.4.5 The contents of the tank and/or well may be then emptied as stated above in 1d.2 and the trench should be sealed. The septic tank and/or collection well may be removed if the structural integrity of the tank and/or well can be maintained.

1.4.6 Approval of the local council under section 68 of the Local Government Act is to be obtained before the vessel(s) is reinstalled.

2. AWTS

2.1 Demolition On-Site

2.1.1 The waste contents of the AWTS are to be removed by a method acceptable to the local council, either by tanker removal to an appropriate site or pumped into a disposal trench (if one exists) and sealed. The liquid content of the AWTS is not to

be irrigated using the land application system and is not to be discharged to the environment.

2.1.2 The sides, lid, baffles or partitions, components and square junctions of the AWTS should be hosed down as the waste is being removed.

2.1.3 The pumps, blowers and internal components of the AWTS may be either collapsed into the AWTS or selectively removed by the owner/occupier, an AWTS manufacturer or service agent for proper disposal to landfill. The owner/occupier, manufacturer or service agent must remove such parts in a manner which will not contaminate the environment or compromise the health and safety of themselves or others. Un-retrieved components must be left in the AWTS.

2.1.4 The AWTS and remaining components are to be disinfected by broadcasting "Builders' (hydrated) Lime" over the exposed surfaces. It is advisable to wear personal protective equipment.

2.1.5 Several holes should be punched or drilled into the base of the tank. The lid and those parts of the walls, baffle and square junctions above the ground should be demolished and also collapsed into the tank and the tank filled with clean soil or rubble and topped with clean soil.

2.1.6 All irrigation lines and spray head, sprinklers, drippers and the like are to be flushed with potable water for 5 minutes. If the irrigation lines are to be connected to the reticulated water supply the installation shall comply with the water supply authority requirements and a backflow prevention device installed.

2.2 Used as a Domestic Greywater Treatment System (DGTS)

The AWTS may be used as a domestic greywater treatment system provided:

2.2.1 The premises is connected to the sewer and the proposal is acceptable to the local council under its wastewater management strategy or policy;

2.2.2 The AWTS is subject to a current "Certificate of Accreditation" issued by the NSW Ministry of Health;

2.2.3 Only greywater is discharged to the AWTS, ie blackwater from any toilet, bidette or bidet is not connected;

2.2.4 Excess treated greywater or untreated greywater is discharged to the sewer when the land application system is overloaded;

2.2.5 The land application system has been reassessed by the owner/occupier to the local council's satisfaction as being suitable for the land application system management of treated greywater;

2.2.6 Prior approval is obtained from the local council to alter and to operate the AWTS as an DGTS; and

2.2.7 The maintenance of the AWTS is carried out by a service contractor suitable to the local council.

***NOTE**: It is not necessary to pump out or recommission the AWTS unless maintenance such as desludging is required.*

2.3 Removed and Relocated

2.3.1 AWTS may only be reused where the AWTS is subject to a current "Certificate of Accreditation" by the NSW Ministry of Health.

2.3.2 The removal and relocation of an AWTS shall be performed by an AWTS manufacturer, installer or service agent familiar with the AWTS brand.

2.3.3 The waste contents of the AWTS are to be removed by a method acceptable to the local council, either by tanker removal to an approved site or pumped to a disposal trench if of sufficient capacity which then should be sealed. The contents of a septic tank or collection well must not be broadcast or discharged above ground.

2.3.4 The sides, lid, baffles or partitions, components and square junctions of the AWTS should be hosed down as the waste is being removed.

2.3.5 The tank should then be filled with clean water and disinfected to a minimum level of 5 mg/L of free residual chlorine, with a minimum one half hour contact time.

2.3.6 All irrigation lines and spray head, sprinklers, drippers and the like are to be flushed with potable water for 5 minutes. If the irrigation lines are to be connected to the reticulated water supply the installation shall comply with the water supply authority requirements and a backflow prevention device installed.

2.3.7 The tank may then be emptied and removed. Tanks of reinforced concrete may only be removed

where the structural integrity of the tank can be maintained.

2.3.8 The pumps, blowers and internal components of the AWTS must be removed by an AWTS manufacturer or service agent for use only as spare parts. The manufacturer or service agent must remove such parts in a manner which will not contaminate the environment or compromise the occupational health and safety of themselves or others.

2.3.9 All mechanical and electrical items such as pumps and blowers must be renewed (not reconditioned), and covered by warranty. Valve diffusers and media may be reused and are to be cleaned and serviced.

2.3.10 Maintenance of the re-installed AWTS must be carried out by service contractor to the satisfaction of the local council.

2.3.11 Installation approval of the local council is to be obtained before the AWTS is reinstalled.

APPENDIX 10 Site Photos

Photo 1 View N showing proposed dwelling

Photo 2 View E sowing proposed dwelling, at arrow. Structure (donga) to the right of dwelling is temporary and is to relocated elsewhere onsite for storage purposes only and not used for accommodation.

Photo 3 View NW showing existing shed and septic tank located at arrow.

Photo 4 View S showing bunded watercourse (dam), proposed LAA downslope marked by arrow.

Photo 5 View SW showing location of proposed raised irrigation field, marked by arrow.

Photo 6 View N showing exposed soil profile.