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## **Site Assessment For Effluent Disposal System Report**

**CLIENT:** JZ MANAGEMENT – GRIFFITH, NSW

**LOCATION:** LOT 102-106, No. 891 WATKINS AVENUE, GRIFFITH, NSW

**REGISTRATION No:** GED20-71

**PROJECT DESCRIPTION:** PROPOSED EFFLUENT DISPOSAL SYSTEM

**DATE REQUESTED:** 9 JUNE 2020

**DATE OF INVESTIGATION:** 19 JUNE 2020

**DATE REPORTED:** 5 AUGUST 2020

**ARTL - NATA ACCREDITED LABORATORIES**



## INTRODUCTION AND PROJECT UNDERSTANDING

It is the purpose of this investigation to assess the above site for the suitability of an onsite treated effluent disposal system. The current property owners are proposing to subdivide the site and construct 5 x five bedroom residential dwellings at the site. As the site is not connected to Council's reticulated sewer network on-site treated effluent disposal will be required.

The field investigation including detailed site visit, excavation of 2 boreholes (BH1 & BH2) to 2.0m and percolation testing were carried out on the 19<sup>th</sup> June 2020. Laboratory testing (Emerson Class and Soil Grading) were completed on recovered samples at our NATA accredited laboratory in Griffith. A site plan showing borehole/percolation test locations, borehole logs and test reports are attached to this report.



## SITE DESCRIPTION

The site is located immediately south of the commercial district of Griffith. The site is situated to the west of Watkins Avenue and is generally flat. A 6 lot subdivision is proposed for the site. This investigation focuses on 5 of the proposed lots (Lot 102 to 106).

The borehole investigation revealed the site is underlain by topsoil to 0.1m overlying alluvial materials comprising low, low to medium, medium & high plasticity sandy clay, clay & silty clay and low plasticity clayey silt extending to the borehole termination depth at 2.0m. No groundwater or seepage was encountered during the drilling, however it should be noted that variations to the water table level could fluctuate with changes to the season, temperature and rainfall.

There was no evidence of surface seepage and soaks and the surface soil was moist at the time of the investigation. No sign of erosion was evident and therefore the site should not pose the problem of uncontrolled run-off and erosion. However, run-on and upslope and down slope seepage, if any, to the land application system should be avoided by using earthworks or a drainage system approved by Council.

**Table 1: Land Capability Rating**

Land Features		Land Capability Class Rating					
		Very Good (1)	Good (2)	Fair (3)	Poor (4)	Very Poor (5)	Site Result
General Characteristics							
Site drainage / runoff		Very Slow	Slow	Moderate	Rapid	Very Rapid	1
Flood / inundation potential (yearly return exceedances)		Never		<1 in 100	<1 in 20	>1 in 20	1
Slope (%)		0 - 2	2 - 8	8 - 12	12 - 20	>20	1
Landslip						Present or past failure	1
Seasonal watertable depth (m) (inc perched water tables)		>5	5 – 2.5	2.5 – 2.0	2.0 – 1.5	<1.5	2
Rainfall (mm/yr)		<450	450 - 650	650 - 750	750 - 1000	>1000	2
Pan Evaporation (mm/yr)		>1500	1250 - 1500	1000 - 1250	-	<1000	2
Soil Profile characteristics	Structure	High	Moderate	Weak	Massive	Single Grained	1
	Profile Depth	>2m	1.5 – 2m	-	1.5m – 1.0m	<1m	1
	Percolation (mm/hr)	50 - 75	20 – 50 75 - 150	15 – 20 150 - 300	- 300 - 500	<15 >500	1-2
	Stoniness (%)	<10		10 - 20	-	>20	1
	Emerson Test (dispersion/slaking)	5&6	4	3	2	1	2-4



## FIELD AND LABORATORY RESULTS

The permeability of the underlying clay was assessed by carrying out a series of percolation tests at the site. The tests indicated an average permeability of 0.17m/day on the underlying material. This classifies the underlying soil as “Category 5” as per Table 5.1 AS1547:2012 – “On-site domestic-wastewater management”. A soil grading was performed on the underlying material and confirms the soil to be a “Category 5”. An Emerson Class Test was also performed and indicated the material to be “potentially moderately to highly dispersive”. The percolation, grading and Emerson class test reports are herewith attached. A land capability assessment has also been undertaken in Table 1 above. The results show that the site features range from very good to poor (Emerson class) and therefore is considered suitable for primary or secondary treated effluent disposal systems with appropriate management practices undertaken.

## Disposal Area Sizing For Each 5 Bedroom Residence

The treated effluent disposal area is to service the proposed 5 bedroom residence and will have water reduction fittings in place including triple A rated taps and reduced flush toilets. It is noted that the residence will have reticulated water supply. Therefore the calculation rates are based on 150L/person/day (allow 6 persons). This assumption is based on Appendix H in AS1547.

It should be noted that if the above design flow rates are adopted then the minimum design capacity for the septic tank shall be determined by:

- Providing for around 24 hours settling volume plus 8 hours hydraulic buffering volume for the daily flows as adopted.
- Providing for scum and sludge accumulation over a 5 year period using the following rates;
  - 1) All waste ..... 80L/person/year
  - 2) Greywater ..... 40L/person/year
  - 3) Blackwater ..... 50L/person/year

The required disposal area is calculated based on the soil data available for different types of land application system. The following assumptions are made in the calculation:

- Daily effluent flow rate per household - 900 litres\*
- Design Loading Rate (DLR) - 10 mm/day
- Design Irrigation Rate (DIR) - 3mm/day
- Width of the trench (where applicable) - 600mm
- Depth of trench (where applicable) - 700mm
- Depth of aggregate (where applicable) - 300mm
- Depth of topsoil (where applicable) - 300mm
- The underlying materials are assessed to be “potentially moderately to highly dispersive”.
- “Soil Category 5” as per AS1547
- Climatic data for Griffith provided by the Bureau of Meteorology is adopted.

Note: \* - Assume 150 litres of waste water per person per day.

### 1. Absorption Trench

Based on the above assumptions, climatic data and water balance analysis undertaken, the following minimum dimensions for the disposal area for the absorption trench disposal system are recommended.

- Minimum Absorption Area (wetted area) - 300m<sup>2</sup>
- Minimum length of the trench - 230m (width 0.6m, depth 0.7m)

## 2. Evapotranspiration – Absorption Area/Trench

Based on the above assumptions, climatic data and water balance analysis undertaken, the following minimum dimensions for the disposal area for the evapotranspiration disposal system are recommended provided that the rate of irrigation does not exceed 3mm/day. **It should be noted that this system is considered suitable for secondary treated effluent only.**

- Area - 200m<sup>2</sup>
- Length - 100m
- Depth of imported material - 200mm

It should be noted that adoption of smaller size disposal area would require deeper depth of imported material. **Vegetation planting on-site to encourage evapotranspiration is considered when calculating irrigation and absorption trench areas for this method of disposal.**

## 3. Pressurised Irrigation System

These systems may be used as alternatives to the conventional sub-surface disposal systems outlined in sections above. Consideration through consultation with the local authority will be required prior to choosing this method of disposal because the treatment system will need to conform to effluent quality standards to ensure protection of public health as such:

- Five days biochemical oxygen demand (BOD5) not greater than 20mg/L
- Suspended solids not greater than 30mg/L
- Thermotolerant coliforms not greater than 10 per 100mL.
- Where chlorine is used as a disinfectant, free residual chlorine measured by a field test at the first irrigation outlet, is not less than 0.5mg/L after a 30min contact period.
- Nutrients not more than authorised by the local authority.

All other requirements are to be met as per AS1547.

### Irrigation Area

Based on the above assumptions, water balance analysis and soil data available, the following minimum irrigation area is recommended provide proper control of the effluent is maintained and the rate of irrigation does not exceed 3mm/day.

- Area - 300m<sup>2</sup>

The area calculated above assumes there will be vegetation planting on-site. If no planting is to occur on site and evaporation only of the treated effluent is utilised for disposal then the disposal area will need to be increased to 350m<sup>2</sup>.



## COMMENTS AND RECOMMENDATIONS

- Land application shall be placed at least 40m away from any channels and 250m away from any domestic groundwater well.
- The irrigation system can only be used for secondary-treated effluent complying with the effluent-quality requirements of Part 4, Appendix 4.2A, 4.2A10.6 of AS1574:2012.
- Primary effluent is normally not suitable for irrigation systems but may be permitted by the local authority under special circumstances.
- The proper drainage system should be incorporated with the land application system design as appropriate to ensure surface run-off does not enter into the system.

Should you have any queries, please do not hesitate to contact us.

Yours truly,

Nathan McLaren  
Environmental Consultant

### Attachments:

- Addendum
- Site Diagram showing Borehole and Percolation Test Locations
- Borehole Logs with Explanatory Note
- Percolation, Emerson Class, and Soil Grading Reports
- Water Balance Calculation

# ADDENDUM

## LIMITS OF INVESTIGATION

The recommendations made in this report are based on the assumption that the test results are representative of the overall subsurface conditions. However, it should be noted that even under optimum circumstances, actual conditions in some parts of the building site may differ from those said to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal all that is hidden by earth, rock and time. Because the investigation procedure generally includes sampling from either one, two or three boreholes, it may not be possible to conclusively establish the presence or extent the condition of the underlying soil and rock over the whole block until site work commences for the construction.

The client should also be aware that our recommendations refer only to our test site locations and the ground level at the time of testing.

The recommendations in this report are based on the following: -

- a) The information gained from our investigation.
- b) The present "state of the art" in testing and design.
- c) The building type and site treatment conveyed to us by the client.
- d) Historical Information

Should the client or their agent have omitted to supply us with the correct relevant information, or make significant changes to the building type and/or building envelope, our report may not take responsibility for any consequences and we reserve the right to make an additional charge if more testing is necessary.

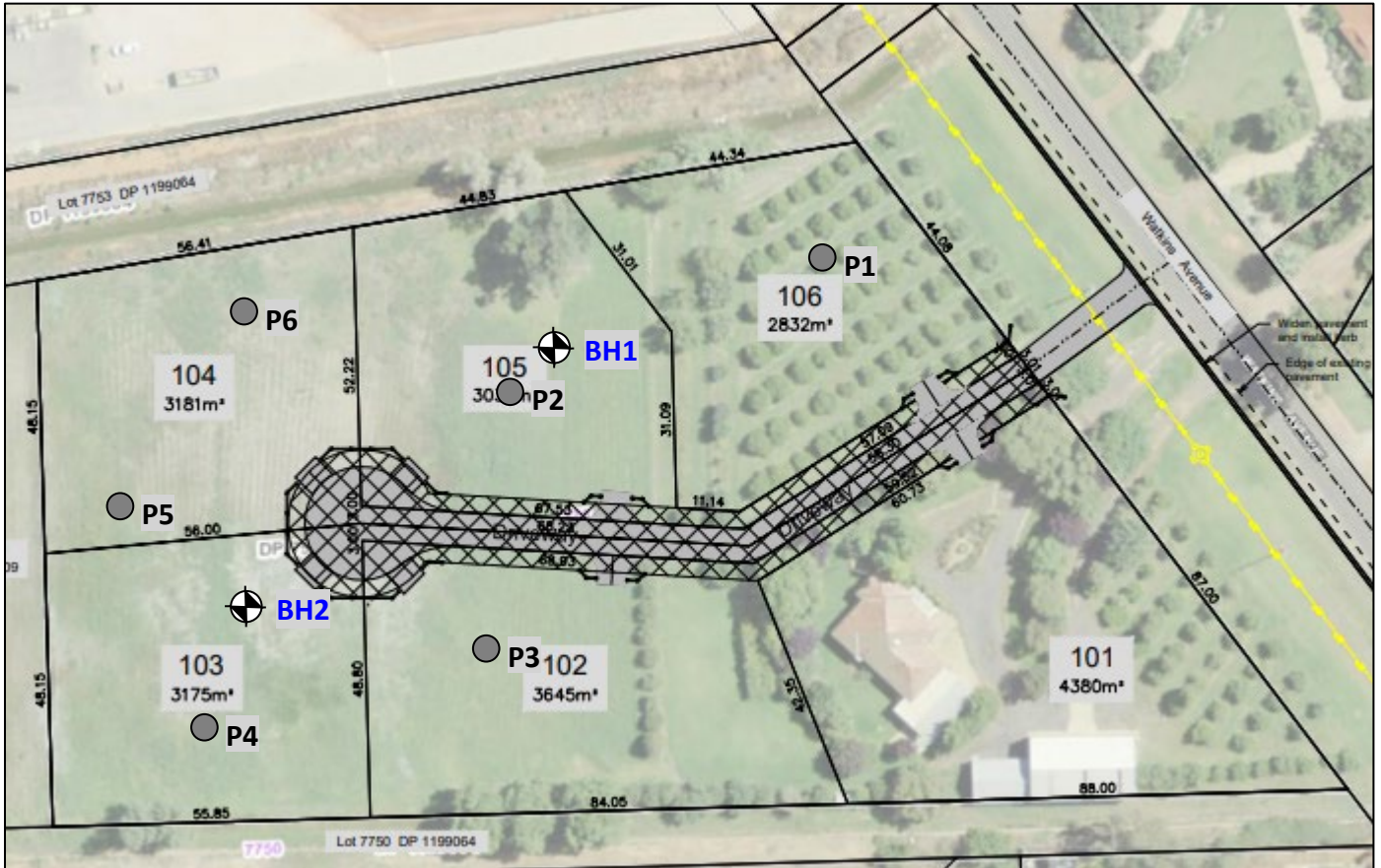
Notwithstanding the recommendations made in this report, we also recommend that whenever footings are close to any excavations or easements, that consideration should be given to deepening the footings.

Unless otherwise stated in our commission, any dimensions or slope direction and magnitude should not be used for any building costing calculations and/or positioning. Any sketch supplied should be considered as only an approximate pictorial evidence of our work.

## ADDITIONAL INFORMATION

Refer also to the CSIRO Information Sheet: - BTF18 "Foundation Maintenance and Footing Performance: A Home Owner's Guide, which can be accessed through <http://www.publish.csiro.au/pid/7076.htm>.

# SITE PLAN



NOT DRAWN TO SCALE



## AITKEN ROWE TESTING LABORATORIES PTY LTD

Borehole No.: 1

Sheet No.: 1 of 1

Ground Level: Existing

Date: 19/06/2020

Method: Auger Drilling with TC Bit

GPS N: 6203791

E: 412516

USCS Symbol	Description	Depth (m)	Moisture Condition	Consistency/ Rel. Density	Sample		Lab. Test	Remarks & Field Records
					Type	No.		
CL	TOPSOIL: Sandy Silty CLAY; low plasticity, fine to medium sand, red brown		MC<PL	F				NATURAL
CL - CI	CLAY; low to medium plasticity, with fine to medium sand, red orange brown		MC>PL		D	1A		
CH	CLAY; high plasticity, with fine to medium sand, orange brown	0.5		St.-VSt.				
		1.0						
CH	CLAY; high plasticity, with fine to medium sand, trace fine to medium gravel, yellow brown	1.5						
CI	Silty CLAY; medium plasticity, with fine to medium sand, trace fine to medium gravel, yellow brown grey	2.0						
	End of Borehole (BH1) @ 2.0m							
		2.5						
		3.0						
		3.5						
		4.0						
Registration No.: GED20-71							Logged By: JP	
Location: Lot 102 - 106, No. 891 Watkins Avenue, Griffith, NSW							Scale: As shown	
Client: JZ Management - Griffith, NSW							Groundwater: Dry on completion	

## AITKEN ROWE TESTING LABORATORIES PTY LTD

Borehole No.: 2

Sheet No.: 1 of 1

Ground Level: Existing

Date: 19/06/2020

Method: Auger Drilling with TC Bit



GPS N: 6023750

E: 412462

USCS Symbol	Description	Depth (m)	Moisture Condition	Consistency/ Rel. Density	Sample		Lab. Test	Remarks & Field Records
					Type	No.		
CL	TOPSOIL: Sandy CLAY; low plasticity, fine to medium sand, red brown		MC>PL	F		2A		
CL	Sandy CLAY; low plasticity, fine to medium sand, red brown				D			
CI	Sandy CLAY; medium plasticity, with fine to medium sand red orange brown	0.5		St.				
CH	CLAY; high plasticity, with fine to medium sand, trace fine to medium gravel, yellow brown	1.0		St.-VSt.				
ML	Clayey SILT; low plasticity, with fine to medium sand, yellow brown grey	1.5		VSt.				
		2.0						
	End of Borehole (BH2) @ 2.0m							
		2.5						
		3.0						
		3.5						
		4.0						
Registration No.: GED20-71							Logged By: JP	
Location: Lot 102 - 106, No. 891 Watkins Avenue, Griffith, NSW							Scale: As shown	
Client: JZ Management - Griffith, NSW							Groundwater: Dry on completion	



**AITKEN ROWE TESTING LABORATORIES PTY LTD**  
**LOG SYMBOLS**

LOG COLUMN	SYMBOLS		DEFINITION		
Groundwater Record			Standing water level. Time delay following completion of drilling may be shown.		
			Groundwater seepage into borehole or excavation noted during drilling or excavation.		
Samples	D		Small disturbed bag sample taken between the depths indicated by lines.		
	B		Bulk disturbed sample taken between the depths indicated by lines.		
	U		Undisturbed 50mm diameter tube sample taken between the depths indicated by lines		
Field Tests	N=17 4, 7, 10		Standard Penetration Test (S.P.T.) performed between depths indicated by lines. Individual figures show blows per 150mm penetration driven by SPT hammer.		
	N <sub>c</sub>	5	Dynamic Cone Penetration Test performed between depths indicated by lines.		
		7	Individual figures show blows per 100mm penetration for 60 degree solid cone driven by 9 Kg hammer.		
		3			
Moisture Condition (Clay or Silt based)	MC>PL		Moisture content estimated to be greater than plastic limit.		
	MC=PL		Moisture content estimated to be approx. equal to plastic limit.		
	MC<PL		Moisture content estimated to be less than plastic limit.		
Moisture Condition (Gravel or Sand based)	D		DRY – runs freely through fingers.		
	M		MOIST – does not run freely but no free water visible on soil surface.		
	W		WET – free water visible on soil surface.		
Consistency (Clay or Silt based)	VS		VERY SOFT – unconfined compressive strength less than 25kPa.		
	S		SOFT – unconfined compressive strength 25-50 kPa.		
	F		FIRM – unconfined compressive strength 50-100kPa.		
	St.		STIFF – unconfined compressive strength 100-200kPa.		
	VSt.		VERY STIFF – unconfined compressive strength 200 – 400kPa.		
	H		HARD – unconfined compressive strength greater than 400kPa.		
Relative Density (Gravel or Sand based)		Description	Density Index Range % S.P.T.	'N' Value Range Blows/300mm	
	VL	VERY LOOSE	<15	0-4	
	L	LOOSE	15-35	4-10	
	MD	MEDIUM DENSE	35-65	10-30	
	D	DENSE	65-85	30-50	
	VD	VERY DENSE	>85	> 50	
Hand Penetrometer Readings	300 250 280	Numbers indicate individual test results in kPa on representative undisturbed material unless noted otherwise.			
Laboratory Test	L.S. %	Linear Shrinkage (As per RTA Method T113)			
	M.C. %	Field Moisture Content (As per Australian Standard AS1289.2.1.1 or RTA Method T120)			
	I <sub>ss</sub>	Shrink-Swell Index (As per Australian Standard AS1289.7.1.1)			
Remarks	'V' bit	Hardened steel 'V' shaped bit.			
	'TC' bit	Tungsten Carbide wing bit.			
	T <sup>60</sup>	Penetration of auger string in mm under static load of rig rear axle without rotation of augers.			

**AITKEN ROWE TESTING LABORATORIES PTY LTD**

ARTL Griffith: 17b Battista Street, Griffith NSW 2680

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**TEST REPORT****SOIL PERCOLATION & EMERSON CLASS**

CLIENT: JZ MANAGEMENT - GRIFFITH, NSW

PROPERTY LOCATION: LOT 102 - 106, No. 891 WATKINS AVENUE

GRIFFITH, NSW

MATERIAL TYPE: CLAY

DATE OF TEST: 19/06/2020

TEST METHOD: AS1547

AS1289.3.8.1

REGISTRATION No.: **GED20-71****MEASUREMENT OF DROP IN WATER LEVEL**

Time Elapsed (minutes)	Water Level (mm)					
	P1	P2	P3	P4	P5	P6
0	*	*	*	*	*	*
10	10	15	5	10	20	10
20	20	30	10	20	30	20
30	30	40	15	30	35	30
40	35	50	20	40	40	40
50	40	55	25	50	45	50
60	45	60	30	55	50	60

**TIME TAKEN FOR 25mm WATER LEVEL FALL**

Site	Absorption Rate (mins/25mm)
P1	33.3
P2	25
P3	50
P4	27.3
P5	30
P6	25

**Permeability:** 0.17 m/day**D.L.R:** 10 mm/day**D.I.R.:** 3 mm/day**Emerson Class Number:** 2 to 4

APPROVED SIGNATORY: \_\_\_\_\_

Nathan McLaren

DATE: 3/6/2020 \_\_\_\_\_

**AITKEN ROWE Testing Laboratories Pty Ltd**

ARTL Griffith: 17b Battista Street, Griffith NSW 2680

\*

**TEST REPORT: GEOTECHNICAL INVESTIGATION - SOIL ANALYSIS**

CLIENT : JZ MANAGEMENT - GRIFFITH, NSW  
 JOB DESCRIPTION : EFFLUENT DISPOSAL ASSESSMENT  
 LOT 102 - 106, No. 891 WATKINS AVENUE  
 GRIFFITH, NSW

PAGE: 1

OF: 1

SUBMITTED BY : ARTL

DATE SAMPLED: 19/06/2020

DATE SUBMITTED: 19/06/2020

SAMPLING METHOD: AS1289.3.6.1

SAMPLING CLAUSE: \*

ORDER No.: \*

MATERIAL SOURCE : CLAY

PROPOSED USE : DESIGN

MATERIAL TYPE : SOIL

REGISTRATION No : R28 **GED20-71**

SAMPLE NUMBER :		1A	2A	*	*	*	*
SAMPLING LOCATION :		100-400	100-400	*	*	*	*
DEPTHS BETWEEN WHICH SAMPLES TAKEN (mm) :		*	*	*	*	*	*
TESTS	TEST ELEMENT	*	*	*	*	*	*
AS1289.3.6.1	PASS 100.0mm SIEVE %	*	*	*	*	*	*
	PASS 75.0mm SIEVE %	*	*	*	*	*	*
	PASS 53.0mm SIEVE %	*	*	*	*	*	*
	PASS 37.5mm SIEVE %	*	*	*	*	*	*
	PASS 26.5mm SIEVE %	*	*	*	*	*	*
	PASS 19.0mm SIEVE %	*	*	*	*	*	*
	PASS 13.2mm SIEVE %	*	*	*	*	*	*
	PASS 9.50mm SIEVE %	*	*	*	*	*	*
	PASS 6.70mm SIEVE %	*	*	*	*	*	*
	PASS 4.75mm SIEVE %	*	*	*	*	*	*
	PASS 2.36mm SIEVE %	*	*	*	*	*	*
	PASS 1.18mm SIEVE %	100	100	*	*	*	*
	PASS 600µm SIEVE %	98	96	*	*	*	*
	PASS 425µm SIEVE %	95	93	*	*	*	*
	PASS 300µm SIEVE %	92	88	*	*	*	*
	PASS 150µm SIEVE %	83	72	*	*	*	*
	PASS 75µm SIEVE %	74	57	*	*	*	*
T111	STANDARD MAX. DRY DENSITY (1L MLD, A.1ii) t/m <sup>3</sup>	*	*	*	*	*	*
	OPTIMUM MOISTURE CONTENT %	*	*	*	*	*	*
T113	LINEAR SHRINKAGE %	*	*	*	*	*	*
AS1289.2.1.1	FIELD MOISTURE CONTENT %	*	*	*	*	*	*
AS1289.3.8.1 (AIR DRIED)	EMERSON CLASS	2	4	*	*	*	*
	TYPE OF WATER	DISTILLED	DISTILLED	*	*	*	*
AS1289.6.7.2	COEFFICIENT OF PERMEABILITY m/sec.	*	*	*	*	*	*
	LABORATORY MOISTURE RATIO %	*	*	*	*	*	*
FALLING HEAD	LABORATORY DENSITY RATIO %	*	*	*	*	*	*
	% OVERSIZE DISCARDED (+19.0mm)	*	*	*	*	*	*
	SURCHARGE MASS APPLIED (1L MOULD, 3kPa)	*	*	*	*	*	*

ACCREDITED FOR  
**TECHNICAL  
COMPETENCE**

Accredited for compliance with  
 ISO/IEC 17025 - Testing.  
 The results of the tests,  
 calibrations and/or measurements  
 included in this document are  
 traceable to Australian/national  
 standards.

ACCREDITATION NUMBER 4679

\*  
\*  
\*

All samples are oven dried and dry sieved during prep. unless otherwise stated

APPROVED SIGNATORY : 

Nathan McLaren

DATE: 3/7/2020

**SIZE OF AREA FOR EACH MONTH (DISREGARDING STORAGE OF EFFLUENT) 900L/Day**

Month	Pan Evaporation <i>E</i> mm	Evapotrans- piration <i>ET</i> ( <i>ET</i> =0.75 <i>E</i> )	Rainfall <i>R</i> mm	Retained rainfall <i>R<sub>r</sub></i> ( <i>R<sub>r</sub></i> = 0.75 <i>R</i> )	<i>LTAR</i> per Day mm	<i>LTAR</i> per month mm	Disposal rate per month mm	Effluent applied per month L	Size of Area m <sup>2</sup>
Jan.		240	53	40	2	62	262	27900	106
Feb.		202	33	25	2	56	233	25200	108
Mar.		162	50	38	2	62	187	27900	150
Apr.		95	40	30	2	60	125	27000	216
May		55	51	38	2	62	79	27900	354
Jun		30	42	32	2	60	58	27000	466
Jul		38	45	34	2	62	66	27900	421
Aug		60	40	30	2	62	92	27900	303
Sep		90	48	36	2	60	114	27000	237
Oct		129	52	39	2	62	152	27900	184
Nov		192	35	26	2	60	226	27000	120
Dec		225	37	28	2	62	259	27900	108
Sum		1518	526						
								Ave. Area =	231

**DEPTH OF STORED EFFLUENT (TRIAL)**

Month	First Trial area m <sup>2</sup>	Effluent applied per month L	Application rate mm	Disposal rate per month mm	Gain/Loss mm	Increase in depth of stored effluent mm	Depth of Effluent for month mm	Increase in depth of effluent mm	Computed depth of Effluent mm
Dec.	200	-	-	-	-	-	-	-	0
Jan.	200	27900	140	262	-123	-409	0	-409	-409
Feb.	200	27900	140	233	-94	-313	-409	-313	-722
Mar.	200	27900	140	187	-47	-157	-722	-157	-878
Apr.	200	27900	140	125	15	48	-878	48	-830
May	200	27900	140	79	61	203	-830	203	-628
Jun	200	27900	140	58	82	272	-628	272	-356
Jul	200	27900	140	66	73	244	-356	244	-112
Aug	200	27900	140	92	48	158	-112	158	47
Sep	200	27900	140	114	26	85	47	85	132
Oct	200	27900	140	152	-13	-42	132	-42	90
Nov	200	27900	140	226	-86	-288	90	-288	-198
Dec	200	27900	140	259	-120	-399	-198	-399	-597

**CALCULATION OF IRRIGATION AREA**

$$\text{Area } A_i = \frac{Q_w}{\text{DIR}}$$

$Q_w = 6300 \text{ Litre}$        $Q_w = \text{weekly effluent flow}$        $\text{DIR} = \text{design irrigation rate}$   
 $\text{DIR} = 21 \text{ mm/week}$

**Irrigation A= 300 m<sup>2</sup>**

**CALCULATION OF ABSORPTION TRENCH**

**Data**      **Note:**      b = minimum 200mm, max. 900mm, Typical 300-450mm  
width b=900mm      Depth of aggregate=min. 200mm, max. 400mm, Typical 200-400mm  
depth d=700mm      Depth of topsoil= min. 100mm, max. 150mm, Typical 100-150mm  
aggregate depth=300mm      Aw= wetted area

$Q_d = \text{design daily flow in L/Day}$        $\text{DLR} = \text{Design Loading Rate in mm/d}$        $W = \text{width in mm}$   
 $Q_d = 900 \text{ litre}$        $\text{DLR(Primary)} = 5 \text{ mm/day}$        $\text{DLR (Secondary)} = 8 \text{ mm/day}$

$A_w = \frac{Q_d}{\text{LTAR}}$        $Q_d = \text{daily effluent flow}$        $\text{LTAR} = \text{Long Term Acceptance Rate (mm/day)}$   
 $Q_d = 900 \text{ litre}$        $\text{LTAR} = 3 \text{ mm/day}$

**A<sub>w</sub> = 300 m<sup>2</sup>**

$L = \frac{A_w}{b + d_w}$        $L = \text{trench length (m)}$        $A_w = \text{wetted area}$        $b = \text{trench width}$        $d_w = 2 * 0.5d$   
 $d_w = \text{allowance for depth of wetted walls (m)}$

**Length, L= 231 m**

$L = \frac{Q_d}{\text{DLR} * W}$        $L = \text{length in mm}$

**Length, L= 257 m (for primary effluent)**      **L= 161 m (for secondary effluent)**

**CALCULATION OF EVAPOTRANSPIRATION - ABSORPTION AREA/TRENCH**

$\text{Area, } A_e = 200 \text{ m}^2$        $B_e = \text{width} + 2\text{depth}$   
 $\text{Length, } L = \frac{A_e}{B_e}$

**Length, L= 100 m**

## **WATER BALANCE 900L/Day**

Parameter	Symbol	Formula	Units	Value
Design wastewater flow	Q		L/Day	900
Design Irrigation Rate	DIR		mm/week	21
Design Percolation Rate	DPR		mm/day	3.0
Nominated Irrigation Area	A		m <sup>2</sup>	300
Design Irrigation Rate	DIR	Q/A	mm/month	91.50

Weather Data: Griffith

Parameter	Symbol	Formula	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Days in month	D		days	31	28	31	30	31	30	31	31	30	31	30	31
Median Precipitation	MP		mm/month	53	33	50	40	51	42	45	40	48	52	35	37
Evapotranspiration	ET		mm/month	240	202	162	95	55	30	38	60	90	129	192	225
Percolation Rate	PR		mm/month	93	84	93	90	93	90	93	93	90	93	90	93
Maximum Allowable Irrigation Rate	MIR		mm/month	280	253	205	145	97	78	86	113	132	170	247	281

During June and July DIR does exceed MIR. Therefore we need to reduce the design irrigation rate.

Parameter	Symbol	Formula	Units	Value
Design wastewater flow	Q		L/Day	900
Nominated Irrigation Area	A		m <sup>2</sup>	351
Design Irrigation Rate	DIR	Q/A	mm/month	78.00

**Required Irrigation Area                      351 m2**