Fiona Loader c/- James de Soyres and Associates Pty Ltd

Onsite Wastewater Assessment: 18-20 Studee Lane, Lovett Bay, NSW, Lot 1, DP1132852

P1706643JR01V01
April 2019

martens consulting engineers

ENVIRONMENTAL

WATER

WASTEWATER

GEOTECHNICAL

CIVIL

PROJECT MANAGEMENT

Limitations Statement

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Document and Distribution Status

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Revision No.	Description	Status	Release Date	Document Location			
				File Copy	Fiona Loader c/- James de Soyres and Associates Pty Ltd		
1	Onsite Wastewater Assessment	Draft	01.03.2019	1P, 1E	1P		
2	Onsite Wastewater Assessment	Final	24.04.2019	1P, 1E	1P		

Distribution Types: F = Fax, H = Hard copy, P = PDF document, E = Other electronic format. Digits indicate number of document copies.

All enquiries regarding this project are to be directed to the Project Manager.

Contents

1 Investigation and Scope

1.1 Background and Objectives

This onsite wastewater assessment is prepared to support a development application (DA) to replace the existing wastewater system at 18 - 20 Sturdee Lane, Lovett Bay, NSW ('the site').

This report provides an assessment of site and soils suitability for onsite wastewater management and recommendations for site wastewater treatment and effluent management systems.

1.2 Aims and Objectives

The aims and objectives of this assessment are:

- Characterise site effluent land capability and assess suitability and design loading for onsite effluent management.
- Identification of areas which are unsuitable for irrigation (including buffer setbacks)
- Estimate design site wastewater generation rates based on current and future site use information provided by the Client.
- Provide recommendations for a new onsite wastewater treatment and effluent management area (EMA).

1.3 Development Proposal

The proposed development is the construction of a new wastewater system suitable for the current dwelling (4 bedrooms and a study) with the capacity to facilitate an additional bedroom in the future (5 bedrooms and a study).

1.4 Relevant Standards and Policy

Guidelines and standards considered in this study include:

- Standards Australia (2012) *Australian /New Zealand Standard 1547: On-site domestic wastewater management.*
- Northern Beaches Council (2017) *Water Management Policy*.
- NSW Department of Local Government (1998) *On-site Sewage Management for Single Households.*

2 Site Description

2.1 Site Details and Conditions

General site details are summarised in Table 1, with a site investigation plan included in Attachment A.

Table 1: Summary description summary.

Item	Comment
Address / Lot / DP	18 - 20 Sturdee Lane, Lovett Bay, NSW. Lot 1, DP1132852
Surveyed area (m^2)	2538 m^2 (SDG, 2017).
Local Government Area	Northern Beaches Council
Existing Development	Clad dwelling with metal roof, wooden decking and paths, and wharf in the north of the site, maintained gardens with several retaining walls to the south (upslope) of the dwelling.
Typical slopes, aspect, elevation	The site typically has a northerly aspect, with steep grades of between 20 - 30%. Site has several retaining walls and rocky outcrops in the north. Elevation ranges from sea level in the north to 30.97m AHD in the south. The proposed irrigation area will have gentler grades, due to the site containing retaining walls and flatter areas in the middle of the site.
Vegetation	Managed gardens with grass, shrubs and trees in the north. Trees and grass cover in the south.
Adjacent environment	The site is bounded by other existing dwellings to the west and east, Pittwater to the north and the Sturdee Lane road reserve to the south.
Drainage	Overland sheet flow north to Pittwater. No defined watercourses on site.
Sub-surface soil / rock units	Fill / colluvium was encountered in BH101, BH102 and BH103 up to approximately 0.2 mBGL, which is considered to have been placed in limited areas of the site for previous site development and / or levelling purposes (cut and fill). Topsoil / colluvium consisting of moderately structured loamy sand with sandstone gravels up to 0.2 mbgl Subsoils comprising moderately structured clayey sand from 0.2 - 0.4 mbgl Weathered rock. For the purpose of this report we have assumed low strength interbedded sandstone and shale to be present below the encountered soils from between approximately 0.7 mBGL and 1.3 mBGL. With medium strength sandstone boulders / floaters in sections of the site.
Groundwater	Groundwater inflow was not observed during drilling of the boreholes up to termination depth of 0.4 mbgl.
Climate	The nearest rainfall station with an appropriately long daily rainfall record is Avalon Beach (Palmgrove Road; station 066079) and the nearest station with appropriate evaporation records is Sydney Airport (station 066037). Median rainfall is approximately 1,140 mm/year, median evaporation is 1,830 mm/year

3 Wastewater Management Assessment

3.1 Soil Profile and Effluent Application Rates

Three boreholes and dynamic cone penetrometer (DCP) tests were excavated in the area considered most suitable for effluent irrigation. Soil profiles and design irrigation rates (DIRs) are summarised in Table 2. Detailed borehole logs and DCP results are provided in Attachment B. DIRs provide an indication of the hydraulic capacity of the soil to assimilate effluent from irrigation systems.

Table 2: Summary of sub-surface profiles and design irrigation rates based on AS/NZS 1547 (2012).

Layer	Depth (m) [1]	Texture	Structure	Agricultural Classification	Soil Permeability Category [2]	Indicative permeability (K_{sat}) (m/d)	Design Irrigation Rate (DIR) (mm/d)
TOPSOIL	0.0 – 0.2	Loamy SAND	Apedal	LS	2b	> 3.0	5.0
SUBSOIL	0.2-0.4	Sandy CLAY LOAM	Moderately structured	SCL	4a	0.5 – 1.5	3.5

Notes:
[1] Depth varies – indicative only due to presence of cobbles and boulders in soil profile.
[2] In accordance with Table 8 of NSW Department of Local Government *et al*. (NSW DLG, 1998).

Due to site constraints (Section 3.2), the adopted DIR for the site is 2.5 mm/day to mitigate any potential adverse effects from onsite effluent irrigation.

3.2 Landform and Soil Constraints Assessment

Landform and soil constraints for onsite wastewater management are assessed in accordance with NSW DLG *et al.* (1998) and summarised in Table 3. The assessment assumes secondary treated effluent being applied.

Table 3: Summary Site and soil suitability for sub-surface effluent irrigation, according to NSW Department of Government *et al.* (1998).

18	Details of Irrigation Areas	Limitation Rating
Flood potential	> 1 in 20 yr flood level	Minor
Sun and wind exposure	High	Minor
Slope (%)	>12 %	Major
Landform	Side slope	Moderate
Erosion potential	No signs present	Minor
Site drainage	No signs of surface dampness	Minor
Buffer to surface water	Not available	Major
Fill	Fill less than 0.2 m deep	Moderate
Rock outcrop	>20 %	Major
Geology	No major discontinuities	Minor
Depth to bedrock (m)	0.7 – 1.3 m	Moderate[1]
Depth to water table (m)	> 1.0 m	Minor
Soil permeability category	Topsoil = 2b Subsoil =4a	Minor
Coarse fragments (%)	0 - 20 %	Minor

Notes: [1] Floaters / boulders were encountered in boreholes at a depth of between 0.3-0.4m, DCPs reached bedrock / floaters at depths between 0.7-1.3 m.

Land and soils capability indicates that the proposed EMAs have a number of constraints that require careful consideration and design to address. The limitations due to shallow and permeable soils, buffer to surface water, shallow bedrock / floaters and slopes are mitigated by reducing irrigation rates and through the use of a surface drip irrigation system.

3.3 Buffer Setbacks for Effluent Reuse Area

Relevant setbacks are assessed against NSW DLG *et al.* (1998) guidelines, with the results summarised in Table 4. Buffers are derived based on experience and consideration of available irrigation area for the proposed development.

Table 4: Recommended setback distances (NSW DLG *et al.*, 1998).

Site Feature	Buffer Distance (m)
Natural waterbodies (rivers, creeks, lakes, *etc.*)	100 [1]
Property Boundaries	2/1 [2]
Buildings	2/1 [2]
Paths & Walkways	1 [2]
Domestic well used for household water supply	250

Note: [1] The application of setbacks to Pittwater is not generally required for western foreshore developments.

[2] X/Y = Downslope/Upslope of effluent management area. Adopted buffers have been modified from guidelines due to highly constrained site as is common practice in unsewered areas of Northern Beaches Council LGA.

Setbacks to Pittwater cannot be achieved. However, as the volume and strength of the effluent is low and the footprint of the effluent management area is large and located as far as possible upslope of Pittwater, this non-compliance is considered acceptable.

3.4 Site Wastewater Generation Rates

Dwelling wastewater generation rates depend on the occupancy rate and availability of reticulated potable water, which is unavailable at this site. It is proposed to retain the four bedrooms and study initially, with scope to add an additional bedroom as part of a separate DA. Design hydraulic load is summarised in Table 5 and calculated using allowances from Table H1 of AS/NZS 1547 (2012) for 5 bedrooms and one study, assuming two persons for the first bedroom plus one for every other bedroom / study.

Table 5: Design wastewater load.

Total number of bedrooms[1]	Design site occupancy	Daily wastewater generation[2]	Design wastewater load (L/day)
6	7	120 L/person/day	840

Notes:

[1] Including potential bedrooms, such as studies.

[2] Adopted wastewater design with on-site roof tank water supply (AS/NZS 1547, 2012).

3.5 Effluent Management System Sizing

Based on the adopted DIR of 2.5 mm/day (Section 3.1) and the above daily wastewater generation rates, the minimum EMA required is 336 m^2.

3.6 Proposed Wastewater Management System

The system should consist of a NSW Department of Health approved aerated wastewater treatment system (AWTS) or equivalent installed such that sufficient clearance to the top of the AWTS is available to allow for maintenance and periodic solids removal. The AWTS is to treat effluent to a secondary treatment standard with disinfection as a minimum (see Table 6).

As gravity drainage of all existing dwelling fixtures is not possible due to space limitations, the existing sewage pump well arrangement will be retained to pump wastewater to the AWTS.

Disinfection is to be via chlorination (tablet or automated dosing) or UV treatment. Ideally, effluent should be filtered prior to UV disinfection to maximise effectiveness of disinfection.

Table 6: Assumed secondary treatment standards.

Parameter	Secondary Standard
BOD_5 (mg/L)	30
Suspended Solids (mg/L)	30
Faecal Coliforms (CFU/100mL)	30
Total Phosphorus (mg/L)	10
Total Nitrogen (mg/L)	25

3.7 Effluent Management Area Requirements

The effluent management area are shown on the site plan (Attachment A). Minimum requirements for the effluent management area are:

- EMA to be constructed as a surface drip irrigation system, consisting of pressure compensating dripline (Netafim 13 mm or equivalent) laid on top of and connected to the ground and covered with leaf litter in accordance with AS/ NZS 1547 (2012).
- Minimum area is to be 336 m^2. EMA area is to exclude any rock outcropping within the EMA boundary.
- EMA is positioned to be furthest possible distance from Pittwater and dwelling.
- Effluent transfer and flushing mains to be HDPE.
- AWTS effluent storage well to include pump set capable of transferring effluent to the EMA.
- Flushing main is to be connected to the inlet of the AWTS and to have a manual valve to allow periodic flushing of the driplines in the EMA.
- No connection with other water reticulation systems is to occur and no standard hose fittings are to be connected to the system.
- Irrigation areas identified on the report plans are indicative only. Final location of all system elements are to be confirmed prior to section 68 application to install.
- Additional details of the pump set and irrigation system should be provided at the section 68 stage.

3.8 Inspection and Maintenance Schedule

All new wastewater treatment and transfer systems and effluent irrigation systems are to be installed, then inspected and certified by a person acceptable to Northern Beaches Council prior to system commissioning. Operations and maintenance for the system is summarised as follows:

- AWTS shall be maintained by a suitably qualified person or persons, acceptable to Council. As a minimum this shall include periodic inspection and maintenance of all system components including all pumps, plumbing, float switches and warning system. It is recommended that quarterly inspections and maintenance be undertaken or in accordance with the manufacturer's specifications.

- Periodic solids management will be required for the AWTS with all waste transported to a suitable off-site facility for treatment and disposal. This will likely involve a privately operated pump-out tanker on a barge. Frequency of solids management depends on frequency of use of the dwelling, but tends to be of the order of once every 3 – 5 years for a system such as this.

- Regular visual inspection of all effluent irrigation areas by the householder should be undertaken to verify that the irrigation areas are operating satisfactorily. All leaks and signs of system malfunction are to be remediated as soon as practical with plumber's assistance.

- We recommend flushing the irrigation driplines a minimum of once every 3 months or in accordance with the manufacturer's specifications.

4 References

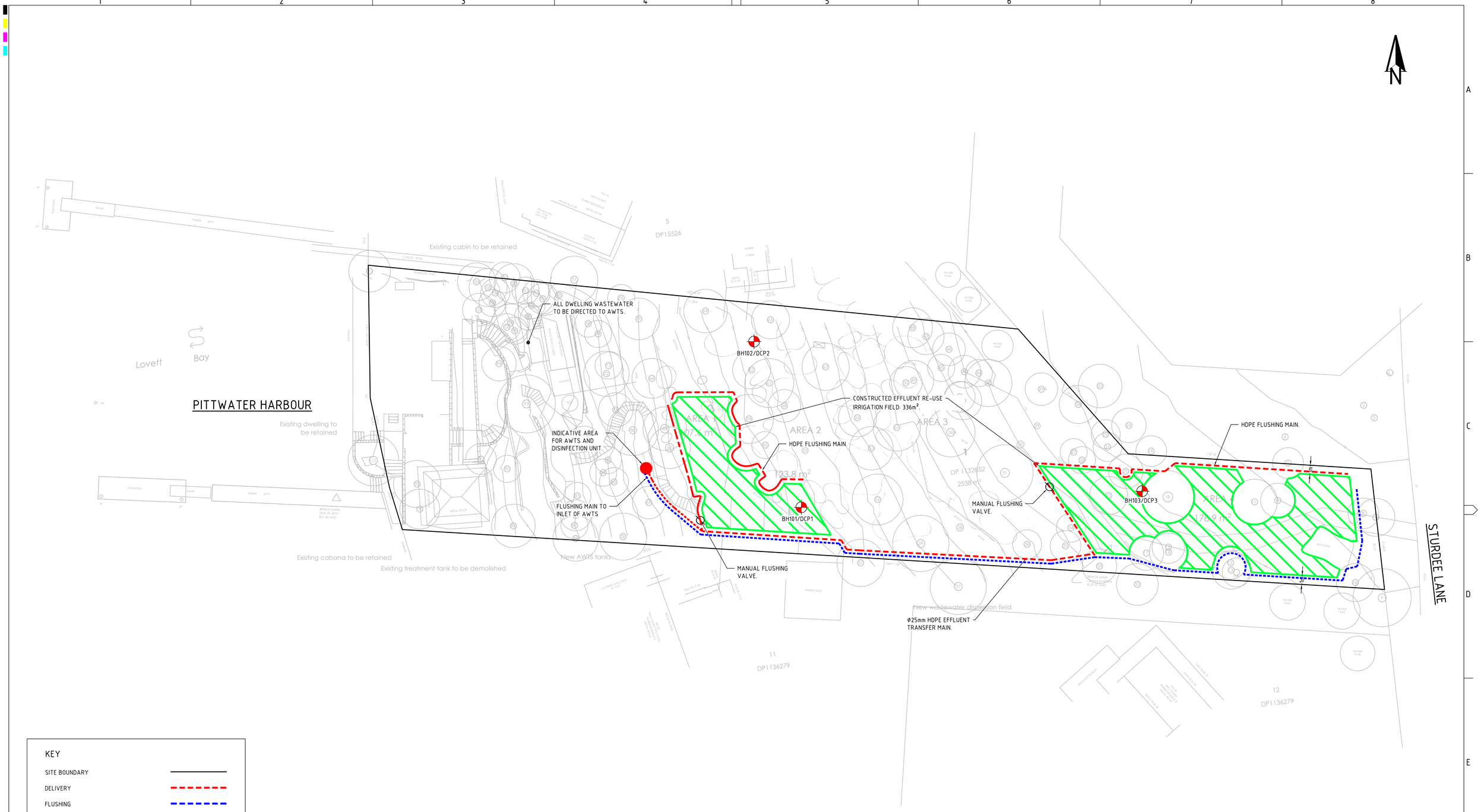
Australian / New Zealand Standard 1547 (2012), *On-site Domestic Wastewater Management.*

Northern Beaches Council (2017) *PL 850 Water Management Policy*

NSW Department of Local Government, NSW Environment Protection Authority, NSW Health Department, NSW Department of Land and Water Conservation and the NSW Department of Urban Affairs and Planning (1998), *Environment and Health Protection Guidelines, On-site Sewage Management for Single Households.*

NSW Department of Primary Industries (1983) *The Sydney 1:100,000 Geological Series.*

5 Attachment A – Site Plan



KEY

- SITE BOUNDARY
- DELIVERY
- FLUSHING
- CONSTRUCTED EFFUENT RE-USE IRRIGATION FIELD
- APPROXIMATE BOREHOLE/DCP LOCATION
- AWTS TREATMENT SYSTEM OR EQUIVALENT

REV	DESCRIPTION	DATE	DRAWN	DESIGNED	CHECKED	APPRVD
B	AMENDED PER CLIENT'S COMMENT	24/04/19	VH	MV	MD	GT
A	INITIAL REVISION	01/03/19	PB	MV	MD	GT

SCALE
0 2 4 6 8 10 12 14 16 18 20 METRES
A1 (A3) 1:200 (1:400)

GRID	DATUM	PROJECT MANAGER
MGA	mAHD	GT

CLIENT
FIONA LOADER

PROJECT NAME/PLANSET TITLE
ENGINEERING SERVICES
WASTEWATER RE-USE IRRIGATION PLAN
18-20 STURDEE LANE, LOVETT BAY, NSW

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DRAWING TITLE
WASTEWATER RE-USE IRRIGATION PLAN

PROJECT NO.	PLANSET NO.	RELEASE NO.	DRAWING NO.	REVISION
P1806643	PS01	R02	PS01-JZ01	B

DRAWING ID: P1806643-PS01-R02-JZ01

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A1 / A3 LANDSCAPE (A1LC_v02.0.01)

6 Attachment B – Bore Hole Logs

CLIENT	James de Soyres & Associates Pty Ltd		COMMENCED	09/07/2018	COMPLETED	09/07/2018	**REF BH101**
PROJECT	Wastewater Engineering Services		LOGGED	DI	CHECKED	HN	Sheet 1 OF 1
SITE	18-20 Sturdee Lane, Lovett Bay, NSW		GEOLOGY	Newport Formation	VEGETATION	Shrubs	PROJECT NO. P1806643
EQUIPMENT	Hand Auger		EASTING		RL SURFACE	22.2 m	DATUM AHD
EXCAVATION DIMENSIONS	⌀0.5x0.5 mm x 0.30 m depth		NORTHING		ASPECT	North	SLOPE 5-10%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
S	L	Not Encountered	0.2	22.20	6643/BH101/0.2/S/1 D 0.20 m			LS	TOPSOIL; Loamy SAND; fine grained; brown, grey and dark brown; with roots and large subangular sandstone gravels.	D / M	F	TOPSOIL / COLLUVIUM
			0.4	*0.30*					Hole Terminated at 0.30 m			0.30: Terminated on inferred sandstone boulder.
			0.6									
			0.8									

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - BOREHOLE

CLIENT	James de Soyres & Associates Pty Ltd		COMMENCED	09/07/2018	COMPLETED	09/07/2018	**REF BH102**
PROJECT	Wastewater Engineering Services		LOGGED	DI	CHECKED	HN	Sheet 1 OF 1
SITE	18-20 Sturdee Lane, Lovett Bay, NSW		GEOLOGY	Newport Formation	VEGETATION	Shrubs	PROJECT NO. P1806643
EQUIPMENT		Hand Auger	EASTING		RL SURFACE	26.8 m	DATUM AHD
EXCAVATION DIMENSIONS		⌀0.5x0.5 mm x 0.40 m depth	NORTHING		ASPECT	North	SLOPE 5-10%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
				26.80				LS	TOPSOIL; Loamy SAND; fine grained; brown, grey and dark brown; with roots.	D / M	F	TOPSOIL / COLLUVIUM
S	L	Not Encountered	0.2	*0.20*								
				26.60				SCL	Sandy Clay LOAM, low plasticity, orange, yellow, pale red.			RESIDUAL SOIL POSSIBLY WEATHERED ROCK
	H				6643/BH102/0.3/S/1 D 0.30 m					M	VSt	
			0.4	*0.40*					Hole Terminated at 0.40 m			
			0.6									
			0.8									

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - BOREHOLE

CLIENT	James de Soyres & Associates Pty Ltd		COMMENCED	09/07/2018	COMPLETED	09/07/2018	**REF BH103**
PROJECT	Wastewater Engineering Services		LOGGED	DI	CHECKED	HN	Sheet 1 OF 1
SITE	18-20 Sturdee Lane, Lovett Bay, NSW		GEOLOGY	Newport Formation	VEGETATION	Shrubs	PROJECT NO. P1806643
EQUIPMENT		Hand Auger	EASTING		RL SURFACE	29.9 m	DATUM AHD
EXCAVATION DIMENSIONS		⌀0.5x0.5 mm x 0.40 m depth	NORTHING		ASPECT	North	SLOPE 5-10%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
				29.90				LS	TOPSOIL; Loamy SAND; fine grained; brown, grey and dark brown; with roots and large subangular sandstone gravels.		St	TOPSOIL / COLLUVIUM
	L-M											
S		Not Encountered	0.2	0.20 29.70				SCL	Sandy Clay LOAM, low plasticity, orange, yellow, pale red.	D / M		RESIDUAL SOIL POSSIBLY WEATHERED ROCK
	H				6643/BH103/0.3/S/1 D 0.30 m						VSt	
			0.4	0.40					Hole Terminated at 0.40 m			0.40: Terminated due to high resistance.
			0.6									
			0.8									

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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