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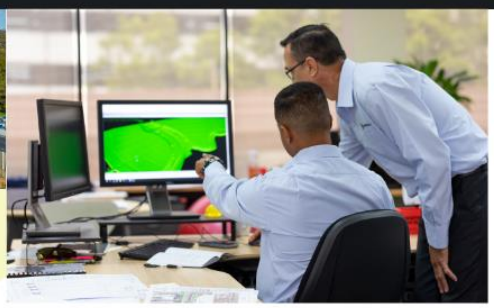

19 and 23 Adele Crescent, Bahrs Scrub

Effluent Disposal Assessment

Client: PacificCorp (Adele) Pty Ltd
Project No: BE220284
Document No: BE220184-RP-EDA-01

August 2022

Document Control Record

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Version No.	Description	Date	Prepared	Approved
00	DRAFT	08.07.2022	NM	PB
01	Initial Issue	22.08.2022	NM	PB

Recipients are responsible for eliminating all superseded documents in their possession

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Executive Summary

Burchills Engineering Solutions were engaged by PacificCorp (Adele) Pty Ltd to prepare an Effluent Disposal Assessment for the property located at 19 and 23 Adele Crescent, Bahrs Scrub which are properly described as Lots 27 & 28 on RP169807.

The subject site falls within the Emerging Community zone of the Logan Planning Scheme 2015 (Version 8.1). The proposed development comprises a 2 into 11 lot subdivision. The site has been historically developed for rural residential land uses with existing development pattern dominated by detached dwellings on large rural residential lots.

An effluent disposal assessment was completed for the subject site in accordance with the requirements of AS/NZS1547:2012 and the *Queensland Plumbing and Wastewater Code 2019*.

The assessment concluded that there is adequate suitable land available on each of the proposed residential lots to accommodate domestic scale advanced secondary sewage treatment and disposal area with appropriate buffers as required by the code.

This is subject to site specific soil capacity assessment being completed for each site once earthworks have been completed.

It should be noted that this report builds upon data collected during geotechnical investigations undertaken by Soil Surveys on 13 June 2022 for 19 and 23 Adele Crescent, Bahrs Scrub.

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1. Introduction

Burchills Engineering Solutions were engaged by PacificCorp (Adele) Pty Ltd to prepare an Effluent Disposal Assessment for the property located at 19 and 23 Adele Crescent, Bahrs Scrub which are properly described as Lots 27 & 28 on RP169807. This report has been prepared to accompany a Reconfiguration of a Lot (RoL) Development Application to the Logan City Council (COGC) which proposes a two (2) into eleven (11) lot rural residential subdivision.

The intent of this assessment is to demonstrate that the onsite effluent disposal at each of the proposed 11 rural residential lots meets the local and state statutory requirements.

It should be noted that this report builds upon data collected during geotechnical investigations undertaken by Soil Surveys on 13 June 2022 for 19 and 23 Adele Crescent, Bahrs Scrub.

1.1 Objectives

The objective of this EDA is to determine the requirements for on-site effluent disposal based on existing site conditions, recommend appropriate systems and management principles, ensuring that effluent is handled and treated to an appropriate level prior to discharge, reducing the potential for negative impacts upon the local catchment / surrounding environment.

1.2 Scope

- Identify demand and system constraints for the effluent disposal on the site;
- On the basis of the above, determine the sizing of the most appropriate system for on-site effluent treatment and disposal in accordance with:
    - *AS1547:2012* On-site Domestic Wastewater Management; and
    - *Queensland Plumbing and Wastewater Code 2019*;
- Identify the area of land required for land-based disposal using low pressure sub surface irrigation methods; and
- Evaluate the efficiency of the proposed system.

2. Site Details

2.1 Site Description

The subject site comprises two properties being 19 and 23 Adele Crescent, Bahrs Scrub which are properly described as Lots 27 & 28 on RP169807. The properties are identified by the Logan Planning Scheme 2015 as being situated within an Emerging Community zone and have a combined area of 73,338m^2.

Lot 28 contains a detached residential dwelling and ancillary shed structures. A large dam is also located on a drainage corridor in the south-western extents of the site adjoining the Adele Crescent road reserve. Approximately 60% of lot 28 remains undeveloped and is vegetated, with the majority of vegetation situated within the north-eastern extents of the site.

Lot 27 contains a detached residential dwelling and ancillary shed structures. A small dam is also located adjacent the properties eastern boundary. The property has been largely cleared of vegetation, with vegetation on the site dominated by a maintained grass cover with scattered mature trees.

Figure 2.1 below provides a site locality plan while Figure 2.2 provides an aerial photograph of the site in its current state.

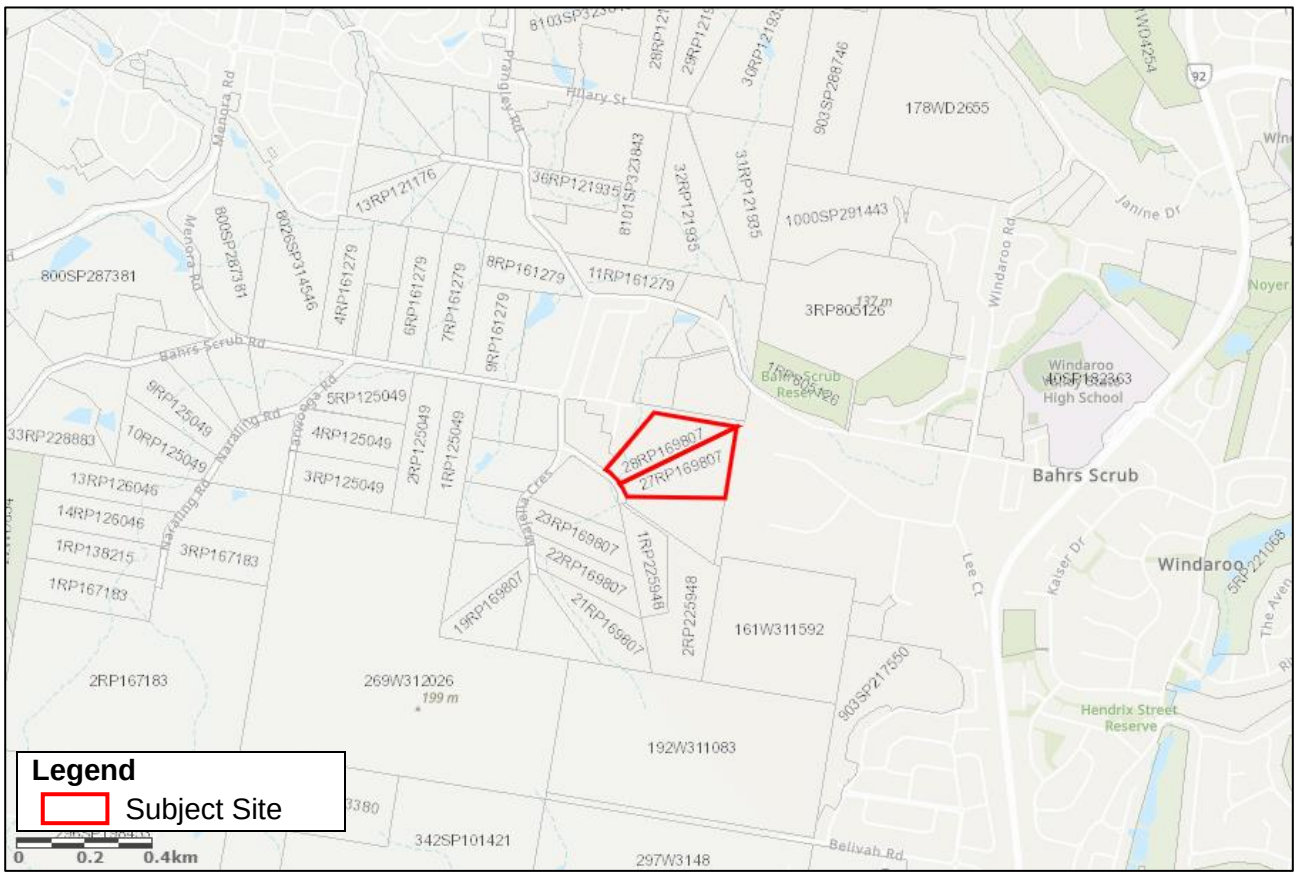


Figure 2.1 Site Locality Plan

Figure 2.2 Site Aerial Photograph

2.2 Topography and Drainage

The property is generally split into two catchments. Approximately two thirds of the site slopes at a grade of approximately 22% to the southern boundary of Lot 27 to north-west towards the drainage reserve which traverses Lot 28. The remaining third of the property (situated in the eastern extents) slopes in an east-north-east direction at a grade of approximately 20%. Surface runoff from the site will discharge from the site's western catchment via the drainage reserve situated in Lot 28. The drainage reserve is a tributary of Windaroo Creek, which eventually flows into the Albert River. Runoff from the site's eastern catchment will discharge from the site via overland flow and eventually makes its way into a drainage channel which is also a tributary of Windaroo Creek.

2.3 Soils and Geology

According to Queensland Globes Detailed Surface Geology mapping series the subject site is identified as being within the Neranleigh-Fernvale beds group which consists of mudstone, shale, arenity, chert, jasper, basic metavolcanics, pillow lava and conglomerate. Figure 2.3 below provides an extract of the Detailed Surface Geology mapping, which depicts the site and soil types.

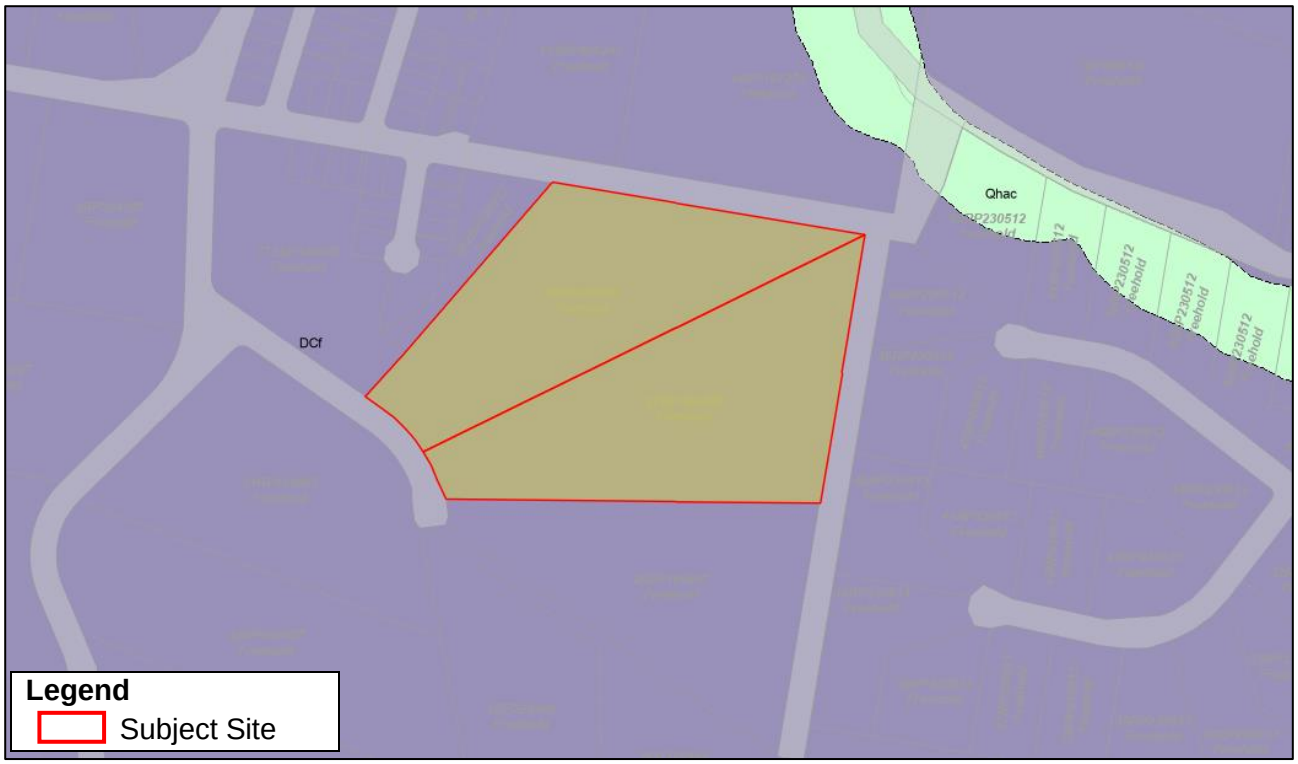


Figure 2.3 Site and regional geology

2.4 Field Assessment

A site assessment was completed using data collected by Soil Surveys when preparing the Geotechnical Report 1.4for the subject site.

Soil textures encountered within the site were generally consistent with moderately structured silty clays (identified as Soil Categories 4 in accordance with AS/NZ 1547:2012). Characteristics of the soil encountered are specified in Table 2.1. Infiltration investigations were also conducted using a Constant-Head permeameter. Saturated hydraulic conductivity (K_{sat}) values for associated boreholes are also described in Table 2.1 below.

Table 2.1 Soil Characteristics

Borehole ID	Depth	Texture	Soil Category	Saturated Hydraulic Conductivity (K sat) (m/s)	Saturated Hydraulic Conductivity (K sat) (m/day)
BH01	0.0 – 0.5	Silty Clay	4	1.632×10^{-5}	1.4107 m/day
BH04	0.0 – 0.5	Silty Clay	4	1.356×10^{-6}	0.1172 m/day
BH05	0.0 – 0.5	Silty Clay	4	2.260×10^{-6}	0.1953 m/day

The approximate locations of soil analysis boreholes sunk during site investigations undertaken when preparing the Soil Surveys report in relation to the proposed plan of development are presented in Figure 2.4 Borehole and Permeability Testing location.

Figure 2.4 Borehole and Permeability Testing locations (Courtesy: Soil Surveys)

The soil profile contained within the boreholes sunk onsite by Soil Surveys were dominated by silty clays having dispersive (sodic) or shrink / swell behaviour and generally had poor storage.

3. Effluent Disposal Assessment

3.1 Statutory Requirements

Sewage treatment systems having peak design capacity less than 20 EP require an on-site effluent disposal permit from local government. On-site wastewater systems designed for a population equivalent of up to 10 persons are outlined in AS1547:2012 while the *Queensland Plumbing and Wastewater Code 2019* addresses sewage treatment systems for up to 20 equivalent persons. Sewage treatment systems discharging effluent to a watercourse also require approval under the *Commonwealth Native Title Act 1993*.

It has been assumed that the proposed residential dwellings will have their sewage treated within an Aerated Wastewater Treatment Plant (AWTP) system for up to 6 EP. Therefore, the system will be below the 20 EP threshold and will not require licensing by the EPA, but will need to comply with AS1547:2012 and the *Queensland Plumbing and Wastewater Code 2019* as well as Local Regulatory Requirements.

3.2 Design Principles

Management of wastewater is based on the following key principles:

- Zero discharge to receiving waters;
- Zero impact on groundwater quality;
- Water conservation measures incorporated into all operating areas;
- Maximisation of wastewater reuse and recycling;
- Easy to operate, monitor and maintain;
- Minimise public health risks and impact on public amenity; and
- Site constraints recognised and taken into account.

3.3 Potential Wastewater Reduction

In order to reduce internal water usage and sewage production it is likely that this development will employ demand management measures. Demand Management involves the implementation of measures that reduce household demand for water. The application of water efficient appliances within the home can achieve substantial water savings. In accordance with the Waterwise Queensland publication by DERM (March 2010), potential reductions in water use can be achieved through the inclusion of the following fixtures:

- 4-star WELs front-loading washing machines: front loading washing machines can use up to 50% less water, 35% less detergent, and 30% less energy than top loading machines;
- Dish Washer: running a full load in a water-efficient dishwasher uses less water than washing dishes by hand;
- Showerheads: installation of a 4-star WELs showerhead and short showers can achieve significant water and energy savings;
- Toilets: the use of dual flush 4 WELs toilet can save up to 8L of water every flush; and
- Taps: replacement of taps with 4-star WELs fixtures can achieve significant reductions in water.

There are various measures that can be implemented to achieve significant water reductions around the household. Although it is recommended that water saving strategies be strongly encouraged throughout the development, these potential reductions in sewage generation will be disregarded in design of the on-site effluent disposal systems.

4. Wastewater System Solution

4.1 Design Features

Table 4.1 below outlines the indicative design features and assumptions made in relation to the Effluent Treatment Systems required to service the proposed development.

Table 4.1 Soil Characteristics & Design Features

	Recommendation / Assumption	
Treatment Plant	An advanced secondary treatment plant with TPA approval is recommended (Everhard Industries, Taylex, Fuji)*	
Water Supply	Water Tanks	
Total Size of Dwelling	4 bedroom dwelling	
Allowance of effluent per Equivalent Person (EP) /day	150L/EP/Day	
Total EP	6EP	
Total Design Volume	900L/day	
Application Method	ETA / ETS Trench and Bed	
Soil Category	4 (In situ)	
Design Loading Rate (DLR)	0 - 10% =	5mm / day
Required Irrigation Area	0 - 10% =	180m^2**
Reserve Area	100% reserve area is available on each new lot.	

** A full list of approved advanced secondary wastewater treatment systems can be found on the Queensland Department of Housing and Public Works website (HPW, 2021). 2,*
*** Design loading rates used to calculate the required effluent irrigation area are based upon pre-development in situ soil investigations.*

It is recommended that additional site-specific soil testing be undertaken as part of future drainage applications for each lot due to variations in soil types and to further confirm land application rates.

It should be noted that soil testing identified a range of permeabilities across the site, areas containing higher permeability may only require an area of 78m^2 for the installation of trenches. Areas with poor permeability may be improved through the import of good quality topsoil which will improve soil conductivity.

4.2 Design Requirements

The approved land application design provides for dedicated effluent disposal areas as “sub- surface evapotranspiration”. Typical layouts and sections of the disposal system are presented on the Building Envelope Plan contained in Appendix A of the report. The following design requirements are to be adhered to for all application areas:

- Irrigation lines are to be laid at a maximum surface slope of 6%;
- Recommended maximum slope of a Bed or Trench is 10% as slopes greater than this can be difficult to construct;
- Upstream flows are to be diverted around the disposal area via constructed diversion drains;
- All irrigation areas are to be located above any flood prone land;
- Irrigation areas are to be vegetated as soon as practicable after construction;
- Surface vegetation shall be grasses and shrubs that tolerate wet conditions and have a high evapotranspiration capacity; and
- Where practicable beds should be well exposed to the sun and wind.

4.3 Setback Distances

The Queensland Plumbing and Wastewater Code V1:2019 Appendix Part 2 – Setbacks prescribes setback distances for various effluent treatment systems. Table T2 prescribes setback distances for subsurface land application areas. Table 4.3 below provides a reproduction of Table T2.

Table 4.2 The Queensland Plumbing and Wastewater Code V1:2019 Appendix Part 2 – Table 2

Feature	Horizontal Separation Distance		
	Up Slope	Down Slope	Level
Property boundaries, pedestrian paths, walkways, recreation areas, retaining wall, and footings for buildings and other structures,	2m	4m	2m
Inground swimming pools	6m	6m	6m
Inground potable water tank not exposed to primary effluent	6m	6m	6m
Inground potable water tank exposed to primary effluent	15m	15m	15m

**Distances are given in metres and are measured from the edge of trench/bed excavation or subsurface irrigation distribution pipework to the nearest point of the feature.*

Table T5 prescribes minimum setback distances for natural features.

Table 4.3 The Queensland Plumbing and Wastewater Code V1:2019 Appendix Part 2 – Table 5

Feature	Horizontal Separation Distance		
	Adv. Secondary	Secondary	Primary
Top of bank of permanent water course	10m	30m	50m
Top of bank of intermittent water course			
Top of bank of a lake, bay or estuary			
Top water level of a surface water source used for agriculture, aquaculture or stock purposes.			
Open stormwater drainage channel or drain			
Bore or a dam			
Unsaturated soil depth to a permanent water table (vertically)	0.3m	0.6m	1.2m

**Distances are given in metres and are measured from the edge of irrigated wetted area to any point of the feature.*

***Note: Primary effluent typically has a Biological Oxygen Demand of between 120-240 mg/L and Total Suspended Solids of between 65-180 mg/L.*

4.4 Effluent Standards

Advanced secondary treatment via an aerated wastewater treatment system with disinfection is considered the most suitable treatment for all wastewater with effluent re-used on-site via a land application system.

Suitable parameters for advanced secondary effluent are defined in the Queensland Plumbing and Wastewater Code 2019, and generally accepted by industry, are detailed in Table 4.5 below.

Table 4.4 Advanced Secondary Treatment – Treatment Parameters

Parameter	Advanced Secondary	
	90%	100%
Biological Oxygen Demand	<10mg/L	<20mg/L
Total Suspended Solids	<10mg/L	<20mg/L
Chlorination	Total chlorine concentration ≥0.5g/m^3 and ≤2.0g/m^3	
Disinfection	Thermo tolerant coliform count not exceeding 10 organisms / 100ml in 90% of samples and not exceeding 200 organisms / 100ml.	

It is recommended that effluent disposal be via sub-surface or covered surface irrigation within dedicated effluent disposal areas. This will sustain the vegetation within the designated areas and alleviate the need to irrigate from other sources.

The systems would use subsurface infiltration of effluent into the soil and evapotranspiration by plants. It is recommended that the disposal area(s) be planted with native plants with an understorey of couch or native grasses and have a soil depth no less than 1 meter.

5. Conclusions

The requirements for sustainable effluent disposal for the subject site are as follows:

- It is recommended that all lots be serviced by a sewage treatment system capable of producing advanced secondary quality effluent;
- It is recommended that ETA / ETS Bed or Trench systems be used for the irrigation of treated effluent;
- ETA / ETS Trenches are to be installed parallel to the contour and at a maximum surface slope of 6%;
- The recommended maximum surface slope for Bed or Trench (as prescribed by AS1547-2012) is 10%, with slopes exceeding this grade being difficult to construct;
- All setback distances prescribed by the Queensland Plumbing and Wastewater Code and detailed in this report shall be implemented;
- All irrigation areas must be located above any flood prone or flood management areas;
- The existing soil profile is dominated by clay-dominated soils (Soil Category 4) having sodic or shrink / swell behaviour and has a hydraulic conductivity of 0.11m – 0.2m / day;
- Based upon the in-situ soil hydraulic conductivity:
    - An irrigation area for subsurface disposal of 180 m² will be required for properties with a slope of 0% - 10%.
- The soil testing identified a range of permeability, areas containing soils with higher permeability may require only 78m^2 for the trenches.
- The calculated land application area for the site is a maximum of 180m^2 (based of in-situ soil permeability results).
- It is recommended that site specific soil testing be undertaken for each lot once earthworks have been completed and the exact location of the house pads are determined.

6. References

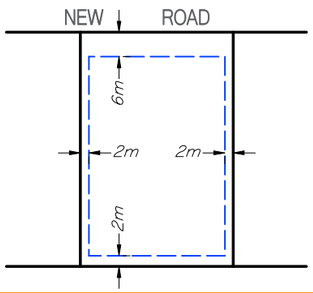
The information presented herein has been prepared with reference to the following:

- AS/NZS 1546:2008 On-site domestic wastewater treatment units - Part 3: Aerated wastewater treatment systems.
- AS/NZS 1547:2012 On-site domestic-wastewater management.
- City of Gold Coast, 2020, Gold Coast City Plan Version 8.
- Department of Natural Resources and Mines, 2002, Onsite Sewerage Facilities Guidelines for Vertical and Horizontal Separation Distance.
- Department of Environment and Resource Management, 2014, Planning Guidelines for Water Supply and Sewerage (April, 2010).
- Department of Housing and Public Works, 2013, Queensland Plumbing and Wastewater Code 2019.
- Department of Housing and Public Works, 2021, Approved facilities for on-site advanced secondary sewage treatment. Accessed on 10 March 2021 from the following website: https://www.business.qld.gov.au/industries/building-property-development/building-construction/plumbing-drainage/on-site-sewerage#AdvancedSecondary
- Queensland Government, 2020. Planning Act 2016.

Appendix A – Building Envelope Plan

LEGEND	
	Site Boundary
	Building Location Envelope
	Indicative Effluent Disposal
	Wildlife Movement Area
	Existing Buildings to be Retained

Typical Building Envelope



1. SITE COVER
- The maximum area covered by all buildings and structure roofed with impervious materials, does not exceed 40% of the lot area or 2000m², whichever is lesser.

2. EFFLUENT
- Final effluent disposal areas must be located within the approved building envelope areas and in accordance with all required setbacks as per the Queensland Plumbing and Wastewater Code and AS/NZS 1547.

N

Scale 1:1250 @ A3 – Lengths are in metres.

10 0 10 20 30 40 50 60 70 80 90 100

CLIENT

PACIFICCORP

(Adele) Pty Ltd

SITE ADDRESS

19 & 23 Adele Crescent, Bahrs Scrub

RPD:	
Lots	27 & 28
Plan	RP169807
Locality	Bahrs Scrub
Local Authority	Logan City
Level Datum	PSM150950
Co-ord System	MGA2020
Origin	AHD 48.640 via CORs
Meridian	MGA2020 plane scale around PSM

Notes

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3. Lot layout data supplied by others and is approximate only.

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SCALE at A3
1:1250

DESIGN
GS

DRAWN
JC

CHECKED
GS

DRAWING TITLE:

Building Envelope Plan

WOLTER consulting group

Planning Urban Design Landscape Environment Surveying

DRAWING NO.	VERSION
22-0099P-05	B
DATE DRAWN	SHEET NO.
18-08-2022	1 of 1

Appendix B – Soil Permeability Test Results

SOIL PERMEABILTY TEST RESULTS

Project No.:	2-15388
Project:	QCS Upgrade
Location:	19-23 Adele Crescent, Bahrs Scrub
Client:	Pacificcorp (Adele) Pty Ltd
Date:	13/06/2022
Operator:	Rick Hayward

Test Location:	BH01			
GPS Coordinates:	**E:**	517265	**N:**	6931340
Soil Description at Test Location:	Silty Clay (CH) (Fill)			
Depth of Auger Hole (*D*):	0.50m			
Depth of Water in Auger Hole (*H*):	0.35m			
Average Radius of Auger Hole (*r*):	0.05m			

PERMEAMETER AND TIME READINGS		
TEST NUMBER:		
Time (minutes)	**Level in Tube (mm)**	**Drop in Level (mm)**
0	720	-
0.5	680	40
1	610	70
2	520	90
3	470	50
4	410	40
5	350	60
6	300	50
7	270	30
8	240	30
9	210	30
10	180	30
11	160	20
12	130	30
13	110	20
14	90	20
15	70	20
Q =	**0.0980 (cm^3/min)**	
K_{sat} =	**1.4107 (m/day)**	

Test Location:	BH04			
GPS Coordinates:	**E:**	517438	**N:**	6931362
Soil Description at Test Location:	Silty Clay (CH)			
Depth of Auger Hole (*D*):	0.50m			
Depth of Water in Auger Hole (*H*):	0.35m			
Average Radius of Auger Hole (*r*):	0.05m			

PERMEAMETER AND TIME READINGS		
TEST NUMBER:		
Time (minutes)	**Level in Tube (mm)**	**Drop in Level (mm)**
0	820	-
5	810	10
10	790	20
15	760	20
20	730	30
25	710	20
Q =	**0.0081 (cm^3/min)**	
K_{sat} =	**0.1172 (m/day)**	

Test Location:	BH05			
GPS Coordinates:	**E:**	517354	**N:**	6931363
Soil Description at Test Location:	Silty Clay (CH)			
Depth of Auger Hole (*D*):	0.50m			
Depth of Water in Auger Hole (*H*):	0.35m			
Average Radius of Auger Hole (*r*):	0.05m			

PERMEAMETER AND TIME READINGS		
TEST NUMBER:		
Time (minutes)	**Level in Tube (mm)**	**Drop in Level (mm)**
0	740	-
5	700	40
10	670	30
15	650	20
20	620	30
25	590	30
Q =	**0.0136 (cm^3/min)**	
K_{sat} =	**0.1953 (m/day)**	

Appendix C – Borehole Location Plan

SCALE NOT TO SCALE				TITLE PROPOSED RESIDENTIAL SUBDIVISION BOREHOLE LOCATION PLAN	CLIENT PACIFICCORP (ADELE) PTY LTD LOCATION 19-23 ADELE CRESCENT BAHRS SCRUB	SOIL SURVEYS SOIL SURVEYS ENGINEERING PTY LIMITED CONSULTING GEOTECHNICAL ENGINEERS
A4	DRAWING NO. 2-15388-02	DATE 12/07/2022	CHECKED KM			

Appendix D – Effluent Disposal Calculations

Effluent Land Application System Options Calculations BE220184

Effluent Volume Calculations				
Source	Flow Allowance (L/Person/Day)	Initial		
		No. Persons	Total Flow (L/day)	
Residence 4 Bedrooms	150	6	900	Based on 4 Bedrooms. Table H1 AS 1547:2012
Total / Week			6,300	

Soil Category 4

Soil Properties		
Texture	Clay Loams	Refer Table M1 AS 1547: 2012
Indicative Permeability	0.06 – 0.12m / day	
Indicative Drainage Class	Moderately Structured	
Soil Category	4	

ETA / ETS Bed and Trench Option Area Calculations			
Design Loading Rate (DLR)	35	mm/week	Refer Table L1 AS 1547: 2012
	5	mm/day	
Area Requirement (A) =	Q(week) / DIR		

ETA / ETS Bed and Trench Irrigation Area Requirement	
Slope	M^2
Irrigation Area (0% - 10%)	180

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