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On Site Effluent Assessment for Subdivision

Ingleside Release Area

July 2015

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1. INTRODUCTION

1.1. Background of Project

SMEC Australia Pty Ltd (SMEC) was engaged by the NSW Department of Planning and Environment (DP&E) to prepare an On Site Effluent Subdivision Assessment for development of the Ingleside Release Area, Ingleside, NSW. The Ingleside precinct occupies approximately 700 hectares within the Pittwater Local Government Area (LGA) and is located approximately 20 km north-east of the Sydney CBD. This report is a technical paper developed to inform the precinct planning process for Ingleside. The precinct planning is being developed as a partnership between the DP&E, Pittwater Council and Urban Growth NSW.

1.2. Purpose

The On Site Effluent Subdivision Assessment is required to develop an understanding of the capacity and constraints associated with on site treatment of residential effluent within the land identified as rural landscape under the Pittwater Local Environmental Plan 2014. The scale of investigation and reporting works has been applied at a subdivision level for three sub-precinct locations containing Rural Landscape and where the proposed reticulated sewerage network may not provide coverage (Figure 1). The three sub-precinct locations are:

- Wirreanda Valley (Wirreanda Road and Addison Road)
- North Ingleside (north of Cicada Glen Road)
- Bayview (Walter Road)

The areas to be serviced within the above sub precinct areas are based on high level service strategies received from Sydney Water.

In the absence of detailed service level or service delivery timeframes this report has assumed that these areas will require conventional asset life cycles.

1.3. Scope of Works

A summary of the key activities for this scope of works is as follows:

- Desktop study to identify representative and accessible assessment sites in accordance with adopted guidelines
- Field works preparation, service locating, drill rig, soil sampling and site walkover
- Laboratory analysis of soil
- On-site Sewage Management Site and Soil Assessment report
- Liaison with the key stakeholders throughout the process including the project manager, relevant government agencies, service providers and the master planner.

1.4. Technical Framework

The site and soil assessment is generally based on the guidance for subdivision scale assessment as provided in *Environment & Health Protection Guidelines On-site Sewage Management for Single Households* (Department of Local Government, 1998).

2. SITE INFORMATION

2.1. Subject Site Description

For the purposes of assessment and reporting, the study area comprises the following sub-precincts and lands identified as Rural Landscape (Figure 1) in accordance with the Pittwater LEP 2014:

- Wirreanda Valley
- North Ingleside
- Bayview

The study areas are made up of individual sites with highly variable size blocks. The average size block for the 31 Lots in Wirreanda Valley is 2.3 hectares, 9 Lots in North Ingleside is 2.1 and the 28 Lots in Bayview is 1.4 hectares.

2.2. Environmental Setting

Collectively, the sub-precincts are generally bordered by the following:

- West - Wirreanda Creek and the Ku-ring-gai Chase National Park.
- North - Ku-ring-gai Chase National Park and the suburb of Church Point.
- East – Warriewood Escarpment, Katandra Bushland Sanctuary and the suburb of Mona Vale.
- South - Garigal National Park and the suburb of Elanora Heights.

It is understood that the subject area adjacent to the study area will accommodate a mixture of land uses including environmental living, low and medium density dwellings (and a range of other land uses) in the future.

2.3. Topography

The landscape of the subject area generally consists of relatively steep areas close to the Warriewood/Ingleside Escarpment, through to lower lying areas around the centre of the precinct (Powder Works Road, McLean Street etc.). Mona Vale Road dissects the subject area and generally follows the ridge line through the subject area. Elevations throughout the subject area generally range from a high of 200 m above sea level near the Baha'i Temple to low of 80 m above sea level in the area around Emmaus Road. In general, the subject area north of Mona Vale Road falls to towards the north and north-east while the subject area south of Mona Vale Road falls to towards the south-east.

There are two creek lines located within the subject area north of Mona Vale Road. Wirreanda Creek follows the western edge of the subject area and flows to the north before discharging into McCarrs Creek, while Cicada Glen Creek flows to the north from Chiltern Road before also discharging into McCarrs Creek.

Figure 1 identifies the creek lines and topography in relation to the subject area.

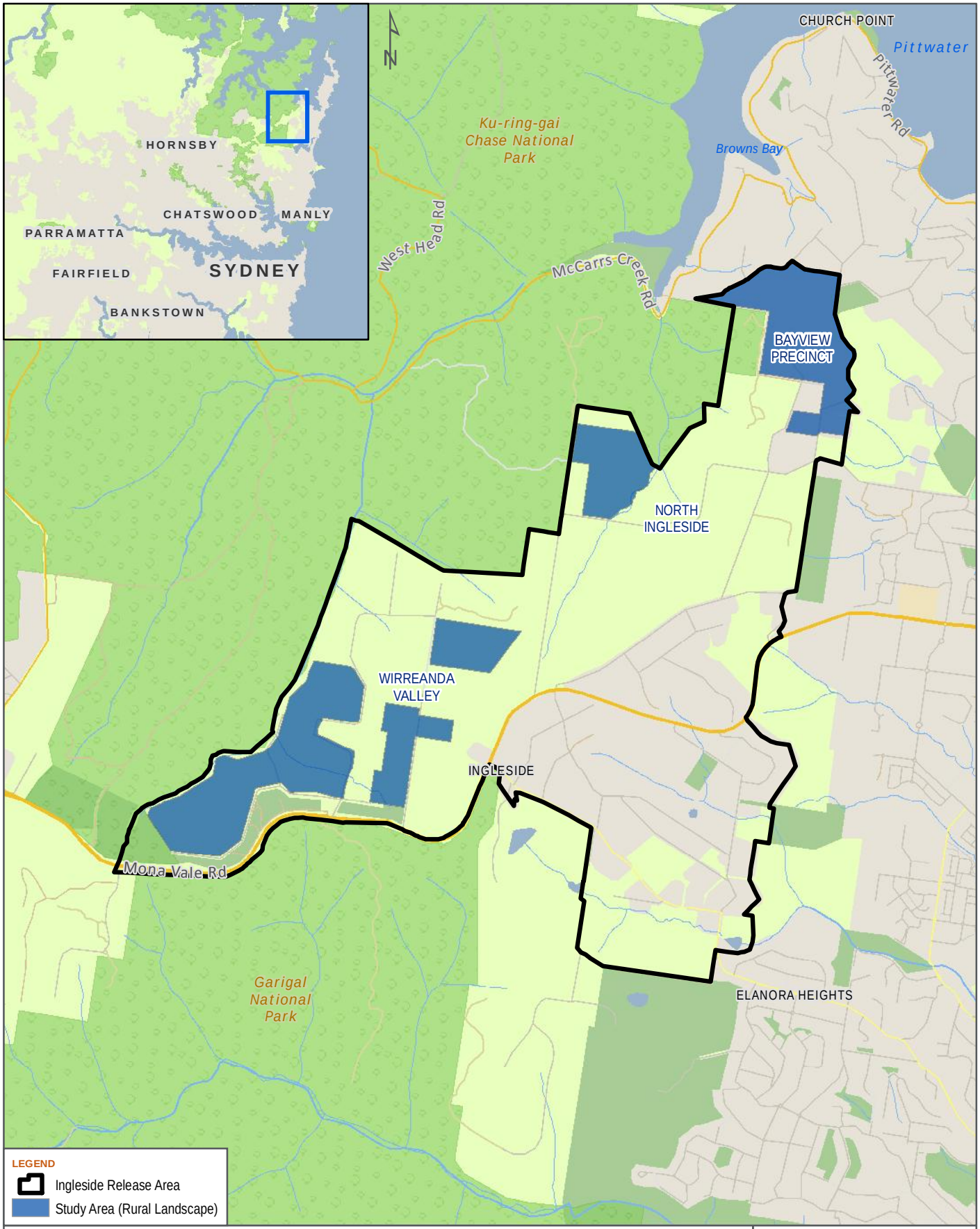

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FIG NO. 1	**FIGURE TITLE** Site location and study area (Rural Landscape)	**PAGE SIZE** A4
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2.4. Geology

The *Sydney 1:100 000 Series Geological Sheet* indicates that the study area is entirely underlain by the Hawkesbury Sandstone formation (mapping unit Rh) of the Wianamatta Group from the Triassic Period.

The Hawkesbury Sandstone formation typically comprises medium to coarse-grained quartz sandstone with very minor shale and laminate lenses.

2.5. Hydrogeology

SMEC completed a search of the Department of Water and Energy Online Database to identify groundwater bores within the subject area. The search indicated that there are 50 registered boreholes in the subject area (Figure 2). NSW Office of Water bore summaries for registered bores within the Ingleside release area are listed in Appendix E.

Regional groundwater is expected to generally flow to the north-east in accordance with the general site topography with localised variations in areas located nearer to water bodies and creek lines.

Water quality information contained within the bore logs is limited. However, the information that is available identifies salinity characteristics as good to fresh which indicates reasonable water quality and non-saline groundwater conditions. This is anticipated given the geology of the subject area.

The recorded bore depths range from 5.3 mbgl to 210 mbgl with historical standing water levels within the bores ranging from 14 mbgl to 105 mbgl. The recorded bore depths and water levels indicate that there is likely more than one aquifer within the subject area.

2.6. Soil Landscapes

The subject area comprises a variety of soil landscapes recognised under the Soil Landscapes of the Sydney 1:100 000 Sheet. Soil landscapes mapped within the subject area include Gymea, Oxford Falls, Hawkesbury and Somersby.

Descriptions and characteristics of the various soil landscapes identified within the subject area are provided in Table 1. Figure 3 identifies the locations of the various soil landscape groups mapped and sampled throughout the subject area.

Table 1 Soils descriptions under the Soil Landscapes of the Sydney 1:100 000 Sheet

Soil Type	Landscape	Soils
Somersby	Gently undulating to rolling rises on deeply weathered Hawkesbury Sandstone plateau. Local relief to 40 m, slopes <15%. Rock outcrop is absent. Crests are broad and convex, valleys are narrow and concave. Extensively cleared, low eucalypt open-woodland and scrubland.	Moderately deep to deep (100-300 cm) Red Earths (Gn2.14) and Yellow Earths (Gn 2.24, Gn2.21) overlying laterite gravels and clays on crests and upper slopes; Yellow Earths (Gn2.21, Gn2.24) and Earthy Sands (Uc5.11, Uc5.22) on mid slopes; Grey Earths (Gn2.81), Leached Sands (Uc2.23) and Siliceous Sands (Uc1.22) on lower slopes and drainage lines; Gleyed Podzolic Soils (Dg3.82, Dg4.51) in low lying poorly drained areas.
Oxford Falls	Hanging valleys on Hawkesbury Sandstone. Local relief <80 m, slopes <15%. Occasional broad benches and broken scarps. Valley floors are relatively wide, gently inclined and often poorly drained. Low eucalypt woodland, scrub heathland and sedgeland.	Moderately deep to deep (50 >150 cm) Earthy Sands (Ue5.23),Yellow Earths (Gn2.84, Gn2.94), Siliceous Sands (Ue 1.21) on slopes; deep (>200 cm) Leached Sands (Uc 2.12), Podzols (Uc2.32, Uc2.36) and Grey Earths (Gn2.81) on valley floors.
Hawkesbury	Lugged, rolling to very steep hills on Hawkesbury Sandstone. Local relief 40-200m, slopes >25% Rock outcrop >50%. Narrow crests and ridges, narrow incised valleys, steep sideslopes with rocky benches, broken scarps and boulders. Mostly uncleared eucalypt open-woodland (dry sclerophyll forest) and tall open-forest (wet sclerophyll forest).	Shallow (>50 cm), discontinuous Lithosols, Siliceous Sands (Ucl.21) associated with rock outcrop; Earthy Sands (Uc5.11, Uc5.23), Yellow Earths (Gn2.24) and some Yellow Podzolic Soils (Dy4.11) on inside of benches and along joints and fractures; localised Yellow and Red Podzolic Soils (Dy4.11, Dy5.21, Dr5.11, Dr5.21) associated with shale lenses; Siliceous Sands (Uc1.2) and secondary Yellow Earths (Gn2.41) along drainage lines.
Gymea	Undulating to rolling rises and low hills on Hawkesbury Sandstone. Local relief 20-80m, slopes 10-25%. Rock outcrop <25%. Broad convex crests, moderately inclined side slopes with wide benches, localised rock outcrop on low broken scarps. Extensively cleared open-forest (dry sclerophyll forest) and eucalypt woodland.	Shallow to moderately deep (30-100 cm) Yellow Earths (Gn2.24) and Earthy Sands (Uc5.11, Uc5.23) on crests and inside of benches; shallow (<20 cm) Siliceous Sands (Ucl.21) on leading edges of benches; localized Gleyed Podzolic Soils (Dg4.21) and Yellow Podzolic Soils (Dy4.11, Dy5.11, Dy5.4V on shale lenses; shallow to moderately deep (<100 cm) Silkeous Sands (Ucl.1.2) and Leached Sands (Uc2.21) along drainage lines.

3. PRECINCT DEVELOPMENT AND STAGING

3.1. Infrastructure Delivery Plan

DP&E engaged Cardno to provide engineering services to assist in the preparation of an Infrastructure Delivery Plan (IDP) for the Ingleside Precinct. The primary objective of the IDP is to assist in nominating the long-term and short-term utility infrastructure strategies that will support the future development of the Precinct.

3.2. Staging

This report is based on servicing strategies identified by Sydney Water. Sydney Water has completed the high level servicing strategy for potable water-and waste water services to the Ingleside.

3.3. Water Supply

The Precinct is partly covered by two of Sydney Water's nominated water supply zones:

- Elanora Heights
- Minkara.

There remains a significant area within the Precinct that is not currently serviced with potable water. Refer to the Cardno Infrastructure Delivery Plan for details.

3.4. Wastewater

The study area does not currently have any connections to the Sydney Water wastewater network and it is anticipated that existing land users rely upon on site disposal systems. It is assumed for the purposes of this report that the study area is already serviced by on site effluent management systems.

4. SITE SUITABILITY ASSESSMENT PARAMETERS

4.1. Rainfall and Evaporation

Climate data available from the Bureau of Meteorology (BOM) (2015) for Observatory Hill in inner Sydney provided the closest weather station to the study areas with records of evaporation as well as rainfall. Data was analysed for the year to February 2015 in order to analyse the balance between rainfall and evaporation which has been summarised in the Table 2 below. Rainfall data from Terrey Hills AWS has also been included for comparative purposes as it is the closest weather station to the study areas just measuring rainfall for the year February 2015.

Table 2. Rainfall and evaporation data for Terrey Hills.

Month	Monthly Rainfall Total (mm)*	Monthly Rainfall Total (mm)**	Monthly Pan Evaporation Total (mm)**	Monthly Water Balance (Evaporation – Rainfall) (mm)**
March 2014	139.6	102.6	159.4	56.8
April 2014	70.6	121.0	110.4	-10.6
May 2014	20.0	27.4	113.6	86.2
June 2014	83.6	68.0	99.4	31.4
July 2014	13.6	16.4	97.4	81.0
August 2014	235.6	215.2	100.4	-114.8
September 2014	71.0	50.4	141.2	90.8
October 2014	64.4	86.6	187.0	100.4
November 2014	28.0	16.0	218.4	202.4
December 2014	167.0	118.0	231.6	113.6
January 2015	187.6	165.8	228.0	62.2
February 2015	49.2	59.0	177.8	118.8

Key:
** Terrey Hills AWS*
*** Observatory Hill AWS*

Table 2 highlights that the study area generally has higher monthly evaporation than the respective monthly rainfall. This indicates the hydraulic load could potentially be utilised for sub-surface irrigation. It is important to note that during periods of wet weather, treated wastewater must be stored and not applied to the ground. Application of wastewater during wet weather could result in pollutants leaching into the groundwater, or the wastewater could resurface creating a range of environmental and health risks.

4.2. Temperature

The average maximum daily temperatures during the winter months (June, July and August) in the Sydney region are between 15 and 18 degrees Celsius, as shown on mapping from the BOM (2011). Temperature data can be referenced in Appendix D. These maps are based upon the 30-year period from 1961-1990. Recent climate data was sourced from the BOM to compare with these averages from Terrey Hills which is the closest available weather station to Ingleside. The Terrey Hills weather station is located less than three kilometres to the west of the Wirreanda Valley Precinct. Average daily maximum temperatures for June, July and August 2014 were 17.3, 16.9, 16.2 degrees Celsius respectively. The *Environment & Health Protection Guidelines for On-site Sewage Management for*

Single Households (Department of Local Government, 1998) state that average maximum daytime temperatures below 15 degrees Celsius decrease the performance of wastewater treatment processes. The average daily maximum temperatures for the study area are not below this threshold.

4.3. Environmental Buffer Distances

Buffer distances adopted for this study are based on the recommended distances in the *Environment & Health Protection Guidelines for On-site Sewage Management for Single Households* (Department of Local Government, 1998). Buffer distances adopted comprised:

- 250 metres between a land application area and a groundwater well used for domestic water supply
- 100 metres to permanent surface waters (eg river, streams, lakes, etc)
- 40 metres to other waters (eg farm dams, intermittent waterways and drainage channels, etc)
- 6 metres if area up-gradient and 3 metres if area down-gradient of swimming pools, property boundaries, driveways and buildings.

Due to the high number of registered bores within the study area, two environmental buffer calculations have been provided for discussion within this section of the study:

- All groundwater bores are being used for domestic purposes, refer to Table 3 and Figure 2
- No groundwater will be used for domestic purposes within the study area. Properties are connected to potable water mains and therefore the 250 m buffer may not apply, refer to Table 4 and Figure 3.

In the event that groundwater is required for domestic purposes within the Ingleside Release area, an additional buffer of 250 m from any land application system must be allowed for in buffer calculations when assessing available land for managing on site effluent capabilities. This buffer layer has significant impact on the amount of available assessment land within the study area. This buffer calculation reduces the land available for assessment for potential onsite effluent management to 41.6 hectares of land from an original study area of 132 hectares. Application of this buffer reduces available land most significantly in North Ingleside area where only 7% of the study area is remaining available for additional assessment if this buffer is applied.

Table 3. Study area breakdown for unconstrained and constrained land based on 250 m buffer for domestic use of groundwater (Department of Local Govt. 1998).

Study Area	Available (ha)	Area not affected by groundwater bore environmental buffer		Constrained Area (to be excluded from onsite effluent management)	
		ha	% of Total Area*	ha	% of Total Area*
Wirreanda Valley	75.5	16.4	22	59	78
North Ingleside Precinct	17.5	1.2	7	1.2	93
Bayview Precinct	39.2	24	61	15.2	39
TOTAL	132.2	41.6	31	90.6	69

*% area is calculated from original study area of 132.2 ha from Table 4

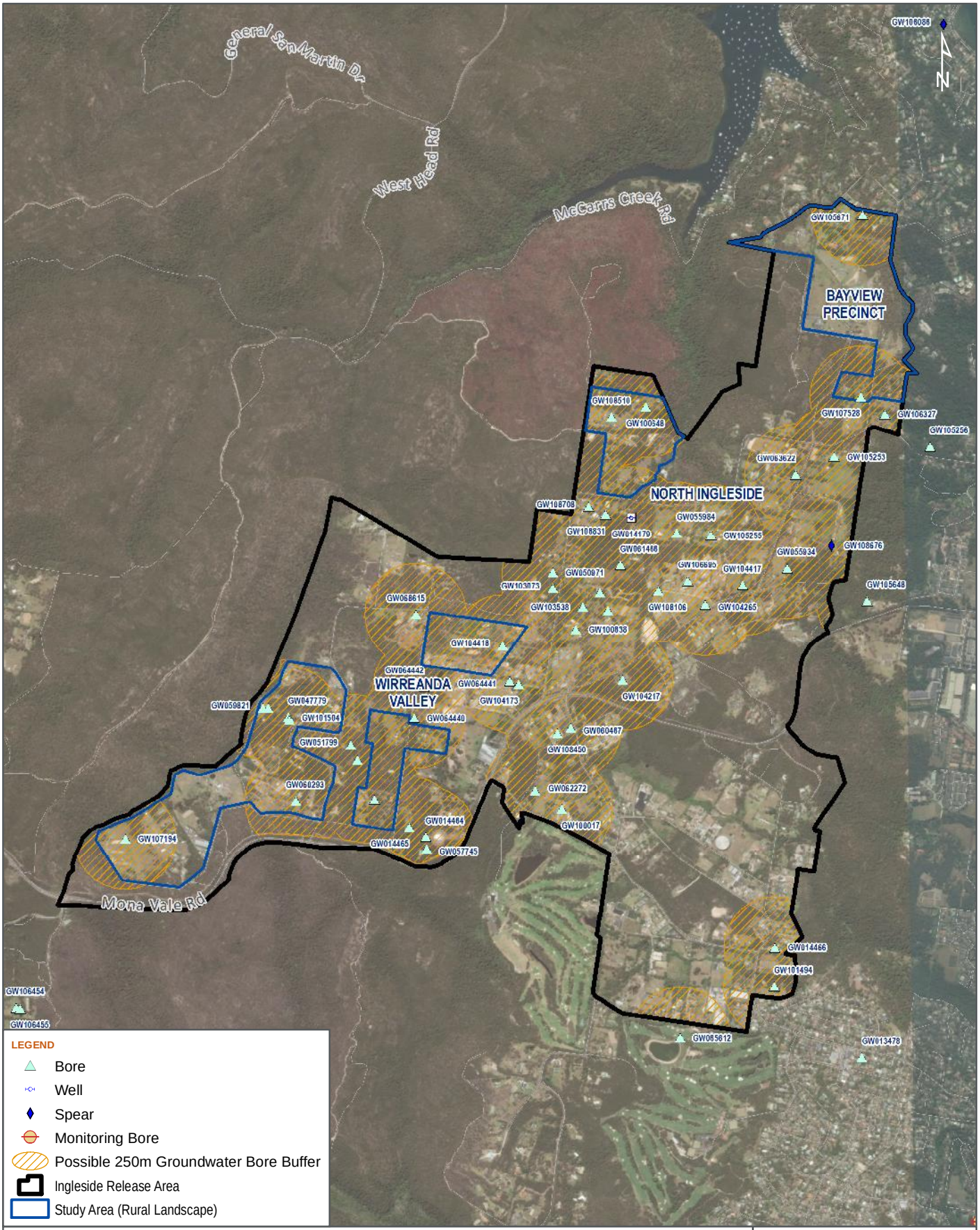

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FIGURE TITLE Groundwater Bore Buffer

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It is likely that a number of the registered bores are no longer operational or required in future as a domestic water source. Applying this buffer layer as a default requirement may not represent the current status of groundwater bore requirements in the study area, however the status of each groundwater bore at each site will need to be established at a site specific scale assessment if buffer is to be removed from the environmental constraints calculations.

In the event that the additional assessment can establish that no groundwater bores are being used for domestic purposes (or domestic use groundwater bores are decommissioned) and areas of assessment will be connected to potable water mains at each site, then calculations for land that may be assessed for onsite effluent management potential within the study area increases to 84.3 hectares.

The spatial analysis applied using the buffer distances in Table 4 and Figure 3, are undertaken with the adopted buffer criteria, however without the groundwater bore buffer being applied. This calculated data is based on subsurface irrigation (Table 5) for onsite systems in order to determine the area that is unconstrained for further assessment of onsite effluent constraints.

Table 4. Study area breakdown for unconstrained and constrained land based on adopted buffers (Department of Local Government, 1998).

Total Study Area (ha)	Unconstrained Area (available for onsite effluent management)		Constrained Area (to be excluded from onsite effluent management)	
	ha	% of Total Area	ha	% of Total Area
132.2	84.3	64	47.9	36

The buffer distances highlighted in Table 4 indicates that 47.9 hectares of the study area has constraints and should be excluded from further consideration in managing on site effluent requirements. The remaining 84.3 hectares presents some potential for onsite effluent to be managed and an appropriate system selection process may proceed in these areas. Constrained and unconstrained areas are mapped in Figure 3.

4.4. Exposure, Slope and Landform

The slope assessment was undertaken on the area of unconstrained area as a result of the buffer distance analysis (i.e. 84.3 hectares of a total possible area of 132.2 hectares). A system limitation rating is listed in Table 5 and is based on the *Environment & Health Protection Guidelines for On-site Sewage Management for Single Households* (Department of Local Government, 1998) provides the categories for slope assessment surface irrigation, subsurface irrigation and absorption systems.

Table 5. Site Assessment Ratings for On site Systems.

Slope %	Minor Limitation	Moderate Limitation	Major Limitation
Surface Irrigation	0-6	6-12	>12
Subsurface Irrigation	0-10	10-20	>20
Absorption System	0-10	10-20	>20

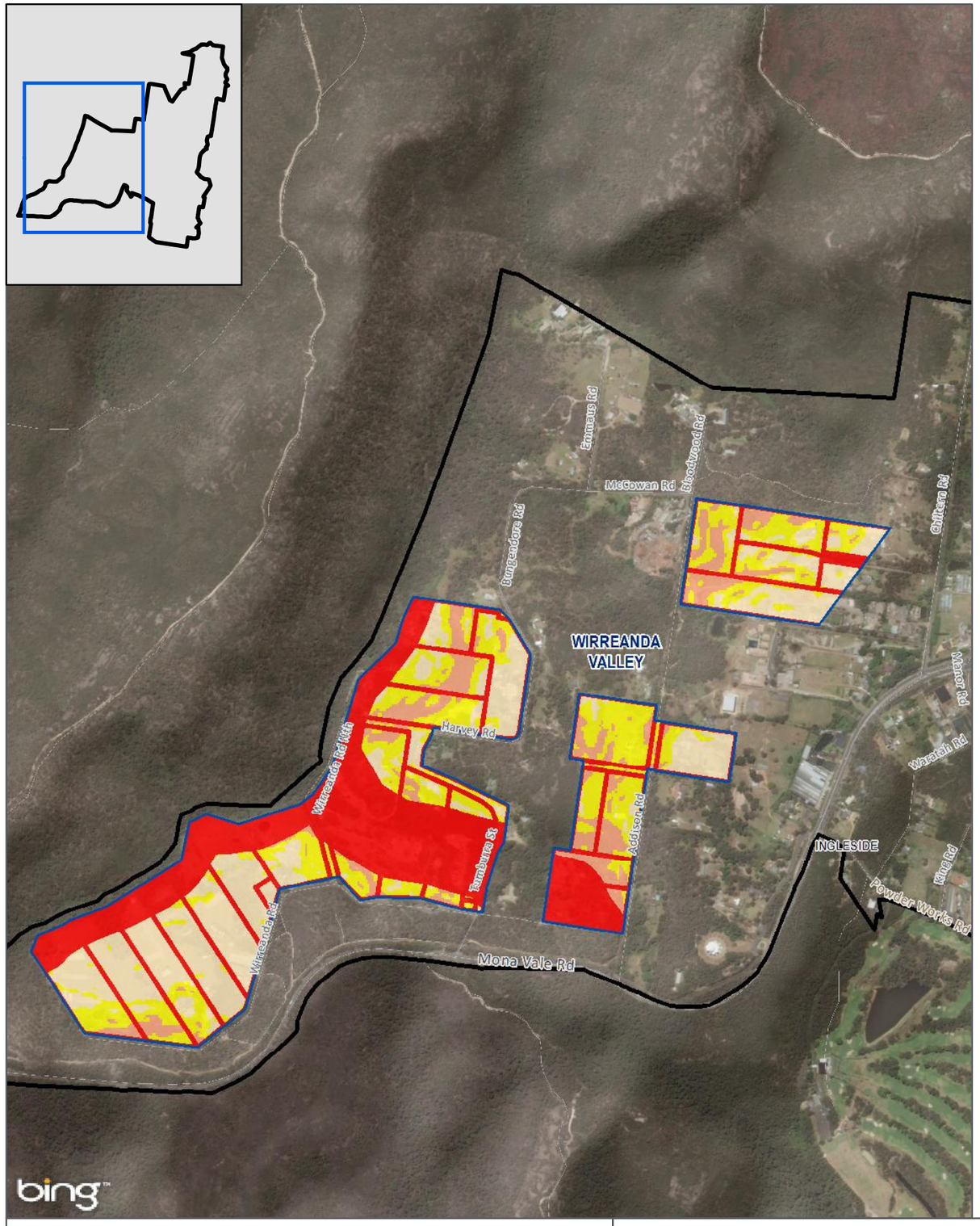
Due to the broad scale of this report, this study has adopted the subsurface and absorption system as a typical on-site system required in a low density rural setting. Site assessment has identified run-off and erosion as the most likely broad scale restrictive feature of the study area based on the high

proportion of sloping land. The Slope % Limitation is illustrated in Figure 3 and is identifying the calculated land areas identified with minor, moderate or major limitations provided in Table 6. Additional specific assessment for system selection maybe required to establish appropriate system selection where the localised landform, site drainage, presence of fill, rocks and out crops may also present additional system limitations.

Table 6. Unconstrained land with minor, moderate or major limitations for subsurface irrigation systems (Department Local Government, 1998).

Study Area	Available (ha)	Minor Limitation (0-10% Slope)		Moderate Limitation (10-20 % Slope)		Major Limitation (>20% Slope)	
		ha	% Area*	ha	% Area*	ha	% Area*
Wirreanda Valley	45	20.2	27	16.6	22	7.7	10
North Ingleside Precinct	10	3.9	23	4.4	25	1.7	10
Bayview Precinct	30	17.8	45	7.5	19	4.4	11
TOTAL	84	42	32	29	22	14	10

*% area is calculated from original study area of 132.2 ha from Table 4



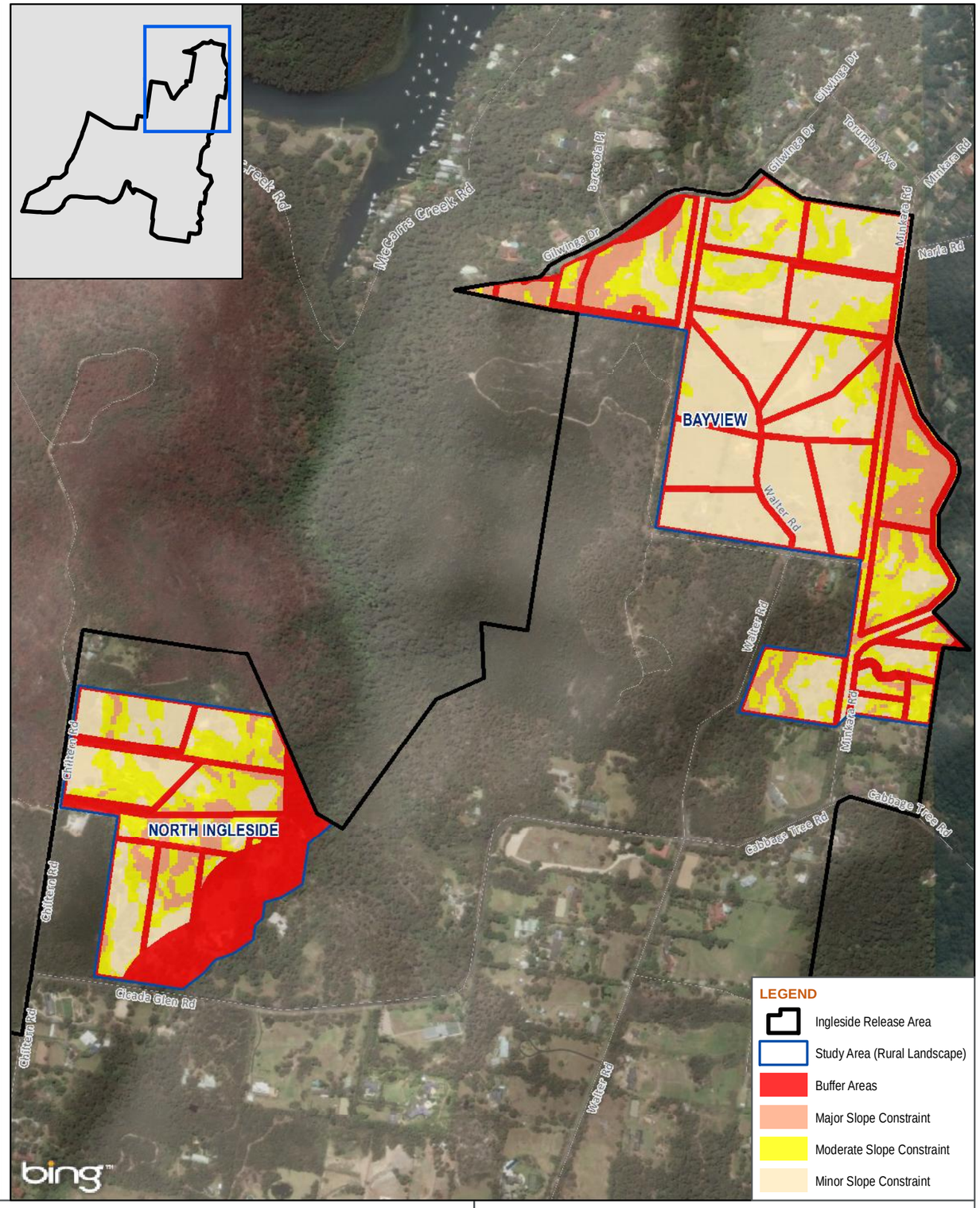


FIG NO. 3	**FIGURE TITLE** Slope constraints and environmental buffers	**DATE** 15/06/2015	**PAGE SIZE** A3	**COORDINATE SYSTEM** GDA 1994 MGA Zone 56	
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4.5. Flood Potential

Pittwater Council does not have flood risk mapping as part of its Local Environmental Plan. A flood study undertaken by Cardno in 2013 on behalf of Pittwater Council was instead used to interpret the flood potential across the study areas. The modelling undertaken for the Ingleside area utilised the 1 in 20 year 'blocked' scenario which was also identified as being equivalent to the 1 in 100 year 'unblocked' scenario.

There is no area within the unconstrained areas that were mapped as having overland flow depths of greater than 0.3m as these areas corresponded to those that have already been constrained by buffer distances analysed in Section 4.3. However, there are a number of small isolated pockets within the remaining unconstrained areas that were mapped as having overland flow depths from the specified flood event of between 0.15 m and 0.3 m. These areas have been calculated and categorised as now constrained. This is in accordance with the recommendations in the Environment & Health Protection Guidelines for On-site Sewage Management for Single Households that on-site systems and their components should be located "above the 1 in 100 year probability flood contour".

4.6. Run-On and Seepage

Run-on of precipitation on to the land application area from up-gradient areas should be avoided. Run-on should be diverted around any land application area by using earthworks or a drainage system approved by the local council.

Upslope seepage can be at least partly controlled by installing groundwater cut-off trenches, provided the lowest level of the trench is above the level at which effluent can enter the land application area.

On-site systems should not be installed on damp sites. Poor drainage and surface dampness are often indicated by the type of vegetation growing on the site. Sedges and ferns are likely to grow in damp conditions. Seepage springs and soaks are also indications of poor site drainage. Assessment of this limitation is to be conducted a site specific level assessment.

4.7. Erosion Potential

The subject area is considered to present as a high erosion hazard due to the typical characteristics of a colluvial and erosional soil landscapes combined with high rainfall intensity which can generate high soil loss. This high erosional hazard implies that significant erosion will occur during development and after land use is established, even with intensive soil conservation measures. Such erosion hazards infers that planning will need to carefully consider the balance between the probability of long term erosion damage and maintenance or repair needed to ensure the viability of the onsite effluent management application areas and establishment of viable vegetative cover. Where practicable, design and construction of waste water systems should aim to minimise hydraulic loads to minimise the potential for soil loss by throughout the operational life of the system.

The likely soil loss rates for soil landscape observed in the study area are listed in Table 7. Erosion and sediment runoff is more likely when clay content is high and is more likely when the dispersion percentage is also high and should be managed with caution when effluent is land applied to ensure surface runoff is prevented. Soil landscape as they occur in within the study area can be viewed in Figure 4.

Table 7. Soil erosion potential.

Soil Type	Limitations
Somersby	Localised permanently high water tables, areas of laterite and stony soil, very low soil fertility, highly permeable soil and slightly reactive Soil Loss 58 t/ha for topsoil and 162 t/ha for subsoil
Oxford Falls	**Very high soil erosion hazard**, perched water tables and swamps, highly permeable soil, very low to low soil fertility, localised rock outcrop. Moderately reactive Soil Loss 91 t/ha for topsoil and 131 t/ha for subsoil
Hawkesbury	**Extreme soil erosion hazard**, mass movement (rock fall) hazard, steep slopes, rock outcrop, shallow, stony, highly permeable soil, low soil fertility. Slightly reactive Soil Loss 109 t/ha for topsoil and 394 t/ha for subsoil
Gymea	Localised steep slopes, high soil erosion hazard, rock outcrop, shallow highly permeable soil, very low soil fertility. Slightly reactive Soil Loss - 19 t/ha for topsoil and 464 t/ha for subsoil

5. SITE INVESTIGATION

5.1. Investigation Methodology

The principal objective of the field investigation was to assess the physical and chemical constraints of the soil landscapes for the purposes of onsite effluent management systems within the study area.

SMEC identified sample locations for each sub-precinct to represent each main soil landscape type as they occurred in the study area and at the sampling density required to support subdivision scale of assessment. Each sub precinct was sampled in following way:

- Wirreanda Valley – Six locations
- North Ingleside – Three locations
- Bayview – Four locations

These locations can be viewed in Figure 4.

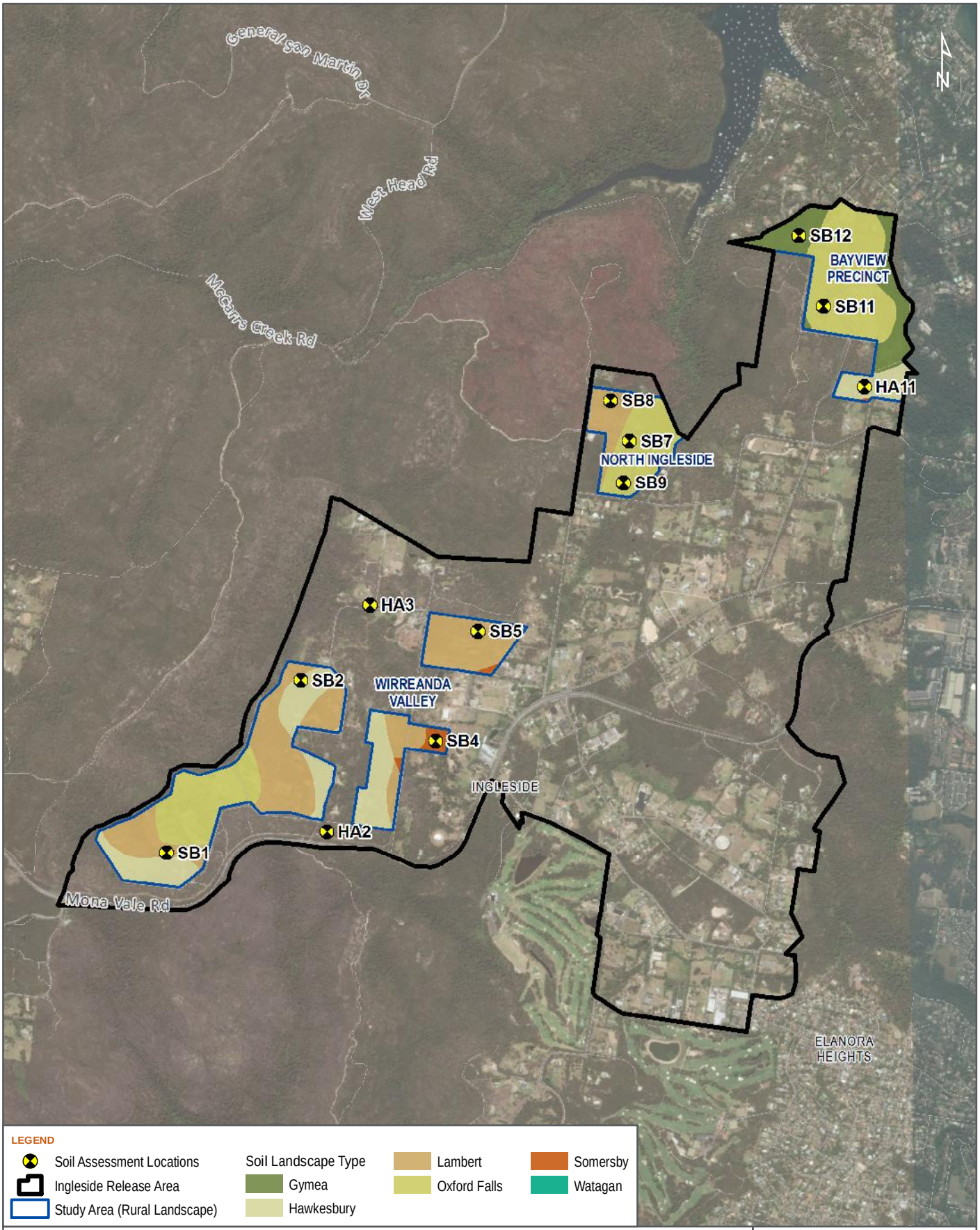
Each soil sample location was augured by a utility-mounted drill rig to 1.2 metres or the restrictive horizon (for example, the hardpan or standing watertable), whichever was the shallower. Hand auger was used in locations where vehicle access was not possible.

Samples were taken for each topsoil and subsoil soil horizon, and analysed for the following parameters:

- Bulk density (topsoil and subsoil)
- Soil pH (1:5 soil:water) - (topsoil and subsoil)
- Electrical conductivity(1:5 soil:water) (topsoil and subsoil)
- Conversion to ECe - (topsoil and subsoil)
- Cation exchange capacity and exchangeable cations, exchangeable sodium percentage - (topsoil and subsoil)
- Phosphorus sorption (topsoil)
- Modified Emerson aggregate test (SAR 5) - (topsoil and subsoil)
- Particle size analysis (hydrometer) - (topsoil)
- Saturated hydraulic conductivity – (interpretive only)

Linear shrinkage testing was not conducted in this assessment as these soils surveyed are not associated with a shrink swell constraints.

SMEC undertook the works in accordance with a site specific Job Safety and Environmental Analysis (JSEA) Plan. The aim of the plan was to manage the potential risks to human health and safety associated with fieldwork activities. All fieldwork was undertaken by suitably qualified, trained and experienced personnel.



LEGEND

- Soil Assessment Locations
- Ingleside Release Area
- Study Area (Rural Landscape)

Soil Landscape Type

- Gymea
- Hawkesbury
- Lambert
- Oxford Falls
- Somersby
- Watagan

DATE 15/06/2015

0 0.5 1 km

1:26,000

COORDINATE SYSTEM GDA 1994 MGA Zone 56

FIG NO. 4

FIGURE TITLE Soil landscapes within study area and soil sample locations **PAGE SIZE** A4

PROJECT NO. 30012289

PROJECT TITLE Ingleside Precinct

CREATED BY LR11993

SOURCES Vector backdrop data © MDS 2015; NSW Soil landscapes dataset
© 2015 DigitalGlobe © 2015 GeoEye Earthstar Geographics SIO © 2015 Microsoft Corporation

SMEC

Location: I:\projects\30012289 - Ingleside Precinct - Contamination and Salinity Investigation\008 DATA\GIS\Maps\Effluent Report Figures\4_SoilLandscapes.mxd

Last updated by: RC10721 on 15/06/2015 at 12:47

5.2. Site Observations – Soil Profile

The targeted borehole soil sampling study conducted by SMEC included an analysis of the types of soil encountered at each sampling location at varying depths. Fill material was encountered at seven of the boreholes drilled. The following table summarises the boreholes drilled and depths that fill material was encountered, if at all. Soil profile logs can be viewed in Appendix A.

Table 8. Borelog summary of fill materials encountered.

Borehole ID	Depth(s) of Fill (mbgl)
SB1	0 – 0.15
SB2	Not encountered
SB4	0 – 0.2
SB5	0.1 – 1.0
SB6	0 – 1.2
SB7	0 – 0.8
SB8	Not encountered
SB9	0 – 0.7
SB10	Not encountered
SB11	0 – 0.4
SB12	Not encountered

The Environment & Health Protection Guidelines for On-site Sewage Management for Single Households states that depths of fill material less than 0.3 metres deep may be suitable for on-site effluent management however also depends on the nature of the fill material and suitability of the underlying soil.

Boreholes SB1, SB2, SB4, SB8, SB10 and SB12 satisfy this guideline depth for fill material.

5.3. Surface Rocks

The Environment & Health Protection Guidelines for On-site Sewage Management for Single Households notes that the presence of rock outcrops usually indicates highly variable bedrock depths. This can be associated with preferential pathways (short-circuits) for effluent to flow along rock fissures and surface elsewhere.

The site inspection undertaken by SMEC observed the presence of localised rock outcrops in a range of locations within the study areas. The eastern side of Addison Road in Wirreanda Valley Precinct was observed to contain rock outcrops in areas and with steep slopes. Rock outcrops were also easily observed in the Bayview Precinct. Similarly to Wirreanda Valley, rock outcrops were commonly observed in areas of relatively steeper slopes.

The presence of rocks can limit evaporation and interfere with drainage. Rocks can also interfere with trench and pipe installations. Cobbles and larger stones can collapse into installations, causing problems with even effluent distribution.

5.4. Groundwater

Groundwater was not encountered during this survey, however it is likely that these soil landscape experience seasonably variable perched and localised water tables.

6. ANALYTICAL SOIL ASSESSMENT

6.1. Soil Chemistry Assessment

The purpose of testing the soils within the study area was to determine the potential for the application of effluent to land aiming to minimise any adverse environmental impacts. Such factors as high or excessive nitrogen levels or lack of any phosphorus retention capacity would limit effluent application. Full nutrient soil test results and how they are interpreted against the adopted guidelines area located in Table 1 Appendix B. Laboratory certificates are located in Appendix C.

The laboratory data show soils assessed exhibit strong acidity (range from 4.3 to 7.8 (pH in $CaCl_2$)) for both topsoil and subsoil), with low phosphorus retention levels (average 750kg/Ha (150mm depth) and six areas already exceeding their capacity to retain any additional phosphorus.

6.2. Soil Physical Assessment

The purpose of testing the soils within the study area was to determine the potential for the application of effluent to land and aiming to minimising any adverse environmental impacts. Such factors as depth to bedrock, presence of episodic water table, soil dispersiveness, soil permeability and bulk density will influence retention time of effluent to be improved and for stabile soil conditions to be maintained over the life of the asset. Full nutrient summary of soil physical test results are provided in Table 1 Appendix B.

All soils over time may be influenced by effluent chemistry and their susceptibility to disperse in effluent slowly increases. This effect is not only a function of the effluent, particularly SAR and EC effects. The modified Emerson Aggregate Test (mEAT) is designed to help classify the structural stability of a soil aggregate (ped) under effluent applications, and indicate the effects of physical manipulation (cultivation) on soil at an elevated moisture level. Structural stability is essential for macroporosity, the pathway of water movement through soil (drainage), while microporosity functions by capillary action, holding plant available water. Both these processes are important for effluent disposal into the soil profile.

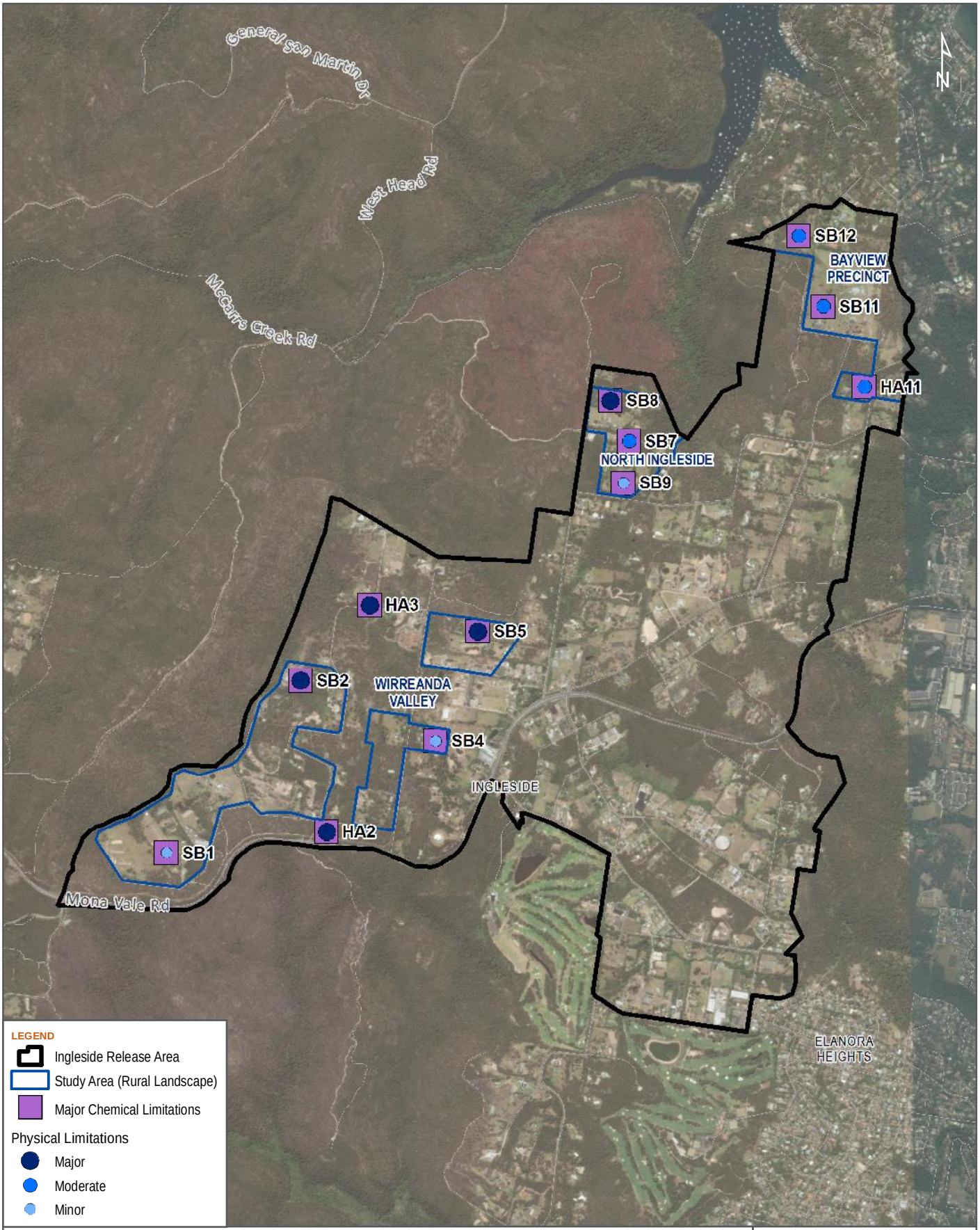
Assessment of the mEAT results is reasonable with a range of Class 4 to Class 7 demonstrate the soil are generally non dispersive (Class 4) to aggregates that swell but remain coherent (Class 8). The Sandy clay soils however have insufficient particle size range and creates soil permeability issues. These soils may require amelioration or special treatment of the soil to overcome the potential for reduced permeability.

6.3. Summary of Results

SMEC undertook a site inspection and soil sampling in March 2015. Analysis was then carried out on the soil samples for their suitability for effluent disposal. Table 9 shows the summary classification of the soil testing conducted by SESL Pty Ltd. The summary of soil testing results and land slope constraints are mapped in Figure 5 and supported by laboratory result table and interpretation of that data in accordance with the adopted criteria in Table 1 Appendix B. Laboratory Test certificates are located in Appendix C.

Table 9. Soil analysis summary table.

Sample ID	Sample Depth	Physical Limitations	Chemical Limitations
SB1	0.1	Minor	Major - Phosphorus
SB2	0.1	Major – Soil Perm	Major - Phosphorus
SB4	0.1	Minor	Major - Phosphorus
SB5	0.1	Major– Soil Perm	Major - Phosphorus
HA2	0.2	Major– Soil Perm	Major - Phosphorus
HA3	0-0.2	Major– Soil Perm	Major - Phosphorus
SB7	0.1	Minor	Major - Phosphorus
SB8	0.1	Major– Soil Perm	Major - Phosphorus
SB9	0.1	Minor	Major - Phosphorus
SB11	0.1	Moderate – Soil Perm	Major - Phosphorus
SB12	0.1	Moderate – Soil Perm	Major - Phosphorus
HA1	0.2	Moderate – Soil Perm	Major - Phosphorus



DATE 15/06/2015

0 0.5 1 km

1:26,000

COORDINATE SYSTEM GDA 1994 MGA Zone 56

FIG NO. 5

FIGURE TITLE Soil Assessment in Topsoil and effluent constraints

PAGE SIZE A4

PROJECT NO. 30012289

PROJECT TITLE Ingleside Precinct

CREATED BY LR11993

SOURCES Vector backdrop data © MDS 2015;
© 2015 DigitalGlobe © 2015 GeoEye Earthstar Geographics SIO © 2015 Microsoft Corporation

SMEC

Location: I:\projects\30012289 - Ingleside Precinct - Contamination and Salinity Investigation\008 DATA\GIS\Maps\Effluent Report Figures\5_SoilAssessment.mxd

Last updated by: RC10721 on 15/06/2015 at 12:55

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Environmental Buffers and Slope Constraints

The study area used in this assessment is approximately 132.2 hectares in size. In the event that all adopted environmental buffers are applied, then the available area for subsequent environmental constraint assessment is reduced by 69% to an approximate 41.6 hectares remaining for onsite effluent system selection assessment. The major constraint in this buffer calculation is due to the inclusion of a 250 m buffer resulting from groundwater bores that may potentially be used for domestic purposes. This groundwater bore setback reduces potential remaining suitable areas for effluent management of the sub precincts areas to less than 7% for North Ingleside, 22% for Wirreanda Valley and 61% for Bayview. It is likely that these numbers will be further reduced once site specific constraints are applied like slope, soil depths and building footprints.

In the event that groundwater bores used for domestic purposes can be demonstrated as non operational, not required as future sources of domestic water supply in proposed landuses and able to be removed from the buffer calculation, the potential study area is increased by approximately 36% to 84 hectares. Slope constraints and other adopted setbacks when applied to remaining available (84 ha) areas result in a further reduction of viable sites in accordance with the risk spectrum of minor constraints representing 32% (42 ha) of the study area, moderate constraints representing 22% (29 ha) of the study area and major limitations representing 10% (14 Ha).

Individual site assessment will be required to take into account the remaining capacity for each site to manage onsite effluent. It is likely that specific site assessment may identify specific constraints and onsite effluent system efficiencies not observed at the subdivision scale of assessment conducted in this report.

7.2. Site Observations

The site survey identified seven out of twelve locations to contain fill materials overlaying natural soil horizons. These fill layers are generally associated with localised cut and fill activities associated with the immediate landuse of the site. Fill material less than 0.3 metres deep may be suitable for on-site effluent management however also depends on the nature of the fill material and suitability of the underlying soil.

The site survey observed the presence of rock outcrops in a range of locations within the study areas. The eastern side of Addison Road in Wirreanda Valley Precinct was observed to contain rock outcrops in areas with steep slopes. Rock outcrops were also easily observed in the Bayview Precinct. Similarly to Wirreanda Valley, rock outcrops were commonly observed in areas of relatively steeper slopes.

7.3. Soil Analysis – Physical

The purpose of testing the soils within the study area was to determine the potential for the application of effluent to land and aiming to minimising any adverse environmental impacts.Soil permeability represents a moderate to major limitation across the study area.

7.4. Soil Analysis – Chemical

Based on the phosphorous loading, it appears that the likely phosphorus load normally associated with effluent water will be a major limiting factor for the study area at a subdivision scale. Therefore, the effluent disposal area must be sized accordingly at a site specific assessment scale. In site specific application nutrient loads and hydraulic loads may be managed in a way to minimise this limitation.

Existing soil nutrient loading represents a major limitation across the study area.

7.5. Soil Improvements

Soil improvements should be made within the likely irrigation areas to enhance the uptake of nutrients and ensure the ongoing absorption of effluent to vegetation on site. The main objective is to increase the pH of the soil by the addition of lime to the topsoil.

7.6. Potential Health and Environmental Impacts

The potential environmental impacts concerned with the proposed On Site Effluent Systems for this subdivision are:

- Health concerns for residents: the large land requirements associated with land application area associated with poor nutrient retention to prevent surface discharge of effluent may not be available.
- Contamination of sensitive environments (i.e. watercourse and reserve vegetation) due to poor nutrient retention properties and shallow soils.

7.7. Recommendation

In the event that groundwater is required for domestic purposes within the Ingleside Release area, an additional buffer of 250 m from any land application system must be allowed for in buffer calculations when assessing available land for managing on site effluent capabilities. Application of this buffer layer has significant impact on the amount of available assessment land within the study area. This buffer calculation reduces the land available for assessment for potential onsite effluent management to 41.6 hectares of land from an original study area of 132 hectares. Application of this buffer reduces available land most significantly in North Ingleside area where only 7% of the study area is remaining available for additional assessment if this buffer is applied.

It is likely that a number of the registered bores are no longer operational or required in the future as a domestic water source, however, even if the domestic use of groundwater buffer is removed from the environmental constraint list, this assessment has identified that 32% of the study area has a minor slope limitation and 100% of the topsoil sample locations represent a major limitation with regard to existing phosphorus loading.

Moderate limitations can be overcome by appropriate selection, design, and sizing of on-site systems, or by modifying the site. Areas where sites are limiting or unsuitable for the installation of on-site systems should be avoided.

The soil landscapes within the study area present a number of soil-related environmental constraints for on-site sewage management systems. Soil depths across the study area can be highly variable. The Hawkesbury Soil Landscape is characterised by sandstone outcrops in sloped areas. Soil depths of less than 0.6 metres to bedrock may not have enough capacity to filter nutrients and pathogens. Shallow soil often has a highly variable depth, and incurs a risk of effluent surfacing near the land application area.

The soils assessed identified that phosphorus loading is already an issue and may not have any capacity to improve the effluent prior to leaving the source site. Any decisions about the on-site management of sewage and system selection should consider these potential impacts and constraints. Ideally the evaluation proceeds from a more detailed site specific assessment.

The identified constraints currently limit the use of conventional effluent management practices unless detailed assessment is conducted at the lot scale.

Collectively, landowners within each of the study areas (Wirreanda Valley, North Ingleside and Bayview) may consider options for alternate or centralised solutions aimed towards the selection of a suitable site specific system that minimises the areas considered not suitable for conventional effluent management practices.

8. REFERENCES

Bureau of Meteorology (BOM) 2011. Average Daily Maximum Temperature Mapping. Australian Government, Canberra.

Bureau of Meteorology (BOM) (2015). Terrey Hills Daily Weather Observations. Australian Government, Canberra.

Cardno (NSW/ACT) Pty Ltd (2013). Pittwater Overland Flow Mapping and Flood Study. St Leonards.

Department of Local Government (1998). Environment & Health Protection Guidelines for On-site Sewage Management for Single Households. Bankstown.

APPENDIX A SOIL PROFILE LOGS

SMEC Testing Services Pty Ltd

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: SMEC Australia Pty Limited
Project: Ingleside Release Area
Location: 15 Wirreanda Road, Ingleside

Project No. 19580/5443C
Date : April 1, 2015
Logged: AC

BOREHOLE NO.: BH SB1

Sheet 1 of 1

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
	SB01 @ 0.1 m		SILTY CLAY: dark grey brown, some fine to medium grained sand, trace of fine gravel FILL	CL		D
	SB01 @ 0.25 m		SAND: grey/yellow brown, fine to medium grained	SP		M
		0.5				
		1.0	SILTY CLAY: red brown/grey, trace of fine to medium grained sand	CL		M
			WEATHERED SANDSTONE: grey		EXTREMELY LOW STRENGTH	D
		1.5	AUGER REFUSAL AT 1.5 M ON WEATHERED SANDSTONE			
		2.0				
		2.5				

NOTES: D - disturbed sample U - undisturbed tube sample B - bulk sample
WT - level of water table or free water N - Standard Penetration Test (SPT)

See explanation sheets for meaning of all descriptive terms and symbols

Contractor: STS
Equipment: Edson RP70
Hole Diameter (mm): 100
Angle from Vertical (°) 0

SMEC Testing Services Pty Ltd

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: SMEC Australia Pty Limited
Project: Ingleside Release Area
Location: 9 Bungendore Street, Ingleside

Project No. 19580/5443C
Date : April 1, 2015
Logged: AC

BOREHOLE NO.: BH SB2

Sheet 1 of 1

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
	SB02 @ SL		SILTY SAND: grey brown, fine to medium grained TOPSOIL	CL		M
	SB02 @ 0.3 m	0.5	CLAYEY SAND: yellow brown, fine to medium grained			M
		1.0	SANDY CLAY: light grey, fine to medium grained sand, (CW Sandstone)	CL		D-M
		1.5				
		2.0	AUGER REFUSAL AT 2.0 M ON WEATHERED SANDSTONE			
		2.5				

NOTES: D - disturbed sample U - undisturbed tube sample B - bulk sample
WT - level of water table or free water N - Standard Penetration Test (SPT)

See explanation sheets for meaning of all descriptive terms and symbols

Contractor: STS
Equipment: Edson RP70
Hole Diameter (mm): 100
Angle from Vertical (°) 0

SMEC Testing Services Pty Ltd

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: SMEC Australia Pty Limited
Project: Ingleside Release Area
Location: 30 Addison Road, Ingleside

Project No. 19580/5443C
Date : April 1, 2015
Logged: AC

BOREHOLE NO.: BH SB4

Sheet 1 of 1

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
	SB04 @ 0.1 m		SILTY CLAY: dark brown, low plasticity race of fine to medium grained sand TOPSOIL/FILL	CL		M
	SB04 @ 0.3 m	0.5	SILTY CLAY: orange brown/grey, trace of fine to medium grained sand	CL		M
		1.0	SILTY CLAY: dark grey/grey/orange brown, trace of fine to medium grained sand, plastic	CL		
		1.5	SILTY CLAY: dark grey, trace of fine to medium grained sand	CL		M-VM
		2.0				
		2.5				
			BOREHOLE DISCONTINUED AT 3.0 M			

NOTES: D - disturbed sample U - undisturbed tube sample B - bulk sample
WT - level of water table or free water N - Standard Penetration Test (SPT)

See explanation sheets for meaning of all descriptive terms and symbols

Contractor: STS
Equipment: Edson RP70
Hole Diameter (mm): 100
Angle from Vertical (°) 0

SMEC Testing Services Pty Ltd

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: SMEC Australia Pty Limited
Project: Ingleside Release Area
Location: 13 Chiltern Road, Ingleside

Project No. 19580/5443C
Date : April 1, 2015
Logged: AC

BOREHOLE NO.: BH SB5

Sheet 1 of 1

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
	SB05 @ 0.1 m		SILTY CLAY: dark brown, low plasticity TOPSOIL	CL		D-M
			CLAYEY SAND: grey/grey brown, fine to medium grained	CL		M
	SB05 @ 0.5 m	0.5	FILL			
			SANDY CLAY: dark grey/grey/brown, fine to medium grained sand	CL		M
		1.0	FILL			
			WEATHERED SANDSTONE: grey		EXTREMELY LOW STRENGTH	D
			AUGER REFUSAL AT 1.2 M ON WEATHERED SANDSTONE			
		1.5				
		2.0				
		2.5				

NOTES: D - disturbed sample U - undisturbed tube sample B - bulk sample
WT - level of water table or free water N - Standard Penetration Test (SPT)

See explanation sheets for meaning of all descriptive terms and symbols

Contractor: STS
Equipment: Edson RP70
Hole Diameter (mm): 100
Angle from Vertical (°) 0

SMEC Testing Services Pty Ltd

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: SMEC Australia Pty Limited
Project: Ingleside Release Area
Location: 4 Cicada Glen Road, Ingleside

Project No. 19580/5443C
Date : April 1, 2015
Logged: AC

BOREHOLE NO.: BH SB6

Sheet 1 of 1

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
	SB06 @ 0.1 m		SANDY CLAY: grey brown/brown/orange brown, fine to medium grained sand, pieces of metal	CL		M
		0.5				
		1.0	FILL			
	SB06 @ 1.2 m		SANDY CLAY: dark grey, fine to medium grained sand	CL		M
		1.5				
		2.0				
		2.5				
			BOREHOLE DISCONTINUED AT 3.0 M			

NOTES: D - disturbed sample U - undisturbed tube sample B - bulk sample
WT - level of water table or free water N - Standard Penetration Test (SPT)

See explanation sheets for meaning of all descriptive terms and symbols

Contractor: STS
Equipment: Edson RP70
Hole Diameter (mm): 100
Angle from Vertical (°) 0

SMEC Testing Services Pty Ltd

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: SMEC Australia Pty Limited
Project: Ingleside Release Area
Location: 20 Chiltern Road, Ingleside

Project No. 19580/5443C
Date : April 1, 2015
Logged: AC

BOREHOLE NO.: BH SB7

Sheet 1 of 1

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
	SB07 @ 0.1 m		SANDY CLAY: grey brown, fine to medium grained sand, trace of fine gravel	CL		M
		0.5	FILL			
	SB07 @ 0.9 m		GRAVELLY SAND: dark grey, fine to medium grained sand, fine gravel			D-M
		1.0	WEATHERED SANDSTONE: yellow brown/grey		EXTREMELY LOW STRENGTH	D
		1.5	AUGER REFUSAL AT 1.4 M ON WEATHERED SANDSTONE			
		2.0				
		2.5				

NOTES: D - disturbed sample U - undisturbed tube sample B - bulk sample
WT - level of water table or free water N - Standard Penetration Test (SPT)

See explanation sheets for meaning of all descriptive terms and symbols

Contractor: STS
Equipment: Edson RP70
Hole Diameter (mm): 100
Angle from Vertical (°) 0

SMEC Testing Services Pty Ltd

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: SMEC Australia Pty Limited
Project: Ingleside Release Area
Location: 24 Chiltern Road, Ingleside

Project No. 19580/5443C
Date : April 1, 2015
Logged: AC

BOREHOLE NO.: BH SB8

Sheet 1 of 1

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
	SB08 @ 0.1 m SB08 @ 0.25 m		SILTY SAND: grey/dark grey, fine to medium grained, trace of organics	SM		D-M
			SAND: grey/light grey, fine to medium grained	SP		M
		0.5	AUGER REFUSAL AT 0.45 M ON WEATHERED SANDSTONE		EXTREMELY LOW STRENGTH	D
		1.0				
		1.5				
		2.0				
		2.5				

NOTES: D - disturbed sample U - undisturbed tube sample B - bulk sample
WT - level of water table or free water N - Standard Penetration Test (SPT)

See explanation sheets for meaning of all descriptive terms and symbols

Contractor: STS
Equipment: Edson RP70
Hole Diameter (mm): 100
Angle from Vertical (°) 0

SMEC Testing Services Pty Ltd

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: SMEC Australia Pty Limited
Project: Ingleside Release Area
Location: 6 Cicada Glen Road, Ingleside

Project No. 19580/5443C
Date : April 1, 2015
Logged: AC

BOREHOLE NO.: BH SB9

Sheet 1 of 1

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
	SB09 @ 0.1 m		SILTY SAND: grey brown/dark grey, fine to medium grained, fine gravel	CL		M
		0.5				
	SB09 @ 0.7 m		FILL			
			CLAYEY SAND: orange brown/brown, fine to medium grained sand			VM-W
		1.0				
			WEATHERED SANDSTONE: orange brown		EXTREMELY LOW STRENGTH	D
		1.5	AUGER REFUSAL AT 1.5 M ON WEATHERED SANDSTONE			
		2.0				
		2.5				

NOTES: D - disturbed sample U - undisturbed tube sample B - bulk sample
WT - level of water table or free water N - Standard Penetration Test (SPT)

See explanation sheets for meaning of all descriptive terms and symbols

Contractor: STS
Equipment: Edson RP70
Hole Diameter (mm): 100
Angle from Vertical (°) 0

SMEC Testing Services Pty Ltd

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: SMEC Australia Pty Limited
Project: Ingleside Release Area
Location: 35 Walter Road, Ingleside

Project No. 19580/5443C
Date : April 1, 2015
Logged: AC

BOREHOLE NO.: BH SB10

Sheet 1 of 1

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
	SB10 @ 0.1 m		SANDY CLAY: dark grey, fine to medium grained sand TOPSOIL	CL		M
			SAND: orange brown/grey, fine to medium grained, fine gravel	SP		M
	SB10 @ 0.5 m	0.5				
			CLAYEY SAND: red brown/grey, fine to medium grained, trace of fine gravel	CL		M
		1.0				
			WEATHERED SANDSTONE: light grey		EXTREMELY LOW STRENGTH	D
		1.5				
			AUGER REFUSAL AT 1.8 M ON WEATHERED SANDSTONE			
		2.0				
		2.5				

NOTES: D - disturbed sample U - undisturbed tube sample B - bulk sample
WT - level of water table or free water N - Standard Penetration Test (SPT)

See explanation sheets for meaning of all descriptive terms and symbols

Contractor: STS
Equipment: Edson RP70
Hole Diameter (mm): 100
Angle from Vertical (°) 0

SMEC Testing Services Pty Ltd

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: SMEC Australia Pty Limited
Project: Ingleside Release Area
Location: 33 Walter Road, Ingleside

Project No. 19580/5443C
Date : April 1, 2015
Logged: AC

BOREHOLE NO.: BH SB11

Sheet 1 of 1

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
	SB11 @ 0.1 m		SILTY SAND: grey/dark grey, fine to medium grained, some fine gravel FILL	SM		D-M
	SB11 @ 0.5 m	0.5	SANDY CLAY: orange brown, fine to medium grained sand	CL		M
		1.0				
		1.5				
			SANDY CLAY: red brown/orange brown/grey, fine to medium grained sand	CL		M
		2.0				
		2.5				
			BOREHOLE DISCONTINUED AT 3.0 M			

NOTES: D - disturbed sample U - undisturbed tube sample B - bulk sample
WT - level of water table or free water N - Standard Penetration Test (SPT)

See explanation sheets for meaning of all descriptive terms and symbols

Contractor: STS
Equipment: Edson RP70
Hole Diameter (mm): 100
Angle from Vertical (°) 0

SMEC Testing Services Pty Ltd

GEOTECHNICAL LOG - NON CORE BOREHOLE

Client: SMEC Australia Pty Limited
Project: Ingleside Release Area
Location: 5 Gilwinga Drive, Bayview

Project No. 19580/5443C
Date : April 1, 2015
Logged: AC

BOREHOLE NO.: BH SB12

Sheet 1 of 1

WATER TABLE	SAMPLES	DEPTH (m)	DESCRIPTION OF DRILLED PRODUCT (Soil type, colour, grain size, plasticity, minor components, observations)	SYMBOL	CONSISTENCY (cohesive soils) or RELATIVE DENSITY (sands and gravels)	MOISTURE
	SB12 @ 0.1 m		SILTY SAND: grey/dark grey, fine to medium grained TOPSOIL	SM		M
			CLAYEY SAND: orange brown/red brown/grey, fine to medium grained, trace of fine gravel			M
	SB12 @ 0.4 m	0.5	WEATHERED SANDSTONE: grey		EXTREMELY LOW STRENGTH	D
			AUGER REFUSAL AT 0.6 M ON WEATHERED SANDSTONE			
		1.0				
		1.5				
		2.0				
		2.5				

NOTES: D - disturbed sample U - undisturbed tube sample B - bulk sample
WT - level of water table or free water N - Standard Penetration Test (SPT)

See explanation sheets for meaning of all descriptive terms and symbols

Contractor: STS
Equipment: Edson RP70
Hole Diameter (mm): 100
Angle from Vertical (°) 0

APPENDIX B SOIL TESTING SUMMARY

Feature	Physical Properties							Chemical Properties					Physical Property
	Depth to bedrock or hardpan (m)	Depth to high episodic/seasonal watertable (m)	Soil permeability Category	Course fragments(%)	Bulk density (based on soil texture) (g/cm3)			pH $_{CaCl}$	Electrical conductivity (dS/m)	Sodicity (exchangeable sodium percentage)	Cation exchange capacity (cmol+/kg) (0-40cm)	Phosphorus sorption (kg/ha) (0-100cm for irrigation) (100cm below intended base of trench)	Modified Emerson Aggregate Test (dispersiveness)
					Sandy Loam	Loam & clay loam	Clay						
Relevant System	sub-surface irrigation	sub-surface irrigation	sub-surface irrigation	All land applications	All land applications			All land ap	All land applications	sub-surface irrigation (0-40cm)	sub-surface irrigation	All land applications	All land applications
Minor Limitation	>1.0	>1.0	2b, 3 and 4	0-20	<1.8	<1.6	<1.4	>6.0	<4	0-5	>15	>6000	Classes 3 -8
Moderate Limitation	0.5-1.0	0.5-1.0	2a, 5	20-40				4.5-6.0	4-8	5-10	5-15	2000-6000	Class 2
Major Limitation	<0.5	<0.5	1 and 6	>40	>1.8	>1.6	>1.4		>8	>10	<5	<2000	Class 1

Sample ID	Sample Depth	Texture	QAQC	Soil Landscape	Precinct											
SB1	0.1	Sandy Clay Loam		Lambert	Wirreanda Valley		1.3	>1.5	3a	Not Gravelly		1.09		5.9	1.71	1.6	12.2	-50.25	Class 5
SB1	0.2	Sandy Loam		Lambert	Wirreanda Valley		1.3	>1.5	2a	Not Gravelly	-	-	-	5.7	0.56	-	-	375.61	Class 5
SB2	0.1	Loamy Sand		Lambert	Wirreanda Valley		2	>2.0	1	Not Gravelly	1.18			4.6	0.46	1.4	1	506.4	Class 5
SB2	0.8	Clayey Sand		Lambert	Wirreanda Valley		2	>2.0	1	Not Gravelly	-	-	-	4.3	0.46	-	-	1247.13	Class 6
SB4	0.1	Sandy Clay Loam		Somersby	Wirreanda Valley		>3.0	>3.0	3a	Not Gravelly		1.17		5.9	0.855	0.3	6.9	975.9	Class 5
SB4	0.3	Light Clay		Somersby	Wirreanda Valley		>3.0	>3.0	5b	Gravelly	-	-	-	6.2	0.946	-	-	817.85	Class 4
SB5	0.1	Loamy Sand		Lambert	Wirreanda Valley		1	>1.2	1	Not Gravelly	1.14			6.1	0.92	0.3	3.8	-201.34	Class 5
SB5	0.5	Sandy Clay		Lambert	Wirreanda Valley		1	>1.2	4a	Not Gravelly	-	-	-	6.4	0.946	-	-	346.34	Class 4
HA2	0.2	Loamy Sand		Hawkesbury	Wirreanda Valley		NA	NA	1	Not Gravelly	1.16			4.6	0.46	1.7	2.3	591.41	Class 7
HA2	0.6-0.8	Sandy Clay		Hawkesbury	Wirreanda Valley		NA	NA	4a	Not Gravelly	-	-	-	4.2	0.172	-	-	1685.91	Class 6
HA3	0-0.2	Sand		Somersby	Wirreanda Valley		NA	NA	1	Not Gravelly	1.28			4.4	0.46	1.2	1.7	-235.48	Class 7
HA3	0.6-0.8	Clayey Sand		Somersby	Wirreanda Valley		NA	NA	1	Not Gravelly	-	-	-	4.3	0.46	-	-	644.01	Class 6
SB6	0.1		HOLD																
SB6	1.2		HOLD																
SB7	0.1	Sandy Clay Loam		Oxford Falls	North Ingleside (Cicada)		1.2	>1.4	3b	Gravelly		1.15		6.8	1.235	0.3	16	1683.51	Class 4
SB7	0.9	Sandy Loam		Oxford Falls	North Ingleside (Cicada)		1.2	>1.4	2a	Gravelly	-	-	-	7.8	2.52	-	-	4332.87	Class 4
SB8	0.1	Sand		Lambert	North Ingleside (Cicada)		0.45	>0.45	1	Not Gravelly	1.23			5.8	1.38	0.2	2.9	1481.81	Class 7
SB8	0.25		HOLD	Lambert	North Ingleside (Cicada)														
SB9	0.1	Sandy Clay Loam		Oxford Falls	North Ingleside (Cicada)		1.3	>1.5	3a	Not Gravelly		1.11		6.9	0.76	0.1	8	251.44	Class 4
SB9	0.6	Sandy Clay Loam		Oxford Falls	North Ingleside (Cicada)		1.3	>1.5	3a	Not Gravelly	-	-	-	6.7	0.665	-	-	250.63	Class 5
SB10	0.1		HOLD																
SB10	0.5		HOLD																
SB11	0.1	Sandy Loam		Oxford Falls	Bayview		>3.0	>3.0	2a	Gravelly	1.34			6.8	0.98	0.2	6.2	-512.45	Class 4
SB11	0.5	Sandy Clay		Oxford Falls	Bayview		>3.0	>3.0	4a	Not Gravelly	-	-	-	6.7	0.172	-	-	754.95	Class 5
SB12	0.1	Sandy Loam		Gymea	Bayview		0.5	>0.6	2a	Not Gravelly	1.23			6.1	0.42	0.5	3.2	-761.54	Class 5
SB12	0.3	Clayey Sand		Gymea	Bayview		0.5	>0.6	1	Gravelly	-	-	-	5.1	0.46	-	-	1207.86	Class 5
HA1	0.2	Sandy Loam		Hawkesbury	Bayview		NA	NA	2a	Not Gravelly	1.2			4.1	0.42	2.4	2.4	937.65	Class 7
HA1	0.6	Sandy Clay		Hawkesbury	Bayview		NA	NA	Na	Not Gravelly	-	-	-	4.4	0.258	-	-	979.85	Class 5

APPENDIX C LABORATORY CERTIFICATES

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 1** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name: **SMEC Australia Pty Ltd - Sydney**
Client Contact: **Daniel Saunders**
Client Job N°:
Client Order N°:
Address: **Level 6, 76 Berry St, North Sydney NSW 2060**

Project Name: **REF: 30012289**
SESL Quote N°:
Sample Name: **SB01/0.1**
Description: **Soil**
Test Type: **EFF**

TEST	RESULT	COMMENTS
pH in water 1:5	6.5	Slight Acidity
pH in $CaCl_2$ 1:5	5.9	Medium Acidity
EC mS/cm 1:5	0.18	Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium	0.36		0.2	1.6	Acceptable
Potassium	0.22		0.11	0.9	Very Low
Calcium	0.54		11	90.2	High
Magnesium	0.19		0.89	7.3	Very Low
Aluminium			<0.03	0	Acceptable
		ECEC	12.2		Moderate
		Ca/Mg	17.7		High: Calcic

Phosphate Retention Index (%): -0.50 Very Low **PRI (mgP/kg):** -25.8 **PRI (kg/ha):** -50.25 to 150 mm

PHYSICAL CHARACTERISTICS

				Comment
Texture:	Sandy Clay Loam	**Field Density (g/mL):**		1.09g/mL
Colour:	-	**Emerson Stability Class:**	H20 Class 5	
Size:	Medium (11 - 25mm)	**High SAR/Low Iconic Strength:**	Class 5	
Aggregate strength:	Pedal - Moderate	**Med SAR/High Iconic Strength:**	Class 5	
Structural unit:	Polyhedral	**Particle Size Analysis (PSA)**		
Approx. Clay Content (%):	20 - 30%	> 2mm	Gravel	
Potential infiltration rate:	Moderate	2 - 0.2 mm	Coarse Sand	
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand	
Additional comments:		0.02 - 0.002 mm	Silt	12.8% Fine Silt Content
		< 0.002 mm	Clay	21.23% Clay Content

Recommendations

Total Nitrogen: 0.15%

For the purpose of onsite effluent disposal report, this soil shows slight acidity and low salinity. The soils ability to absorb phosphorus is very low. The negative value obtained PRI generally indicates the sample is saturated with Total Phosphorus or Available Phosphorus, rendering the sample unsuitable for this test.

The Emerson Stability Class indicates soil aggregates disperse when the water content intermediates between field capacity and that of suspension. Materials disperse when severely provoked by dilution into slurry form combined with significant mechanical action. They represent a much lower erosion risk on exposed soil but will erode if raindrop impact and running water are combined. Precautions to reduce the velocity of running water (i.e. soil conservation structures, roughened surface etc) should be employed where there is a risk (i.e. long slopes). This soil poses slight to nil limitations to effluent disposal depending on topography.

Please note only particle size analysis via hydrometer was conducted and repacked density was conducted as sample was not suitable for wax block density.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 2** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**SB1/0.2**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St North Sydney NSW 2060**	Test Type:	**pHEC_S, BSP, mEAT, PRI**

TEST	RESULT	COMMENTS
pH in water 1:5	6.7	Very Slight Acidity
pH in $CaCl_2$ 1:5	5.7	Medium Acidity
EC mS/cm 1:5	0.04	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
		ECEC			
		Ca/Mg	-		

Phosphate Retention Index (%): 4.10 Very Low **PRI (mgP/kg):** 192.6 **PRI (kg/ha):** 375.61 to 150 mm

PHYSICAL CHARACTERISTICS			Comment
Texture:	Sandy Loam	**Field Density (g/mL):**	
Colour:	-	**Emerson Stability Class:**	H20 Class 5
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 5
Aggregate strength:	Pedal - Weak	**Med SAR/High Iconic Strength:**	Class 5
Structural unit:	Crumb	**Particle Size Analysis (PSA)**	
Approx. Clay Content (%):	10 - 20%	> 2mm	Gravel
Potential infiltration rate:	Rapid	2 - 0.2 mm	Coarse Sand
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand
Additional comments:		0.02 - 0.002 mm	Silt
		< 0.002 mm	Clay

Recommendations

For the purpose of onsite effluent disposal report, this soil shows very slight acidity and very low salinity. The soils ability to absorb phosphorus is very low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates disperse when the water content intermediates between field capacity and that of suspension. Materials disperse when severely provoked by dilution into slurry form combined with significant mechanical action. They represent a much lower erosion risk on exposed soil but will erode if raindrop impact and running water are combined. Precautions to reduce the velocity of running water (i.e. soil conservation structures, roughened surface etc) should be employed where there is a risk (i.e. long slopes). This soil poses slight to nil limitations to effluent disposal depending on topography.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
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Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 3** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**SB2/0.1**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St** **North Sydney NSW 2060**	Test Type:	**EFF**

TEST	RESULT	COMMENTS
pH in water 1:5	5.7	Medium Acidity
pH in $CaCl_2$ 1:5	4.6	Very Strong Acidity
EC mS/cm 1:5	0.02	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium	0.02		0.015	1.4	Acceptable
Potassium	0.03		0.013	1.3	Very Low
Calcium	0		0.55	53	Low
Magnesium	0.02		0.2	19.3	Slightly Low
Aluminium			0.26	25.1	Extreme
		ECEC	1		Very Low
		Ca/Mg	4.1		Normal

Phosphate Retention Index (%): 5.50 Very Low **PRI (mgP/kg):** 259.7 **PRI (kg/ha):** 506.4 to 150 mm

PHYSICAL CHARACTERISTICS				Comment
Texture:	Loamy Sand	**Field Density (g/mL):**		1.18g/mL
Colour:	-	**Emerson Stability Class:**	H20 Class 5	
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 5	
Aggregate strength:	Pedal - Weak	**Med SAR/High Iconic Strength:**	Class 5	
Structural unit:	Crumb	**Particle Size Analysis (PSA)**		
Approx. Clay Content (%):	5 - 10%	> 2mm	Gravel	
Potential infiltration rate:	Very Rapid	2 - 0.2 mm	Coarse Sand	
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand	
Additional comments:		0.02 - 0.002 mm	Silt	3.9% Fine Silt Content
		< 0.002 mm	Clay	4.4% Clay Content

Recommendations

Total Nitrogen: 0.04%
For the purpose of onsite effluent disposal report, this soil shows moderate acidity and very low salinity. The soils ability to absorb phosphorus is very low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.
The Emerson Stability Class indicates soil aggregates disperse when the water content intermediates between field capacity and that of suspension. Materials disperse when severely provoked by dilution into slurry form combined with significant mechanical action. They represent a much lower erosion risk on exposed soil but will erode if raindrop impact and running water are combined. Precautions to reduce the velocity of running water (i.e. soil conservation structures, roughened surface etc) should be employed where there is a risk (i.e. long slopes). This soil poses slight to nil limitations to effluent disposal depending on topography
The low pH and extremely available aluminium is the main limitation to effluent disposal. As such, a lime application is required:
- Incorporate 40g/sqm of lime into the soil in order to increase pH and reduce available aluminium.
Please note only particle size analysis via hydrometer was conducted and repacked density was conducted as sample was not suitable for wax block density.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
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Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 4** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**SB2/0.8**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St North Sydney NSW 2060**	Test Type:	**pHEC_S, BSP, mEAT, PRI**

TEST	RESULT	COMMENTS
pH in water 1:5	5.1	Strong Acidity
pH in $CaCl_2$ 1:5	4.3	Extreme Acidity
EC mS/cm 1:5	0.02	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
		ECEC			
		Ca/Mg	-		

Phosphate Retention Index (%): 13.50 Low **PRI (mgP/kg):** 639.6 **PRI (kg/ha):** 1247.13 to 150 mm

PHYSICAL CHARACTERISTICS **Comment**

Texture:	Clayey Sand	**Field Density (g/mL):**	
Colour:	-	**Emerson Stability Class:**	H20 Class 6
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 6
Aggregate strength:	Pedal - Weak	**Med SAR/High Iconic Strength:**	Class 6
Structural unit:	Crumb	**Particle Size Analysis (PSA)**	
Approx. Clay Content (%):	5 - 10%	> 2mm	Gravel
Potential infiltration rate:	Very Rapid	2 - 0.2 mm	Coarse Sand
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand
Additional comments:		0.02 - 0.002 mm	Silt
		< 0.002 mm	Clay

Recommendations

For the purpose of onsite effluent disposal report, this soil shows strong acidity and very low salinity. The soils ability to absorb phosphorus is low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates, in suspension, flocculate completely after standing for five minutes. Aggregates in this class are mechanically weak (slaking) but chemical conditions are such that colloids will not disperse even if severely provoked. A minimum of precaution in ploughed fields to prevent long runoff slopes is required. This soil poses slight to nil limitations to effluent disposal depending of topography.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 5** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**SB4/0.1**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St** **North Sydney NSW 2060**	Test Type:	**EFF**

TEST	RESULT	COMMENTS
pH in water 1:5	6.4	Slight Acidity
pH in $CaCl_2$ 1:5	5.9	Medium Acidity
EC mS/cm 1:5	0.09	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium	0.08		0.018	0.3	Acceptable
Potassium	0.23		0	0	Very Low
Calcium	0.56		6.4	93.5	Extreme
Magnesium	0.25		0.43	6.3	Very Low
Aluminium			<0.03	0.1	Acceptable
		ECEC	6.9		Low
		Ca/Mg	16.8		High : Calcic

Phosphate Retention Index (%): 10.80 Very Low **PRI (mgP/kg):** 500.5 **PRI (kg/ha):** 975.9 to 150 mm

PHYSICAL CHARACTERISTICS				Comment
Texture:	Sandy Clay Loam	**Field Density (g/mL):**		1.17g/mL
Colour:	-	**Emerson Stability Class:**	H20 Class 5	
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 5	
Aggregate strength:	Pedal - Moderate	**Med SAR/High Iconic Strength:**	Class 5	
Structural unit:	Crumb	**Particle Size Analysis (PSA)**		
Approx. Clay Content (%):	20 - 30%	> 2mm	Gravel	
Potential infiltration rate:	Moderate	2 - 0.2 mm	Coarse Sand	
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand	
Additional comments:		0.02 - 0.002 mm	Silt	8.8 Fine Silt Content
		< 0.002 mm	Clay	12.81% Clay Content

Recommendations

Total Nitrogen: 0.12%

For the purpose of onsite effluent disposal report, this soil shows slight acidity and very low salinity. The soils ability to absorb phosphorus is very low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates disperse when the water content intermediates between field capacity and that of suspension. Materials disperse when severely provoked by dilution into slurry form combined with significant mechanical action. They represent a much lower erosion risk on exposed soil but will erode if raindrop impact and running water are combined. Precautions to reduce the velocity of running water (i.e. soil conservation structures, roughened surface etc) should be employed where there is a risk (i.e. long slopes). This soil poses slight to nil limitations to effluent disposal depending on topography

Please note only particle size analysis via hydrometer was conducted and repacked density was conducted as sample was not suitable for wax block density.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 6** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**SB4/0.3**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St North Sydney NSW 2060**	Test Type:	**pHEC_S, BSP, mEAT, PRI**

TEST	RESULT	COMMENTS
pH in water 1:5	6.7	Very Slight Acidity
pH in $CaCl_2$ 1:5	6.2	Slight Acidity
EC mS/cm 1:5	0.11	Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
		ECEC			
		Ca/Mg	-		

Phosphate Retention Index (%): 9.00 Very Low **PRI (mgP/kg):** 419.4 **PRI (kg/ha):** 817.85 to 150 mm

PHYSICAL CHARACTERISTICS			Comment
Texture:	Light Clay	**Field Density (g/mL):**	
Colour:	-	**Emerson Stability Class:**	H20 Class 4
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 4
Aggregate strength:	Pedal - Moderate	**Med SAR/High Iconic Strength:**	Class 4
Structural unit:	Polyhedral	**Particle Size Analysis (PSA)**	
Approx. Clay Content (%):	35 - 40%	> 2mm	Gravel
Potential infiltration rate:	Slow	2 - 0.2 mm	Coarse Sand
Gravel Content:	Soil is Gravelly	0.2 - 0.02 mm	Fine Sand
Additional comments:	+ve Fizz Test - CaCO3 present	0.02 - 0.002 mm	Silt
		< 0.002 mm	Clay

Recommendations

For the purpose of onsite effluent disposal report, this soil shows very slight acidity and low salinity. The soils ability to absorb phosphorus is very low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates do not disperse after remoulding at field capacity. This represents a more stable class of aggregate that is kept from dispersing by the presence of gypsum of high soluble calcium content. Only likely to erode if exposed to mechanical action of rainfall or running water of sufficient velocity to carry the particle size contained. This soil poses slight to nil limitations to effluent disposal depending on topography.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
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Fax: 1300 64 46 89
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Batch N°: 34277A **Sample N°: 7** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name: **SMEC Australia Pty Ltd - Sydney**
Client Contact: **Daniel Saunders**
Client Job N°:
Client Order N°:
Address: **Level 6, 76 Berry St, North Sydney NSW 2060**

Project Name: **REF: 30012289**
SESL Quote N°:
Sample Name: **SB5/0.1**
Description: **Soil**
Test Type: **EFF**

TEST	RESULT	COMMENTS
pH in water 1:5	6.8	Very Slight Acidity
pH in $CaCl_2$ 1:5	6.1	Slight Acidity
EC mS/cm 1:5	0.04	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium	0.03		0.011	0.3	Acceptable
Potassium	0.12		0	0	Very Low
Calcium	0		3.4	89.5	High
Magnesium	0.03		0.39	10.3	Low
Aluminium			<0.03	0.2	Acceptable
		ECEC	3.8		Very Low
		Ca/Mg	13.4		High: Calcic

Phosphate Retention Index (%): -2.10 Very Low **PRI (mgP/kg):** -103.3 **PRI (kg/ha):** -201.34 to 150 mm

PHYSICAL CHARACTERISTICS

				Comment
Texture:	Loamy Sand	**Field Density (g/mL):**		1.14g/mL
Colour:	-	**Emerson Stability Class:**	H20 Class 5	
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 5	
Aggregate strength:	Pedal - Weak	**Med SAR/High Iconic Strength:**	Class 6	
Structural unit:	Crumb	**Particle Size Analysis (PSA)**		
Approx. Clay Content (%):	5 - 10%	> 2mm	Gravel	
Potential infiltration rate:	Very Rapid	2 - 0.2 mm	Coarse Sand	
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand	
Additional comments:		0.02 - 0.002 mm	Silt	8.2% Fine Silt Content
		< 0.002 mm	Clay	8.6% Clay Content

Recommendations

Total Nitrogen:0.05%
For the purpose of onsite effluent disposal report, this soil shows very slight acidity and very low salinity. The soils ability to absorb phosphorus is very low. The negative value obtained PRI generally indicates the sample is saturated with Total Phosphorus or Available Phosphorus, rendering the sample unsuitable for this test.
The Emerson Stability Class indicates soil aggregates disperse when the water content intermediates between field capacity and that of suspension. Materials disperse when severely provoked by dilution into slurry form combined with significant mechanical action. They represent a much lower erosion risk on exposed soil but will erode if raindrop impact and running water are combined. Precautions to reduce the velocity of running water (i.e. soil conservation structures, roughened surface etc) should be employed where there is a risk (i.e. long slopes). This soil poses slight to nil limitations to effluent disposal depending on topography

Please note only particle size analysis via hydrometer was conducted and repacked density was conducted as sample was not suitable for wax block density.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
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Batch N°: 34277A **Sample N°: 8** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**SB5/0.5**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St North Sydney NSW 2060**	Test Type:	**pHEC_S, BSP, mEAT, PRI**

TEST	RESULT	COMMENTS
pH in water 1:5	7.1	Neutral
pH in $CaCl_2$ 1:5	6.4	Slight Acidity
EC mS/cm 1:5	0.11	Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
ECEC					
Ca/Mg			-		

Phosphate Retention Index (%): 3.80 Very Low **PRI (mgP/kg):** 177.6 **PRI (kg/ha):** 346.34 to 150 mm

PHYSICAL CHARACTERISTICS **Comment**

Texture:	Sandy Clay	**Field Density (g/mL):**	
Colour:	-	**Emerson Stability Class:**	H20 Class 4
Size:	Medium (11 - 25mm)	**High SAR/Low Iconic Strength:**	Class 4
Aggregate strength:	Pedal - Moderate	**Med SAR/High Iconic Strength:**	Class 4
Structural unit:	Polyhedral	**Particle Size Analysis (PSA)**	
Approx. Clay Content (%):	35 - 45%	> 2mm	Gravel
Potential infiltration rate:	Slow	2 - 0.2 mm	Coarse Sand
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand
Additional comments:	+ve Fizz Test - CaCO3 present	0.02 - 0.002 mm	Silt
		< 0.002 mm	Clay

Recommendations

For the purpose of onsite effluent disposal report, this soil shows neutral pH and low salinity. The soils ability to absorb phosphorus is very low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates do not disperse after remoulding at field capacity. This represents a more stable class of aggregate that is kept from dispersing by the presence of gypsum of high soluble calcium content. Only likely to erode if exposed to mechanical action of rainfall or running water of sufficient velocity to carry the particle size contained. This soil poses slight to nil limitations to effluent disposal depending on topography.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
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Batch N°: 34277A **Sample N°: 9** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**HA2/0.2**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St** **North Sydney NSW 2060**	Test Type:	**EFF**

TEST	RESULT	COMMENTS
pH in water 1:5	5.9	Medium Acidity
pH in $CaCl_2$ 1:5	4.6	Very Strong Acidity
EC mS/cm 1:5	0.02	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium	0.06		0.038	1.7	Acceptable
Potassium	0.06		0.041	1.8	Very Low
Calcium	0		1.1	48.3	Very Low
Magnesium	0.04		0.77	33.8	High
Aluminium			0.33	14.5	Extreme
		ECEC	2.3		Very Low
		Ca/Mg	2.2		Low:Magnesic

Phosphate Retention Index (%): 6.50 Very Low **PRI (mgP/kg):** 303.3 **PRI (kg/ha):** 591.41 to 150 mm

PHYSICAL CHARACTERISTICS				Comment
Texture:	Loamy Sand	**Field Density (g/mL):**		1.16g/mL
Colour:	-	**Emerson Stability Class:**	H20 Class 7	
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 7	
Aggregate strength:	Pedal - Weak	**Med SAR/High Iconic Strength:**	Class 7	
Structural unit:	Crumb	**Particle Size Analysis (PSA)**		
Approx. Clay Content (%):	5 - 10%	> 2mm	Gravel	
Potential infiltration rate:	Very Rapid	2 - 0.2 mm	Coarse Sand	
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand	
Additional comments:		0.02 - 0.002 mm	Silt	4.9% Fine Silt Content
		< 0.002 mm	Clay	7.42% Clay Content

Recommendations

Total Nitrogen: 0.06%
For the purpose of onsite effluent disposal report, this soil shows medium acidity and very low salinity. The soils ability to absorb phosphorus is very low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.
The Emerson Stability Class indicates soil aggregates swell but remain coherent. The most stable class of aggregates most suitable to cropping and cultivation.
Very few erosion problems but swelling aggregates can be mechanically weak and should not be trafficked or ploughed when at or above field capacity.
The unbalanced soil chemistry is the main limitation to effluent disposal. The low pH and extremely available aluminium is likely to significantly restrict plant growth.
As such, the following corrective actions are recommended:
- Incorporate 50g/sqm of lime into the soil in order to increase pH and reduce available aluminium
- Incorporate 10g/sqm of gypsum into the soil in order to increase calcium level and improve cation balance
Please note only particle size analysis via hydrometer was conducted and repacked density was conducted as sample was not suitable for wax block density.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
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Batch N°: 34277A **Sample N°: 10** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name: **SMEC Australia Pty Ltd - Sydney**
Client Contact: **Daniel Saunders**
Client Job N°:
Client Order N°:
Address: **Level 6, 76 Berry St, North Sydney NSW 2060**

Project Name: **REF: 30012289**
SESL Quote N°:
Sample Name: **HA2/0.6-0.8**
Description: **Soil**
Test Type: **pHEC_S, BSP, mEAT, PRI**

TEST	RESULT	COMMENTS
pH in water 1:5	5.4	Strong Acidity
pH in $CaCl_2$ 1:5	4.2	Extreme Acidity
EC mS/cm 1:5	0.02	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
		ECEC			
		Ca/Mg	-		

Phosphate Retention Index (%): 18.30 Low **PRI (mgP/kg):** 864.6 **PRI (kg/ha):** 1685.91 to 150 mm

PHYSICAL CHARACTERISTICS **Comment**

Texture: Sandy Clay
Colour: -
Size: Fine (1 - 10mm)
Aggregate strength: Pedal - Strong
Structural unit: Crumb
Approx. Clay Content (%): 35 - 45%
Potential infiltration rate: Slow
Gravel Content: Soil is Not gravelly
Additional comments:

Field Density (g/mL):
Emerson Stability Class: H20 Class 6
High SAR/Low Iconic Strength: Class 6
Med SAR/High Iconic Strength: Class 6

Particle Size Analysis (PSA)

> 2mm	Gravel
2 - 0.2 mm	Coarse Sand
0.2 - 0.02 mm	Fine Sand
0.02 - 0.002 mm	Silt
< 0.002 mm	Clay

Recommendations

For the purpose of onsite effluent disposal report, this soil shows strong acidity and very low salinity. The soils ability to absorb phosphorus is low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates, in suspension, flocculate completely after standing for five minutes. Aggregates in this class are mechanically weak (slaking) but chemical conditions are such that colloids will not disperse even if severely provoked. A minimum of precaution in ploughed fields to prevent long runoff slopes is required. This soil poses slight to nil limitations to effluent disposal depending of topography.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
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Batch N°: 34277A **Sample N°: 11** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**HA3/0-0.2**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St** **North Sydney NSW 2060**	Test Type:	**EFF**

TEST	RESULT	COMMENTS
pH in water 1:5	5.4	Strong Acidity
pH in $CaCl_2$ 1:5	4.4	Extreme Acidity
EC mS/cm 1:5	0.02	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium	0.04		0.02	1.2	Acceptable
Potassium	0.03		0.056	3.4	Low
Calcium	0		0.87	52.2	Low
Magnesium	0.03		0.69	41.4	Extreme
Aluminium			<0.03	1	Acceptable
		ECEC	1.7		Very Low
		Ca/Mg	2		Low: Magnesic

Phosphate Retention Index (%): -2.50 Very Low **PRI (mgP/kg):** -120.8 **PRI (kg/ha):** -235.48 to 150 mm

PHYSICAL CHARACTERISTICS				Comment
Texture:	Sand	**Field Density (g/mL):**		1.28g/mL
Colour:	-	**Emerson Stability Class:**	H20 Class 7	
Size:	--	**High SAR/Low Iconic Strength:**	Class 7	
Aggregate strength:	Apedal - Single Grained	**Med SAR/High Iconic Strength:**	Class 7	
Structural unit:	--	**Particle Size Analysis (PSA)**		
Approx. Clay Content (%):	< 5%	> 2mm	Gravel	
Potential infiltration rate:	Very Rapid	2 - 0.2 mm	Coarse Sand	
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand	
Additional comments:		0.02 - 0.002 mm	Silt	1.5% Fine Silt Content
		< 0.002 mm	Clay	4.16% Clay Content

Recommendations

Total Nitrogen: 0.04%
For the purpose of onsite effluent disposal report, this soil shows strong acidity and very low salinity. The soils ability to absorb phosphorus is very low. The negative value obtained PRI generally indicates the sample is saturated with Total Phosphorus or Available Phosphorus, rendering the sample unsuitable for this test.
The Emerson Stability Class indicates soil aggregates swell but remain coherent. The most stable class of aggregates most suitable to cropping and cultivation. Very few erosion problems but swelling aggregates can be mechanically weak and should not be trafficked or ploughed when at or above field capacity.
The unbalanced soil chemistry is the main limitation to effluent disposal. The low pH and extremely available aluminium is likely to significantly restrict plant growth. As such, the following corrective actions are recommended:
- Incorporate 10g/sqm of lime into the soil in order to increase pH.
- Incorporate 50g/sqm of gypsum into the soil in order to increase calcium level and improve cation balance.
Please note only particle size analysis via hydrometer was conducted and repacked density was conducted as sample was not suitable for wax block density.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
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Batch N°: 34277A **Sample N°: 12** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**HA3/0.6-0.8**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St North Sydney NSW 2060**	Test Type:	**pHEC_S, BSP, mEAT, PRI**

TEST	RESULT	COMMENTS
pH in water 1:5	5.0	Very Strong Acidity
pH in $CaCl_2$ 1:5	4.3	Extreme Acidity
EC mS/cm 1:5	0.02	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
		ECEC			
		Ca/Mg	-		

Phosphate Retention Index (%): 6.70 Very Low **PRI (mgP/kg):** 330.3 **PRI (kg/ha):** 644.01 to 150 mm

PHYSICAL CHARACTERISTICS **Comment**

Texture:	Clayey Sand	**Field Density (g/mL):**	
Colour:	-	**Emerson Stability Class:**	H20 Class 6
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 6
Aggregate strength:	Pedal - Weak	**Med SAR/High Iconic Strength:**	Class 6
Structural unit:	Crumb	**Particle Size Analysis (PSA)**	
Approx. Clay Content (%):	5 - 10%	> 2mm	Gravel
Potential infiltration rate:	Very Rapid	2 - 0.2 mm	Coarse Sand
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand
Additional comments:		0.02 - 0.002 mm	Silt
		< 0.002 mm	Clay

Recommendations

For the purpose of onsite effluent disposal report, this soil shows very strong acidity and very low salinity. The soils ability to absorb phosphorus is very low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates, in suspension, flocculate completely after standing for five minutes. Aggregates in this class are mechanically weak (slaking) but chemical conditions are such that colloids will not disperse even if severely provoked. A minimum of precaution in ploughed fields to prevent long runoff slopes is required. This soil poses slight to nil limitations to effluent disposal depending of topography.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 13** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name: **SMEC Australia Pty Ltd - Sydney**
Client Contact: **Daniel Saunders**
Client Job N°:
Client Order N°:
Address: **Level 6, 76 Berry St, North Sydney NSW 2060**

Project Name: **REF: 30012289**
SESL Quote N°:
Sample Name: **SB6/0.1**
Description: **Soil**
Test Type: **HOLD**

TEST	RESULT	COMMENTS
pH in water 1:5		
pH in $CaCl_2$ 1:5		
EC mS/cm 1:5	-	

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
		ECEC			
		Ca/Mg	-		

Phosphate Retention Index (%): **PRI (mgP/kg):** **PRI (kg/ha):** -

PHYSICAL CHARACTERISTICS **Comment**

Texture: -
Colour: -
Size: -
Aggregate strength: -
Structural unit: Did not test
Approx. Clay Content (%): Did not test
Potential infiltration rate: Did Not Test
Gravel Content: Soil is
Additional comments:

Field Density (g/mL):
Emerson Stability Class: H20
High SAR/Low Iconic Strength:
Med SAR/High Iconic Strength:

Particle Size Analysis (PSA)

> 2mm	Gravel
2 - 0.2 mm	Coarse Sand
0.2 - 0.02 mm	Fine Sand
0.02 - 0.002 mm	Silt
< 0.002 mm	Clay

Recommendations

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 14** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name: **SMEC Australia Pty Ltd - Sydney**
Client Contact: **Daniel Saunders**
Client Job N°:
Client Order N°:
Address: **Level 6, 76 Berry St, North Sydney NSW 2060**

Project Name: **REF: 30012289**
SESL Quote N°:
Sample Name: **SB6/1.2**
Description: **Soil**
Test Type: **HOLD**

TEST	RESULT	COMMENTS
pH in water 1:5		
pH in $CaCl_2$ 1:5		
EC mS/cm 1:5	-	

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
		ECEC			
		Ca/Mg	-		

Phosphate Retention Index (%): **PRI (mgP/kg):** **PRI (kg/ha):** -

PHYSICAL CHARACTERISTICS **Comment**

Texture: -
Colour: -
Size: -
Aggregate strength: -
Structural unit: Did not test
Approx. Clay Content (%): Did not test
Potential infiltration rate: Did Not Test
Gravel Content: Soil is
Additional comments:

Field Density (g/mL):
Emerson Stability Class: H20
High SAR/Low Iconic Strength:
Med SAR/High Iconic Strength:

Particle Size Analysis (PSA)

> 2mm	Gravel
2 - 0.2 mm	Coarse Sand
0.2 - 0.02 mm	Fine Sand
0.02 - 0.002 mm	Silt
< 0.002 mm	Clay

Recommendations

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

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Batch N°: 34277A **Sample N°: 15** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name: **SMEC Australia Pty Ltd - Sydney**
Client Contact: **Daniel Saunders**
Client Job N°:
Client Order N°:
Address: **Level 6, 76 Berry St, North Sydney NSW 2060**

Project Name: **REF: 30012289**
SESL Quote N°:
Sample Name: **SB7/0.1**
Description: **Soil**
Test Type: **EFF**

TEST	RESULT	COMMENTS
pH in water 1:5	7.8	Slight Alkalinity
pH in $CaCl_2$ 1:5	6.8	Neutral
EC mS/cm 1:5	0.13	Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium	0.05		0.046	0.3	Acceptable
Potassium	0.1		0.18	1.1	Very Low
Calcium	0.66		14.3	89.8	High
Magnesium	0.2		1.4	8.8	Very Low
Aluminium			<0.03	0	Acceptable
		ECEC	16		Moderate
		Ca/Mg	15.5		High:Calcic

Phosphate Retention Index (%): 17.70 Low **PRI (mgP/kg):** 863.3 **PRI (kg/ha):** 1683.51 to 150 mm

PHYSICAL CHARACTERISTICS				Comment
Texture:	Sandy Clay Loam	**Field Density (g/mL):**		1.15g/mL
Colour:	-	**Emerson Stability Class:**	H20 Class 4	
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 4	
Aggregate strength:	Pedal - Weak	**Med SAR/High Iconic Strength:**	Class 4	
Structural unit:	Polyhedral	**Particle Size Analysis (PSA)**		
Approx. Clay Content (%):	20 - 30%	> 2mm	Gravel	
Potential infiltration rate:	Moderate	2 - 0.2 mm	Coarse Sand	
Gravel Content:	Soil is Gravelly	0.2 - 0.02 mm	Fine Sand	
Additional comments:	+ve Fizz Test - CaCO3 present	0.02 - 0.002 mm	Silt	10.1% Fine Silt Content
		< 0.002 mm	Clay	14.63% Clay Content

Recommendations

Total Nitrogen: 0.08%
For the purpose of onsite effluent disposal report, this soil shows slight alkalinity and low salinity. The soils ability to absorb phosphorus is low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates do not disperse after remoulding at field capacity. This represents a more stable class of aggregate that is kept from dispersing by the presence of gypsum of high soluble calcium content. Only likely to erode if exposed to mechanical action of rainfall or running water of sufficient velocity to carry the particle size contained. This soil poses slight to nil limitations to effluent disposal depending on topography.

Please note only particle size analysis via hydrometer was conducted and repacked density was conducted as sample was not suitable for wax block density.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
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Web: www.sesl.com.au

Batch N°: 34277A | **Sample N°: 16** | **Date Received: 13/4/15** | **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**SB7/0.9**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St North Sydney NSW 2060**	Test Type:	**pHEC_S, BSP, mEAT, PRI**

TEST	RESULT	COMMENTS
pH in water 1:5	8.5	Moderate Alkalinity
pH in $CaCl_2$ 1:5	7.8	Slight Alkalinity
EC mS/cm 1:5	0.18	Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
		ECEC			
		Ca/Mg	-		

Phosphate Retention Index (%): 45.50 Medium **PRI (mgP/kg):** 2222.0 **PRI (kg/ha):** 4332.87 to 150 mm

PHYSICAL CHARACTERISTICS			Comment
Texture:	Sandy Loam	**Field Density (g/mL):**	
Colour:	-	**Emerson Stability Class:**	H20 Class 4
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 4
Aggregate strength:	Pedal - Weak	**Med SAR/High Iconic Strength:**	Class 4
Structural unit:	Crumb	**Particle Size Analysis (PSA)**	
Approx. Clay Content (%):	10 - 20%	> 2mm	Gravel
Potential infiltration rate:	Rapid	2 - 0.2 mm	Coarse Sand
Gravel Content:	Soil is Gravelly	0.2 - 0.02 mm	Fine Sand
Additional comments:	+ve Fizz Test - CaCO3 present	0.02 - 0.002 mm	Silt
		< 0.002 mm	Clay

Recommendations

For the purpose of onsite effluent disposal report, this soil shows moderate alkalinity and low salinity. The soils ability to absorb phosphorus is moderate but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates do not disperse after remoulding at field capacity. This represents a more stable class of aggregate that is kept from dispersing by the presence of gypsum of high soluble calcium content. Only likely to erode if exposed to mechanical action of rainfall or running water of sufficient velocity to carry the particle size contained. This soil poses slight to nil limitations to effluent disposal depending on topography.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
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Batch N°: 34277A **Sample N°: 17** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**SB8/0.1**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St** **North Sydney NSW 2060**	Test Type:	**EFF**

TEST	RESULT	COMMENTS
pH in water 1:5	6.7	Very Slight Acidity
pH in $CaCl_2$ 1:5	5.8	Medium Acidity
EC mS/cm 1:5	0.06	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium	0.07		0.007	0.2	Acceptable
Potassium	0.04		0.04	1.4	Very Low
Calcium	0.07		2.2	76.2	Elevated
Magnesium	0.06		0.64	22.2	Acceptable
Aluminium			<0.03	0.7	Acceptable
		ECEC	2.9		Very Low
		Ca/Mg	5.4		Normal

Phosphate Retention Index (%): 15.30 Low **PRI (mgP/kg):** 759.9 **PRI (kg/ha):** 1481.81 to 150 mm

PHYSICAL CHARACTERISTICS				Comment
Texture:	Sand	**Field Density (g/mL):**		1.23g/mL
Colour:	-	**Emerson Stability Class:**	H20 Class 7	
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 7	
Aggregate strength:	Pedal - Weak	**Med SAR/High Iconic Strength:**	Class 7	
Structural unit:	Crumb	**Particle Size Analysis (PSA)**		
Approx. Clay Content (%):	< 5%	> 2mm	Gravel	
Potential infiltration rate:	Very Rapid	2 - 0.2 mm	Coarse Sand	
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand	
Additional comments:		0.02 - 0.002 mm	Silt	0% Fine Silt Content
		< 0.002 mm	Clay	1.52% Clay Content

Recommendations

Total Nitrogen: 0.11%

For the purpose of onsite effluent disposal report, this soil shows very slight acidity and very low salinity. The soils ability to absorb phosphorus is low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates swell but remain coherent. The most stable class of aggregates most suitable to cropping and cultivation. Very few erosion problems but swelling aggregates can be mechanically weak and should not be trafficked or ploughed when at or above field capacity.

Please note only particle size analysis via hydrometer was conducted and repacked density was conducted as sample was not suitable for wax block density.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
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Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 18** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**SB8/0.25**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St** **North Sydney NSW 2060**	Test Type:	**HOLD**

TEST	RESULT	COMMENTS
pH in water 1:5		
pH in $CaCl_2$ 1:5		
EC mS/cm 1:5	-	

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
		ECEC			
		Ca/Mg	-		

Phosphate Retention Index (%): **PRI (mgP/kg):** **PRI (kg/ha):** -

PHYSICAL CHARACTERISTICS			Comment
Texture:	-	**Field Density (g/mL):**	
Colour:	-	**Emerson Stability Class:**	H20
Size:	-	**High SAR/Low Iconic Strength:**	
Aggregate strength:	-	**Med SAR/High Iconic Strength:**	
Structural unit:	Did not test	**Particle Size Analysis (PSA)**	
Approx. Clay Content (%):	Did not test	> 2mm	Gravel
Potential infiltration rate:	Did Not Test	2 - 0.2 mm	Coarse Sand
Gravel Content:	Soil is	0.2 - 0.02 mm	Fine Sand
Additional comments:		0.02 - 0.002 mm	Silt
		< 0.002 mm	Clay

Recommendations

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
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Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 19** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name: **SMEC Australia Pty Ltd - Sydney**
Client Contact: **Daniel Saunders**
Client Job N°:
Client Order N°:
Address: **Level 6, 76 Berry St, North Sydney NSW 2060**

Project Name: **REF: 30012289**
SESL Quote N°:
Sample Name: **SB9/0.1**
Description: **Soil**
Test Type: **EFF**

TEST	RESULT	COMMENTS
pH in water 1:5	7.6	Slight Alkalinity
pH in $CaCl_2$ 1:5	6.6	Very Slight Acidity
EC mS/cm 1:5	0.08	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium	0.03		0.011	0.1	Acceptable
Potassium	0.22		0	0	Very Low
Calcium	0.48		7.4	93.2	Extreme
Magnesium	0.15		0.53	6.7	Very Low
Aluminium			<0.03	0	Acceptable
		ECEC	8		Low
		Ca/Mg	19		High: Calcic

Phosphate Retention Index (%): 2.70 Very Low **PRI (mgP/kg):** 128.9 **PRI (kg/ha):** 251.44 to 150 mm

PHYSICAL CHARACTERISTICS

				Comment
Texture:	Sandy Clay Loam	**Field Density (g/mL):**		1.11g/mL
Colour:	-	**Emerson Stability Class:**	H20 Class 4	
Size:	Medium (11 - 25mm)	**High SAR/Low Iconic Strength:**	Class 4	
Aggregate strength:	Pedal - Moderate	**Med SAR/High Iconic Strength:**	Class 4	
Structural unit:	Polyhedral	**Particle Size Analysis (PSA)**		
Approx. Clay Content (%):	20 - 30%	> 2mm	Gravel	
Potential infiltration rate:	Moderate	2 - 0.2 mm	Coarse Sand	
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand	
Additional comments:	+ve Fizz Test - CaCO3 present	0.02 - 0.002 mm	Silt	8.1% Fine Silt Content
		< 0.002 mm	Clay	13.41% Clay Content

Recommendations

Total Nitrogen: 0.1%
For the purpose of onsite effluent disposal report, this soil shows slight alkalinity and very low salinity. The soils ability to absorb phosphorus is very low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates do not disperse after remoulding at field capacity. This represents a more stable class of aggregate that is kept from dispersing by the presence of gypsum of high soluble calcium content. Only likely to erode if exposed to mechanical action of rainfall or running water of sufficient velocity to carry the particle size contained. This soil poses slight to nil limitations to effluent disposal depending on topography.

Please note only particle size analysis via hydrometer was conducted and repacked density was conducted as sample was not suitable for wax block density.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
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Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 20** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**SB9/0.6**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St North Sydney NSW 2060**	Test Type:	**pHEC_S, BSP, mEAT, PRI**

TEST	RESULT	COMMENTS
pH in water 1:5	7.7	Slight Alkalinity
pH in $CaCl_2$ 1:5	6.7	Very Slight Acidity
EC mS/cm 1:5	0.07	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
		ECEC			
		Ca/Mg	-		

Phosphate Retention Index (%): 2.70 Very Low **PRI (mgP/kg):** 128.5 **PRI (kg/ha):** 250.63 to 150 mm

PHYSICAL CHARACTERISTICS			Comment
Texture:	Sandy Clay Loam	**Field Density (g/mL):**	
Colour:	-	**Emerson Stability Class:**	H20 Class 5
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 5
Aggregate strength:	Pedal - Moderate	**Med SAR/High Iconic Strength:**	Class 6
Structural unit:	Crumb	**Particle Size Analysis (PSA)**	
Approx. Clay Content (%):	20 - 30%	> 2mm	Gravel
Potential infiltration rate:	Moderate	2 - 0.2 mm	Coarse Sand
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand
Additional comments:		0.02 - 0.002 mm	Silt
		< 0.002 mm	Clay

Recommendations

For the purpose of onsite effluent disposal report, this soil shows slight alkalinity and very low salinity. The soils ability to absorb phosphorus is very low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates disperse when the water content intermediates between field capacity and that of suspension. Materials disperse when severely provoked by dilution into slurry form combined with significant mechanical action. They represent a much lower erosion risk on exposed soil but will erode if raindrop impact and running water are combined. Precautions to reduce the velocity of running water (i.e. soil conservation structures, roughened surface etc) should be employed where there is a risk (i.e. long slopes). This soil poses slight to nil limitations to effluent disposal depending on topography.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 21** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name: **SMEC Australia Pty Ltd - Sydney**
Client Contact: **Daniel Saunders**
Client Job N°:
Client Order N°:
Address: **Level 6, 76 Berry St, North Sydney NSW 2060**

Project Name: **REF: 30012289**
SESL Quote N°:
Sample Name: **SB10/0.1**
Description: **Soil**
Test Type: **HOLD**

TEST	RESULT	COMMENTS
pH in water 1:5		
pH in $CaCl_2$ 1:5		
EC mS/cm 1:5	-	

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
		ECEC			
		Ca/Mg	-		

Phosphate Retention Index (%): **PRI (mgP/kg):** **PRI (kg/ha):** -

PHYSICAL CHARACTERISTICS **Comment**

Texture: -
Colour: -
Size: -
Aggregate strength: -
Structural unit: Did not test
Approx. Clay Content (%): Did not test
Potential infiltration rate: Did Not Test
Gravel Content: Soil is
Additional comments:

Field Density (g/mL):
Emerson Stability Class: H20
High SAR/Low Iconic Strength:
Med SAR/High Iconic Strength:

Particle Size Analysis (PSA)

> 2mm	Gravel
2 - 0.2 mm	Coarse Sand
0.2 - 0.02 mm	Fine Sand
0.02 - 0.002 mm	Silt
< 0.002 mm	Clay

Recommendations

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 22** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name: **SMEC Australia Pty Ltd - Sydney**
Client Contact: **Daniel Saunders**
Client Job N°:
Client Order N°:
Address: **Level 6, 76 Berry St, North Sydney NSW 2060**

Project Name: **REF: 30012289**
SESL Quote N°:
Sample Name: **SB10/0.5**
Description: **Soil**
Test Type: **HOLD**

TEST	RESULT	COMMENTS
pH in water 1:5		
pH in $CaCl_2$ 1:5		
EC mS/cm 1:5	-	

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
		ECEC			
		Ca/Mg	-		

Phosphate Retention Index (%): **PRI (mgP/kg):** **PRI (kg/ha):** -

PHYSICAL CHARACTERISTICS **Comment**

Texture: -
Colour: -
Size: -
Aggregate strength: -
Structural unit: Did not test
Approx. Clay Content (%): Did not test
Potential infiltration rate: Did Not Test
Gravel Content: Soil is
Additional comments:

Field Density (g/mL):
Emerson Stability Class: H20
High SAR/Low Iconic Strength:
Med SAR/High Iconic Strength:

Particle Size Analysis (PSA)

> 2mm	Gravel
2 - 0.2 mm	Coarse Sand
0.2 - 0.02 mm	Fine Sand
0.02 - 0.002 mm	Silt
< 0.002 mm	Clay

Recommendations

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
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Em: info@sesl.com.au
Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 23** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**SB11/0.1**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St** **North Sydney NSW 2060**	Test Type:	**EFF**

TEST	RESULT	COMMENTS
pH in water 1:5	7.6	Slight Alkalinity
pH in $CaCl_2$ 1:5	6.8	Neutral
EC mS/cm 1:5	0.07	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium	0.03		0.015	0.2	Acceptable
Potassium	0.1		0.089	1.4	Very Low
Calcium	0.31		5.7	92	Extreme
Magnesium	0.08		0.39	6.3	Very Low
Aluminium			<0.03	0	Acceptable
		ECEC	6.2		Low
		Ca/Mg	21.1		High:Calcic

Phosphate Retention Index (%): -5.50 Very Low **PRI (mgP/kg):** -262.8 **PRI (kg/ha):** -512.45 to 150 mm

PHYSICAL CHARACTERISTICS				Comment
Texture:	Sandy Loam	**Field Density (g/mL):**		1.34g/mL
Colour:	-	**Emerson Stability Class:**	H20 Class 4	
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 4	
Aggregate strength:	Pedal - Weak	**Med SAR/High Iconic Strength:**	Class 4	
Structural unit:	Crumb	**Particle Size Analysis (PSA)**		
Approx. Clay Content (%):	10 - 20%	> 2mm	Gravel	
Potential infiltration rate:	Rapid	2 - 0.2 mm	Coarse Sand	
Gravel Content:	Soil is Gravelly	0.2 - 0.02 mm	Fine Sand	
Additional comments:	+ve Fizz Test - CaCO3 present	0.02 - 0.002 mm	Silt	2.9% Fine Silt Content
		< 0.002 mm	Clay	4.1% Clay Content

Recommendations

Total Nitrogen: 0.05%
For the purpose of onsite effluent disposal report, this soil shows slight alkalinity and very low salinity. The soils ability to absorb phosphorus is very low. The negative value obtained for PRI generally indicates the sample is saturated with Total Phosphorus or Available Phosphorus, rendering the sample unsuitable for this test.

The Emerson Stability Class indicates soil aggregates do not disperse after remoulding at field capacity. This represents a more stable class of aggregate that is kept from dispersing by the presence of gypsum of high soluble calcium content. Only likely to erode if exposed to mechanical action of rainfall or running water of sufficient velocity to carry the particle size contained. This soil poses slight to nil limitations to effluent disposal depending on topography.

Please note only particle size analysis via hydrometer was conducted and repacked density was conducted as sample was not suitable for wax block density.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
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Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 24** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**SB11/0.5**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St North Sydney NSW 2060**	Test Type:	**pHEC_S, BSP, mEAT, PRI**

TEST	RESULT	COMMENTS
pH in water 1:5	7.6	Slight Alkalinity
pH in $CaCl_2$ 1:5	6.7	Very Slight Acidity
EC mS/cm 1:5	0.02	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
		ECEC			
		Ca/Mg	-		

Phosphate Retention Index (%): 7.90 Very Low **PRI (mgP/kg):** 387.2 **PRI (kg/ha):** 754.95 to 150 mm

PHYSICAL CHARACTERISTICS			Comment
Texture:	Sandy Clay	**Field Density (g/mL):**	
Colour:	-	**Emerson Stability Class:**	H20 Class 5
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 5
Aggregate strength:	Pedal - Moderate	**Med SAR/High Iconic Strength:**	Class 6
Structural unit:	Crumb	**Particle Size Analysis (PSA)**	
Approx. Clay Content (%):	35 - 45%	> 2mm	Gravel
Potential infiltration rate:	Slow	2 - 0.2 mm	Coarse Sand
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand
Additional comments:		0.02 - 0.002 mm	Silt
		< 0.002 mm	Clay

Recommendations

For the purpose of onsite effluent disposal report, this soil shows slight alkalinity and very low salinity. The soils ability to absorb phosphorus is very low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates disperse when the water content intermediates between field capacity and that of suspension. Materials disperse when severely provoked by dilution into slurry form combined with significant mechanical action. They represent a much lower erosion risk on exposed soil but will erode if raindrop impact and running water are combined. Precautions to reduce the velocity of running water (i.e. soil conservation structures, roughened surface etc) should be employed where there is a risk (i.e. long slopes). This soil poses slight to nil limitations to effluent disposal depending on topography.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
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Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 25** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**SB12/0.1**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St** **North Sydney NSW 2060**	Test Type:	**EFF**

TEST	RESULT	COMMENTS
pH in water 1:5	7.1	Neutral
pH in $CaCl_2$ 1:5	6.1	Slight Acidity
EC mS/cm 1:5	0.03	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium	0.02		0.017	0.5	Acceptable
Potassium	0.05		0.038	1.2	Very Low
Calcium	0.06		2.7	84	High
Magnesium	0.04		0.46	14.3	Low
Aluminium			<0.03	0.1	Acceptable
		ECEC	3.2		Very Low
		Ca/Mg	9.1		High:Calcic

Phosphate Retention Index (%): -8.00 Very Low **PRI (mgP/kg):** -390.5 **PRI (kg/ha):** -761.54 to 150 mm

PHYSICAL CHARACTERISTICS				Comment
Texture:	Sandy Loam	**Field Density (g/mL):**		1.23g/mL
Colour:	-	**Emerson Stability Class:**	H20 Class 5	
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 5	
Aggregate strength:	Pedal - Weak	**Med SAR/High Iconic Strength:**	Class 5	
Structural unit:	Crumb	**Particle Size Analysis (PSA)**		
Approx. Clay Content (%):	10 - 20%	> 2mm	Gravel	
Potential infiltration rate:	Rapid	2 - 0.2 mm	Coarse Sand	
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand	
Additional comments:		0.02 - 0.002 mm	Silt	3.8 Fine Silt Content
		< 0.002 mm	Clay	4.29% Clay Content

Recommendations

Total Nitrogen: 0.07%
For the purpose of onsite effluent disposal report, this soil shows neutral pH and very low salinity. The soils ability to absorb phosphorus is very low. The negative value obtained for PRI generally indicates the sample is saturated with Total Phosphorus or Available Phosphorus, rendering the sample unsuitable for this test.

The Emerson Stability Class indicates soil aggregates disperse when the water content intermediates between field capacity and that of suspension. Materials disperse when severely provoked by dilution into slurry form combined with significant mechanical action. They represent a much lower erosion risk on exposed soil but will erode if raindrop impact and running water are combined. Precautions to reduce the velocity of running water (i.e. soil conservation structures, roughened surface etc) should be employed where there is a risk (i.e. long slopes). This soil poses slight to nil limitations to effluent disposal depending on topography.

Please note only particle size analysis via hydrometer was conducted and repacked density was conducted as sample was not suitable for wax block density.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
Tel: 1300 30 40 80
Fax: 1300 64 46 89
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Web: www.sesl.com.au

Batch N°: 34277A **Sample N°: 26** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**SB12/0.3**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St North Sydney NSW 2060**	Test Type:	**pHEC_S, BSP, mEAT, PRI**

TEST	RESULT	COMMENTS
pH in water 1:5	6.4	Slight Acidity
pH in $CaCl_2$ 1:5	5.1	Strong Acidity
EC mS/cm 1:5	0.02	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
		ECEC			
		Ca/Mg	-		

Phosphate Retention Index (%): 12.90 Low **PRI (mgP/kg):** 619.4 **PRI (kg/ha):** 1207.86 to 150 mm

PHYSICAL CHARACTERISTICS			Comment
Texture:	Clayey Sand	**Field Density (g/mL):**	
Colour:	-	**Emerson Stability Class:**	H20 Class 5
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 5
Aggregate strength:	Pedal - Moderate	**Med SAR/High Iconic Strength:**	Class 6
Structural unit:	Crumb	**Particle Size Analysis (PSA)**	
Approx. Clay Content (%):	5 - 10%	> 2mm	Gravel
Potential infiltration rate:	Very Rapid	2 - 0.2 mm	Coarse Sand
Gravel Content:	Soil is Gravelly	0.2 - 0.02 mm	Fine Sand
Additional comments:		0.02 - 0.002 mm	Silt
		< 0.002 mm	Clay

Recommendations

For the purpose of onsite effluent disposal report, this soil shows slight acidity and very low salinity. The soils ability to absorb phosphorus is low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates disperse when the water content intermediates between field capacity and that of suspension. Materials disperse when severely provoked by dilution into slurry form combined with significant mechanical action. They represent a much lower erosion risk on exposed soil but will erode if raindrop impact and running water are combined. Precautions to reduce the velocity of running water (i.e. soil conservation structures, roughened surface etc) should be employed where there is a risk (i.e. long slopes). This soil poses slight to nil limitations to effluent disposal depending on topography.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

Sample Drop Off: 16 Chilvers Road, Thornleigh NSW 2120
Mailing Address: PO Box 357, Pennant Hills NSW 1715
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Batch N°: 34277A **Sample N°: 27** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**HA1/0.2**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St** **North Sydney NSW 2060**	Test Type:	**EFF**

TEST	RESULT	COMMENTS
pH in water 1:5	5.2	Strong Acidity
pH in $CaCl_2$ 1:5	4.1	Extreme Acidity
EC mS/cm 1:5	0.03	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium	0.06		0.058	2.4	Acceptable
Potassium	0.03		0.07	2.9	Very Low
Calcium	0		0.66	27.8	Very Low
Magnesium	0.03		0.49	20.6	Acceptable
Aluminium			1.1	44.8	Extreme
		ECEC	2.4		Very Low
		Ca/Mg	2.1		Low:Magnesic

Phosphate Retention Index (%): 9.80 Very Low **PRI (mgP/kg):** 480.8 **PRI (kg/ha):** 937.65 to 150 mm

PHYSICAL CHARACTERISTICS				Comment
Texture:	Sandy Loam	**Field Density (g/mL):**		1.2g/mL
Colour:	-	**Emerson Stability Class:**	H20 Class 7	
Size:	Fine (1 - 10mm)	**High SAR/Low Iconic Strength:**	Class 7	
Aggregate strength:	Pedal - Weak	**Med SAR/High Iconic Strength:**	Class 7	
Structural unit:	Crumb	**Particle Size Analysis (PSA)**		
Approx. Clay Content (%):	10 - 20%	> 2mm	Gravel	
Potential infiltration rate:	Rapid	2 - 0.2 mm	Coarse Sand	
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand	
Additional comments:		0.02 - 0.002 mm	Silt	5.0% Fine Silt Content
		< 0.002 mm	Clay	5.73% Clay Content

Recommendations

Total Nitrogen: 0.13%
For the purpose of onsite effluent disposal report, this soil shows strong acidity and very low salinity. The soils ability to absorb phosphorus is very low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates swell but remain coherent. The most stable class of aggregates most suitable to cropping and cultivation. Very few erosion problems but swelling aggregates can be mechanically weak and should not be trafficked or ploughed when at or above field capacity.

The low pH and extremely available aluminium are the main limitations to effluent disposal. As such, a lime application is required:
- Incorporate 160g/sqm of lime into the soil in order to increase pH and reduce available aluminium

Please note only particle size analysis via hydrometer was conducted and repacked density was conducted as sample was not suitable for wax block density.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee

Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

Effluent Subdivison Profile

SESL AUSTRALIA
Environment & Soil Sciences

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Batch N°: 34277A **Sample N°: 28** **Date Received: 13/4/15** **Report Status:** ◉ Draft ○ Final

Client Name:	**SMEC Australia Pty Ltd - Sydney**	Project Name:	**REF: 30012289**
Client Contact:	**Daniel Saunders**	SESL Quote N°:	
Client Job N°:		Sample Name:	**HA1/0.6**
Client Order N°:		Description:	**Soil**
Address:	**Level 6, 76 Berry St North Sydney NSW 2060**	Test Type:	**pHEC_S, BSP, mEAT, PRI**

TEST	RESULT	COMMENTS
pH in water 1:5	5.2	Strong Acidity
pH in $CaCl_2$ 1:5	4.4	Extreme Acidity
EC mS/cm 1:5	0.03	Very Low Salinity

CATION ANALYSIS

TEST	SOLUBLE		EXCHANGEABLE		
	meq%	Comment	meq%	% of ECEC	Comment
Sodium			-	-	
Potassium			-	-	
Calcium			-	-	
Magnesium			-	-	
Aluminium			-	-	
ECEC					
Ca/Mg			-		

Phosphate Retention Index (%): 10.60 Very Low **PRI (mgP/kg):** 502.5 **PRI (kg/ha):** 979.85 to 150 mm

PHYSICAL CHARACTERISTICS **Comment**

Texture:	Sandy Clay	**Field Density (g/mL):**	
Colour:	-	**Emerson Stability Class:**	H20 Class 5
Size:	Medium (11 - 25mm)	**High SAR/Low Iconic Strength:**	Class 5
Aggregate strength:	Pedal - Weak	**Med SAR/High Iconic Strength:**	Class 5
Structural unit:	Crumb	**Particle Size Analysis (PSA)**	
Approx. Clay Content (%):	35 - 45%	> 2mm	Gravel
Potential infiltration rate:	Slow	2 - 0.2 mm	Coarse Sand
Gravel Content:	Soil is Not gravelly	0.2 - 0.02 mm	Fine Sand
Additional comments:		0.02 - 0.002 mm	Silt
		< 0.002 mm	Clay

Recommendations

For the purpose of onsite effluent disposal report, this soil shows strong acidity and very low salinity. The soils ability to absorb phosphorus is very low but to depth of 150mm can absorb a considerable amount, increasing the longevity of the effluent disposal system.

The Emerson Stability Class indicates soil aggregates disperse when the water content intermediates between field capacity and that of suspension. Materials disperse when severely provoked by dilution into slurry form combined with significant mechanical action. They represent a much lower erosion risk on exposed soil but will erode if raindrop impact and running water are combined. Precautions to reduce the velocity of running water (i.e. soil conservation structures, roughened surface etc) should be employed where there is a risk (i.e. long slopes). This soil poses slight to nil limitations to effluent disposal depending on topography.

Method References:
pH, EC, Soluble Cations, Nitrate: Bradley et al (1983). Exchangeable Cations, ECEC: Method 15A1 Rayment & Higginson (1992)
Chloride: Vogel (1961). Aluminium: Method 3500 APHA (1992). Phosphate: 9H1 of Rayment & Lyons. Wax Block Density: Method 30-4 Black (1983), Emerson's Aggregate Test: Charman & Murphy (1991), Particle Size Analysis: Modified Black (1983) Method 43-1 to 43-6. Texture/Structure/Colour - PM0003 (Texture- "Northcote" (1992), Structure- "Murphy" (1991), Colour- "Munsell" (2000))

Consultant: Kelly Lee Authorised Signatory:

Date Report Generated
24/04/2015

PRI_depth_mm 150

APPENDIX D TEMPERATURE DATA

Sydney, New South Wales
November 2014 Daily Weather Observations

Most observations from Observatory Hill, but some from Fort Denison and Sydney Airport.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Sa	21.3	36.5		10.0	10.6				29.1	35	1	NNW	28	1003.9	32.4	31	6	NW	24	998.2
2	Su	13.7	23.5	2.4	15.0	12.9	W	56	06:28	16.8	26	1	W	28	1017.9	21.8	23	1	ESE	22	1017.9
3	Mo	13.8	21.5	0.2	7.8	6.8	ESE	37	14:51	17.0	52	3	WNW	11	1025.4	19.5	57	4	ESE	26	1023.7
4	Tu	16.1	21.8	0	6.6	8.8	ENE	46	14:38	20.4	60	7	NNE	13	1024.0	21.0	64	2	ENE	31	1019.4
5	We	17.7	23.5	0	6.0	3.8	NNE	67	16:38	20.7	67	7	ESE	15	1017.1	21.0	75	7	NE	30	1012.6
6	Th	15.5	23.2	2.0	5.6	9.5	SSW	50	04:08	20.1	64	6	SSW	24	1014.8	20.9	57	6	SE	28	1013.9
7	Fr	16.5	22.1	0	6.2	11.9	E	30	14:18	20.6	54	4	E	9	1019.4	21.8	56	5	E	22	1019.5
8	Sa	14.4	23.1	0	6.4	12.3	ENE	41	14:56	21.4	61	2	E	9	1022.4	21.9	60	0	NE	22	1018.9
9	Su	16.5	26.2	0	6.8	10.9	S	54	09:18	23.1	60	1	S	22	1018.8	25.2	53	6	SSE	24	1017.6
10	Mo	18.7	23.6	0	8.0	3.2	ESE	37	15:56	20.7	73	8	S	13	1018.2	22.2	61	6	SE	20	1016.8
11	Tu	16.6	23.2	0	4.2	5.1	ESE	35	12:25	21.3	51	6	ESE	7	1020.1	19.0	66	8	SE	20	1019.6
12	We	16.4	22.2	0	4.6	6.1	ENE	33	16:00	18.8	66	6	WNW	6	1019.7	21.6	51	1	E	20	1016.0
13	Th	18.5	23.5	0	6.8	6.6	NE	39	15:03	20.0	64	7	ENE	15	1019.2	22.1	68	7	ENE	22	1015.7
14	Fr	17.7	32.2	0	4.8	11.2	SSW	72	20:26	23.3	69	3	SSW	2	1011.8	31.7	39	7	ESE	13	1006.7
15	Sa	18.9	24.1	0	12.8	2.3	SE	39	12:45	20.1	60	8	S	7	1009.9	22.6	50	8	SSE	24	1010.0
16	Su	18.1	28.5	5.6	5.0	7.3	W	74	13:42	18.2	87	8	NW	22	1005.6	28.1	27	2	W	44	1001.5
17	Mo	15.2	25.5	0.4	7.0	12.6	E	35	16:37	21.3	38	2	W	15	1013.8	22.9	48	3	E	24	1011.8
18	Tu	18.6	26.7	0	8.0	11.7	SSE	43	14:30	22.3	60	3	W	20	1016.7	25.2	45	1	SSE	24	1016.4
19	We	18.1	24.9	0	8.0	10.1	ENE	41	17:46	21.9	65	7	ENE	11	1021.8	22.7	59	5	E	28	1018.6
20	Th	18.8	31.1	0	6.8	10.6	ENE	41	13:52	24.8	56	7	NE	6	1014.3	26.0	57	6	ENE	24	1008.7
21	Fr	22.1	33.9	0	8.4	11.0	SSE	63	20:19	31.0	36	2	SSE	7	1007.4	30.3	46	2	E	22	1004.6
22	Sa	19.1	26.3	0	10.0	9.3	SSE	37	23:13	23.6	50	4	SE	9	1015.9	23.4	60	7	E	19	1011.5
23	Su	19.6	30.1	0	6.0	10.6	SE	44	17:39	24.9	62	3	E	4	1011.5	28.9	54	3	E	22	1007.4
24	Mo	21.1	30.2	0	7.2	6.4	E	33	13:54	23.5	71	6	SSW	6	1015.0	23.6	76	6	E	28	1007.4
25	Tu	21.8	24.7	5.0	6.6	5.6	SW	52	08:57	24.0	65	7	SSW	13	1013.0	21.6	56	5	ESE	24	1016.4
26	We	19.3	23.3	0	7.4	7.3	ENE	41	16:00	21.5	58	6	ENE	17	1019.7	21.9	66	7	ENE	26	1016.6
27	Th	18.9	20.9	0.4	7.6	0.0	ESE	43	04:55	19.8	71	6	SSE	26	1022.0	20.3	61	7	SE	20	1022.4
28	Fr		23.3		3.4	11.9	ENE	37	17:18			3	E	13		22.3	46	2	E	19	1021.3
29	Sa	16.6	25.3		7.4	11.8	ENE	43	15:33	20.9	66	2	W	7	1019.7	24.3	62	4	ENE	28	1015.1
30	Su	19.1	26.8	0	8.0	8.4	NNE	44	13:56	23.8	64	2	ENE	11	1014.2	24.6	63	4	NE	26	1011.2
Statistics for November 2014																					
Mean		17.9	25.7		7.3	8.6				21.9	59	4		13	1016.3	23.7	54	4		24	1013.9
Lowest		13.7	20.9		3.4	0.0				16.8	26	1	SSW	2	1003.9	19.0	23	0	ESE	13	998.2
Highest		22.1	36.5	5.6	15.0	12.9	W	74		31.0	87	8	#	28	1025.4	32.4	76	8	W	44	1023.7
Total				16.0	218.4	256.6															

Temperature, humidity, pressure and rainfall observations are from Sydney (Observatory Hill) {station 066062}. Cloud, evaporation and sunshine observations are from Sydney Airport AMO {station 066037}. Wind observations are from Fort Denison {station 066022}

Cloud, evaporation and sunshine observations are from Sydney Airport, about 10 km to the south.

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Sydney, New South Wales
October 2014 Daily Weather Observations

Most observations from Observatory Hill, but some from Fort Denison and Sydney Airport.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	We	15.6	22.1	0	12.0	11.3	WSW	61	06:59	18.2	19	1	W	28	1017.7	19.6	28	1	SE	24	1018.5
2	Th	10.4	24.9	0	7.2	11.1	WNW	30	10:03	17.6	45	1	W	11	1022.1	21.3	45	0	NE	13	1017.2
3	Fr	12.8	21.1	0	5.8	6.3	ESE	31	16:24	19.0	63	4	W	6	1021.1	19.1	58	7	E	17	1019.6
4	Sa	16.4	21.9	0	3.0	8.5	ENE	39	13:32	19.2	73	7	NE	19	1020.2	21.5	68	1	NE	24	1015.5
5	Su	14.0	33.8	0	4.4	10.6	SSW	63	18:43	18.4	65	1	W	11	1016.0	30.8	23	1	E	17	1012.9
6	Mo	17.3	26.0	0	8.8	8.3	NE	46	17:56	19.7	67	7	WNW	9	1019.2	21.8	64	2	ENE	19	1012.4
7	Tu	19.7	27.9	0	8.0	7.7	NW	61	07:17	24.1	44	7	WSW	28	1007.8	25.2	30	1	ESE	20	1008.3
8	We	15.1	21.1	5.4	4.6	3.7	SSW	35	23:53	16.7	80	7	SSE	20	1018.7	18.8	54	2	ESE	19	1018.0
9	Th	14.4	21.2	0	4.8	8.5	ENE	37	16:26	18.6	61	1	WNW	7	1023.2	21.0	49	1	ENE	22	1020.2
10	Fr	14.0	22.8	0.2	4.8	7.9	NE	35	17:44	20.2	53	6	NNW	13	1019.5	21.9	58	6	ENE	22	1015.5
11	Sa	14.4	26.8	0	5.4	11.1	NNE	41	19:23	19.9	61	1	WNW	13	1016.8	23.6	61	1	E	19	1014.2
12	Su	17.0	24.7	0	7.8	11.2	NNE	52	19:50	20.3	66	0	W	9	1017.5	23.3	61	1	NE	26	1013.4
13	Mo	17.9	26.2	0	8.8	5.0	WNW	57	17:36	22.5	60	7	ESE	11	1007.6	21.5	69	8	ENE	13	1005.7
14	Tu	13.2	17.6	9.4	5.8	3.0	S	76	22:14	14.9	49	6	W	26	1008.5	17.1	42	7	WSW	20	1008.5
15	We	10.6	16.0	70.8		0.1	SW	78	02:12	11.6	79	8	SW	28	1011.7	15.1	52	7	SSW	26	1013.4
16	Th	9.0	23.4	0.2	4.0	11.7	ENE	30	13:35	14.3	61	2	W	11	1018.4	20.1	43	6	E	24	1015.8
17	Fr	12.2	20.8	0	4.0	8.8	SSE	50	12:40	15.2	75	7	SSE	20	1024.6	19.9	45	3	S	31	1024.9
18	Sa	12.9	20.4	0	7.6	6.2	ENE	26	15:30	15.3	66	7	W	15	1029.8	19.6	46	1	E	17	1027.4
19	Su	12.4	23.9	0	2.6	12.0	NNE	41	18:12	18.6	57	1	W	9	1027.5	23.1	49	1	NE	19	1022.6
20	Mo	15.8	20.8	0	10.6	4.0	SSE	69	05:30	19.8	59	7	S	33	1028.7	17.0	74	8	S	22	1029.8
21	Tu	15.0	18.7	0.4	2.6	0.0	ENE	31	22:30	17.4	50	8	ESE	19	1032.5	18.5	49	7	E	19	1030.7
22	We	15.0	21.3	0	5.0	9.2	NNE	46	20:58	17.8	54	7	NNW	4	1027.1	20.4	54	1	NE	28	1022.0
23	Th	14.5	28.0	0	6.0	10.7	E	28	13:10	19.7	64	3	W	6	1018.0	25.1	56	2	E	20	1015.9
24	Fr	18.6	26.4	0	5.8	7.1	NNE	48	19:26	22.0	78	6	NNW	13	1020.1	23.1	70	5	ENE	30	1014.9
25	Sa	18.5	29.9	0.2	6.0	8.4	SSE	39	13:21	21.0	81	1	WNW	19	1015.3	25.9	59	6	SSE	19	1013.6
26	Su	18.5	32.5	0	5.0	11.2	S	44	14:24	23.5	64	0	W	11	1010.2	25.8	55	5	SSE	24	1007.9
27	Mo	19.4	31.6	0	6.6	8.9	WNW	70	14:05	23.2	60	5	NNE	13	1007.8	29.6	26	7	W	41	1002.7
28	Tu	15.9	28.9	0	7.8	10.4	W	43	18:15	21.7	36	2	W	17	1012.2	28.0	18	1	W	22	1008.3
29	We	16.6	24.6	0	7.2	11.4	ENE	37	16:54	22.6	35	1	SSW	7	1017.2	21.8	63	2	E	26	1015.8
30	Th	15.5	30.8	0	5.8	12.6	E	28	13:02	21.1	61	2	W	13	1015.6	28.4	32	3	ENE	17	1011.6
31	Fr	16.3	30.2	0	9.2	11.7	NNE	41	17:00	22.4	55	1	WNW	13	1013.4	26.3	43	6	ENE	13	1008.2
Statistics for October 2014																					
	Mean	15.1	24.7		6.2	8.3				19.2	59	4		14	1018.3	22.4	49	3		21	1015.7
	Lowest	9.0	16.0		2.6	0.0				11.6	19	0	NNW	4	1007.6	15.1	18	0	#	13	1002.7
	Highest	19.7	33.8	70.8	12.0	12.6	SW	78		24.1	81	8	S	33	1032.5	30.8	74	8	W	41	1030.7
	Total			86.6	187.0	258.6															

Temperature, humidity, pressure and rainfall observations are from Sydney (Observatory Hill) {station 066062}. Cloud, evaporation and sunshine observations are from Sydney Airport AMO {station 066037}. Wind observations are from Fort Denison {station 066022}

Cloud, evaporation and sunshine observations are from Sydney Airport, about 10 km to the south.

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Sydney, New South Wales
September 2014 Daily Weather Observations

Most observations from Observatory Hill, but some from Fort Denison and Sydney Airport.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Mo	10.7	23.6	0	3.2	8.7	NE	31	16:17	14.6	77	4	WNW	13	1016.9	20.7	51	7	ENE	13	1010.9
2	Tu	14.1	18.4	0.2	5.2	1.5	W	59	21:43	15.8	59	5	W	7	1009.1	13.7	66	7	S	22	1007.9
3	We	8.9	16.7	5.0	4.2	7.7	SW	76	12:52	13.1	52	6	SW	28	1013.3	16.2	45	5	SSW	30	1012.3
4	Th	9.8	17.6	0.2	3.0	8.3	S	61	14:04	13.4	53	3	SSW	24	1015.9	14.7	52	6	SSW	31	1015.1
5	Fr	8.8	18.2	4.4	3.6	8.7	SSW	52	15:14	13.2	72	3	W	17	1021.8	16.7	57	2	S	26	1021.7
6	Sa	10.3	19.1	11.0	3.2	2.3	ESE	43	14:40	12.3	92	7	NW	7	1029.7	15.7	73	7	SE	24	1028.5
7	Su	11.2	19.0	18.4	3.6	6.9	ESE	31	16:09	12.5	90	7	W	15	1032.0	17.7	65	2	SE	17	1028.2
8	Mo	10.9	19.5	1.0	2.4	10.5	NE	35	14:09	12.2	93	1	WNW	17	1029.5	18.2	60	2	NE	24	1024.2
9	Tu	12.2	23.1	0	5.0	10.3	NNE	41	17:47	19.3	56	1	NNW	17	1019.4	20.6	56	4	NE	22	1012.8
10	We	14.0	24.4	5.0	6.8	8.3	W	59	11:30	14.8	84	7	W	9	1008.2	23.2	28	3	WSW	28	1008.9
11	Th	12.1	25.8	0.2	5.2	10.9	SSW	50	20:40	18.1	36	1	WNW	13	1016.7	23.7	32	1	E	17	1013.7
12	Fr	13.9	18.4	0.2	6.8	1.8	S	41	01:55	14.7	67	7	SSW	13	1025.7	16.9	52	4	SE	15	1024.1
13	Sa	12.9	17.6	0.8	2.4	3.8	E	28	16:13	14.4	80	7	WNW	9	1026.9	16.8	72	4	E	17	1023.5
14	Su	12.9	22.6	0.4	2.8	9.5	SSE	35	16:49	17.3	69	0	WNW	11	1020.6	20.5	66	1	E	17	1016.0
15	Mo	13.1	20.1	0	3.8	10.1	ENE	30	16:23	17.7	68	1	WNW	11	1018.6	19.2	55	5	ENE	22	1015.1
16	Tu	15.2	21.7	0	4.8	5.1				18.6	76	6	NE	28	1009.9	20.6	66	3	ENE	4	1005.5
17	We	13.3	22.2		5.2	10.7	W	61	09:49	17.7	36	6	W	35	1012.2	20.9	25	3	WSW	30	1010.1
18	Th	12.2	20.5	0	7.0	10.8	WSW	44	06:53	15.6	33	1	WSW	28	1018.6	18.4	31	3	SE	24	1017.1
19	Fr	9.2	22.2	0	5.4	9.7	ESE	31	14:55	14.7	50	7	W	19	1022.3	18.2	33	7	E	26	1018.5
20	Sa	9.1	20.3	0	4.2	11.0	S	41	11:29	15.4	50	1	WNW	13	1024.5	19.4	41	1	SSE	22	1023.7
21	Su	10.9	20.9	1.0	3.6	8.0	ESE	30	12:35	15.4	71	6	WNW	15	1030.5	18.3	49	2	ESE	15	1027.3
22	Mo	12.3	20.2	0.2	4.8	10.6	E	26	15:31	16.9	55	4	WNW	6	1032.1	18.9	51	1	E	17	1028.9
23	Tu	10.9	21.2	0	4.0	10.9	NE	37	13:30	17.2	58	0	W	11	1030.2	19.6	53	0	NE	20	1026.2
24	We	11.7	22.2	0	5.4	10.7	NNE	37	18:48	18.5	66	0	WNW	6	1022.7	20.8	66	3	NE	17	1016.6
25	Th	17.4	24.6	0	6.2	1.2	WSW	61	12:15	20.0	60	7	W	6	1011.9	20.2	65	7	SSE	17	1009.8
26	Fr	14.3	21.7	2.0	3.0	8.3	SSE	41	09:09	18.8	59	5	SSW	22	1017.9	20.1	51	5	SE	19	1015.9
27	Sa	13.0	22.8	0.2	5.0	11.1	ESE	35	13:07	18.8	53	5	SSW	15	1021.1	20.2	45	1	SE	20	1019.3
28	Su	11.6	25.4	0.2	5.4	11.2	NNE	50	18:30	20.4	54	0	NNW	19	1021.9	21.2	50	0	NE	24	1016.2
29	Mo	16.5	32.9	0	8.0	10.6	NNW	37	05:32	25.2	29	2	N	17	1014.6	32.3	17	0	WNW	15	1011.2
30	Tu	16.6	33.5	0	8.0	6.8	NW	52	15:13	23.7	42	4	SE	2	1013.7	32.7	16	5	NW	26	1007.2
Statistics for September 2014																					
	Mean	12.3	21.9		4.7	8.2				16.7	61	3		15	1020.3	19.9	49	3		20	1017.2
	Lowest	8.8	16.7		2.4	1.2				12.2	29	0	SE	2	1008.2	13.7	16	0	ENE	4	1005.5
	Highest	17.4	33.5	18.4	8.0	11.2	SW	76		25.2	93	7	W	35	1032.1	32.7	73	7	SSW	31	1028.9
	Total			50.4	141.2	246.0															

Temperature, humidity, pressure and rainfall observations are from Sydney (Observatory Hill) {station 066062}. Cloud, evaporation and sunshine observations are from Sydney Airport AMO {station 066037}. Wind observations are from Fort Denison {station 066022}

Cloud, evaporation and sunshine observations are from Sydney Airport, about 10 km to the south.

IDCJDW2124.201409 Prepared at 16:01 UTC on 7 Apr 2015

Sydney, New South Wales
April 2014 Daily Weather Observations

Most observations from Observatory Hill, but some from Fort Denison and Sydney Airport.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Tu	17.5	26.4	0	3.2	6.2	NNE	31	17:39	20.5	78	7	WNW	13	1019.7	24.6	66	7	ENE	17	1017.5
2	We	18.1	26.0	0	4.8	10.9	E	26	12:04	18.9	91	2	WNW	11	1017.9	24.7	67	1	E	20	1014.6
3	Th	18.9	26.3	0	3.0	8.8	SSW	31	22:47	21.3	82	1	WNW	13	1017.5	25.1	70	7	E	24	1015.0
4	Fr	19.9	22.3	0	6.0	0.0	S	43	00:06	20.4	82	8	SSW	11	1018.5	21.5	74	8	S	19	1016.5
5	Sa	18.0	26.0	5.6	9.2	6.4	SSW	50	16:47	20.6	80	7	WNW	13	1018.8	23.8	63	3	SSE	24	1016.9
6	Su	17.2	21.7	3.4	4.6	1.1	SSW	48	10:51	19.2	86	7	SW	9	1020.9	19.5	86	8	SW	7	1020.8
7	Mo	15.3	22.4	16.0	4.2	3.3	SSE	39	11:46	16.9	83	6	WSW	13	1025.5	21.1	63	6	SSE	9	1023.6
8	Tu	17.2	23.2	5.0	5.2	1.2	W	22	00:19	19.6	77	7	WNW	13	1023.9	22.9	53	6	E	13	1020.1
9	We	15.9	24.1	0	0.4	4.6	ENE	22	15:17	20.4	68	7	WNW	13	1021.4	23.2	58	7	E	17	1017.9
10	Th	17.8	24.7	0	2.6	0.0	W	17	07:44	20.2	74	7	W	11	1016.9	20.0	82	8	E	7	1012.7
11	Fr	18.9	28.0	5.6	1.6	3.7	NW	37	08:29	24.1	64	5	NW	22	1005.5	25.7	55	7	SW	9	1002.9
12	Sa	17.9	21.0	5.0	3.8	0.7	SSW	54	11:19	19.1	76	7	SW	26	1011.1	20.0	74	6	SSW	22	1011.9
13	Su	16.0	20.6	3.8	1.4	1.0	SSE	52	13:33	17.8	86	7	SW	20	1016.8	18.5	88	7	S	15	1016.1
14	Mo	13.5	21.0	2.8	3.6	3.3	SSW	41	10:10	17.2	64	6	W	20	1020.4	19.4	69	5	S	15	1018.8
15	Tu	13.4	21.9	4.2	3.4	3.5	SSE	50	15:37	17.3	58	7	W	22	1020.7	20.8	64	8	S	28	1018.4
16	We	14.3	23.3	29.6	3.2	9.0	SW	43	10:35	17.7	69	5	W	20	1019.8	21.9	57	3	S	22	1017.3
17	Th	13.1	23.7	0	5.2	9.0	SSE	41	13:35	17.2	65	5	W	19	1019.6	23.1	39	1	SSE	22	1017.4
18	Fr	13.5	26.5	0	2.2	10.8	WSW	35	11:03	16.7	68	2	WNW	15	1016.3	26.1	31	3	WNW	13	1011.7
19	Sa	15.0	22.7	0	3.8	10.7	SSE	41	14:36	19.2	60	1	SSW	17	1016.4	20.8	42	1	SSE	22	1014.8
20	Su	13.2	22.9	0	5.2	10.4	WSW	28	23:24	16.3	61	3	W	17	1018.4	21.9	56	1	ENE	17	1014.7
21	Mo	13.2	25.3	0	4.0	9.7	W	35	08:15	15.9	48	1	W	20	1021.1	24.4	31	3	ESE	15	1018.5
22	Tu	12.4	25.8	0	4.0	7.9	W	20	07:10	15.8	67	7	WNW	17	1018.7	24.4	32	7	W	11	1014.9
23	We	13.4	26.1	0	4.2	9.0	W	24	07:49	17.6	59	7	W	20	1017.6	24.0	36	3	ESE	13	1014.9
24	Th	14.1	29.9	0	3.8	9.1	SE	41	22:31	19.3	53	6	WNW	15	1013.7	28.9	28	7	WNW	6	1011.3
25	Fr	17.6	20.9	6.8	4.6	3.2	SSE	39	02:33	17.7	84	8	S	7	1023.2	20.7	67	1	ENE	15	1019.2
26	Sa	15.5	23.1	9.2	2.0	1.2	S	30	23:59	18.2	72	7	N	7	1015.0	22.6	63	7	WNW	6	1011.5
27	Su	16.9	17.9	0.4	2.2	0.0	SSW	35	06:33	17.9	83	5	SSE	19	1023.5	17.0	87	7	S	15	1023.1
28	Mo	15.0	20.6	20.2	1.0	2.8	W	20	00:21	17.4	75	6	W	11	1025.9	20.4	67	6	NNE	11	1022.1
29	Tu	14.9	25.7	0	3.0	8.5	NNW	31	11:17	18.4	71	1	NNW	13	1017.7	23.6	61	7	NE	15	1013.3
30	We	18.2	25.3	3.4	5.0	7.1	WSW	44	13:43	18.6	83	7	WSW	15	1012.5	24.3	28	2	SSW	20	1011.4
Statistics for April 2014																					
Mean		15.9	23.8		3.7	5.4				18.6	72	5		15	1018.5	22.5	58	5		15	1016.0
Lowest		12.4	17.9		0.4	0.0				15.8	48	1	#	7	1005.5	17.0	28	1	WNW	6	1002.9
Highest		19.9	29.9	29.6	9.2	10.9	SSW	54		24.1	91	8	SW	26	1025.9	28.9	88	8	S	28	1023.6
Total				121.0	110.4	163.1															

Temperature, humidity, pressure and rainfall observations are from Sydney (Observatory Hill) {station 066062}. Cloud, evaporation and sunshine observations are from Sydney Airport AMO {station 066037}. Wind observations are from Fort Denison {station 066022}

Cloud, evaporation and sunshine observations are from Sydney Airport, about 10 km to the south.

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Sydney, New South Wales
August 2014 Daily Weather Observations

Most observations from Observatory Hill, but some from Fort Denison and Sydney Airport.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Fr	15.9	18.2	0	8.4	10.0	W	72	19:35	16.8	41	1	WNW	22	1007.2	16.7	23	1	W	28	1008.7
2	Sa	7.2	16.1	0	6.4	10.0	W	46	01:10	9.6	45	1	W	28	1024.6	15.0	36	1	S	28	1026.8
3	Su	5.5	17.6	0	3.8	9.5	W	28	01:36	8.4	60	1	W	20	1034.1	16.5	45	1	ESE	15	1032.2
4	Mo	6.4	17.2	0	2.6	10.1	E	26	14:16	9.9	69	3	WNW	17	1034.4	16.0	58	4	E	20	1030.4
5	Tu	7.9	20.6	0	1.6	10.2	SSE	33	14:20	10.0	75	0	W	17	1032.0	17.5	40	1	SSE	17	1030.1
6	We	6.5	22.4	0	2.6	10.1	W	35	22:33	9.7	64	1	W	20	1032.6	20.1	43	1	NE	11	1026.2
7	Th	9.6	20.4	0	4.6	6.8	W	41	07:07	11.4	53	6	W	28	1029.6	18.8	36	1	SE	13	1027.5
8	Fr	9.1	18.1	0	2.6	4.0	WNW	24	03:21	10.9	76	7	W	17	1032.1	16.9	64	3	ESE	15	1029.6
9	Sa	8.9	19.2	0	1.8	6.8	NE	26	14:39	10.2	94	8	W	13	1029.9	18.6	62	3	NE	15	1024.7
10	Su	9.9	23.2	0	3.0	3.5	SW	31	20:04	12.7	46	6	W	9	1022.4	22.7	27	1	WNW	9	1017.6
11	Mo	8.1	14.4	0	3.4	4.5	SSE	48	17:28	10.3	62	7	W	15	1025.4	13.7	45	5	S	24	1025.1
12	Tu	6.3	15.4	21.4	5.6	3.9	S	44	12:03	8.9	84	7	W	17	1030.0	12.3	78	7	SW	11	1028.2
13	We	7.9	17.0	19.4	3.6	10.1	SSW	37	10:06	10.5	77	2	W	19	1033.3	16.2	46	2	SSE	20	1031.9
14	Th	6.4	19.3	0.2	2.8	10.3	SSE	30	14:51	9.5	64	1	W	20	1035.0	18.1	49	2	SE	22	1032.5
15	Fr	7.9	19.0	0	3.4	9.3	WNW	28	07:23	10.5	81	1	W	17	1031.6	17.8	53	1	ESE	17	1026.5
16	Sa	8.7	16.8	0	1.2	0.3	ESE	26	16:51	10.3	86	7	W	13	1023.8	16.4	70	7	ESE	13	1019.0
17	Su	10.3	17.5	28.6		2.2	ESE	46	10:13	14.4	90	8	E	28	1010.3	17.0	74	7	WNW	22	1004.2
18	Mo	11.0	15.7	21.8		0.0	SSE	63	10:54	13.8	94	8	SSE	31	1001.8	13.3	90	8	SSW	28	1005.0
19	Tu	12.8	17.7	38.4	4.4	3.0	SSE	78	07:38	15.5	69	7	S	28	1015.3	14.5	80	7	SW	26	1016.6
20	We	9.5	17.1	8.2	4.6	5.0	SW	44	00:02	12.5	68	7	W	22	1024.7	15.7	54	6	S	22	1024.5
21	Th	9.4	18.1	10.8	2.0	7.1	SE	43	19:57	11.7	86	7	WNW	19	1029.2	17.1	65	3	S	22	1027.0
22	Fr	11.2	19.6	10.2	2.4	10.1	SSE	28	13:53	13.2	88	6	W	17	1031.8	18.5	61	3	SSE	17	1029.0
23	Sa	9.9	19.3	3.2	3.2	2.9	ESE	31	14:45	11.8	92	5	NW	4	1031.6	14.8	85	7	E	20	1029.3
24	Su	11.1	19.4	3.8	0.2	7.3	W	22	22:42	13.0	88	4	WNW	17	1029.7	18.4	64	2	E	11	1026.4
25	Mo	10.5	19.3	0	3.2	8.9	ESE	44	20:35	13.7	81	0	W	13	1025.7	18.8	61	2	ESE	19	1022.4
26	Tu	11.6	15.6	12.6	4.6	0.0	ESE	52	19:51	13.6	93	8	SSW	2	1024.3	14.9	87	7	SSW	9	1022.7
27	We	13.4	19.8	13.2	3.2	5.3	SSE	56	11:41	15.3	80	7	S	19	1025.3	18.7	54	5	SE	28	1023.9
28	Th	12.3	19.7	15.2	6.6	8.8	SSE	48	11:55	15.3	81	2	SSE	20	1026.8	17.8	51	4	SSE	26	1025.9
29	Fr	9.4	18.0	2.0	3.8	5.4	SSW	50	15:17	12.1	85	7	W	17	1026.7	15.8	65	4	SSW	24	1024.0
30	Sa	12.0	16.1	3.2	3.8	2.7	SSW	52	04:15	12.5	89	8	SW	20	1023.9	14.9	84	7	SW	22	1021.7
31	Su	11.7	20.8	3.0	1.0	9.5	W	37	07:42	14.8	67	1	W	20	1021.1	20.5	55	1	ESE	15	1017.2
Statistics for August 2014																					
Mean		9.6	18.3		3.5	6.4				12.0	75	4		18	1026.0	16.9	58	3		19	1023.8
Lowest		5.5	14.4		0.2	0.0				8.4	41	0	SSW	2	1001.8	12.3	23	1	#	9	1004.2
Highest		15.9	23.2	38.4	8.4	10.3	SSE	78		16.8	94	8	SSE	31	1035.0	22.7	90	8	#	28	1032.5
Total				215.2	100.4	197.6															

Temperature, humidity, pressure and rainfall observations are from Sydney (Observatory Hill) {station 066062}. Cloud, evaporation and sunshine observations are from Sydney Airport AMO {station 066037}. Wind observations are from Fort Denison {station 066022}

Cloud, evaporation and sunshine observations are from Sydney Airport, about 10 km to the south.

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Sydney, New South Wales
December 2014 Daily Weather Observations

Most observations from Observatory Hill, but some from Fort Denison and Sydney Airport.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Mo	19.6	26.8	3.2	9.8	8.0	NNE	46	16:25	25.1	59	6	E	6	1011.0	23.6	69	7	NE	20	1007.9
2	Tu	19.0	28.9	8.2	8.6	10.7	SE	61	00:14	23.7	71	6	WNW	15	1011.9	27.8	56	2	NNE	20	1008.8
3	We	21.6	29.3	1.0	8.4	7.6	S	59	16:23	26.2	68	4	E	4	1013.2	28.4	55	7	ENE	17	1009.4
4	Th	20.0	26.9	23.8	8.0	0.0	W	61	22:09	22.7	80	7	ENE	9	1012.5	25.3	74	7	ENE	22	1009.4
5	Fr	19.6	27.2	6.2	11.0	6.9	WNW	52	16:21	24.3	64	7	N	9	1008.3	26.3	59	5	NE	17	1005.6
6	Sa	20.5	26.7	1.8	5.6	6.6	ENE	30	11:49	23.4	70	6	NE	17	1007.7	25.5	61	7	E	17	1004.1
7	Su	18.7	27.2	5.4	7.8	8.9	WNW	50	16:29	24.5	68	2	ENE	11	1006.0	23.6	81	4	E	22	1003.9
8	Mo	18.9	32.0	15.8	8.6	7.5	W	70	12:06	22.0	81	6	ESE	2	1006.8	29.2	42	7	WSW	17	1006.3
9	Tu	21.1	23.8	0.4	7.4	2.1	S	31	00:17	22.5	71	7	ESE	19	1015.0	23.0	70	6	ESE	22	1014.3
10	We	20.4	25.3	0	5.0	2.6	E	33	16:46	22.5	73	6	E	17	1014.8	24.7	69	7	E	22	1011.4
11	Th	20.7	22.0	9.8	3.4	0.7	SSW	65	12:27	21.7	92	7	W	19	1005.5	18.6	85	7	SSW	26	1008.8
12	Fr	16.6	23.0	12.2	6.0		SSE	63	23:59	20.1	55	3	SSE	33	1017.5	22.4	54	3	SSE	31	1018.2
13	Sa	16.7	24.1	0	8.4	9.7	ESE	44	10:35	20.6	53	5	SE	19	1018.6	21.2	54	4	ESE	28	1016.9
14	Su	15.3	24.4	0	8.0	10.8	NNE	39	16:56	20.0	69	5	WNW	7	1014.4	23.2	48	1	ENE	24	1010.7
15	Mo	17.8	25.9	0	8.0	13.0	NE	41	16:41	24.3	54	1	ENE	6	1012.2	24.6	48	1	ENE	24	1010.8
16	Tu	20.0	25.0	0	11.4	8.7	NE	65	14:41	22.1	60	7	NNE	13	1007.9	24.3	67	3	NE	39	999.6
17	We	19.2	23.8	0	7.6	5.8				21.2	61	2	SSE	33	1006.3	22.3	51	7	SE	22	1007.8
18	Th	18.3	25.3	0	6.8	5.6	E	31	15:20	19.1	80	8	WNW	11	1010.3	24.4	70	6	E	20	1005.5
19	Fr	18.2	24.1	0	6.6	10.8	SSW	56	03:12	21.2	53	1	SSE	31	1012.4	23.2	44	1	SE	22	1013.0
20	Sa	18.0	23.1	0	8.4	9.5	ENE	31	15:42	20.7	51	5	ESE	9	1018.5	22.2	50	1	E	20	1016.6
21	Su	16.8	25.7	0	7.0	12.6	ENE	46	16:34	22.5	65	1	W	6	1018.6	24.1	61	1	E	31	1016.0
22	Mo	20.5	26.4	0	9.2	8.8	NE	57	13:55	24.8	63	3	ENE	15	1016.9	25.1	69	5	NE	33	1014.8
23	Tu	20.7	26.1	0	8.2	4.6	NE	41	23:29	21.1	84	7	NW	11	1015.4	23.8	81	8	NNE	13	1012.8
24	We	21.0	24.3	1.6	5.0	3.3	SSW	54	10:03	22.4	82	7	S	17	1013.7	22.7	71	7	S	28	1013.9
25	Th	19.8	26.8	0	5.8	5.3	WSW	59	16:22	23.2	77	7	N	9	1011.5	25.6	71	7	NE	22	1005.7
26	Fr	19.9	30.4	28.6	4.0	8.9	SSE	57	13:36	24.1	67	3	WSW	19	1007.8	22.7	66	6	SE	37	1011.3
27	Sa	18.8	21.7	0	10.6	0.0	ENE	31	22:31	20.6	50	7	ESE	11	1021.0	20.7	53	7	ESE	15	1020.6
28	Su	18.9	24.2	0	4.0	2.0	ENE	30	15:47	20.2	75	7	S	2	1019.2	23.5	61	7	E	13	1015.9
29	Mo	17.7	27.3	0	5.4	12.6	NNE	46	20:31	23.6	62	1	NNW	13	1009.7	25.4	66	1	NE	24	1004.1
30	Tu	19.4	28.1	0	8.0	12.7	SSW	54	22:25	23.4	59	0	S	13	1007.4	26.9	50	0	E	17	1004.0
31	We	19.3	25.2	0	9.6	8.0	SSW	46	23:01	22.2	64	5	E	17	1015.6	23.9	57	2	E	24	1014.4
Statistics for December 2014																					
	Mean	19.1	25.8		7.5	7.1				22.5	67	4		13	1012.5	24.1	61	4		22	1010.4
	Lowest	15.3	21.7		3.4	0.0				19.1	50	0	#	2	1005.5	18.6	42	0	#	13	999.6
	Highest	21.6	32.0	28.6	11.4	13.0	W	70		26.2	92	8	SSE	33	1021.0	29.2	85	8	NE	39	1020.6
	Total			118.0	231.6	214.3															

Temperature, humidity, pressure and rainfall observations are from Sydney (Observatory Hill) {station 066062}. Cloud, evaporation and sunshine observations are from Sydney Airport AMO {station 066037}. Wind observations are from Fort Denison {station 066022}

Cloud, evaporation and sunshine observations are from Sydney Airport, about 10 km to the south.

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Sydney, New South Wales
February 2015 Daily Weather Observations

Most observations from Observatory Hill, but some from Fort Denison and Sydney Airport.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Su	19.3	26.6	0	9.4	7.0	SE	37	13:06	22.0	75	7	SSW	9	1009.5	24.2	55	6	ESE	19	1009.3
2	Mo	18.0	25.0	3.4	6.6	8.7	SSE	61	15:13	19.6	81	7	SSW	19	1015.5	23.4	59	2	S	35	1015.9
3	Tu	18.5	26.5	1.0	8.6	9.8	SSE	43	13:13	20.1	72	5	SW	17	1020.1	25.7	45	2	SE	24	1017.5
4	We	17.3	25.6	1.2	6.4	6.6	SSE	43	14:00	20.1	70	7	W	15	1015.7	22.9	58	6	SSE	30	1015.7
5	Th	18.6	24.3	7.4	7.2	0.5	ESE	46	01:03	21.9	59	7	ESE	20	1023.2	22.5	54	7	ESE	13	1024.1
6	Fr	17.6	25.6	0.2	4.2	7.8	ESE	31	10:20	20.5	80	7	W	9	1027.7	23.6	53	7	ESE	15	1026.2
7	Sa	18.8	26.5	0	5.4	6.9	ENE	35	16:38	20.3	77	8	WNW	9	1025.2	26.0	50	4	ENE	22	1021.8
8	Su	18.9	32.1	0	5.6	12.2	E	26	12:45	23.3	71	0	W	9	1018.9	28.3	58	1	E	22	1017.0
9	Mo	22.7	25.9	0	8.0	1.2	S	46	04:25	23.7	76	7	S	20	1023.8	25.3	66	7	SE	20	1023.9
10	Tu	21.5	28.2	0	5.8	7.7	ENE	33	18:42	24.0	82	5	WNW	6	1024.6	27.7	65	3	E	19	1023.1
11	We	22.8	28.6	0.2	5.8	11.3	ENE	41	17:47	25.8	72	6	ENE	17	1023.6	27.1	59	2	E	28	1021.0
12	Th	21.0	28.8	0	8.0	10.0	ESE	37	15:36	26.1	62	1	SE	4	1021.8	27.6	61	5	ESE	26	1021.0
13	Fr	20.4	28.1	6.8	7.8	4.6	ENE	31	19:52	22.1	94	7	WNW	7	1024.2	25.1	61	5	ESE	19	1023.3
14	Sa	20.4	27.2	4.4	5.0	6.7	ENE	39	13:20	23.1	82	2	W	7	1023.1	26.9	55	7	NE	17	1019.9
15	Su	20.3	29.4	0.6	5.6	8.8	NE	37	18:11	22.4	85	7	N	4	1017.0	26.4	59	3	ENE	20	1014.8
16	Mo	22.1	28.0	0	8.0	11.1	NE	46	17:20	25.4	62	3	NE	19	1016.9	26.8	57	7	NE	28	1015.7
17	Tu	21.9	27.8	0	8.4	12.2	NE	48	15:24	25.7	59	3	NNE	19	1019.0	26.1	56	2	ENE	31	1017.6
18	We	22.2	27.6	0	10.4	12.2	E	41	14:20	26.4	59	2	NE	9	1019.9	26.7	60	2	E	28	1019.0
19	Th	22.2	27.6	0.2	9.6	5.1	ENE	39	15:45	23.0	88	7	ENE	11	1021.8	25.8	63	5	E	17	1019.4
20	Fr	21.7	26.8	0	5.0	1.8	NE	43	22:22	23.8	82	7	W	6	1018.0	25.6	67	7	E	9	1016.2
21	Sa	20.5	25.6	1.0	2.8	0.0	ENE	37	23:42	22.9	88	8	SSE	6	1017.1	24.5	74	8	ESE	15	1016.0
22	Su	20.7	27.4	1.2	3.4	10.7	E	31	03:02	23.8	82	3	ESE	4	1017.7	26.8	62	6	E	20	1016.9
23	Mo	22.4	27.6	0	6.6	5.5	ENE	31	16:44	24.1	76	5	NNE	15	1016.9	26.9	63	4	E	17	1014.6
24	Tu	22.2	25.6	0.2	5.2	6.2	SSE	61	13:47	23.3	89	7	NNW	4	1014.8	24.8	66	6	S	33	1015.1
25	We	20.1	23.8	0	6.6	9.1	SE	44	10:10	22.2	76	7	WSW	6	1015.6	22.9	77	7	SSE	30	1015.2
26	Th	19.9	25.8	4.2	2.2	4.7	E	20	14:01	21.5	86	7	WNW	15	1010.9	24.9	72	7	E	17	1007.2
27	Fr	20.0	27.5	26.8	4.6	8.4	SE	28	09:04	21.1	97	6	S	11	1010.8	26.4	60	2	ESE	17	1009.5
28	Sa	20.1	27.0	0.2	5.6	6.0	NNE	43	20:10	23.3	78	7	ENE	9	1010.8	26.5	62	7	NE	22	1008.5
Statistics for February 2015																					
	Mean	20.4	27.0		6.3	7.2				22.9	77	5		10	1018.7	25.6	60	4		21	1017.3
	Lowest	17.3	23.8		2.2	0.0				19.6	59	0	#	4	1009.5	22.5	45	1	E	9	1007.2
	Highest	22.8	32.1	26.8	10.4	12.2	SSE	61		26.4	97	8	#	20	1027.7	28.3	77	8	S	35	1026.2
	Total			59.0	177.8	202.8															

Temperature, humidity, pressure and rainfall observations are from Sydney (Observatory Hill) {station 066062}. Cloud, evaporation and sunshine observations are from Sydney Airport AMO {station 066037}. Wind observations are from Fort Denison {station 066022}

Cloud, evaporation and sunshine observations are from Sydney Airport, about 10 km to the south.

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Sydney, New South Wales
January 2015 Daily Weather Observations

Most observations from Observatory Hill, but some from Fort Denison and Sydney Airport.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Th	21.4	28.4	0	6.8	11.0	ENE	43	15:55	25.2	68	1	NE	15	1014.5	27.5	69	3	NE	24	1011.4
2	Fr	21.2	28.5	0	9.2	3.6	S	37	01:23	23.2	78	7	S	17	1018.8	26.3	76	7	ESE	17	1017.7
3	Sa	22.0	28.8	0	4.0	12.0	NE	48	18:22	26.3	76	3	E	15	1020.2	27.7	70	1	NE	22	1017.5
4	Su	22.4	30.4	0	10.2	8.9	SSW	52	18:59	26.9	69	1	E	11	1015.9	27.1	66	7	NE	15	1012.8
5	Mo	20.5	26.3	0.2	10.0	3.4	S	35	02:22	21.8	82	7	SSW	9	1019.4	25.9	66	7	ESE	15	1018.7
6	Tu	21.3	28.2	0.2	4.0	11.8	E	26	15:33	24.4	80	5	SSE	11	1020.7	26.8	64	3	E	17	1019.9
7	We	22.8	29.3	0	6.6	12.4	NNE	44	15:32	27.1	64	3	E	17	1020.6	27.9	50	1	NE	22	1018.3
8	Th	21.2	28.0	0	9.2	13.0				25.8	55	1	N	6	1016.1	27.4	55	1	NE	31	1011.7
9	Fr	21.8	29.9	0	13.6	8.7	NE	48	14:50	25.7	72	1	E	13	1010.6	26.9	64	2	ENE	31	1007.8
10	Sa	22.0	28.7	0	7.4	1.0				24.3	81	7	ESE	2	1010.8	25.2	78	8	ENE	13	1009.1
11	Su	20.6	22.9	21.0	7.4	0.0	S	33	00:42	21.1	96	8	ESE	19	1013.6	21.1	92	8	S	13	1012.6
12	Mo	20.4	24.4	9.6		3.3	S	56	12:08	22.9	76	7	SSE	22	1014.7	22.9	78	7	S	30	1013.3
13	Tu	18.9	28.8	4.8	5.4	7.5	NNE	43	17:49	21.2	94	6	WSW	6	1010.2	24.5	77	5	ENE	20	1005.6
14	We	21.1	34.2	0	6.2	12.7	WSW	54	18:07	28.6	55	1	WNW	6	999.1	33.4	32	2	WNW	28	997.2
15	Th	22.0	29.0	0	11.0	11.7	W	35	06:26	26.1	45	2	WSW	11	1004.0	24.8	57	1	ESE	24	1004.2
16	Fr	21.2	27.6	0	8.2	12.9	ENE	33	17:29	24.7	67	3	WSW	6	1008.6	26.6	63	2	E	22	1005.8
17	Sa	20.7	35.7	0	3.2	13.4	WNW	39	12:30	27.0	35	0	W	7	1008.0	33.5	23	1	E	24	1005.2
18	Su	20.7	29.1	0	10.2	11.8	ESE	39	16:43	24.5	73	5	SSW	13	1011.7	28.6	43	6	ESE	20	1010.0
19	Mo	20.9	22.7	0	10.4	0.1	SE	44	04:58	21.7	66	8	SSE	28	1014.9	21.7	61	8	SE	24	1015.2
20	Tu	18.1	24.8	6.2	3.4	7.3	ENE	48	09:39	20.3	88	8	ENE	20	1014.3	23.9	64	5	NE	26	1011.9
21	We	19.7	28.0	18.0	7.4	10.5	E	59	04:07	24.4	78	5	SSE	2	1011.0	27.1	61	3	E	20	1010.6
22	Th	22.5	28.3	0.2	8.4	11.7	ENE	37	16:06	26.4	68	5	ESE	9	1014.5	27.5	58	1	E	19	1012.1
23	Fr	22.4	29.1	0	8.0	10.5	NNE	52	16:35	25.8	74	7	NE	11	1010.1	28.7	61	2	NE	30	1007.0
24	Sa	22.7	29.1	0	9.2	9.8	NE	43	12:06	26.7	69	1	E	15	1008.1	28.3	54	1	NE	24	1004.9
25	Su	21.6	34.4	1.0	8.0	11.2	S	59	18:31	25.0	77	2	W	6	1003.1	31.2	44	5	E	19	1001.6
26	Mo	20.2	20.4	0.6	10.6	0.0	SSE	35	23:01	20.4	84	8	SSE	20	1013.2	19.7	88	8	S	17	1013.3
27	Tu	18.9	20.4	33.0	5.4	0.0	ESE	37	00:47	19.2	96	8	ESE	20	1013.3	20.2	93	8	E	13	1012.5
28	We	17.3	20.5	57.0	7.2	2.3	S	43	17:54	17.9	95	8	SSE	17	1013.3	18.2	92	7	SSW	6	1013.5
29	Th	14.6	24.3	14.0	2.8	12.2	S	57	13:18	19.0	54	3	SSW	17	1012.9	22.1	47	3	S	35	1011.0
30	Fr	15.2	27.3	0	8.8	11.2	WSW	48	12:45	19.6	43	1	WSW	20	1009.4	26.8	28	3	WSW	17	1005.4
31	Sa	17.0	26.1	0	5.8	11.7	ESE	26	12:11	21.4	59	2	WNW	9	1008.1	24.2	42	2	ESE	19	1005.8
Statistics for January 2015																					
	Mean	20.4	27.5		7.6	8.3				23.7	71	4		12	1012.4	25.9	61	4		21	1010.4
	Lowest	14.6	20.4		2.8	0.0				17.9	35	0	#	2	999.1	18.2	23	1	SSW	6	997.2
	Highest	22.8	35.7	57.0	13.6	13.4	#	59		28.6	96	8	SSE	28	1020.7	33.5	93	8	S	35	1019.9
	Total			165.8	228.0	257.6															

Temperature, humidity, pressure and rainfall observations are from Sydney (Observatory Hill) {station 066062}. Cloud, evaporation and sunshine observations are from Sydney Airport AMO {station 066037}. Wind observations are from Fort Denison {station 066022}

Cloud, evaporation and sunshine observations are from Sydney Airport, about 10 km to the south.

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Sydney, New South Wales
July 2014 Daily Weather Observations

Most observations from Observatory Hill, but some from Fort Denison and Sydney Airport.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Tu	8.9	19.1	0	3.0	9.3	W	33	10:42	10.1	64	1	W	20	1025.0	18.3	36	1	W	7	1024.0
2	We	7.4	20.2	0	3.8	9.6	W	37	05:41	9.6	67	1	W	28	1027.6	19.2	36	1	SSE	13	1025.2
3	Th	6.7	18.3	0	1.2	9.6	W	28	04:24	9.1	71	1	W	19	1027.3	17.2	54	1	ENE	13	1023.3
4	Fr	6.7	20.4	0	2.4	9.9	NW	30	19:21	9.3	71	0	W	9	1021.3	19.6	33	1	ESE	7	1016.6
5	Sa	8.2	18.0	0	3.6	9.6	W	48	14:27	10.1	62	1	W	17	1016.2	17.3	33	1	WNW	28	1012.0
6	Su	8.2	18.1	0	4.0	9.9	W	43	16:09	11.6	59	1	W	17	1013.6	16.2	36	1	WSW	24	1010.8
7	Mo	8.3	19.5	0	3.0	9.2	W	43	16:58	10.7	59	1	W	17	1014.4	18.8	35	2	WSW	19	1011.9
8	Tu	7.9	18.7	0	3.8	9.7	W	33	01:54	9.0	66	1	W	20	1016.6	16.2	51	1	E	6	1012.2
9	We	6.6	21.3	0	2.6	9.4	W	67	19:21	11.9	49	0	NNW	11	1007.6	20.7	22	1	NNE	22	999.6
10	Th	8.8	17.3	0.2	5.8	9.8	WNW	61	11:37	11.9	52	1	WNW	15	1005.8	16.8	32	2	W	37	1005.1
11	Fr	9.0	18.5	0	4.0	9.9	W	35	12:16	11.8	58	1	WNW	17	1017.4	18.2	32	0	W	19	1016.0
12	Sa	6.4	18.5	0.2	3.4	9.5	W	44	15:01	8.9	64	0	WNW	11	1019.6	17.7	33	1	WSW	26	1017.1
13	Su	6.5	16.3	0	3.6	9.6	S	46	13:07	8.2	54	1	W	28	1027.4	15.1	47	3	S	24	1027.3
14	Mo	6.6	17.9	0	3.2	5.1	W	35	07:37	9.2	62	6	W	17	1032.0	15.7	64	6	SSW	19	1029.0
15	Tu	9.2	15.6	1.6	0.4	0.0	W	22	22:55	11.5	88	7	W	13	1025.8	15.3	74	8	E	2	1021.3
16	We	11.4	18.5	1.8	1.2	3.9	W	41	16:12	13.2	86	8	ENE	4	1013.7	17.9	52	2	W	20	1010.7
17	Th	9.5	19.9	0	2.0	9.4	W	56	17:28	13.1	56	1	NW	20	1012.6	19.1	33	3	WNW	26	1008.6
18	Fr	8.6	15.9	0	4.0	7.9	WSW	63	13:37	9.6	47	2	W	28	1011.2	14.1	35	4	WSW	39	1011.1
19	Sa	8.5	14.9	0	4.6	3.2	SW	70	13:33	10.1	50	6	W	26	1021.2	13.6	57	6	SSW	24	1021.4
20	Su	9.8	15.3	0.2	4.0	1.1	SSW	54	01:55	11.2	66	7	W	20	1025.7	15.2	60	7	S	22	1024.9
21	Mo	8.9	18.3	0	2.0	7.5	W	31	04:36	9.9	69	7	W	22	1026.9	15.7	64	7	SSE	17	1023.3
22	Tu	8.7	19.0	0	1.4	9.6	W	24	06:24	10.8	81	2	W	22	1024.6	16.5	59	2	SE	11	1022.3
23	We	8.9	18.9	0	3.2	6.7	W	22	04:14	10.7	87	3	WNW	17	1025.5	17.1	57	5	ESE	13	1021.6
24	Th	8.5	19.8	0	0.6	2.4	N	20	14:16	10.9	83	5	WNW	11	1022.5	19.7	48	7	N	9	1019.2
25	Fr	9.6	18.8	0	2.8	2.6	W	52	11:37	11.5	82	7	NW	9	1023.0	18.3	59	7	N	15	1019.9
26	Sa	11.3	18.7	8.2	2.0	4.2	W	43	14:50	13.0	90	8	WNW	22	1024.9	17.2	42	3	WNW	24	1020.4
27	Su	9.4	21.0	4.2	1.8	10.2	W	31	08:47	11.9	65	1	W	20	1024.6	18.7	38	1	ESE	15	1021.5
28	Mo	8.8	18.5	0	3.2	6.7	WSW	46	11:23	11.9	62	7	W	15	1021.3	17.4	41	6	WNW	15	1018.1
29	Tu	11.8	23.3	0	4.0	5.1	NNW	44	12:39	14.9	49	7	WNW	22	1018.0	22.9	27	1	NNE	20	1013.2
30	We	13.0	24.0	0	6.2	10.2	NW	41	15:03	17.3	44	6	WNW	13	1018.0	23.3	31	1	WNW	22	1014.5
31	Th	13.9	25.0	0	6.6	10.1	NNW	61	14:10	17.7	40	1	NNW	24	1014.2	24.5	21	0	NW	35	1007.3
Statistics for July 2014																					
	Mean	8.9	19.0		3.1	7.4				11.3	64	3		17	1020.2	17.9	43	2		19	1017.1
	Lowest	6.4	14.9		0.4	0.0				8.2	40	0	ENE	4	1005.8	13.6	21	0	E	2	999.6
	Highest	13.9	25.0	8.2	6.6	10.2	SW	70		17.7	90	8	W	28	1032.0	24.5	74	8	WSW	39	1029.0
	Total			16.4	97.4	230.9															

Temperature, humidity, pressure and rainfall observations are from Sydney (Observatory Hill) {station 066062}. Cloud, evaporation and sunshine observations are from Sydney Airport AMO {station 066037}. Wind observations are from Fort Denison {station 066022}

Cloud, evaporation and sunshine observations are from Sydney Airport, about 10 km to the south.

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Sydney, New South Wales
June 2014 Daily Weather Observations

Most observations from Observatory Hill, but some from Fort Denison and Sydney Airport.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Su	14.8	20.7	11.2	5.0	0.4	W	46	15:14	17.0	87	7	NW	7	1020.5	17.8	70	8	W	26	1018.0
2	Mo	12.4	22.3	1.0	2.0	5.9	W	30	04:29	14.5	85	7	W	11	1017.2	19.9	54	3	WNW	9	1014.9
3	Tu	10.5	20.3	0	1.8	9.9	W	39	16:35	13.2	70	1	WSW	9	1018.4	19.5	42	1	WNW	17	1016.2
4	We	11.2	22.3	0	3.6	9.6	W	33	08:50	13.6	69	1	W	24	1024.1	22.0	53	3	SSE	13	1022.9
5	Th	13.6	19.8	8.6	4.0	0.4	SSE	30	15:30	15.3	91	8	W	19	1025.7	18.0	80	7	SSW	11	1024.1
6	Fr	14.5	15.5	13.2	7.2	0.5	S	48	13:12	15.3	86	7	SSW	22	1026.3	14.9	85	7	SSW	17	1024.8
7	Sa	10.1	19.4	6.8	2.4	7.8	SSW	39	11:23	12.2	67	2	W	26	1027.2	17.8	60	6	SSW	19	1025.0
8	Su	10.5	17.7	0	3.6	6.3	SSE	46	16:27	11.9	65	3	W	17	1026.9	16.0	59	7	SSW	24	1025.8
9	Mo	8.6	18.4	2.2	2.6	5.1	SSE	46	13:28	10.4	71	1	W	22	1028.4	16.9	73	7	SE	17	1027.3
10	Tu	10.4	19.2	13.8	2.0	3.6	SSE	31	00:04	13.0	91	7	W	20	1030.5	18.8	49	1	SE	19	1027.4
11	We	10.4	19.6	5.6	2.2	5.6	W	24	08:04	11.9	86	6	WNW	19	1026.6	17.7	62	6	SSE	9	1022.8
12	Th	11.1	20.4	0	1.0	5.8	W	30	03:54	12.1	86	7	W	15	1022.0	19.5	52	6	NNE	9	1018.9
13	Fr	10.7	20.9	0	2.4	3.3	N	28	15:05	11.8	85	7	W	15	1019.4	20.4	48	7	N	15	1015.0
14	Sa	11.8	19.9	5.0	2.4	3.9	W	31	12:51	14.3	89	8	WNW	17	1012.1	19.2	53	2	W	19	1009.2
15	Su	10.3	17.2	0.2	2.6	1.2	W	54	13:32	13.0	65	7	NW	13	1008.9	16.9	49	7	WSW	22	1008.3
16	Mo	9.3	19.5	0.4	0.8	9.7	SW	44	17:34	11.3	78	1	W	15	1020.8	19.4	36	1	WNW	11	1018.4
17	Tu	10.0	19.8	0	4.4	9.1	WSW	43	10:35	13.5	63	1	W	20	1023.4	17.8	46	5	SSW	19	1024.0
18	We	11.4	20.4	0	1.8	9.4	W	35	02:56	12.5	67	1	W	22	1030.1	18.7	51	1	ESE	11	1027.9
19	Th	10.6	21.5	0	1.8	8.5	W	24	08:31	12.0	81	3	WNW	15	1027.8	19.8	57	3	NE	13	1022.9
20	Fr	12.0	21.3	0	4.6	6.3	WSW	28	13:50	15.5	66	2	N	6	1019.9	19.6	54	6	W	6	1015.9
21	Sa	10.5	21.9	0	2.4	9.5	W	30	07:10	11.8	79	1	WNW	22	1020.4	21.4	31	1	W	11	1018.5
22	Su	11.1	19.7	0	3.4	4.4	W	26	04:17	11.9	79	7	WNW	15	1023.0	19.6	49	1	NNE	4	1020.0
23	Mo	10.0	16.6	0	0.6	1.8	N	37	15:01	13.5	76	7	NNW	15	1014.9	15.8	57	7	N	22	1008.6
24	Tu	11.5	16.7	0	6.2	9.7	WNW	81	15:08	12.1	47	1	NW	28	1007.1	16.1	35	1	WNW	33	1003.4
25	We	11.1	18.1	0	4.0	9.7	W	76	11:24	14.8	45	1	W	31	1012.2	17.7	35	1	W	39	1012.8
26	Th	10.7	22.2	0	4.8	9.8	WNW	41	10:14	15.1	47	1	WNW	17	1018.8	21.1	31	5	WNW	15	1017.9
27	Fr	10.4	21.2	0	4.0	8.1	N	30	18:19	12.1	68	7	NW	11	1021.0	20.4	39	7	NNE	9	1015.1
28	Sa	12.0	22.8	0	5.0	6.9	W	96	16:17	15.8	36	7	N	28	1007.2	20.3	34	2	NW	20	999.9
29	Su	10.0	16.4	0	7.0	9.6	NW	69	00:49	12.1	45	1	NW	28	1004.5	15.5	37	3	NW	28	1004.8
30	Mo	9.4	16.1	0	3.8	9.4	WSW	50	09:44	11.4	53	1	W	24	1015.1	16.0	29	1	WSW	22	1015.7
Statistics for June 2014																					
Mean		11.0	19.6		3.3	6.4				13.2	70	4		18	1020.0	18.5	50	4		16	1017.5
Lowest		8.6	15.5		0.6	0.4				10.4	36	1	N	6	1004.5	14.9	29	1	NNE	4	999.9
Highest		14.8	22.8	13.8	7.2	9.9	W	96		17.0	91	8	W	31	1030.5	22.0	85	8	W	39	1027.9
Total				68.0	99.4	191.2															

Temperature, humidity, pressure and rainfall observations are from Sydney (Observatory Hill) {station 066062}. Cloud, evaporation and sunshine observations are from Sydney Airport AMO {station 066037}. Wind observations are from Fort Denison {station 066022}

Cloud, evaporation and sunshine observations are from Sydney Airport, about 10 km to the south.

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Sydney, New South Wales
March 2014 Daily Weather Observations

Most observations from Observatory Hill, but some from Fort Denison and Sydney Airport.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Sa	18.2	22.7	10.4	1.6	0.0	NNE	26	16:09	19.6	90	7	WNW	2	1020.5	22.0	75	8	ENE	11	1019.1
2	Su	17.9	22.8	6.6	2.4	1.2	ESE	41	18:52	19.3	85	7	SSW	11	1020.3	19.8	86	8	S	17	1020.6
3	Mo	18.8	26.3	4.6	3.8	3.8	ESE	37	11:43	21.7	70	3	WNW	11	1024.8	22.2	75	7	SE	11	1024.5
4	Tu	19.0	25.4	1.4	2.6	3.3	ENE	22	20:35	20.9	83	7	WNW	7	1026.1	24.7	58	7	E	11	1023.7
5	We	18.1	27.5	0.2	4.0	7.7	S	50	15:46	21.9	69	1	WNW	4	1018.6	26.6	62	3	NE	15	1014.0
6	Th	21.0	26.8	1.6	7.0	5.8	SSW	46	02:50	22.3	75	7	SSW	20	1018.6	25.8	58	7	S	22	1018.3
7	Fr	19.3	26.9	0.2	5.2	7.5	NNE	31	19:06	23.0	69	4	WNW	13	1020.3	25.7	64	5	E	20	1018.7
8	Sa	21.6	27.2	0	5.6	8.9	ESE	39	17:27	23.8	63	7	NNE	13	1022.6	24.7	64	2	ESE	22	1021.5
9	Su	19.6	27.1	0	6.4	11.1	E	31	13:21	22.8	68	4	W	6	1023.6	25.7	53	3	E	20	1020.9
10	Mo	21.9	27.5	0.2	6.8	11.0	ENE	37	12:31	25.6	60	3	NNE	11	1023.4	26.4	55	2	E	26	1021.5
11	Tu	19.6	27.8	0	8.6	10.8	NE	35	12:49	22.8	67	1	W	9	1023.6	26.3	46	1	NE	20	1021.3
12	We	19.2	29.2	0	8.2	6.2	SE	37	20:37	22.1	69	6	WNW	7	1018.1	27.6	52	7	E	11	1015.4
13	Th	18.5	27.0	27.8	7.0	6.2	S	44	00:08	19.6	81	6	SW	15	1020.4	26.0	56	3	SE	15	1018.2
14	Fr	19.3	26.3	0.2	4.0	7.9	NNE	43	20:02	22.7	70	6	NNW	7	1018.4	25.2	55	1	ENE	30	1014.7
15	Sa	19.5	26.6	0	7.8	5.8	WSW	91	16:37	22.5	64	4	NNW	7	1013.0	25.8	62	7	NE	17	1008.4
16	Su	19.2	29.3	5.4	5.8	5.8	W	57	11:41	24.2	57	2	WNW	9	1005.5	22.5	74	7	WNW	13	1004.7
17	Mo	15.1	28.0	5.0	6.2	11.2	NNE	35	18:20	19.4	47	1	W	15	1016.9	27.5	25	1	ENE	26	1015.0
18	Tu	16.1	29.7	0.2	7.2	10.4	NE	31	13:42	19.9	58	1	W	19	1021.0	28.7	33	5	NE	19	1018.7
19	We	19.6	27.9	0	6.6	10.1	S	48	14:14	23.9	66	1	SSW	13	1023.9	27.8	57	6	SSE	26	1023.6
20	Th	21.7	27.0	0	6.2	9.2	E	33	15:42	25.5	58	3		Calm	1026.9	26.4	54	3	E	22	1024.2
21	Fr	20.4	26.8	1.0	6.0	5.2	NE	39	18:33	21.7	75	7	NNE	6	1022.5	25.2	58	4	ENE	19	1018.9
22	Sa	18.7	26.7	0	6.0	9.5	SSW	37	21:59	23.6	68	3	ESE	6	1017.8	25.7	60	2	ENE	20	1014.5
23	Su	20.3	27.0	0	5.2	7.2	NNW	41	21:09	23.0	70	3	SE	6	1017.6	25.7	63	7	ENE	19	1013.2
24	Mo	20.1	23.2	0.4	6.2	0.0	W	54	12:32	20.3	79	8	SSW	24	1016.4	17.5	89	8	W	31	1015.3
25	Tu	17.1	25.2	6.8	4.2	6.5	ESE	35	15:08	19.8	82	1	W	11	1020.0	24.7	67	7	ESE	9	1019.6
26	We	19.7	24.9	0.6	2.8	0.0	NE	37	18:42	21.2	89	7	WNW	11	1022.5	24.4	72	7	E	9	1021.2
27	Th	20.6	22.2	18.0	2.8	0.0	N	35	11:45	21.2	89	8	NNE	2	1022.3	20.3	77	8	N	7	1020.0
28	Fr	18.0	24.7	7.4	1.0	0.0	WSW	26	22:30	18.7	84	7	WNW	13	1017.0	24.3	66	8	WSW	11	1013.3
29	Sa	18.7	25.7	0.8	3.6	5.6	SSE	41	11:47	20.6	80	6	W	15	1015.3	24.4	59	7	SSE	24	1015.0
30	Su	19.4	27.0	0.2	3.6	10.1	SE	35	18:57	22.4	69	3	WNW	11	1020.1	27.0	55	3	ESE	22	1019.2
31	Mo	17.5	25.0	3.6	5.0	10.2	W	26	00:50	19.6	79	3	WNW	15	1022.4	23.5	64	6	ESE	15	1019.7
Statistics for March 2014																					
Mean		19.2	26.4		5.1	6.4				21.8	72	4		10	1020.0	24.8	61	5		18	1018.0
Lowest		15.1	22.2		1.0	0.0				18.7	47	1		Calm	1005.5	17.5	25	1	N	7	1004.7
Highest		21.9	29.7	27.8	8.6	11.2	WSW	91		25.6	90	8	SSW	24	1026.9	28.7	89	8	W	31	1024.5
Total				102.6	159.4	198.2															

Temperature, humidity, pressure and rainfall observations are from Sydney (Observatory Hill) {station 066062}. Cloud, evaporation and sunshine observations are from Sydney Airport AMO {station 066037}. Wind observations are from Fort Denison {station 066022}

Cloud, evaporation and sunshine observations are from Sydney Airport, about 10 km to the south.

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Sydney, New South Wales
May 2014 Daily Weather Observations

Most observations from Observatory Hill, but some from Fort Denison and Sydney Airport.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Th	11.3	23.0	0	5.2	10.2	W	31	06:16	14.7	59	1	W	19	1017.7	19.6	44	1	ESE	15	1013.8
2	Fr	13.3	22.2	0	2.8	7.3	W	46	12:16	16.1	71	2	W	17	1006.9	21.5	35	6	W	19	1001.9
3	Sa	11.7	15.7	1.2	5.6	1.1	W	57	11:07	12.7	81	7	NW	13	996.5	14.8	46	7	W	35	994.8
4	Su	10.8	20.5	3.8	3.8	8.5	W	54	13:19	15.0	61	5	W	20	1001.9	19.3	31	1	W	31	1003.7
5	Mo	10.3	20.9	0	5.4	10.4	W	39	08:00	12.8	54	1	W	22	1017.9	20.2	32	3	NW	7	1016.8
6	Tu	10.7	23.4	0	3.4	8.2	W	39	09:38	14.6	58	5	W	26	1021.2	21.6	35	3	ENE	6	1018.5
7	We	11.2	20.7	0	3.2	9.7	S	43	12:02	13.9	59	3	W	20	1023.8	19.3	41	2	S	20	1022.9
8	Th	11.1	21.0	0	5.8	6.2	SSW	46	11:12	14.2	66	2	W	19	1026.2	18.2	65	6	SSE	19	1024.3
9	Fr	11.8	21.9	7.4	3.0	3.0	W	26	04:09	13.9	84	4	WNW	9	1026.3	18.8	62	7	E	13	1023.6
10	Sa	12.0	24.8	0.4	2.2	5.2	NW	35	22:46	14.5	80	3	W	13	1023.9	21.4	51	7	N	13	1020.0
11	Su	14.4	22.9	0.8	2.0	8.3	SSE	41	15:45	16.7	76	1	W	15	1022.2	19.9	59	3	SSW	20	1022.1
12	Mo	12.6	23.0	0	4.0	8.8	SSE	37	11:02	16.7	73	3	W	17	1030.1	22.7	51	2	S	20	1028.5
13	Tu	13.7	23.0	11.2	4.8	8.8	W	26	07:31	15.6	74	1	W	20	1030.5	21.0	52	3	E	9	1027.2
14	We	12.6	23.2	0.2	1.8	9.5	ENE	28	15:07	14.8	78	1	WNW	13	1029.3	21.4	54	2	NE	17	1025.8
15	Th	11.7	22.9	0	4.0	10.0	WNW	24	08:23	13.7	82	1	W	15	1028.7	21.5	51	1	E	13	1025.3
16	Fr	12.0	25.3	0	3.2	9.9	W	28	03:09	14.6	75	0	W	19	1029.4	23.3	40	1	ENE	13	1027.0
17	Sa	12.0	24.2	0	4.0	9.1	NNE	26	15:53	14.3	72	6	WNW	11	1030.4	22.4	55	3	ENE	13	1026.7
18	Su	13.0	24.8	0	3.4	2.8	W	20	07:35	14.8	69	7	W	15	1028.3	24.4	41	7	W	7	1025.2
19	Mo	13.1	26.1	0	2.4	7.5	WNW	24	05:02	15.8	72	7	W	19	1026.0	25.8	33	1	WNW	7	1022.4
20	Tu	14.4	25.5	0	3.2	4.7	W	24	02:20	16.2	69	7	W	17	1022.9	25.2	41	7	WNW	7	1019.6
21	We	14.8	23.5	0	3.6	9.8	W	26	05:19	17.5	66	2	WNW	13	1024.4	22.6	58	2	ESE	13	1022.6
22	Th	13.1	27.1	0	2.2	9.4	W	24	04:00	14.9	82	1	W	13	1023.5	26.8	30	1	W	6	1018.7
23	Fr	13.9	25.1	0	4.0	8.0	W	22	04:35	16.5	64	3	W	11	1017.9	23.8	41	5	WNW	13	1013.0
24	Sa	15.7	25.2	0	4.8	7.4	WSW	35	12:57	17.7	62	2	W	13	1015.4	22.6	45	6	SSW	15	1014.0
25	Su	15.5	26.9	0	3.4	7.1	W	26	06:34	17.2	75	5	W	19	1018.3	24.9	43	2	ESE	17	1017.1
26	Mo	14.1	23.6	0	3.4	9.4	NNE	30	20:16	16.3	81	6	WNW	13	1023.4	23.3	59	6	ENE	17	1020.9
27	Tu	16.0	24.0	0	2.6	3.0	N	48	13:15	19.4	68	7	NNE	11	1018.0	23.8	46	7	NNE	26	1010.8
28	We	17.1	24.1	0	5.6	9.6	NW	48	14:11	19.3	54	1	NW	22	1013.8	23.2	31	1	WNW	26	1013.5
29	Th	12.8	21.3	0	5.4	7.7	S	35	12:19	15.3	59	2	W	20	1023.1	19.7	61	5	S	22	1022.1
30	Fr	14.5	21.4	0	4.4	5.2	SSW	33	10:37	15.9	71	6	W	19	1026.8	20.7	58	3	S	17	1024.5
31	Sa	14.3	20.7	2.4	1.0	7.5	NNE	31	20:05	15.2	86	5	WNW	15	1026.9	20.0	61	4	ENE	17	1022.8
Statistics for May 2014																					
Mean		13.1	23.2		3.7	7.5				15.5	70	3		16	1021.7	21.7	46	3		15	1019.0
Lowest		10.3	15.7		1.0	1.1				12.7	54	0	WNW	9	996.5	14.8	30	1	#	6	994.8
Highest		17.1	27.1	11.2	5.8	10.4	W	57		19.4	86	7	W	26	1030.5	26.8	65	7	W	35	1028.5
Total				27.4	113.6	233.3															

Temperature, humidity, pressure and rainfall observations are from Sydney (Observatory Hill) {station 066062}. Cloud, evaporation and sunshine observations are from Sydney Airport AMO {station 066037}. Wind observations are from Fort Denison {station 066022}

Cloud, evaporation and sunshine observations are from Sydney Airport, about 10 km to the south.

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APPENDIX EWATER BORE REGISTER DATA

NSW OFFICE OF WATER
Work Summary

GW014179

Converted From HYDSYS

Licence : 10BL007801
Licence Status Active

Work Type : Well
Work Status : Supply Obtained
Construct. Method : (Unknown)
Owner Type : Private

Authorised Purpose(s)	Intended Purpose(s)
DOMESTIC	GENERAL USE
FARMING	

Commenced Date :
Completion Date : 01-Jan-1959
Final Depth : 5.30 m
Drilled Depth : 5.30 m

Contractor Name :
Driller :
Assistant Driller's Name :

Property : - N/A
GWMA : 603 - SYDNEY BASIN
GW Zone : -

Standing Water Level :
Salinity : (Unknown)
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARRABEEN	202
	Licensed : CUMBERLAND	NARRABEEN	202

Region : 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District :

CMA Map : 9130-1S MONA VALE
Grid Zone : 56/1
Scale : 1:25,000

Elevation :
Elevation Source : (Unknown)

Northing : 6272942
Easting : 339549
Latitude (S) : 33° 40' 17"
Longitude (E) : 151° 16' 9"

GS Map : 0055B3
MGA Zone : 56
Coordinate Source : GD.,PR. MAP

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing Brick	0.00	0.20	1346			(Unknown)

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

(No Water Bearing Zone Details Found)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.22	0.22	Loam Sandy	Loam	
0.22	5.33	5.11	Sandstone	Sandstone	

Remarks

***** End of GW014179 *****

NSW OFFICE OF WATER
Work Summary

GW014464

Converted From HYDSYS

Licence : 10BL009510

Licence Status Cancelled

Work Type : Bore open thru rock
Work Status : (Unknown)
Construct. Method : Cable Tool
Owner Type : Private

Authorised Purpose(s)	Intended Purpose(s)
DOMESTIC	IRRIGATION
ORCHARDS (GROUNDWATER)	

Commenced Date :
Completion Date : 01-Aug-1960
Final Depth : 33.50 m
Drilled Depth : 33.50 m

Contractor Name :
Driller :
Assistant Driller's Name :

Property : - N/A
GWMA : 603 - SYDNEY BASIN
GW Zone : -

Standing Water Level :
Salinity : (Unknown)
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARRABEEN	69
	Licensed : CUMBERLAND	NARRABEEN	7 25951

Region : 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District :

CMA Map : 9130-1S MONA VALE
Grid Zone : 56/1
Scale : 1:25,000

Elevation :
Elevation Source : (Unknown)

Northing : 6271365
Easting : 338534
Latitude (S) : 33° 41' 7"
Longitude (E) : 151° 15' 29"

GS Map : 0055B3
MGA Zone : 56
Coordinate Source : GD.,PR. MAP

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	Threaded Steel	-0.10	12.00	152			(Unknown)
1	1	Opening	Perforations	0.00		152		1	Mechanically Slotted; SL: 0mm; A: 0mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
6.00	6.00	0.00	Unconsolidated	3.00		0.03			(Unknown)
30.40	30.40	0.00	Consolidated	3.00		0.10			(Unknown)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	12.19	12.19	Soil Clay Water Supply	Soil	
12.19	33.52	21.33	Sandstone Water Supply	Sandstone	

Remarks

MONA VALE RD INGLESIDE

***** End of GW014464 *****

NSW OFFICE OF WATER
Work Summary

GW014465

Converted From HYDSYS

Licence :10BL011016

Licence Status Active

Work Type : Bore open thru rock
Work Status :(Unknown)
Construct. Method : Cable Tool
Owner Type : Private

Authorised Purpose(s)
DOMESTIC
FARMING

Intended Purpose(s)
GENERAL USE

Commenced Date :
Completion Date :01-Nov-1960
Final Depth : 39.00 m
Drilled Depth : 39.00 m

Contractor Name :
Driller :
Assistant Driller's Name :

Property : - N/A
GWMA :603 - SYDNEY BASIN
GW Zone : -

Standing Water Level :
Salinity : (Unknown)
Yield :

Site Details

Site Chosen By

	County	Parish	Portion/Lot DP
Form A :	CUMBERLAND	NARRABEEN	69
Licensed :	CUMBERLAND	NARRABEEN	C 25951

Region :10 - SYDNEY SOUTH COAST
River Basin :212 - HAWKESBURY RIVER
Area / District :

CMA Map :9130-1S MONA VALE
Grid Zone :56/1 **Scale :**1:25,000

Elevation :
Elevation Source :(Unknown)

Northing :6271412 **Latitude (S) :**33° 41' 6"
Easting :338454 **Longitude (E) :**151° 15' 26"

GS Map :0055B3 **MGA Zone :**56 **Coordinate Source :**GD.,PR. MAP

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing Asbestos Cement	0.00	0.90	152			Cemented

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

(No Water Bearing Zone Details Found)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	30.48	30.48	Sandstone	Sandstone	
30.48	39.01	8.53	Mudstone	Mudstone	

Remarks

LOT 7 MONA VALE RD INGLESIDE

***** End of GW014465 *****

NSW OFFICE OF WATER
Work Summary

GW014466

Converted From HYDSYS

Licence : 10BL010502 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore open thru rock	DOMESTIC	DOMESTIC
Work Status : (Unknown)		
Construct. Method : Cable Tool		
Owner Type : Private		

Commenced Date : **Final Depth :** 35.30 m
Completion Date : 01-May-1960 **Drilled Depth :** 35.40 m

Contractor Name :
Driller :
Assistant Driller's Name :

Property : - GREEN ACRES **Standing Water Level :**
GWMA : 603 - SYDNEY BASIN **Salinity :** (Unknown)
GW Zone : - **Yield :**

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARRABEEN	63
	Licensed : CUMBERLAND	NARRABEEN	PT 63

Region : 10 - SYDNEY SOUTH COAST **CMA Map :** 9130-1S MONA VALE
River Basin : 213 - SYDNEY COAST - GEORGES RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District :

Elevation : **Northing :** 6270818 **Latitude (S) :** 33° 41' 26"
Elevation Source : (Unknown) **Easting :** 340259 **Longitude (E) :** 151° 16' 36"

GS Map : 0055B3 **MGA Zone :** 56 **Coordinate Source :** GD.,PR. MAP

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing Asbestos Cement	0.00	1.50	152			Cemented

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
21.30	21.30	0.00	Consolidated	16.40		0.01			(Unknown)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	1.21	1.21	Soil	Soil	
1.21	35.35	34.14	Sandstone Water Supply	Sandstone	

Remarks

INGLESIDE RD NTH NARRABEEN

***** End of GW014466 *****

NSW OFFICE OF WATER
Work Summary

GW047779

Converted From HYDSYS

Licence :10BL110873

Licence Status Active

Work Type : Bore open thru rock
Work Status :(Unknown)
Construct. Method : Rotary Air
Owner Type : Private

Authorised Purpose(s)	**Intended Purpose(s)**
DOMESTIC	IRRIGATION
INDUSTRIAL	

Commenced Date :
Completion Date :01-Oct-1979

Final Depth : 67.00 m
Drilled Depth : 67.00 m

Contractor Name :
Driller :
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : 0-500 ppm
Yield :

Site Details

Site Chosen By	**County**	**Parish**	**Portion/Lot DP**
	Form A :CUMBERLAND	NARRABEEN	169
	Licensed :CUMBERLAND	NARRABEEN	169 752046

Region :10 - SYDNEY SOUTH COAST
River Basin :212 - HAWKESBURY RIVER
Area / District :

CMA Map :
Grid Zone :
Scale :

Elevation :
Elevation Source :(Unknown)

Northing :6271958
Easting :337854

Latitude (S) :33° 40' 48"
Longitude (E) :151° 15' 3"

GS Map :0055B3 **MGA Zone :**56

Coordinate Source :

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing P.V.C.	0.00	18.00	150			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
33.60	35.00	1.40	Consolidated	16.50		2.00			0-500 ppm

Drillers Log

From (m)	To (m)	Thickness(m	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	Soil	Soil	
1.00	9.00	8.00	Clay Soft Shale	Clay	
1.00	9.00	8.00	Sandstone	Sandstone	
9.00	33.60	24.60	Sandstone	Sandstone	
33.60	35.00	1.40	Water Supply	(Unknown)	
35.00	67.00	32.00	Sandstone	Sandstone	

Remarks

***** End of GW047779 *****

NSW OFFICE OF WATER
Work Summary

GW050971

Converted From HYDSYS

Licence : 10BL109711
Licence Status Active
Authorised Purpose(s) DOMESTIC
Intended Purpose(s) DOMESTIC

Work Type : Bore open thru rock
Work Status : Supply Obtained
Construct. Method : Cable Tool
Owner Type : Private

Commenced Date :
Completion Date : 01-Apr-1979
Final Depth : 17.00 m
Drilled Depth : 17.00 m

Contractor Name :
Driller : 1435 ISELT, John Hans
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -
Standing Water Level :
Salinity : (Unknown)
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Form A :	CUMBERLAND	NARRABEEN	L8 DP30325 (87)
Licensed :	CUMBERLAND	NARRABEEN	8 30325

Region : 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District :
CMA Map : 9130-1S MONA VALE
Grid Zone : 56/1
Scale : 1:25,000

Elevation :
Elevation Source : (Unknown)
Northing : 6272670
Easting : 339162
Latitude (S) : 33° 40' 25"
Longitude (E) : 151° 15' 54"

GS Map : 0055B3
MGA Zone : 56
Coordinate Source :

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	Welded Steel	-0.20	1.40	165			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
10.90	11.00	0.10	Consolidated	5.80		0.06			(Unknown)

Drillers Log

From (m)	To (m)	Thickness(m	Drillers Description	Geological Material	Comments
0.00	0.40	0.40	Topsoil Sandy	Topsoil	
0.40	0.80	0.40	Clay Shale	Clay	
0.80	10.90	10.10	Sandstone Yellow	Sandstone	
0.80	10.90	10.10	Ironstone Bands	Ironstone	
10.90	11.00	0.10	Sandstone Yellow Open Water Supply	Sandstone	
11.00	13.60	2.60	Sandstone Yellow	Sandstone	
13.60	17.00	3.40	Sandstone Grey	Sandstone	

Remarks

***** End of GW050971 *****

NSW OFFICE OF WATER
Work Summary

GW051799

Converted From HYDSYS

Licence : 10BL113896 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	NOT KNOWN
Work Status : Supply Obtained		
Construct. Method : Cable Tool		
Owner Type : Private		

Commenced Date : **Final Depth :** 27.50 m
Completion Date : 01-Jan-1981 **Drilled Depth :** 27.50 m

Contractor Name :
Driller :
Assistant Driller's Name :

Property : - N/A **Standing Water Level :**
GWMA : - **Salinity :** 0-500 ppm
GW Zone : - **Yield :**

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARRABEEN	179
	Licensed : CUMBERLAND	NARRABEEN	179

Region : 10 - SYDNEY SOUTH COAST **CMA Map :** 9130-1S MONA VALE
River Basin : 212 - HAWKESBURY RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District :

Elevation : **Northing :** 6271820 **Latitude (S) :** 33° 40' 52"
Elevation Source : (Unknown) **Easting :** 338166 **Longitude (E) :** 151° 15' 15"

GS Map : 0055B3 **MGA Zone :** 56 **Coordinate Source :**

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing Welded Steel	0.30	3.00	162			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
9.00	9.50	0.50	Consolidated						(Unknown)
11.00	11.50	0.50	Unconsolidated						(Unknown)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	9.00	9.00	Sandstone Multicoloured	Sandstone	
9.00	11.00	2.00	Sandstone Water Bearing	Sandstone	
11.00	27.50	16.50	Sand Silty Water Bearing	Sand	

Remarks

***** End of GW051799 *****

NSW OFFICE OF WATER
Work Summary

GW051861

Converted From HYDSYS

Licence : 10BL113891
Licence Status Active
Authorised Purpose(s) DOMESTIC
Intended Purpose(s) DOMESTIC

Work Type : Bore
Work Status : Supply Obtained
Construct. Method : Cable Tool
Owner Type : Private

Commenced Date :
Completion Date : 01-Jan-1981
Final Depth : 42.00 m
Drilled Depth : 42.00 m

Contractor Name :
Driller :
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : (Unknown)
Yield :

Site Details

Site Chosen By

	County	Parish	Portion/Lot DP
Form A :	CUMBERLAND	NARRABEEN	L52 (179)
Licensed :	CUMBERLAND	NARRABEEN	L52 (179)

Region : 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District :

CMA Map : 9130-1S MONA VALE
Grid Zone : 56/1
Scale : 1:25,000

Elevation :
Elevation Source : (Unknown)

Northing : 6271745
Easting : 338199
Latitude (S) : 33° 40' 55"
Longitude (E) : 151° 15' 16"

GS Map : 0055B3
MGA Zone : 56
Coordinate Source :

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	Threaded Steel	0.30	1.00	152			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
18.00	19.00	1.00	Unconsolidated	9.40					(Unknown)
38.00	39.00	1.00	Unconsolidated	27.50					(Unknown)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	18.00	18.00	Sandstone Coloured	Sandstone	
18.00	38.00	20.00	Sand Silty Water Bearing	Sand	
38.00	40.00	2.00	Sand Water Bearing	Sand	
40.00	42.00	2.00	Sand Silty	Sand	

Remarks

***** End of GW051861 *****

NSW OFFICE OF WATER
Work Summary

GW055934

Converted From HYDSYS

Licence :10BL121705

Licence Status Active

Work Type : Bore open thru rock
Work Status :(Unknown)
Construct. Method : Cable Tool
Owner Type : Private

Authorised Purpose(s)	**Intended Purpose(s)**
DOMESTIC	DOMESTIC

Commenced Date : **Final Depth :** 60.00 m
Completion Date :01-Dec-1981 **Drilled Depth :** 60.00 m

Contractor Name :
Driller :1441 BARRETT, Roy Max
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : Good
Yield :

Site Details

Site Chosen By	**County**	**Parish**	**Portion/Lot DP**
	Form A :CUMBERLAND	NARRABEEN	L16 (87)
	Licensed :CUMBERLAND	NARRABEEN	L16 (P+ Port 87)

Region :10 - SYDNEY SOUTH COAST
River Basin :213 - SYDNEY COAST - GEORGES RIVER
Area / District :

CMA Map :9130-1S MONA VALE
Grid Zone :56/1 **Scale :**1:25,000

Elevation :
Elevation Source :(Unknown)

Northing :6272692 **Latitude (S) :**33° 40' 25"
Easting :340320 **Longitude (E) :**151° 16' 39"

GS Map :0055B3 **MGA Zone :**56 **Coordinate Source :**

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	Threaded Steel	0.00	3.00	200			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
15.00	60.00	45.00	Consolidated	6.00		0.18			Good

Drillers Log

From (m)	To (m)	Thickness(m	Drillers Description	Geological Material	Comments
0.00	34.00	34.00	Sandstone Water Supply	Sandstone	
0.00	34.00	34.00	Clay Seams Water Supply	Clay	
34.00	60.00	26.00	Sandstone White Water Supply	Sandstone	

Remarks

***** End of GW055934 *****

NSW OFFICE OF WATER
Work Summary

GW055984

Converted From HYDSYS

Licence : 10BL121849
Licence Status Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : (Unknown)	STOCK	STOCK
Construct. Method : Cable Tool		
Owner Type : Private		

Commenced Date : **Final Depth :** 53.00 m
Completion Date : 01-Dec-1981 **Drilled Depth :** 53.00 m

Contractor Name :
Driller :
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : (Unknown)
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARRABEEN	203
	Licensed : CUMBERLAND	NARRABEEN	203

Region : 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District :

CMA Map : 9130-1S MONA VALE
Grid Zone : 56/1 **Scale :** 1:25,000

Elevation :
Elevation Source : (Unknown)

Northing : 6272867 **Latitude (S) :** 33° 40' 19"
Easting : 339776 **Longitude (E) :** 151° 16' 18"

GS Map : 0055B3 **MGA Zone :** 56 **Coordinate Source :**

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing (Unknown)	-0.30	1.70	152			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
18.00	19.00	1.00	(Unknown)						(Unknown)
26.00	27.00	1.00	(Unknown)						(Unknown)
48.00	49.00	1.00	(Unknown)						(Unknown)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	16.00	16.00	Sandstone	Sandstone	
16.00	18.00	2.00	Ironstone	Ironstone	
18.00	28.00	10.00	Sandstone Shaley Water Bearing	Sandstone	
28.00	30.00	2.00	Ironstone	Ironstone	
30.00	44.00	14.00	Sand Silty	Sand	
44.00	45.00	1.00	Ironstone	Ironstone	
45.00	53.00	8.00	Sand Silty Water Bearing	Sand	

Remarks

***** End of GW055984 *****

NSW OFFICE OF WATER
Work Summary

GW057745

Converted From HYDSYS

Licence : 10BL123454

Licence Status Lapsed

Work Type : Bore open thru rock
Work Status : (Unknown)
Construct. Method : Cable Tool
Owner Type : Private

Authorised Purpose(s)
DOMESTIC
IRRIGATION
STOCK

Intended Purpose(s)
IRRIGATION

Commenced Date :
Completion Date : 01-Sep-1982
Final Depth : 150.00 m
Drilled Depth : 150.00 m

Contractor Name :
Driller : 1435 ISELT, John Hans
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : 0-500 ppm
Yield :

Site Details

Site Chosen By

	County	Parish	Portion/Lot DP
Form A :	CUMBERLAND	NARRABEEN	L10 DP25951 (69)
Licensed :	CUMBERLAND	NARRABEEN	10 25951

Region : 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District :

CMA Map : 9130-1S MONA VALE
Grid Zone : 56/1
Scale : 1:25,000

Elevation :
Elevation Source : (Unknown)

Northing : 6271306
Easting : 338540

Latitude (S) : 33° 41' 9"
Longitude (E) : 151° 15' 29"

GS Map : 0055B3 **MGA Zone :** 56

Coordinate Source :

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	Galvinised Steel	-0.30	6.20	168			Cemented
1	1	Casing	Pressure Cemented Casing	0.00	6.20	0			(Unknown)

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
24.80	25.00	0.20	Consolidated	25.00		0.03			Fresh
145.10	146.00	0.90	Consolidated	32.00		0.27			Fresh

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.60	0.60	Topsoil	Topsoil	
0.60	0.90	0.30	Gravel Sandy	Gravel	
0.90	12.10	11.20	Sandstone Yellow Silty	Sandstone	
12.10	13.90	1.80	Sandstone Silty	Sandstone	
13.90	24.80	10.90	Sandstone Yellow Silty	Sandstone	
24.80	25.00	0.20	Sandstone Yellow Silty Open	Sandstone	
25.00	37.10	12.10	Sandstone Red Silty	Sandstone	
37.10	49.00	11.90	Sandstone Yellow Silty	Sandstone	
49.00	52.20	3.20	Sandstone Grey	Sandstone	
52.20	135.30	83.10	Sandstone Yellow	Sandstone	
135.30	138.50	3.20	Clay Sandy	Clay	
138.50	145.10	6.60	Sandstone Yellow	Sandstone	
145.10	146.00	0.90	Sandstone Yellow Open Water Supply	Sandstone	
146.00	150.00	4.00	Sandstone	Sandstone	

Remarks

***** End of GW057745 *****

NSW OFFICE OF WATER
Work Summary

GW059821

Converted From HYDSYS

Licence : 10BL151475

Licence Status Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore open thru rock	DOMESTIC	DOMESTIC
Work Status : (Unknown)	STOCK	STOCK
Construct. Method : Rotary		
Owner Type : Private		

Commenced Date : 01-Feb-1993 **Final Depth :** 116.00 m
Completion Date : 03-Feb-1993 **Drilled Depth :** 116.00 m

Contractor Name : INTERTECH DRILLING
Driller : 1489 BARDEN, Colin Leslie
Assistant Driller's Name :

Property : - SMITH
GWMA : -
GW Zone : -

Standing Water Level : 14.50 m
Salinity : 140.00 mg/L Fresh
Yield : 1.30 L/s

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARRABEEN	169
	Licensed : CUMBERLAND	NARRABEEN	169 752046

Region : 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District :

CMA Map : 9130-4S HORNSBY
Grid Zone : 56/1 **Scale :** 1:25,000

Elevation :
Elevation Source : (Unknown)

Northing : 6272001 **Latitude (S) :** 33° 40' 46"
Easting : 337729 **Longitude (E) :** 151° 14' 58"

GS Map : 0055A3 **MGA Zone :** 56 **Coordinate Source :** GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	42.00	116.00	152			Down Hole Hammer
1	1	Casing	PVC Class 9	-0.50	4.70	160			
1	1	Casing	Pressure Cemented Casing	0.00	4.70	0			(Unknown)

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
83.00	107.50	24.50		14.50		1.30	116.00		140.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
42.00	60.00	18.00	SANDSTONE/GREY F.G.		
60.00	61.00	1.00	SANDSTONE/BED SHALE		
61.00	61.20	0.20	FRACTURED		
61.20	68.00	6.80	SANDSTONE GREY F.G.		
68.00	83.00	15.00	SANDSTONE GREY SMALL FRACT./BED SHALES		
83.00	107.00	24.00	SANDSTONE COURSE OPEN GRAIN W.B.		
107.00	107.50	0.50	FRACTURED W.D.		
107.50	116.00	8.50	SANDSTONE COURSE OPEN GRAIN W.B.		

Remarks

Previous Lic No: 10BL131472 due to alteration work.

***** End of GW059821 *****

NSW OFFICE OF WATER
Work Summary

GW060293

Converted From HYDSYS

Licence :10BL127611 **Licence Status** Cancelled

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore open thru rock	IRRIGATION	IRRIGATION

Work Status :(Unknown)
Construct. Method : Cable Tool
Owner Type : Private

Commenced Date : **Final Depth :** 34.00 m
Completion Date :01-Sep-1986 **Drilled Depth :** 34.00 m

Contractor Name :
Driller :1435 ISELT, John Hans
Assistant Driller's Name :

Property : - N/A **Standing Water Level :**
GWMA : - **Salinity :** Fresh
GW Zone : - **Yield :**

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A :CUMBERLAND	NARRABEEN	L2 DP52208 (139)
	Licensed :CUMBERLAND	NARRABEEN	LT11 DP52208 PT139

Region :10 - SYDNEY SOUTH COAST **CMA Map :**9130-4S HORNSBY
River Basin :212 - HAWKESBURY RIVER **Grid Zone :**56/1 **Scale :**1:25,000
Area / District :

Elevation : **Northing :**6271542 **Latitude (S) :**33° 41' 1"
Elevation Source :(Unknown) **Easting :**337892 **Longitude (E) :**151° 15' 4"

GS Map :0055B3 **MGA Zone :**56 **Coordinate Source :**GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing Welded Steel	-0.20	4.40	168			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
29.20	30.30	1.10	Consolidated	18.00		1.10			Fresh

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	1.40	1.40	Soil Sandy	Soil	
1.40	3.60	2.20	Sandstone Yellow	Sandstone	
1.40	3.60	2.20	Clay Layer	Clay	
3.60	29.20	25.60	Sandstone Grey	Sandstone	
29.20	30.30	1.10	Sandstone Grey Coarse Water Supply	Sandstone	
30.30	34.00	3.70	Sandstone Grey	Sandstone	

Remarks

***** End of GW060293 *****

NSW OFFICE OF WATER
Work Summary

GW060467

Converted From HYDSYS

Licence :10BL122807

Licence Status Active

Work Type : Bore open thru rock
Work Status :(Unknown)
Construct. Method :(Unknown)
Owner Type : Private

Authorised Purpose(s)
DOMESTIC
IRRIGATION
STOCK

Intended Purpose(s)
IRRIGATION

Commenced Date :
Completion Date :01-Jan-1982

Final Depth : 130.10 m
Drilled Depth : 0.00

Contractor Name :
Driller :
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : (Unknown)
Yield :

Site Details

Site Chosen By

	County	Parish	Portion/Lot DP
Form A :	CUMBERLAND	NARRABEEN	L14 DP12115 (81)
Licensed :	CUMBERLAND	NARRABEEN	15 12115

Region :10 - SYDNEY SOUTH COAST
River Basin :213 - SYDNEY COAST - GEORGES RIVER
Area / District :

CMA Map :9130-1S MONA VALE
Grid Zone :56/1 **Scale :**1:25,000

Elevation :
Elevation Source :(Unknown)

Northing :6271903 **Latitude (S) :**33° 40' 50"
Easting :339251 **Longitude (E) :**151° 15' 57"

GS Map :0055B3 **MGA Zone :**56 **Coordinate Source :**GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing Asbestos Cement	0.00	9.10	152			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

(No Water Bearing Zone Details Found)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments

Remarks

***** End of GW060467 *****

NSW OFFICE OF WATER
Work Summary

GW061466

Converted From HYDSYS

Licence :10BL133892 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC

Work Status :(Unknown)
Construct. Method :(Unknown)
Owner Type : Private

Commenced Date : **Final Depth :** 76.20 m
Completion Date :01-Jan-1983 **Drilled Depth :** 0.00

Contractor Name :
Driller :
Assistant Driller's Name :

Property : - N/A **Standing Water Level :**
GWMA : - **Salinity :** (Unknown)
GW Zone : - **Yield :**

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A :CUMBERLAND	NARRABEEN	61
	Licensed :CUMBERLAND	NARRABEEN	3

Region :10 - SYDNEY SOUTH COAST **CMA Map :**9130-1S MONA VALE
River Basin :212 - HAWKESBURY RIVER **Grid Zone :**56/1 **Scale :**1:25,000
Area / District :

Elevation : **Northing :**6272709 **Latitude (S) :**33° 40' 24"
Elevation Source :(Unknown) **Easting :**339495 **Longitude (E) :**151° 16' 7"

GS Map :0055B3 **MGA Zone :**56 **Coordinate Source :**GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	P.V.C.	0.00	0.00	152			(Unknown)

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

(No Water Bearing Zone Details Found)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments

Remarks

***** End of GW061466 *****

NSW OFFICE OF WATER
Work Summary

GW062272

Converted From HYDSYS

Licence :10BL143759

Licence Status Active

Work Type : Bore open thru rock
Work Status :(Unknown)
Construct. Method :(Unknown)
Owner Type : Private

Authorised Purpose(s)	**Intended Purpose(s)**
DOMESTIC	IRRIGATION
STOCK	

Commenced Date :
Completion Date :

Final Depth : 114.00 m
Drilled Depth : 0.00

Contractor Name :
Driller :
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : (Unknown)
Yield :

Site Details

Site Chosen By	**County**	**Parish**	**Portion/Lot DP**
	Form A :CUMBERLAND	NARRABEEN	81
	Licensed :CUMBERLAND	NARRABEEN	PT81

Region :10 - SYDNEY SOUTH COAST
River Basin :213 - SYDNEY COAST - GEORGES RIVER
Area / District :

CMA Map :9130-1S MONA VALE
Grid Zone :56/1 **Scale :**1:25,000

Elevation :
Elevation Source :(Unknown)

Northing :6271592 **Latitude (S) :**33° 41' 0"
Easting :339076 **Longitude (E) :**151° 15' 50"

GS Map :0055B3 **MGA Zone :**56 **Coordinate Source :**GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing (Unknown)	0.00	0.00	150			(Unknown)

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

(No Water Bearing Zone Details Found)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments

Remarks

***** End of GW062272 *****

NSW OFFICE OF WATER
Work Summary

GW063622

Converted From HYDSYS

Licence :10BL135164
Licence Status Active
Work Type : Bore
Work Status :(Unknown)
Construct. Method : Cable Tool
Owner Type : Private

Authorised Purpose(s)	Intended Purpose(s)
DOMESTIC	DOMESTIC

Commenced Date : **Final Depth :** 46.00 m
Completion Date :01-Sep-1986 **Drilled Depth :** 46.00 m

Contractor Name :
Driller :1435 ISELT, John Hans
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : Fresh
Yield :

Site Details

Site Chosen By

	County	Parish	Portion/Lot DP
Form A :	CUMBERLAND	NARRABEEN	L2 DP30325 (87)
Licensed :	CUMBERLAND	NARRABEEN	2 30325

Region :10 - SYDNEY SOUTH COAST
River Basin :212 - HAWKESBURY RIVER
Area / District :

CMA Map :9130-1S MONA VALE
Grid Zone :56/1 **Scale :**1:25,000

Elevation :
Elevation Source :(Unknown)

Northing :6273154 **Latitude (S) :**33° 40' 10"
Easting :340363 **Longitude (E) :**151° 16' 41"

GS Map :0055B3 **MGA Zone :**56 **Coordinate Source :**GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	Steel	-0.30	6.20	168			Cemented
1	1	Casing	Pressure Cemented Casing	0.00	6.20	168			(Unknown)

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
22.30	22.60	0.30	Consolidated	20.00		0.10			Fresh
37.20	37.80	0.60	Consolidated	9.00		0.30			Fresh

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.80	0.80	Soil Sandy	Soil	
0.80	1.60	0.80	Clay Sandy Gravel	Clay	
1.60	2.90	1.30	Shale	Shale	
2.90	46.00	43.10	Sandstone Yellow	Sandstone	

Remarks

***** End of GW063622 *****

NSW OFFICE OF WATER
Work Summary

GW064440

Converted From HYDSYS

Licence :10BL138571
Licence Status Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status :(Unknown)	STOCK	STOCK
Construct. Method : Rotary Air		
Owner Type : Private		

Commenced Date : **Final Depth :** 150.00 m
Completion Date :01-Nov-1988 **Drilled Depth :** 0.00

Contractor Name :
Driller :
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : (Unknown)
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A :CUMBERLAND	NARRABEEN	L1 DP213794 (83)
	Licensed :CUMBERLAND	NARRABEEN	LT1 DP213794

Region :10 - SYDNEY SOUTH COAST
River Basin :212 - HAWKESBURY RIVER
Area / District :

CMA Map :9130-1S MONA VALE
Grid Zone :56/1 **Scale :**1:25,000

Elevation :
Elevation Source :(Unknown)

Northing :6271952 **Latitude (S) :**33° 40' 48"
Easting :338477 **Longitude (E) :**151° 15' 27"

GS Map :0055B3 **MGA Zone :**56 **Coordinate Source :**GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	Steel	0.00	33.00	168			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
84.00	90.00	6.00	Consolidated			0.20			(Unknown)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments

Remarks

PUMP TEST DATA SUSPECT

***** End of GW064440 *****

NSW OFFICE OF WATER
Work Summary

GW064441

Licence : 10BL160105
Licence Status Active

	Authorised Purpose(s)	Intended Purpose(s)
	INDUSTRIAL	INDUSTRIAL
	RECREATION (GROUNDWATER)	RECREATION (GROUNDWATER)

Work Type : Bore
Work Status : Supply Obtained
Construct. Method : Down Hole Hammer
Owner Type : Private

Commenced Date : 23-Aug-1990 **Final Depth :** 150.00 m
Completion Date : 18-Sep-1990 **Drilled Depth :** 150.00 m

Contractor Name : INTERTECH DRILLING
Driller : 1466 FERGUSON, Gary
Assistant Driller's Name :

Property : - HAMAZKAINE
GWMA : -
GW Zone : -

Standing Water Level : 31.90 m
Salinity : Good
Yield : 1.25 L/s Cumulative

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARRABEEN	1//808703
	Licensed : CUMBERLAND	NARRABEEN	1 808703

Region : 10 - SYDNEY SOUTH COAST
River Basin :
Area / District :

CMA Map :
Grid Zone :
Scale :

Elevation :
Elevation Source :

Northing : 6272134
Easting : 338950

Latitude (S) : 33° 40' 43"
Longitude (E) : 151° 15' 46"

GS Map :
MGA Zone : 56
Coordinate Source :

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	150.00	152			Down Hole Hammer
1	1	Casing	Steel	-0.50	6.50	168.3	158.7		C: .5-6.5m; Seated on Bottom

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
84.00	86.00	2.00				0.02	86.00		
120.00	150.00	30.00				1.23	150.00		

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	6.00	6.00	SANDSTONE	Sandstone	
6.00	9.00	3.00	SANDSTONE /FINE CLAY	Sandstone	
9.00	21.00	12.00	BROWN SANDSTONE,SILT AND CLAY	Sandstone	
21.00	24.00	3.00	BLACK SANDSTONE,SILT AND CLAY	Sandstone	
24.00	48.00	24.00	RED SANDSTONE,IRON AND CLAY	Sandstone	
48.00	87.00	39.00	PINK SANDSTONE, SILT AND CLAY	Sandstone	
87.00	96.00	9.00	RED SANDSTONE,IRON AND CLAY	Sandstone	
96.00	99.00	3.00	DARK GREY SHALE AND CLAY	Shale	
99.00	117.00	18.00	PALE PINK SANDSTONE AND CLAY	Sandstone	
117.00	150.00	33.00	WHITE SANDSTONE AND CLAY	Sandstone	

Remarks

PREVIOUS LIC NO: 10BL141627

***** End of GW064441 *****

NSW OFFICE OF WATER
Work Summary

GW064442

Converted From HYDSYS

Licence : 10BL160104
Licence Status Active

Work Type : Bore
Work Status : Supply Obtained
Construct. Method : Rotary Air
Owner Type : Private

Authorised Purpose(s)	Intended Purpose(s)
INDUSTRIAL	INDUSTRIAL
RECREATION (GROUNDWATER)	RECREATION (GROUNDWATER)

Commenced Date :
Completion Date : 01-Nov-1988
Final Depth : 115.00 m
Drilled Depth : 115.00 m

Contractor Name :
Driller :
Assistant Driller's Name :

Property : - HAMAZKAINE
GWMA : -
GW Zone : -

Standing Water Level : 45.00 m
Salinity : Good
Yield : 0.30 L/s

Site Details

Site Chosen By

	County	Parish	Portion/Lot DP
Form A :	CUMBERLAND	NARRABEEN	LT 1 DP 808703
Licensed :	CUMBERLAND	NARRABEEN	1 808703

Region : 10 - SYDNEY SOUTH COAST
River Basin : 212 - HAWKESBURY RIVER
Area / District :

CMA Map : 9130-1S MONA VALE
Grid Zone : 56/1
Scale : 1:25,000

Elevation :
Elevation Source : (Unknown)

Northing : 6272107
Easting : 338526
Latitude (S) : 33° 40' 43"
Longitude (E) : 151° 15' 29"

GS Map : 0055B3
MGA Zone : 56
Coordinate Source : GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing P.V.C.	0.00	13.00	168			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
90.00	115.00	25.00	(Unknown)	45.00		0.30			Good

Drillers Log

From (m)	To (m)	Thickness(m	Drillers Description	Geological Material	Comments
0.00	3.00	3.00	Gravel	Gravel	
3.00	100.00	97.00	Sandstone Water Supply	Sandstone	
100.00	115.00	15.00	Shale Water Supply	Shale	

Remarks

PREVIOUS LIC NO: 10BL138709

***** End of GW064442 *****

NSW OFFICE OF WATER
Work Summary

GW068615

Licence : 10BL141903 **Licence Status** Active

Authorised Purpose(s) DOMESTIC **Intended Purpose(s)**

Work Type : Bore
Work Status : (Unknown)
Construct. Method : Rotary
Owner Type :

Commenced Date : 10-Feb-1981 **Final Depth :** 125.00 m
Completion Date : 17-Feb-1981 **Drilled Depth :** 125.00 m

Contractor Name : SLADE DRILLING
Driller : SLADE, W.E.
Assistant Driller's Name :

Property : - WILLCOCKS **Standing Water Level :** 15.50 m
GWMA : - **Salinity :**
GW Zone : - **Yield :** 0.45 L/s

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Form A :	CUMBERLAND	NARRABEEN	174//752046
Licensed :	CUMBERLAND	NARRABEEN	174 752046

Region : 10 - SYDNEY SOUTH COAST **CMA Map :**
River Basin : **Grid Zone :** **Scale :**
Area / District :

Elevation : **Northing :** 6272464 **Latitude (S) :** 33° 40' 32"
Elevation Source : **Easting :** 338486 **Longitude (E) :** 151° 15' 28"

GS Map : **MGA Zone :** 56 **Coordinate Source :**

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	125.00	155			Rotary
1	1	Casing	P.V.C.	0.00	12.00	155			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
5.00	6.00	1.00				0.06	9.00		
91.00	93.00	2.00				0.16	94.00		
99.00	100.00	1.00		0.00		0.08	101.00		
114.00	116.00	2.00		15.50		0.15	125.00		

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	SOIL		
2.00	27.00	25.00	SOFT MUDSTONE AND SHALE		
27.00	107.00	80.00	HARD SANDSTONE		
107.00	109.00	2.00	SHALE		
109.00	125.00	16.00	SANDSTONE		

Remarks

***** End of GW068615 *****

NSW OFFICE OF WATER
Work Summary

GW100017

Licence : 10BL153221
Licence Status Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : (Unknown)	IRRIGATION	IRRIGATION
Construct. Method : Other	STOCK	STOCK
Owner Type :		

Commenced Date : **Final Depth :** 151.00 m
Completion Date : 23-Oct-1993 **Drilled Depth :** 151.00 m

Contractor Name : INTERTECH DRILLING
Driller : 1489 BARDEN, Colin Leslie
Assistant Driller's Name :

Property : - SANTA MULE
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : 200.00 mg/L
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARELLAN	38 12115
	Licensed : CUMBERLAND	NARRABEEN	38 12115

Region : 10 - SYDNEY SOUTH COAST
River Basin :
Area / District :

CMA Map :
Grid Zone :
Scale :

Elevation :
Elevation Source :

Northing : 6271502
Easting : 339206
Latitude (S) : 33° 41' 3"
Longitude (E) : 151° 15' 55"

GS Map :
MGA Zone : 56
Coordinate Source :

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type		From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	6.00	203			Rotary Air
1		Hole	Hole	6.00	151.00	156			Rotary Air
1	1	Casing	Steel	-0.50	6.50				C: 0-6m; Seated on Bottom

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
12.50	13.00	0.50					6.00		150.00
60.00	80.00	20.00				0.25	6.00		200.00
99.00	104.00	5.00				0.05	6.00		200.00
139.00	150.00	11.00		62.00		0.10	6.00		

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	OVERBURDEN & FILLING		
2.00	3.50	1.50	ORANGE MED. GRAIN S.S.		
3.50	3.80	0.30	WHITE CLAY BAND		
3.80	5.00	1.20	ORANGE & WHITE MED. GRAIN S.S.		
5.00	41.00	36.00	WHITE S.S. & BED CLAY		
41.00	41.20	0.20	SMALL CAVITY		
41.20	50.00	8.80	WHITE S.S. & BED SHALE		
50.00	51.00	1.00	WHITE S.S. & BED SHALE		
51.00	51.50	0.50	SHALE BANDS		
51.50	60.00	8.50	WHITE S.S. & BED SHALE		
60.00	80.00	20.00	WHITE OPEN S.S. & WATER BEARING		
80.00	99.00	19.00	WHITE/ORANGE S.S. CLAY IN MATRIX		
99.00	99.20	0.20	SMALL CAVITY		
99.20	104.00	4.80	WHITE S.S. & BED SHALE		
104.00	112.00	8.00	WHITE GREY S.S. MED. GRAIN		
112.00	115.00	3.00	WHITE S.S. & BED SHALE		
115.00	132.00	17.00	WHITE L.G.S.S. WITH SMALL FRACTURED		
132.00	137.00	5.00	WHITE S.S. OPEN WATER BEARING		
137.00	139.00	2.00	WHITE S.S. & BED SHALE		
139.00	151.00	12.00	WHITE S.S. MED. GRAIN		
151.00	151.00	0.00	E.O.H.		

Remarks

***** End of GW100017 *****

NSW OFFICE OF WATER
Work Summary

GW100648

Licence : 10BL157628
Licence Status Active

Authorised Purpose(s)	**Intended Purpose(s)**
DOMESTIC	DOMESTIC
	STOCK

Work Type : Bore
Work Status : (Unknown)
Construct. Method : Rot. Rev. Circ. Air
Owner Type :

Commenced Date : **Final Depth :** 120.00 m
Completion Date : 13-May-1996 **Drilled Depth :** 120.00 m

Contractor Name : J.H. ISELT
Driller : 1435 ISELT, John Hans
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : Fresh
Yield :

Site Details

Site Chosen By	**County**	**Parish**	**Portion/Lot DP**
Driller	**Form A :** CUMBERLAND	NARRABEEN	2//595804
	Licensed : CUMBERLAND	NARRABEEN	2 595804

Region : 10 - SYDNEY SOUTH COAST
River Basin :
Area / District :

CMA Map :
Grid Zone :
Scale :

Elevation :
Elevation Source :

Northing : 6273489
Easting : 339622

Latitude (S) : 33° 39' 59"
Longitude (E) : 151° 16' 13"

GS Map :
MGA Zone : 56
Coordinate Source :

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	120.00	150			Rotary
1	1	Casing	P.V.C.	-0.30	3.00	160			C: 0-3m; Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
59.50	59.70	0.20		30.00	120.00	0.12	120.00	1.00	Fresh

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.30	0.30	Topsoil		
0.30	1.50	1.20	Sandstone Yellow		
1.50	3.50	2.00	Sandstone White		
3.50	59.50	56.00	Sandstone Yellow		
59.50	59.70	0.20	Sandstone Yellow (W.B.)		
59.70	65.00	5.30	Sandstone Yellow		
65.00	120.00	55.00	Shale		

Remarks

***** End of GW100648 *****

NSW OFFICE OF WATER
Work Summary

GW100838

Licence : 10BL157556
Licence Status Active

Authorised Purpose(s)	**Intended Purpose(s)**
DOMESTIC	DOMESTIC
	STOCK

Work Type : Bore
Work Status : (Unknown)
Construct. Method : Rotary
Owner Type :

Commenced Date : **Final Depth :** 90.50 m
Completion Date : 27-Mar-1996 **Drilled Depth :** 90.50 m

Contractor Name : INTERTECH DRILLING
Driller : 1648 AULD, Richard
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : 100.00 mg/L
Yield :

Site Details

Site Chosen By		**County**	**Parish**	**Portion/Lot DP**
Client	Driller	**Form A :** CUMBERLAND	NARRABEEN	13//803203
		Licensed : CUMBERLAND	NARRABEEN	13 803203

Region : 10 - SYDNEY SOUTH COAST
River Basin :
Area / District :

CMA Map :
Grid Zone :
Scale :

Elevation :
Elevation Source :

Northing : 6272390
Easting : 339276

Latitude (S) : 33° 40' 35"
Longitude (E) : 151° 15' 58"

GS Map :
MGA Zone : 56
Coordinate Source :

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	1.30	210			Rotary
1		Hole	Hole	1.30	10.80	210			Rotary
1		Hole	Hole	10.80	90.50	158			Rotary
1	1	Casing	Steel	-1.00	11.00	168.3	158.7		C: -.1-10.8m; Welded; Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
35.50	40.50	5.00				0.10	42.50	0.25	80.00
60.30	65.80	5.50				0.40	66.50	0.25	80.00
78.00	78.70	0.70				0.20	78.50	0.25	100.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.80	0.80	SANDY LOAM		
0.80	1.30	0.50	GREY CLAY		
1.30	26.50	25.20	SANDSTONE BROWN/GREY BANDS CLAY MATRIX		
26.50	27.40	0.90	GREY CLAY		
27.40	28.50	1.10	IRON STONE		
28.50	29.50	1.00	SANDSTONE, GREY, QUARTZ MATRIX		
29.50	30.00	0.50	IRONSTONE		
30.00	30.60	0.60	GREY MUDSTONE		
30.60	35.50	4.90	SANDSTONE; LT GREY, CLAY MATRIX		
35.50	40.50	5.00	SANDSTONE, BWN, QUARTZ MAT		
40.50	49.70	9.20	SANDSTONE; LT GREY, CLAY MATRIX		
49.70	51.10	1.40	IRONSTONE		
51.10	59.20	8.10	SANDSTONE; LT. GREY, COARSE GRAIN		
59.20	60.30	1.10	IRONSTONE		
60.30	65.80	5.50	SANDSTONE LT.GREY, PEBBLY QUARTZ MATRIX		
65.80	71.50	5.70	SANDSTONE LT. GREY C.G.		
71.50	71.90	0.40	GREY MUDSTONE		
71.90	78.70	6.80	SANDSTONE, LT. BWN, NARROW QUARTZ BANDS		
78.70	80.90	2.20	IRONSTONE		
80.90	82.30	1.40	SANDSTONE LT GREY, QUARTZ MATRIX		
82.30	86.40	4.10	SANDSTONE; LT GREY C.G.		
86.40	90.50	4.10	BANDED SANDSTONE - IRONSTONE, SOFT & FRACTURED		

Remarks

***** End of GW100838 *****

NSW OFFICE OF WATER
Work Summary

GW101494

Licence : 10BL158124 **Licence Status** Cancelled

	Authorised Purpose(s)	Intended Purpose(s)
	RECREATION (GROUNDWATER)	IRRIGATION

Work Type : Bore
Work Status : (Unknown)
Construct. Method : Rotary
Owner Type :

Commenced Date : **Final Depth :** 140.00 m
Completion Date : 29-Aug-1997 **Drilled Depth :** 140.00 m

Contractor Name : B.B. DRILLING
Driller : 1649 BARRETT, Michael Gerard
Assistant Driller's Name :

Property : - N/A **Standing Water Level :**
GWMA : - **Salinity :**
GW Zone : - **Yield :**

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARRABEEN	2//525908
	Licensed : CUMBERLAND	NARRABEEN	2 525908

Region : 10 - SYDNEY SOUTH COAST **CMA Map :**
River Basin : **Grid Zone :** **Scale :**
Area / District :

Elevation : **Northing :** 6270626 **Latitude (S) :** 33° 41' 32"
Elevation Source : **Easting :** 340256 **Longitude (E) :** 151° 16' 35"

GS Map : **MGA Zone :** 56 **Coordinate Source :**

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	140.00	150			Percussion
1	1	Casing	Steel	0.00	3.00	150			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
14.90	120.00	105.10		14.90	110.00	0.20	140.00	8.00	Good

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	60.00	60.00	SANDSTONE, DARK GREY		
60.00	120.00	60.00	SANDSTONE, WHITE		
120.00	140.00	20.00	SHALE, DARK GREY		

Remarks

Form A Remarks:
COMMENT IN COMPLETION DETAILS. "OPEN HOLE"

***** End of GW101494 *****

NSW OFFICE OF WATER
Work Summary

GW101503

Licence : 10BL158708 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	INDUSTRIAL	INDUSTRIAL
Work Status : Supply Obtained		
Construct. Method : Cable Tool		
Owner Type : Private		

Commenced Date : **Final Depth :** 46.00 m
Completion Date : 08-Feb-1984 **Drilled Depth :** 46.00 m

Contractor Name : J.H. ISELT
Driller : 986 ISELT, John Hans
Assistant Driller's Name :

Property : - SMITH **Standing Water Level :** 14.00 m
GWMA : - **Salinity :** Fresh
GW Zone : - **Yield :** 1.25 L/s

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARRABEEN	169 752046
	Licensed : CUMBERLAND	NARRABEEN	169 752046

Region : 10 - SYDNEY SOUTH COAST **CMA Map :**
River Basin : **Grid Zone :** **Scale :**
Area / District :

Elevation : **Northing :** 6272001 **Latitude (S) :** 33° 40' 46"
Elevation Source : **Easting :** 337755 **Longitude (E) :** 151° 14' 59"

GS Map : **MGA Zone :** 56 **Coordinate Source :** GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	46.00	152			Percussion
1	1	Casing	P.V.C.	-0.50	4.70				C: 0-4.7m; Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
12.10	12.40	0.30		8.00	16.00	0.19	16.00		Fresh
30.80	31.30	0.50		14.00	17.00	1.25	46.00		Fresh

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	2.10	2.10	SANDY GRAVEL	Gravel	
2.10	8.50	6.40	YELLOW SANDSTONE	Sandstone	
8.50	9.30	0.80	GREY SANDSTONE	Sandstone	
9.30	12.10	2.80	YELLOW SANDSTONE	Sandstone	
12.10	12.40	0.30	GREY SANDSTONE(OPEN AND W.B.)	Sandstone	
12.40	30.30	17.90	GREY SANDSTONE	Sandstone	
30.30	30.80	0.50	SHALE	Shale	
30.80	31.30	0.50	GREY SANDSTONE(COARSE OPEN & W.B.	Sandstone	
31.30	36.40	5.10	GREY SANDSTONE	Sandstone	
36.40	36.70	0.30	SHALE	Shale	
36.70	46.00	9.30	GREY SANDSTONE	Sandstone	

Remarks

Form A Remarks:
13 STAGE GRUNDFOR SUBMERSIBLE 415 VOLT 3 PHASE 1 1/2 INCH DIAMETER DELIVERY PUMP

***** End of GW101503 *****

NSW OFFICE OF WATER
Work Summary

GW101504

Licence : 10BL158707 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	INDUSTRIAL	INDUSTRIAL

Work Status : Supply Obtained
Construct. Method : Rotary
Owner Type : Private

Commenced Date : **Final Depth :** 48.00 m
Completion Date : 09-Feb-1993 **Drilled Depth :** 48.00 m

Contractor Name : INTERTECH DRILLING
Driller : 1489 BARDEN, Colin Leslie
Assistant Driller's Name :

Property : - SMITH **Standing Water Level :**
GWMA : - **Salinity :** 180.00 mg/L
GW Zone : - **Yield :** 1.60 L/s

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARRABEEN	LT 169 DP 752046
	Licensed : CUMBERLAND	NARRABEEN	169 752046

Region : 10 - SYDNEY SOUTH COAST **CMA Map :**
River Basin : **Grid Zone :** **Scale :**
Area / District :

Elevation : **Northing :** 6271942 **Latitude (S) :** 33° 40' 48"
Elevation Source : **Easting :** 337859 **Longitude (E) :** 151° 15' 3"

GS Map : **MGA Zone :** 56 **Coordinate Source :** GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	40.00	152			Down Hole Hammer
1	1	Casing	Steel	-0.60	9.60				C: 0-9.6m; Seated on Bottom

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
35.00	35.30	0.30		24.00		1.60	48.00		180.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	3.00	3.00	TOPSOIL AND CLAY	Topsoil	
3.00	9.00	6.00	CLAY AND SANDSTONE	Clay	
9.00	24.00	15.00	SANDSTONE,F.G.GREY. SMALL AMT CLAY	Sandstone	
24.00	36.00	12.00	SANDSTONE AND QUARTZ. LOT OF CLAY	Sandstone	
36.00	36.30	0.30	FRACTURE W.B. W.B 1.5 L/PS	Invalid Code	
36.30	48.00	11.70	SANDSTONE AND QURTZ. OPEN GRAIN	Sandstone	

Remarks

***** End of GW101504 *****

NSW OFFICE OF WATER
Work Summary

GW101751

Licence : 10BL158944 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : (Unknown)	STOCK	STOCK
Construct. Method : Rotary Air		
Owner Type :		

Commenced Date : **Final Depth :** 132.00 m
Completion Date : 01-Feb-1999 **Drilled Depth :** 132.00 m

Contractor Name : INTERTECH
Driller : 1736 MILGATE, Dean John
Assistant Driller's Name :

Property : - N/A **Standing Water Level :** 36.00 m
GWMA : - **Salinity :** 102.00 mg/L
GW Zone : - **Yield :** 1.80 L/s

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
Client	Driller	**Form A :** CUMBERLAND	NARRABEEN	1//596295
		Licensed : CUMBERLAND	NARRABEEN	1 596295

Region : 10 - SYDNEY SOUTH COAST **CMA Map :**
River Basin : **Grid Zone :** **Scale :**
Area / District :

Elevation : **Northing :** 6272483 **Latitude (S) :** 33° 40' 32"
Elevation Source : **Easting :** 339433 **Longitude (E) :** 151° 16' 5"

GS Map : **MGA Zone :** 56 **Coordinate Source :**

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.60	210			Rotary Air
1		Hole	Hole	5.60	132.00	159			Rotary Air
1	1	Casing	Steel	-0.40	5.60	168.3	158.7		C: 0-5.6m; Driven into Hole
1	1	Casing	PVC Class 9	-0.40	53.60	140			Screwed and Glued; Suspended in Clamps
1	1	Opening	Slots - Vertical	46.00	49.00	140			PVC Class 9; Sawn; SL: 100mm; A: 4mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
46.00	49.00	3.00				0.10	54.00	0.25	90.00
74.50	75.00	0.50				0.60	78.00	0.25	96.00
112.50	113.00	0.50				0.30	114.00	0.25	109.00
123.00	123.50	0.50				0.80	132.00	0.50	102.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	Fill	Fill	
2.00	6.50	4.50	Grey Sandstone M.G.	Sandstone	
6.50	7.00	0.50	Grey Clay	Clay	
7.00	18.00	11.00	Weathered Sandstone	Sandstone	
18.00	24.00	6.00	Sandstone and Quartz	Sandstone	
24.00	25.00	1.00	Grey Clay	Clay	
25.00	40.00	15.00	Grey Sandstone M.G.	Sandstone	
40.00	40.50	0.50	Grey Clay	Clay	
40.50	45.00	4.50	Grey Sandstone M.G.	Sandstone	
45.00	46.00	1.00	Grey Clay	Clay	
46.00	49.00	3.00	Sandstone and Quartz, Fractured	Sandstone	
49.00	51.00	2.00	Ironstone	Ironstone	
51.00	60.00	9.00	Sandstone and Quartz	Sandstone	
60.00	74.50	14.50	Grey Sandstone M.G.	Sandstone	
74.50	75.00	0.50	Sandstone and Quartz, Fractured	Sandstone	
75.00	90.00	15.00	White Sandstone M.G.	Sandstone	
90.00	92.00	2.00	Ironstone	Ironstone	
92.00	112.50	20.50	White Sandstone M.G.	Sandstone	
112.50	113.00	0.50	Sandstone and Quartz, Fractured	Sandstone	
113.00	123.00	10.00	White Sandstone M.G.	Sandstone	
123.00	123.50	0.50	Sandstone and Quartz, Fractured	Sandstone	
123.50	132.00	8.50	Grey Sandstone M.G.	Sandstone	

Remarks

***** End of GW101751 *****

NSW OFFICE OF WATER
Work Summary

GW103073

Licence : 10BL159597 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : (Unknown)	STOCK	STOCK
Construct. Method : Rotary Air		
Owner Type :		

Commenced Date : **Final Depth :** 150.00 m
Completion Date : 29-Mar-2000 **Drilled Depth :** 150.00 m

Contractor Name : INTERTECH
Driller : 1737 READY, Mark Edward
Assistant Driller's Name :

Property : - N/A **Standing Water Level :**
GWMA : - **Salinity :** 140.00 mg/L
GW Zone : - **Yield :**

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
Client	Driller	**Form A :** CUMBERLAND	NARRABEEN	255//752046
		Licensed : CUMBERLAND	NARRABEEN	232

Region : 10 - SYDNEY SOUTH COAST **CMA Map :**
River Basin : **Grid Zone :** **Scale :**
Area / District :

Elevation : **Northing :** 6272593 **Latitude (S) :** 33° 40' 28"
Elevation Source : **Easting :** 339163 **Longitude (E) :** 151° 15' 54"

GS Map : **MGA Zone :** 56 **Coordinate Source :**

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.60	210			Down Hole Hammer
1		Hole	Hole	5.60	150.00	158			Down Hole Hammer
1	1	Casing	Steel	-0.40	5.60	168.3	158.7		C: -.1-5.6m; Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
81.00	82.00	1.00		43.00		0.50	84.00	1.00	140.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.50	0.50	SANDY LOAM	Loam	
0.50	3.50	3.00	YELLOW SANDSTONE M.G.	Sandstone	
3.50	16.00	12.50	WHITE SANDSTONE M.G.	Sandstone	
16.00	16.20	0.20	IRONSTONE	Ironstone	
16.20	24.00	7.80	YELLOW SANDSTONE WITH IRON	Sandstone	
24.00	30.00	6.00	WHITE SANDSTONE M.G	Sandstone	
30.00	46.00	16.00	LT GREY SANDSTONE M.G.	Sandstone	
46.00	46.50	0.50	IRONSTONE	Ironstone	
46.50	59.00	12.50	YELLOW SANDSTONE M.G.	Sandstone	
59.00	62.00	3.00	WHITE SANDSTONE M.G.	Sandstone	
62.00	73.00	11.00	LT GREY SANDSTONE M.G.	Sandstone	
73.00	73.50	0.50	IRONSTONE	Ironstone	
73.50	82.00	8.50	LT GREY SANDSTONE/QUARTZ BANDS	Sandstone	
82.00	82.30	0.30	IRONSTONE	Ironstone	
82.30	85.00	2.70	PINK TO WHITE SANDSTONE M.G.	Sandstone	
85.00	135.00	50.00	LT GREY SANDSTONE M.G.	Sandstone	
135.00	150.00	15.00	LT TO DARK GREY SANDSTONE M.G.	Sandstone	

Remarks

***** End of GW103073 *****

NSW OFFICE OF WATER
Work Summary

GW103160

Licence : 10BL159765
Licence Status Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : (Unknown)	STOCK	STOCK
Construct. Method : Rotary Air		
Owner Type :		

Commenced Date : **Final Depth :** 120.50 m
Completion Date : 03-Aug-2000 **Drilled Depth :** 120.50 m

Contractor Name : INTERTECH
Driller : 1783 CRUMP, William
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : 145.00 mg/L
Yield :

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
Client	Driller	**Form A :** CUMBERLAND	NARRABEEN	1831//812302
		Licensed : CUMBERLAND	NARRABEEN	1831 812302

Region : 10 - SYDNEY SOUTH COAST
River Basin :
Area / District :

CMA Map :
Grid Zone :
Scale :

Elevation :
Elevation Source :

Northing : 6271548
Easting : 338282

Latitude (S) : 33° 41' 1"
Longitude (E) : 151° 15' 19"

GS Map :
MGA Zone : 56
Coordinate Source :

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	9.00	205			Rotary Air
1		Hole	Hole	9.00	11.50	210			Down Hole Hammer
1		Hole	Hole	11.50	120.50	155			Down Hole Hammer
1	1	Casing	Steel	-0.40	11.60	168.3	158.7		C: -.1-11.6m; Welded; Driven into Hole
1	1	Casing	P.V.C.	-0.40	17.50	140			Suspended in Clamps
1	1	Opening	Slots - Vertical	15.50	17.50	140			PVC Class 9; Sawn; SL: .1mm; A: 4mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
15.00	18.00	3.00				0.30	18.00	0.25	153.00
105.00	107.00	2.00				0.05	108.00	0.25	145.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	9.00	9.00	FILL	Fill	
9.00	14.00	5.00	SANDSTONE GREY	Sandstone	
14.00	15.00	1.00	SANDSTONE / CLAY	Sandstone	
15.00	18.00	3.00	SANDSTONE / QUARTZ	Sandstone	
18.00	20.00	2.00	QUARTZ	Quartz	
20.00	22.00	2.00	SANDSTONE/ QUARTZ	Sandstone	
22.00	32.00	10.00	SANDSTONE GREY	Sandstone	
32.00	38.00	6.00	SANDSTONE QUARTZ	Sandstone	
38.00	40.00	2.00	SANDSTONE GREY	Sandstone	
40.00	41.00	1.00	SANDSTONE / SHALE	Sandstone	
41.00	42.50	1.50	SANDSTONE GREY	Sandstone	
42.50	43.00	0.50	QUARTZ	Quartz	
43.00	45.00	2.00	SANDSTONE QUARTZ	Sandstone	
45.00	52.00	7.00	SANDSTONE GREY	Sandstone	
52.00	54.50	2.50	SILTSTONE FRACTURED	Siltstone	
54.50	59.00	4.50	SANDSTONE GREY AND WHITE	Sandstone	
59.00	61.00	2.00	SANDSTONE QUARTZ	Sandstone	
61.00	66.00	5.00	SANDSTONE GREY	Sandstone	
66.00	67.00	1.00	HARD SHALE	Shale	
67.00	77.00	10.00	SANDSTONE GREY	Sandstone	
77.00	78.00	1.00	SANDSTONE QUARTZ	Sandstone	
78.00	93.50	15.50	SANDSTONE GREY	Sandstone	
93.50	105.00	11.50	SANDSTONE WHITE	Sandstone	
105.00	107.00	2.00	SANDSTONE QUARTZ	Sandstone	
107.00	112.50	5.50	SANDSTONE GREY	Sandstone	
112.50	113.00	0.50	SANDSTONE QUARTZ	Sandstone	
113.00	120.50	7.50	SANDSTONE GREY	Sandstone	

Remarks

***** End of GW103160 *****

NSW OFFICE OF WATER
Work Summary

GW103538

Licence : 10BL159951
Licence Status Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : (Unknown)	STOCK	STOCK
Construct. Method : Rotary Air		
Owner Type :		

Commenced Date : **Final Depth :** 132.00 m
Completion Date : 17-Jan-2001 **Drilled Depth :** 132.00 m

Contractor Name : INTERTECH
Driller : 1737 READY, Mark Edward
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : 139.00 mg/L
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Client	**Form A :** CUMBERLAND	NARRABEEN	2//596295
	Licensed : CUMBERLAND	NARRABEEN	2 596295

Region : 10 - SYDNEY SOUTH COAST
River Basin :
Area / District :

CMA Map :
Grid Zone :
Scale :

Elevation :
Elevation Source :

Northing : 6272500
Easting : 339309

Latitude (S) : 33° 40' 31"
Longitude (E) : 151° 15' 60"

GS Map :
MGA Zone : 56
Coordinate Source :

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.60	210			Down Hole Hammer
1		Hole	Hole	5.60	132.00	156.5			Down Hole Hammer
1	1	Casing	Steel	-0.40	5.60	168.3	158.7		C: 3-5.6m; Driven into Hole
1	1	Casing	PVC Class 9	-0.40	47.60	140			Screwed and Glued; Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
54.00	55.00	1.00				0.10	60.00	25.00	150.00
88.00	89.00	1.00				0.10	90.00	25.00	150.00
112.00	113.00	1.00				0.40	114.00	25.00	140.00
115.00	117.00	2.00		32.00		0.10	120.00	50.00	139.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.50	0.50	OVERBURDEN	Overburden	
0.50	2.00	1.50	WEATHERED SANDSTONE	Sandstone	
2.00	14.00	12.00	WHITE TO PINK SANDSTONE M.G.	Sandstone	
14.00	19.00	5.00	YELLOW SANDSTONE M.G.	Sandstone	
19.00	19.20	0.20	IRONSTONE	Ironstone	
19.20	20.00	0.80	GREY SANDSTONE M.G.	Sandstone	
20.00	20.40	0.40	WHITE CLAY	Clay	
20.40	21.00	0.60	WHITE SANDSTONE M.G.	Sandstone	
21.00	21.50	0.50	WHITE CLAY	Clay	
21.50	26.00	4.50	IRONSTONE	Ironstone	
26.00	37.00	11.00	WHITE SANDSTONE M.G.	Sandstone	
37.00	37.50	0.50	IRONSTONE	Ironstone	
37.50	39.00	1.50	GREY CLAYSTONE	Clay	
39.00	57.00	18.00	WHITE SANDSTONE M.G.	Sandstone	
57.00	78.00	21.00	LT GREY SANDSTONE	Sandstone	
78.00	90.00	12.00	WHITE TO RED SANDSTONE M.G.	Sandstone	
90.00	99.00	9.00	LT GREY SANDSTONE M.G.	Sandstone	
99.00	99.20	0.20	IRONSTONE	Ironstone	
99.20	102.00	2.80	WHITE TO GREY SANDSTONE M.G.	Sandstone	
102.00	111.00	9.00	LY GREY SANDSTONE M.G.	Sandstone	
111.00	113.00	2.00	DK GREY SANDSTONE M.G.	Dacite(Tonalite)	
113.00	115.00	2.00	WHITE SANDSTONE QUARTZ	Sandstone	
115.00	115.30	0.30	IRONSTONE	Ironstone	
115.30	117.00	1.70	LT GREY SANDSTONE + QUARTZ	Sandstone	
117.00	125.00	8.00	DK GREY SANDSTONE M.G.	Dacite(Tonalite)	
125.00	132.00	7.00	LT GREY SANDSTONE M.G.	Sandstone	

Remarks

***** End of GW103538 *****

NSW OFFICE OF WATER
Work Summary

GW104173

Licence : 10BL160499
Licence Status Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status :	STOCK	STOCK
Construct. Method : Rotary		
Owner Type :		

Commenced Date : **Final Depth :** 150.50 m
Completion Date : 01-Mar-2002 **Drilled Depth :** 150.50 m

Contractor Name : INTERTECH DRILLING
Driller : 1783 CRUMP, William
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level :
Salinity : 134.00 mg/L
Yield :

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Client	**Form A :** CUMBERLAND	NARRABEEN	LT D DP 33150
	Licensed : CUMBERLAND	NARRABEEN	D 33150

Region : 10 - SYDNEY SOUTH COAST
River Basin :
Area / District :

CMA Map :
Grid Zone : **Scale :**

Elevation :
Elevation Source :

Northing : 6272118 **Latitude (S) :** 33° 40' 43"
Easting : 338993 **Longitude (E) :** 151° 15' 47"

GS Map : **MGA Zone :** 56 **Coordinate Source :**

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.50	210			Down Hole Hammer
1		Hole	Hole	5.50	150.50	158			Down Hole Hammer
1	1	Casing	Steel	-0.50	5.50	168.3	158.7		C: -.1-5.5m; Driven into Hole
1	1	Casing	PVC Class 9	-0.50	89.50	140	130		Screwed and Glued; Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
86.30	90.00	3.70				0.30	90.50	0.25	97.00
94.00	100.00	6.00				0.30	102.50	0.25	106.00
142.00	142.50	0.50				0.90	144.50	0.25	120.00
143.50	144.00	0.50		50.00		1.10	150.50	0.25	134.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	SAND AND ROCKS	Sand	
2.00	4.00	2.00	PINK SANDSTONE	Sandstone	
4.00	27.00	23.00	SANDSTONE LIGHT BROWN	Sandstone	
27.00	28.50	1.50	IRONSTONE AND QUARTZ	Ironstone Gravel	
28.50	30.00	1.50	CLAYSTONE DARK GREY	Claystone	
30.00	44.00	14.00	SANDSTONE LIGHT GREY	Sandstone	
44.00	44.30	0.30	CLAY, CREAM	Clay	
44.30	45.50	1.20	IRONSTONE , QUARTZ	Ironstone Gravel	
45.50	47.00	1.50	CLAYSTONE DARK GREY	Claystone	
47.00	56.50	9.50	SANDSTONE LIGHT GREY	Sandstone	
56.50	58.00	1.50	CLAY STIFF, GREY	Clay	
58.00	61.00	3.00	IRONSTONE AND QUARTZ	Ironstone Gravel	
61.00	62.00	1.00	IRONSTONE, BANDS OF CLAY	Ironstone	
62.00	85.00	23.00	SANDSTONE LIGHT GREY	Sandstone	
85.00	86.00	1.00	SANDSTONE QUARTZ	Sandstone	
86.00	86.30	0.30	IRONSTONE	Ironstone	
86.30	90.00	3.70	SANDSTONE , QUARTZ	Sandstone	
90.00	94.00	4.00	IRONSTONE, SANDSTONE	Ironstone	
94.00	100.00	6.00	SANDSTONE , QUARTZ	Sandstone	
100.00	105.50	5.50	SANDSTONE LIGHT GREY	Sandstone	
105.50	110.00	4.50	SANDSTONE D/G. FRACT.	Sandstone	
110.00	142.00	32.00	SANDSTONE GREY	Sandstone	
142.00	142.50	0.50	FINE QUARTZ	Quartz	
142.50	143.50	1.00	SANDSTONE GREY	Sandstone	
143.50	144.00	0.50	SANDSTONE QUARTZ, FRACT.	Sandstone	
144.00	150.50	6.50	SANDSTONE GREY	Sandstone	

Remarks

***** End of GW104173 *****

NSW OFFICE OF WATER
Work Summary

GW104217

Licence : 10BL160567 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Rotary		
Owner Type : Private		

Commenced Date : **Final Depth :** 150.00 m
Completion Date : 05-Mar-2002 **Drilled Depth :** 150.00 m

Contractor Name : INTERTECH DRILLING
Driller : 1783 CRUMP, William
Assistant Driller's Name :

Property : - SACCO **Standing Water Level :** 58.00 m
GWMA : - **Salinity :** 134.00 mg/L
GW Zone : - **Yield :** 0.20 L/s

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
Client	Driller	**Form A :** CUMBERLAND	NARRABEEN	LT 26 DP 12115
		Licensed : CUMBERLAND	NARRABEEN	26 12115

Region : 10 - SYDNEY SOUTH COAST **CMA Map :**
River Basin : **Grid Zone :** **Scale :**
Area / District :

Elevation : **Northing :** 6272141 **Latitude (S) :** 33° 40' 43"
Elevation Source : **Easting :** 339505 **Longitude (E) :** 151° 16' 7"

GS Map : **MGA Zone :** 56 **Coordinate Source :** Map Interpretation

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.50	210			Down Hole Hammer
1		Hole	Hole	5.50	150.00	158			Down Hole Hammer
1	1	Casing	Steel	-0.50	5.50	168.3	158.7		C: -.1-5.5m; Driven into Hole
1	1	Casing	PVC Class 9	-0.50	89.50	140	130		Screwed and Glued; Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
60.50	61.00	0.50				0.10			120.00
94.00	101.50	7.50				0.30			128.00
116.00	117.00	1.00				0.30			134.00
132.00	133.00	1.00		58.00		0.20			134.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	1.50	1.50	SANDS AND LARGE ROCKS	Sandstone	
1.50	3.00	1.50	SANDSTONE RED	Sandstone	
3.00	21.00	18.00	SANDSTONE LIGHT BROWN	Sandstone	
21.00	21.50	0.50	CLAY DARK BROWN	Clay	
21.50	29.00	7.50	SANDSTONE LIGHT BROWN	Sandstone	
29.00	30.50	1.50	SHALE	Shale	
30.50	45.00	14.50	SANDSTONE LIGHT GREY	Sandstone	
45.00	45.50	0.50	SHALE	Shale	
45.50	50.00	4.50	SANDSTONE GREY	Sandstone	
50.00	55.00	5.00	IRONSTONE/QUARTZ	Ironstone	
55.00	60.50	5.50	SANDSTONE GREY	Sandstone	
60.50	61.00	0.50	QUARTZ	Invalid Code	
61.00	75.00	14.00	SANDSTONE L/G	Sandstone	
75.00	76.50	1.50	IRONSTONE	Ironstone	
76.50	79.00	2.50	SANDSTONE QUARTZ	Sandstone	
79.00	79.50	0.50	IRONSTONE FRACTURED	Ironstone Gravel	
79.50	89.00	9.50	SANDSTONE QUARTZ	Sandstone	
89.00	93.50	4.50	SANDSTONE FRACTURED	Sandstone	
93.50	94.00	0.50	CLAY/QUARTZ	Clay	
94.00	101.50	7.50	SANDSTONE/QUARTZ	Sandstone	
101.50	102.00	0.50	IRONSTONE	Ironstone	
102.00	107.00	5.00	SANDSTONE GREY	Sandstone	
107.00	107.30	0.30	CLAY	Clay	
107.30	116.00	8.70	SANDSTONE GREY	Sandstone	
116.00	117.00	1.00	SAND/QUARTZ FINE	Sand	
117.00	132.00	15.00	SANDSTONE L/G	Sandstone	
132.00	133.00	1.00	SANDSTONE QUARTZ	Sandstone	
133.00	150.00	17.00	SANDSTONE GREY	Sandstone	

Remarks

***** End of GW104217 *****

NSW OFFICE OF WATER
Work Summary

GW104265

Licence : 10BL160616 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Rotary		
Owner Type : Private		

Commenced Date : **Final Depth :** 210.00 m
Completion Date : 18-Apr-2002 **Drilled Depth :** 210.00 m

Contractor Name : INTERTECH DRILLING
Driller : 1783 CRUMP, William
Assistant Driller's Name :

Property : - N/A **Standing Water Level :** 43.00 m
GWMA : - **Salinity :** 134.00 mg/L
GW Zone : - **Yield :** 0.10 L/s

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Client	**Form A :** CUMBERLAND	NARRABEEN	LT 71 DP 752046
	Licensed : CUMBERLAND	NARRABEEN	71 752046

Region : 10 - SYDNEY SOUTH COAST **CMA Map :**
River Basin : **Grid Zone :** **Scale :**
Area / District :

Elevation : **Northing :** 6272512 **Latitude (S) :** 33° 40' 31"
Elevation Source : **Easting :** 339916 **Longitude (E) :** 151° 16' 23"

GS Map : **MGA Zone :** 56 **Coordinate Source :** Map Interpretation

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.50	210			Down Hole Hammer
1		Hole	Hole	5.50	210.00	160			Down Hole Hammer
1	1	Casing	Steel	-0.50	5.50	168.3	158.7		C: -.1-5.5m; Driven into Hole
1	1	Casing	PVC Class 9	-0.50	59.50	140	130		Screwed and Glued; Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
48.00	50.00	2.00				0.10	54.00	0.25	120.00
80.00	84.00	4.00				0.10	84.00	0.25	126.00
101.50	102.00	0.50				0.10	102.00	0.25	132.00
111.00	112.00	1.00				0.10	114.00	0.25	134.00
143.00	146.00	3.00		43.00		0.10	210.00	0.25	134.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	SAND	Sand	
1.00	8.00	7.00	SANDSTONE SOFT	Sandstone	
8.00	26.00	18.00	SANDSTONE/IRONSTONE	Sandstone	
26.00	28.00	2.00	CLAYSTONE	Claystone	
28.00	32.00	4.00	SILTSTONE	Siltstone	
32.00	37.00	5.00	SANDSTONE/IRONSTONE	Sandstone	
37.00	42.00	5.00	SANDSTONE GREY	Sandstone	
42.00	48.00	6.00	SILTSTONE	Siltstone	
48.00	50.00	2.00	IRONSTONE AND QUARTZ	Ironstone Gravel	
50.00	54.00	4.00	SANSDSTONE GREY	Sand	
54.00	58.00	4.00	IRONSTONE AND QUARTZ	Ironstone Gravel	
58.00	65.00	7.00	SANDSTONE GREY	Sandstone	
65.00	80.00	15.00	SANDSTONE WITH IRONSTONE BANDS	Sandstone	
80.00	84.00	4.00	SANDSTONE/QUARTZ	Sandstone	
84.00	101.50	17.50	SANDSTONE GREY	Sandstone	
101.50	102.00	0.50	SANDSTONE/QUARTZ	Sandstone	
102.00	104.00	2.00	SANDSTONE FRACTURED	Sandstone	
104.00	111.00	7.00	SANDSTONE GREY	Sandstone	
111.00	112.00	1.00	SANDSTONE QUARTZ	Sandstone	
112.00	143.00	31.00	SANDSTONE GREY	Sandstone	
143.00	146.00	3.00	SANDSTONE DARK GREY FRACT.	Sandstone	
146.00	166.00	20.00	SANDSTONE GREY	Sandstone	
166.00	170.00	4.00	SANDSTONE DARK GREY	Sandstone	
170.00	198.00	28.00	SANDSTONE GREY	Sandstone	
198.00	202.00	4.00	SANDSTONE DARK GREY	Sandstone	
202.00	205.00	3.00	SANDSTONE DARK GREY	Sandstone	
205.00	210.00	5.00	SANDSTONE DARK GREY	Sandstone	

Remarks

***** End of GW104265 *****

NSW OFFICE OF WATER
Work Summary

GW104417

Licence : 10BL160790
Licence Status Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Rotary		
Owner Type : Private		

Commenced Date : **Final Depth :** 180.00 m
Completion Date : 23-Aug-1982 **Drilled Depth :** 180.00 m

Contractor Name : unknown
Driller : 1783 CRUMP, William
Assistant Driller's Name :

Property : - N/A
GWMA : -
GW Zone : -

Standing Water Level : 33.00 m
Salinity : 134.00 mg/L
Yield : 0.20 L/s

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Client	**Form A :** CUMBERLAND	NARRABEEN	LT 8 DP 30325
	Licensed : CUMBERLAND	NARRABEEN	8 30325

Region : 10 - SYDNEY SOUTH COAST
River Basin :
Area / District :
CMA Map :
Grid Zone :
Scale :

Elevation :
Elevation Source :
Northing : 6272609
Easting : 340101
Latitude (S) : 33° 40' 28"
Longitude (E) : 151° 16' 31"

GS Map :
MGA Zone : 56
Coordinate Source : Map Interpretation

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.50	210			Down Hole Hammer
1		Hole	Hole	5.50	180.00	159			Down Hole Hammer
1	1	Casing	Steel	-0.50	5.50	168.3	158.7		C: -.1-5.5m; Driven into Hole
1	1	Casing	PVC Class 9	-0.50	47.50	140			Screwed and Glued; Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
45.00	48.00	3.00				0.10	48.00	0.25	134.00
67.00	70.00	3.00				0.20	72.00	0.25	134.00
71.50	72.50	1.00				0.30	78.00	0.25	134.00
133.00	135.00	2.00		33.00		0.20	138.00	0.25	134.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	TOPSOIL	Topsoil	
1.00	10.00	9.00	SANDSTONE LIGHT BROWN	Sandstone	
10.00	14.00	4.00	SHALE	Shale	
14.00	32.00	18.00	SANDST0NE LIGHT BROWN	Sandstone	
32.00	32.50	0.50	CLAY WHITE	Clay	
32.50	35.00	2.50	SANDSTONE WHITE	Sandstone	
35.00	35.50	0.50	CLAY	Sandstone	
35.50	39.00	3.50	SANDSTONE WHITE	Sandstone	
39.00	44.70	5.70	SANDSTONE GREY	Sandstone	
44.70	45.00	0.30	CLAY WHITE	Clay	
45.00	48.00	3.00	SANDSTONE QUARTZ	Sandstone	
48.00	67.00	19.00	SANDSTONE GREY	Sandstone	
67.00	70.00	3.00	SANDSTONE QUARTZ	Sandstone	
70.00	71.50	1.50	SANDSTONE GREY	Sandstone	
71.50	72.50	1.00	IRONSTONE QUARTZ	Ironstone Gravel	
72.50	74.00	1.50	SANDSTONE QUARTZ	Sandstone	
74.00	75.50	1.50	SANDSTONE QUARTZ FRACTURED	Sandstone	
75.50	95.00	19.50	SANDSTONE GREY	Sandstone	
95.00	95.30	0.30	CLAY WHITE	Clay	
95.30	111.00	15.70	SANDSTONE GREY	Sandstone	
111.00	112.00	1.00	SANDSTONE DARK GREY	Sandstone	
112.00	133.00	21.00	SANDSTONE GREY	Sandstone	
133.00	135.00	2.00	SANDSTONE D/G FRACTURED	Sandstone	
135.00	180.00	45.00	SANDSTONE GREY	Sandstone	

Remarks

***** End of GW104417 *****

NSW OFFICE OF WATER
Work Summary

GW104418

Licence : 10BL160792 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Rotary		
Owner Type : Private		

Commenced Date : **Final Depth :** 180.00 m
Completion Date : 21-Aug-2002 **Drilled Depth :** 180.00 m

Contractor Name : INTERTECH DRILLING
Driller : 1783 CRUMP, William
Assistant Driller's Name :

Property : - N/A **Standing Water Level :** 71.00 m
GWMA : - **Salinity :** 134.00 mg/L
GW Zone : - **Yield :** 0.30 L/s

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
Client	Driller	**Form A :** CUMBERLAND	NARRABEEN	LT B DP 403166
		Licensed : CUMBERLAND	NARRABEEN	B 403166

Region : 10 - SYDNEY SOUTH COAST **CMA Map :**
River Basin : **Grid Zone :** **Scale :**
Area / District :

Elevation : **Northing :** 6272310 **Latitude (S) :** 33° 40' 37"
Elevation Source : **Easting :** 338914 **Longitude (E) :** 151° 15' 44"

GS Map : **MGA Zone :** 56 **Coordinate Source :** Map Interpretation

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.50	210			Down Hole Hammer
1		Hole	Hole	5.50	180.00	157			Down Hole Hammer
1	1	Casing	Steel	-0.50	5.50	168.3	158.7		C: -.1-5.5m; Driven into Hole
1	1	Casing	PVC Class 9	-0.50	71.50	140			Screwed and Glued; Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
86.50	94.00	7.50				0.25	96.00	0.25	134.00
114.00	114.50	0.50		71.00		0.05	120.00	0.25	134.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.50	0.50	TOPSOIL	Topsoil	
0.50	17.00	16.50	SANDSTONE LIGHT BROWN	Sandstone	
17.00	22.00	5.00	SANDSTONE GREY	Sandstone	
22.00	23.00	1.00	SHALE	Shale	
23.00	28.00	5.00	SANDSTONE GREY	Sandstone	
28.00	28.30	0.30	CLAY	Clay	
28.30	29.00	0.70	IRONSTONE	Ironstone	
29.00	30.00	1.00	SANDSTONE QUARTZ	Sandstone	
30.00	35.00	5.00	SANDSTONE LIGHT BROWN SOFT	Sandstone	
35.00	43.00	8.00	SANDSTONE WHITE	Sandstone	
43.00	45.00	2.00	IRONSTONE FRACTURED	Ironstone Gravel	
45.00	57.00	12.00	SANDSTONE GREY	Sandstone	
57.00	60.00	3.00	SHALE SOFT	Shale	
60.00	68.00	8.00	SANDSTONE GREY	Sandstone	
68.00	69.00	1.00	IRONSTONE	Ironstone	
69.00	86.50	17.50	SANDSTONE GREY	Sandstone	
86.50	93.00	6.50	SANDSTONE FINE QUARTZ	Sandstone	
93.00	94.00	1.00	FINE QUARTZ SOFT	Invalid Code	
94.00	98.00	4.00	SANDSTONE FINE QUARTZ	Sandstone	
98.00	114.00	16.00	SANDSTONE GREY	Sandstone	
114.00	114.50	0.50	SANDSTONE QUARTZ	Sandstone	
114.50	180.00	65.50	SANDSTONE GREY	Sandstone	

Remarks

***** End of GW104418 *****

NSW OFFICE OF WATER
Work Summary

GW105253

Licence : 10BL162186 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Rotary Air		
Owner Type :		

Commenced Date : **Final Depth :** 192.50 m
Completion Date : 16-Oct-2003 **Drilled Depth :** 192.50 m

Contractor Name : INTERTECH DRILLING
Driller : 1489 BARDEN, Colin Leslie
Assistant Driller's Name :

Property : - MARFLEET **Standing Water Level :** 87.00 m
GWMA : - **Salinity :** 206.00 mg/L
GW Zone : - **Yield :** 0.10 L/s

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
Client	Driller	**Form A :** CUMBERLAND	NARRABEEN	9 30325
		Licensed : CUMBERLAND	NARRABEEN	9 30325

Region : 10 - SYDNEY SOUTH COAST **CMA Map :** 9130-1S MONA VALE
River Basin : 212 - HAWKESBURY RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District :

Elevation : 0.00 **Northing :** 6273242 **Latitude (S) :** 33° 40' 8"
Elevation Source : (Unknown) **Easting :** 340553 **Longitude (E) :** 151° 16' 49"

GS Map : **MGA Zone :** 56 **Coordinate Source :**

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.60	205			Down Hole Hammer
1		Hole	Hole	5.60	102.50	159			Down Hole Hammer
1		Hole	Hole	102.50	192.50	154			Down Hole Hammer
1	1	Casing	Steel	-0.40	5.60	168.3	158.7		C: 0-5.6m; Driven into Hole
1	1	Casing	PVC Class 9	-0.40	24.00	140			Screwed and Glued; Suspended in Clamps
1	1	Opening	Slots - Diagonal	24.00	30.00	140			PVC Class 9; SL: .1mm; A: 4mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
26.50	27.50	1.00				0.20	30.50	0.25	125.00
127.00	128.00	1.00				0.10	132.50	0.25	142.00
151.00	151.30	0.30				0.10	156.50	0.25	220.00
184.50	185.50	1.00		87.00		0.10	186.50	0.50	240.00

Drillers Log

From (m)	To (m)	Thickness(m	Drillers Description	Geological Material	Comments
0.00	0.20	0.20	TOPSOIL	Topsoil	
0.20	6.20	6.00	SANDSTONE LT GREY M/G	Sandstone	
6.20	6.50	0.30	CLAY WHITE	Clay	
6.50	24.50	18.00	SANDSTONE GREY BROWN/IRONSTONE	Sandstone	
24.50	42.50	18.00	SANDSTONE F.W.GREY BROWN M/G	Sandstone	
42.50	56.50	14.00	SANDSTONE BROWN/IRONSTONE	Sandstone	
56.50	57.50	1.00	F. SANDSTONE BROWN/IRONSTONE	Invalid Code	
57.50	127.70	70.20	SANDSTONE GREY/DARK GREY M.G	Sandstone	
127.70	128.00	0.30	F.W. SANDSTONE GREY	Invalid Code	
128.00	137.00	9.00	SANDSTONE GREY M/G	Sandstone	
137.00	147.50	10.50	SANDSTONE DARK GREY	Sandstone	
147.50	175.00	27.50	SANDSTONE GREY/DARK GREY M.G	Sandstone	
175.00	186.50	11.50	F. SANDSTONE GREY W.	Invalid Code	
186.50	188.00	1.50	SANDSTONE GREY/DARK GREY	Sandstone	
188.00	190.50	2.50	RED SHALE	Invalid Code	
190.50	192.50	2.00	SANDSTONE GREY	Sandstone	

Remarks

***** End of GW105253 *****

NSW OFFICE OF WATER
Work Summary

GW105255

Licence : 10BL600322 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Rotary		
Owner Type :		

Commenced Date : **Final Depth :** 114.00 m
Completion Date : 16-Oct-2003 **Drilled Depth :** 114.00 m

Contractor Name : ULTRA DRIILING
Driller : 1423 DODD, Alan Marcus
Assistant Driller's Name :

Property : - FARAH **Standing Water Level :** 44.00 m
GWMA : - **Salinity :** 96.00 mg/L
GW Zone : - **Yield :** 1.00 L/s

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Client	**Form A :** CUMBERLAND	NARRABEEN	264 752046
	Licensed : CUMBERLAND	NARRABEEN	264 752046

Region : 10 - SYDNEY SOUTH COAST **CMA Map :** 9130-1S MONA VALE
River Basin : 213 - SYDNEY COAST - GEORGES RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District :

Elevation : 0.00 **Northing :** 6272855 **Latitude (S) :** 33° 40' 20"
Elevation Source : (Unknown) **Easting :** 339944 **Longitude (E) :** 151° 16' 25"

GS Map : **MGA Zone :** 56 **Coordinate Source :**

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	36.00	170			Down Hole Hammer
1		Hole	Hole	36.00	114.00	130			Down Hole Hammer
1	1	Casing	Steel	0.30	2.00	160			Driven into Hole
1	1	Casing	PVC Class 9	0.30	36.00	140			Glued; Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
66.00	67.00	1.00			68.00	0.60	68.00	1.00	100.00
72.00	73.00	1.00		44.00	75.00	1.00	75.00	1.50	96.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	CLAY	Clay	
2.00	22.00	20.00	BROKEN SANDSTONE	Invalid Code	
22.00	30.00	8.00	SHALE	Shale	
30.00	76.00	46.00	WHITE SANDSTONE	Invalid Code	
76.00	83.00	7.00	SANDSTONE/SHALE	Sandstone	
83.00	114.00	31.00	WHITE SANDSTONE	Invalid Code	

Remarks

Previous Lic No:10BL162212

***** End of GW105255 *****

NSW OFFICE OF WATER
Work Summary

GW105671

Licence : 10BL162365 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC

Work Status : Supply Obtained
Construct. Method : Down Hole Hammer
Owner Type : Private

Commenced Date : **Final Depth :** 180.00 m
Completion Date : 22-Oct-2003 **Drilled Depth :** 180.00 m

Contractor Name : Ultradrilling
Driller : 1600 DODD, Bradley Alan
Assistant Driller's Name :

Property : - BIRD **Standing Water Level :** 105.00 m
GWMA : - **Salinity :** 110.00 mg/L
GW Zone : - **Yield :** 105.00 L/s cumulative

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARRABEEN	2//618622
	Licensed : CUMBERLAND	NARRABEEN	2 618622

Region : 10 - SYDNEY SOUTH COAST **CMA Map :** 9130-1S MONA VALE
River Basin : 212 - HAWKESBURY RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District :

Elevation : 0.00 **Northing :** 6274438 **Latitude (S) :** 33° 39' 29"
Elevation Source : (Unknown) **Easting :** 340693 **Longitude (E) :** 151° 16' 55"

GS Map : **MGA Zone :** 56 **Coordinate Source :** GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	72.00	174			Down Hole Hammer
1		Hole	Hole	72.00	180.00	140			Down Hole Hammer
1	1	Casing	Steel	0.30	1.00	168			Glued; Driven into Hole
1	1	Casing	PVC Class 9	0.30	72.00	140			Glued; Driven into Hole; Open End

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
162.00	163.00	1.00			164.00	0.40		1.00	110.00
174.00	175.00	1.00		105.00	180.00	0.60		2.00	110.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	soil, dirt	Soil	
1.00	3.00	2.00	clay	Clay	
3.00	66.00	63.00	sandstone, soft yellow	Sandstone	
66.00	150.00	84.00	sandstone, shale	Sandstone	
150.00	174.00	24.00	shale	Shale	
174.00	180.00	6.00	shale, red	Shale	

Remarks

updated from original form A

***** End of GW105671 *****

NSW OFFICE OF WATER
Work Summary

GW106327

Licence : 10BL163449 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Down Hole Hammer		
Owner Type : Private		

Commenced Date : **Final Depth :** 180.00 m
Completion Date : 07-Jul-2004 **Drilled Depth :** 180.00 m

Contractor Name : INTERTECH
Driller : 1783 CRUMP, William
Assistant Driller's Name :

Property : - HAUGH **Standing Water Level :** 49.50 m
GWMA : - **Salinity :** 198.00 mg/L
GW Zone : - **Yield :** 0.40 L/s cumualtive

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
Client	Driller	**Form A :** CUMBERLAND	NARRABEEN	82//875079
		Licensed : CUMBERLAND	NARRABEEN	82 875079

Region : 10 - SYDNEY SOUTH COAST **CMA Map :** 9130-1S MONA VALE
River Basin : 212 - HAWKESBURY RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District :

Elevation : 0.00 **Northing :** 6273453 **Latitude (S) :** 33° 40' 1"
Elevation Source : (Unknown) **Easting :** 340803 **Longitude (E) :** 151° 16' 58"

GS Map : **MGA Zone :** 56 **Coordinate Source :** GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.50	206			Down Hole Hammer
1		Hole	Hole	5.50	72.00	159			Down Hole Hammer
1		Hole	Hole	72.00	180.00	155			Down Hole Hammer
1	1	Casing	Steel	-0.50	5.50	168.3	158.7		Screwed and Glued; Suspended in Clamps
1	1	Casing	PVC Class 9	-0.50	11.00	140			Screwed and Glued; Driven into Hole; Open End
1	1	Opening	Slots - Diagonal	11.00	21.50	140			PVC Class 9; Sawn; SL: .1mm; A: 3mm; Screwed and Glued

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
11.30	11.50	0.20				0.10			149.00
18.30	21.10	2.80				0.10			201.00
52.00	55.00	3.00		49.50		0.01			198.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	3.00	3.00	sand, silty	Sand	
3.00	11.30	8.30	sandstone, light grey	Sandstone	
11.30	11.50	0.20	sandstone, fractured	Sandstone	
11.50	15.00	3.50	sandstone, light brown	Sandstone	
15.00	15.20	0.20	sandstone, fractured	Sandstone	
15.20	17.50	2.30	sandstone, light brown	Sandstone	
17.50	18.30	0.80	sandstone, very soft	Sandstone	
18.30	21.00	2.70	sandstone, quartz	Sandstone	
21.00	21.10	0.10	sandstone, fracture	Sandstone	
21.10	21.70	0.60	sandstone, grey	Sandstone	
21.70	22.20	0.50	clay, white	Clay	
22.20	33.00	10.80	sandstone, ironstone bands	Sandstone	
33.00	40.00	7.00	sandstone, grey	Sandstone	
40.00	40.20	0.20	clay, white	Clay	
40.20	52.00	11.80	sandstone, grey	Sandstone	
52.00	55.00	3.00	sandstone, dark grey	Sandstone	
55.00	93.50	38.50	sandstone, grey	Sandstone	
93.50	93.70	0.20	sandstone, fracture	Sandstone	
93.70	153.50	59.80	sandstone, grey	Sandstone	
153.50	159.00	5.50	silt, stone	Silt	
159.00	164.00	5.00	sandstone, grey	Sandstone	
164.00	165.50	1.50	silt, stone, grey	Silt	
165.50	178.00	12.50	silt, stone red	Silt	
178.00	180.00	2.00	silt stone, grey	Silt	

Remarks

updated from original form A

***** End of GW106327 *****

NSW OFFICE OF WATER
Work Summary

GW106695

Licence : 10BL164232 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Down Hole Hammer		
Owner Type : Private		

Commenced Date : **Final Depth :** 120.00 m
Completion Date : 23-Nov-2004 **Drilled Depth :** 120.00 m

Contractor Name : INTERTECH
Driller : 1783 CRUMP, William
Assistant Driller's Name :

Property : - DAWE **Standing Water Level :** 38.00 m
GWMA : - **Salinity :** 132.00 mg/L
GW Zone : - **Yield :** 0.90 L/s cumulative

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
Client	Driller	**Form A :** CUMBERLAND	NARRABEEN	6//1044346
		Licensed : CUMBERLAND	NARRABEEN	6 1044346

Region : 10 - SYDNEY SOUTH COAST **CMA Map :** 9130-1S MONA VALE
River Basin : 213 - SYDNEY COAST - GEORGES RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District :

Elevation : **Northing :** 6272628 **Latitude (S) :** 33° 40' 27"
Elevation Source : **Easting :** 339830 **Longitude (E) :** 151° 16' 20"

GS Map : **MGA Zone :** 56 **Coordinate Source :** GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.50	208			Down Hole Hammer
1		Hole	Hole	5.50	120.00	156			Down Hole Hammer
1	1	Casing	PVC Class 9	-42.00	53.00				Screwed and Glued
1	1	Casing	Steel	-0.40	5.60	156	146.4		Driven into Hole; Open End
1	1	Casing	PVC Class 9	-0.40	30.00	140			Screwed and Glued; Suspended in Clamps
1	1	Opening	Slots - Diagonal	30.00	42.00	140			PVC Class 9; Sawn; SL: .1mm; A: 3mm; Screwed and Glued
1	1	Opening	Slots - Diagonal	53.00	59.60	140			PVC Class 9; Sawn; SL: .1mm; A: 3mm; Screwed and Glued
1		Annulus	Concrete	-0.10	5.50	208	168		

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
31.00	35.00	4.00				0.20			145.00
53.00	54.00	1.00				0.20			144.00
67.00	70.00	3.00		38.00		0.20			140.00
72.00	86.00	14.00				0.30			132.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	fill, sandstone, rocker clay	Fill	
2.00	4.00	2.00	sandstone, very soft	Sandstone	
4.00	20.00	16.00	sandstone, light brown	Sandstone	
20.00	26.00	6.00	sandstone, quartz bands	Sandstone	
26.00	27.00	1.00	clay, soft	Clay	
27.00	31.00	4.00	sandstone, light brown	Sandstone	
31.00	35.00	4.00	sandstone, quartz soft	Sandstone	
35.00	41.00	6.00	ironstone, sandstone,	Ironstone	
41.00	41.30	0.30	clay	Clay	
41.30	41.60	0.30	quartz, course	Quartz	
41.60	44.00	2.40	clay	Clay	
44.00	49.00	5.00	siltstone	Siltstone	
49.00	53.00	4.00	sandstone, grey	Sandstone	
53.00	54.00	1.00	sandstone, fractured	Sandstone	
54.00	57.00	3.00	sandstone, quartz	Sandstone	
57.00	67.00	10.00	sandstone, grey	Sandstone	
67.00	67.50	0.50	quartz, course	Quartz	
67.50	70.00	2.50	sandstone, grey	Sandstone	
70.00	72.00	2.00	ironstone	Ironstone	
72.00	86.00	14.00	sandstone, fractured quartz	Sandstone	
86.00	90.00	4.00	sandstone, grey	Sandstone	
90.00	94.00	4.00	sandstone, ironstone, fractured quartz	Sandstone	
94.00	95.00	1.00	clay, sandstone, soft	Clay	
95.00	102.00	7.00	sandstone, quartz bands	Sandstone	
102.00	120.00	18.00	sandstone, grey	Sandstone	

Remarks

updated from original form A

***** End of GW106695 *****

NSW OFFICE OF WATER
Work Summary

GW107194

Licence : 10BL163459 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Rotary - Percussion (Down Hole Hammer)		
Owner Type : Private		

Commenced Date : **Final Depth :** 192.00 m
Completion Date : 28-Sep-2004 **Drilled Depth :** 192.00 m

Contractor Name : CENTRAL WEST WATER DRILLING
Driller : 1812 REYNOLDS, Christopher Howard R
Assistant Driller's Name :

Property : - SWIFT **Standing Water Level :** 18.00 m
GWMA : - **Salinity :**
GW Zone : - **Yield :** 0.40 L/s cumulative

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARRABEEN	137 752046
	Licensed : CUMBERLAND	NARRABEEN	137 752046

Region : 10 - SYDNEY SOUTH COAST **CMA Map :**
River Basin : **Grid Zone :** **Scale :**
Area / District :

Elevation : **Northing :** 6271355 **Latitude (S) :** 33° 41' 7"
Elevation Source : **Easting :** 337051 **Longitude (E) :** 151° 14' 31"

GS Map : **MGA Zone :** 56 **Coordinate Source :** GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	192.00	200			Rotary - Percussion (Down Hole Hammer)
1	1	Casing	PVC Class 9	-0.40	192.00	164	163.8		Riveted and Glued; Driven into Hole; Open End; S: 170~192m
1	1	Opening	Slots - Vertical	0.00	0.00	164			PVC Class 9; Casing - Hand Sawn Slot; SL: 200mm; A: 2mm; Riveted and Glued

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
74.00	170.00	96.00		18.00		0.40		2.00	

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	3.00	3.00	tospsoil	Topsoil	
3.00	4.00	1.00	clay, sandy	Clay	
4.00	20.00	16.00	sandstone	Sandstone	
20.00	22.00	2.00	shales, grey	Shale	
22.00	52.00	30.00	sandstone	Sandstone	
52.00	56.00	4.00	clays	Claystone	
56.00	170.00	114.00	sandstone	Sandstone	
170.00	192.00	22.00	shales, grey	Shale	

Remarks

updated from original form A

***** End of GW107194 *****

NSW OFFICE OF WATER
Work Summary

GW107518

Licence : 10BL164091 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained		
Construct. Method : (Unknown)		
Owner Type : Private		

Commenced Date : **Final Depth :** 120.00 m
Completion Date : 01-Jul-2005 **Drilled Depth :** 120.00 m

Contractor Name : unknown
Driller : 400 UNKNOWN, Unkown
Assistant Driller's Name :

Property : - CHOULARTON **Standing Water Level :**
GWMA : - **Salinity :**
GW Zone : - **Yield :** 500 L/day

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARRABEEN	208//752046
	Licensed : CUMBERLAND	NARRABEEN	208 752046

Region : 10 - SYDNEY SOUTH COAST **CMA Map :** 9130-1S MONA VALE
River Basin : 213 - SYDNEY COAST - GEORGES RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District :

Elevation : **Northing :** 6272572 **Latitude (S) :** 33° 40' 29"
Elevation Source : **Easting :** 339395 **Longitude (E) :** 151° 16' 3"

GS Map : **MGA Zone :** 56 **Coordinate Source :** GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details

(No Construction Details Found)

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

(No Water Bearing Zone Details Found)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments

Remarks

Type of casing PVC, diameter of casing 150mm updated from AG form

***** End of GW107518 *****

NSW OFFICE OF WATER
Work Summary

GW107528

Licence : 10BL165517 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Down Hole Hammer		
Owner Type : Private		

Commenced Date : **Final Depth :** 180.30 m
Completion Date : 28-Sep-2005 **Drilled Depth :** 180.30 m

Contractor Name : INTERTECH
Driller : 1950 WYATT, Brett Roy
Assistant Driller's Name :

Property : - MORRIS **Standing Water Level :** 83.60 m
GWMA : - **Salinity :** 390.00 mg/L
GW Zone : - **Yield :** 0.60 L/s cumulative

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Client	**Form A :** CUMBERLAND	NARRABEEN	156//752046
	Licensed : CUMBERLAND	NARRABEEN	156 752046

Region : 10 - SYDNEY SOUTH COAST **CMA Map :** 9130-1S MONA VALE
River Basin : 213 - SYDNEY COAST - GEORGES RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District :

Elevation : **Northing :** 6273541 **Latitude (S) :** 33° 39' 58"
Elevation Source : **Easting :** 340683 **Longitude (E) :** 151° 16' 54"

GS Map : **MGA Zone :** 56 **Coordinate Source :** GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.60	202			Down Hole Hammer
1		Hole	Hole	5.60	102.30	165			Down Hole Hammer
1		Hole	Hole	102.30	180.30	159			Down Hole Hammer
1	1	Casing	Steel	-0.20	5.80	165	155.4		Driven into Hole
1	1	Casing	PVC Class 9	-0.20	59.80	140			Screwed and Glued; Suspended in Clamps
1	1	Opening	Slots - Diagonal	17.80	23.80	140			PVC Class 9; Sawn; SL: 100mm; A: 3mm
1	1	Opening	Slots - Diagonal	29.80	41.80	140			PVC Class 9; Sawn; SL: 100mm; A: 3mm
1	1	Opening	Slots - Diagonal	47.80	53.80	140			PVC Class 9; Sawn; SL: 100mm; A: 3mm
1		Annulus	Concrete	0.00	5.80	165			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
19.80	20.30	0.50				0.08			132.00
35.70	50.90	15.20		17.00		0.13			155.00
130.50	131.20	0.70				0.10			225.00
156.00	166.00	10.00		83.60		0.30			390.00

Drillers Log

From (m)	To (m)	Thickness(m	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	clay, light brown	Clay	
1.00	2.00	1.00	sandstone, brown weathered	Sandstone	
2.00	2.80	0.80	sandstone & ironstone, brown, water bearing	Sandstone	
2.80	13.60	10.80	sandstone, brown	Sandstone	
13.60	14.40	0.80	shale, grey	Shale	
14.40	19.80	5.40	sandstone, brown, grey pink	Sandstone	
19.80	20.30	0.50	sandstone, pink and quartz, water bearing	Sandstone	
20.30	26.50	6.20	sandstone & ironstone, brown	Sandstone	
26.50	26.90	0.40	clay, light brown	Clay	
26.90	35.70	8.80	sandstone, grey, light brown	Sandstone	
35.70	35.80	0.10	quartz, water bearing	Quartz	
35.80	37.00	1.20	ironstone	Ironstone	
37.00	37.30	0.30	clay, light brown	Clay	
37.30	47.70	10.40	sandstone, pink, grey, brown	Sandstone	
47.70	47.90	0.20	shale, grey	Shale	
47.90	50.80	2.90	sandstone, grey	Sandstone	
50.80	50.90	0.10	sandstone, grey and quartz, water bearing	Sandstone	
50.90	63.50	12.60	sandstone, grey	Sandstone	
63.50	67.80	4.30	shale, black silty	Shale	
67.80	71.70	3.90	sandstone, light grey	Sandstone	
71.70	78.60	6.90	shale, black silty	Shale	
78.60	130.50	51.90	sandstone, grey black shale bands	Sandstone	
130.50	131.20	0.70	sandstone, grey, fractured, water bearing	Sandstone	
131.20	166.00	34.80	sandstone, grey, & grey silty shale, water bearing	Sandstone	
166.00	180.30	14.30	shale, grey silty, red silty shale	Shale	

Remarks

Form A Remarks:

NSW OFFICE OF WATER
Work Summary

GW107528

130.5 - 131.2 very unstable - aire lifted at 132m 0.5lps updated from original form A

***** End of GW107528 *****

NSW OFFICE OF WATER
Work Summary

GW108106

Licence : 10BL600255 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Down Hole Hammer		
Owner Type : Private		

Commenced Date : **Final Depth :** 180.00 m
Completion Date : 15-May-2006 **Drilled Depth :** 180.00 m

Contractor Name : INTERTECH
Driller : 1489 BARDEN, Colin Leslie
Assistant Driller's Name :

Property : - MEDWAY **Standing Water Level :** 50.00 m
GWMA : - **Salinity :**
GW Zone : - **Yield :** 0.70 L/s cumulative

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
Client	**Form A :** CUMBERLAND	NARRABEEN	8 1044346
	Licensed : CUMBERLAND	NARRABEEN	8 1044346

Region : 10 - SYDNEY SOUTH COAST **CMA Map :**
River Basin : **Grid Zone :** **Scale :**
Area / District :

Elevation : **Northing :** 6272580 **Latitude (S) :** 33° 40' 29"
Elevation Source : **Easting :** 339684 **Longitude (E) :** 151° 16' 14"

GS Map : **MGA Zone :** 56 **Coordinate Source :** GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.50	203			Down Hole Hammer
1		Hole	Hole	5.50	120.00	164			Down Hole Hammer
1		Hole	Hole	120.00	180.00	160			Down Hole Hammer
1	1	Casing	Steel	-0.50	5.50	168	158.4		Driven into Hole; Suspended in Clamps; Open End
1	1	Casing	PVC Class 9	-0.50	71.50	140			Screwed and Glued; Suspended in Clamps; Open End
1		Annulus	Concrete	0.00	5.50	203			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
35.00	42.00	7.00				0.01			156.00
66.00	66.30	0.30				0.49			130.00
90.50	93.00	2.50				0.10			130.00
130.00	131.50	1.50		50.00		0.10			148.00

Drillers Log

From (m)	To (m)	Thickness(m	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	sand, clay	Sand	
1.00	15.00	14.00	sandstone, weathered	Sandstone	
15.00	15.20	0.20	clay, grey	Clay	
15.20	28.00	12.80	sandstone, weathere d	Sandstone	
28.00	30.00	2.00	ironstone	Ironstone	
30.00	35.00	5.00	shale	Shale	
35.00	42.00	7.00	sandstone, grey quartz	Sandstone	
42.00	44.00	2.00	claym grey	Clay	
44.00	51.50	7.50	sandstone, grey	Sandstone	
51.50	66.00	14.50	sandstone, grey quartz	Sandstone	
66.00	66.30	0.30	quartz, fractured	Quartz	
66.30	88.00	21.70	sandstone, grey quartz	Sandstone	
88.00	88.50	0.50	ironstone	Ironstone	
88.50	90.50	2.00	sandstone, grey	Sandstone	
90.50	93.00	2.50	quartz	Quartz	
93.00	94.50	1.50	sandstone, grey	Sandstone	
94.50	95.00	0.50	clay, grey	Clay	
95.00	100.00	5.00	sandstone, grey	Sandstone	
100.00	103.00	3.00	sandstone, grey clay quartz	Sandstone	
103.00	104.00	1.00	sandstone, grey	Sandstone	
104.00	107.00	3.00	sandstone, grey clay	Sandstone	
107.00	122.00	15.00	sandstone, grey	Sandstone	
122.00	130.00	8.00	sandstone, grey siltstone	Sandstone	
130.00	131.50	1.50	sandstone, grey quartz	Sandstone	
131.50	158.00	26.50	sandstone, grey	Sandstone	
158.00	160.00	2.00	siltstone	Siltstone	
160.00	170.00	10.00	sandstone, grey siltstone	Sandstone	
170.00	180.00	10.00	sandstone, grey		

Remarks

updated from original form A

NSW OFFICE OF WATER
Work Summary

GW108106

***** End of GW108106 *****

NSW OFFICE OF WATER
Work Summary

GW108450

Licence : 10BL601060 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Down Hole Hammer		
Owner Type : Private		

Commenced Date : **Final Depth :** 150.00 m
Completion Date : 19-Jan-2007 **Drilled Depth :** 150.00 m

Contractor Name : INTERTECH DRILLING
Driller : 1489 BARDEN, Colin Leslie
Assistant Driller's Name :

Property : - SHIELDS **Standing Water Level :** 41.30 m
GWMA : - **Salinity :** 110.00 mg/L
GW Zone : - **Yield :** 0.55 L/s Cumulative

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
Client	Driller	**Form A :** CUMBERLAND	NARRABEEN	86//12115
		Licensed : CUMBERLAND	NARRABEEN	86 12115

Region : 10 - SYDNEY SOUTH COAST **CMA Map :** 9130-1S MONA VALE
River Basin : 213 - SYDNEY COAST - GEORGES RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District :

Elevation : **Northing :** 6271876 **Latitude (S) :** 33° 40' 51"
Elevation Source : **Easting :** 339185 **Longitude (E) :** 151° 15' 55"

GS Map : **MGA Zone :** 56 **Coordinate Source :** GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	2.70	203			Down Hole Hammer
1		Hole	Hole	2.70	150.00	161			Down Hole Hammer
1	1	Casing	Steel	-0.30	2.70	168	158.4		Driven into Hole; Suspended in Clamps; Open End
1	1	Casing	PVC Class 9	-0.30	41.70	140			Screwed and Glued; Suspended in Clamps
1		Annulus	Concrete	0.00	2.70	203			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
35.50	37.00	1.50				0.02			125.00
73.00	75.00	2.00				0.10			98.00
101.00	103.00	2.00				0.23			92.00
133.00	137.00	4.00		41.30		0.20			110.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.50	0.50	Soil, sandy	Soil	
0.50	22.00	21.50	Sandstone, yellow	Sandstone	
22.00	25.00	3.00	Ironstone	Ironstone	
25.00	35.50	10.50	Sandstone, grey	Sandstone	
35.50	37.00	1.50	Sandstone-Quartz, water bearing	Sandstone	
37.00	38.00	1.00	Clay band	Clay	
38.00	49.00	11.00	Sandstone, grey	Sandstone	
49.00	63.00	14.00	Sandstone-Quartz	Sandstone	
63.00	73.00	10.00	Sandstone, grey	Sandstone	
73.00	75.00	2.00	Sandstone-Quartz, water bearing	Sandstone	
75.00	101.00	26.00	Sandstone, grey	Sandstone	
101.00	103.00	2.00	Sandstone-Quartz, water bearing	Sandstone	
103.00	116.00	13.00	Sandstone, grey	Sandstone	
116.00	117.00	1.00	Siltstone	Siltstone	
117.00	129.00	12.00	Sandstone, grey	Sandstone	
129.00	129.50	0.50	Clay	Clay	
129.50	133.00	3.50	Sandstone, grey	Sandstone	
133.00	137.00	4.00	Sandstone-Quartz, water bearing	Sandstone	
137.00	139.00	2.00	Sandstone-Siltstone	Sandstone	
139.00	148.50	9.50	Sandstone, grey	Sandstone	
148.50	149.00	0.50	Siltstone	Siltstone	
149.00	150.00	1.00	Sandstone, grey	Sandstone	

Remarks

updated from original form A

***** End of GW108450 *****

NSW OFFICE OF WATER
Work Summary

GW108510

Licence : 10BL600637 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Down Hole Hammer		
Owner Type : Private		

Commenced Date : **Final Depth :** 102.00 m
Completion Date : 27-Sep-2006 **Drilled Depth :** 102.00 m

Contractor Name : INTERTECH DRILLING
Driller : 1489 BARDEN, Colin Leslie
Assistant Driller's Name :

Property : - CRAIG PERKINS INVESTMENTS **Standing Water Level :** 32.40 m
GWMA : - **Salinity :** 125.00 mg/L
GW Zone : - **Yield :** 2.40 L/s Cumulative

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
Client	Driller	**Form A :** CUMBERLAND	NARRABEEN	1//598867
		Licensed : CUMBERLAND	NARRABEEN	1 598867

Region : 10 - SYDNEY SOUTH COAST **CMA Map :** 9130-1S MONA VALE
River Basin : 212 - HAWKESBURY RIVER **Grid Zone :** 56/1 **Scale :** 1:25,000
Area / District :

Elevation : **Northing :** 6273441 **Latitude (S) :** 33° 40' 1"
Elevation Source : **Easting :** 339452 **Longitude (E) :** 151° 16' 6"

GS Map : **MGA Zone :** 56 **Coordinate Source :** GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	2.60	203			Down Hole Hammer
1		Hole	Hole	2.60	102.00	164			Down Hole Hammer
1	1	Casing	Steel	-0.40	2.60	168	158.4		Driven into Hole; Suspended in Clamps; Open End
1	1	Casing	PVC Class 9	-0.40	17.60	140			Screwed and Glued; Suspended in Clamps
1		Annulus	Concrete	0.00	2.60	203			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
54.00	58.00	4.00				0.20			115.00
85.50	90.00	4.50		32.40		2.20			125.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.60	0.60	Soil, sandy	Soil	
0.60	2.80	2.20	Sandstone, weathered	Sandstone	
2.80	5.40	2.60	Shale	Shale	
5.40	7.00	1.60	Sandstone, weathered	Sandstone	
7.00	8.00	1.00	Shale	Shale	
8.00	15.00	7.00	Sandstone, grey	Sandstone	
15.00	22.00	7.00	Sandstone, yellow	Sandstone	
22.00	43.00	21.00	Sandstone, grey	Sandstone	
43.00	45.00	2.00	Sandstone, grey Quartz	Sandstone	
45.00	47.00	2.00	Sandstone, grey	Sandstone	
47.00	50.00	3.00	Sandstone, grey Quartz	Sandstone	
50.00	54.00	4.00	Sandstone, grey	Sandstone	
54.00	58.00	4.00	Sandstone, grey Quartz, water bearing	Sandstone	
58.00	67.00	9.00	Sandstone, grey	Sandstone	
67.00	73.00	6.00	Sandstone, grey Quartz	Sandstone	
73.00	85.50	12.50	Sandstone, grey	Sandstone	
85.50	90.00	4.50	Quartz	Quartz	
90.00	102.00	12.00	Sandstone, grey	Sandstone	

Remarks

updated from original form A

***** End of GW108510 *****

NSW OFFICE OF WATER
Work Summary

GW108676

Licence : 10BL601385 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
	DOMESTIC	DOMESTIC

Work Type : Spear
Work Status : Abandoned Bore
Construct. Method : Down Hole Hammer
Owner Type : Private

Commenced Date : **Final Depth :** 120.00 m
Completion Date : 01-Mar-2007 **Drilled Depth :** 120.00 m

Contractor Name : Highland Drilling
Driller : 1771 DELAMONT, Brett
Assistant Driller's Name :

Property : - CONGAGLEN **Standing Water Level :**
GWMA : - **Salinity :**
GW Zone : - **Yield :**

Site Details

Site Chosen By	County	Parish	Portion/Lot DP
	Form A : CUMBERLAND	NARRABEEN	2//579095
	Licensed : CUMBERLAND	NARRABEEN	2 579095

Region : 10 - SYDNEY SOUTH COAST **CMA Map :**
River Basin : **Grid Zone :** **Scale :**
Area / District :

Elevation : **Northing :** 6272803 **Latitude (S) :** 33° 40' 22"
Elevation Source : **Easting :** 340538 **Longitude (E) :** 151° 16' 48"

GS Map : **MGA Zone :** 56 **Coordinate Source :** GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole Hole	0.00	120.00	200			Down Hole Hammer

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

(No Water Bearing Zone Details Found)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	24.00	24.00	sandstone, pink orange	Sandstone	
24.00	72.00	48.00	sandstone, fine grey	Sandstone	
72.00	84.00	12.00	shale	Shale	
84.00	114.00	30.00	sandstone, fine grey	Sandstone	
114.00	120.00	6.00	shale	Shale	

Remarks

Abandoned bore. updated from original form A

***** End of GW108676 *****

NSW OFFICE OF WATER
Work Summary

GW108708

Licence : 10BL601568 **Licence Status** Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Down Hole Hammer		
Owner Type : Private		

Commenced Date : **Final Depth :** 150.00 m
Completion Date : 19-Apr-2007 **Drilled Depth :** 150.00 m

Contractor Name : INTERTECH DRILLING
Driller : 1997 SHEEHY, Paul
Assistant Driller's Name :

Property : - ADDISON **Standing Water Level :** 38.00 m
GWMA : - **Salinity :** 270.00 mg/L
GW Zone : - **Yield :** 0.85 L/s cumulative

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
Client	Driller	**Form A :** CUMBERLAND	NARRABEEN	1//595401
		Licensed : CUMBERLAND	NARRABEEN	1 595401

Region : 10 - SYDNEY SOUTH COAST **CMA Map :**
River Basin : **Grid Zone :** **Scale :**
Area / District :

Elevation : **Northing :** 6272996 **Latitude (S) :** 33° 40' 15"
Elevation Source : **Easting :** 339338 **Longitude (E) :** 151° 16' 1"

GS Map : **MGA Zone :** 56 **Coordinate Source :** GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.60	203			Down Hole Hammer
1		Hole	Hole	5.60	150.00	158			Down Hole Hammer
1	1	Casing	Steel	-0.40	5.60	168			Driven into Hole; Open End
1	1	Casing	PVC Class 9	-0.40	95.60	140			Screwed and Glued; Suspended in Clamps; Open End
1	1	Opening	Slots - Diagonal	72.00	90.00	140			PVC Class 9; Sawn; SL: 100mm; A: 3mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
37.00	42.00	5.00				0.10			121.00
73.00	76.00	3.00				0.10			150.00
108.50	112.00	3.50				0.65			270.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.20	0.20	topsoil	Topsoil	
0.20	21.00	20.80	sandstone, grey	Sandstone	
21.00	21.50	0.50	ironstone	Ironstone	
21.50	31.50	10.00	sandstone, grey	Sandstone	
31.50	34.00	2.50	sandstone, quartz	Sandstone	
34.00	37.00	3.00	sandstone, grey	Sandstone	
37.00	42.00	5.00	sandstone, quartz	Sandstone	
42.00	56.50	14.50	sandstone, grey	Sandstone	
56.50	67.00	10.50	sandstone, quartz	Sandstone	
67.00	73.00	6.00	sandstone, grey	Sandstone	
73.00	76.00	3.00	sandstone, quartz	Sandstone	
76.00	77.00	1.00	sandstone, grey	Sandstone	
77.00	78.50	1.50	siltstone, clay band	Siltstone	
78.50	85.00	6.50	sandstone, grey	Sandstone	
85.00	85.50	0.50	siltstone, clay band	Siltstone	
85.50	94.00	8.50	sandstone, quartz	Sandstone	
94.00	94.50	0.50	clay, quartz band	Clay	
94.50	98.00	3.50	sandstone, quartz	Sandstone	
98.00	108.50	10.50	sandstone, grey	Sandstone	
108.50	112.00	3.50	sandstone, quartz	Sandstone	
112.00	128.50	16.50	sandstone, grey	Sandstone	
128.50	130.00	1.50	siltstone	Siltstone	
130.00	136.00	6.00	sandstone, grey	Sandstone	
136.00	140.00	4.00	siltstone	Siltstone	
140.00	150.00	10.00	sandstone, grey	Sandstone	

Remarks

updated from original form A

***** End of GW108708 *****

NSW OFFICE OF WATER
Work Summary

GW108831

Licence : 10BL601319
Licence Status Active

	Authorised Purpose(s)	Intended Purpose(s)
Work Type : Bore	DOMESTIC	DOMESTIC
Work Status : Supply Obtained	STOCK	STOCK
Construct. Method : Down Hole Hammer		
Owner Type : Private		

Commenced Date : **Final Depth :** 180.00 m
Completion Date : 17-Apr-2007 **Drilled Depth :** 180.00 m

Contractor Name : INTERTECH DRILLING
Driller : 1997 SHEEHY, Paul
Assistant Driller's Name :

Property : - SCARF
GWMA : -
GW Zone : -

Standing Water Level : 21.00 m
Salinity :
Yield : 0.20 L/s cumulative

Site Details

Site Chosen By		County	Parish	Portion/Lot DP
Client	Driller	**Form A :** CUMBERLAND	NARRABEEN	2//595401
		Licensed : CUMBERLAND	NARRABEEN	2 595401

Region : 10 - SYDNEY SOUTH COAST
River Basin :
Area / District :

CMA Map :
Grid Zone :
Scale :

Elevation :
Elevation Source :

Northing : 6272957
Easting : 339422
Latitude (S) : 33° 40' 16"
Longitude (E) : 151° 16' 4"

GS Map : **MGA Zone :** 56 **Coordinate Source :** GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	5.60	203			Down Hole Hammer
1		Hole	Hole	5.60	180.00	158			Down Hole Hammer
1	1	Casing	Steel	-0.40	5.60	168			Seated on Bottom; Open End
1	1	Casing	PVC Class 9	-0.40	107.60	140			Screwed and Glued; Suspended in Clamps; Open End
1	1	Opening	Slots - Diagonal	20.00	24.00	140			PVC Class 9; Sawn; SL: 100mm; A: 3mm
1	1	Opening	Slots - Diagonal	57.00	60.00	140			PVC Class 9; Sawn; SL: 100mm; A: 3mm
1	1	Opening	Slots - Diagonal	90.00	102.00	140			PVC Class 9; Sawn; SL: 100mm; A: 3mm
1		Annulus	Concrete	0.00	5.60	203			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
22.00	22.50	0.50				0.05			115.00
89.00	91.00	2.00				0.10			140.00
98.00	98.50	0.50				0.05			151.00

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.50	0.50	topsoil	Topsoil	
0.50	13.00	12.50	sandstone, yellow	Sandstone	
13.00	13.50	0.50	clay	Clay	
13.50	22.00	8.50	sandstone, yellow	Sandstone	
22.00	22.50	0.50	sandstone, quartz	Sandstone	
22.50	23.00	0.50	clay	Clay	
23.00	43.00	20.00	sandstone, yellow	Sandstone	
43.00	52.50	9.50	sandstone, quartz	Sandstone	
52.50	55.50	3.00	sandstone, grey	Sandstone	
55.50	56.50	1.00	shale, soft	Shale	
56.50	58.50	2.00	sandstone, quartz	Sandstone	
58.50	64.50	6.00	shale, clay band	Shale	
64.50	74.00	9.50	sandstone, grey	Sandstone	
74.00	77.00	3.00	shale, soft	Shale	
77.00	89.00	12.00	sandstone, grey	Sandstone	
89.00	91.00	2.00	sandstone, quartz	Sandstone	
91.00	94.00	3.00	sandstone, grey	Sandstone	
94.00	95.00	1.00	sandstone, clay band	Sandstone	
95.00	98.00	3.00	sandstone, grey	Sandstone	
98.00	98.50	0.50	sandstone, quartz	Sandstone	
98.50	100.50	2.00	sandstone, grey	Sandstone	
100.50	102.00	1.50	sandstone, clay band	Sandstone	
102.00	121.00	19.00	sandstone, grey	Sandstone	
121.00	125.00	4.00	shale	Shale	
125.00	145.00	20.00	sandstone, grey	Sandstone	
145.00	146.00	1.00	shale	Shale	
146.00	180.00	34.00	sandstone, grey	Sandstone	

Remarks

updated from original form A

NSW OFFICE OF WATER
Work Summary

GW108831

***** End of GW108831 *****

DOCUMENT/REPORT CONTROL FORM

File Location Name:	30012289.V01
Project Name:	On Site Effluent Subdivision Assessment for development of the Ingleside Release Area, Ingleside, NSW
Project Number:	30012289.V01
Revision Number:	R03

Revision History

Revision #	Date	Prepared by	Reviewed by	Approved for Issue by
Draft R00	14/05/2015	Lachlan Edwards	Daniel Saunders	Daniel Saunders
Draft R01	15/06/2015	Daniel Saunders	Lachlan Edwards	Daniel Saunders
Draft R02	26/06/2015	Lachlan Edwards	Daniel Saunders	Daniel Saunders
Final R03	14/07/2015	Daniel Saunders	Daniel Saunders	Daniel Saunders

Issue Register

Distribution List	Date Issued	Number of Copies
Liz Gonzales Department of Planning and Environment	14/07/15	1
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SMEC Project File	14/07/15	1

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