Beveridge North West PSP

METROPOLITAN PLANNING AUTHORITY

Groundwater Quality Assessment

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Beveridge North West PSP

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V2	13/06/14	MPA comments	W Rodger	C Bannister	C Bannister

Contents

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The sole purpose of this report and the associated services performed by Jacobs is assess the water quality within previously installed wells at the Beveridge North West PSP in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

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1. Introduction

1.1 Background

Sinclair Knight Merz Pty Ltd (Jacobs SKM) was commissioned by the Metropolitan Planning Authority (MPA) to undertake additional groundwater assessment at Lot 8 and 9 Camerons Lane, Beveridge within the Beveridge North West 1059 Precinct Structure Plan (PSP) area. This additional investigation is in accordance with recommendations made in the earlier desktop environmental, hydrological and geotechnical assessment prepared by SKM in October 2013 (SKM, 2013). These properties are owned by Yarra Valley Water and are hereafter collectively referred to as 'the Site'. A site location plan is presented in Figure 1 while the layout (with sampling locations) is presented in Figure 2.

The Beveridge North West PSP Area has been identified as potential future land supply primarily for residential land use, although also with a view to various commercial and community land uses. The aim of the earlier assessment completed in 2013 was to identify opportunities and constraints to the proposed land development which may potentially be caused by existing or past land uses, and site and sub-surface conditions. The YVW site that is the subject of this assessment was observed to be a potentially source of groundwater contamination, since it is currently used for irrigation using recycled water from the nearby Wallan Sewage Treatment Plant (STP). This report documents the additional sampling and analysis program that was undertaken in order to identify the nature, extent and significance of contamination (if any) resulting from this source that may preclude the beneficial uses of groundwater relevant under the proposed future site development.

1.2 Scope of works

The following scope of works was undertaken as part of this assessment:

- Collection of 13 primary groundwater and effluent samples from the site and the immediate perimeter as well as relevant quality control samples
- Laboratory analysis of water samples for contaminants of primary concern
- Comparison of laboratory results against relevant assessment criteria endorsed by EPA Victoria for the protection of human health and the environment
- Comparison of laboratory results against historical results obtained at the site by YVW to assess longer term contaminant concentration trends
- Preparation of a summary report documenting the tasks completed as part of the assessment as well as conclusions and recommendations in relation to the current condition of the site

1.3 Abbreviations and acronyms

- ALS – Australian Laboratory Services
- AS – Australian Standard
- COC – Chain of custody
- DQO – Data quality objectives
- EIL – Ecological investigation level
- EPA – Environment Protection Authority (Victoria)
- ESA – Environmental site assessment
- GAA – Growth Areas Authority (now Metropolitan Planning Authority)
- GVW – Goulburn Valley Water
- HIL – Health investigation level

- HSEC – Health, safety environment and community
- MDL – Method detection limit
- MPA – Metropolitan Planning Authority
- NATA – National Association of Testing Authorities
- NEPC – National Environment Protection Council
- NEPM – National Environment Protection (Assessment of Site Contamination) Amendment Measure
- PQL – Practicable quantitation limit
- PSP – Precinct Structure Plan
- QA/QC – Quality assurance / quality control
- RPD – Relative percentage difference
- SEPP – State Environmental Protection Policy
- SKM – Sinclair Knight Merz
- STP – Sewage treatment plant
- USEPA – United States Environment al Protection Agency
- YVW – Yarra Valley Water

2. Site use and previous investigation

2.1 Site use

The water re-use scheme that currently operates at the site was established by Goulburn Valley Water (GVW) before ownership was transferred to YVW in January 2006 - at this time, irrigation commenced at the site. The water re-use scheme was established by GVW to make use of treated effluent from the nearby Wallan STP. Prior to 2006 historical aerial imagery indicates the site (and much of the surrounding area) was used for agricultural purposes.

Irrigation of the site is ongoing at four main locations. Two boom irrigators operate to the south of the winter storage facility, one in each of the paddocks either side of the access road between Camerons Lane and winter storage reservoir. Each of these irrigators operates over an area of approximately 50 hectares (ha). Two further centre-pivot irrigators operate to the north of the winter storage area, one occupying an area of 10 ha and the other 40 ha. The existing winter storage reservoir currently occupies an area of 5 ha. Figure 2 illustrates the location of the irrigators at the site while Plate 2.1 below provides a selection of photographs if the equipment.

Boom irrigators operating at Lot 8

Boom irrigators at Lot 8, illustrating the spraying mechanism

Plate 2.1 : Boom irrigators in operation at the site

2.2 Previous investigations

This section summarises the previous investigation reports reviewed by SKM as part of this assessment that relate to groundwater.

2.2.1 SKM, 2002 – Wallan Reclaimed Water Re-Use Site: Hydrogeological Assessment

In 2002, GVW commissioned SKM to undertake a hydrogeological assessment to determine background groundwater conditions at Lot 8 and 9 (17 wells). The assessment was undertaken pre-irrigation and provides some relevant “baseline” data.

Groundwater flow direction was determined to be towards the south which is consistent with the latest 2014 assessment (see Figure 4). Groundwater salinity ranged from 920 to 8,500 µS/cm, which is consistent with the latest 2014 assessment (see Section 5.5 for further information). Concentrations of nitrate (as N mg/L) varied between 0.11 – 3.2 mg/L, nitrite from <0.01 – 0.82 mg/L and ammonia <0.01 to 0.5 mg/L across the 17 sampled wells.

A comparison between the current 2014 data vs SKM’s 2002 (pre irrigation) data is provided in Section 5.5.

2.2.2 YVW, 2008 – Camerons Lane Lots 8 & 9: Preliminary Assessment of Groundwater Monitoring Results

In 2008 Yarra Valley Water prepared an assessment report documenting the results of periodic groundwater monitoring events undertaken across a network of 18 groundwater monitoring bores and windmills at the site. The purpose of the assessment was to confirm that the irrigation of the site using recycled water was not having a detrimental impact upon groundwater quality and the relevant beneficial use segments as defined in the State Environmental Protection Policy (SEPP). Laboratory results were compared against background results obtained by SKM prior to commencement of irrigation, in order to assess groundwater quality trends. These results were also compared against the ANZECC & ARMCANZ (2000) assessment criteria for the relevant protected beneficial uses which included stock watering, irrigation water, industrial use of groundwater, ecosystem protection and buildings and structures.

Yarra Valley Water concluded that the majority of parameters generally reported stable concentrations trends between pre and post irrigation monitoring. Where exceedances of the relevant criteria were observed, these were either:

- For analytes that also reported exceedances prior to irrigation commencing and were therefore deemed unlikely to have resulted from the irrigation itself (i.e. TDS)
- For analytes that were not tested for during pre-irrigation monitoring and therefore results could not be attributed to irrigation (i.e. sodium, chloride and pH)

The report also provides a summary of the water quality parameters for the recycled irrigation water, which was derived from the Wallan Sewage Treatment Plant. The discharged water is rated as Class C recycled water, which can be used for the following uses (as described by YVW):

> *'Class C may be used for a number of uses including for cooked or processed human food crops including wine grapes and olives. It can also be used for livestock grazing and fodder and for human food crops grown over a meter above the ground and eaten raw such as apples, pears, table grapes and cherries. It can be used by councils for specific purposes but there are restrictions around human contact'*

While nutrient concentrations (nitrate, nitrite and ammonia) as well as E.coli are generally raised, concentrations of metals, selected solvents, volatile organics and monocyclic aromatic hydrocarbons (MAHs) were generally reported below laboratory limits of detection.

3. Investigation methodology

3.1 Selection of sampling locations

Samples were obtained from 13 targeted locations at the site between 11 and 13 March 2014. Twelve of these locations were groundwater sampling locations while a further treated effluent / recycled water sample was collected from the winter storage facility (sample EFF). The treated effluent contained in the winter storage facility is used to irrigate the site. Sampling locations are presented in Figure 2.

Groundwater samples were predominantly collected from locations around the immediate perimeter of Lots 8 and 9, as well as a single location near the existing winter storage reservoir towards the centre of the site. While bores were previously located within a number of the irrigated paddocks, these appear to have been removed since the previous groundwater monitoring report was prepared in 2008. Jacobs SKM assumes these have been removed due to their obstruction of the boom irrigators or other farm machinery. Despite the lack of monitoring wells towards to interior of the site, the perimeter wells selected will provide an indication of potential off-site migration of contaminants of concern at the site (if any) that supplement the results obtained for WSBH, located in the vicinity of the winter storage reservoir.

Treated effluent sampling location EFF has been selected, as it provides a valuable reference against which groundwater quality results for the site can be compared. In order to restrict access to the winter storage reservoir itself, YVW has installed a dedicated sampling point on the external wall of one of the administration buildings nearby. It is from this location that a treated effluent sample was collected (refer Plate 3.1).

3.2 Sampling methodology

Fieldwork undertaken as part of the additional investigations was completed in accordance with Jacobs SKM's standard work procedures for the investigation of contaminated sites. A site-specific Health, Safety, Environment and Community (HSEC) plan was also prepared and implemented by the field team throughout the investigations.

Groundwater samples were collected using a range of methods, depending upon the nature of the groundwater bores installed, the above-ground infrastructure present as well as borehole yields. Sampling methods adopted for the investigation included:

- Low flow (micropurge) sampling
- Disposable bailer
- Foot valve
- Direct sampling from taps or other above-ground sampling points

Low flow sampling was preferentially adopted for the investigation with the general sampling procedure described below.

The depth to water and total depth measurements of each groundwater monitoring well was recorded using a multi-phase interface probe that detects water levels and the presence of non-aqueous phase liquids. To ensure representative groundwater samples were collected from each monitoring well, wells were purged using low flow sampling techniques with a bladder pump and dedicated tubing. Physical and chemical water quality parameters were recorded at regular intervals and once these parameters had stabilised, groundwater samples were collected. During purging, the pumping rate as well as the SWL was recorded to ensure that drawdown of groundwater was minimised and suitable representative samples were collected for laboratory analysis. Where necessary the pumping rate (cycles per minute) was reduced.

Physical and chemical water quality indicator data was recorded using a TPS 90FL multi parameter meter. Parameters recoded included conductivity, reduction/oxidation (redox) potential, pH, dissolved oxygen (mg/L and percentage saturation) and temperature. Stabilisation of parameters was considered to have been reached when three consecutive field measurements were reported within the following ranges:

- Dissolved oxygen (DO) +/- 10%
- Electrical conductivity (EC) +/-3%
- pH +/-0.05; and
- Redox potential +/-10mV

Where stabilisation of all of the above field measurements could not be achieved, sampling was undertaken when the majority of parameters had stabilised. The stabilisation criteria adopted are derived from EPA Victoria *Groundwater Sampling Guidelines*.

Samples were collected in appropriately preserved sampling containers specific to the required analysis. These containers were provided by the primary laboratory (Eurofins-MGT). To assess dissolved metal concentrations, each sample was also field filtered using a disposable 0.45 µM Stericup filter prior to chemical preservation. Samples were immediately placed in a chilled esky before being transferred to the primary laboratory under appropriate chain of custody (CoC) documentation (presented in Appendix D).

Fresh tubing, bladders and Stericup filters dedicated to each location were used when sampling. All non-dedicated sampling equipment was decontaminated between sampling locations to prevent cross contamination. Fresh disposable nitrile gloves were also used at each sampling location.

Low flow sampling methods were preferentially adopted for the investigation. However, in some cases this methodology could not be applied. Alternative sampling approaches were used in the following circumstances:

- Insufficient groundwater. At location BH12 the volume of groundwater in the well was insufficient to allow the low flow sampling equipment to operate effectively (i.e. a water column of less than 1m). As such, a disposable bailer was used for sampling. The well was purged dry and allowed to recharge before a sample was collected for laboratory analysis.
- Poor well recharge. BH11 reported a poor recharge rate using the low flow sampling kit with groundwater drawdown in the well equivalent to the volume of water removed during purging. This was the case even at the lowest possible rate of extraction. As such, groundwater samples collected were not considered representative of the wider aquifer. Therefore, a disposable bailer was used to sample the well instead. Purging using a bailer induced in increased rate of groundwater recharge in the well. As such, the bore could not be purged dry before sampling. Instead, water quality parameters were recorded at regular intervals and a sample for laboratory analysis was collected once these parameters stabilised.
- Partial obstruction of the well. A number of bores were installed with windmills for stock watering purposes. A typical example is presented in Plate 3.1. The existing pumping infrastructure in these wells prevented the use of the low flow sampling pump. As such, sampling was undertaken using a disposable foot valve and LDPE tubing. Where the mill was operational and therefore being continually purged (i.e. BH18) a sample was collected immediately. Where the mill was not operational (i.e. BH15 and BH17) groundwater was purged until water quality parameters stabilised.
- Complete obstruction of the well or sampling points. Where the well or sampling location was obstructed completely samples were instead collected from taps or other connected sampling points. These locations include:
    - BH5 where a sample was collected from a garden tap fed by the target bore (refer Plate 3.1)
    - The bore adjacent to the winter storage facility (named WSBH) where a sample was collected from a tap inside the main building
    - The winter storage facility where an effluent sample (EFF) was collected from a dedicated sampling point outside the compound (refer Plate 3.1)

- BH14 where mill infrastructure necessitated the sample being collected from the mill discharge pipe to an adjacent storage tank

Windmill sampling location BH18. Restricted access to the well

Windmill sampling location BH17 with restricted access to the well

Effluent sampling location (EFF). Pump used to obtain sample

BH5 sampled directly from a tap connected to the bore

Plate 3.1 : Examples of sampling locations

Sampling methods adopted during the investigation are summarised in Table 3.1.

Table 3.1 : Summary of sampling methods adopted

Location		Sampling method	Comments
ID	Description		
BH2	South west corner of Lot 8	Micropurge	
BH5	South west corner of Lot 8	Tap	No direct access to bore
BH7	Eastern perimeter of Lot 8	Micropurge	
BH10	North east corner or Lot 9	Micropurge	
BH11	North west corner of Lot 9	Bailer	Poor recharge rate
BH12	Eastern perimeter of Lot 8	Bailer	Insufficient groundwater for micropurge
BH14	Eastern perimeter of Lot 9	Windmill discharge	
BH15	Western perimeter of Lot 8	Foot valve	Windmill. Restricted access to bore
BH16	Western perimeter of Lot 8	Micropurge	

Location		Sampling method	Comments
ID	Description		
BH17	Eastern perimeter of Lot 9	Foot valve	Windmill. Restricted access to bore
BH18	Eastern perimeter of Lot 8	Foot valve	Windmill. Restricted access to bore
WSBH	Bore adjacent to winter storage	Tap	No direct access to bore
EFF	Treated effluent from winter storage	Tap	No access to winter storage reservoir

3.3 Laboratory analysis

In total, thirteen primary samples and four quality control samples were submitted for laboratory analysis for contaminants of concern. Eurofins-MGT was selected as the primary laboratory to conduct analysis while Australian Laboratory Services (ALS) was used as the secondary quality control laboratory. Both laboratories are accredited by the National Association of Testing Authorities (NATA) for the analyses undertaken. A summary of the samples submitted for analysis is presented in Section 3.3.1 and 3.3.2 below.

3.3.1 Primary samples

Primary groundwater and effluent samples were submitted for analysis as presented in Table 3.2.

Table 3.2 : Summary of analysis of primary water samples

Analysis Suite		Total Samples
Groundwater suite	Dissolved metals (16), nutrients, inorganics and TDS	12
Surface water / effluent	Total metals (16), nutrients, inorganics and TDS	1

NOTES:

- Metals (16) - As, Be, B, Cd, Ca, Cr, Co, Cu, Mg, Mn, Ni, Pb, K, Na, Hg, Zn
- Nutrients – ammonia, nitrate, nitrite, total Kjeldahl nitrogen, total nitrogen
- Inorganics – sulphate, fluoride, total cyanide

3.3.2 Quality control samples

Four quality control samples were submitted for analysis as presented in Table 3.3.

Table 3.3 : Summary of quality control samples

Quality Control Samples		Total Samples
Blind duplicate (intralab duplicate)	Total metals (16), nutrients, inorganics and TDS	1
Split duplicate (interlab duplicate)	Total metals (16), nutrients, inorganics and TDS	1
Rinsate blanks	Total metals (16), nutrients, inorganics	2

NOTES:

- Metals (16) - As, Be, B, Cd, Ca, Cr, Co, Cu, Mg, Mn, Ni, Pb, K, Na, Hg, Zn
- Nutrients – ammonia, nitrate, nitrite, total Kjeldahl nitrogen, total nitrogen
- Inorganics – sulphate, fluoride, total cyanide

Analysis was undertaken in order to satisfy quality criteria outlined in AS 5667.1:1998 *'Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples'* (Standards Australia, 1998) as well as EPA Victoria *Groundwater Sampling Guidelines* (2000). A discussion of Quality Assurance/Quality Control procedures and results is provided in Appendix A.

3.4 Analytical data validation

Analytical data validation is the process of assessing whether data are in compliance with method requirements and project specifications. The primary objectives of this process are to ensure that data of known quality are reported, and to identify if the data can be used to fulfil the overall project objectives.

The data validation guidelines adopted are based upon data validation guidance documents published by the United States Environmental Protection Agency (USEPA). The process involves the checking of analytical procedure compliance and an assessment of the accuracy and precision of the analytical data from a range of quality control measurements, generated from both the sampling and analytical programs.

Specific elements that have been checked and assessed for this investigation were:

- Preservation and storage of samples upon collection and during transport to the laboratory
- Sample holding times
- Use of appropriate analytical procedures
- Required limits of reporting
- Frequency of conducting quality control measurements
- Laboratory blank results
- Field duplicate results
- Surrogate spike results
- The occurrence of apparently unusual or anomalous results, e.g. laboratory results that appear to be inconsistent with field observations and measurements

4. Regulatory framework

4.1 Legislation and policy

4.1.1 Environment Protection Act 1970

The *Environment Protection Act 1970* established the Victorian Environment Protection Authority (EPA) and made provisions with respect to the powers, duties, and functions of the EPA and the protection of the environment. The Act provides for environmental audits, which are used to provide an authoritative opinion on the suitability of potentially contaminated land for future use, and form an integral part of the land use planning and approval process. The Act also provides the basis for the various environmental health and waste policies / regulations, which provide the framework for the assessment and management of the environmental quality of land, surface waters and groundwater in Victoria.

4.1.2 The Planning and Environment Act 1987

The *Planning and Environment Act 1987* is administered by the Department of Transport, Planning and Local Infrastructure (DTPLI) and sets out the requirements of planning authorities when preparing planning schemes or amendments to planning schemes. The Act requires planning authorities to "take into account any significant effects which it considers the scheme or amendment might have on the environment or which it considers the environment might have on any use or development envisaged in the scheme or amendment".

Under Section 12 (2) (a) of the Planning and Environment Act 1987, *'Ministerial Direction No. 1 – Potentially Contaminated Land'* requires planning authorities to satisfy themselves that the environmental conditions of land proposed to be used for a sensitive use, agriculture or public open space are, or will be, suitable for that use. This is generally done through the completion of an environmental site assessment and audit process.

4.1.3 Groundwater State Environment Protection Policy 1997

The State Environment Protection Policy (Groundwaters of Victoria) (Groundwater SEPP) defines a range of protected beneficial uses for defined segments of the groundwater environment, which are based on groundwater salinity (total dissolved solids or TDS). The EPA considers that groundwater is *polluted* where current and/or future protected beneficial uses for the relevant segment are precluded. Beneficial uses of groundwater are considered to be precluded when relevant groundwater quality objectives set out in the groundwater SEPP for those beneficial uses have been exceeded, or where non-aqueous phase liquid is present.

Where groundwater has been polluted, groundwater must be cleaned up such that the protection of beneficial uses is restored, or to cleaned up the extent practicable.

The SEPP identifies the following beneficial uses of groundwater that are to be protected:

- Maintenance of marine ecosystems
- Maintenance of freshwater ecosystems
- Potable water supply (desirable)
- Potable mineral water supply
- Agriculture, parks and gardens
- Stock watering
- Industrial water use
- Primary contact recreation (e.g. bathing, swimming)
- Buildings and structures.

Not all of the above beneficial uses are relevant to the PSP area under the proposed future use scenario for the site. Those that are relevant are discussed further in Section 5.3.2 in the context of the reported groundwater salinity (TDS).

4.2 Guidelines and standards

4.2.1 National Environment Protection (Assessment of Site Contamination) Amendment Measure (NEPM) 2013

The NEPM is the national guideline for assessing contaminated sites and was prepared by the National Environment Protection Council (NEPC). The NEPM is implemented in each Australian jurisdiction under the *National Environment Protection Measures (Implementation) Act 1998 (Commonwealth)*. The NEPM document ensures there is a nationally consistent approach to the assessment of contamination. The NEPM provides guidance on the methods of site contamination assessment, environmental and health based investigation levels for soil and groundwater contaminants, human and environmental health risk assessment and reporting requirements. The original NEPM published in 1999 has been recently superseded by a version published in April 2013.

In accordance with the Groundwater SEPP, groundwater quality objectives for protected beneficial uses are primarily sourced from the National Environment Protection (Assessment of Site Contamination) Amendment Measure (NEPC, 2013) ('the NEPM'), specifically those provided in Schedule B(1) of the NEPM, 'Guideline on the Investigation Levels for Soil and Groundwater.'

Groundwater investigation levels (GILs) are defined as 'the concentration of a contaminant in groundwater above which further investigation (point of extraction) or a response (point of use) is required'.

4.2.2 EPA Victoria guidance documents

EPA Victoria has published a number of guideline documents relating to the assessment of groundwater quality in Victoria. These are discussed below.

Groundwater Sampling Guidelines (2000) were published by the EPA under the *Environment Protection Act 1970*. The guidelines have been developed to assist those involved in groundwater sampling to reduce the potential for error, allowing subsequent groundwater management decisions to be based on representative groundwater quality data.

Hydrogeological Assessment (Groundwater Quality) Guidelines published by the EPA in 2006 provide a detailed overview of the requirements for hydrogeological assessments in order to aid owners, developers, potential purchasers and regulators to identify the risk to health and the environment from potential contamination.

The Industrial Waste Resource Guidelines (Sampling and Analysis of Waters, Wastewaters, Soils and Wastes) was published by the EPA in 2009 and provides general direction on appropriate sampling, preservation, storage, analytical and quality assurance procedures.

4.2.3 Australian Standard 5667

Australian Standard 5667.1:1998 *'Water Quality Sampling - Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples'* as well as Australian Standard 5667.1:1998 *'Water Quality Sampling - Part 11: Guidance on sampling of groundwaters'* provide general principles to be applied to the physical, chemical and microbiological analysis of waters and waste waters. These standards include the principles to be applied to the design of sampling programs, general guidance on sampling techniques, procedures for the preservation and transport of samples.

5. Summary of groundwater results

5.1 General observations and well integrity

A search of the *Visualising Victoria's Groundwater* website indicates that seven of the 12 boreholes selected by Jacobs SKM for sampling are registered by DEPI. While detailed borelogs were not available, a general driller's description of the lithology is provided for five of these. This information is summarised in Table 5.1 and Appendix C.

Table 5.1 : Summary of registered bores

Well Name	Registered ID	Total Depth (mbgl)[1]	Description of Lithology	Bore Condition for Sampling
BH2	S9020401/1	15	Basalt overlain by clay and topsoil	Moderate
BH5	79155	14.63	Weathered basalt	Unknown
BH7	145710	13.7	No information	Good
BH10	145714	20.6	Basalt overlain by clay and topsoil	Good
BH11	145715	18.2	Basalt overlain by clay and topsoil	Good
BH12	145711	15.8	Basalt overlain by clay and topsoil	Good
BH14	N/A	N/A[2]	N/A	Good
BH15	N/A	N/A[2]	N/A	Moderate
BH16	N/A	41.6[3]	N/A	Poor
BH17	N/A	N/A[2]	N/A	Moderate
BH18	N/A	N/A[2]	N/A	Moderate
WSBH	S9020401/2	25	No information	Good

NOTES:

1. Registered depth (DEPI)
2. Bore depth could not be established in the field due to well obstruction.
3. Bore depth recorded in the field

During the sampling event, boreholes were observed in varying conditions as described above. Windmill bores (BH14, BH15, BH17 and BH18) were generally in moderate to good condition. Due to the installation of pumping equipment, the top of the wells were not fully sealed at the surface and it is possible that foreign materials and exposure to the environment, more generally, may impact on reported results.

Groundwater wells installed with monument gatics were generally in good condition. These include BH7, BH10, BH11, BH12 and WSBH. BH2 was the only exception where the protective cover had been removed.

BH16 was observed to be in poor condition. It appeared that this bore was formerly a windmill although this structure has now been removed. As such, the top of the well was not sealed to prevent foreign materials entering the well.

Examples of groundwater bore installations are presented in Plate 5.1 while the implications of the condition of the bores are discussed in greater detail in Section 5.4.

Windmill bore BH17. Surface water can readily enter the well

BH16. Former windmill bore no longer sealed

Plate 5.1 : Examples of groundwater bore installations

5.2 Groundwater levels / flow direction

Groundwater was encountered between 5 mbgl and 10 mbgl. However, towards the western perimeter of Lot 8 (BH12) groundwater was encountered at approximately 16 mbgl. These observations correspond well with spatial data obtained from the Victorian Department of Environment and Primary Industry (DEPI) presented in Figure 3.

Groundwater height data indicates the groundwater flow direction is towards the south, towards the creek at the southern end of the site, which is consistent with the previous 2002 SKM assessment (SKM, 2002). A groundwater contour plan is provided as Figure 4.

5.3 Physical and chemical water quality parameters

5.3.1 Field measurements

Physical and chemical groundwater quality parameters were recorded as part of the groundwater sampling program. The parameters reported at stabilisation are presented in Table 5.2. Groundwater sampling forms are provided in Appendix B.

Table 5.2 : Summary of physical and chemical water quality parameters

Well ID[1]	Sample Date	Dissolved Oxygen		EC (mS/cm)	pH	Redox (mV)	Temp (°C)	Comments
		% Sat[1]	mg/L					
BH2	11/03/14	56.4	5.18	2.68	7.29	145	17.6	Clear sample
BH5	11/03/14	43.9	3.61	2.83	7.11	144	23.3	Clear sample
BH7	12/03/14	74.2	6.89	2.12	7.12	90	17.0	Clear sample
BH10	11/03/14	45.0	4.07	2.66	7.15	66	18.3	Clear sample
BH11	12/03/14	38.9	3.72	6.09	7.18	22	15.6	Slightly cloudy
BH12	12/03/14	91.8	8.60	3.88	8.01	141	16.6	High sediment, brown
BH14	12/03/14	22.9	2.11	2.07	6.87	105	17.3	Clear with some flocculent
BH15	13/03/14	61.0	5.81	2.88	7.45	175	15.8	High sediment, brown
BH16	12/03/14	14.3	1.34	3.41	6.41	9	16.5	Slight sediment
BH17	13/03/14	51.9	4.80	1.28	7.41	99	17.2	Slight sediment

Well ID[1]	Sample Date	Dissolved Oxygen		EC (mS/cm)	pH	Redox (mV)	Temp (°C)	Comments
		% Sat[1]	mg/L					
BH18	13/03/14	24.3	2.24	1.29	7.63	139	17.4	Slight sediment, pale brown
WSBH	13/03/14	23.8	2.21	2.59	6.35	143	17.1	Clear
EFF	13/03/14	28.5	2.56	0.972	7.62	87	18.7	Cloudy

NOTES:

1. Percentage saturation is an estimated value that has been calculated based on concentration in mg/L, water temperature and site altitude (300 mADH).

Reported water quality parameters indicate that the groundwater across the site is characterised by a fairly neural pH with a relatively low salinity, ranging from 1.28 mS/cm (BH17) to 6.09 mS/cm (BH7). The results for reduction/oxidation (redox) potential are positive which is indicative of oxidising conditions. Dissolved oxygen concentrations vary across the site, although concentrations are all below saturation. Samples collected using either a foot valve or a disposable bailer generally report higher dissolved oxygen concentration. These sampling methods agitate the sample to a greater degree than low flow techniques and can result in increased aeration and consequently dissolved oxygen concentrations.

5.3.2 Laboratory total dissolved solids

Laboratory TDS concentrations for groundwater (which are an indicator of salinity) ranged from 700 mg/L to 3,500 mg/L during the most recent round of groundwater monitoring. The average TDS concentration is 1,656 mg/L. In accordance with the Groundwater SEPP, the sampled aquifer is classified as Segment A2 (501 – 1,000 mg/L) based on the lowest reported TDS concentration. As such, the beneficial uses of groundwater to be protected include:

- Maintenance of ecosystems
- Potable water supply (acceptable)
- Potable mineral water supply
- Agriculture, parks and gardens
- Stock watering
- Industrial use
- Primary contact recreation
- Buildings and structures

Of these, use of groundwater for mineral water supply is not considered relevant. Regional groundwater is not considered typical of mineral waters which are naturally effervescent and high in bicarbonate concentrations.

The following sections present the results obtained as part of the most recent sampling event in comparison with the relevant assessment criteria for each of the beneficial uses identified above.

5.4 Laboratory analytical results

Comparison of laboratory results against criteria for individual beneficial uses is detailed in Sections 5.4.1 to 5.4.4 below.

5.4.1 Comparison of laboratory results against human health criteria

Laboratory analytical results were compared against the following criteria for the protection of human health:

- Australian drinking water guidelines (ADWG) (NHMRC & NRMMC, 2011)
- Guidelines for managing risks in recreational waters (GMRRW) (NHMRC, 2008)

These criteria consider the suitability of groundwater at the site for the potable water supply and primary contact recreation protected beneficial uses of groundwater.

Analytes reporting exceedances of the assessment criteria are summarised in Table 5.3 below with tabulated results presented in Data Table A at the end of the report.

Table 5.3 : Summary of exceedances of the assessment criteria for the protection of human health

Contaminant of Concern		Concentration Range[1]		No. Results[2]	No. Samples Exceeding Human Health Criteria		
					ADWG		GMRRW
Group	Analyte	Minimum	Maximum		Health	Aesthetic	
Metals	Manganese	<5	750	15	**2**	**4**	None
	Nickel	<1	26	15	**1**	N/A	None
Inorganics	Nitrite (as N)	<2	3,800	15	**3**(3)	N/A	None
	Sodium	157 mg/L	720 mg/L	15	N/A	**11**	N/A
	TDS	620 mg/L	3,500 mg/L	15	N/A	**15**	N/A

NOTES:

1. Units are µg/L unless stated otherwise
2. Includes primary and duplicate samples
3. These nitrite exceedances are from samples collected directly from the winter storage effluent holding pond (EFF)

5.4.2 Comparison of laboratory results against ecological criteria

Laboratory results were compared against the following criteria for the protection of ecosystems:

- Australian water quality guidelines for fresh water (AWQG) (ANZECC & ARMCANZ, 2000)

These criteria consider the suitability of groundwater at the site for the maintenance of ecosystems beneficial use. The maintenance of ecosystems beneficial use is considered to apply to groundwater at the point of discharge to the relevant surface water receptor, in this case, the heavily modified unnamed creek running along the southern portion of site (see Figure 5). Based on the groundwater contour plan, this creek is directly down gradient from site (see Figure 4).

The creek has been heavily modified, including the construction of several storage dams along its alignment - storage dams have been constructed in the southern portion of site, immediately offsite to the south (on the quarry site) and further south, on the recently constructed golf course. As part of construction of the golf course, the actual alignment of the creek has also been re-shaped / moved (see Figure 5). Given the highly modified nature of the creek, an 80% level of ecosystem protection has been assigned for the creek (ANZECC 80% level of ecosystem protection guidelines have been used).

Analytes reporting exceedances of the assessment criteria are summarised in Table 5.4 below with tabulated results presented in Data Table B at the end of the report.

Table 5.4 : Summary of exceedances of the assessment criteria for the protection of ecosystems

Contaminant of Concern		Concentration Range[1]		No. Results[2]	No. Samples Exceeding AWQG
Group	Analyte	Minimum	Maximum		
Metals	Copper	<1	300	15	**8**
	Nickel	<1	26	15	**1**
	Zinc	<1	360	15	**4**
Inorganics	Total Cyanide	<5	23	15	**1**[(3)]

NOTES:

1. Units are µg/L unless stated otherwise
2. Includes primary and duplicate samples
3. Cyanide exceedance is from a sample collected directly from the winter storage effluent holding pond (EFF)

5.4.3 Comparison of laboratory results against primary use criteria

Laboratory results were compared against the following criteria for the primary use of groundwater:

- Irrigation water short term trigger values (ANZECC, 2000) – up to 20 years
- Recommended water quality trigger values for livestock drinking water (ANZECC & ARMCANZ, 2000)

The irrigation short term trigger value (up to 20 years) was deemed to be applicable for the assessment. These criteria consider the suitability of groundwater at the site for the agriculture, parks and gardens as well as stock watering beneficial uses.

Analytes reporting exceedances of the assessment criteria are summarised in Table 5.5 below with tabulated results presented in Data Table C at the end of the report.

Table 5.5 : Summary of exceedances of the assessment criteria for the primary use of groundwater

Contaminant of Concern		Concentration Range[1]		No. Results[2]	No. Samples Exceeding Primary Use Criteria	
					Irrigation Trigger Values (TV)	Stock Watering
Group	Analyte	Minimum	Maximum		Short Term TV	
Inorganics	TDS	620 mg/L	3,500 mg/L	15	None	**2**

NOTES:

1. Units are µg/L unless stated otherwise
2. Includes primary and duplicate samples

5.4.4 Comparison of laboratory results against industrial use and buildings and structures criteria

Laboratory results were compared against the following criteria for the use of groundwater for industrial purposes and for the protection of buildings and structures:

- Criteria for the industrial use of groundwater (ANZECC, 1992)
- Exposure classification criteria for concrete piles in soil (AS 2159-2009) (Standards Australia, 2009)

Tabulated results presented in Data Table C at the end of the report.

Groundwater results for the site reported no exceedances of the relevant criteria for either beneficial use.

5.5 Comparison with 2002 analytical data

A comparison between SKM's available 2002 and recent data has been made, to help to assess changes in groundwater conditions over time. Analytical data was available for 6 wells across the site (nitrate, nitrite, ammonia and TDS data) and a comparison is presented in Table 5.6 below.

Table 5.6 : Comparison – 2002 vs 2014 groundwater analytical data

Analyte	Nitrate (mg/L)		Nitrite (mg/L)		Ammonia (mg/L)		TDS (mg/L)	
Yr sampled / Well ID	2002	2014	2002	2014	2002	2014	2002	2014
BH10 / PS2	0.88	1.6	<0.01	<0.02	0.2	<0.01	1500	1600
BH11 / PS1	0.11	<0.02	<0.01	<0.02	0.2	**0.03**	5000	3500
BH15 / WM3	0.72	**5**	<0.01	<0.02	<0.3	<0.01	2700	1700
BH17 / WM5	2.2	3.2	<0.01	<0.02	<0.1	<0.01	720	700
BH18 / WM6	0.3	0.22	<0.01	<0.02	0.2	**<0.01**	700	770
BH7 / PS5	0.88	**2.8**	0.82	**<0.02**	<0.1	<0.01	1400	1200

NOTES:

1. 2002 data is referred to as "Baseline" Data
2. **5** – Concentration significantly increased since 2002 assessment
3. **5** – concentration significantly decreased since 2002 assessment

Concentrations of nitrate, nitrite and ammonia were detected "pre-irrigation" (in 2002), showing these contaminant concentrations were reflective of background and likely regional conditions. The comparison in Table 5.6 shows that concentrations of the analytes have remained relatively consistent over the past 12 years (including TDS), with some increases in nitrate concentrations in two wells (BH15 and BH7).

Jacobs SKM note that all the above concentrations (excluding TDS) are still below applicable criteria used for this assessment (see Section 5.4. and Tables section).

5.6 Discussion of impact on beneficial uses of groundwater

Groundwater is considered to be polluted where groundwater quality is such that the groundwater is unsuitable for a beneficial use (that is, a beneficial use is precluded) and / or it affects beneficial uses of other segments of the environment, such as soil and air.

Groundwater beneath the site has been classified as Segment A2 in accordance with SEPP Groundwaters of Victoria. As discussed in Section 5.3.2, the protection of the following beneficial uses of the groundwater at the site have been assessed:

- Maintenance of ecosystems
- Potable water supply (acceptable)

- Agriculture, parks and gardens
- Industrial water use
- Primary contact recreation (e.g. bathing, swimming)
- Buildings and structures

A discussion of contaminant concentration exceedances of the groundwater quality criteria for each of the beneficial uses is outlined below.

- *Maintenance of ecosystems:* Maintenance of ecosystem criteria were exceeded for copper, nickel and zinc. In several samples. Based on the known previous and current site use (no significant source of these analytes identified), these exceedances are likely reflective of background / regional conditions. Jacobs SKM note there was also an exeedance for cyanide, however, this was a surface water sample collected from the winter storage effluent pond (EFF) and was not collected from underlying groundwater
- *Potable water supply (acceptable):* Potable water supply criteria were exceeded for manganese, nickel, sodium and TDS in several samples. Based on the known previous and current site use (no significant source of these analytes identified), these exceedances are likely reflective of background / regional conditions. Jacobs SKM note there were also 3 nitrite exceedances reported, however, these were surface water samples collected from the winter storage effluent pond (EFF) and were not collected from underlying groundwater
- *Agriculture, parks and gardens (irrigation):* Stock irrigation TDS criteria was exceeded in two samples. Jacobs SKM note that TDS concentrations are likely reflective of background / regional conditions (see Table 5.6)
- *Industrial water / Buildings and Structures:* There were no reported exceedances for these beneficial uses
- *Primary contact recreation (e.g. bathing, swimming):* There were no reported exceedances for this beneficial use

Based on the groundwater sampling program undertaken, exceedances of groundwater quality objectives for heavy metals, sodium and TDS are likely reflective of background or regional conditions. Therefore, no beneficial uses of groundwater are considered to be precluded based on the detected concentrations of contaminants.

5.7 Analytical data quality

It is considered that the QA/QC program was in accordance with recommended good practice (e.g. AS4482.1-2005). Overall the program is adequate considering the scope and nature of the assessment program undertaken. The data are considered sufficiently reliable for the purpose for which they have been obtained and used.

Further discussion in relation to data validation, quality assurance and control is provided in Appendix A.

6. Conclusions and recommendations

6.1 Conclusions

Based on the results of the groundwater sampling and laboratory analysis undertaken, heavy metals, sodium, nitrate and TDS were reported above adopted assessment guidelines. Concentrations of heavy metals and sodium are likely reflective of background / regional conditions, given no significant source of these contaminants were identified as part of the recent Jacobs SKM desktop assessment (Jacobs SKM, 2014). Concentrations of TDS and nitrate are likely mostly reflective of background / regional conditions, based on concentrations reported as part of SKM's 2002 "pre irrigation" groundwater sampling program (SKM, 2002). Jacobs SKM note that some increases in nitrate concentrations were reported as part of the 2014 groundwater sampling program, however, concentrations were still below applicable guidelines adopted for the assessment.

Elevated nitrite and cyanide were reported in the surface water sample collected from the winter storage facility, which holds the treated effluent used for irrigation. However, no contaminant concentrations of these contaminants were reported above adopted assessment guidelines as part of the actual groundwater sampling program.

Therefore, no beneficial uses of groundwater are considered to be precluded based on the detected concentrations of contaminants.

6.2 Recommendations

The groundwater well network should be periodically monitored by YVW (or other) while irrigation is being undertaken to help ensure the underlying groundwater quality remains acceptable for the relevant protected beneficial uses. If groundwater quality deterioration is reported during this routine monitoring this should act as a trigger for further detailed assessment and / or management. Deterioration in this case could be:

- A notable increase in concentrations of contaminants of concern in groundwater above the concentrations that have historically been reported at the site
- Reported exceedances of relevant assessment criteria for protected beneficial uses of groundwater at the site.

7. References

ANZECC/NHMRC, 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Environment and Conservation Council & National Health and Medical Research Council, October 2000.

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EPAV, 2006. Hydrogeological Assessment (Groundwater Quality) Guidelines. Environment Protection Authority Victoria, Publication No. 668, September 2006

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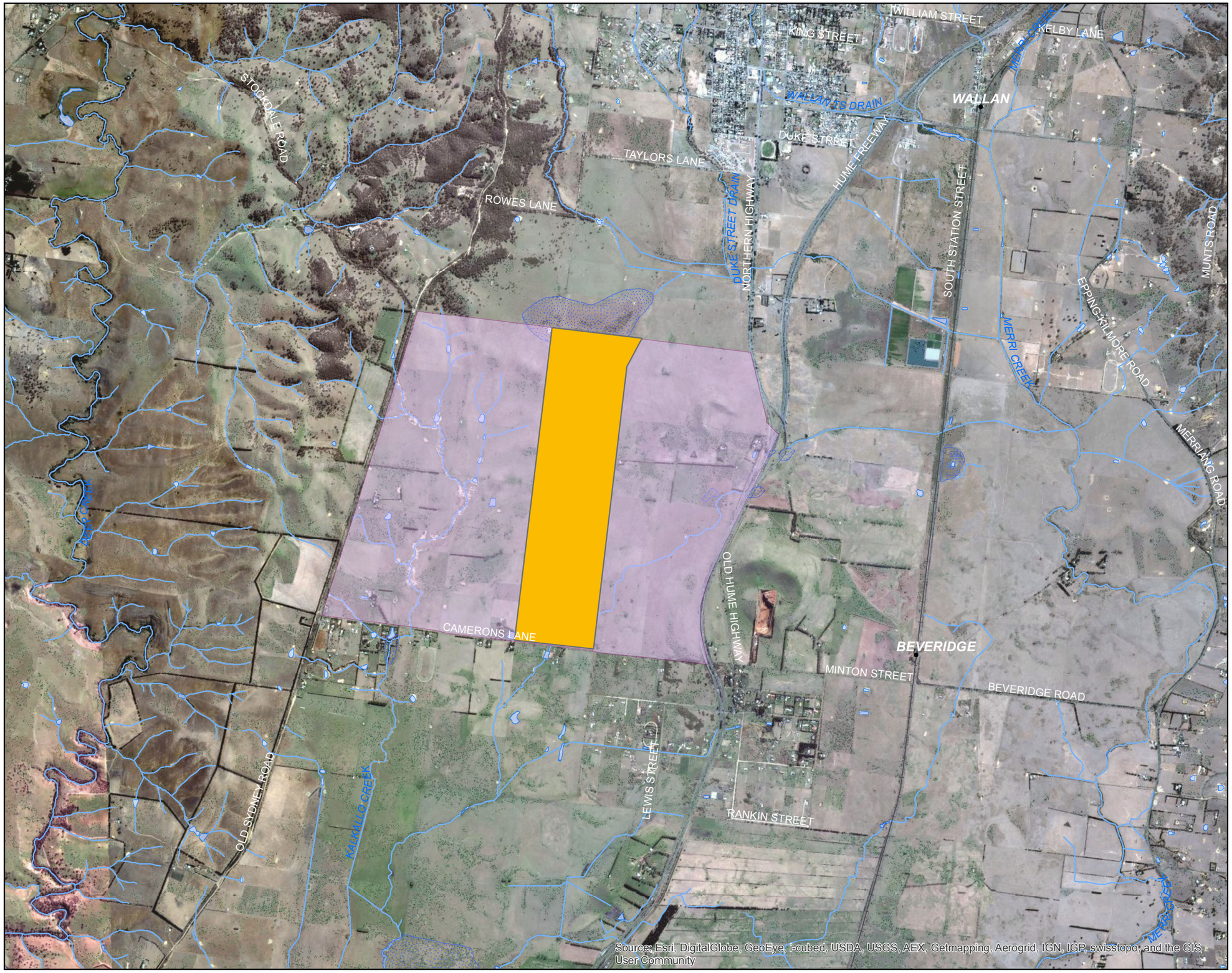
Victorian Government, 2003. State Environment Protection Policy (Waters of Victoria). Vic. Govt. Gazette No. S107, 4 June 2003

Victorian Government, 1997. State Environment Protection Policy (Groundwaters of Victoria). Vic. Govt. Gazette, 17 December 1997

YVW, 2008. Wallan Reclaimed Water Re-Use Scheme: Camerons Lane Lots 8 & 9 – Preliminary Assessment of Groundwater Monitoring Results. Yarra Valley Water, May 2008

Figures

[Figure 1 - Locality Map]



LEGEND

- Lot 8 & 9 Camerons Lane
- PSP Boundary
- Rail
- Lake
- Flat
- Wetland Swamp
- Watercourse

JACOBS SKM

DATA SOURCES
[Contains Vicmap Information © State of Victoria 2013, © Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3]

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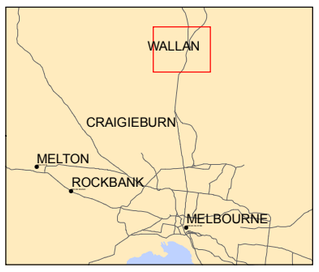

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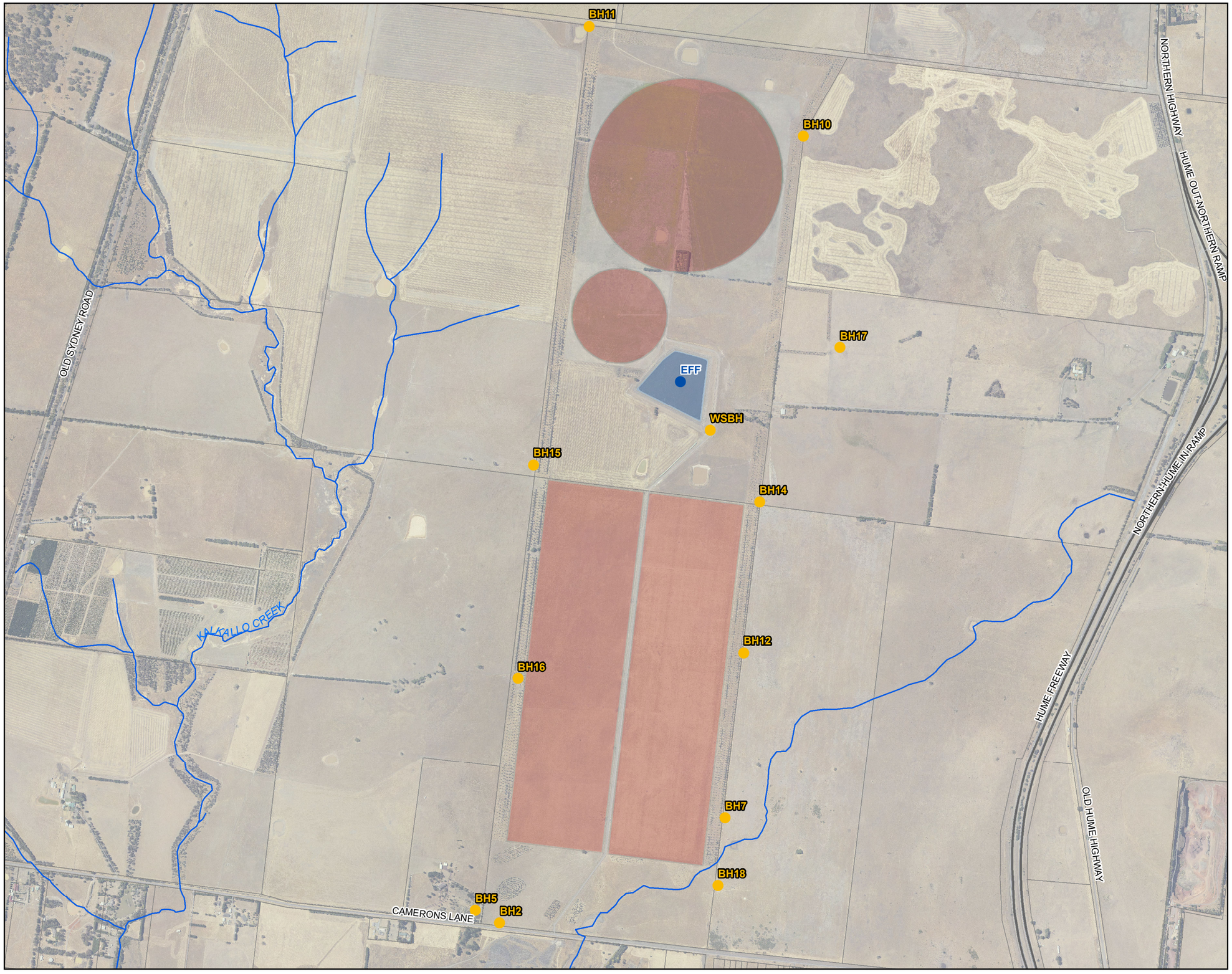
[Figure 2 - Site Layout : Lot 8 and 9 Camerons Road]



LEGEND

- Effluent Sample
- Groundwater Well
- Winter Storage Reservoir
- Irrigators
- Watercourse
- Freeway
- Sub-arterial
- Local Road

JACOBS SKM

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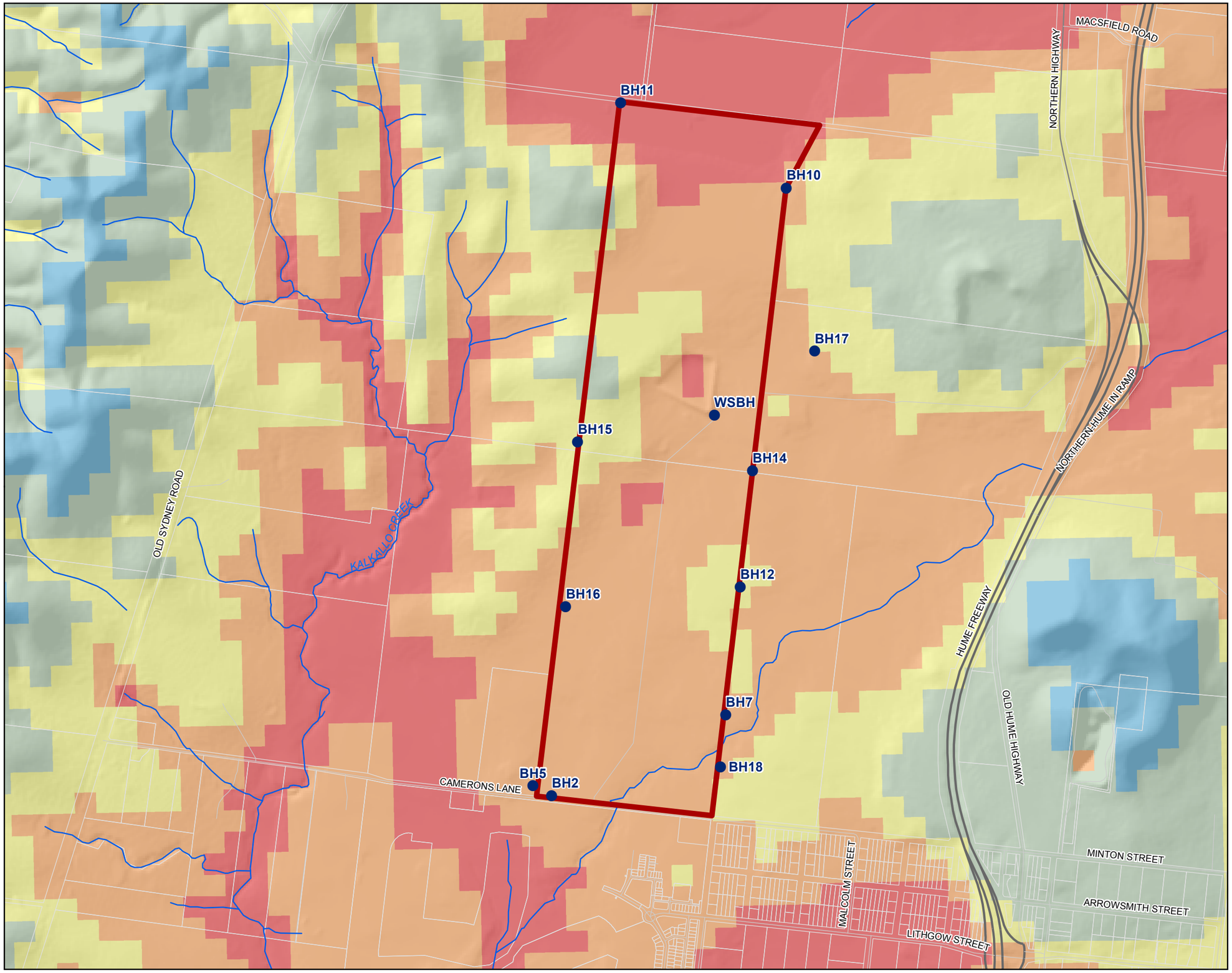
[Figure 3 - Depth to Watertable : Lot 8 and 9 Camerons Road]



LEGEND

- Groundwater Well
- Lot 8 & 9 Camerons Lane
- Watercourse
- Freeway
- Sub-arterial
- Local Road

Depth to watertable (mbgl)

- 5
- 10
- 20
- 50
- 100

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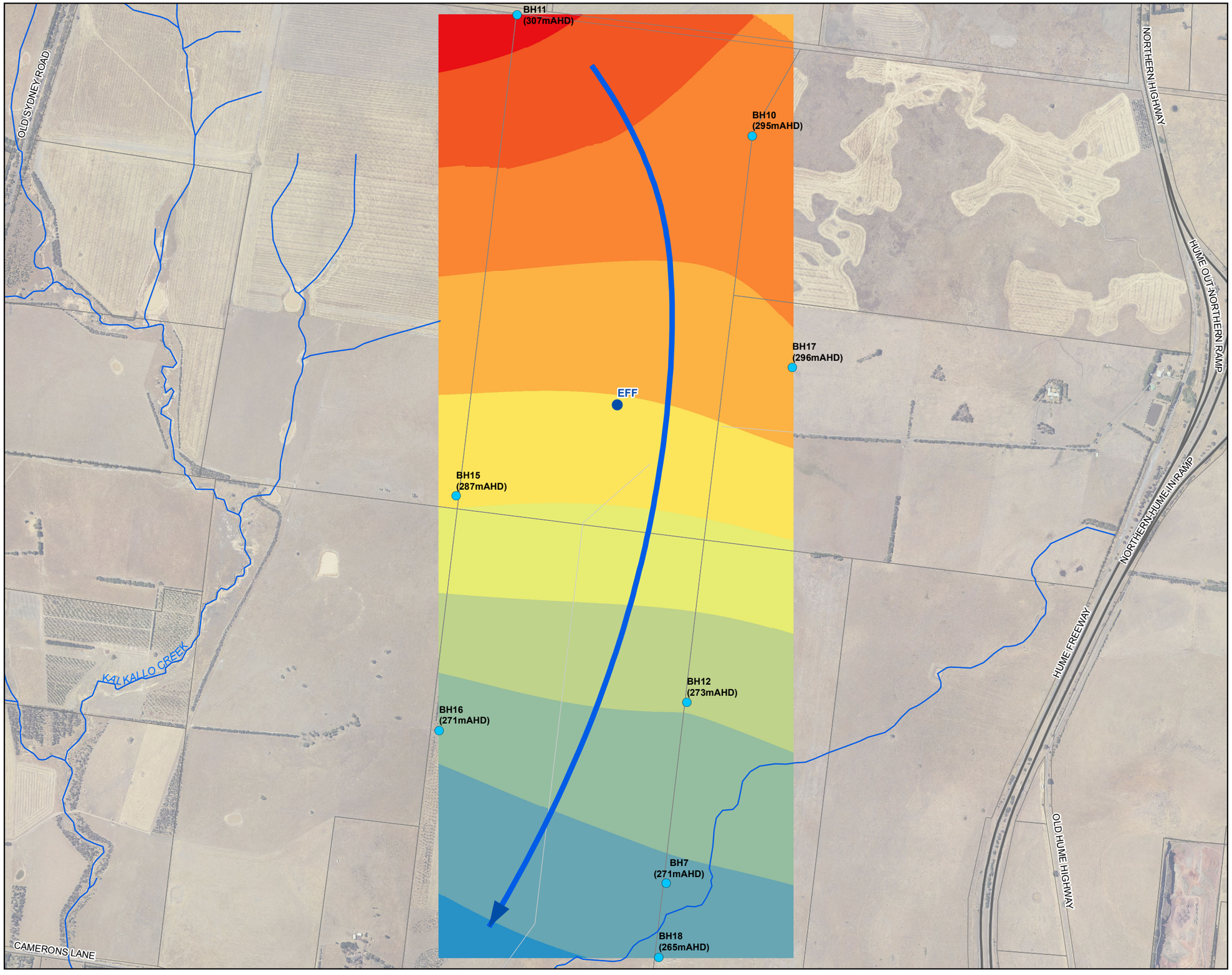
[Figure 4: Groundwater Contour Plan]



LEGEND

- Effluent Sample
- Groundwater Well
- GroundWaterDirection
- Watercourse
- Cadastre Parcel

Ground Water Height (mADH)

- 260 - 265
- 265 - 270
- 270 - 275
- 275 - 280
- 280 - 285
- 285 - 290
- 290 - 295
- 295 - 300
- 300 - 305
- 305 - 310

DATA SOURCES
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[Stage 2 - Beveridge North West PSP Additional Groundwater Assessment | VW07335]

[Figure 5 - Heavily Modified Creek]

LEGEND

- PSP Boundary
- Storage Dam
- Rail
- Heavily Modified Creek

NOTES

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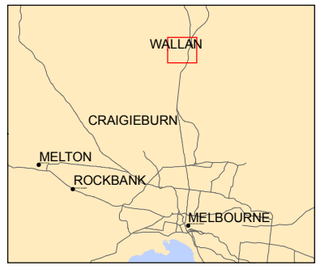

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Tables

TABLE A :

Comparison of groundwater results against criteria for the protection of human health

Well Code	BH10	BH11	BH12	BH14	BH15	BH16	BH17	BH18	BH2	BH5	BH7	EFF	EFF	EFF	WSBH
Field ID	BH10	BH11	BH12	BH14	BH15	BH16	BH17	BH18	BH2	BH5	BH7	1303-QA1	1303-QA2	EFF	WSBH
Sample Type	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Blind D	Split D	Primary	Primary
Sampled Date	11/03/2014	11/03/2014	12/03/2014	12/03/2014	13/03/2014	12/03/2014	13/03/2014	13/03/2014	11/03/2014	11/03/2014	12/03/2014	13/03/2014	13/03/2014	13/03/2014	13/03/2014
Monitoring Round	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March "14	March '14	March '14
Lab Report Number	411557	411868	411868	411868	411868	411868	411868	411868	411557	411557	411868	411868	EM1402371	411868	411868
Sample Description	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	Effluent	Effluent	Effluent	GW

Chemical Name	Units	EQL	Australian Drinking Water Guidelines (ADWG, 2011) Human Health Criteria	Australian Drinking Water Guidelines (ADWG, 2011) Aesthetic Criteria	Recreational Water Quality (GMRRW, 2008)															
Metals																				
Arsenic	µg/L		**10**		**100**	<1	5	3	<1	<1	<1	<1	<1	<1	<1	<1	3	3	3	<1
Beryllium	µg/L		**60**		**600**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Boron	µg/L		**4000**		**40000**	<50	<50	<50	<50	<50	<50	<50	90	50	<50	<50	70	190	70	<50
Cadmium	µg/L		**2**		**20**	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.2	<0.2
Calcium	µg/L	500				57,000	33,000	16,000	19,000	40,000	78,000	28,000	19,000	36,000	40,000	32,000	21,000	16000	18,000	79,000
Chromium (III+VI)	µg/L					3	<1	<1	<1	<1	<1	3	<1	<1	<1	<1	<1	8	<1	<1
Cobalt	µg/L					<1	11	<1	<1	<1	3	<1	<1	<1	<1	<1	1	4	1	1
Copper	µg/L		**2000**	**1000**	**20000**	<1	<1	3	47	300	24	2	7	<1	13	1	2	9	2	12
Lead	µg/L		**10**		**10**	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	2	<1	<1
Magnesium	µg/L	500				170000	290000	230000	110000	140000	240000	82000	40000	160000	130000	130000	21000	17000	18000	170000
Manganese	µg/L		**500**	**100**	**5000**	<5	**240**	38	<5	12	**750**	<5	6	<5	36	13	38	**118**	29	**600**
Mercury	µg/L		**1**		**10**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	µg/L		**20**		**200**	<1	**26**	2	1	<1	1	<1	<1	<1	<1	1	5	8	5	3
Potassium	µg/L	500				5300	10,000	16,000	3600	42,000	33,000	18,000	25,000	5000	10,000	22,000	39,000	21000	47,000	21,000
Zinc	µg/L	1		**3000**		7	5	11	30	150	320	14	360	11	16	7	3	20	<1	98
Inorganics																				
Ammonia as N	µg/L	10				<10	30	270	<10	<10	<10	<10	<10	<10	<10	<10	<10	200	<10	<10
Cyanide Total	mg/L	0.004	**0.08**		**0.8**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	0.023	<0.005
Fluoride	mg/L	0.1	**1.5**		**15**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	0.8	0.7	<0.5
Kjeldahl Nitrogen Total	mg/L	0.1				<0.2	<0.2	1.6	<0.2	2.7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	3.2	3.1	<0.2
Nitrate (as N)	mg/L	0.01	**11.287**		**113**	1.6	<0.02	7.3	1.9	5	<0.02	3.2	0.22	2.4	<0.02	2.8	5.5	6.82	5.8	0.08
Nitrite (as N)	mg/L	0.01	**0.912**		**9.2**	<0.02	<0.02	0.22	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**3.8**	**1.39**	**3.6**	<0.02
Nitrogen (Total Oxidised)	mg/L	0.01				1.6	<0.05	7.6	1.9	5	<0.05	3.2	0.22	2.4	<0.05	2.8	9.3	8.21	9.4	0.08
Nitrogen (Total)	µg/L	100				1600	<200	9200	1900	7700	<200	3200	220	2400	<200	2800	9300	11,400	13,000	<200
Sodium	mg/L	0.5		**180**		**270**	**720**	**580**	**330**	**400**	**460**	**180**	**250**	**290**	**360**	**280**	**180**	157	**180**	**340**
Sulphate as S	mg/L	5				<5	43	16	11	14	10	<5	<5	7.4	12	12	14	34	14	12
TDS	mg/L	10		**600**		**1600**	**3500**	**2200**	**1300**	**1700**	**2000**	**700**	**770**	**1600**	**1500**	**1200**	**700**	**1540**	**620**	**1800**

TABLE B :

Comparison of groundwater results against criteria for the protection of ecosystems

Well Code	BH10	BH11	BH12	BH14	BH15	BH16	BH17	BH18	BH2	BH5	BH7	EFF	EFF	EFF	WSBH
Field ID	BH10	BH11	BH12	BH14	BH15	BH16	BH17	BH18	BH2	BH5	BH7	1303-QA1	1303-QA2	EFF	WSBH
Sample Type	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Blind D	Split D	Primary	Primary
Sampled Date	11/03/2014	11/03/2014	12/03/2014	12/03/2014	13/03/2014	12/03/2014	13/03/2014	13/03/2014	11/03/2014	11/03/2014	12/03/2014	13/03/2014	13/03/2014	13/03/2014	13/03/2014
Monitoring Round	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March "14	March '14	March '14
Lab Report Number	411557	411868	411868	411868	411868	411868	411868	411868	411557	411557	411868	411868	EM1402371	411868	411868
Sample Description	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	Effluent	Effluent	Effluent	GW

Chemical Name	Units	EQL	Freshwater ecosystems (80%) (ANZECC, 2000)														
Metals																	
Arsenic	µg/L			<1	5	3	<1	<1	<1	<1	<1	<1	<1	3	3	3	<1
Beryllium	µg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Boron	µg/L		**1300**	<50	<50	<50	<50	<50	<50	<50	90	50	<50	<50	70	190	70	<50
Cadmium	µg/L		**0.8**	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.2	<0.2
Calcium	µg/L	500		57,000	33,000	16,000	19,000	40,000	78,000	28,000	19,000	36,000	40,000	32,000	21,000	16000	18,000	79,000
Chromium (III+VI)	µg/L			3	<1	<1	<1	<1	<1	3	<1	<1	<1	<1	<1	8	<1	<1
Cobalt	µg/L			<1	11	<1	<1	<1	3	<1	<1	<1	<1	<1	1	4	1	1
Copper	µg/L		**2.5**	<1	<1	**3**	**47**	**300**	**24**	2	**7**	<1	**13**	1	2	**9**	2	**12**
Lead	µg/L		**9.4**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0.002	<1	<1
Magnesium	µg/L	500		170000	290000	230000	110000	140000	240000	82000	40000	160000	130000	130000	21000	17000	18000	170000
Manganese	µg/L		**3600**	<5	240	38	<5	12	750	<5	60	<5	36	13	38	118	29	600
Mercury	µg/L		**5.4**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	µg/L		**17**	<1	**26**	2	1	<1	1	<1	<1	<1	<1	1	5	8	5	3
Potassium	µg/L	500		5300	10,000	16,000	3600	42,000	33,000	18,000	25,000	5000	10,000	22,000	39,000	21000	47,000	21,000
Zinc	µg/L	1	**31**	7	5	11	30	**150**	**320**	14	**360**	11	16	7	3	20	<1	**98**
Inorganics																		
Ammonia as N	µg/L	10		<10	30	270	<10	<10	<10	<10	<10	<10	<10	<10	<10	200	<10	<10
Cyanide Total	mg/L	0.004	**0.018**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	**0.023**	<0.005
Fluoride	mg/L	0.1		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	0.8	0.7	<0.5
Kjeldahl Nitrogen Total	mg/L	0.1		<0.2	<0.2	1.6	<0.2	2.7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	3.2	3.1	<0.2
Nitrate (as N)	mg/L	0.01	**17**	1.6	<0.02	7.3	1.9	5	<0.02	3.2	0.22	2.4	<0.02	2.8	5.5	6.82	5.8	0.08
Nitrite (as N)	mg/L	0.01		<0.02	<0.02	0.22	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	3.8	1.39	3.6	<0.02
Nitrogen (Total Oxidised)	mg/L	0.01		1.6	<0.05	7.6	1.9	5	<0.05	3.2	0.22	2.4	<0.05	2.8	9.3	8.21	9.4	0.08
Nitrogen (Total)	µg/L	100		1600	<200	9200	1900	7700	<200	3200	220	2400	<200	2800	9300	11,400	13,000	<200
Sodium	mg/L	0.5		270	720	580	330	400	460	180	250	290	360	280	180	157	180	340
Sulphate as S	mg/L	5		<5	43	16	11	14	10	<5	<5	7.4	12	12	14	34	14	12
TDS	mg/L	10		1600	3500	2200	1300	1700	2000	700	770	1600	1500	1200	700	1540	620	1800

TABLE C :

Comparison of groundwater results against criteria for the primary use of groundwater

Well Code	BH10	BH11	BH12	BH14	BH15	BH16	BH17	BH18	BH2	BH5	BH7	EFF	EFF	EFF	WSBH
Field ID	BH10	BH11	BH12	BH14	BH15	BH16	BH17	BH18	BH2	BH5	BH7	1303-QA1	1303-QA2	EFF	WSBH
Sample Type	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Blind D	Split D	Primary	Primary
Sampled Date	11/03/2014	11/03/2014	12/03/2014	12/03/2014	13/03/2014	12/03/2014	13/03/2014	13/03/2014	11/03/2014	11/03/2014	12/03/2014	13/03/2014	13/03/2014	13/03/2014	13/03/2014
Monitoring Round	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March ''14	March '14	March '14
Lab Report Number	411557	411868	411868	411868	411868	411868	411868	411868	411557	411557	411868	411868	EM1402371	411868	411868
Sample Description	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	Effluent	Effluent	Effluent	GW
Chemical Name	**Units**	**EQL**	**Irrigation Water Short-Term Trigger Values (ANZECC, 2000) - up to 20 years**	**Stock Watering (ANZECC, 2000)**													
Metals																	
Arsenic	µg/L		**2000**	**500**	<1	5	3	<1	<1	<1	<1	<1	<1	<1	3	3	3	<1
Beryllium	µg/L		**500**		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Boron	µg/L			**5000**	<50	<50	<50	<50	<50	<50	<50	90	50	<50	<50	70	190	70	<50
Cadmium	µg/L		**50**	**10**	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.2	<0.2
Calcium	µg/L	500			57,000	33,000	16,000	19,000	40,000	78,000	28,000	19,000	36,000	40,000	32,000	21,000	16000	18,000	79,000
Chromium (III+VI)	µg/L		**1000**	**1000**	3	<1	<1	<1	<1	<1	3	<1	<1	<1	<1	<1	8	<1	<1
Cobalt	µg/L		**100**	**1000**	<1	11	<1	<1	<1	3	<1	<1	<1	<1	<1	1	4	1	1
Copper	µg/L		**5000**	**400[#1]**	<1	<1	3	47	300	24	2	7	<1	13	1	2	9	2	12
Lead	µg/L		**5000**	**100**	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	2	<1	<1
Magnesium	µg/L	500			170000	290000	230000	110000	140000	240000	82000	40000	160000	130000	130000	21000	17000	18000	170000
Manganese	µg/L		**10,000**		<5	240	38	<5	12	750	<5	60	<5	36	13	38	118	29	0.6
Mercury	µg/L		**2**	**2**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	µg/L		**2000**	**1000**	<1	26	2	1	<1	1	<1	<1	<1	<1	1	5	8	5	3
Potassium	µg/L	500			5300	10,000	16,000	3600	42,000	33,000	18,000	25,000	5000	10,000	22,000	39,000	21000	47,000	21,000
Zinc	µg/L	1	**5000**	**20000**	7	5	11	30	150	320	14	360	11	16	7	3	20	<1	98
Inorganics																			
Ammonia as N	µg/L	10			<10	30	270	<10	<10	<10	<10	<10	<10	<10	<10	<10	200	<10	<10
Cyanide Total	mg/L	0.004			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	0.023	<0.005
Fluoride	mg/L	0.1	**2**	**2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	0.8	0.7	<0.5
Kjeldahl Nitrogen Total	mg/L	0.1			<0.2	<0.2	1.6	<0.2	2.7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	3.2	3.1	<0.2
Nitrate (as N)	mg/L	0.01			1.6	<0.02	7.3	1.9	5	<0.02	3.2	0.22	2.4	<0.02	2.8	5.5	6.82	5.8	0.08
Nitrite (as N)	mg/L	0.01			<0.02	<0.02	0.22	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	3.8	1.39	3.6	<0.02
Nitrogen (Total Oxidised)	mg/L	0.01			1.6	<0.05	7.6	1.9	5	<0.05	3.2	0.22	2.4	<0.05	2.8	9.3	8.21	9.4	0.08
Nitrogen (Total)	µg/L	100	**25000**		1600	<200	9200	1900	7700	<200	3200	220	2400	<200	2800	9300	11,400	13,000	<200
Sodium	mg/L	0.5			270	720	580	330	400	460	180	250	290	360	280	180	157	180	340
Sulphate as S	mg/L	5			<5	43	16	11	14	10	<5	<5	7.4	12	12	14	34	14	12
TDS	mg/L	10		**2000[#2]**	1600	**3500**	**2200**	1300	1700	2000	700	770	1600	1500	1200	700	1540	620	1800

Comments

#1 Trigget value for sheep adopted

#2 Poultry

TABLE D :

Comparison of groundwater results against criteria for Industrial use, buildings and structures

Chemical Name	Units	EQL	Industrial Use of Groundwater (ANZECC 1992)	Piling Design (AS2159-2009)														
Well Code					BH10	BH11	BH12	BH14	BH15	BH16	BH17	BH18	BH2	BH5	BH7	EFF	EFF	EFF	WSBH
Field ID					BH10	BH11	BH12	BH14	BH15	BH16	BH17	BH18	BH2	BH5	BH7	1303-QA1	1303-QA2	EFF	WSBH
Sample Type					Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Blind D	Split D	Primary	Primary
Sampled Date					11/03/2014	11/03/2014	12/03/2014	12/03/2014	13/03/2014	12/03/2014	13/03/2014	13/03/2014	11/03/2014	11/03/2014	12/03/2014	13/03/2014	13/03/2014	13/03/2014	13/03/2014
Monitoring Round					March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March '14	March "14	March '14	March '14
Lab Report Number					411557	411868	411868	411868	411868	411868	411868	411868	411557	411557	411868	411868	EM1402371	411868	411868
Sample Description					GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	Effluent	Effluent	Effluent	GW
Metals																			
Arsenic	µg/L				<1	5	3	<1	<1	<1	<1	<1	<1	<1	<1	3	3	3	<1
Beryllium	µg/L				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Boron	µg/L				<50	<50	<50	<50	<50	<50	<50	90	50	<50	<50	70	190	70	<50
Cadmium	µg/L				<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.2	<0.2
Calcium	µg/L	500	**420000**		57,000	33,000	16,000	19,000	40,000	78,000	28,000	19,000	36,000	40,000	32,000	21,000	16000	18,000	79,000
Chromium (III+VI)	µg/L	1			3	<1	<1	<1	<1	<1	3	<1	<1	<1	<1	<1	8	<1	<1
Cobalt	µg/L	1			<1	11	<1	<1	<1	3	<1	<1	<1	<1	<1	1	4	1	1
Copper	µg/L	1			<1	<1	3	47	300	24	2	7	<1	13	1	2	9	2	12
Lead	µg/L	1			<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	2	<1	<1
Magnesium	µg/L	500			170000	290000	230000	110000	140000	240000	82000	40000	160000	130000	130000	21000	17000	18000	170000
Manganese	µg/L				<5	240	38	<5	12	750	<5	60	<5	36	13	38	118	29	600
Mercury	µg/L				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	µg/L				<1	26	2	1	<1	1	<1	<1	<1	<1	1	5	8	5	3
Potassium	µg/L	500			5300	10,000	16,000	3600	42,000	33,000	18,000	25,000	5000	10,000	22,000	39,000	21000	47,000	21,000
Zinc	µg/L	1			7	5	11	30	150	320	14	360	11	16	7	3	20	<1	98
Inorganics																			
Ammonia as N	µg/L	10			<10	30	270	<10	<10	<10	<10	<10	<10	<10	<10	<10	200	<10	<10
Cyanide Total	mg/L	0.004			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	0.023	<0.005
Fluoride	mg/L	0.1			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	0.8	0.7	<0.5
Kjeldahl Nitrogen Total	mg/L	0.1			<0.2	<0.2	1.6	<0.2	2.7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	3.2	3.1	<0.2
Nitrate (as N)	mg/L	0.01			1.6	<0.02	7.3	1.9	5	<0.02	3.2	0.22	2.4	<0.02	2.8	5.5	6.82	5.8	0.08
Nitrite (as N)	mg/L	0.01			<0.02	<0.02	0.22	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	3.8	1.39	3.6	<0.02
Nitrogen (Total Oxidised)	mg/L	0.01			1.6	<0.05	7.6	1.9	5	<0.05	3.2	0.22	2.4	<0.05	2.8	9.3	8.21	9.4	0.08
Nitrogen (Total)	µg/L	100			1600	<200	9200	1900	7700	<200	3200	220	2400	<200	2800	9300	11,400	13,000	<200
Sodium	mg/L	0.5			270	720	580	330	400	460	180	250	290	360	280	180	157	180	340
Sulphate as S	mg/L	5		**1000**	<5	43	16	11	14	10	<5	<5	7.4	12	12	14	34	14	12
TDS	mg/L	10	**35000**		1600	3500	2200	1300	1700	2000	700	770	1600	1500	1200	700	1540	620	1800

TABLE E :

QA QC

Field Duplicate and Split Samples

Sample ID	EFF	1303-QA1	Diff	Average	RPD(1)	EFF	1303-QA2	Diff	Average	RPD(1)
Analyte / Laboratory	Eurofins	Eurofins				Eurofins	ALS			
Metals										
Arsenic	3	3	0	3	0	3	3	0	3	0
Beryllium	<1	<1	NA	NA	NA	<1	<1	NA	NA	NA
Boron	70	70	0	70	0	70	190	120	130	**92**
Cadmium	<0.2	<0.2	NA	NA	NA	<0.2	<0.1	NA	NA	NA
Calcium	18,000	21,000	3000	19500	15	18,000	16000	2,000	17000	12
Chromium (III+VI)	<1	<1	NA	NA	NA	<1	8	NA	NA	NA
Cobalt	1	1	0	1	0	1	4	3	2.5	**120**
Copper	2	2	0	2	0	2	9	7	5.5	**127**
Lead	<1	<1	NA	NA	NA	<1	2	NA	NA	NA
Magnesium	18000	21000	3000	19500	15	18000	17000	1000	17500	6
Manganese	29	38	9	33.5	27	29	118	89	73.5	**121**
Mercury	<0.1	<0.1	NA	NA	NA	<0.1	<0.1	NA	NA	NA
Nickel	5	5	0	5	0	5	8	3	6.5	46
Potassium	47,000	39,000	8,000	43000	19	47,000	21000	26,000	34000	**76**
Zinc	<1	3	NA	NA	NA	<1	20	NA	NA	NA
Inorganics			NA	NA	NA					
Ammonia as N	<10	<10	NA	NA	NA	<10	200	NA	NA	NA
Cyanide Total	0.023	<0.005	NA	NA	NA	0.023	<0.004	NA	NA	NA
Fluoride	0.7	0.6	0.1	0.65	15	0.7	0.8	0.1	0.75	13
Kjeldahl Nitrogen Total	3.1	<0.2	NA	NA	NA	3.1	3.2	0.1	3.15	3
Nitrate (as N)	5.8	5.5	0.3	5.65	5	5.8	6.82	1.02	6.31	16
Nitrite (as N)	3.6	3.8	0.2	3.7	5	3.6	1.39	2.21	2.495	**89**
Nitrogen (Total Oxidised)	9.4	9.3	0.1	9.35	1	9.4	8.21	1.19	8.805	14
Nitrogen (Total)	13,000	9300	3,700	11150	33	13,000	11,400	1,600	12200	13
Sodium	180	180	0	180	0	180	157	23	168.5	14
Sulphate as S	14	14	0	14	0	14	34	20	24	**83**
TDS	620	700	80	660	12	620	1540	920	1080	**85**

(1) RPD - Relative Percentage Difference

Rinsate Blank Results

			March 2014 Sampling Program	
Sample			R1-1203	1103-R1
Medium	Units	EQL	Water	Water
Date			12/04/2014	11/03/2014
Laboratory			Eurofins	Eurofins
Metals				
Arsenic	mg/L	0.001	< 0.001	< 0.001
Beryllium	mg/L	0.001	< 0.001	< 0.001
Boron	mg/L	0.05	< 0.05	< 0.05
Cadmium	mg/L	0.0002	< 0.0002	< 0.0002
Calcium	mg/L	0.5	< 0.5	< 0.5
Chromium (III+VI)	mg/L	0.001	< 0.001	< 0.001
Cobalt	mg/L	0.001	< 0.001	< 0.001
Copper	mg/L	0.001	< 0.001	< 0.001
Lead	mg/L	0.001	< 0.001	< 0.001
Magnesium	mg/L	0.5	< 0.5	< 0.5
Manganese	mg/L	0.005	< 0.005	< 0.005
Mercury	mg/L	0.001	< 0.001	< 0.001
Nickel	mg/L	0.001	< 0.001	< 0.001
Potassium	mg/L	0.5	< 0.5	< 0.5
Zinc	mg/L	0.001	< 0.001	< 0.001
Inorganics				
Ammonia as N	mg/L	0.01	< 0.01	< 0.01
Cyanide Total	mg/L	0.005	< 0.005	< 0.005
Fluoride	mg/L	0.5	< 0.5	< 0.5
Kjeldahl Nitrogen Total	mg/L	0.2	< 0.2	< 0.2
Nitrate (as N)	mg/L	0.02	< 0.02	< 0.02
Nitrite (as N)	mg/L	0.02	< 0.02	< 0.02
Nitrogen (Total)	µg/L	0.2	< 0.2	< 0.2
Sodium	mg/L	0.5	< 0.5	< 0.5
Sulphate as S	mg/L	5	< 5	< 5

Appendix A. Quality assurance/ quality control

A.1 Scope

This appendix describes the testing methods and quality assurance/quality control (QA/QC) procedures used for analysis of samples obtained during the field activities. This includes:

- Sampling procedures which followed good practice, including sample storage/transport and equipment decontamination procedures
- Well-established and approved analytical methods used by NATA-accredited laboratories
- An adequate number (in compliance with EPA Victoria sampling guidelines) of field blind duplicate samples analysed at the primary laboratory (Eurofins-MGT) for the primary contaminants of potential concern
- An adequate number (in compliance with EPA Victoria sampling guidelines) of field split duplicate samples analysed at the secondary laboratory (ALS) for the principal contaminants of potential concern
- An adequate number (in compliance with EPA Victoria sampling guidelines) of rinsate samples for the principal contaminants of potential concern
- Intra-laboratory QC protocols, including analysis of matrix spike/matrix spike duplicates, laboratory duplicate analysis and method (reagent) blanks
- Other QA/QC protocols in accordance with SKM procedures, based on accepted good practice and relevant guidelines or Australian Standards

The results of the QA/QC Program are detailed in the following sections.

A.2 Field QA/QC

Quality control sampling and analysis is regularly conducted as part of SKM's QA/QC program to validate the integrity of field procedures and assess the reliability of laboratory analyses. The following table outlines the quality control samples collected during the project field activities and the analyses conducted on these samples.

Table A.1 : Quality control samples

Sample type	Sample ID	Analysis conducted	Comments
Blind duplicate	1303-QA1	Total metals (16), nutrients, inorganics and TDS	1303-QA1 is a duplicate of EFF
Split duplicate	1303-QA2	Total metals (16), nutrients, inorganics and TDS	1303-QA2 is a duplicate of EFF
Rinsate blank	1103-R1	Total metals (16), nutrients, inorganics	Collected from rinsate off the sampling pump
Rinsate blank	R1-1203	Total metals (16), nutrients, inorganics	Collected from rinsate off the sampling pump

NOTES:

- Metals (16) - As, Be, B, Cd, Ca, Cr, Co, Cu, Mg, Mn, Ni, Pb, K, Na, Hg, Zn
- Nutrients – ammonia, nitrate, nitrite, total Kjeldahl nitrogen, total nitrogen
- Inorganics – sulphate, fluoride, total cyanide

A.2.1 Sample frequency

A set of soil blind/split duplicate samples were obtained at a frequency of 1 set per 13 primary samples.

The rinsate blank sample was obtained at the rate of one sample per day of field activities per item of dedicated equipment. While sampling was undertaken over three days, on 13 March disposable foot valves were used for undertaking the sampling.

A trip blank was not submitted for analysis as part of the assessment. A trip blank is a blank sample pre-prepared by the laboratory and sent with the sample containers. The trip blank is meant to remains with the samples until they are returned to the laboratory. It is analysed to assess whether concentrations of volatile compounds (if any) can be attributed to cross-contamination during transport and storage of the samples rather

than from site sources. Volatile organic contaminants are not considered primary contaminants of concern at the site and therefore a trip blank was not considered necessary.

A.2.2 Duplicate results

The relative precision of duplicate results was assessed by the magnitude of the Relative Percentage Difference (RPD), calculated as follows:

$$RPD\ (\%) = \frac{D_1 - D_2}{(D_1 + D_2) / 2} \times 100$$

Where:

D_1=duplicate result 1

D_2=duplicate result 2

An acceptable range for field RPDs is <30-50%. This variation can be expected to be higher for organic compounds than for inorganics, and for low concentrations of analytes. Discussions with laboratories indicate that if detected concentrations are less than five times the detection limit, higher RPDs (up to the theoretical maximum of 200%) are common and may be considered acceptable depending on specific circumstances.

The results of field duplicate analyses and RPD calculations are shown in Table E and can be summarised as follows.

Field blind duplicate (Eurofins-MGT / Eurofins-MGT)

The data quality objective of RPD<30-50% was not exceeded in any sample pairs

Field split duplicate (Eurofins-MGT / ALS)

The data quality objective of RPD<30-50% was exceeded on eight occasions (76 – 127%), for several heavy metals and nitrite, sulphate and TDS

The above exceedances of the data quality objective can likely be attributed to the differences that may exist in the sample preparation and laboratory analysis performed by the two laboratories.

Given both laboratories are NATA accredited, and the field blind duplicates showed satisfactory agreement, the results from the Eurofins-MGT (primary laboratory) laboratory analysis program are deemed to be acceptable.

A.2.3 Rinsate results

Following completion of groundwater sampling using the low flow technique on 11 and 13 March, a rinsate blank sample was taken from the sampling pump. The rinsate samples were collected to assess the potential for cross-contamination between groundwater sampling locations as a result of inadequate equipment decontamination procedures. The rinsate water used to collect the rinsate samples was laboratory provided deionised water. Rinsate results are presented in Table E.

Samples were noted collected on other sampling days, as dedicated / disposable well sampling equipment was used (foot valve or bailer).

Analysis of the rinsate blank sample indicated that no contaminant concentrations were reported above laboratory detection limits. Therefore, decontamination procedures adopted throughout the investigation are deemed adequate.

A.3 Sample holding times

Table A.2 below summarises the approved sample holding times for groundwater samples for particular contaminants of concern, as referenced by Table 1, Schedule B(3) of the NEPM (NEPC, 2013).

Table A.2 : Water analyte holding times

Analyte	Maximum holding time
Metals	6 months
Chromium (Cr VI or Hexavalent)	28 days
Cyanide	14 days
Nitrate	2 days
Nitrite	2 days
TDS	7 days
Ammonia	28 days

A review of the analytical reports indicates that all samples were extracted within the prescribed holding times.

A.4 Laboratory internal QA/QC

All samples were collected in the field by SKM personnel, placed into laboratory prepared sample containers and transferred to the laboratory using appropriate sample preservation procedures and chain-of-custody (CoC) documentation (presented in Appendix D). Samples were submitted to Eurofins-MGT of Oakleigh, Victoria. Split duplicate samples were forwarded to ALS. The analytical data as presented by Eurofins-MGT and ALS is presented in Appendix E. Eurofins-MGT and ALS's analytical methods are certified by the National Association of Testing Authorities (NATA). These methods are also documented in the original laboratory reports.

All analytical laboratories used by SKM are required to adhere to NATA-endorsed testing methodologies and conduct regular quality control checks on their analyses. SKM requires these laboratories to regularly provide results of control/method blanks, repeat duplicates and recoveries.

- Spiked sample recovery tests were performed in the assessment and validation programs by the primary laboratory for key indicators, with acceptable recoveries in the range 70 – 130%. All spiked sample recoveries were reported within this range.
- Internal laboratory duplicate analyses were undertaken for key indicators during the assessment, with consistent agreement between duplicate data pairs – the 30% data quality objective was not exceeded
- Reagent (method) blank analyses by the laboratory did not detect any contaminants, indicating no contamination from laboratory sources

A.5 Suitability of method detection limits

Eurofins-MGT and ALS's practical quantification limits/method detection limits were reviewed and compared with the adopted assessment criteria. All PQLs/MDLs were below the relevant criterion for all analytes.

A.6 Conclusions and statement of analytical reliability

It is considered that the QA/QC program was in accordance with recommended good practice (e.g. AS5667.1-1998 and EPA Victoria *Groundwater Sampling Guidelines*), with some minor non-compliances with data quality objectives noted above. Overall the program is adequate considering the scope and nature of the assessment program undertaken. The data are considered sufficiently reliable for the purpose for which they have been obtained and used.

Appendix B. Groundwater sampling sheets

WELL DEVELOPMENT, PURGING AND GROUNDWATER SAMPLING DATA SHEET

WELL No: BH2

SKM

Project No: VW07335 **Project Name:** Beveridge PSP - GW Sampling **Date:** 11 /04/2014

Development

Performed By: _____ Well Diameter: 50mm

Development Method _____

Time Started _____ SWL (start) _____ Volume Removed _____ Bore Depth (start) _____

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present _____

(If yes, thickness) _____

Purging

Performed By: C.Bannister / W Rodger

Purge Method Micropurge Kit

Time Started 9:20 SWL (start) 8.318 Volume Removed 7L Bore Depth (start) 15.86m TOC

Time Stopped 10:13 SWL (end) _____ Discharge Rate 3CPM Bore Depth (end) _____

Comments clear from start. Well cap in place but not a cover on well. NAPL Present _____

(If yes, thickness) No

Sampling

Performed By: C.Bannister / W Rodger

Sampling Method Micropurge Kit Sampling Depth ~~14m~~ 13.5m bTOC. (top of well)

Time Started ~~8:45~~ 10:13 SWL (start) 8.62

Time Stopped 10:20 SWL (end) 8.65

Tubing Type twin

Comments Started at CPM 4, reduced to CPM 3

Duplicate Sample Collected? Y (N) Duplicate Sample ID: —

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Comments (colour, turbidity, odours, sheen, etc)
9:45	0.5	1.56 MS	7.39	20.0	197	5.44 ppm		8.662 4CPM Clear
9:50	1.0	2385 µS	7.19	18.2	183	5.13		8.669 3CPM clear
9:54	3.0	2.68MS	7.15	19.9	174	4.81		8.664 " clear
9:59	4.0	2.68	7.18	17.6	162	4.83		8.666 " clear
10:04	5.0	2.68	7.25	17.6	155	5.08		8.65 " "
10:09	6.0	2.67	7.28	17.5	150	5.11		8.66 " "
10:13	7.0	2.68	7.29	17.6	145	5.18		8.65 " "
Stabilisation Criteria		+/- 3%	+/- 0.05	+/- 10%	+/- 10%	+/- 10%		

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*

_____ m (-) _____ (=) _____

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME

_____ (X) _____ (=) _____ L

Refer to Work Instructions WI113, WI114 and WI115

WELL DEVELOPMENT, PURGING AND GROUNDWATER SAMPLING DATA SHEET

WELL No: BH5

SKM

Project No: VW07335 **Project Name:** Beveridge PSP - GW Sampling **Date:** 11 /04/2014

Development

Performed By: _____ Well Diameter : 50mm

Development Method _____

Time Started _____ SWL (start) _____ Volume Removed _____ Bore Depth (start) _____

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present _____

(If yes, thickness) _____

Purging

Performed By: C.Bannister / W Rodger

Purge Method ~~Micropurge Kit~~ Tap - ran tap for 5 minutes.

Time Started 10:50 SWL (start) ✓ Volume Removed 30L Bore Depth (start) ✓

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) ✓

Comments Bore connected to a nearby tap. Ran tap to purge then sampled. NAPL Present ✓

(If yes, thickness) _____

Sampling

Performed By: C.Bannister / W Rodger

Sampling Method ~~Micropurge Kit~~ Tap. Sampling Depth _____

Time Started _____ SWL (start) _____

Time Stopped _____ SWL (end) _____

Tubing Type _____

Comments _____

Duplicate Sample Collected? Y / N Duplicate Sample ID: _____

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Comments (colour, turbidity, odours, sheen, etc)
10:50	30L	2.74mS	7.08	23.3	166	2.71ppm		Clear. Collected fm tap.
10:52	35L	2.81	7.11	23.2	162	3.67		Clear Collected fm tap.
10:55	45L	2.83	7.11	23.3	144	3.61		Clear. Collected fm tap.
Stabilisation Criteria		+/- 3%	+/- 0.05	+/- 10%	+/- 10%	+/- 10%		

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*

_____ m (-) _____ (=) _____

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME

_____ (X) _____ (=) _____ L

Refer to Work Instructions WI113, WI114 and WI115

WELL DEVELOPMENT, PURGING AND GROUNDWATER SAMPLING DATA SHEET

WELL No: BH7

SKM

Project No: VW07335 **Project Name:** Beveridge PSP - GW Sampling **Date:** 12/04/2014

Development

Performed By: _____ Well Diameter : 50mm

Development Method _____

Time Started _____ SWL (start) _____ Volume Removed _____ Bore Depth (start) _____

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present _____

_____ (If yes, thickness) _____

Purging

Performed By: C.Bannister / W Rodger

Purge Method Micropurge Kit mbTOW

Time Started 16.29 SWL (start) 9.230 Volume Removed 7 Litre Bore Depth (start) 15.00mTOW.

Time Stopped 16.44 SWL (end) _____ Discharge Rate 4LPM Bore Depth (end) _____

Comments _____ NAPL Present _____

_____ (If yes, thickness) No.

Sampling

Performed By: C.Bannister / W Rodger

Sampling Method Micropurge Kit Sampling Depth 14mTOW

Time Started 16:44 SWL (start) 9.240

Time Stopped _____ SWL (end) 9.240.

Tubing Type twin

Comments Clear sample, good recharge.

Duplicate Sample Collected? (Y)/N Duplicate Sample ID: _____

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Comments (colour, turbidity, odours, sheen, etc)
16:29	0.5	2104mS	7.27	19.4	119	7.57ppm		9.240 clear 4LPM
16:31	1.0	2109	7.22	17.8	110	7.24		9.240 clear "
16:35	3.0	2116	7.21	17.1	101	6.98		9.240 clear "
16:37	4.0	2117	7.14	17.1	100	6.87		9.240 clear "
16:39	5.0	2113	7.14	16.9	97	6.89		" " "
16:41	6.0	2117	7.09	16.9	94	6.82		" " "
16:44	7.0	2118	7.12	17.0	90	6.89		" " "
		Sampled @ 7 Litres.						
Stabilisation Criteria		+/- 3%	+/- 0.05	+/- 10%	+/- 10%	+/- 10%		

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*

_____ m (-) _____ (=) _____

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME

_____ (X) _____ (=) _____ L

Refer to Work Instructions WI113, WI114 and WI115

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WELL DEVELOPMENT, PURGING AND GROUNDWATER SAMPLING DATA SHEET

WELL No: BH10

SKM

Project No: VW07335 **Project Name:** Beveridge PSP - GW Sampling **Date:** 11 /04/2014

Development

Performed By: _____ Well Diameter: 50mm

Development Method _____

Time Started _____ SWL (start) _____ Volume Removed _____ Bore Depth (start) _____

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present _____

(If yes, thickness) _____

Purging

Performed By: C.Bannister / W Rodger Top of well

Purge Method Micropurge Kit

Time Started 15:15 SWL (start) 9.800 TOW Volume Removed 5L Bore Depth (start) 20.130 TOW

Time Stopped 15:31 SWL (end) ~~9.760~~ Discharge Rate 4→3 CPM Bore Depth (end) _____

Comments Reduced cycles from CPM 4 to 3 after 1 Litre. GW level Stabilised NAPL Present _____

(If yes, thickness) No

Sampling

Performed By: C.Bannister / W Rodger

Sampling Method Micropurge Kit Sampling Depth _____

Time Started 15:31 SWL (start) 9.700

Time Stopped 15:40 SWL (end) 9.760

Tubing Type twin

Comments clear sample

Duplicate Sample Collected? Y (N) Duplicate Sample ID: _____

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Comments (colour, turbidity, odours, sheen, etc)
15:15	0.5	2.77MS	7.30	21.5	75	5.03ppm		9.700 4CPM Clear
15:18	1.0	2.73	7.22	19.1	69	4.39ppm		9.670 " "
15:20	2.0	2.70	7.19	18.3	67	4.20		9.750 3 CPM "
15:23	3.0	2.68	7.15	18.3	67	3.94		9.730 " "
15:27	4.0	2.66	7.14	18.4	66	3.93		9.750 " "
15:31	5.0	2.66	7.15	18.3	66	4.07		9.760 " "
	Sapled @ 5.0 Litres. Clear.							
Stabilisation Criteria		+/- 3%	+/- 0.05	+/- 10%	+/- 10%	+/- 10%		

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*

_____ m (-) _____ (=) _____

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME

_____ (X) _____ (=) _____ L

Refer to Work Instructions WI113, WI114 and WI115

WELL DEVELOPMENT, PURGING AND GROUNDWATER SAMPLING DATA SHEET

WELL No: BH11

SKM

Project No: VW07335 **Project Name:** Beveridge PSP - GW Sampling **Date:** 11 /04/2014

Development

Performed By: _____ Well Diameter: 50mm

Development Method _____

Time Started _____ SWL (start) _____ Volume Removed _____ Bore Depth (start) _____

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present _____

(If yes, thickness) _____

Purging

Performed By: C.Bannister / W Rodger

Purge Method Micropurge Kit

Time Started 13:45 SWL (start) 4.055 bTOW (top of well) Volume Removed _____ Bore Depth (start) 18.850 bTOW

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present _____

(If yes, thickness) _____

Sampling

Performed By: C.Bannister / W Rodger

Sampling Method Micropurge Kit Sampling Depth 17mbTOW

Time Started _____ SWL (start) ~~21.635~~ 3.760 bTOW

Time Stopped _____ SWL (end) _____

Tubing Type Twin

Comments V.Slightly milky, clearing quickly. Started CPM4, changed to CPM1.

Duplicate Sample Collected? Y (N) Duplicate Sample ID: —

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Comments (colour, turbidity, odours, sheen, etc)
13:58	0.5	6.29mS	7.21	19.5	161	1.92ppm		~~21.635~~ 3.760 CPM4 Slightly milky.
14:00	1.0	6.35	7.07	18.3	6	1.17		4.04 CPM3 clearing
14:04	1.5	6.35	7.04	18.8	-15	0.94		4.16 CPM1 clearing
14:09	2.0	6.35	7.05	19.9	-30	0.70		4.39 " "
14:16	2.5	6.35	7.08	20.8	-36	0.64		4.48 " "
No recharge - Left to bail with disposable bailer to purge dry. 12/3/14								
Bailed:								
9:45	40L	5.87	7.19	15.9	104	4.10ppm		
9:47	45L	6.35	7.15	15.7	61	6.61ppm		
9:49	47L	6.13	7.13	15.6	46	8.04		
9:51	50L	6.26	7.16	15.6	33	8.76		
9:53	52L	6.35	7.19	15.6	26	4.46		
9:55	54L	6.09	7.18	15.6	22	3.72		
	Sampled using bailer.							
Stabilisation Criteria		+/- 3%	+/- 0.05	+/- 10%	+/- 10%	+/- 10%		

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*

_____ m (-) _____ (=) _____

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME

_____ (X) _____ (=) _____ L

Refer to Work Instructions WI113, WI114 and WI115

WELL DEVELOPMENT, PURGING AND GROUNDWATER SAMPLING DATA SHEET

WELL No: BH12

Project No: VW07335 **Project Name:** Beveridge PSP - GW Sampling **Date:** 12 /04/2014

Development

Performed By: _____ Well Diameter : 50mm

Development Method _____

Time Started _____ SWL (start) _____ Volume Removed _____ Bore Depth (start) _____

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present _____

_____ (If yes, thickness) _____

Purging

Performed By: C.Bannister / W Rodger

Purge Method Micropurge Kit Bailer

Time Started 15:47 SWL (start) 16.10 mTOC Volume Removed _____ Bore Depth (start) 17.30 mBTOC

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments Bailer to sample (only 1m of water in the well. NAPL Present _____

(If yes, thickness) _____

Sampling

Performed By: C.Bannister / W Rodger

Sampling Method ~~Micropurge Kit~~ Bailer Sampling Depth _____

Time Started _____ SWL (start) _____

Time Stopped _____ SWL (end) _____

~~Tubing Type~~ _____

Comments Sediment in well. _____

Duplicate Sample Collected? Y / N Duplicate Sample ID: _____

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Comments (colour, turbidity, odours, sheen, etc)
15:47	1L	3.89mS	8.15	17.3	160	2.52		Sediment, brown.
15:49	3L	3.88	8.01	16.6	141	8.60		"
	Purged Dry.							
Stabilisation Criteria		+/- 3%	+/- 0.05	+/- 10%	+/- 10%	+/- 10%		

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*

_____ m (-)_____ (=) _____

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME

_____(X) _____ (=) _____ L

Refer to Work Instructions WI113, WI114 and WI115

WELL DEVELOPMENT, PURGING AND GROUNDWATER SAMPLING DATA SHEET

WELL No: BH14

Project No: VW07335 **Project Name:** Beveridge PSP - GW Sampling **Date:** 12 /04/2014

Development

Performed By: _____ Well Diameter : 50mm

Development Method _____

Time Started _____ SWL (start) _____ Volume Removed _____ Bore Depth (start) _____

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present _____

_____ (If yes, thickness) _____

Purging

Performed By: C.Bannister / W Rodger

Purge Method Micropurge Kit

Time Started _____ SWL (start) _____ Volume Removed _____ Bore Depth (start) _____

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present _____

_____ (If yes, thickness) _____

Sampling

Performed By: C.Bannister / W Rodger

Sampling Method ~~Micropurge Kit~~ Sampled from windmill. Sampling Depth _____

Time Started _____ SWL (start) _____

Time Stopped _____ SWL (end) _____

Tubing Type _____

Comments _____

_____

Duplicate Sample Collected? Y / N Duplicate Sample ID: _____

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Comments (colour, turbidity, odours, sheen, etc)
11:30	-	2074µS	6.87	17.3	105	2.11		Clear. minor flocculating sampling.
Sampled from windmill, at top of bore.								
Stabilisation Criteria		+/- 3%	+/- 0.05	+/- 10%	+/- 10%	+/- 10%		

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*

_____ m (-) _____ (=) _____

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME

_____ (X) _____ (=) _____ L

Refer to Work Instructions WI113, WI114 and WI115

WELL DEVELOPMENT, PURGING AND GROUNDWATER SAMPLING DATA SHEET

WELL No: BH15

SKM

Project No: VW07335 **Project Name:** Beveridge PSP - GW Sampling **Date:** 13 /04/2014

Development

Performed By: _____ Well Diameter : 50mm

Development Method _____

Time Started _____ SWL (start) _____ Volume Removed _____ Bore Depth (start) _____

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present _____

(If yes, thickness) _____

Purging

Performed By: C.Bannister / W Rodger

Purge Method Micropurge Kit ~~Micropurge Kit~~ foot valve.

Time Started 9:10 SWL (start) 9.05 mTOW Volume Removed _____ Bore Depth (start) N/A (couldn't get

Time Stopped 9:24 SWL (end) _____ Discharge Rate _____ Bore Depth (end) dipper past pump

Comments _____ NAPL Present in bore).

(If yes, thickness) —

Sampling

Performed By: C.Bannister / W Rodger

Sampling Method ~~Micropurge Kit~~ foot value Sampling Depth —

Time Started 9:45 SWL (start) —

Time Stopped 9:50 SWL (end) —

Tubing Type 16Ø Single line (foot value)

Comments High sediment load. brown sample. Bore purged dry before sampling

Duplicate Sample Collected? Y (N) Duplicate Sample ID: —

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Comments (colour, turbidity, odours, sheen, etc)
9:10	2	2.86	7.39	16.0	200	4.02		foot value. Brown, high sediment
9:16	12	2.88	7.41	15.9	194	4.66		
9:18	20	2.86	7.59	15.6	188	5.17		
9:20	25	2.87	7.37	15.7	182	5.50		10:33m TOW
9:24	30	2.88	7.45	15.8	175	5.81		
	Purged dry. left for 20 mins to recharge.							
	Sampled							
Stabilisation Criteria		+/- 3%	+/- 0.05	+/- 10%	+/- 10%	+/- 10%		

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*

_____ m (-) _____ (=) _____

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME

_____ (X) _____ (=) _____ L

Refer to Work Instructions WI113, WI114 and WI115

WELL DEVELOPMENT, PURGING AND GROUNDWATER SAMPLING DATA SHEET

WELL No: BH16

SKM

Project No: VW07335 **Project Name:** Beveridge PSP - GW Sampling **Date:** 1/04/2014

Top of Well.

Development

Performed By: _____ Well Diameter: 50mm

Development Method _____

Time Started _____ SWL (start) _____ Volume Removed _____ Bore Depth (start) _____

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present _____

(If yes, thickness) _____

Purging

Performed By: C.Bannister / W Rodger

Purge Method Micropurge Kit 1P. BTOW

Time Started 13:B4 SWL (start) 6.030 Volume Removed 8L Bore Depth (start) 41.6000 BTOW

Time Stopped _____ SWL (end) _____ Discharge Rate CPM4 Bore Depth (end) _____

Comments _____ NAPL Present _____

(If yes, thickness) No

Sampling

Performed By: C.Bannister / W Rodger

Sampling Method Micropurge Kit ✓ Sampling Depth 25m b TOW

Time Started 13:30 SWL (start) 6.030

Time Stopped 13:35 SWL (end) 6.030

Tubing Type Twin

Comments Slight sediment in well.

Duplicate Sample Collected? Y / N Duplicate Sample ID: _____

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Comments (colour, turbidity, odours, sheen, etc)
13:B4	0.5	3.38mS	6.46	18.1	14	1.87		6.030 Clear CPM4 Slight sediment
13:16	1.0	3.41	6.46	16.7	9	1.16		6.030 Clear "
13:18	2.0	3.41	6.38	16.6	6	0.85		6.030 "
13:20	3.0	3.40	6.37	16.7	6	0.91		6.030 "
13:22	4.0	3.40	6.35	16.5	6	0.97		6.030 "
13:24	5.0	3.39	6.35	16.4	7	1.05		6.030 "
13:26	6.0	3.38	6.40	16.5	8	1.14		"
13:28	7.0	3.38	6.41	16.5	9	1.27		"
13:30	8.0	3.41	6.41	16.5	9	1.34		"
	Sapled @ 8.0 Litres							
Stabilisation Criteria		+/- 3%	+/- 0.05	+/- 10%	+/- 10%	+/- 10%		

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*

_____ m (-) _____ (=) _____

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME

_____ (X) _____ (=) _____ L

Refer to Work Instructions WI113, WI114 and WI115

WELL DEVELOPMENT, PURGING AND GROUNDWATER SAMPLING DATA SHEET

WELL No: BA17

SKM

Project No: VW07335 **Project Name:** Beveridge PSP - GW Sampling **Date:** 13 /04/2014

Development

Performed By: _____ Well Diameter : 50mm

Development Method _____

Time Started _____ SWL (start) _____ Volume Removed _____ Bore Depth (start) _____

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present _____

(If yes, thickness) _____

Purging

Performed By: C.Bannister / W Rodger

Purge Method ~~Micropurge Kit~~ Foot value

Time Started 12:41 SWL (start) 6.70mTOW Volume Removed _____ Bore Depth (start) ✓

Time Stopped 12:55 SWL (end) _____ Discharge Rate ✓ Bore Depth (end) ✓

Comments Windmill. Not pumping. NAPL Present _____

(If yes, thickness) NA

Sampling

Performed By: C.Bannister / W Rodger

Sampling Method ~~Micropurge Kit~~ Foot value Sampling Depth _____

Time Started 12:55 SWL (start) _____

Time Stopped 13:00 SWL (end) _____

Tubing Type _____

Comments _____

Duplicate Sample Collected? Y (N) Duplicate Sample ID: ✓

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Comments (colour, turbidity, odours, sheen, etc)
12:41	1L	1252µs	7.67	19.4	116	5.45	6.70	clear/very slight sediment
12:43	5L	1273	7.50	17.8	113	4.84		" "
12:46	10L	1301	7.48	17.6	105	4.74		6.89om "
12:49	15L	1275	7.44	17.5	105	5.02		clear with some sediment
12:52	20L	1263	7.44	17.3	103	4.45		
12:54	25L	1284	7.41	17.2	99	4.80		clear, some sediment.
Sampled at 25L. Foot value. Mill not pumping.								
Stabilisation Criteria		+/- 3%	+/- 0.05	+/- 10%	+/- 10%	+/- 10%		

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*

_____ m (-) _____ (=) _____

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME

_____ (X) _____ (=) _____ L

Refer to Work Instructions WI113, WI114 and WI115

WELL DEVELOPMENT, PURGING AND GROUNDWATER SAMPLING DATA SHEET

WELL No: RH18

SKM

Project No: VW07335 **Project Name:** Beveridge PSP - GW Sampling **Date:** 13 /04/2014

Development

Performed By: _____ Well Diameter : 50mm

Development Method _____

Time Started _____ SWL (start) _____ Volume Removed _____ Bore Depth (start) _____

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present

(If yes, thickness) _____

Purging

Performed By: C.Bannister / W Rodger

Purge Method ~~Micropurge Kit~~ Foot valve

Time Started 10:15 SWL (start) 10.750 Volume Removed _____ Bore Depth (start) _____

Time Stopped 10:28 SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments Brown colour (pale) with some sediment. NAPL Present

(If yes, thickness) _____

Sampling

Performed By: C.Bannister / W Rodger

Sampling Method ~~Micropurge Kit~~ Foot valve Sampling Depth ✓

Time Started 10:28 SWL (start) ✓

Time Stopped 10:35 SWL (end) ✓

Tubing Type Single line 100 (footvalve)

Comments _____

Duplicate Sample Collected? Y (N) Duplicate Sample ID: ✓

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Comments (colour, turbidity, odours, sheen, etc)
~~10:28~~	5L	1289 µS	7.63	17.4	139	2.24		Some sediment. Slight brown colour.
Well operational - No purging required. Sampled immediately.								
Stabilisation Criteria		+/- 3%	+/- 0.05	+/- 10%	+/- 10%	+/- 10%		

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*

_____ m (-) _____ (=) _____

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME

_____ (X) _____ (=) _____ L

Refer to Work Instructions WI113, WI114 and WI115

(water storage borehole)

WELL DEVELOPMENT, PURGING AND GROUNDWATER SAMPLING DATA SHEET

WELL No: WSBH

SKM

Project No: VW07335 **Project Name:** Beveridge PSP - GW Sampling **Date:** 13 /04/2014

Development

Performed By: _____ Well Diameter : 50mm

Development Method _____

Time Started _____ SWL (start) _____ Volume Removed _____ Bore Depth (start) _____

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present

(If yes, thickness) _____

Purging

Performed By: C.Bannister / W Rodger

Purge Method ~~Micropurge Kit~~ Ran for 10 seconds before sampling

Time Started ✓ SWL (start) ✓ Volume Removed ✓ Bore Depth (start) ✓

Time Stopped ✓ SWL (end) ✓ Discharge Rate ✓ Bore Depth (end) ✓

Comments _____ NAPL Present

(If yes, thickness) NO

Sampling

Performed By: C.Bannister / W Rodger

Sampling Method ~~Micropurge Kit~~ Tap. Sampling Depth ✓

Time Started 11:10 SWL (start) ✓

Time Stopped 11:15 SWL (end) ✓

Tubing Type Tap

Comments Bore at rear of main building. Tap inside building used to collect sample

Duplicate Sample Collected? Y / (N) Duplicate Sample ID: ✓

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Comments (colour, turbidity, odours, sheen, etc)
11:10	✓	2586 µS	6.35	17.1	143	2.21 ppm		Clear.
Stabilisation Criteria		+/- 3%	+/- 0.05	+/- 10%	+/- 10%	+/- 10%		

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*

_____ m (-) _____ (=) _____

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME

_____ (X) _____ (=) _____ L

Refer to Work Instructions WI113, WI114 and WI115

WELL DEVELOPMENT, PURGING AND GROUNDWATER SAMPLING DATA SHEET

WELL No: EFF

SKM

Project No: VW07335 **Project Name:** Beveridge PSP - GW Sampling **Date:** 13 /04/2014

Development

Performed By: _____ Well Diameter: 50mm

Development Method _____

Time Started _____ SWL (start) _____ Volume Removed _____ Bore Depth (start) _____

Time Stopped _____ SWL (end) _____ Discharge Rate _____ Bore Depth (end) _____

Comments _____ NAPL Present _____

(If yes, thickness) _____

Purging

Performed By: C.Bannister / W Rodger

Purge Method ~~Micropurge Kit~~ TAP

Time Started / SWL (start) / Volume Removed / Bore Depth (start) /

Time Stopped / SWL (end) / Discharge Rate / Bore Depth (end) /

Comments _____ NAPL Present

(If yes, thickness) No

Sampling

Performed By: C.Bannister / W Rodger

Sampling Method ~~Micropurge~~ Kit TAP Sampling Depth –

Time Started 11:20 SWL (start) –

Time Stopped 11:25 SWL (end) –

Tubing Type TAP.

Comments Effluent sampling point. → no cyanide bottle

Duplicate Sample Collected? (Y) N Duplicate Sample ID: Blind: 1303/QA1 Split: 1303/QA2

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Comments (colour, turbidity, odours, sheen, etc)
11:22	–	972µS	7.62	18.7	87	2.56ppm		Cloudy.
Sapled from a tap outside the main building next to the YVW winter storage area.								
Stabilisation Criteria		+/- 3%	+/- 0.05	+/- 10%	+/- 10%	+/- 10%		

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*

_____ m (-) _____ (=) _____

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME

_____ (X) _____ (=) _____ L

Refer to Work Instructions WI113, WI114 and WI115

Appendix C. Lithology of registered bores

VVG Visualising Victoria's Groundwater

Bore Details: 79155

Printable Version

Lithology details for bore: 79155

Log Type	From (m)	To (m)	Description
Driller	0.00	14.63	WEATHERED BASALT

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VVG Visualising Victoria's Groundwater

Bore Details: 145710

Printable Version

Lithology details for bore: 145710

Log Type	From (m)	To (m)	Description
Driller	0.00	1.00	TOPSOIL & SUBSOIL
Driller	1.00	2.00	CLAY & LOOSE ROCKS
Driller	2.00	2.10	BROWN CLAY
Driller	2.10	2.70	GREY CLAY
Driller	2.70	2.90	LIGHT BROWN CLAY
Driller	2.90	4.30	HARD BLUESTONE
Driller	4.30	12.00	WEATHERED BASALT
Driller	12.00	13.70	VERY HARD BLUESTONE

Federation UNIVERSITY • AUSTRALIA

VVG Visualising Victoria's Groundwater

Bore Details: 145714

Printable Version

Lithology details for bore: 145714

Log Type	From (m)	To (m)	Description
Driller	0.00	1.00	TOP SOIL & RUBBLE
Driller	1.00	1.80	RED BROWN CLAY
Driller	1.80	16.70	VERY HARD BLUESTONE
Driller	16.70	17.30	FRACTURED BLUESTONE
Driller	17.30	20.60	HARD BLUESTONE

Federation UNIVERSITY • AUSTRALIA

VVG Visualising Victoria's Groundwater

Bore Details: 145715

Printable Version

Lithology details for bore: 145715

Log Type	From (m)	To (m)	Description
Driller	0.00	1.00	GREY TOPSOIL & CLAY
Driller	1.00	3.10	GREY CLAY
Driller	3.10	4.30	RED BROWN CLAY
Driller	4.30	7.40	LIGHT GREY CLAY
Driller	7.40	17.20	WEATHERED BASALT
Driller	17.20	18.20	YELLOW CLAY

Federation UNIVERSITY • AUSTRALIA

VVG Visualising Victoria's Groundwater

Bore Details: 145711

Printable Version

Lithology details for bore: 145711

Log Type	From (m)	To (m)	Description
Driller	0.00	0.50	TOPSOIL & BOULDERS
Driller	0.50	1.20	GREY CLAY
Driller	1.20	1.40	YELLOW CAY
Driller	1.40	9.00	VERY HARD BLUESTONE
Driller	9.00	13.00	WEATHERED BASALT
Driller	13.00	15.80	VERY HARD BLUESTONE

Federation UNIVERSITY • AUSTRALIA

Appendix D. Chain of custody documentation

Sinclair Knight Merz Pty Ltd
PO Box 2500
Malvern, VIC 3144
ABN 37 001 024 095
Ph: +61 3 9248 3100
Fx: +61 3 9248 3364

CHAIN OF CUSTODY &

LAB: Eurofins
ADDRESS: 3-5 Kingston Town Close, Oakeligh
PHONE: 9564 7055
FAX: 9564 7190

PROJECT #: VW07335
PROJECT NAME: Beveridge PSP GW Sampling Progam - Mar 14
SAMPLE COLLECTOR'S NAME: Corey Bannister
LAB JOB #:

PRELIM. RESULTS BY: ☐ VERBAL ☐ FAX ☑ EMAIL
FINAL REPORT BY: Std TAT
SEND TO EMAIL ADDRESS(ES): Sampler: cbannister @globalskm.com; Proj Mgr: cbannister @globalskm.com
LAB QUOTE REF:
SKM ORDER No: Batch 1

SAMPLE ID	DEPTH (metres)	LAB #	MATRIX: WATER	SOIL	AIR	SLUDGE	PRESERVATION METHOD: ICE	ACID-IFIED	OTHER	NONE	SAMPLING DATE	No. OF CONTAINERS	METHOD CODE & ANALYSIS REQUIRED: Metals (As, Be, B, Cd, Ca, Co, Cr, Cu, Ni, Pb, Mg, Mn, K, Na, Hg, Zn)	Nutrients (ammonia, nitrate, nitrite, total Kjeldahl nitrogen, total nitrogen)	Inorganics (sulphate, fluoride, total cyanide)	TDS									COMMENTS (see below) (1) (2) (3)
BH2			X				X				11/3	4	X	X	X	X									☐ ☐ ☐
BH5			X				X				11/3	4	X	X	X	X									☐ ☐ ☐
BH10			X				X				11/3	4	X	X	X	X									☐ ☐ ☐
TOTALS			1	1	0	0							0	1	0	0	0	0	2	0	0	0	0	0	0	

Relinquished by (SIGN/PRINT): Corey B of SKM — Date 12/3 — Time 8am
Relinquished by (SIGN/PRINT): of — Date — Time
Received by (SIGN/PRINT): of — Date — Time
Received by (SIGN/PRINT): Catherine of EF mgt — Date 12/3 — Time 2.59pm

Custody Seals Intact? Yes / No
Sample Receipt Temp. °C

Additional Comments/Instructions:
All final lab reports to be provided electronically as .pdf and datafile to both emails above. (1) Sample highly contaminated; (2) Sample unfiltered - lab to filter prior to metals analysis; (3) TPH chromatogram required in prelim. and final reports (if TPH detected)

411557

Tony

SKM

Sinclair Knight Merz Pty Ltd
PO Box 2500
Malvern, VIC 3144 Ph: +61 3 9248 3100
ABN 37 001 024 095 Fx: +61 3 9248 3364

CHAIN OF CUSTODY &

LAB: Eurofins
ADDRESS: 3-5 Kingston Town Close, Oakeligh
PHONE: 9564 7055
FAX: 9564 7190

PROJECT #: VW07335
PROJECT NAME: Beveridge PSP GW Sampling Progam - Mar 14
SAMPLE COLLECTOR'S NAME: Corey Bannister
LAB JOB #:

PRELIM. RESULTS BY: ☐ VERBAL ☐ FAX ☑ EMAIL
FINAL REPORT BY: Std TAT
SEND TO EMAIL ADDRESS(ES): Sampler: Corey.Bannister @jacobs.com; Proj Mgr: Corey.Bannister @jacobs.com
LAB QUOTE REF:
SKM ORDER No: Batch 1

METHOD CODE & ANALYSIS REQUIRED

SAMPLE ID	DEPTH (metres)	LAB #	MATRIX: WATER	SOIL	AIR	SLUDGE	PRESERVATION METHOD: ICE	ACID-IFIED	OTHER	NONE	SAMPLING DATE	No. OF CONTAINERS	Metals (As, Be, B, Cd, Ca, Co, Cr, Cu, Ni, Pb, Mg, Mn, K, Na, Hg, Zn)	Nutrients (ammonia, nitrate, nitrite, total Kjeldahl nitrogen, total nitrogen)	Inorganics (sulphate, fluoride, total cyanide)	TDS	COMMENTS
EFF			X				X				13/3/14	4	X	X	X	X	
WSBH			X				X				13/3/14	4	X	X	X	X	
BH15			X				X				13/3/14	4	X	X	X	X	Eurofins mgt
BH18			X				X				13/3/14	4	X	X	X	X	
BH7			X				X				12/3/14	4	X	X	X	X	Report #
BH17			X				X				13/3/14	4	X	X	X	X	
BH12			X				X				12/3/14	4	X	X	X	X	411868
BH14			X				X				12/3/14	4	X	X	X	X	
BH16			X				X				12/3/14	4	X	X	X	X	
BH11			X				X				11/3/14	4	X	X	X	X	
			X				X										
1303-QA1			X				X				13-Mar-14	3	X	X	X	X	
1303-QA2			X				X				13-Mar-14	4					Please send to ALS
R1-1203			X				X				12-Mar-14	4	X	X	X		
1103-R1			X				X				11-Mar-14	4	X	X	X		
TOTALS			15	1	0	0							13	13	13	13	

Totals for remaining analysis columns: 0, 0, 2, 0, 0, 0, 0, 0, 0

COMMENTS (see below) (1) (2) (3):
*Please see sample bottles for sampling dates
Sample 1303-QA1 - please analyse for cyanide from inorganics bottle (no bottle for cyanide)

Relinquished by (SIGN/PRINT): Corey B of SKM — Date: 14-Mar-14 — Time: 10.15am
Received by (SIGN/PRINT): John of Eurofins mgt — Date: 14/3/14 — Time: 12:53pm
Custody Seals Intact? Yes / No

Relinquished by (SIGN/PRINT): of — Date — Time
Received by (SIGN/PRINT): of — Date — Time
Sample Receipt Temp. °C

Additional Comments/Instructions:
All final lab reports to be provided electronically as .pdf and datafile to both emails above. (1) Sample highly contaminated; (2) Sample unfiltered - lab to filter prior to metals analysis; (3) TPH chromatogram required in prelim. and final reports (if TPH detected)

COC - second batch

Sinclair Knight Merz Pty Ltd
PO Box 2500
Malvern, VIC 3144
ABN 37 001 024 095
Ph: +61 3 9248 3100
Fx: +61 3 9248 3364

CHAIN OF CUSTODY &

LAB: ALS
ADDRESS:
PHONE:
FAX:

PROJECT #: VW07335
PROJECT NAME: Beveridge PSP GW Sampling Progam - Mar 14
SAMPLE COLLECTOR'S NAME: Corey Bannister
LAB JOB #:

SAMPLE ID	DEPTH (metres)	LAB #	MATRIX: WATER	SOIL	AIR	SLUDGE	PRESERVATION METHOD: ICE	ACID-IFIED	OTHER	NONE	SAMPLING DATE	No. OF CONTAINERS	METHOD CODE & ANALYSIS REQUIRED: Metals (As, Be, B, Cd, Ca, Co, Cr, Cu, Ni, Pb, Mg, Mn, K, Na, Hg, Zn)	Nutrients (ammonia; nitrate; nitrite; total Kjeldahl nitrogen, total nitrogen)	Inorganics (sulphate, fluoride, total cyanide)	TDS									
1303-QA2			X				X				13-Mar-14	4	X	X	X	X									
TOTALS			1	1	0	0							1	1	1	1	0	0	2	0	0	0	0	0	0

PRELIM. RESULTS BY: ☐ VERBAL ☐ FAX ☑ EMAIL

FINAL REPORT BY: Std TAT

SEND TO EMAIL ADDRESS(ES):
Sampler: Corey.Bannister @jacobs.com
Proj Mgr: Corey.Bannister @jacobs.com

LAB QUOTE REF:

SKM ORDER No: Batch 1

COMMENTS (see below) (1) (2) (3)

Environmental Division
Melbourne
Work Order
EM1402371

Telephone : +61-3-8549 9600

Relinquished by (SIGN/PRINT): Corey B of SKM
Date: 14-Mar-14 Time: 10.15am
Received by (SIGN/PRINT): Rec[illegible] of
Date: 17/3/14 Time: 10.55 am

Custody Seals Intact? Yes / No

Relinquished by (SIGN/PRINT): of
Date: Time:
Received by (SIGN/PRINT): of
Date: Time:

Sample Receipt Temp. °C

Additional Comments/Instructions:
All final lab reports to be provided electronically as .pdf and datafile to both emails above. (1) Sample highly contaminated; (2) Sample unfiltered - lab to filter prior to metals analysis; (3) TPH chromatogram required in prelim. and final reports (if TPH detected)

Appendix E. Laboratory certificates of analysis

eurofins | mgt

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 1254

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

Jacobs SKM
PO Box 312 Flinders Lane
Melbourne
VIC 8009

Attention: **Corey Bannister**

Report **411557-W**
Client Reference BEVERIDGE PSP GW SAMPLING PROGRAM - MAR 14 VW07335
Received Date Mar 12, 2014

Client Sample ID **Sample Matrix** **Eurofins | mgt Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**BH2** **Water** **M14-Ma08465** **Mar 11, 2014**	**BH5** **Water** **M14-Ma08466** **Mar 11, 2014**	**BH10** **Water** **M14-Ma08467** **Mar 11, 2014**
Ammonia (as N)	0.01	mg/L	< 0.01	< 0.01	< 0.01
Cyanide (total)	0.005	mg/L	< 0.005	< 0.005	< 0.005
Fluoride	0.5	mg/L	< 0.5	< 0.5	< 0.5
Nitrate (as N)	0.02	mg/L	2.4	< 0.02	1.6
Nitrite (as N)	0.02	mg/L	< 0.02	< 0.02	< 0.02
Sulphate (as S)	5	mg/L	7.4	12	< 5
Total Dissolved Solids	10	mg/L	1600	1500	1600
Total Nitrogen Set (as N)					
Nitrate & Nitrite (as N)	0.05	mg/L	2.4	< 0.05	1.6
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	< 0.2	< 0.2	< 0.2
Total Nitrogen (as N)	0.2	mg/L	2.4	< 0.2	1.6
Heavy Metals					
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Beryllium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Boron (filtered)	0.05	mg/L	0.05	< 0.05	< 0.05
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	0.003
Cobalt (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	< 0.001	0.013	< 0.001
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Manganese (filtered)	0.005	mg/L	< 0.005	0.036	< 0.005
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Zinc (filtered)	0.001	mg/L	0.011	0.016	0.007
Alkali Metals					
Calcium	0.5	mg/L	36	40	57
Magnesium	0.5	mg/L	160	130	170
Potassium	0.5	mg/L	5.0	10	5.3
Sodium	0.5	mg/L	290	360	270

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Ammonia (as N)	Melbourne	Mar 13, 2014	28 Day
- Method: APHA 4500-NH3 Ammonia Nitrogen by FIA			
Cyanide (total)	Melbourne	Mar 12, 2014	14 Day
- Method: USEPA 9010 Cyanide			
Fluoride	Melbourne	Mar 12, 2014	28 Day
- Method: LM-LTM-INO-4300 (Fluoride by Ion Chromatography)			
Nitrate (as N)	Melbourne	Mar 13, 2014	2 Day
- Method: APHA 4500-NO3 Nitrate Nitrogen by FIA			
Nitrite (as N)	Melbourne	Mar 13, 2014	2 Day
- Method: APHA 4500-NO2 Nitrite Nitrogen by FIA			
Sulphate (as S)	Melbourne	Mar 12, 2014	28 Day
- Method: In house MGT1110A (SO4 by Discrete Analyser)			
Total Dissolved Solids	Melbourne	Mar 17, 2014	7 Day
- Method: APHA 2540C Total Dissolved Solids			
Total Nitrogen Set (as N)			
Nitrate & Nitrite (as N)	Melbourne	Mar 13, 2014	28 Day
- Method: APHA 4500-NO3/NO2 Nitrate-Nitrite Nitrogen by FIA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Mar 13, 2014	7 Day
- Method: APHA 4500 TKN			
Heavy Metals (filtered)	Melbourne	Mar 12, 2014	180 Day
- Method: USEPA 6020 Heavy Metals			
Mobil Metals : Metals M15	Melbourne	Mar 12, 2014	28 Day
- Method: USEPA 6010/6020 Heavy Metals & USEPA 7470/71 Mercury			
Alkali Metals	Melbourne	Mar 12, 2014	180 Day
- Method: USEPA 6010 Alkali Metals			

Eurofins | mgt Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual PQLs are matrix dependant. Quoted PQLs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Acknowledgment.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

UNITS

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Units

TERMS

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
ASLP	Australian Standard Leaching Procedure (AS4439.3)
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - ACCEPTANCE CRITERIA

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries : Recoveries must lie between 50-150% - Phenols 20-130%.

QC DATA GENERAL COMMENTS

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxophene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxophene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Arochlor 1260 in Matrix Spikes and LCS's.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPD's are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Ammonia (as N)	mg/L	< 0.01			0.01	Pass	
Cyanide (total)	mg/L	< 0.005			0.005	Pass	
Fluoride	mg/L	< 0.5			0.5	Pass	
Nitrate (as N)	mg/L	< 0.02			0.02	Pass	
Nitrite (as N)	mg/L	< 0.02			0.02	Pass	
Sulphate (as S)	mg/L	< 5			5	Pass	
Total Dissolved Solids	mg/L	< 10			10	Pass	
Method Blank							
Total Nitrogen Set (as N)							
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Beryllium (filtered)	mg/L	< 0.001			0.001	Pass	
Boron (filtered)	mg/L	< 0.05			0.05	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Cobalt (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Manganese (filtered)	mg/L	< 0.005			0.005	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.001			0.001	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
LCS - % Recovery							
Ammonia (as N)	%	99			70-130	Pass	
Cyanide (total)	%	109			70-130	Pass	
Fluoride	%	99			70-130	Pass	
Nitrate (as N)	%	102			70-130	Pass	
Nitrite (as N)	%	92			70-130	Pass	
Sulphate (as S)	%	109			70-130	Pass	
LCS - % Recovery							
Total Nitrogen Set (as N)							
Nitrate & Nitrite (as N)	%	102			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	92			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic (filtered)	%	87			80-120	Pass	
Boron (filtered)	%	91			80-120	Pass	
Cadmium (filtered)	%	88			80-120	Pass	
Chromium (filtered)	%	88			80-120	Pass	
Cobalt (filtered)	%	86			80-120	Pass	
Copper (filtered)	%	87			80-120	Pass	
Lead (filtered)	%	87			80-120	Pass	
Manganese (filtered)	%	88			80-120	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Mercury (filtered)			%	80			70-130	Pass	
Nickel (filtered)			%	86			80-120	Pass	
Zinc (filtered)			%	89			80-120	Pass	
LCS - % Recovery									
Alkali Metals									
Calcium			%	89			70-130	Pass	
Magnesium			%	88			70-130	Pass	
Potassium			%	80			70-130	Pass	
Sodium			%	83			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
				Result 1					
Ammonia (as N)	M14-Ma08323	NCP	%	99			70-130	Pass	
Cyanide (total)	M14-Ma05350	NCP	%	104			70-130	Pass	
Fluoride	M14-Ma08094	NCP	%	101			70-130	Pass	
Nitrate (as N)	M14-Ma08323	NCP	%	104			70-130	Pass	
Nitrite (as N)	M14-Ma08323	NCP	%	86			70-130	Pass	
Sulphate (as S)	M14-Ma08436	NCP	%	90			70-130	Pass	
Spike - % Recovery									
Total Nitrogen Set (as N)				Result 1					
Nitrate & Nitrite (as N)	M14-Ma08323	NCP	%	104			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	M14-Ma10615	NCP	%	87			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	M14-Ma08600	NCP	%	85			70-130	Pass	
Beryllium (filtered)	M14-Ma08600	NCP	%	81			75-125	Pass	
Boron (filtered)	M14-Ma08600	NCP	%	78			75-125	Pass	
Cadmium (filtered)	M14-Ma08600	NCP	%	76			70-130	Pass	
Chromium (filtered)	M14-Ma08600	NCP	%	83			70-130	Pass	
Cobalt (filtered)	M14-Ma08600	NCP	%	80			75-125	Pass	
Copper (filtered)	M14-Ma08600	NCP	%	77			70-130	Pass	
Lead (filtered)	M14-Ma08600	NCP	%	80			70-130	Pass	
Manganese (filtered)	M14-Ma08600	NCP	%	81			70-130	Pass	
Mercury (filtered)	M14-Ma09544	NCP	%	92			70-130	Pass	
Nickel (filtered)	M14-Ma08600	NCP	%	77			70-130	Pass	
Zinc (filtered)	M14-Ma08600	NCP	%	79			70-130	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	M14-Ma08462	NCP	%	92			70-130	Pass	
Magnesium	M14-Ma08462	NCP	%	100			70-130	Pass	
Potassium	M14-Ma08462	NCP	%	82			70-130	Pass	
Sodium	M14-Ma08462	NCP	%	98			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	M14-Ma08323	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
Cyanide (total)	M14-Ma07187	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Fluoride	M14-Ma08094	NCP	mg/L	0.63	0.61	3.0	30%	Pass	
Nitrate (as N)	M14-Ma08323	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Nitrite (as N)	M14-Ma08323	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Sulphate (as S)	M14-Ma08754	NCP	mg/L	180	180	<1	30%	Pass	

Duplicate									
Total Nitrogen Set (as N)				Result 1	Result 2	RPD			
Nitrate & Nitrite (as N)	M14-Ma08323	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Total Kjeldahl Nitrogen (as N)	M14-Ma10615	NCP	mg/L	< 0.2	< 0.2	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	M14-Ma08600	NCP	mg/L	0.0017	0.0016	1.6	30%	Pass	
Beryllium (filtered)	M14-Ma08600	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Boron (filtered)	M14-Ma08600	NCP	mg/L	0.35	0.34	2.5	30%	Pass	
Cadmium (filtered)	M14-Ma08600	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	M14-Ma08600	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cobalt (filtered)	M14-Ma08600	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	M14-Ma08600	NCP	mg/L	0.013	0.013	3.5	30%	Pass	
Lead (filtered)	M14-Ma08600	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Manganese (filtered)	M14-Ma08600	NCP	mg/L	0.031	0.030	4.7	30%	Pass	
Mercury (filtered)	M14-Ma09544	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	M14-Ma08600	NCP	mg/L	0.0065	0.0064	2.6	30%	Pass	
Zinc (filtered)	M14-Ma08600	NCP	mg/L	0.095	0.095	<1	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M14-Ma09226	NCP	mg/L	5.4	5.7	5.0	30%	Pass	
Magnesium	M14-Ma09226	NCP	mg/L	46	47	2.0	30%	Pass	
Potassium	M14-Ma08462	NCP	mg/L	25	28	14	30%	Pass	
Sodium	M14-Ma09226	NCP	mg/L	190	190	2.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Dissolved Solids	M14-Ma08467	CP	mg/L	1600	1600	3.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Organic samples had Teflon liners	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised By

Adrian Tabacchiera	Client Services
Emily Rosenberg	Senior Analyst-Metal (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)

Glenn Jackson
Laboratory Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Uncertainty data is available on request

eurofins | mgt

Certificate of Analysis

Jacobs SKM
PO Box 312 Flinders Lane
Melbourne
VIC 8009

NATA Accredited
Accreditation Number 1261
Site Number 1254

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

Attention: **Corey Bannister**

Report **411868-W**
Client Reference BEVERIDGE PSP GW SAMPLING PROGRAM MAR 14 VW07335
Received Date Mar 14, 2014

Client Sample ID **Sample Matrix** **Eurofins | mgt Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**EFF** **Water** **M14-Ma10861** **Mar 13, 2014**	**WSBH** **Water** **M14-Ma10862** **Mar 13, 2014**	**BH15** **Water** **M14-Ma10863** **Mar 13, 2014**	**BH18** **Water** **M14-Ma10864** **Mar 13, 2014**
Ammonia (as N)	0.01	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
Cyanide (total)	0.005	mg/L	0.023	< 0.005	< 0.005	< 0.005
Fluoride	0.5	mg/L	0.7	< 0.5	< 0.5	< 0.5
Nitrate (as N)	0.02	mg/L	5.8	0.08	5.0	0.22
Nitrite (as N)	0.02	mg/L	3.6	< 0.02	< 0.02	< 0.02
Sulphate (as S)	5	mg/L	14	12	14	< 5
Total Dissolved Solids	10	mg/L	620	1800	1700	770
Total Nitrogen Set (as N)						
Nitrate & Nitrite (as N)	0.05	mg/L	9.4	0.08	5.0	0.22
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	3.1	< 0.2	2.7	< 0.2
Total Nitrogen (as N)	0.2	mg/L	13	< 0.2	7.7	0.22
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	0.003	< 0.001	< 0.001	< 0.001
Beryllium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Boron (filtered)	0.05	mg/L	0.07	< 0.05	< 0.05	0.09
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt (filtered)	0.001	mg/L	0.001	0.001	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	0.002	0.012	0.30	0.007
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Manganese (filtered)	0.005	mg/L	0.029	0.60	0.012	0.060
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.005	0.003	< 0.001	< 0.001
Zinc (filtered)	0.001	mg/L	< 0.001	0.098	0.15	0.36
Alkali Metals						
Calcium	0.5	mg/L	18	79	40	19
Magnesium	0.5	mg/L	18	170	140	40
Potassium	0.5	mg/L	47	21	42	25
Sodium	0.5	mg/L	180	340	400	250

Client Sample ID			BH7	BH17	BH12	BH14
Sample Matrix			Water	Water	Water	Water
Eurofins | mgt Sample No.			M14-Ma10865	M14-Ma10866	M14-Ma10867	M14-Ma10868
Date Sampled			Mar 12, 2014	Mar 13, 2014	Mar 12, 2014	Mar 12, 2014
Test/Reference	LOR	Unit				
Ammonia (as N)	0.01	mg/L	< 0.01	< 0.01	0.27	< 0.01
Cyanide (total)	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Fluoride	0.5	mg/L	< 0.5	< 0.5	< 0.5	< 0.5
Nitrate (as N)	0.02	mg/L	2.8	3.2	7.3	1.9
Nitrite (as N)	0.02	mg/L	< 0.02	< 0.02	0.22	< 0.02
Sulphate (as S)	5	mg/L	12	< 5	16	11
Total Dissolved Solids	10	mg/L	1200	700	2200	1300
Total Nitrogen Set (as N)						
Nitrate & Nitrite (as N)	0.05	mg/L	2.8	3.2	7.6	1.9
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	< 0.2	< 0.2	1.6	< 0.2
Total Nitrogen (as N)	0.2	mg/L	2.8	3.2	9.2	1.9
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001	0.003	< 0.001
Beryllium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Boron (filtered)	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	0.003	< 0.001	< 0.001
Cobalt (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	0.001	0.002	0.003	0.047
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	0.001
Manganese (filtered)	0.005	mg/L	0.013	< 0.005	0.038	< 0.005
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.001	< 0.001	0.002	0.001
Zinc (filtered)	0.001	mg/L	0.007	0.014	0.011	0.030
Alkali Metals						
Calcium	0.5	mg/L	32	28	16	19
Magnesium	0.5	mg/L	130	82	230	110
Potassium	0.5	mg/L	22	18	16	3.6
Sodium	0.5	mg/L	280	180	580	330

Client Sample ID			BH16	BH11	1303-QA1	R1-1203
Sample Matrix			Water	Water	Water	Water
Eurofins | mgt Sample No.			M14-Ma10869	M14-Ma10870	M14-Ma10871	M14-Ma10872
Date Sampled			Mar 12, 2014	Mar 11, 2014	Mar 13, 2014	Mar 12, 2014
Test/Reference	LOR	Unit				
Ammonia (as N)	0.01	mg/L	< 0.01	0.03	< 0.01	< 0.01
Cyanide (total)	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Fluoride	0.5	mg/L	< 0.5	< 0.5	0.6	< 0.5
Nitrate (as N)	0.02	mg/L	< 0.02	< 0.02	5.5	< 0.02
Nitrite (as N)	0.02	mg/L	< 0.02	< 0.02	3.8	< 0.02
Sulphate (as S)	5	mg/L	10	43	14	< 5
Total Dissolved Solids	10	mg/L	2000	3500	700	-
Total Nitrogen Set (as N)						
Nitrate & Nitrite (as N)	0.05	mg/L	< 0.05	< 0.05	9.3	< 0.05
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	< 0.2	< 0.2	< 0.2	< 0.2
Total Nitrogen (as N)	0.2	mg/L	< 0.2	< 0.2	9.3	< 0.2

Client Sample ID			BH16	BH11	1303-QA1	R1-1203
Sample Matrix			Water	Water	Water	Water
Eurofins | mgt Sample No.			M14-Ma10869	M14-Ma10870	M14-Ma10871	M14-Ma10872
Date Sampled			Mar 12, 2014	Mar 11, 2014	Mar 13, 2014	Mar 12, 2014
Test/Reference	LOR	Unit				
Heavy Metals						
Arsenic	0.001	mg/L	-	-	-	< 0.001
Arsenic (filtered)	0.001	mg/L	< 0.001	0.005	0.003	-
Beryllium	0.001	mg/L	-	-	-	< 0.001
Beryllium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Boron	0.05	mg/L	-	-	-	< 0.05
Boron (filtered)	0.05	mg/L	< 0.05	< 0.05	0.07	-
Cadmium	0.0002	mg/L	-	-	-	< 0.0002
Cadmium (filtered)	0.0002	mg/L	0.0002	< 0.0002	< 0.0002	-
Chromium	0.001	mg/L	-	-	-	< 0.001
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Cobalt	0.001	mg/L	-	-	-	< 0.001
Cobalt (filtered)	0.001	mg/L	0.003	0.011	0.001	-
Copper	0.001	mg/L	-	-	-	< 0.001
Copper (filtered)	0.001	mg/L	0.024	< 0.001	0.002	-
Lead	0.001	mg/L	-	-	-	< 0.001
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Manganese	0.005	mg/L	-	-	-	< 0.005
Manganese (filtered)	0.005	mg/L	0.75	0.24	0.038	-
Mercury	0.0001	mg/L	-	-	-	< 0.0001
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	-
Nickel	0.001	mg/L	-	-	-	< 0.001
Nickel (filtered)	0.001	mg/L	0.001	0.026	0.005	-
Zinc	0.001	mg/L	-	-	-	< 0.001
Zinc (filtered)	0.001	mg/L	0.32	0.005	0.003	-
Alkali Metals						
Calcium	0.5	mg/L	78	33	21	< 0.5
Magnesium	0.5	mg/L	240	290	21	< 0.5
Potassium	0.5	mg/L	33	10	39	< 0.5
Sodium	0.5	mg/L	460	720	180	< 0.5

Client Sample ID			1103-R1
Sample Matrix			Water
Eurofins | mgt Sample No.			M14-Ma10873
Date Sampled			Mar 11, 2014
Test/Reference	LOR	Unit	
Ammonia (as N)	0.01	mg/L	< 0.01
Cyanide (total)	0.005	mg/L	< 0.005
Fluoride	0.5	mg/L	< 0.5
Nitrate (as N)	0.02	mg/L	< 0.02
Nitrite (as N)	0.02	mg/L	< 0.02
Sulphate (as S)	5	mg/L	< 5
Total Nitrogen Set (as N)			
Nitrate & Nitrite (as N)	0.05	mg/L	< 0.05
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	< 0.2
Total Nitrogen (as N)	0.2	mg/L	< 0.2

Client Sample ID			1103-R1
Sample Matrix			**Water**
Eurofins | mgt Sample No.			**M14-Ma10873**
Date Sampled			**Mar 11, 2014**
Test/Reference	LOR	Unit	
Heavy Metals			
Arsenic	0.001	mg/L	< 0.001
Beryllium	0.001	mg/L	< 0.001
Boron	0.05	mg/L	< 0.05
Cadmium	0.0002	mg/L	< 0.0002
Chromium	0.001	mg/L	< 0.001
Cobalt	0.001	mg/L	< 0.001
Copper	0.001	mg/L	< 0.001
Lead	0.001	mg/L	< 0.001
Manganese	0.005	mg/L	< 0.005
Mercury	0.0001	mg/L	< 0.0001
Nickel	0.001	mg/L	< 0.001
Zinc	0.001	mg/L	< 0.001
Alkali Metals			
Calcium	0.5	mg/L	< 0.5
Magnesium	0.5	mg/L	< 0.5
Potassium	0.5	mg/L	< 0.5
Sodium	0.5	mg/L	< 0.5

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Ammonia (as N)	Melbourne	Mar 14, 2014	28 Day
- Method: APHA 4500-NH3 Ammonia Nitrogen by FIA			
Cyanide (total)	Melbourne	Mar 14, 2014	14 Day
- Method: USEPA 9010 Cyanide			
Fluoride	Melbourne	Mar 18, 2014	28 Day
- Method: LM-LTM-INO-4300 (Fluoride by Ion Chromatography)			
Nitrate (as N)	Melbourne	Mar 14, 2014	2 Day
- Method: APHA 4500-NO3 Nitrate Nitrogen by FIA			
Nitrite (as N)	Melbourne	Mar 14, 2014	2 Day
- Method: APHA 4500-NO2 Nitrite Nitrogen by FIA			
Sulphate (as S)	Melbourne	Mar 14, 2014	28 Day
- Method: In house MGT1110A (SO4 by Discrete Analyser)			
Total Dissolved Solids	Melbourne	Mar 20, 2014	7 Day
- Method: APHA 2540C Total Dissolved Solids			
Total Nitrogen Set (as N)			
Nitrate & Nitrite (as N)	Melbourne	Mar 14, 2014	28 Day
- Method: APHA 4500-NO3/NO2 Nitrate-Nitrite Nitrogen by FIA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Mar 14, 2014	7 Day
- Method: APHA 4500 TKN			
Heavy Metals	Melbourne	Mar 14, 2014	180 Day
- Method: USEPA 6010/6020 Heavy Metals			
Heavy Metals (filtered)	Melbourne	Mar 14, 2014	180 Day
- Method: USEPA 6020 Heavy Metals			
Mobil Metals : Metals M15	Melbourne	Mar 14, 2014	28 Day
- Method: USEPA 6010/6020 Heavy Metals & USEPA 7470/71 Mercury			
Alkali Metals	Melbourne	Mar 14, 2014	180 Day
- Method: USEPA 6010 Alkali Metals			

Eurofins | mgt Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual PQLs are matrix dependant. Quoted PQLs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Acknowledgment.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

UNITS

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Units

TERMS

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
ASLP	Australian Standard Leaching Procedure (AS4439.3)
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - ACCEPTANCE CRITERIA

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries : Recoveries must lie between 50-150% - Phenols 20-130%.

QC DATA GENERAL COMMENTS

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxophene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxophene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Arochlor 1260 in Matrix Spikes and LCS's.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPD's are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Ammonia (as N)	mg/L	< 0.01			0.01	Pass	
Fluoride	mg/L	< 0.5			0.5	Pass	
Nitrate (as N)	mg/L	< 0.02			0.02	Pass	
Nitrite (as N)	mg/L	< 0.02			0.02	Pass	
Sulphate (as S)	mg/L	< 5			5	Pass	
Total Dissolved Solids	mg/L	< 10			10	Pass	
Method Blank							
Total Nitrogen Set (as N)							
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/L	< 0.001			0.001	Pass	
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Beryllium	mg/L	< 0.001			0.001	Pass	
Beryllium (filtered)	mg/L	< 0.001			0.001	Pass	
Boron	mg/L	< 0.05			0.05	Pass	
Boron (filtered)	mg/L	< 0.05			0.05	Pass	
Cadmium	mg/L	< 0.0002			0.0002	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium	mg/L	< 0.001			0.001	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Cobalt	mg/L	< 0.001			0.001	Pass	
Cobalt (filtered)	mg/L	< 0.001			0.001	Pass	
Copper	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Manganese	mg/L	< 0.005			0.005	Pass	
Manganese (filtered)	mg/L	< 0.005			0.005	Pass	
Mercury	mg/L	< 0.0001			0.0001	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel	mg/L	< 0.001			0.001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.001			0.001	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
LCS - % Recovery							
Ammonia (as N)	%	90			70-130	Pass	
Fluoride	%	91			70-130	Pass	
Nitrate (as N)	%	107			70-130	Pass	
Nitrite (as N)	%	96			70-130	Pass	
Sulphate (as S)	%	108			70-130	Pass	
LCS - % Recovery							
Total Nitrogen Set (as N)							
Nitrate & Nitrite (as N)	%	107			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	98			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Heavy Metals							
Arsenic	%	93			80-120	Pass	
Arsenic (filtered)	%	94			80-120	Pass	
Beryllium	%	90			80-120	Pass	
Boron	%	85			80-120	Pass	
Boron (filtered)	%	98			80-120	Pass	
Cadmium	%	90			80-120	Pass	
Cadmium (filtered)	%	93			80-120	Pass	
Chromium	%	89			80-120	Pass	
Chromium (filtered)	%	92			80-120	Pass	
Cobalt	%	89			80-120	Pass	
Cobalt (filtered)	%	93			80-120	Pass	
Copper	%	88			80-120	Pass	
Copper (filtered)	%	93			80-120	Pass	
Lead	%	90			80-120	Pass	
Lead (filtered)	%	91			80-120	Pass	
Manganese	%	89			80-120	Pass	
Manganese (filtered)	%	91			80-120	Pass	
Mercury	%	80			75-125	Pass	
Mercury (filtered)	%	80			70-130	Pass	
Nickel	%	89			80-120	Pass	
Nickel (filtered)	%	91			80-120	Pass	
Zinc	%	92			80-120	Pass	
Zinc (filtered)	%	94			80-120	Pass	
LCS - % Recovery							
Alkali Metals							
Calcium	%	80			70-130	Pass	
Magnesium	%	81			70-130	Pass	
Potassium	%	98			70-130	Pass	
Sodium	%	81			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Ammonia (as N)	M14-Ma09777	NCP	%	82			70-130	Pass	
Nitrate (as N)	M14-Ma09777	NCP	%	104			70-130	Pass	
Nitrite (as N)	M14-Ma09777	NCP	%	95			70-130	Pass	
Spike - % Recovery									
Total Nitrogen Set (as N)				Result 1					
Nitrate & Nitrite (as N)	M14-Ma09777	NCP	%	104			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	M14-Ma10233	NCP	%	95			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	M14-Ma11361	NCP	%	92			70-130	Pass	
Beryllium (filtered)	M14-Ma11361	NCP	%	78			75-125	Pass	
Boron (filtered)	M14-Ma11361	NCP	%	79			75-125	Pass	
Cadmium (filtered)	M14-Ma11361	NCP	%	82			70-130	Pass	
Chromium (filtered)	M14-Ma11361	NCP	%	89			70-130	Pass	
Cobalt (filtered)	M14-Ma11361	NCP	%	86			75-125	Pass	
Copper (filtered)	M14-Ma11361	NCP	%	85			70-130	Pass	
Lead (filtered)	M14-Ma11361	NCP	%	86			70-130	Pass	
Manganese (filtered)	M14-Ma11361	NCP	%	84			70-130	Pass	
Nickel (filtered)	M14-Ma11361	NCP	%	81			70-130	Pass	
Zinc (filtered)	M14-Ma11361	NCP	%	77			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	M14-Ma10190	NCP	%	116			70-130	Pass	
Magnesium	M14-Ma10190	NCP	%	118			70-130	Pass	
Potassium	M14-Ma09241	NCP	%	108			70-130	Pass	
Sodium	M14-Ma10233	NCP	%	89			70-130	Pass	
Spike - % Recovery									
				Result 1					
Cyanide (total)	M14-Ma10867	CP	%	75			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Mercury (filtered)	M14-Ma10868	CP	%	84			70-130	Pass	
Spike - % Recovery									
				Result 1					
Fluoride	M14-Ma10871	CP	%	97			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	M14-Ma10322	NCP	%	81			75-125	Pass	
Beryllium	M14-Ma10322	NCP	%	77			75-125	Pass	
Boron	M14-Ma09244	NCP	%	91			75-125	Pass	
Cadmium	M14-Ma10322	NCP	%	75			75-125	Pass	
Chromium	M14-Ma10322	NCP	%	81			75-125	Pass	
Cobalt	M14-Ma10322	NCP	%	77			75-125	Pass	
Copper	M14-Ma09244	NCP	%	92			75-125	Pass	
Lead	M14-Ma10322	NCP	%	82			75-125	Pass	
Manganese	M14-Ma10322	NCP	%	83			75-125	Pass	
Mercury	M14-Ma11981	NCP	%	78			70-130	Pass	
Nickel	M14-Ma09244	NCP	%	84			75-125	Pass	
Zinc	M14-Ma09244	NCP	%	87			75-125	Pass	
Spike - % Recovery									
				Result 1					
Sulphate (as S)	M14-Ma10873	CP	%	106			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	M14-Ma09777	NCP	mg/L	0.030	0.030	7.0	30%	Pass	
Nitrate (as N)	M14-Ma09777	NCP	mg/L	0.070	0.060	15	30%	Pass	
Nitrite (as N)	M14-Ma09777	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Duplicate									
Total Nitrogen Set (as N)				Result 1	Result 2	RPD			
Nitrate & Nitrite (as N)	M14-Ma09777	NCP	mg/L	0.070	0.060	15	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	M14-Ma09544	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Beryllium (filtered)	M14-Ma09544	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Boron (filtered)	M14-Ma09544	NCP	mg/L	0.17	0.17	1.3	30%	Pass	
Cadmium (filtered)	M14-Ma09544	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	M14-Ma09544	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cobalt (filtered)	M14-Ma09544	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	M14-Ma09544	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Lead (filtered)	M14-Ma09544	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Manganese (filtered)	M14-Ma09544	NCP	mg/L	0.31	0.31	2.3	30%	Pass	
Nickel (filtered)	M14-Ma09544	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc (filtered)	M14-Ma09544	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	

Duplicate									
				Result 1	Result 2	RPD			
Total Dissolved Solids	M14-Ma10862	CP	mg/L	1800	1900	5.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Cyanide (total)	M14-Ma10867	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Mercury (filtered)	M14-Ma10868	CP	mg/L	< 0.0001	0.0002	200	30%	Fail	Q15
Duplicate									
				Result 1	Result 2	RPD			
Total Dissolved Solids	M14-Ma10870	CP	mg/L	3500	3700	5.0	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M14-Ma10870	CP	mg/L	33	35	5.0	30%	Pass	
Magnesium	M14-Ma10870	CP	mg/L	290	300	3.0	30%	Pass	
Potassium	M14-Ma10870	CP	mg/L	10	11	4.0	30%	Pass	
Sodium	M14-Ma10870	CP	mg/L	720	720	1.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Fluoride	M14-Ma10871	CP	mg/L	0.6	0.6	2.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	M14-Ma10322	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Beryllium	M14-Ma10322	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Boron	M14-Ma10322	NCP	mg/L	0.18	0.17	3.4	30%	Pass	
Cadmium	M14-Ma10322	NCP	mg/L	< 0.0002	< 0.0005	<1	30%	Pass	
Chromium	M14-Ma10322	NCP	mg/L	0.013	0.013	3.6	30%	Pass	
Cobalt	M14-Ma10322	NCP	mg/L	0.014	0.013	6.1	30%	Pass	
Copper	M14-Ma10322	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Lead	M14-Ma10322	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Manganese	M14-Ma10322	NCP	mg/L	0.027	0.027	<1	30%	Pass	
Mercury	M14-Ma11665	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel	M14-Ma10322	NCP	mg/L	0.064	0.064	<1	30%	Pass	
Zinc	M14-Ma10322	NCP	mg/L	0.033	0.032	1.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Sulphate (as S)	M14-Ma10873	CP	mg/L	< 5	< 5	<1	30%	Pass	
Duplicate									
Total Nitrogen Set (as N)				Result 1	Result 2	RPD			
Total Kjeldahl Nitrogen (as N)	M14-Ma10873	CP	mg/L	< 0.2	< 0.2	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Organic samples had Teflon liners	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
Q15	The RPD reported passes Eurofins | mgt's Acceptance Criteria as stipulated in SOP 05. Refer to Glossary Page of this report for further details

Authorised By

Adrian Tabacchiera	Client Services
Emily Rosenberg	Senior Analyst-Metal (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)

Glenn Jackson
Laboratory Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Uncertainty data is available on request

CERTIFICATE OF ANALYSIS

Work Order	: **EM1402371**	Page	: 1 of 4
Client	: **SINCLAIR KNIGHT MERZ**	Laboratory	: Environmental Division Melbourne
Contact	: MR COREY BANNISTER	Contact	: Carol Walsh
Address	: P O BOX 312 FLINDERS LANE MELBOURNE VIC AUSTRALIA 8009	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: cbannister@globalskm.com	E-mail	: carol.walsh@alsglobal.com
Telephone	: +61 03 9248 3100	Telephone	: +61-3-8549 9608
Facsimile	: +61 03 9248 3364	Facsimile	: +61-3-8549 9601
Project	: VW07335 Beveridge PSP GW Sampling Program - Mar 14	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 17-MAR-2014
Sampler	: CB	Issue Date	: 21-MAR-2014
Site	: ----		
		No. of samples received	: 1
Quote number	: EN/003/13	No. of samples analysed	: 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics
Herman Lin	Laboratory Manager	Melbourne Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EK026SF : EM1402322-001 matrix spike failed for total cyanide due to possible sample interference. This has been confirmed by re-analysis.**
- **TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	1303-QA2	----	----	----	----
				Client sampling date / time	13-MAR-2014 15:00	----	----	----	----
					EM1402371-001	**----**	**----**	**----**	**----**
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	10	mg/L		**1540**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**34**	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**16**	----	----	----	----
Magnesium	7439-95-4	1	mg/L		**17**	----	----	----	----
Sodium	7440-23-5	1	mg/L		**157**	----	----	----	----
Potassium	7440-09-7	1	mg/L		**21**	----	----	----	----
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		**0.003**	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		**0.008**	----	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.009**	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L		**0.004**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		**0.008**	----	----	----	----
Lead	7439-92-1	0.001	mg/L		**0.002**	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.020**	----	----	----	----
Manganese	7439-96-5	0.001	mg/L		**0.118**	----	----	----	----
Boron	7440-42-8	0.05	mg/L		**0.19**	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.8**	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.20**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L		**1.39**	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**6.82**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	1303-QA2	----	----	----	----
				Client sampling date / time	13-MAR-2014 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1402371-001	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser - Continued									
Nitrite + Nitrate as N	----	0.01	mg/L	**8.21**	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**3.2**	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L	**11.4**	----	----	----	----