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5th August 2013

Ref: E49/7

Bicorp Pty Ltd

50 Wyllie Road

KEMBLA GRANGE NSW 2756

Dear Adam,

Re: Salinity Assessment

50 Wyllie Road, Kembla Grange NSW

This assessment presents the results of an investigation of soil salinity of 50 Wyllie Road, Kembla Grange NSW (hereafter known as the "site").

The objective of this assessment was to identify any salinity issues within the site and subsequently provide recommendations for salinity management in regards to the likely impact of the increase of processing capacities of up to 230,000 tonnes of construction and demolition waste materials per annum, with associated waste storage and stockpile areas and ancillary structures (i.e. plant and equipment). This also includes the construction of a large warehouse.

The salinity assessment was carried out with reference to the following Department of Land & Water Conservation (DLWC), now the Department Natural Resources (DNR) and Australian Standard publications:

- "*Site Investigations for Urban Salinity*" – 2002
- "*Building in a Saline Environment*" – 2003
- "*Map of Salinity Potential*" – 2002
- *''NSW Soil and Land Information System"*
- *"Dryland Salinity Occurrences and indicators " 1999*
- *"Salinity Hazard" 1999*
- *"Soil Profiles" 2005*
- *"Piling and Design" 2009*

1.0 SCOPE OF WORK

In order to achieve the objective of this assessment, the following scope of work was conducted:

- Review of the DNR publications mentioned above.
- A thorough site inspection to identify any visible indicators of soil and/or water salinity.
- Sampling of soils within the site in accordance with the abovementioned DNR guidelines.
- Analysis of salinity indicators by a NATA accredited laboratory.
- Assessment of the laboratory test data against applicable reference materials, including impacts on future building and infrastructure within the site.
- Preparation of this letter report.

2.0 SITE DESCRIPTION

The proposed works are to be undertaken at the site identified as 50 Wyllie Road, Kembla Grange, NSW (Lot 10 in 878167). The site is located within the Wollongong City Council Area. Surrounding properties are zoned as recreation (RE2 and RE1), light industrial (IN2) and environment conservation (E2).

The upgrade of the Resource Recovery Facility is proposed to occur at the south-western portion of the site near Wyllie Road. This proposed development area in currently zoned as light industrial (IN2).

The site is bound to the north by an existing ridgeline. To the west the site is bounded by industrial facilities. To the south and east the site is bordered by vacant land.

The field scientist also carried out an inspection to observe and record any visually obvious signs of salinity within the site and surrounding region, including salt tolerant plant species, areas of erosion, or salt deposits, or evidence of salt attack on existing buildings. No such indicators were noted within the site.

3.0 TOPOGRAPHY AND GEOLOGY

Topographic information indicates the site is situated in a sloping area ranging from approximately 15-30 metres above sea level. The majority of the site slopes towards Wyllie Road and also is intersected by an onsite creek. with the surrounding topography being gently undulating. Site stormwater runoff is expected to be either captured for reuse within the onsite-retention dams or is expected to flow via stormwater drains and site surfaces into the onsite creek within the site.

The Geological Map of Wollongong (Geological Series Sheet S1 56-9, Scale 1:250,000, 1966), published by the Department of Mineral Resources indicates the residual soils within the site to be underlain by Shoalhaven Group geological profiles, comprising red, brown and grey lithic sandstone.

The site covers only one soil landscape area and is confirmed by the similar soil profile in each of the boreholes that were augured at different locations within the site.

In general, the following sub-surface soil profile was encountered across the site:

Topsoil	Silty Sandy Clay, med-high plasticity, brown, moist with some organic materials
Natural Soil	Silty Sandy Clay, high plasticity, brown, moist
Bedrock	Shale, weathered, dark brown/grey, weak (maximum depth of drilling).

All the boreholes were dry to the maximum depth of auguring (2.0m) below the existing natural ground level. It should be noted that fluctuations in the level of the regional groundwater might occur due to variations in rainfall, and/or other factors.

It should be noted that dry boreholes do not necessarily indicate that the water table was not encountered. It may take an extended period of time (days) for sufficient seepage to become observable and considerably longer time for the true groundwater level to stabilise, however, the boreholes were dry for the entire period they remained open and it is unlikely that groundwater will be encountered as no basement excavation is proposed. Therefore, groundwater should not affect the proposed development.

4.0 SOIL SALINITY ASSESSMENT CRITERIA

Salinity is the accumulation of mineral salts in the soil, groundwater and surface waters. It is primarily a groundwater problem that produces effects at the soil surface, which can lead to serious land degradation problems. High salinity can also cause dehydration of plant cells, reducing plant growth potential and sometimes causing death of a species. Saline soils in an urban environment can cause damage to bitumen, concrete structures, bricks and steel structures (including pipes).

The three main sources of salts are as follows:

- Salts transported from the ocean and deposited by rainfall.
- Salts released during the process of soil and rock weathering.
- Salts naturally present in the soil profile, resulting from marine sediments deposited in earlier geological times.

Soil salinity in is thought to be primarily the result of early marine sediment deposits and the extent is largely related to the underlying Wianamatta Group shales. Soil salinity can also be related to the process of soil and rock weathering and therefore it is not unusual for higher salt content to be present at or close to the soil / bedrock interface in a residual soil profile.

Surface water and groundwater can dissolve salts present in soils and mobilise these salts to other areas. Over time, a balance is reached between water and the movement of salt and ecosystems will develop that are adapted to the salt in soil and water.

Land development can change the movement of surface and groundwater and as a consequence, carry the salts to other areas potentially outside the balanced environment. This movement can have adverse impacts on ecosystems; particularly plant growth and can also result in damage to building materials where salts accumulate.

Measuring Electrical Conductivity (EC) generally assesses soil salinity. A soil sample for salinity testing is generally made up of 1:5 soil water suspension, which is one part in air dried soil to five parts distilled water. The determined Electrical Conductivity (EC) is multiplied by a factor (varying from 6 to 17) based on the texture of the soil sample, to obtain Corrected Electrical Conductivity designated as EC_e.

The *Environmental Planning and Assessment Regulation 1994* defines saline soils as soil profiles or layers (within the upper 2m of soil) with an Electrical Conductivity (EC_e) of Saturated Extracts greater than 4dS/m. The Department of Conservation and Land Management publication "*Dryland Salinity – Introductory Extension Notes - 1991*" defines various classes of saline soils, as shown in the following table:

Classification	**EC_e (dS/m)**
Non saline	<2
Slightly saline	2 – 4
Moderately saline	4 – 8
Very saline	8 – 16
Highly saline	>16

The impact of saline or potentially saline soils is also associated with other factors, including pH and the relative amounts of cations, such as sodium, calcium, magnesium and potassium. The impact of salts on building materials is related to

the amount of salt and water present, the types of salts, chemical and physical reactions with the building materials and the amount of wetting and drying occurring.

The DNR 2002 publication "*Site Investigations for Urban Salinity*" provides guidance for assessing and managing the impacts of salinity on development sites. In carrying out a comprehensive assessment, the publication recommends determination of a number of soil and/or water chemical and physical properties, such as the following:

- Permeability
- Cation Exchange Capacity
- Sodicity
- Corrosivity (pH, sulphate, chloride)
- Salinity (electrical conductivity)

Once the chemical and physical parameters of the soil and/or water are obtained, the DNR publication suggests reference to the following:

- Australian Standard AS3600-2001: Concrete Structures
- Australian Standard AS3700-2001: Masonry Structures
- Australian Standard AS2159-2009: Piling – Design and Installation
- Australian Standard AS2870-1996: Residential Slabs and Footings - Construction

Aqueous solutions of chlorides cause corrosion of iron and steel, including steel reinforcements in concrete. Corrosion damage by chlorides is only relevant to the

iron and steel. The aggressivity classifications of soil and groundwater applicable to **iron and steel**, in accordance with Australian Standard AS2159-2009, are as follows.

Chloride		pH	Resistivity (ohm)	Soil Condition A*	Soil Condition B#
In Soil (ppm)	In Water (ppm)				
<5000	<1000	>5.0	>5000	Non-aggressive	Non-aggressive
5000-20000	1000-10000	4.0-5.0	2000-5000	Mild	Non-aggressive
20000-50000	10000-20000	3.0-4.0	1000-2000	Moderate	Mild
>50000	>20000	<3.0	<1000	Severe	Moderate

*Soil Condition A = high permeability soils (e.g. sands and gravels) which are below groundwater

#Soil Condition B = low permeability soils (e.g. silts and clays) and all soils above groundwater

The aggressivity classifications of soil and groundwater applicable to **concrete**, in accordance with Australian Standard AS2159-2009, are given below.

Sulphate expressed as SO_4		pH	Chloride in Water (ppm)	Soil Condition A*	Soil Condition B#
In Soil (ppm)	In Groundwater (ppm)				
<5000	300-1000	>5.5	6000	Mild	Non-aggressive
5000-10000	1000-2500	4.5-5.5	6000-12000	Moderate	Mild
10000-20000	2500-500	4.0-4.5	12000-30000	Severe	Moderate
>2000	>5000	<4.0	>30000	Very Severe	Severe

Approximately 100ppm of SO_4 = 80ppm of SO_3

*Soil Condition A = high permeability soils (e.g. sands and gravels) which are below groundwater

#Soil Condition B = low permeability soils (e.g. silts and clays) and all soils above groundwater

The appropriate site condition for predominant soils at the site is assessed to be "Condition B".

5.0 FIELD WORK AND LABORATORY ANALYSIS

An Environmental Scientist, who was responsible for positioning the sampling locations, carried out soil sampling on 10th July 2013, sample recovery, preparation of samples for delivery to a NATA accredited laboratory and logging the sub-surface profile encountered at each sampling location.

Six (6) boreholes (A1 - A6) were augured across the site as part of this assessment.

Representative soil samples were recovered from near surface and at depth, as recommended in the *Environmental Planning and Assessment Regulation 1994* and the DNR 2002 publication "*Site Investigations for Urban Salinity*". The sampling strategy adopted was aimed at assessing the salinity of the soil through the profile within the site.

The soil samples were forwarded to the NATA accredited laboratory of Eurofins MGT Pty Ltd and a selection were analysed for the following:

- Electrical Conductivity (EC)
- pH
- Chloride
- Sulphate
- Exchangeable Sodium

6.0 LABORATORY RESULTS AND ASSESSMENT

The laboratory test results certificates are attached with this report. The attached Tables A -C present the results, together with the assessment criteria adopted, soil descriptions and appropriate multiplication factors.

TABLE A
ELECTRICAL CONDUCTIVITY TEST RESULTS

Sample location	Depth(m)	Electrical Conductivity (dS/m) EC	Multiplication Factor [a]	Electrical Conductivity of Saturated Extract (dS/m) EC_e	Soil Type
Surface soils					
A1	0.5	0.096	7	0.67	Silty sandy clay, med-high plasticity
A2	0.6	0.093	7	0.65	Silty sandy clay, med-high plasticity
Soil Horizon 0.7 -2.0m BGL					
A1	1.5	0.11	7	0.77	Silty sandy clay, high plasticity
A2	1.8	0.079	7	0.55	Silty sandy clay, high plasticity
A3	1	0.087	7	0.61	Silty sandy clay, high plasticity
A4	0.9	0.12	7	0.84	Silty sandy clay, high plasticity
A5	1.3	0.087	7	0.61	Silty sandy clay, high plasticity
A6	1.2	0.096	7	0.67	Silty sandy clay, high plasticity
Environmental Planning & Assessment Regulation 1994				Saline at >4 dS/m	
Dryland Salinity (1993)				Non-saline <2 dS/m Slightly saline 2-4 dS/m Moderately saline 4-8 dS/m Very saline 8-16 dS/m Highly saline >16 dS/m	

The soil electrical conductivity test results are presented in Table A. With reference to NSW Department of Natural Resources "*Site Investigations for Urban Salinity*" – 2002", the soils are considered to be generally non saline.

TABLE B
pH, CHLORIDE, SULPHATE, RESISTIVITY TEST RESULTS

Sample location	Depth(m)	pH	Chloride in Soil (mg/kg)	Sulphate in Soil (mg/kg)
Surface soils				
A1	0.5	5.4	58	34
A2	0.6	5.2	58	37
Soil Horizon 0.7 -2.0m BGL				
A1	1.5	5	84	43
A2	1.8	5.3	52	41
A3	1	5.2	53	34
A4	0.9	5.7	37	56
A5	1.3	5.2	45	31
A6	1.2	5.2	60	36
AS2159-2009				
Piling - Design and Installation				
Reinforced Concrete Piles				
High Permeability Soils				
non-aggressive		>5.5		<5000
mild		4.5 - 5.5		5000 - 10000
moderately aggressive		4 - 4.5		10000 - 20000
severely aggressive		<4		>20000
Low Permeability Soils				
non-aggressive		>5		<5000
mild		4.5 - 5		5000 - 10000
moderately aggressive		4 - 4.5		10000 - 20000
severely aggressive		<4		>20000
Steel Piles				
High Permeability Soils				
non-aggressive		>5	<20000	
mild		4.0 - 5.0	20000 - 50000	
moderately aggressive		3.0 - 4.0	20000 - 50000	
severe		<3	>50000	
Low Permeability Soils				
non-aggressive		>5	<20000	
non-aggressive		4.0 - 5.0	20000 - 50000	
mild		3.0 - 4.0	20000-50000	
moderately aggressive		<3	>50000	

Note: *High Permeability soils (e.g,, sands and gravels) that are in groundwater
*Low Permeability soils (e.g,, silts and clay) or all soils that are above groundwater

The soil pH, chloride, and sulphate test results are presented in Table B. With reference to AS2159-2009 “Piling-Design and Installation”, the soils are considered to be generally non-aggressive to concrete and steel.

TABLE C
EXCHANGEABLE SODIUM PERCENTAGE TEST RESULTS

Sample location	depth(m)	Exchangeable Sodium Percentage (ESP)	Soil Type
Surface soils			
A1	0.5	2	Silty sandy clay, med-high plasticity
A2	0.6	2	Silty sandy clay, med-high plasticity
Soil Horizon 0.7 -2.0m BGL			
A1	1.5	3	Silty sandy clay, high plasticity
A2	1.8	3	Silty sandy clay, high plasticity
A3	1	2	Silty sandy clay, high plasticity
A4	0.9	2	Silty sandy clay, high plasticity
A5	1.3	2	Silty sandy clay, high plasticity
A6	1.2	2	Silty sandy clay, high plasticity
Dryland Salinity (Introductory Extension Notes)			
non-sodic		<5	
marginally sodic		5 - 10	
highly sodic		>10	
Sodic Soils (Distribution, Properties, Management, and Environmental Consequences)			
sodic		>15	

The soil exchangeable sodium percentage test results are presented in Table C. With reference to NSW Department of Natural Resources "*Site Investigations for Urban Salinity*" – 2002", the soils are considered to be generally non sodic.

CONCLUSION

Based on assessment of the sub-surface profile encountered at the borehole locations and the results of laboratory testing, it is our assessment that the soils likely to be disturbed by the proposed development are generally non-saline, non aggressive to steel and concrete piles, and are also non-sodic.

It is our assessment, that from a salinity consideration, the site is **suitable** for the proposed development with minimal concerns.

Should you have any questions regarding this report, please do not hesitate to contact the undersigned.

For and on behalf of
Benviron Group

Ben Buckley

Ben Buckley
Director
Senior Environmental Forensic Scientist

Attachments

Important Information About Your Environmental Report
Figure 1 – Site Plan
Laboratory Results

LIMITATIONS

Whilst to the best of our knowledge, information contained in this report is accurate at the date of issue, although subsurface conditions, including groundwater levels and contaminant concentrations, can change in a limited time. This should be borne in mind if the report is used after a protracted delay.

There is always some disparity in subsurface conditions across a site that cannot be fully defined by investigation. Hence it is unlikely that measurements and values obtained from sampling and testing during environmental works carried out at a site will characterise the extremes of conditions that exist within the site.

There is no investigation that is thorough enough to preclude the presence of material that presently or in the future, may be considered hazardous at the site. Since regulatory criteria are constantly changing, concentrations of contaminants presently considered low may, in the future, fall under different regulatory standards that require remediation.

Opinions are judgements that are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions.

Although the information provided by an Salinity Assessment can reduce exposure to risks, no assessment, however diligently carried out, can eliminate them. It must be noted that these findings are professional findings and have limitations. Even a rigorous professional assessment may fail to detect all salinity on a site. Impacted soils may be present in areas that were not surveyed or sampled.

Important information about your environmental report should also be read in conjunction with this report.

References

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14. Walker, M – Causes, Effects, Remediation and Measurement of Land and River Salinity in Australia, Runoff and Solute Processes in High Water table Areas: Measurement, Modelling and Management, Cooperative Research Centre for Catchment Hydrology, 1994.
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19. Hazelton, P. A. & Murphy, B. W (ed) – What Do All the Number Mean? A Guide for the Interpretation of Soil Test Results, Department of Conservation and Land Management, 1992.
20. Standards Australia - AS2159-2009 “Piling – Design and Installation”, 2009.

IMPORTANT INFORMATION ABOUT YOUR ENVIRONMENTAL SITE ASSESSMENT

These notes have been prepared by Benviron Group Pty Ltd and its associated companies using guidelines prepared by ASFE (The Association) of Engineering Firms Practising in the Geo-sciences. They are offered to help you in the interpretation of your Environmental Site Assessment (ESA) reports.

REASONS FOR CONDUCTING AN ESA

ESA's are typically, though not exclusively, carried out in the following circumstances:

- as pre-acquisition assessments, on behalf of either purchaser or vender, when a property is to be sold;
- as pre-development assessments, when a property or area of land is to be redeveloped or have its use changed for example, from a factory to a residential subdivision;
- as pre-development assessments of greenfield sites, to establish "baseline" conditions and assess environmental, geological and hydrological constraints to the development of, for example, a landftll; and
- as audits of the environmental effects of an ongoing operation.

Each of these circumstances requires a specific approach to the assessment of soil and gro nd;vat r contamination. In all cases however, the obJectlve 1s to identify and if possible quantify the risks that unrecognised contanlination poses to the proposed activity. Such risks may be both fmancial, for example, cleanup costs or limitations on site use, and physical, for example, health risks to site users or the public.

THE LIMITATIONS OF AN ESA

Although the information provided by an ESA could reduce exposure to such risks, no ESA, however, diligently carried out can eliminate them. Even a rigorous professional assessment may fail to detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled.

AN ESA REPORT IS BASED ON A UNIQUE SET OF PROJECT SPECIFIC FACTORS

Your environmental report should not be used:

- when the nature of the proposed development is changed, for example, if a residential development is proposed instead of a commercial one;
- when the size or configuration of the proposed development is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership
- or for application to an adjacent site.

To help avoid costly problems, refer to your consultant to determine how any factors, which have changed subsequent to the date of the report, may affect its recommendations.

ESA "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site assessment identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists who then render an opinion about overall subsurface conditions, the nature and extent of contamination, its likely inlpact on the proposed development and appropriate remediation measures. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is bidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to help minimise its impact. For this reason owners should retain the services of their consultants

through the development stage, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Natural processes and the activity of man change subsurface conditions. As an ESA report is based on conditions, which existed at the time of subsurface exploration, decisions should not be based on an ESA report whose adequacy may have been affected by time. Speak with the consultant to learn if additional tests are advisable.

ESA SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Every study and ESA report is prepared in response to a specific brief to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Other persons should not use a report for any purpose, or by the client for a different purpose. No individual other than the client should apply a report even apparently for its intended purpose without first conferring with the consultant. No person should apply a report for any purpose other than that originally contemplated without first conferring with the consultant.

AN ESA REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when design professionals develop their plans based on misinterpretations of an ESA. To help avoid these problems, the environmental consultant should be retained to work with appropriate design professionals to explain relevant fmdings and to review the adequacy of their plans and specifications relative to contamination issues.

LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

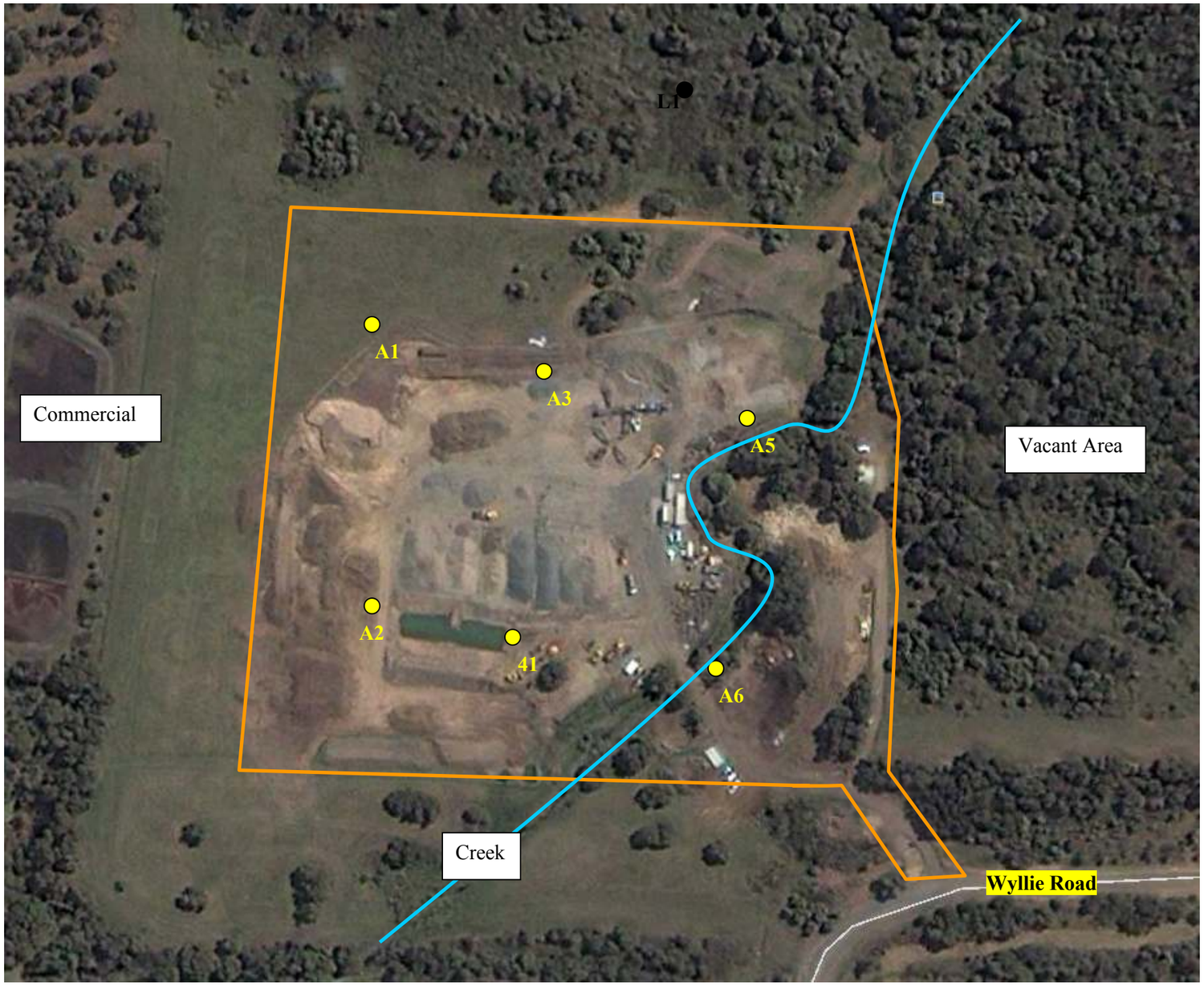
Final borehole or test pit logs are developed by environmental scientists, engineers or geologists based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only fmal logs customarily included in our reports. These logs should not under any circumstances be redrawn for inclusion in site remediation or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimise the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To reduce the likelihood of boring log misinterpretation, the complete report must be available to persons or organisations involved in the project, such as contractors, for their use. Those who o not provide such access may proceed under the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing all the available information to persons and organisations such as contractors helps prevent costly construction problems and the adversarial attitudes that may aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because an ESA is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in transmittals. These are not exculpatory clauses designed to foist liabilities onto some other party. Rather, they are defmitive clauses that identify where your consultant's responsibilities begin and end. Their use helps all parties involved recognise their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your ESA report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

SITE PLAN



N

Legend

Proposed Site Footprint

Borehole Locations

Drawn	BB
Approved	BB
Date	29.07.2013
Approx Scale	NTS

Salinity Assessment Site Plan

Bicorp Pty Ltd

50 Wyllie Road, Kembla Grange NSW

Figure: 1

Job No: E49/7

eurofins | mgt

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

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.

Benviron Group
64 Glenrock Parade
Koolewong
NSW 2256

Attention: **Ben Buckley**

Report **385714-S**
Client Reference KEMBLA GRANGE SALINITY E49/5
Received Date Jul 11, 2013

Client Sample ID			**A1 0.5**	**A1 1.5**	**A2 0.6**	**A2 1.8**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S13-JI08801**	**S13-JI08802**	**S13-JI08803**	**S13-JI08804**
Date Sampled			**Jul 10, 2013**	**Jul 10, 2013**	**Jul 10, 2013**	**Jul 10, 2013**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	58	84	58	52
Conductivity (1:5 aqueous extract at 25°C)	5	uS/cm	96	110	93	79
pH (1:5 Aqueous extract)	0.1	units	5.4	5.0	5.2	5.3
Sulphate (as S)	10	mg/kg	34	43	37	41
% Moisture	0.1	%	30	22	30	22
Exchangeable Cations						
Sodium (exchangeable)*	0.1	meq/100g	2.0	2.6	2.0	3.3

Client Sample ID			**A3 1.0**	**A4 0.9**	**A5 1.3**	**A6 1.2**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S13-JI08805**	**S13-JI08806**	**S13-JI08807**	**S13-JI08808**
Date Sampled			**Jul 10, 2013**	**Jul 10, 2013**	**Jul 10, 2013**	**Jul 10, 2013**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	53	37	45	60
Conductivity (1:5 aqueous extract at 25°C)	5	uS/cm	87	120	87	96
pH (1:5 Aqueous extract)	0.1	units	5.2	5.7	5.2	5.2
Sulphate (as S)	10	mg/kg	34	56	31	36
% Moisture	0.1	%	29	18	29	30
Exchangeable Cations						
Sodium (exchangeable)*	0.1	meq/100g	2.0	1.9	2.0	2.0

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).

Description	Testing Site	Extracted	Holding Time
Chloride	Sydney	Jul 16, 2013	28 Day
- Method: E033 /E045 /E047 Chloride			
Conductivity (1:5 aqueous extract at 25°C)	Sydney	Jul 12, 2013	7 Day
- Method: E032 Electrical Conductivity (EC)			
pH (1:5 Aqueous extract)	Sydney	Jul 12, 2013	7 Day
- Method: E018 pH			
Sulphate (as S)	Sydney	Jul 16, 2013	28 Day
- Method: E045 Sulphate			
% Moisture	Sydney	Jul 12, 2013	28 Day
- Method: E005 Moisture Content			
Exchangeable Cations	Melbourne	Jul 29, 2013	28 Day
- Method: 15B1, 15B2, 15B3 Soil Chemical Methods			
- Method: Rayment and Lyons			

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Client Job No.: KEMBLA GRANGE SALINITY E49/5

Order No.:
Report #: 385714
Phone:
Fax:

Received: Jul 11, 2013 1:20 PM
Due: Jul 18, 2013
Priority: 5 Day
Contact Name: Ben Buckley

Eurofins | mgt Client Manager: Jean Heng

Sample Detail					% Moisture	Chloride	Conductivity (1:5 aqueous extract at 25°C)	Exchangeable Sodium Percentage (ESP)*	pH (1:5 Aqueous extract)	Sodium	Sulphate (as S)
Laboratory where analysis is conducted											
Melbourne Laboratory - NATA Site # 1254 & 14271								X		X	
Sydney Laboratory - NATA Site # 18217					X	X	X		X		X
Brisbane Laboratory - NATA Site # 20794											
External Laboratory											
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**							
A1 0.5	Jul 10, 2013		Soil	S13-Jl08801	X	X	X	X	X	X	X
A1 1.5	Jul 10, 2013		Soil	S13-Jl08802	X	X	X	X	X	X	X
A2 0.6	Jul 10, 2013		Soil	S13-Jl08803	X	X	X	X	X	X	X
A2 1.8	Jul 10, 2013		Soil	S13-Jl08804	X	X	X	X	X	X	X
A3 1.0	Jul 10, 2013		Soil	S13-Jl08805	X	X	X	X	X	X	X
A4 0.9	Jul 10, 2013		Soil	S13-Jl08806	X	X	X	X	X	X	X
A5 1.3	Jul 10, 2013		Soil	S13-Jl08807	X	X	X	X	X	X	X
A6 1.2	Jul 10, 2013		Soil	S13-Jl08808	X	X	X	X	X	X	X

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 Environment Protection Authority
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

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.

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/kg	< 10			10	Pass	
Sulphate (as S)	mg/kg	< 10			10	Pass	
LCS - % Recovery							
Chloride	%	101			70-130	Pass	
Sulphate (as S)	%	103			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25°C)	S13-Jl08801	CP	uS/cm	96	95	1.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Chloride	S13-Jl08804	CP	mg/kg	52	51	2.0	30%	Pass	
Sulphate (as S)	S13-Jl08804	CP	mg/kg	41	44	5.8	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

Jean Heng	Client Services
Bob Symons	Senior Analyst-Inorganic (NSW)
Emily Rosenberg	Senior Analyst-Metal (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)

Dr. Bob Symons
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