Soil investigation report – Residential house

771 Cudgen Road,
Cudgen, NSW

January 2019, Ref. 18084 R01 V2

CAVVANBA
consulting

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Report Details

Report:

Soil investigation report – Residential house

771 Cudgen Road,
Cudgen, NSW

Ref: 18084 R01

for

Woollam Constructions Pty Ltd

Distribution:

Deliverables	Status	Date	Recipient
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Environmental Scientist

Date: 24 January 2019

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Principal Environmental Scientist

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1.0 Introduction

Cavvanba Consulting Pty Ltd (Cavvanba) was commissioned by Woollam Constructions (WC) to undertake an intrusive soil investigation at 771 Cudgen Road, Cudgen NSW 2487.

The scope of work was detailed in Cavvanba's proposal to Woollam Constructions, and associated acceptance of engagement on 16 November 2018. This report should be read in conjunction with Cavvanba's *General Limitations*, included as Section 1.5.

1.1 Professional experience

Cavvanba is a specialist contaminated land consultancy and is suitably qualified to conduct the works. Cavvanba employees hold certified environmental practitioner (CEnvP) qualifications, which are nationally recognised competencies.

Cavvanba is a full member of the Australian Contaminated Land Consultants Association (ACLCA) in NSW and Queensland. ACLCA is an association that "represents the major environmental consulting firms involved in the assessment and management of contaminated sites in Australia".

Ben Wackett is a WorkCover NSW licensed asbestos assessor (LAA 000132), and an associate member of the Australian Institute of Occupational Hygienists (AIOH). Ben is also a NSW EPA accredited Site Auditor, under the *Contaminated Land Management Act 1997.*

Ben is a member of the Environmental Institute of Australia and New Zealand (EIANZ).

1.2 Background

The site consists of a farm shed, residential house and garage with farmland extending out into the western portion. Refer to Appendix A for a photographic log and Figure 1 for the investigation boundary and features. It is understood that the previous owner had occupied the site for approximately 30 years, and used it for agriculture.

As part of the new Tweed Valley Hospital development, the residential house and garage are proposed to be demolished in order for preliminary works to continue at the site. OCTIEF conducted a preliminary and detailed investigation at the site in September 2018 (OCTIEF 2018), *Preliminary and Detailed Site Investigation – 771 Cudgen Road, Cudgen, NSW 2487 (Ref. J8961).* For further information please refer to Section 3.0 of this report.

Lead in soils is a common contaminated land issue associated with old buildings, and the EPA (2003) *Managing Lead Contamination in Home Maintenance, Renovation and Demolition Practices. A Guide for Councils* states that:

- there are over a million homes in NSW that were built before 1970 and are potentially contaminated with lead paint, dust and soil; and
- New Zealand research found soil lead levels of 16–28 ppm in homes built less than 10years ago but 455– 16,858 ppm in homes built over 90 years ago.

1.3 Objectives

The objectives of the soil investigation report were to address the potential site contamination issues associated with lead paint from the residential house and organochlorine pesticides (OCPs) associated with sub slab pest treatment underneath the garage.

1.4 Scope of work

The scope of work included:

- Review of previous environmental investigations report OCTIEF (2018).
- Completion of a comprehensive site walkover and visual inspection for key features to identify potential areas of environmental concern on- and off-site.
- Advancement of 22 soil test pits using a hand auger in a staged investigation.
- Collection and analysis of samples for potential contaminants of concern, which will assist in the classification of any material required for offsite disposal.
- Inclusion of the results and findings into a report.

Guidance that will be considered in preparing this soil investigation report includes:

- Department of Urban Affairs and Planning (1998) *State Environmental Planning Policy number 55: Managing Land Contamination, Planning Guidelines SEPP 55 – Remediation of Land.*
- NSW EPA (formerly Office of Environment and Heritage (OEH)) (2011) *Guidelines for Consultants Reporting on Contaminated Sites*.
- NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme (3rd edition)*.
- National Environment Protection Council (NEPC) *National Environment Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM (2013)) – Schedule B2: Guideline on Site Characterisation* (2013).

The development application pathway for the Project consists of a staged Significant Development Application under section 4.22 of the *Environmental Planning and Assessment Act 1979* (EP&A) Act. This report is provided to meet the requirements of SEPP 55 and Department of Planning and Urban Affairs (1998) *Planning Guidelines SEPP 55 – Remediation of Land*.

1.5 Limitations

The findings of this report are based on the objectives and scope of work outlined above. Cavvanba performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties or guarantees, express or implied, are made. Subject to the scope of work, Cavvanba's assessment is limited strictly to identifying typical environmental conditions associated with the subject property, and does not include evaluation of any other issues. This report does not comment on any regulatory obligations based on the findings, for which a legal opinion should be sought. This report relates only to the objectives and scope of work stated, and does not relate to any other works undertaken for the Client.

The report and conclusions are based on the information obtained at the time of the assessment. Changes to the subsurface conditions may occur subsequent to the investigation described herein, through natural processes or through the intentional or accidental addition of contaminants, and these conditions may change with space and time.

The site history, and associated uses, areas of use, and potential contaminants, were determined based on the activities described in the scope of work. Additional site history information held by the Client, regulatory authorities, or in the public domain, which was not provided to Cavvanba or was not sourced by Cavvanba under the scope of work, may

identify additional uses, areas of use and/or potential contaminants. The information sources referenced have been used to determine site history and desktop information regarding local subsurface conditions. While Cavvanba has used reasonable care to avoid reliance on data and information that is inaccurate or unsuitable, Cavvanba is not able to verify the accuracy or completeness of all information and data made available.

Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history, and which may not be expected at the site. The absence of any identified hazardous or toxic materials on the subject property, should not be interpreted as a warranty or guarantee that such materials do not exist on the site. If additional certainty is required, additional site history or desktop studies, or environmental sampling and analysis, should be commissioned.

The results of this assessment are based upon site inspection and fieldwork conducted by Cavvanba personnel and information provided by the Client. All conclusions regarding the property area are the professional opinions of the Cavvanba personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, Cavvanba assumes no responsibility or liability for errors in any data obtained from regulatory agencies, information from sources outside of Cavvanba, or developments resulting from situations outside the scope of this project.

2.0 Site setting

2.1 Site identification

The site location and investigation boundary are shown on Figure 1.

Owner:	Health Infrastructure NSW
Street address:	771 Cudgen Road, Cudgen NSW 2487
Property description:	Lot 11, Deposited Plan (DP) 1246853.
Investigation area (part of Lot 11 DP 1246853):	Approximately 900 m^2 (consisting of the area surrounding the residential house and garage).
Co-ordinates:	Latitude: -28.265228 Longitude: 153.566395
Local government area:	Tweed Shire Council.
Elevation:	Approximately 27 m above AHD.
Landuse – existing:	Rural Residential/Agricultural
Landuse – proposed:	Hospital
Zoning – existing:	RU1 Primary Production
Zoning – proposed:	SP2 Infrastructure (Hospital)

2.2 Surrounding land uses

The site is located in an area of mainly rural and recreational landuse, with the surrounding landuses identified as:

North:	Agricultural land use, followed by bushland.
East:	Cudgen Road followed by TAFE NSW Kingscliff.
West:	Agricultural land use.
South:	Cudgen Road followed by agricultural land use.

2.3 Topography

The site is relatively flat with a slight slope falling toward the south-west.

2.4 Geology and soils

2.4.1 Geology

Based on NSW Environment & Heritage Soil and Land Information (eSPADE, accessed 13 December 2018), the site lies on Lamington Volcanics—Tertiary basalt, consisting of rhyolite, trachyte, tuff, agglomerate and conglomerate.

The landscape consists of very low to low undulating hills and rises on the Cudgen Plateau and nearby basalt caps. The elevation is 30–40 m on the Cudgen Plateau.

The vegetation in the area is cleared closed-forest (rainforest). Most of this landscape is cultivated, but the original vegetation would have been be similar to that of the Limpinwood (li) or Green Pigeon (gp) soil landscapes.

2.4.2 Soils

Based on NSW Environment & Heritage Soil and Land Information (eSPADE, accessed 13 December 2018), the soil profile in the area consists of deep (>100 cm), well-drained red silty clay (Krasnozems). This soil profile description is consistent with the observations made during the investigation of the house and garage.

3.0 Previous investigations

3.1 OCTIEF (2018)

OCTIEF conducted a preliminary and detailed investigation at the site in September 2018:
- OCTIEF (2018), *Preliminary and Detailed Site Investigation – 771 Cudgen Road, Cudgen, NSW 2487* (Ref. J8961).

The objectives of the investigation were to:

- identify potential sources of contamination and determine potential contaminants of concern;
- identify areas of potential contamination;
- provide Health Infrastructure NSW with high level confidence that site contamination characteristics are sufficiently understood to allow (if required) remedial planning and implementation;
- provide sufficient confidence and reliance that there will be no foreseeable contamination issues which may affect redevelopment or suitability for the State Significant Development Application (concept design and stage 1 works); and
- assess suitability of the site for rezoning (to SP2 Infrastructure) and the proposed land use (Hospital).

The scope comprised of an extensive soil and groundwater investigation which extended broadly over 771 Cudgen Road (Lot 11, DP 1246853). A total of 44 boreholes were advanced across the site, however it is noted that no soil sampling was conducted by OCTIEF within the current investigation area. A Figure from this report is included in Appendix B.

3.2 Cavvanba (2018)

Cavvanba conducted a hazardous materials assessment on the residential house and garage on 19 November 2018 prior to the intrusive investigation:
- Cavvanba (2018), *Hazardous materials register, 771 Cudgen Creek Road, Cudgen NSW.* (Ref:.18084).

A total of 20 building material samples were collected:

- Fourteen samples of various fibrous cement sheeting were analysed for asbestos.

- Six paint samples were collected from internal and external locations representing the variety of visible paint and analysed for lead (as lead paint).

No asbestos was detected in any of the samples collected from the residential house and garage, which included the fibrous cement materials underneath the residence.

Lead was detected in four samples which were taken from the internal walls and ceiling of the residential house, and this was interpreted to represent the presence of lead paint.

No other demolition waste was identified associated with the residential house.

4.0 Site inspection

A site inspection was undertaken to confirm anecdotal evidence and consolidate the findings of the information review through physical inspection of potential contaminant sources, pathways and receptors.

4.1 Site observations

Multiple site inspections were undertaken by Glen Chisnall and Ben Wackett of Cavvanba during November and December 2018. A photographic log has been provided as Appendix A.

The following observations, relevant to the use and environmental condition of the investigation area were made:

- a residential house and garage were present in the centre of the investigation area;
- a concrete slab ~ 70 m^2 was evident underneath the garage;
- the grass surface was observed to be in good condition around the edges of the building with no visible staining or contamination present;
- a gravel road entered the site from Cudgen Road before entering into the carpark area;
- a paved brick area ~ 20 m^2 was present to the west of the residential house; and
- potential lead paint was identified inside the residential house.

5.0 Limited soil sampling investigation

5.1 Contaminants of concern

Potential contaminants of concern are detailed in Table 5.1 below and are associated with the former buildings – namely lead paint and sub slab pest treatment. Asbestos was eliminated as a potential contaminant of concern during the hazardous materials assessment.

Table 5.1: PCOCs and summary of areas of concern

PCOCs	Description and common relationship
Lead (Pb)	Lead paint associated with older housing.
Organochloride Pesticides (OCPs)	Organochlorine control/fertilisers. OCPs are persistent in the environment.

5.2 Relevant environmental media

The environmental media considered relevant for the investigation was limited to shallow soils. This was considered appropriate based on the potential sources of contamination being:

- lead paint from the former residential house; and
- OCPs associated with sub slab pest treatment.

5.3 Relevant soil environmental criteria

For soil, the appropriate criteria are based on the National Environment Protection (Assessment of Site Contamination) Measure (NEPM) (2013) and in particular the health investigation levels (HILs), environmental investigation levels (EILs), environmental screening levels (ESLs) and health screening levels (HSLs) applicable for residential landuses.

ASC NEPM 2013 states that the NEPM HILs are not protective of construction workers, and site specific risk should be taken into consideration: (Schedule B7: Guideline on health-based investigation levels – Section 3.1) *The HILs are therefore considered to be protective of exposures to other receptor populations; however, the HILs do not specifically address short-duration exposures that may occur during construction and maintenance of a site (including intrusive works). These exposures should be addressed on a site-specific basis.*

Considering the above description and the following points, residential criteria is an appropriately conservative criteria for handing the site over for construction purposes without the need for further site specific risk assessment:

- the use of residential criteria is also consistent with the OCTIEF investigation documents;
- the potential area of lead impacted soil typically presents a small volume which can be feasibly removed from the site;
- the high level of public interest, and desire for conservative criteria to be implemented;
- the development was to be staged separately between demolition and construction, and the contaminated land investigation and potential remediation was expected to be undertaken prior to construction; and
- the proposed construction works and the HILs for commercial/industrial landuse not being protective of the risks to construction workers.

6.0 Soil investigation

The field work was completed on 30 November; 11 and 12 of December 2018 by Glen Chisnall with oversight from Ben Wackett of Cavvanba Consulting.

The sampling and analytical strategy and methodology are described below. The results of the assessment are provided in Section 8. Soil sample locations are shown on Figure 2.

6.1 Soil sampling strategy

Objective

To investigate the presence of lead and OCP contamination on-site, and to classify any material required for offsite disposal.

Strategy – initial investigation

A total of 22 test pits were advanced across the site in order to provide spatial coverage over the residential house and beneath the garage slab which may represent potential sources of contamination as detailed in Table 5.1. Cavvanba's expectation of contamination based on similar sites, is that lead contamination from paint is generally limited to within 2 – 3 m of the drip zone, and within 0.5 m of surface. At this site, the original house appeared to have been extended, therefore it was possible that lead would be present beneath the building. The extent of OCP contamination is also expected to be limited to surface soils directly beneath the house and garage slab.

The sampling strategy included collection of samples at the following locations:
- within 1 m of existing perimeter on each side of the residential house and garage, two samples per side;
- step out locations of another approximately 2 m from the house and garage perimeter;
- four samples beneath the house;
- three samples beneath the garage slab;
- depth samples at 0.1, 0.3, 0.6 m at each location.

Of those samples collected, the first stage of sample analysis selection was based on a minimum:
- all samples beneath the building and garage slab;
- all samples within 1 m of building perimeter i.e. on each side of the house and garage; and
- from those locations, all samples at shallow depth (0.1 m).

Additional analysis was undertaken at step-out locations and greater depths to delineate any criteria exceedances on an as needs basis. The sampling strategy completed was considered to meet the definition of a systematic approach, and meets the minimum sampling requirements in accordance with *Sampling Design Guidelines* (NSW EPA, 1995). Additionally, consideration was given to the Tweed Shire Council for Pre-Demolition Testing of organochlorine pesticides beneath structures and dwellings.

Table 6.1 below describes the rationale for the chosen sampling design and additional delineation sampling/analysis.

Table 6.1: Overall rationale for sampling design

Location/sample ID	Rationale
First stage of analysis	
TP01_0.1 to TP04_0.1	Targeting any potential sources of lead paint located underneath the residential house at the surface.
TP05_0.1 to TP10_0.1 & TP17_0.1 to TP19_0.1	Targeting the potential drip zone from the walls of the residential house and garage at the surface.
TP28_0.1, TP29_0.1, TP30_0.1	Targeting sub slab of garage.
TP11_0.1 to TP16_0.1	Samples taken to delineate any potential lead impact from the residential house.
Delineation sampling/analysis	
TP01_0.3, TP01_0.6, TP02_0.3, TP02_0.6, TP03_0.3, TP03_0.6, TP04_0.3	Further sampling/analysis conducted at 0.3 and 0.6 m below the ground surface; aiming to delineate the vertical extent of lead impact.

6.2 Soil sampling methodology

Soil samples were collected using stainless steel hand tools, ensuring that soil sampled had not been in direct contact with the hand tool.

All soil samples were collected into laboratory supplied glass jars and placed directly into chilled eskies and transported to the laboratory under chain of custody documentation, in accordance with Cavvanba fieldwork procedures.

Overburden was placed alongside the sample location sequentially during excavation and backfilled in the same sequence it was excavated.

6.3 Data usability

A background to data usability is provided in Appendix C. All site work was completed in accordance with standard Cavvanba sampling protocols, including a QA/QC programme and fieldwork procedures.

A data usability assessment has been performed for the sampling undertaken during this investigation, as summarised in Appendix C and includes:
- summary of field quality assurance/quality control;
- field quality control soil samples summary; and
- summary of laboratory quality assurance/quality control.

The material subject to this soil investigation report was sampled as part of a larger investigation program which was conducted at another portion of 771 Cudgen Road,

Cudgen NSW. Therefore, there are samples which are referred to in the laboratory report and data usability assessment which are not related directly to this report.

Only samples listed in Table 6.1 above are relevant to this soil investigation report. Overall, the data usability assessment shows that the data is of suitable quality to support the conclusions made in this report.

7.0 Conditions encountered

The subsurface conditions encountered are summarised below. For descriptions of the subsurface conditions at specific locations, refer to Table 1, attached. A photographic log is provided as Appendix A.

7.1 Soil conditions

The soil profile identified across the site consisted of a red to brown silty clay.

7.2 Evidence of reworked soil

Reworked natural material was observed underneath the former house, in the test pit located approximately 5 m to the south of the building and in the southern portion of the investigation area. Anthropogenic inclusions of glass and tiles were identified in the following test pit locations:

- TP01 (0.1 and 0.3 m);
- TP01 (0.1 and 0.3 m);
- TP03 (0.1 and 0.3 m);
- TP04 (0.1 and 0.3 m);
- TP14 at 0.1 m; and
- TP15 at 0.3 m.

A location map has been provided as Figure 2 showing the sample locations.

8.0 Soil analytical results

The results are summarised below by contaminant. The laboratory analytical reports are included in Appendix D. The analytical results have been compared to the screening criteria adopted for the site. The NEPM health investigation and screening levels for residential land use (HIL A) have been used along with the ecological investigation levels (EILs) for urban residential and public open space to ascertain the magnitude of impacts.

Table 8.1: Soil analytical summary

Analyte	Health criteria	Ecological criteria	Site data			
	HIL / HSL (mg/kg)	EIL/ESL (mg/kg)	No. samples analysed	Number of detects	Max' (mg/kg)	Meets screening criteria?
Metals						
Lead	**300**	1,100	27	27	**1,600**	**No**
Organochlorine pesticides						
DDT+DDE+DDD	240	180[1]	24	10	9.07	Yes
Aldrin and dieldrin	6	-[2]		7	1.18	Yes
Chlordane	50	-		4	4.10	Yes
Endosulfan	270	-		0	<0.05	Yes
Endrin	10	-		0	<0.05	Yes
Heptachlor	6	-		0	<0.05	Yes
HCB	10	-		0	<0.05	Yes
Methoxychlor	300	-		0	<0.2	Yes

Table notes:
1 – Criteria for DDT only.
2 – = No criteria available.
3 – **BOLD** indicates exceedance of HILs criteria.
4 – Underscore indicates exceedances of EILs criteria.

The results are also summarised as eight samples exceeded HILs (Residential A) for lead collected from four locations (TP01, TP02, TP03 and TP06).

The maximum reported lead concentration of 1,600 mg/kg was reported at TP03_0.3 (located underneath the south-western corner of the residential house). This sample also exceeded the EILs (urban residential and open public space) criteria for lead.

All samples (excluding TP06_0.1) which exceeded the HILs were located underneath the residential house. OCPs were detected at 10 sample locations, concentrations were almost all an order of magnitude below the adopted criteria.

9.0 Discussion and recommendations

9.1 Lead

Lead concentrations exceeding site criteria were present:
- underneath the former residential house in all four samples locations to 0.3 m depth;
- approximately 1 m from the eastern wall of the residential house, in the southern portion associated with TP06 to 0.1 m depth; and
- extending to 0.6 m depth at TP02 which had reported concentrations of 324 mg/kg which marginally exceeds site criteria.

Based on the trends of decreasing lead concentrations with depth at TP02, it is anticipated that exceedances of residential criteria will not extend below 0.7 m below ground surface:
- TP02_0.1 = 1,070 mg/kg;
- TP02_0.3 = 838 mg/kg; and
- TP02_0.6 = 324 mg/kg.

Figure 3 attached shows the estimated extent of exceedances of site criteria.

Validation samples will be collected to confirm that lead contamination is not present beyond these depths following remediation.

9.2 Recommendations

Based on the concentrations of lead detected underneath the former residential house and ~1 m from the eastern wall, remediation and/or management is required.

A remedial action plan should be prepared for the former residential house which should consider:
- off-site disposal; and/or
- on-site management/capping including long term management.

10.0 Glossary and references

10.1 Glossary

AST	Aboveground storage tank
BTEXN	Benzene, toluene, ethyl benzene, xylenes and naphthalene
CSM	Conceptual site model
EIL	Environmental Investigation Level
ESL	Environmental Screening Level
EMP	Environmental Management Plan
ESA	Environmental site assessment
GME	Groundwater monitoring event
HHRA	Human health risk assessment
HIL	Health Investigation Level
HSL	Health Screening Level
LOR	Limit of reporting
Metals	Arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), and zinc (Zn)
NATA	National Association of Testing Authorities
NEPM/C	National Environmental Protection Measure/Council
OCPs	Organochlorine pesticides
OH&S	Occupational health and safety
OPPs	Organophosphorus pesticides
PAHs	Polycyclic aromatic hydrocarbons, including the USEPA 16 priority pollutants: naphthalene; acenaphthylene; acenaphthene; fluorine; phenanthrene; anthracene; fluoranthene; pyrene; benzo(a) anthracene; chrysene; benzo(b)fluoranthene; benzo(k) fluoranthene; benzo(a)pyrene; indeno(1.2.3.cd)pyrene; dibenz (a.h)anthracene; and benzo(g.h.i)perylene
PCBs	Polychlorinated biphenyls
PID	Photo-ionisation detector
PSH	Phase separated hydrocarbons
QA/QC	Quality assurance/quality control
RAP	Remediation action plan

RPD	Relative Percentage Difference
SWL	Standing water level
TRHs	Total recoverable hydrocarbons, including volatile C6 – C10 fraction and semi- and non-volatile >C10 – C36 fractions
UCL	Upper confidence limit
UST	Underground storage tank
VRP	Voluntary remediation proposal
VOCs	Volatile organic compounds

10.2 References

Previous Reports

(OCTIEF 2018), *Preliminary and Detailed Site Investigation – 771 Cudgen Road, Cudgen, NSW 2487 (Ref. J8961).*

Cavvanba (2018), *Hazardous materials register, 771 Cudgen Creek Road, Cudgen NSW*. (Ref:.18084).

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Figures

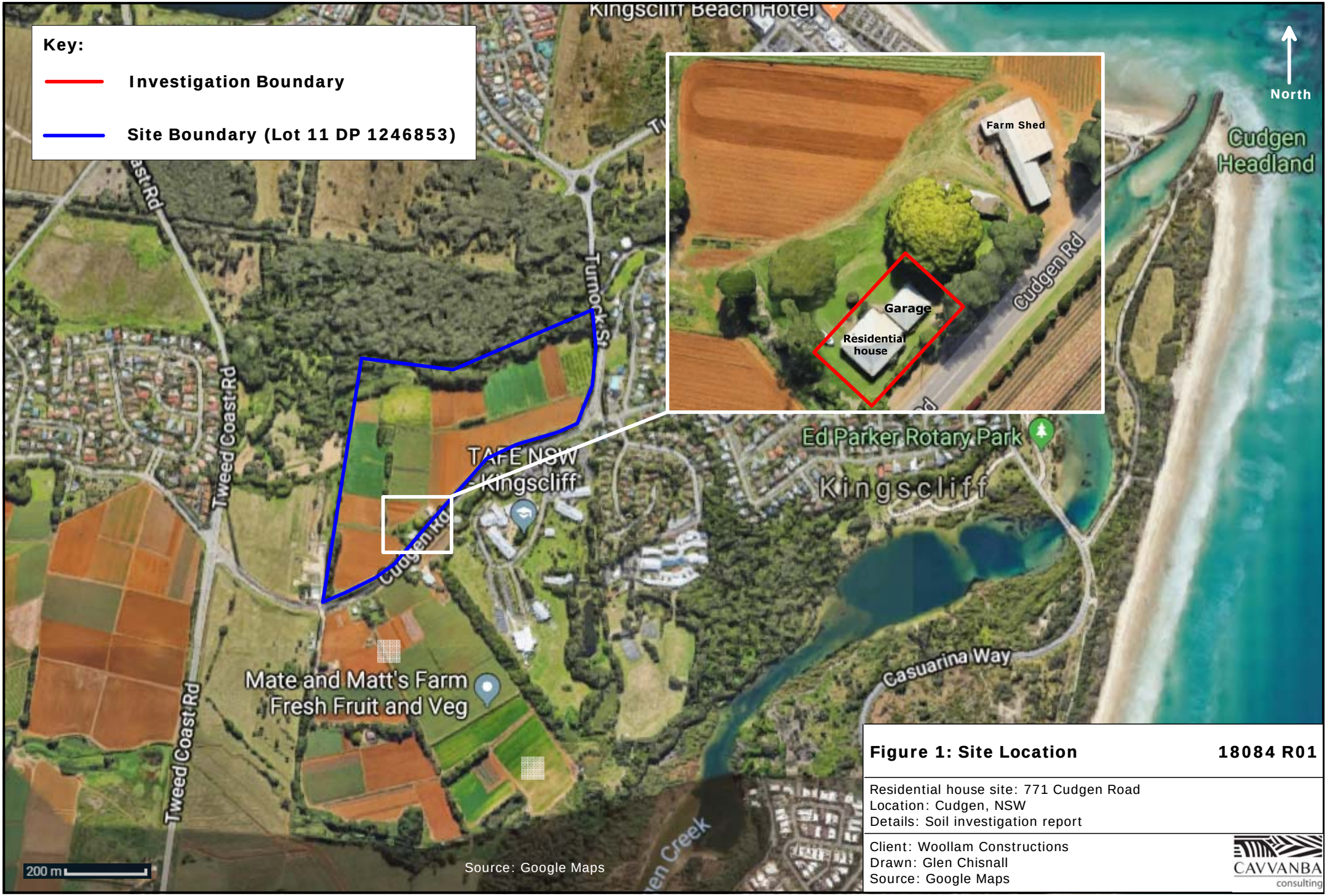

Figure 1: Site Location **18084 R01**

Residential house site: 771 Cudgen Road
Location: Cudgen, NSW
Details: Soil investigation report

Client: Woollam Constructions
Drawn: Glen Chisnall
Source: Google Maps

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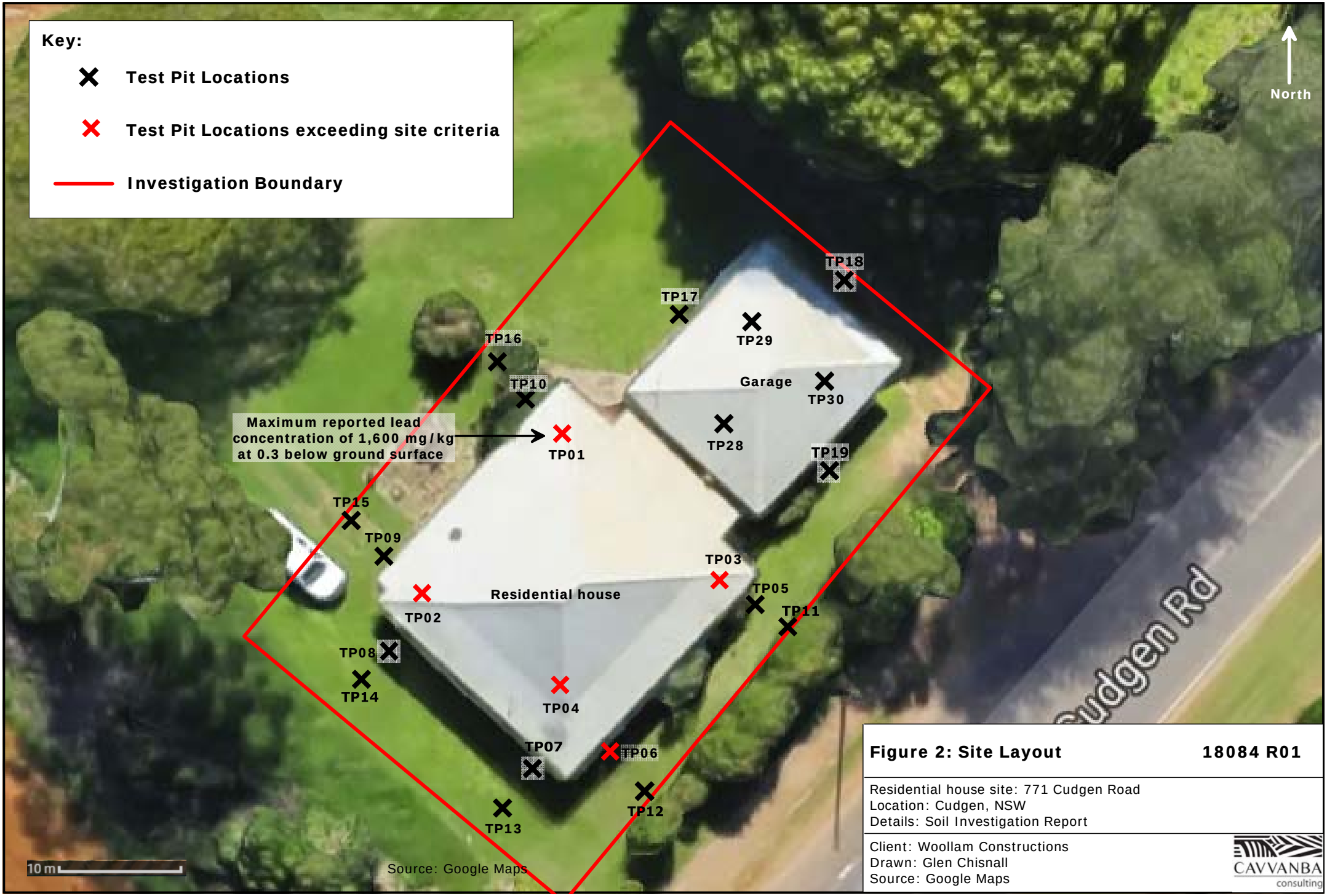

Figure 2: Site Layout **18084 R01**

Residential house site: 771 Cudgen Road
Location: Cudgen, NSW
Details: Soil Investigation Report

Client: Woollam Constructions
Drawn: Glen Chisnall
Source: Google Maps

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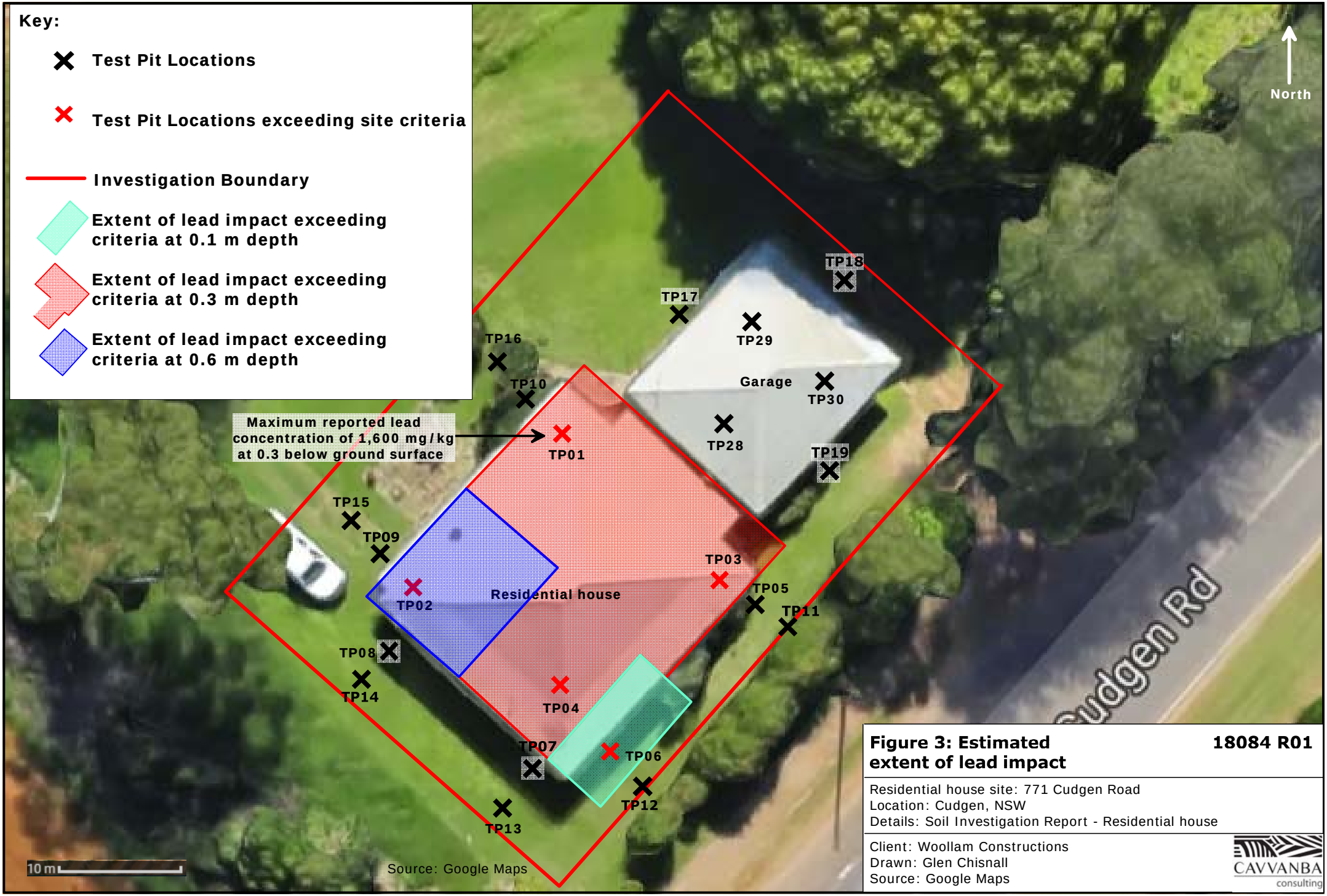

Figure 3: Estimated extent of lead impact **18084 R01**

Residential house site: 771 Cudgen Road
Location: Cudgen, NSW
Details: Soil Investigation Report - Residential house

Client: Woollam Constructions
Drawn: Glen Chisnall
Source: Google Maps

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Tables

Table 1: Sample Description and Analytical Summary

Sample	Depth (m)	Date sampled	Description	Lead	OCPs
Soil - Test Pits					
Residential house					
TP01	0.1	30/11/18	Reworked natural: Dark brown to red silty clay. Slightly moist with low plasticity. Anthropogenic inclusions of glass and tiles.	•	•
TP01	0.3	30/11/18	Reworked natural: Dark brown to red silty clay. Slightly moist with low plasticity. Anthropogenic inclusions of glass and tiles.	•	•
TP01	0.6	12/12/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	
TP02	0.1	30/11/18	Reworked natural: Dark brown to red silty clay. Slightly moist with low plasticity. Anthropogenic inclusions of glass and tiles.	•	•
TP02	0.3	30/11/18	Reworked natural: Dark brown to red silty clay. Slightly moist with low plasticity. Anthropogenic inclusions of glass and tiles.	•	
TP02	0.6	12/12/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	
TP03	0.1	30/11/18	Reworked natural: Dark brown to red silty clay. Slightly moist with low plasticity. Anthropogenic inclusions of glass and tiles.	•	•
TP03	0.3	30/11/18	Reworked natural: Dark brown to red silty clay. Slightly moist with low plasticity. Anthropogenic inclusions of glass and tiles.	•	•
TP03	0.6	12/12/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	
TP04	0.1	30/11/18	Reworked natural: Dark brown to red silty clay. Slightly moist with low plasticity. Anthropogenic inclusions of glass and tiles.	•	•
TP04	0.3	30/11/18	Reworked natural: Dark brown to red silty clay. Slightly moist with low plasticity. Anthropogenic inclusions of glass and tiles.	•	
TP05	0.1	30/11/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	•
TP06	0.1	30/11/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	•

Table 1: Sample Description and Analytical Summary

Sample	Depth (m)	Date sampled	Description	Lead	OCPs
TP06	0.3	12/12/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	
TP07	0.1	30/11/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	•
TP08	0.1	30/11/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	•
TP09	0.1	30/11/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	•
TP10	0.1	30/11/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	•
TP11	0.1	30/11/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	•
TP12	0.1	30/11/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	•
TP13	0.1	30/11/18	Reworked natural: Dark brown to red silty clay. Slightly moist with low plasticity. Anthropogenic inclusions of glass and tiles.	•	•
TP14	0.1	30/11/18	Reworked natural: Dark brown to red silty clay. Slightly moist with low plasticity. Anthropogenic inclusions of glass and tiles.	•	•
TP15	0.1	30/11/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	•
TP16	0.1	30/11/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	•
TP17	0.1	30/11/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	•
TP18	0.1	30/11/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	•
TP19	0.1	30/11/18	Dark brown to red silty clay. Slightly moist with low plasticity.	•	•
Underneath garage slab					
TP28	0.1	11/12/18	Dark brown to red silty clay. Slightly moist with low plasticity.		•
TP29	0.1	11/12/18	Dark brown to red silty clay. Slightly moist with low plasticity.		•
TP30	0.1	11/12/18	Dark brown to red silty clay. Slightly moist with low plasticity.		•

Table 2: Soil Analytical Summary, OCPs and Lead

Sample	Depth (m)	Heptachlor	Total Chlordane (sum)	Endrin	Endosulfan (sum)	Methoxychlor	Sum of Aldrin + Dieldrin	Sum of DDD + DDE + DDT	Hexachlorobenzene (HCB)	Sum of OCPs	Lead
LORs		*0.05*	*0.05*	*0.05*	*0.05*	*0.2*	*0.05*	*0.05*	*0.05*	-	*0.1*
Analytical - Test pits											
Residential House											
TP01	0.1	nd	4.1	nd	nd	nd	0.77	3.58	nd	8.45	**1,090**
TP01	0.3	nd	2.06	nd	nd	nd	1.18	9.07	nd	12.31	**1,600**
TP01	0.6	-	-	-	-	-	-	-	-	-	144
TP02	0.1	nd	0.16	nd	nd	nd	0.14	0.06	nd	0.36	**1,070**
TP02	0.3	-	-	-	-	-	-	-	-	-	**838**
TP02	0.6	-	-	-	-	-	-	-	-	-	**324**
TP03	0.1	nd	nd	nd	nd	nd	0.88	1.09	nd	1.97	**502**
TP03	0.3	nd	nd	nd	nd	nd	0.34	0.25	nd	0.59	**416**
TP03	0.6	-	-	-	-	-	-	-	-	-	15
TP04	0.1	nd	0.14	nd	nd	nd	0.29	0.08	nd	0.51	**324**
TP04	0.3	-	-	-	-	-	-	-	-	-	252
TP05	0.1	nd	nd	nd	nd	nd	nd	0.83	nd	0.83	155
TP06	0.1	nd	nd	nd	nd	nd	nd	nd	nd	nd	**317**
TP06	0.3	-	-	-	-	-	-	-	-	-	162
TP07	0.1	nd	nd	nd	nd	nd	nd	nd	nd	nd	64.6
TP08	0.1	nd	nd	nd	nd	nd	nd	nd	nd	nd	60.9
TP09	0.1	nd	nd	nd	nd	nd	nd	nd	nd	nd	161
TP10	0.1	nd	nd	nd	nd	nd	0.23	0.07	nd	0.3	119
TP11	0.1	nd	nd	nd	nd	nd	nd	nd	nd	nd	32.2
TP12	0.1	nd	nd	nd	nd	nd	nd	0.1	nd	0.1	195
TP13	0.1	nd	nd	nd	nd	nd	nd	nd	nd	nd	34
TP14	0.1	nd	nd	nd	nd	nd	nd	nd	nd	nd	54.8
TP15	0.1	nd	nd	nd	nd	nd	nd	nd	nd	nd	72.4
TP16	0.1	nd	nd	nd	nd	nd	nd	nd	nd	nd	134
TP17	0.1	nd	nd	nd	nd	nd	nd	nd	nd	nd	76.5
TP18	0.1	nd	nd	nd	nd	nd	nd	0.07	nd	0.07	27
TP19	0.1	nd	nd	nd	nd	nd	nd	nd	nd	nd	31.6

Table 2: Soil Analytical Summary, OCPs and Lead

Sample	Depth (m)	Heptachlor	Total Chlordane (sum)	Endrin	Endosulfan (sum)	Methoxychlor	Sum of Aldrin + Dieldrin	Sum of DDD + DDE + DDT	Hexachlorobenzene (HCB)	Sum of OCPs	Lead
LORs		*0.05*	*0.05*	*0.05*	*0.05*	*0.2*	*0.05*	*0.05*	*0.05*	-	*0.1*
Underneath garage slab											
TP28	0.1	nd	nd	nd	nd	nd	5.18	nd	nd	5.18	-
TP29	0.1	nd	nd	nd	nd	nd	5.19	0.1	nd	5.29	-
TP30	0.1	nd	nd	nd	nd	nd	10.6	nd	nd	10.6	-
Statistics											
Samples analysed		21	21	21	21	21	21	21	21	21	27
Detects		0	4	0	0	0	7	10	0	10	27
% detect		0%	19%	0%	0%	0%	33%	48%	0%	48%	100%
Maximum		<0.05	4.10	<0.05	<0.05	<0.05	1.18	9.07	<0.05	12	**1,600**
Mean		<0.05	0.31	<0.05	<0.05	<0.05	0.18	0.72	<0.05	1.21	306
Median		<0.05	1.11	<0.05	<0.05	<0.05	0.34	0.18	<0.05	0.55	155
Minimum		<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	15
Criteria											
HILs- Residential A		6	50	10	270	300	6	240	10	-	**300**
EILs - Urban residential and public open space		-	-	-	-	-	-	180 (DDT only)	-	-	1,100

Table 3: Soil Analytical Summary, Quality Control (mg/kg)

Analyte	LOR mg/kg	TP09_0.1	QS01	**RPD**	TP09_0.1	QS02	**RPD**
Type	-	*Primary*	*Duplicate*	*%*	*Primary*	*Inter-laboratory Duplicate*	*%*
Date	-	30/11/18	30/11/18	-	30/11/18	30/11/18	-
Media	*Soil*	*Soil*	*Soil*	-	*Soil*	*Soil*	-
Heavy metals							
Lead	5	161	167	4	161	140	14
Organochlorine Pesticides (OCPs)							
Heptachlor	0.05	nd	nd	-	nd	nd	-
Total Chlordane (sum)	0.05	nd	nd	-	nd	nd	-
Endrin	0.05	nd	nd	-	nd	nd	-
Endosulfan (sum)	0.05	nd	nd	-	nd	nd	-
Methoxychlor	0.2	nd	nd	-	nd	nd	-
Sum of Aldrin + Dieldrin	0.05	nd	0.88	-	nd	nd	-
Sum of DDD + DDE + DDT	0.05	nd	0.11	-	nd	nd	-
Hexachlorobenzene (HCB)	0.05	nd	nd	-	nd	nd	-
Sum of OCPs	-	nd	0.99	-	nd	nd	-
Data Quality Indicator		-	-	*<50%*	-	-	*<50%*

See tables notes at end of section

Table 3: Soil Analytical Summary, Quality Control (mg/kg)

Analyte	LOR mg/kg	TP07_0.1	QS03	**RPD**	TP07_0.1	QS04	**RPD**
Type	-	*Primary*	*Duplicate*	*%*	*Primary*	*Inter-laboratory Duplicate*	*%*
Date	-	30/11/18	30/11/18	-	30/11/18	30/11/18	-
Media	*Soil*	*Soil*	*Soil*	-	*Soil*	*Soil*	-
Heavy metals							
Lead	5	64.6	61.9	4	64.6	57	13
Organochlorine Pesticides (OCPs)							
Heptachlor	0.05	nd	nd	-	nd	nd	-
Total Chlordane (sum)	0.05	nd	nd	-	nd	nd	-
Endrin	0.05	nd	nd	-	nd	nd	-
Endosulfan (sum)	0.05	nd	nd	-	nd	nd	-
Methoxychlor	0.2	nd	nd	-	nd	nd	-
Sum of Aldrin + Dieldrin	0.05	nd	nd	-	nd	nd	-
Sum of DDD + DDE + DDT	0.05	nd	nd	-	nd	nd	-
Hexachlorobenzene (HCB)	0.05	nd	nd	-	nd	nd	-
Sum of OCPs	-	nd	nd	-	nd	nd	
Data Quality Indicator		-	-	*<50%*	-	-	*<50%*

See tables notes at end of section

Table 3: Soil Analytical Summary, Quality Control (mg/kg)

Analyte	LOR mg/kg	TP03_0.6	QS03	**RPD**	TP03_0.6	QS06	**RPD**
Type	-	*Primary*	*Duplicate*	*%*	*Primary*	*Inter-laboratory Duplicate*	*%*
Date	-	12/12/18	12/12/18	-	12/12/18	12/12/18	-
Media	*Soil*	*Soil*	*Soil*	-	*Soil*	*Soil*	-
Heavy metals							
Lead	5	15	26	**54**	15	6	**86**
Organochlorine Pesticides (OCPs)							
Heptachlor	0.05	-	-	-	-	-	**-**
Total Chlordane (sum)	0.05	-	-	-	-	-	**-**
Endrin	0.05	-	-	-	-	-	**-**
Endosulfan (sum)	0.05	-	-	-	-	-	**-**
Methoxychlor	0.2	-	-	-	-	-	**-**
Sum of Aldrin + Dieldrin	0.05	-	-	-	-	-	**-**
Sum of DDD + DDE + DDT	0.05	-	-	-	-	-	**-**
Hexachlorobenzene (HCB)	0.05	-	-	-	-	-	-
Sum of OCPs	-	-	-	-	-	-	
Data Quality Indicator		-	-	***<50%***	-	-	***<50%***

See tables notes at end of section

Soil Analytical Summary Table Notes

LOR denotes limit of reporting (standard LOR unless otherwise shown)

PBILs denotes phytotoxicity based investigation levels

nd denotes not detected above the LOR

NL denotes non-limiting

- denotes not analysed/not available

Bold - Exceeds landuse criteria

^ denotes raised LOR

TRH C6-C10 F1 = TRH C6-C10 minus BTEX compounds

*analyte list shown on laboratory report

1. Methyl mercury / inorganic mercury
2. Netherlands protection of terrestrial organisms/ Netherlands human health based and human health and ecologically based protection level.
3. Criteria for phenol

Appendix A

Photographic log

Photograph 1.
View east of investigation area, garage to the left and the residential house on the right. All photographs taken on 30 November; 11 and 12 December 2018.

Photograph 2.
View of TP02; located underneath the south-western section of the former residential house. Anthropogenic materials consisting of plastic and glass scattered around the test pit location.

Photograph 3.
View of test pit location TP04; located underneath southeast portion of the house, in the southeast portion.

Photograph 4.
Test pit location TP06, located ~ 1 m from the eastern wall of the former residential house.

Photograph 5.
View of test pit location TP14, sampled ~ 5 m to the south of the residential house. Anthropogenic inclusions of glass and tiles were identified within this location.

Photograph 6.
View over garage slab. Test pit locations TP28 and TP30 visible in foreground followed by demolition waste from the former residential house.

Appendix B

OCTIEF (2018) *Preliminary and detailed site investigation – 771 Cudgen Road, Cudgen, NSW 2487*

Figure 3 DSI sampling locations

REV	DESCRIPTION	DATE	INT	APP
1		04/4/2016	MO	RJ

OCTIEF

CLIENT:	Health Infrastructure NSW	DESIGNED:	DRAWN:
PROJECT TITLE:	Tweed Hospital PSI/DSI	CHECKED:	No. SHEETS:
		SCALE:	DATE STARTED:
SITE ADDRESS:	771 Cudgen Road, Cudgen	JOB No:	J8961
DRAWING TITLE:	DSI Sampling Locations	DRAWING No:	3

Attachment C
Data usability and Introduction to Data Usability

Data Usability Summary Assessment

A background to data usability is provided in this attachment. All site work was completed in accordance with standard Cavvanba sampling protocols, including a quality assurance/quality control (QA/QC) programme and standard operating procedures.

A data usability assessment was performed for the soil data collected by Cavvanba, as summarised in the following tables:
- Table 1.1, field QC samples summary,
- Table 1.2, summary of field QA/QC, and
- Table 1.3, summary of laboratory QA/QC.

It should be noted that the data usability has been conducted on the whole data set, consisting of the following laboratory batches:
- ES1836474;
- ES1837028;
- ES1837749; and
- ES1837355.

Table 1.1: Field QC samples summary

	Total samples	Field duplicates [1]	Inter-lab duplicates [1]	Trip spike	Trip blank	Rinsate
Soil						
Lead (pb)	30	3 (10%)	3 (10%)	-	-	-
OCPs	24	3 (12.5%)	3 (12.5%)	-	-	-

Notes:
1. Shows number of duplicate samples collected and the percentage of total samples analysed.
2. Arsenic, cadmium, chromium, copper, lead, nickel, zinc and mercury.
   – = not applicable, as trip spike/blank analysed for volatile compounds only.

Table 1.2: Summary of field QA/QC

Parameter	Complies	Comments [1]
Precision		
Standard operating procedures (SOPs) appropriate and complied with	Yes	Sampling was conducted in accordance with Cavvanba's standard field operating procedures. The sampling methods generally complied with industry standards and guidelines.
Field duplicates	Partial	RPD[2] criteria < 30% – 50%, frequency ≥ 5%. RPD exceedances were reported lead. The frequency of field duplicates was within the acceptable range.

Parameter	Complies	Comments [1]
Inter-laboratory duplicates	Yes	RPD[2] criteria < 30% – 50%, frequency ≥ 5%. No RPD exceedances were reported for inter-laboratory duplicates. The frequency of inter-laboratory duplicates was within the acceptable range.
Accuracy		
Matrix spikes samples appropriate	Partial	≥ 1/media type. Some matrix spikes were conducted on anonymous samples.
Representativeness		
Sample collection - preservation	Yes	All samples were collected directly into laboratory supplied jars/bottles with no headspace.
Sample collection - sample splitting	Yes	-
Field equipment calibrated	Yes	PID calibration records have been included within attachment C within the validation report.
Decontamination procedures	Yes	Decontamination procedures to prevent cross contamination between samples included use of dedicated sampling equipment, otherwise decontamination of the sampling equipment between each sampling location (using DECON 90) and the use of dedicated sampling containers provided by the laboratory. Field samplers also wore new disposable nitrile gloves during sampling.
Rinsate samples	No	Required ≥ 1/field batch, < LORs. No rinsate samples were collected.
Trip blanks	No	≥ 1/field batch (volatiles), < LORs. No trip blanks were collected/analysed as part of the investigation.
Trip spikes	No	≥ 1/field batch (volatiles), 70 - 130%, (recovery) or ≤ 30 - 50% (RPDs). No trip spikes were collected/analysed as part of the investigation.
Comparability		
Consistent sampling staff	Yes	All field work was conducted by Glen Chisnall of Cavvanba Consulting.
Consistent weather/field conditions	Yes	-

Parameter	Complies	Comments [1]
Completeness		
Sample logs and field data	Yes	Standard field sampling sheets were used during the investigation.
Chain of Custody	Yes	-

Notes:
1. For QC samples, specified frequency and acceptance criteria shown.
2. RPD = relative percentage difference.

Table 1.3: Summary of laboratory QA/QC

Parameter	Complies	Notes [1]
Precision		
Laboratory duplicates	Partial	laboratory specified RPD range, frequency ≥ 10%. Laboratory duplicate RPD exceedances have been reported for OCPs. The frequency of laboratory duplicates was within the acceptable range.
Accuracy		
Surrogate spikes	Yes	Organics by GC, RPD criteria of 70% - 130%. No surrogate recovery outliers exist. The frequency of surrogate spikes was within the acceptable range.
Matrix spikes analysis appropriate	Yes	RPD criteria of ≥ 70% - 130%. No matrix spike outliers occurred. The frequency of matrix spike analysis was within the acceptable range.
Laboratory control samples (LCSs)	Yes	RPD criteria of 70% - 130%, frequency of ≥ 1/lab batch Laboratory control sample recoveries were within the laboratory specified global acceptance criteria. The frequency of laboratory control samples was within the acceptable range.
Certified reference material (CRM)	n/a	-
Representativeness		
Sample condition	Yes	-
Holding times	Yes	No sample holding times have been reported.

Parameter	Complies	Notes [1]
Laboratory blanks	Yes	≥ 1/lab batch, < LORs.
Comparability		
NATA accredited laboratory	Yes	ALS is a NATA accredited laboratory (825). The secondary laboratory is Envirolab, which is also NATA accredited (2901).
NEPM methods or similar	Yes	ALS and Envirolab follow methods in accordance with the requirements of NEPC (amended 2013).
Limits of reporting (LORs) consistent and appropriate	Yes	-
Completeness		
Sample receipt	Yes	-
Laboratory Reports	Yes	-

Notes:
1. For QC samples, acceptance criteria shown. Acceptance criteria can vary based on analyte, statistical data and laboratory specific methods. Laboratory specified relates to detected concentrations based on LORs, e.g. result < 10 x LOR = no limit, 10 – 20 x LOR = 0 - 50%, > 20 x LOR = 0 - 20%. See laboratory reports for specific details.

Summary and discussion

The following issues were identified with the data:

Precision

Outliers were reported for duplicate RPD recoveries with respect to lead in soil. This is likely due to the inherent variability associated with metal concentrations in the soil matrix and is not considered to significantly detract from the data sets precision.

Laboratory duplicate outliers were reported for OCPs as recoveries were outside the RPD range of 20%. This is considered acceptable and does not detract from the data sets precision as all samples collected and analysed were below the adopted site criteria.

Accuracy

No outliers have been reported for QC samples collected to assist in the qualification of accuracy. Surrogate spikes, matrix spikes and laboratory control sample recoveries were within acceptable ranges.

Representativeness

No rinsate samples were collected during the investigation. This is considered acceptable because single use sampling equipment was used.

Trip spike and trip blanks were not collected for this investigation. This is considered acceptable and does not detract from the data sets representativeness as all samples were placed immediately into chilled eskies following collection and delivered directly to the laboratory therefore limiting the chance for loss volatile compounds.

Comparability

The data is considered to be acceptable, with experienced sampling staff used, NATA accredited laboratories used and all LORs below the relevant criteria.

Completeness

Laboratory and field documentation is considered to be complete.

Background to Data Usability

1.0 Introduction

Information generated from environmental investigations requires some statement in regard to the usability of the data[1], and therefore quality assurance (QA) and quality control (QC) are an integral part of the analysis and interpretation of environmental data. QA/QC used in contaminated sites investigations is briefly reviewed in this section.

Quality assurance involves all of the actions, procedures, checks and decisions undertaken to ensure the representativeness and integrity of samples, and accuracy and reliability of analytical results (NEPC as amended 2013). Quality control is the component of QA which monitors and measures the effectiveness of other procedures by the comparison of these measures to previously decided objectives.

There are various components of QA/QC which address the operation of the laboratories and the routine procedures conducted to achieve a minimum level of quality. Examples of QA components include sample control, data transfer, instrument calibration, staff training, etc. Examples of QC components include the measurement of samples to access the quality of reagents and standards, cleanliness of apparatus, accuracy and precision of methods and instruments, etc. Generally, the management of laboratory QA issues is addressed through accreditation by the National Association of Testing Authorities (NATA), or similar, and monitoring of these issues is not addressed on a project by project basis.

On a project specific basis, those involved in collecting, assessing or reviewing the relevant data should ensure the minimum level of QA is conducted. Appropriate numbers and types of QC samples should be collected and analysed, both field QC samples and laboratory QC samples. While minimum levels of QA/QC are specified in some guidelines, e.g. NSW EPA 1994, AS 4482.1-1997, NEPC as amended 2013, the minimum level required may vary between projects, based on site and project specific aspects. This means that the minimum specified requirements may not be sufficient for a particular project. As described in the NEPM (NEPC 1999):

> *As a general rule, the level of required QC is that which adequately measures the effects of all possible influences upon sample integrity, accuracy and precision, and is capable of predicting their variation with a high degree of confidence.*

2.0 PARCC parameters

Following receipt of laboratory analytical results, data validation is conducted to determine if the specified acceptance criteria have been met. This is conducted to ensure that all data, and subsequent decisions based on that data, are technically sound. Data quality is typically discussed in terms of precision, accuracy, representativeness, comparability and completeness. These are referred to as the PARCC parameters[2]. Field QA/QC and laboratory QC is described below within the PARCC framework.

[1] To avoid confusion with the data quality objectives (DQOs) process, the term data usability is used rather than data quality.

[2] The PARCC parameters are sometimes referred to as data quality indicators (DQIs).

2.1 Precision

2.1.1 Duplicates

Precision is a measure of the reproducibility of results under a given set of conditions and is assessed on the basis of agreement between a set of duplicate results obtained from duplicate analyses. The precision of a duplicate determination is measured by comparing the difference between the two samples to the average of the two samples, expressed as a relative percentage difference (RPD).

The determination is:

$$RPD = (P-D)/(P+D/2) \times 100$$

P = primary sample

D = duplicate sample

Three types of duplicates are commonly used:
- field duplicates are used to measure the precision of the sampling and analytical process;
- inter-laboratory duplicates are used to check on the analytical performance of the primary laboratory; and
- laboratory duplicates are used to measure the precision of the analytical process.

2.1.2 Field Duplicates

Field duplicates (or blind replicates) are collected from the same location and submitted to the laboratory for analyses, as a primary sample. The sample nomenclature is such that the laboratory is not aware which sample is a duplicate. The RPD is calculated to determine the degree of repeatability (precision) of results obtained from the duplicate analysis. Where results are below the practical quantification limit (PQLs) or limits of reporting (LORs), i.e. non-detects, RPDs cannot be calculated. Where one result is detected, the results are considered to conform when the detected result is less than five times the PQL/LOR.

The PQL/LOR is the lowest concentration of an analyte that can be determined with acceptable precision (repeatability) and accuracy under the test conditions. The PQL/LOR is usually calculated as five times the lower limit of detection (or method detection limit). However, adjustments in PQLs/LORs may be required due to interference from high contaminant concentrations.

As environmental samples can exhibit a high degree of heterogeneity, field duplicates often exceed the acceptance criterion, particularly if the samples are co-collected, for example, because of the potential for losing volatiles during sample splitting. It is generally accepted that before results which fail the acceptance criterion are described as due to low concentrations or sample heterogeneity, the sample should be re-analysed. This may not be necessary when the analytical results are significantly less than the landuse criteria.

2.1.3 Inter-laboratory duplicates

Inter-laboratory duplicates (or split samples) are field duplicates which are sent to a second laboratory and analysed for the same analytes and, as far as possible, by the same methods. These provide a check on the analytical performance of the primary laboratory.

2.1.4 Laboratory Duplicates

Laboratory duplicates (or check samples) are field samples which are split by the laboratory and thereafter treated as separate samples. The RPD is calculated to determine the degree of repeatability (precision) of results obtained from the duplicate analysis.

USEPA (1994) specifies that for inorganics, if the results for laboratory duplicates fall outside of the recommended control limits for a particular analyte, all results for that analyte, in all associated samples of the same matrix, should be qualified as an estimated quantity. For organics, USEPA (1999) does not specify recommended actions for laboratory duplicates.

2.2 Accuracy

Accuracy is a measure of the agreement between an experimental determination and the true value of the parameter being measured. Inasmuch as the true sample concentrations are not known, the determination of accuracy is achieved through the analysis of known reference materials or assessed by the analysis of matrix spikes. Spiking of reference material into the actual sample matrix is the preferred technique because it provides a measure of the matrix effects on the analytical recovery.

Accuracy is measured in terms of percentage recovery as defined by:

$$\%R = ((SSR - SR) / SA) \times 100$$

%R = percentage recovery spike
SSR = spiked sample result
SR = sample result
SA = spike added

2.2.1 Matrix spikes/matrix spike duplicates

These are samples prepared in the laboratory by dividing a sample into two aliquots and then spiking each with identical concentrations of specific analytes. The matrix spike (MS) and matrix spike duplicate (MSD) are then analysed separately and the results compared to determine the accuracy and precision of the analytes.

2.2.2 Surrogate spikes

Surrogate spikes provide an indication of analytical accuracy. They are used only for analyses which use gas chromatography and are compounds which are similar to the organic analytes of interest in chemical composition, extraction and chromatography, but which are not normally found in field samples. Surrogates are generally spiked into all sample aliquots prior to preparation and analysis. If the surrogate spike recovery does not meet the prescribed acceptance criteria, the samples should be re-analysed.

2.2.3 Laboratory control samples

Laboratory control samples (quality control check samples) are laboratory prepared samples of an appropriate clean matrix (i.e. sand or distilled water) which are spiked with known concentrations of specific analytes. The laboratory control sample (LCS) is then analysed and the results are used to assess sample preparation and analytical accuracy, free of matrix effects. Certified reference material (CRM) is another form of LCS, and involves the analysis of a known standard as part of the laboratory batch, e.g. British Columbia sediment samples for analysis of metals.

2.3 Representativeness

Representativeness refers to the degree to which the samples reflect the site specific conditions. It is primarily dependent on the design and implementation of the sampling program, with representativeness of the data being partially ensured by the avoidance of cross-contamination, adherence to sample handling and analytical methods, use of field duplicates, ensuring that samples do not exceed holding times prior to analysis, use of chain-of-custody forms and other appropriate documentation.

There are a number of QC samples which can be collected to assist in the qualification of representativeness, including:

2.3.1 Rinsate blanks

Used to determine if sampling equipment has been adequately decontaminated to ensure that cross-contamination between samples has not occurred. The frequency for rinsate blanks is one per piece of equipment per day (AS 4482.1-1997), however it should be noted that cross-contamination will bias samples upwards, and the frequency should therefore be at the investigators discretion.

2.3.2 Trip blanks

Used only when volatile organics are sampled to determine if transport in motor vehicles or similar has resulted in contamination of the samples. For trip blanks, a sufficient number should be analysed to allow the representativeness of the sampling to be determined. However, it should be noted that cross-contamination will bias samples upwards, and the frequency should therefore be at the investigators discretion.

2.3.3 Trip spikes

Used only when volatile organics are sampled to attempt to quantify loss of volatiles during the analytical process. For trip spikes, a sufficient number of samples should be analysed to allow qualification of the likely loss of volatiles during the field sampling.

2.3.4 Laboratory blanks

Laboratory blanks (or method blanks, or analysis blanks) are used to verify that contaminants are not introduced into the samples during sample preparation and analysis. The NEPM (NEPC 1999) specifies that laboratory blanks should be conducted at a frequency of "at least one per process batch". The acceptance criterion for laboratory blanks is non-detect at the PQL/LOR.

2.4 Comparability

Comparability is a qualitative parameter designed to express the confidence with which one data set may be compared with another, including established criteria. Comparability is maintained by using consistent methods and ensuring that PQLs/LORs are below the relevant criteria.

2.5 Completeness

Quality control sample completeness is defined as the number of QC samples which should have been analysed, compared to the actual number analysed. If the appropriate number of QC samples are not analysed with each matrix or sample batch, then the data reviewer should use professional judgement to determine if the associated sample data should be qualified.

Completeness also refers to the complete and correct inclusion of field/sample documentation and laboratory documentation.

2.5.1 QC sample frequency and criteria

Based on EPA made or approved guidelines, the following QC samples are required for all contaminated site investigations, unless otherwise specified as part of the data quality objectives (DQOs) process review. All data to be used for validation should conform as a minimum to the requirements specified, regardless of minimum sample size.

Quality control sample	Frequency	Results [1]
Precision		
Field duplicates.	≥ 5%	≤ 30 - 50% [2]
Inter-laboratory duplicates.	≥ 5%	≤ 30 - 50% [2]
Laboratory duplicates.	≥ 10%	Lab specified [3]
Accuracy		
Surrogate spikes.	Organics by GC	70 – 130% [4]
Matrix spikes (MSs).	≥ 1/media type	70 - 130% [5]
Laboratory control samples (LCSs).	≥ 1/lab batch	70 - 130% [6]
Certified reference material (CRM).	LCS for metals	Lab specified [7]
Representativeness		
Rinsate samples.	≥ 1/field batch	< LOR
Trip blanks.	≥ 1/field batch (volatiles)	< LOR
Trip spikes.	≥ 1/field batch (volatiles)	70 - 130%, ≤ 30 - 50% [8]
Laboratory blanks.	≥ 1/lab batch	< LOR

Notes:
1. Where results are laboratory specified, the laboratory analytical reports should be consulted for specific information.
2. Relative percentage differences (RPDs) for field duplicates from AS 4482.1 (1997).
3. RPDs for laboratory duplicates specified by the laboratory. Based on the magnitude of the results compared to the level of reporting (LOR), e.g. ALS: result < 10 x LOR = no limit, 10 – 20 x LOR = 0-50%, > 20 x LOR = 0-20%. LabMark: < 5 x LOR = 0-100%, 5 – 10 x LOR = 0-75%, > 10 x LOR = 0-50% or 0-30% for metals.
4. Surrogate recoveries specified by laboratory based on global acceptance criteria or dynamic recovery limits based on statistical evaluation of actual laboratory data.
5. MS recoveries specified by laboratory based on global acceptance criteria.
6. LCS recoveries specified by laboratory based on global acceptance criteria or dynamic recovery limits based on statistical evaluation of actual laboratory data.
7. CRM recoveries specified by laboratory based on global acceptance criteria.
8. Trip spike results are specified as either recoveries or RPDs.

3.0 References

Australian New Zealand Environment and Conservation Council (1996) *Guidelines for the laboratory analysis of contaminated soils*. ANZECC, Canberra, ACT.

Australian Standard AS 4482.1 (2005) *Guide to the sampling and investigation of potentially contaminated soil, Part 1: Non-volatile and Semi-volatile compounds.* Standards Australia, Homebush, NSW.

National Environment Protection Council (NEPC) (1999) *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (as amended April 2013). National Environment Protection Council, Canberra.

NSW Environment Protection Authority (1994) *Contaminated Sites: Guidelines for Assessing Service Station Sites.* NSW EPA, Chatswood, NSW.

NSW Environment Protection Authority (1997) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites.* NSW EPA, Chatswood, NSW.

United States Environmental Protection Agency, Contract Laboratory Program (1994) *National Functional Guidelines for Inorganic Data Review.* USEPA, Washington, DC.

United States Environment Protection Agency, Contract Laboratory Program (1999) *National Functional Guidelines for Organic Data Review.* USEPA, Washington, DC.

Attachment D
Laboratory Reports

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1836474**	Page	: 1 of 8
Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Contact	: Brenda Hong
Address	: PO BOX 2191 BYRON BAY NSW 2481	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 6685 7811	Telephone	: +61 2 8784 8555
Project	: 18084	Date Samples Received	: 05-Dec-2018 14:14
Order number	: 18084	Date Analysis Commenced	: 05-Dec-2018
C-O-C number	: ----	Issue Date	: 07-Dec-2018 20:04
Sampler	: GLEN CHISNALL		
Site	: ----		
Quote number	: SYBQ/409/18		
No. of samples received	: 49		
No. of samples analysed	: 21		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP07_0.1	TP08_0.1	TP09_0.1	TP10_0.1	TP01_0.1
			Client sampling date / time	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	ES1836474-001	ES1836474-004	ES1836474-007	ES1836474-010	ES1836474-013
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**28.9**	**34.8**	**44.8**	**24.9**	**26.9**
EG020T: Total Metals by ICP-MS								
Lead	7439-92-1	0.1	mg/kg	**64.6**	**60.9**	**161**	**119**	**1090**
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	**0.16**
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	**4.10**
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	**2.31**
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	**1.79**
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	**0.23**	**0.77**
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	**0.07**	**0.95**
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	**0.43**
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	**2.2**
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	**0.23**	**0.77**
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.05	mg/kg	<0.05	<0.05	<0.05	**0.07**	**3.58**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**105**	**73.8**	**96.3**	**64.5**	**80.8**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**79.9**	**62.5**	**71.2**	**62.7**	**75.5**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP02_0.1	TP03_0.1	TP04_0.1	TP05_0.1	TP06_0.1
			Client sampling date / time	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	ES1836474-015	ES1836474-017	ES1836474-019	ES1836474-021	ES1836474-024
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**45.4**	**27.0**	**25.8**	**33.2**	**34.0**
EG020T: Total Metals by ICP-MS								
Lead	7439-92-1	0.1	mg/kg	**1070**	**502**	**324**	**155**	**317**
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	**0.16**	<0.05	**0.14**	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	**0.08**	<0.05	**0.09**	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	**0.08**	<0.05	**0.05**	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	**0.14**	**0.88**	**0.29**	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	**0.43**	**0.08**	**0.43**	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	**0.06**	**0.06**	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	**0.6**	<0.2	**0.4**	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	**0.14**	**0.88**	**0.29**	<0.05	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.05	mg/kg	**0.06**	**1.09**	**0.08**	**0.83**	<0.05
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**98.6**	**117**	**125**	**114**	**90.1**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**72.2**	**71.3**	**112**	**126**	**66.9**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP11_0.1	TP12_0.1	TP13_0.1	TP14_0.1	TP15_0.1
			Client sampling date / time	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	ES1836474-027	ES1836474-029	ES1836474-031	ES1836474-033	ES1836474-035
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	32.2	29.8	41.0	37.2	31.5
EG020T: Total Metals by ICP-MS								
Lead	7439-92-1	0.1	mg/kg	32.2	195	34.0	54.8	72.4
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.10	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.05	mg/kg	<0.05	0.10	<0.05	<0.05	<0.05
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	99.5	115	98.2	97.5	109
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	74.7	96.2	73.1	71.3	79.7

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP16_0.1	TP17_0.1	TP18_0.1	TP19_0.1	QS01
			Client sampling date / time	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	ES1836474-037	ES1836474-039	ES1836474-042	ES1836474-045	ES1836474-048
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**36.7**	**38.6**	**35.8**	**30.9**	**31.2**
EG020T: Total Metals by ICP-MS								
Lead	7439-92-1	0.1	mg/kg	**134**	**76.5**	**27.0**	**31.6**	**167**
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	**0.88**
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	**0.07**	<0.05	**0.11**
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	**0.88**
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.05	mg/kg	<0.05	<0.05	**0.07**	<0.05	**0.11**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**105**	**98.8**	**95.4**	**133**	**91.0**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**75.3**	**70.9**	**67.8**	**104**	**79.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	QS03	----	----	----	----
			Client sampling date / time	30-Nov-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1836474-049	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**51.0**	----	----	----	----
EG020T: Total Metals by ICP-MS								
Lead	7439-92-1	0.1	mg/kg	**61.9**	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	----	----	----
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	----	----	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	----	----	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	----	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	----	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-29-3	0.05	mg/kg	<0.05	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**85.6**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**60.7**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1836474**	Page	: 1 of 5
Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Telephone	: +61 2 8784 8555
Project	: 18084	Date Samples Received	: 05-Dec-2018
Site	: ----	Issue Date	: 07-Dec-2018
Sampler	: GLEN CHISNALL	No. of samples received	: 49
Order number	: 18084	No. of samples analysed	: 21

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
TP07_0.1, TP08_0.1, TP09_0.1, TP10_0.1, TP01_0.1, TP02_0.1, TP03_0.1, TP04_0.1, TP05_0.1, TP06_0.1, TP11_0.1, TP12_0.1, TP13_0.1, TP14_0.1, TP15_0.1, TP16_0.1, TP17_0.1, TP18_0.1, TP19_0.1, QS01, QS03	**30-Nov-2018**	**----**	----	----	**05-Dec-2018**	14-Dec-2018	✓
EG020T: Total Metals by ICP-MS							
Soil Glass Jar - Unpreserved (EG020X-T)							
TP07_0.1, TP08_0.1, TP09_0.1, TP10_0.1, TP01_0.1, TP02_0.1, TP03_0.1, TP04_0.1, TP05_0.1, TP06_0.1, TP11_0.1, TP12_0.1, TP13_0.1, TP14_0.1, TP15_0.1, TP16_0.1, TP17_0.1, TP18_0.1, TP19_0.1, QS01, QS03	**30-Nov-2018**	**06-Dec-2018**	29-May-2019	✓	**06-Dec-2018**	29-May-2019	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068)							
TP07_0.1, TP08_0.1, TP09_0.1, TP10_0.1, TP01_0.1, TP02_0.1, TP03_0.1, TP04_0.1, TP05_0.1, TP06_0.1, TP11_0.1, TP12_0.1, TP13_0.1, TP14_0.1, TP15_0.1, TP16_0.1, TP17_0.1, TP18_0.1, TP19_0.1, QS01, QS03	**30-Nov-2018**	**06-Dec-2018**	14-Dec-2018	✓	**06-Dec-2018**	15-Jan-2019	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	3	21	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite X	EG020X-T	3	22	**13.64**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Pesticides by GCMS	EP068	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite X	EG020X-T	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Pesticides by GCMS	EP068	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite X	EG020X-T	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Pesticides by GCMS	EP068	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite X	EG020X-T	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-MS - Suite X	EG020X-T	SOIL	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1836474**	Page	: 1 of 7
Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Contact	: Brenda Hong
Address	: PO BOX 2191 BYRON BAY NSW 2481	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 6685 7811	Telephone	: +61 2 8784 8555
Project	: 18084	Date Samples Received	: 05-Dec-2018
Order number	: 18084	Date Analysis Commenced	: 05-Dec-2018
C-O-C number	: ----	Issue Date	: 07-Dec-2018
Sampler	: GLEN CHISNALL		
Site	: ----		
Quote number	: SYBQ/409/18		
No. of samples received	: 49		
No. of samples analysed	: 21		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
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
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2077535)									
ES1836474-001	TP07_0.1	EA055: Moisture Content	----	0.1	%	28.9	32.2	10.8	0% - 20%
ES1836474-029	TP12_0.1	EA055: Moisture Content	----	0.1	%	29.8	30.1	1.02	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2077536)									
ES1836474-049	QS03	EA055: Moisture Content	----	0.1	%	51.0	54.9	7.26	0% - 20%
ES1836478-005	Anonymous	EA055: Moisture Content	----	0.1	%	3.6	3.0	17.2	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 2079134)									
ES1836474-024	TP06_0.1	EG020X-T: Lead	7439-92-1	0.1	mg/kg	317	270	16.1	0% - 20%
ES1836404-001	Anonymous	EG020X-T: Lead	7439-92-1	0.1	mg/kg	8.4	7.7	9.48	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 2079135)									
ES1836474-048	QS01	EG020X-T: Lead	7439-92-1	0.1	mg/kg	167	201	18.2	0% - 20%
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2077265)									
ES1836474-001	TP07_0.1	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2077265) - continued									
ES1836474-001	TP07_0.1	EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
ES1836474-027	TP11_0.1	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2077270)									
ES1836474-049	QS03	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2077270) - continued									
ES1836474-049	QS03	EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 2079134)								
EG020X-T: Lead	7439-92-1	0.1	mg/kg	<0.1	40 mg/kg	91.9	73	128
EG020T: Total Metals by ICP-MS (QCLot: 2079135)								
EG020X-T: Lead	7439-92-1	0.1	mg/kg	<0.1	40 mg/kg	103	73	128
EP068A: Organochlorine Pesticides (OC) (QCLot: 2077265)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	94.9	69	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	93.6	65	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	99.2	67	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	100	68	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	96.8	65	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	95.6	67	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	96.9	69	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	102	62	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	94.0	63	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	100	66	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	95.1	64	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	100	66	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	102	67	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	91.0	67	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	103	69	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	102	69	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	102	56	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	92.1	62	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	99.0	66	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	100	64	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	85.9	54	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 2077270)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	94.9	69	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	94.4	65	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	94.5	67	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	97.5	68	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	91.8	65	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	92.0	67	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	94.2	69	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	96.6	62	118

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP068A: Organochlorine Pesticides (OC) (QCLot: 2077270) - continued								
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	88.7	63	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	95.7	66	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	89.9	64	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	94.9	66	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	96.6	67	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	83.8	67	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	97.4	69	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	96.9	69	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	95.1	56	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	86.2	62	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	92.2	66	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	95.6	64	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	78.0	54	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG020T: Total Metals by ICP-MS (QCLot: 2079134)							
ES1836404-001	Anonymous	EG020X-T: Lead	7439-92-1	250 mg/kg	91.6	70	130
EG020T: Total Metals by ICP-MS (QCLot: 2079135)							
ES1836474-048	QS01	EG020X-T: Lead	7439-92-1	250 mg/kg	99.4	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 2077265)							
ES1836474-001	TP07_0.1	EP068: gamma-BHC	58-89-9	0.5 mg/kg	89.7	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	85.2	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	120	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	89.4	70	130
		EP068: Endrin	72-20-8	2 mg/kg	110	70	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	80.2	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 2077270)							
ES1836474-049	QS03	EP068: gamma-BHC	58-89-9	0.5 mg/kg	89.2	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	86.2	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	118	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	88.2	70	130
		EP068: Endrin	72-20-8	2 mg/kg	108	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP068A: Organochlorine Pesticides (OC) (QCLot: 2077270) - continued							
ES1836474-049	QS03	EP068: 4.4`-DDT	50-29-3	2 mg/kg	90.3	70	130

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1836474**

Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Contact	: Brenda Hong
Address	: PO BOX 2191 BYRON BAY NSW 2481	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: ben@cavvanba.com	E-mail	: Brenda.Hong@ALSGlobal.com
Telephone	: +61 02 6685 7811	Telephone	: +61 2 8784 8555
Facsimile	: +61 02 6685 5083	Facsimile	: +61-2-8784 8500
Project	: 18084	Page	: 1 of 4
Order number	: 18084	Quote number	: EB2017CAVCON0001 (SYBQ/409/18)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: GLEN CHISNALL		

Dates

Date Samples Received	: 05-Dec-2018 14:14	Issue Date	: 05-Dec-2018
Client Requested Due Date	: 06-Dec-2018	Scheduled Reporting Date	: **07-Dec-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 10.7'C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 49 / 21

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **SAMPLES QS02 AND QS04 WERE FORWARDED TO ENVIROLAB**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EG020T (solids) Total Metals by ICP-MS	SOIL - EP068A (solids) Organochlorine Pesticides by GCMS
ES1836474-001	30-Nov-2018 00:00	TP07_0.1		✓	✓	✓
ES1836474-002	30-Nov-2018 00:00	TP07_0.3	✓			
ES1836474-003	30-Nov-2018 00:00	TP07_0.5	✓			
ES1836474-004	30-Nov-2018 00:00	TP08_0.1		✓	✓	✓
ES1836474-005	30-Nov-2018 00:00	TP08_0.3	✓			
ES1836474-006	30-Nov-2018 00:00	TP08_0.5	✓			
ES1836474-007	30-Nov-2018 00:00	TP09_0.1		✓	✓	✓
ES1836474-008	30-Nov-2018 00:00	TP09_0.3	✓			
ES1836474-009	30-Nov-2018 00:00	TP09_0.5	✓			
ES1836474-010	30-Nov-2018 00:00	TP10_0.1		✓	✓	✓
ES1836474-011	30-Nov-2018 00:00	TP10_0.3	✓			
ES1836474-012	30-Nov-2018 00:00	TP10_0.5	✓			
ES1836474-013	30-Nov-2018 00:00	TP01_0.1		✓	✓	✓
ES1836474-014	30-Nov-2018 00:00	TP01_0.3	✓			
ES1836474-015	30-Nov-2018 00:00	TP02_0.1		✓	✓	✓
ES1836474-016	30-Nov-2018 00:00	TP02_0.3	✓			
ES1836474-017	30-Nov-2018 00:00	TP03_0.1		✓	✓	✓
ES1836474-018	30-Nov-2018 00:00	TP03_0.3	✓			
ES1836474-019	30-Nov-2018 00:00	TP04_0.1		✓	✓	✓
ES1836474-020	30-Nov-2018 00:00	TP04_0.3	✓			
ES1836474-021	30-Nov-2018 00:00	TP05_0.1		✓	✓	✓
ES1836474-022	30-Nov-2018 00:00	TP05_0.3	✓			
ES1836474-023	30-Nov-2018 00:00	TP05_0.5	✓			
ES1836474-024	30-Nov-2018 00:00	TP06_0.1		✓	✓	✓
ES1836474-025	30-Nov-2018 00:00	TP06_0.3	✓			
ES1836474-026	30-Nov-2018 00:00	TP06_0.5	✓			
ES1836474-027	30-Nov-2018 00:00	TP11_0.1		✓	✓	✓
ES1836474-028	30-Nov-2018 00:00	TP11_0.3	✓			
ES1836474-029	30-Nov-2018 00:00	TP12_0.1		✓	✓	✓
ES1836474-030	30-Nov-2018 00:00	TP12_0.3	✓			
ES1836474-031	30-Nov-2018 00:00	TP13_0.1		✓	✓	✓
ES1836474-032	30-Nov-2018 00:00	TP13_0.3	✓			
ES1836474-033	30-Nov-2018 00:00	TP14_0.1		✓	✓	✓
ES1836474-034	30-Nov-2018 00:00	TP14_0.3	✓			
ES1836474-035	30-Nov-2018 00:00	TP15_0.1		✓	✓	✓

			(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EG020T (solids) Total Metals by ICP-MS	SOIL - EP068A (solids) Organochlorine Pesticides by GCMS
ES1836474-036	30-Nov-2018 00:00	TP15_0.3	✓			
ES1836474-037	30-Nov-2018 00:00	TP16_0.1		✓	✓	✓
ES1836474-038	30-Nov-2018 00:00	TP16_0.3	✓			
ES1836474-039	30-Nov-2018 00:00	TP17_0.1		✓	✓	✓
ES1836474-040	30-Nov-2018 00:00	TP17_0.3	✓			
ES1836474-041	30-Nov-2018 00:00	TP17_0.5	✓			
ES1836474-042	30-Nov-2018 00:00	TP18_0.1		✓	✓	✓
ES1836474-043	30-Nov-2018 00:00	TP18_0.3	✓			
ES1836474-044	30-Nov-2018 00:00	TP18_0.5	✓			
ES1836474-045	30-Nov-2018 00:00	TP19_0.1		✓	✓	✓
ES1836474-046	30-Nov-2018 00:00	TP19_0.3	✓			
ES1836474-047	30-Nov-2018 00:00	TP19_0.5	✓			
ES1836474-048	30-Nov-2018 00:00	QS01		✓	✓	✓
ES1836474-049	30-Nov-2018 00:00	QS03		✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE		
- A4 - AU Tax Invoice (INV)	Email	inbox@cavvanba.com
BEN WACKETT		
- *AU Certificate of Analysis - NATA (COA)	Email	ben@cavvanba.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ben@cavvanba.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ben@cavvanba.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ben@cavvanba.com
- Chain of Custody (CoC) (COC)	Email	ben@cavvanba.com
- EDI Format - ENMRG (ENMRG)	Email	ben@cavvanba.com
- EDI Format - ESDAT (ESDAT)	Email	ben@cavvanba.com
GLEN CHISNALL		
- *AU Certificate of Analysis - NATA (COA)	Email	glen@cavvanba.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	glen@cavvanba.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	glen@cavvanba.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	glen@cavvanba.com
- Chain of Custody (CoC) (COC)	Email	glen@cavvanba.com
- EDI Format - ENMRG (ENMRG)	Email	glen@cavvanba.com
- EDI Format - ESDAT (ESDAT)	Email	glen@cavvanba.com
ROB MCLELLAND		
- A4 - AU Tax Invoice (INV)	Email	rob@cavvanba.com
ROSS NICOLSON		
- *AU Certificate of Analysis - NATA (COA)	Email	ross@cavvanba.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ross@cavvanba.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ross@cavvanba.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ross@cavvanba.com
- Chain of Custody (CoC) (COC)	Email	ross@cavvanba.com
- EDI Format - ENMRG (ENMRG)	Email	ross@cavvanba.com
- EDI Format - ESDAT (ESDAT)	Email	ross@cavvanba.com

7/12/18

CHAIN OF CUSTODY

ALS Laboratory: please tick →

BRISBANE 32 Shand Street Stafford Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5800 E: gladstone@alsglobal.com
ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com
PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
TOWNSVILLE 14-16 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: Cavvanba Consulting	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☒ Standard TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)**
OFFICE: Byron Bay		☒ Non Standard or urgent TAT (List due date): 6/12/18	Custody Seal Intact? Yes / No / (N/A)
PROJECT: 18084	**ALS QUOTE NO.:** SYBQ/409/18	**COC SEQUENCE NUMBER (Circle)**	Free ice / frozen ice bricks present upon receipt? Yes / No / N/A
ORDER NUMBER: 18084		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 10.7 °C
PROJECT MANAGER: Ben Wackett	**CONTACT PH:** 0488 225 692	OF: 1 2 3 4 5 6 7	Other comment:
SAMPLER: Glen Chisnall	**SAMPLER MOBILE:** 0499401092		
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):**		
Email Reports to (will default to PM if no other addresses are listed): glen@cavvanba.com, ross@cavvanba.com			
Email Invoice to (will default to PM if no other addresses are listed): rob@cavvanba.com			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Glen Chisnall			MC
DATE/TIME: 6/12/2018	DATE/TIME:	DATE/TIME:	DATE/TIME: 5/12/18 11:00 am

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Lead, OCPs	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	TP07_0.1	30/11/2018	Soil	JAR	1	X	
2	TP07_0.3	30/11/2018	Soil	JAR	1	ON HOLD	
3	TP07_0.5	30/11/2018	Soil	JAR	1	ON HOLD	
4	TP08_0.1	30/11/2018	Soil	JAR	1	X	
5	TP08_0.3	30/11/2018	Soil	JAR	1	ON HOLD	
6	TP08_0.5	30/11/2018	Soil	JAR	1	ON HOLD	
7	TP09_0.1	30/11/2018	Soil	JAR	1	X	
8	TP09_0.3	30/11/2018	Soil	JAR	1	ON HOLD	
9	TP09_0.5	30/11/2018	Soil	JAR	1	ON HOLD	
10	TP10_0.1	30/11/2018	Soil	JAR	1	X	
11	TP10_0.3	30/11/2018	Soil	JAR	1	ON HOLD	
12	TP10_0.5	30/11/2018	Soil	JAR	1	ON HOLD	
				TOTAL	14		

Subcon / Forward Lab / Split WO
Lab / Analysis: Samoes QSO2
Organised By / Date: QSO4
Relinquished By / Date:
Connote / Courier: ES1836474 1 DAY
WO No: ENVIROLAB TURNAROUND
Attach By PO / Internal Sheet: TIME ON SAMPLES PLEASE

ES1836474

Environmental Division
Sydney
Work Order Reference
ES1836474

Telephone : + 61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber G
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plas
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

served Plastic; F = Formaldehyde Preserved Glass;

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☐NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: Cavvanba Consulting	**TURNAROUND REQUIREMENTS :** ☒ Standard TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)**
OFFICE: Byron Bay	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date): 6/12/18	Custody Seal Intact? Yes / No / N/A
PROJECT: 18084	**ALS QUOTE NO.:** SYBQ/409/18	Free ice / frozen ice bricks present upon receipt? Yes / No / N/A
ORDER NUMBER: 18084	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 1.0.7 °C
PROJECT MANAGER: Ben Wackett — **CONTACT PH:** 0488 225 692	OF: 1 2 3 4 5 6 7	Other comment:
SAMPLER: Glen Chisnall — **SAMPLER MOBILE:** 0499401092	**RELINQUISHED BY:** Glen Chisnall	**RECEIVED BY:**
COC emailed to ALS? (YES / NO) — **EDD FORMAT (or default):**	DATE/TIME: 5/12/2018	DATE/TIME:
Email Reports to (will default to PM if no other addresses are listed): glen@cavvanba.com, ross@cavvanba.com	**RELINQUISHED BY:**	**RECEIVED BY:** ML
Email Invoice to (will default to PM if no other addresses are listed): rob@cavvanba.com	DATE/TIME:	DATE/TIME: 5/12/18 11:00a

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Lead, OCPs								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	TP01_0.1	30/11/2018	Soil	JAR	1	x								10 DAY
14	TP01_0.3	30/11/2018	Soil	JAR	1	ON HOLD								TURNAROUND
15	TP02_0.1	30/11/2018	Soil	JAR	1	x								TIME
16	TP02_0.3	30/11/2018	Soil	JAR	1	ON HOLD								ON SAMPLES
17	TP03_0.1	30/11/2018	Soil	JAR	1	x								PLEASE
18	TP03_0.3	30/11/2018	Soil	JAR	1	ON HOLD								
19	TP04_0.1	30/11/2018	Soil	JAR	1	x								
20	TP04_0.3	30/11/2018	Soil	JAR	1	ON HOLD								
21	TP05_0.1	30/11/2018	Soil	JAR	1	x								
22	TP05_0.3	30/11/2018	Soil	JAR	1	ON HOLD								
23	TP05_0.5	30/11/2018	Soil	JAR	1	ON HOLD								
24	TP06_0.1	30/11/2018	Soil	JAR	1	x								
25	TP06_0.3	30/11/2018	Soil	JAR	1	ON HOLD								
26	TP06_0.5	30/11/2018	Soil	JAR	1	ON HOLD								
				TOTAL	14									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
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☐NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville environmental@alsglobe.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: Cavvanba Consulting	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☒ Standard TAT (List due date):
OFFICE: Byron Bay		☒ Non Standard or urgent TAT (List due date): 6/12/18
PROJECT: 18084	**ALS QUOTE NO.:** SYBQ/409/18	
ORDER NUMBER: 18084		
PROJECT MANAGER: Ben Wackett	**CONTACT PH:** 0488 225 692	
SAMPLER: Glen Chisnall	**SAMPLER MOBILE:** 0499401092	
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):**	
Email Reports to (will default to PM if no other addresses are listed): glen@cavvanba.com, ross@cavvanba.com		
Email Invoice to (will default to PM if no other addresses are listed): rob@cavvanba.com		

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:	10.7 °C		
Other comment:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Glen Chisnall			MC
DATE/TIME: 12/2018	DATE/TIME:	DATE/TIME:	DATE/TIME: 5/12/18 11:00AM

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Lead, OCPs								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
27	TP11_0.1	30/11/2018	Soil	JAR	1	X								1 DAY TURNAROUND TIME ON SAMPLES PLEASE
28	TP11_0.3	30/11/2018	Soil	JAR	1	ON HOLD								
29	TP12_0.1	30/11/2018	Soil	JAR	1	X								
30	TP12_0.3	30/11/2018	Soil	JAR	1	ON HOLD								
31	TP13_0.1	30/11/2018	Soil	JAR	1	X								
32	TP13_0.3	30/11/2018	Soil	JAR	1	ON HOLD								
33	TP14_0.1	30/11/2018	Soil	JAR	1	X								
34	TP14_0.3	30/11/2018	Soil	JAR	1	ON HOLD								
35	TP15_0.1	30/11/2018	Soil	JAR	1	X								1
36	TP15_0.3	30/11/2018	Soil	JAR	1	ON HOLD								
37	TP16_0.1	30/11/2018	Soil	JAR	1	X								
38	TP16_0.3	30/11/2018	Soil	JAR	1	ON HOLD								
39	TP17_0.1	30/11/2018	Soil	JAR	1	X								
40	TP17_0.3	30/11/2018	Soil	JAR	1	ON HOLD								
				TOTAL	14									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

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CLIENT: Cavvanba Consulting	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)	☒ Standard TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)**
OFFICE: Byron Bay		☒ Non Standard or urgent TAT (List due date): 6/12/18	Custody Seal Intact? Yes / No / N/A
PROJECT: 18084	**ALS QUOTE NO.:** SYBQ/409/18	**COC SEQUENCE NUMBER (Circle)**	Free ice / frozen ice bricks present upon receipt? Yes / No / N/A
ORDER NUMBER: 18084		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 10.7 °C
PROJECT MANAGER: Ben Wackett	**CONTACT PH:** 0488 225 692	OF: 1 2 3 4 5 6 7	Other comment:
SAMPLER: Glen Chisnall	**SAMPLER MOBILE:** 0499401092		
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):**		
Email Reports to (will default to PM if no other addresses are listed): glen@cavvanba.com, ross@cavvanba.com			
Email Invoice to (will default to PM if no other addresses are listed): rob@cavvanba.com			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Glen Chisnall			MC
DATE/TIME: 6/12/2018	DATE/TIME:	DATE/TIME:	DATE/TIME: 5/12/18 11:00am

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Lead, OCPs								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
41	TP17_0.5	30/11/2018	Soil	JAR	1	ON HOLD								1 DAY TURN AROUND TIME ON SAMPLES PLEASE
42	TP18_0.1	30/11/2018	Soil	JAR	1	X								
43	TP18_0.3	30/11/2018	Soil	JAR	1	ON HOLD								
44	TP18_0.5	30/11/2018	Soil	JAR	1	ON HOLD								
45	TP19_0.1	30/11/2018	Soil	JAR	1	X								
46	TP19_0.3	30/11/2018	Soil	JAR	1	ON HOLD								
47	TP19_0.5	30/11/2018	Soil	JAR	1	ON HOLD								
48	QS01	30/11/2018	Soil	JAR	1	X								
—	QS02	30/11/2018	Soil	JAR	1	Please forward analysis to envirolab for Lead (pb) and OCPs								
49	QS03	30/11/2018	Soil	JAR	1	X								
—	QS04	30/11/2018	Soil	JAR	1	Please forward analysis to envirolab for Lead (pb) and OCPs								
				TOTAL	14									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1837028**	Page	: 1 of 4
Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Contact	: Brenda Hong
Address	: PO BOX 2191 BYRON BAY NSW 2481	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 6685 7811	Telephone	: +61 2 8784 8555
Project	: 18084	Date Samples Received	: 10-Dec-2018 12:00
Order number	: ----	Date Analysis Commenced	: 10-Dec-2018
C-O-C number	: ----	Issue Date	: 11-Dec-2018 17:35
Sampler	: ----		
Site	: ----		
Quote number	: SYBQ/409/18		
No. of samples received	: 5		
No. of samples analysed	: 5		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP068: Positive results have been confirmed by re-extraction and re-analysis.
- EP068: Poor duplicate precision due to sample heterogeneity. Confirmed by re-extraction and re-analysis.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP01_0.3	TP02_0.3	TP03_0.3	TP04_0.3	TP06_0.3
			Client sampling date / time	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00	30-Nov-2018 00:00
Compound	CAS Number	LOR	Unit	ES1837028-001	ES1837028-002	ES1837028-003	ES1837028-004	ES1837028-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	29.3	52.1	45.8	26.1	37.7
EG005T: Total Metals by ICP-AES								
Lead	7439-92-1	5	mg/kg	1600	838	416	252	162
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	<0.05	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	<0.05	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	<0.05	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	<0.05	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	<0.05	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	<0.05	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	<0.05	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	0.07	----	<0.05	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg	2.06	----	<0.05	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	1.16	----	<0.05	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	<0.05	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	0.90	----	<0.05	----	----
Dieldrin	60-57-1	0.05	mg/kg	1.18	----	0.34	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	1.63	----	0.25	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	----	<0.05	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	<0.05	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	----	<0.05	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	1.64	----	<0.05	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	<0.05	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	<0.05	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	5.8	----	<0.2	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	<0.05	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	<0.2	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	1.18	----	0.34	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.05	mg/kg	9.07	----	0.25	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	108	----	91.7	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	109	----	88.2	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1837028**	Page	: 1 of 4
Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Telephone	: +61 2 8784 8555
Project	: 18084	Date Samples Received	: 10-Dec-2018
Site	: ----	Issue Date	: 11-Dec-2018
Sampler	: ----	No. of samples received	: 5
Order number	: ----	No. of samples analysed	: 5

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EP068A: Organochlorine Pesticides (OC)	ES1837028--001	TP01_0.3	**trans-Chlordane**	5103-74-2	33.0 %	0% - 20%	**RPD exceeds LOR based limits**
EP068A: Organochlorine Pesticides (OC)	ES1837028--001	TP01_0.3	**Dieldrin**	60-57-1	56.1 %	0% - 20%	**RPD exceeds LOR based limits**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
TP01_0.3, TP02_0.3, TP03_0.3, TP04_0.3, TP06_0.3	**30-Nov-2018**	**----**	----	----	**10-Dec-2018**	14-Dec-2018	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
TP01_0.3, TP02_0.3, TP03_0.3, TP04_0.3, TP06_0.3	**30-Nov-2018**	**10-Dec-2018**	29-May-2019	✓	**10-Dec-2018**	29-May-2019	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068)							
TP01_0.3, TP03_0.3	**30-Nov-2018**	**10-Dec-2018**	14-Dec-2018	✓	**11-Dec-2018**	19-Jan-2019	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Pesticides by GCMS	EP068	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Pesticides by GCMS	EP068	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Pesticides by GCMS	EP068	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1837028**	Page	: 1 of 5
Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Contact	: Brenda Hong
Address	: PO BOX 2191 BYRON BAY NSW 2481	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 6685 7811	Telephone	: +61 2 8784 8555
Project	: 18084	Date Samples Received	: 10-Dec-2018
Order number	: ----	Date Analysis Commenced	: 10-Dec-2018
C-O-C number	: ----	Issue Date	: 11-Dec-2018
Sampler	: ----		
Site	: ----		
Quote number	: SYBQ/409/18		
No. of samples received	: 5		
No. of samples analysed	: 5		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
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
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2086434)									
ES1837028-003	TP03_0.3	EA055: Moisture Content	----	0.1	%	45.8	46.4	1.16	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 2085212)									
ES1836596-010	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	7	7	0.00	No Limit
ES1836960-003	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	12	8	37.3	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2085972)									
ES1837028-001	TP01_0.3	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	0.07	<0.05	32.8	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	1.16	# 0.83	33.0	0% - 20%
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	0.90	0.64	33.6	0% - 50%
		EP068: Dieldrin	60-57-1	0.05	mg/kg	1.18	# 0.66	56.1	0% - 20%
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	1.63	1.67	2.48	0% - 20%
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	1.64	1.46	11.9	0% - 20%
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2085972) - continued									
ES1837028-001	TP01_0.3	EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	5.8	5.4	7.68	0% - 20%
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2085212)								
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	92.6	80	114
EP068A: Organochlorine Pesticides (OC) (QCLot: 2085972)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	88.4	69	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	89.6	65	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	98.4	67	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	101	68	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	88.6	65	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	84.6	67	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	87.8	69	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	87.0	62	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	84.7	63	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	89.8	66	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	84.9	64	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	90.9	66	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	92.0	67	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	89.9	67	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	89.9	69	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	90.3	69	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	84.9	56	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	90.6	62	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	82.9	66	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	90.2	64	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	86.0	54	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2085212)							
ES1836596-010	Anonymous	EG005T: Lead	7439-92-1	250 mg/kg	95.8	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 2085972)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP068A: Organochlorine Pesticides (OC) (QCLot: 2085972) - continued							
ES1837028-001	TP01_0.3	EP068: gamma-BHC	58-89-9	0.5 mg/kg	75.8	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	95.0	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	103	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	108	70	130
		EP068: Endrin	72-20-8	2 mg/kg	81.7	70	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	73.9	70	130

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1837028**

Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Contact	: Brenda Hong
Address	: PO BOX 2191 BYRON BAY NSW 2481	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: ben@cavvanba.com	E-mail	: Brenda.Hong@ALSGlobal.com
Telephone	: +61 02 6685 7811	Telephone	: +61 2 8784 8555
Facsimile	: +61 02 6685 5083	Facsimile	: +61-2-8784 8500
Project	: 18084	Page	: 1 of 2
Order number	: ----	Quote number	: EB2017CAVCON0001 (SYBQ/409/18)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 10-Dec-2018 12:00	Issue Date	: 10-Dec-2018
Client Requested Due Date	: 11-Dec-2018	Scheduled Reporting Date	: **11-Dec-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: 4.1' C
Receipt Detail	:	No. of samples received / analysed	: 5 / 5

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **This is a rebatch of ES1836474.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - EG005T (solids) Total Metals by ICP-AES	SOIL - EP068A (solids) Organochlorine Pesticides by GCMS
ES1837028-001	30-Nov-2018 00:00	TP01_0.3	✓	✓	✓
ES1837028-002	30-Nov-2018 00:00	TP02_0.3	✓	✓	
ES1837028-003	30-Nov-2018 00:00	TP03_0.3	✓	✓	✓
ES1837028-004	30-Nov-2018 00:00	TP04_0.3	✓	✓	
ES1837028-005	30-Nov-2018 00:00	TP06_0.3	✓	✓	

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	inbox@cavvanba.com

BEN WACKETT

- *AU Certificate of Analysis - NATA (COA)	Email	ben@cavvanba.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ben@cavvanba.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ben@cavvanba.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ben@cavvanba.com
- Chain of Custody (CoC) (COC)	Email	ben@cavvanba.com
- EDI Format - ENMRG (ENMRG)	Email	ben@cavvanba.com
- EDI Format - ESDAT (ESDAT)	Email	ben@cavvanba.com

GLEN CHISNALL

- *AU Certificate of Analysis - NATA (COA)	Email	glen@cavvanba.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	glen@cavvanba.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	glen@cavvanba.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	glen@cavvanba.com
- Chain of Custody (CoC) (COC)	Email	glen@cavvanba.com
- EDI Format - ENMRG (ENMRG)	Email	glen@cavvanba.com
- EDI Format - ESDAT (ESDAT)	Email	glen@cavvanba.com

ROB MCLELLAND

- A4 - AU Tax Invoice (INV)	Email	rob@cavvanba.com

ROSS NICOLSON

- *AU Certificate of Analysis - NATA (COA)	Email	ross@cavvanba.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ross@cavvanba.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ross@cavvanba.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ross@cavvanba.com
- Chain of Custody (CoC) (COC)	Email	ross@cavvanba.com
- EDI Format - ENMRG (ENMRG)	Email	ross@cavvanba.com
- EDI Format - ESDAT (ESDAT)	Email	ross@cavvanba.com

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1837749**	Page	: 1 of 2
Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Contact	: Brenda Hong
Address	: PO BOX 2191 BYRON BAY NSW 2481	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 6685 7811	Telephone	: +61 2 8784 8555
Project	: 18084	Date Samples Received	: 14-Dec-2018 12:30
Order number	: 18084	Date Analysis Commenced	: 14-Dec-2018
C-O-C number	: ----	Issue Date	: 17-Dec-2018 15:39
Sampler	: GLEN CHISNALL		
Site	: ----		
Quote number	: SYBQ/409/18		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**TP01_0.6**	**TP02_0.6**	**TP03_0.6**	**QS05**	**----**
			Client sampling date / time	12-Dec-2018 00:00	12-Dec-2018 00:00	12-Dec-2018 00:00	12-Dec-2018 00:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES1837749-001**	**ES1837749-002**	**ES1837749-003**	**ES1837749-004**	**--------**
				Result	Result	Result	Result	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**35.0**	**33.4**	**28.2**	**44.4**	**----**
EG005T: Total Metals by ICP-AES								
Lead	7439-92-1	5	mg/kg	**144**	**324**	**15**	**26**	**----**

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1837749**	Page	: 1 of 4
Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Telephone	: +61 2 8784 8555
Project	: 18084	Date Samples Received	: 14-Dec-2018
Site	: ----	Issue Date	: 17-Dec-2018
Sampler	: GLEN CHISNALL	No. of samples received	: 4
Order number	: 18084	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Moisture Content	1	11	9.09	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / ***Container*** / Client Sample ID(s)	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
TP01_0.6, TP02_0.6, TP03_0.6, QS05	**12-Dec-2018**	**----**	----	----	**15-Dec-2018**	26-Dec-2018	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
TP01_0.6, TP02_0.6, TP03_0.6, QS05	**12-Dec-2018**	**14-Dec-2018**	10-Jun-2019	✓	**14-Dec-2018**	10-Jun-2019	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	1	11	**9.09**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	22	**13.64**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Total Metals by ICP-AES	EG005T	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Total Metals by ICP-AES	EG005T	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Total Metals by ICP-AES	EG005T	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1837749**	Page	: 1 of 3
Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Contact	: Brenda Hong
Address	: PO BOX 2191 BYRON BAY NSW 2481	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 6685 7811	Telephone	: +61 2 8784 8555
Project	: 18084	Date Samples Received	: 14-Dec-2018
Order number	: 18084	Date Analysis Commenced	: 14-Dec-2018
C-O-C number	: ----	Issue Date	: 17-Dec-2018
Sampler	: GLEN CHISNALL		
Site	: ----		
Quote number	: SYBQ/409/18		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
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
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2097465)									
ES1837624-001	Anonymous	EA055: Moisture Content	----	0.1	%	3.7	4.0	7.79	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 2096590)									
ES1837478-001	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	38	36	3.42	No Limit
ES1837478-014	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	9	7	27.5	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 2096592)									
ES1837749-003	TP03_0.6	EG005T: Lead	7439-92-1	5	mg/kg	15	8	58.4	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2096590)								
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	97.3	80	114
EG005T: Total Metals by ICP-AES (QCLot: 2096592)								
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	98.3	80	114

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2096590)							
ES1837478-001	Anonymous	EG005T: Lead	7439-92-1	250 mg/kg	96.2	70	130
EG005T: Total Metals by ICP-AES (QCLot: 2096592)							
ES1837749-003	TP03_0.6	EG005T: Lead	7439-92-1	250 mg/kg	88.9	70	130

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1837749**

Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Contact	: Brenda Hong
Address	: PO BOX 2191 BYRON BAY NSW 2481	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: ben@cavvanba.com	E-mail	: Brenda.Hong@ALSGlobal.com
Telephone	: +61 02 6685 7811	Telephone	: +61 2 8784 8555
Facsimile	: +61 02 6685 5083	Facsimile	: +61-2-8784 8500
Project	: 18084	Page	: 1 of 2
Order number	: 18084	Quote number	: EB2017CAVCON0001 (SYBQ/409/18)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: GLEN CHISNALL		

Dates

Date Samples Received	: 14-Dec-2018 12:30	Issue Date	: 14-Dec-2018
Client Requested Due Date	: 17-Dec-2018	Scheduled Reporting Date	: **17-Dec-2018**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	:	No. of samples received / analysed	: 4 / 4

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Sample QS06 forwarded to Envirolab as per COC.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - EG005T (solids) Total Metals by ICP-AES
ES1837749-001	12-Dec-2018 00:00	TP01_0.6	✓	✓
ES1837749-002	12-Dec-2018 00:00	TP02_0.6	✓	✓
ES1837749-003	12-Dec-2018 00:00	TP03_0.6	✓	✓
ES1837749-004	12-Dec-2018 00:00	QS05	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE		
- A4 - AU Tax Invoice (INV)	Email	inbox@cavvanba.com
BEN WACKETT		
- *AU Certificate of Analysis - NATA (COA)	Email	ben@cavvanba.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ben@cavvanba.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ben@cavvanba.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ben@cavvanba.com
- Chain of Custody (CoC) (COC)	Email	ben@cavvanba.com
- EDI Format - ENMRG (ENMRG)	Email	ben@cavvanba.com
- EDI Format - ESDAT (ESDAT)	Email	ben@cavvanba.com
GLEN CHISNALL		
- *AU Certificate of Analysis - NATA (COA)	Email	glen@cavvanba.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	glen@cavvanba.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	glen@cavvanba.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	glen@cavvanba.com
- Chain of Custody (CoC) (COC)	Email	glen@cavvanba.com
- EDI Format - ENMRG (ENMRG)	Email	glen@cavvanba.com
- EDI Format - ESDAT (ESDAT)	Email	glen@cavvanba.com
ROB MCLELLAND		
- A4 - AU Tax Invoice (INV)	Email	rob@cavvanba.com
ROSS NICOLSON		
- *AU Certificate of Analysis - NATA (COA)	Email	ross@cavvanba.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ross@cavvanba.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ross@cavvanba.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ross@cavvanba.com
- Chain of Custody (CoC) (COC)	Email	ross@cavvanba.com
- EDI Format - ENMRG (ENMRG)	Email	ross@cavvanba.com
- EDI Format - ESDAT (ESDAT)	Email	ross@cavvanba.com

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
☐MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
☐TOWNSVILLE 14-16 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: Cavvanba Consulting	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)**
OFFICE: Byron Bay		☒ Non Standard or urgent TAT (List due date): 24 HR TAT	Custody Seal Intact? Yes No N/A
PROJECT: 18084	**ALS QUOTE NO.:** SYBQ/409/18		Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: 18084		COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 2.0 °C
PROJECT MANAGER: Ben Wackett	**CONTACT PH:** 0488 225 692		Other comment:
SAMPLER: Glen Chisnall	**SAMPLER MOBILE:** 0499401092		
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):**		
Email Reports to (will default to PM if no other addresses are listed): glen@cavvanba.com, ross@cavvanba.com, ben@cavvanba.com			
Email Invoice to (will default to PM if no other addresses are listed): rob@cavvanba.com			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Glen Chisnall			MC
DATE/TIME: 12/12/2018	DATE/TIME:	DATE/TIME:	DATE/TIME: 14/12/18 @ 12:30pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Lead (pb)								
1	TP01_0.6	12/12/2018	Soil	JAR	1	x								
2	TP02_0.6	12/12/2018	Soil	JAR	1	x								
3	TP03_0.6	12/12/2018	Soil	JAR	1	x								
4	QS05	12/12/2018	Soil	JAR	1	x								
	QS06	12/12/2018	Soil	JAR	1	Please forward analysis to envirolab for lead (pb)								
					TOTAL	5								

Subcon / Forward Lab / Split WO
Lab / Analysis: Envirolab
Organised By / Date: QSOS
Relinquished By / Date:
Connote / Courier:
WO No: ES1837749
Attach By PO / Internal Sheet:

TAT

Environmental Division Sydney
Work Order Reference
ES1837749

Telephone : +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpr
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle, SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1837355**	Page	: 1 of 6
Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Contact	: Brenda Hong
Address	: PO BOX 2191 BYRON BAY NSW 2481	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 6685 7811	Telephone	: +61 2 8784 8555
Project	: 18084	Date Samples Received	: 12-Dec-2018 11:00
Order number	: 18084	Date Analysis Commenced	: 12-Dec-2018
C-O-C number	: ----	Issue Date	: 14-Dec-2018 16:50
Sampler	: GLEN CHISNALL		
Site	: ----		
Quote number	: SYBQ/409/18		
No. of samples received	: 22		
No. of samples analysed	: 11		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

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.

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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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP068: Positive results have been confirmed by re-extraction and re-analysis.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP20_0.1	TP21_0.1	TP22_0.1	TP23_0.1	TP24_0.1
			Client sampling date / time	11-Dec-2018 00:00	11-Dec-2018 00:00	11-Dec-2018 00:00	11-Dec-2018 00:00	11-Dec-2018 00:00
Compound	CAS Number	LOR	Unit	ES1837355-001	ES1837355-003	ES1837355-005	ES1837355-007	ES1837355-009
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	21.2	21.2	19.6	33.9	22.6
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	93.5	67.9	95.3	105	85.7
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	66.9	100.0	109	117	111

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP25_0.1	TP26_0.1	TP27_0.1	TP28_0.1	TP29_0.1
			Client sampling date / time	11-Dec-2018 00:00	11-Dec-2018 00:00	11-Dec-2018 00:00	11-Dec-2018 00:00	11-Dec-2018 00:00
Compound	CAS Number	LOR	Unit	ES1837355-011	ES1837355-013	ES1837355-015	ES1837355-017	ES1837355-019
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**26.2**	**18.8**	**27.4**	**4.8**	**11.3**
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	**1.29**	**2.14**
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	**0.56**	**0.19**	<0.05	**3.89**	**3.05**
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	**0.10**
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	**0.13**	**0.06**
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	**0.56**	**0.19**	<0.05	**5.18**	**5.19**
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	**0.10**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**138**	**124**	**103**	**110**	**105**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**110**	**77.8**	**63.8**	**62.3**	**41.1**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP30_0.1	----	----	----	----
			Client sampling date / time	11-Dec-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1837355-021	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**1.7**	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg	**4.68**	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	----	----	----
Dieldrin	60-57-1	0.05	mg/kg	**5.90**	----	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	**0.47**	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	**10.6**	----	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.05	mg/kg	<0.05	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**130**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**90.3**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1837355**	Page	: 1 of 4
Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Telephone	: +61 2 8784 8555
Project	: 18084	Date Samples Received	: 12-Dec-2018
Site	: ----	Issue Date	: 14-Dec-2018
Sampler	: GLEN CHISNALL	No. of samples received	: 22
Order number	: 18084	No. of samples analysed	: 11

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
TP20_0.1, TP21_0.1, TP22_0.1, TP23_0.1, TP24_0.1, TP25_0.1, TP26_0.1, TP27_0.1, TP28_0.1, TP29_0.1, TP30_0.1	**11-Dec-2018**	**----**	----	----	**12-Dec-2018**	25-Dec-2018	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068)							
TP20_0.1, TP21_0.1, TP22_0.1, TP23_0.1, TP24_0.1, TP25_0.1, TP26_0.1, TP27_0.1, TP28_0.1, TP29_0.1, TP30_0.1	**11-Dec-2018**	**13-Dec-2018**	25-Dec-2018	✓	**13-Dec-2018**	22-Jan-2019	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Pesticides by GCMS	EP068	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Pesticides by GCMS	EP068	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Pesticides by GCMS	EP068	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)

Preparation Methods	Method	Matrix	Method Descriptions
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1837355**	Page	: 1 of 5
Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Contact	: Brenda Hong
Address	: PO BOX 2191 BYRON BAY NSW 2481	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 6685 7811	Telephone	: +61 2 8784 8555
Project	: 18084	Date Samples Received	: 12-Dec-2018
Order number	: 18084	Date Analysis Commenced	: 12-Dec-2018
C-O-C number	: ----	Issue Date	: 14-Dec-2018
Sampler	: GLEN CHISNALL		
Site	: ----		
Quote number	: SYBQ/409/18		
No. of samples received	: 22		
No. of samples analysed	: 11		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
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
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2090923)									
ES1837327-003	Anonymous	EA055: Moisture Content	----	0.1	%	9.7	10.3	5.32	0% - 20%
ES1837348-008	Anonymous	EA055: Moisture Content	----	0.1	%	16.4	17.6	6.73	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2090924)									
ES1837355-009	TP24_0.1	EA055: Moisture Content	----	0.1	%	22.6	26.6	16.4	0% - 20%
ES1837362-005	Anonymous	EA055: Moisture Content	----	0.1	%	9.0	9.0	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2090828)									
ES1837355-001	TP20_0.1	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2090828) - continued									
ES1837355-001	TP20_0.1	EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
ES1837355-021	TP30_0.1	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	4.68	4.07	14.0	0% - 20%
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	5.90	5.20	12.7	0% - 20%
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	0.47	0.36	24.8	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 2090828)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	98.2	69	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	94.8	65	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	100.0	67	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	99.6	68	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	95.4	65	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	93.1	67	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	96.4	69	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	92.9	62	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	97.3	63	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	102	66	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	106	64	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	103	66	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	96.7	67	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	105	67	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	107	69	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	104	69	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	107	56	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	108	62	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	98.2	66	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	106	64	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	97.6	54	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 2090828)							
ES1837355-001	TP20_0.1	EP068: gamma-BHC	58-89-9	0.5 mg/kg	81.8	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	83.7	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	105	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	76.8	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP068A: Organochlorine Pesticides (OC) (QCLot: 2090828) - continued							
ES1837355-001	TP20_0.1	EP068: Endrin	72-20-8	2 mg/kg	112	70	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	95.1	70	130

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1837355**

Client	: **CAVVANBA CONSULTING**	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WACKETT	Contact	: Brenda Hong
Address	: PO BOX 2191 BYRON BAY NSW 2481	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: ben@cavvanba.com	E-mail	: Brenda.Hong@ALSGlobal.com
Telephone	: +61 02 6685 7811	Telephone	: +61 2 8784 8555
Facsimile	: +61 02 6685 5083	Facsimile	: +61-2-8784 8500
Project	: 18084	Page	: 1 of 3
Order number	: 18084	Quote number	: EB2017CAVCON0001 (SYBQ/409/18)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: GLEN CHISNALL		

Dates

Date Samples Received	: 12-Dec-2018 11:00	Issue Date	: 12-Dec-2018
Client Requested Due Date	: 13-Dec-2018	Scheduled Reporting Date	: **14-Dec-2018**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 21.1'C
Receipt Detail	:	No. of samples received / analysed	: 22 / 11

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EP068A (solids) Organochlorine Pesticides by GCMS
ES1837355-001	11-Dec-2018 00:00	TP20_0.1		✓	✓
ES1837355-002	11-Dec-2018 00:00	TP20_0.3	✓		
ES1837355-003	11-Dec-2018 00:00	TP21_0.1		✓	✓
ES1837355-004	11-Dec-2018 00:00	TP21_0.3	✓		
ES1837355-005	11-Dec-2018 00:00	TP22_0.1		✓	✓
ES1837355-006	11-Dec-2018 00:00	TP22_0.3	✓		
ES1837355-007	11-Dec-2018 00:00	TP23_0.1		✓	✓
ES1837355-008	11-Dec-2018 00:00	TP23_0.3	✓		
ES1837355-009	11-Dec-2018 00:00	TP24_0.1		✓	✓
ES1837355-010	11-Dec-2018 00:00	TP24_0.3	✓		
ES1837355-011	11-Dec-2018 00:00	TP25_0.1		✓	✓
ES1837355-012	11-Dec-2018 00:00	TP25_0.3	✓		
ES1837355-013	11-Dec-2018 00:00	TP26_0.1		✓	✓
ES1837355-014	11-Dec-2018 00:00	TP26_0.3	✓		
ES1837355-015	11-Dec-2018 00:00	TP27_0.1		✓	✓
ES1837355-016	11-Dec-2018 00:00	TP27_0.3	✓		
ES1837355-017	11-Dec-2018 00:00	TP28_0.1		✓	✓
ES1837355-018	11-Dec-2018 00:00	TP28_0.3	✓		
ES1837355-019	11-Dec-2018 00:00	TP29_0.1		✓	✓
ES1837355-020	11-Dec-2018 00:00	TP29_0.3	✓		
ES1837355-021	11-Dec-2018 00:00	TP30_0.1		✓	✓
ES1837355-022	11-Dec-2018 00:00	TP30_0.3	✓		

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE		
- A4 - AU Tax Invoice (INV)	Email	inbox@cavvanba.com
BEN WACKETT		
- *AU Certificate of Analysis - NATA (COA)	Email	ben@cavvanba.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ben@cavvanba.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ben@cavvanba.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ben@cavvanba.com
- Chain of Custody (CoC) (COC)	Email	ben@cavvanba.com
- EDI Format - ENMRG (ENMRG)	Email	ben@cavvanba.com
- EDI Format - ESDAT (ESDAT)	Email	ben@cavvanba.com
GLEN CHISNALL		
- *AU Certificate of Analysis - NATA (COA)	Email	glen@cavvanba.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	glen@cavvanba.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	glen@cavvanba.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	glen@cavvanba.com
- Chain of Custody (CoC) (COC)	Email	glen@cavvanba.com
- EDI Format - ENMRG (ENMRG)	Email	glen@cavvanba.com
- EDI Format - ESDAT (ESDAT)	Email	glen@cavvanba.com
ROB MCLELLAND		
- A4 - AU Tax Invoice (INV)	Email	rob@cavvanba.com
ROSS NICOLSON		
- *AU Certificate of Analysis - NATA (COA)	Email	ross@cavvanba.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ross@cavvanba.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ross@cavvanba.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ross@cavvanba.com
- Chain of Custody (CoC) (COC)	Email	ross@cavvanba.com
- EDI Format - ENMRG (ENMRG)	Email	ross@cavvanba.com
- EDI Format - ESDAT (ESDAT)	Email	ross@cavvanba.com

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CERTIFICATE OF ANALYSIS 207488

Client Details

Client	Cavvanba
Attention	Glen Chisnall, Ross Nicolson, Ben Wackett
Address	PO Box 2191, Byron Bay, NSW, 2481

Sample Details

Your Reference	**18084**
Number of Samples	2 Soil
Date samples received	06/12/2018
Date completed instructions received	06/12/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	07/12/2018
Date of Issue	07/12/2018

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Results Approved By
Jeremy Faircloth, Organics Supervisor
Leon Ow, Chemist

Authorised By

Jacinta Hurst, Laboratory Manager

Organochlorine Pesticides in soil			
Our Reference		207488-1	207488-2
Your Reference	UNITS	QS02	QS04
Date Sampled		30/11/2018	30/11/2018
Type of sample		Soil	Soil
Date extracted	-	06/12/2018	06/12/2018
Date analysed	-	06/12/2018	06/12/2018
HCB	mg/kg	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	1.1	<0.1
Endrin	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1
Surrogate TCMX	%	96	102

Acid Extractable metals in soil			
Our Reference		207488-1	207488-2
Your Reference	UNITS	QS02	QS04
Date Sampled		30/11/2018	30/11/2018
Type of sample		Soil	Soil
Date prepared	-	06/12/2018	06/12/2018
Date analysed	-	07/12/2018	07/12/2018
Lead	mg/kg	140	57

Moisture			
Our Reference		207488-1	207488-2
Your Reference	UNITS	QS02	QS04
Date Sampled		30/11/2018	30/11/2018
Type of sample		Soil	Soil
Date prepared	-	06/12/2018	06/12/2018
Date analysed	-	07/12/2018	07/12/2018
Moisture	%	23	40

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-12	[NT]
Date extracted	-			06/12/2018	[NT]	[NT]	[NT]	[NT]	06/12/2018	[NT]
Date analysed	-			06/12/2018	[NT]	[NT]	[NT]	[NT]	06/12/2018	[NT]
HCB	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
gamma-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Heptachlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	87	[NT]
delta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	109	[NT]
Dieldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	118	[NT]
Endrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	90	[NT]
pp-DDD	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Endosulfan II	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	85	[NT]
Methoxychlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-005	121	[NT]	[NT]	[NT]	[NT]	119	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-12	[NT]
Date prepared	-			06/12/2018	[NT]	[NT]	[NT]	[NT]	06/12/2018	[NT]
Date analysed	-			07/12/2018	[NT]	[NT]	[NT]	[NT]	07/12/2018	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

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Measurement Uncertainty estimates are available for most tests upon request.

Envirolab Services Pty Ltd
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ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Cavvanba
Attention	Glen Chisnall, Ross Nicolson, Ben Wackett

Sample Login Details

Your reference	18084
Envirolab Reference	207488
Date Sample Received	06/12/2018
Date Instructions Received	06/12/2018
Date Results Expected to be Reported	07/12/2018

Sample Condition

Samples received in appropriate condition for analysis	YES
No. of Samples Provided	2 Soil
Turnaround Time Requested	1 day
Temperature on Receipt (°C)	17.7
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

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Sample ID	Organochlorine Pesticidesin soil	Acid Extractable metalsin soil
QS02	✓	✓
QS04	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info
Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.

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CERTIFICATE OF ANALYSIS 208283

Client Details

Client	Cavvanba
Attention	Glen Chisnall, Ross Nicolson, Ben Wackett
Address	PO Box 2191, Byron Bay, NSW, 2481

Sample Details

Your Reference	**18084**
Number of Samples	1 Soil
Date samples received	17/12/2018
Date completed instructions received	17/12/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	18/12/2018
Date of Issue	18/12/2018

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Long Pham, Team Leader, Metals

Authorised By

Jacinta Hurst, Laboratory Manager

Acid Extractable metals in soil		
Our Reference		208283-1
Your Reference	UNITS	QS06
Date Sampled		12/12/2018
Type of sample		Soil
Date prepared	-	17/12/2018
Date analysed	-	17/12/2018
Lead	mg/kg	6

Moisture		
Our Reference		208283-1
Your Reference	UNITS	QS06
Date Sampled		12/12/2018
Type of sample		Soil
Date prepared	-	17/12/2018
Date analysed	-	18/12/2018
Moisture	%	21

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Date prepared	-			17/12/2018	[NT]	[NT]	[NT]	[NT]	17/12/2018	[NT]
Date analysed	-			17/12/2018	[NT]	[NT]	[NT]	[NT]	17/12/2018	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

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SAMPLE RECEIPT ADVICE

Client Details

Client	Cavvanba
Attention	Glen Chisnall, Ross Nicolson, Ben Wackett

Sample Login Details

Your reference	18084
Envirolab Reference	208283
Date Sample Received	17/12/2018
Date Instructions Received	17/12/2018
Date Results Expected to be Reported	18/12/2018

Sample Condition

Samples received in appropriate condition for analysis	YES
No. of Samples Provided	1 Soil
Turnaround Time Requested	1 day
Temperature on Receipt (°C)	12.7
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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Phone: 02 9910 6200	**Phone: 02 9910 6200**
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Sample ID	Acid Extractable metalsin soil
QS06	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

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