CATTLE DIP EXCLUSION ZONE ASSESSMENT

66 THE SADDLE ROAD, BRUNSWICK HEADS, NSW

PREPARED FOR:

Gulgan Properties Pty Ltd
PO Box 806 Springwood NSW
Via Email: Julie@MI5.net.au

PREPARED BY:

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PO Box 389, Alstonville NSW 2477

18 November 2021

REVISION HISTORY:

Revision	Description	Distributed to	Date
Rev0	Initial draft for Review	Mat Morris	18 Nov 2021

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ABBREVIATIONS

AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
BGS	Below Ground Surface
BH	Bore Hole
BTEXN	Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene
BTOC	Below Top of Casing
C_6-C_{36}	Hydrocarbon chain length fraction
COPC	Contaminants of Potential Concern
CSI Aus	Contaminated Site Investigations Australia
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
GPR	Ground Penetrating Radar
HDPE	High Density Polyethylene
HIL	Health Investigation Level
HSL	Health Screening Level
IP	Interface Probe
LNAPL	Light Non-Aqueous Phase Liquid
MAH	Monocyclic Aromatic Hydrocarbon
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photoionisation Detector
RPD	Relative Percentage Difference
QA	Quality Assurance
QC	Quality Control
RAP	Remediation Action Plan
SAQP	Sampling Analysis and Quality Plan
SVB	Soil Vapour Bore
TDS	Total Dissolved Solid
TOC	Top of Casing
TPH	Total Petroleum Hydrocarbon
TRH	Total Recoverable Hydrocarbon
USCS	Unified Soil Classification System
UST	Underground Storage Tank
VOC	Volatile Organic Compound
XRF	X-Ray Fluorescence Analyser

1 Introduction

Contaminated Site Investigations Australia Pty Ltd (CSI Aus) was commissioned by Mat Morris of Across the Line Consulting, who was acting on behalf of Gulgan Road Property Pty Ltd (the owners) to conduct an additional assessment of the cattle dip portion of the site located at 66 The Saddle Road, Brunswick Heads, New South Wales (the site). A preliminary site investigation (PSI) was conducted by CSI Aus in June 2021 and this report is supplementary to that investigation.

The site is currently used for residential and cattle farming and has one residential dwelling. The site owner (Gulgan Properties Pty Ltd) is interested in a change of land use to business park/light commercial in line with Byron Shire Councils Industrial land strategy.

The PSI report identified some impacted soil around the former cattle dip portion of the site. This assessment was conducted to assess how far from the cattle dip that the contamination had spread to surface soils, and if the proposed business park could be expanded closer to the dip than originally considered.

1.1 Objectives

The objective of the investigation was to assess how far away from the cattle dip that surface soils were impacted by dip chemicals. This objective was not to gather information that would assist in remediation of the dip, but rather to assess the lateral spread in surface soils so that the proposed development could be expanded closer to the dip. This objective was met via a site visit and walk-over, surface soil sampling and subsequent laboratory analysis.

1.2 Scope of Works

The following scope of work was undertaken by CSI Aus, in accordance with NSW EPA guidelines and Byron Shire Councils specifications:

- Desktop assessment of site location, setting and historical use;
- Review of available historical aerial photography and historical title searches;
- Site visit and walk-over (see photos in report);
- Collection of a limited number of soil samples (14 in total) to assess for contaminants of potential concern (COPC);
- Chain of Custody documentation;
- Analysis of samples via a NATA accredited laboratory; and
- Preparation of this investigation report.

2 Site Information

2.1 Site Identification

The site is located approximately 3.5 kilometers east of the township of Mullumbimby, in a predominantly rural area. General site information is presented in Table 1 below, and site layout and setting is presented in Appendix 1, Figures 1 to 3.

Table 1: General Site Information

Table 1 - General Site Information	
Site Address and ID:	66 The Saddle Road, Brunswick Heads, NSW. Lot 2 in DP 1159910
Land Description:	Largely cleared of native vegetation, grass covered rural property for cattle farming and residential use.
Site Area:	Approximately 52.13 hectares
Site Owner:	Gulgan Road Property Pty Ltd
Municipality	Byron Shire Council
Current Zoning:	DM – Deferred Matter and RU2 – Rural Landscape
Current Site Use:	Residential and cattle farming
Proposed Site Use:	Residential and Commercial/Light Industrial
Adjoining Land Uses:	**North:** The Pacific Motorway and the township of Brunswick Heads **East:** The Pacific Motorway and Simpsons Creek, beyond the Pacific Ocean **South:** large rural/residential properties **West:** large rural/residential properties and the township of Mullumbimby

2.2 Regional Setting

The site is located at approximately 6 m to 50m AHD and slopes generally to the south with low lying valley floor landscape across the southern portion of the site. The landscape has low gently undulating to rolling rises and hills on plateau surfaces of the Lismore Basalts geological formation. The area has been extensively cleared during early settlement times and was previously closed-forest (Big Scrub). The nearest surface water body is The Brunswick River located approximately 800m west of the site. The site has a dam located in the southern central portion and at the time of the site visit, there was some saturated low-lying swampy areas. The property is approximately 1.9 kilometers inland from the coast in the northern rivers area of NSW.

2.3 Geology/Soils

A review of the NSW Environment online mapping service, indicates that the site is considered to be low probability for potential acid sulphate soils. Soil mapping for the site identifies the predominant soil type as “Bangalow” which is typical of the region and the underlying Lismore Basalts. This soil landscape covers the central and elevated portion of the site. This soil type can be quite deep (>200cm) and well-draining as it has a

low moisture holding capacity. The crests and side slopes tend to have a shallower soil profile and potential for mottled clay lenses. pH of the soil is typically 4.0 – 5.0.

The site soils were relatively uniform in lithology and consisted of a firm dark reddish-brown clay loam (Krasnozems also known as Ferrosols) consistent with the Environment NSW soil maps.

Shallow soils were high in organic material in the form of grass rootlets. No visual or olfactory indicators of soil contamination were identified from the site visit conducted during June 2021 (Excluding the cattle dip).

A total of eleven primary soil samples and one duplicate were collected from surface soils and submitted for analysis by a NATA accredited laboratory. See Section 6 for summary results and Appendix B for laboratory reports. Sample locations and identification are presented in Appendix 1, Figure 2.

2.4 Site Visit and Observations

A Site visit and walk-over was conducted by Dane Egelton of CSI Aus on 24 May and 30 October 2021. The property has one residential dwelling with associated machinery sheds, livestock sheds, cattle crush, cattle pens and generic farm work areas typical of the region.

The majority of the site had been historically cleared of original native vegetation with only sparse mature vegetation remaining along fence lines and in remnant pockets. The remainder of the site is vacant and grass covered for cattle farming.

Due to the identification of persistent pesticide chemicals in surface soils around the cattle dip during the PSI assessment, some further assessment was required to delineate the lateral spread of chemicals away from the dip trench and drip pen.

PHOTOGRAPH 1
AERIAL VIEW OF THE PORTION OF THE SITE BEING ASSESSED

2.5 Cattle Dip Search Results

The Department of Primary industries online services identified that a former cattle dip is on the site and also the chemicals used during its operation which have been summarised below.

Table 3 – Cattle Dip Chemicals Used During Operation

Chemicals used in dip trench	Date first used
Arsenic	6/58
DDT	1/61
Dioxathion	10/62
Dioxathion Chlormediform	10/73
Dioxathion Ethion Chlormediform	12/75
Amitraz	1/77

The cattle dip trench is capped and disused. The cattle dip area is not proposed for any type of soil disturbance or use, as part of the proposed land use change at this stage. The lateral distribution of dip chemicals in surface soil has been assessed as part of this secondary investigation of the cattle dip area to determine an appropriate exclusion zone.

3 Contaminants of Concern

With the focus of this investigation being the cattle dip area, the following potential sources and type of contamination has been identified.

- Cattle Dip Chemicals (arsenic based or organochlorine and organophosphate persistent pesticides).

3.1 Sampling Rationale

The sampling plan for this investigation was to assess the contamination status of surface soil extending away from the dip area to assess if the proposed development can be extended towards the dip, more so than previously planned.

The data collected during the PSI showed that soils close to the dip were impacted by dip chemicals. This supplementary sampling plan was designed to assess the soil concentrations at a distance of 10 metres from the dip, dip path and drip pad to assess the lateral distribution of contaminants.

Samples have been collected at judgmentally selected locations extending away from the dip infrastructure to make an assessment of an appropriate exclusion zone around the dip.

4 Guidelines & Criteria

The soil analytical results have been assessed with regard to the suitability of the site for the proposed commercial development. The following receptors have been identified as requiring protection:

- Human Health - Future occupants of the commercial development or construction workers during development.
- Maintenance of Modified Ecosystems

The adopted guidelines associated with the protection of each identified receptor are detailed in the following sections. The guidelines have been sourced from the National Environment Protection Measure - Assessment of Site Contamination, as amended in 2013 (NEPM). The NEPM presents a range of guidelines applicable for the protection of receptors associated with land uses.

It is emphasised within the NEPM that the purpose of the guidelines is to provide a basis whereby the chemical profile for a site may be screened to identify conditions that may warrant further consideration of risks to human health or the environment. Therefore, the guidelines do not represent values above which remedial action or other site management measure would be required. Rather, the adopted guidelines provide an appropriate basis for identifying conditions which do not warrant any further consideration.

4.1 Human Health Criteria

The NEPM provides Health Investigation Levels (HILs) and Health Screening Levels (HSLs) for a range of different land uses and soil types. The human health criteria for the site have been adopted for the land use setting 'Commercial/Industrial D'. The selected soil texture 'silt' has been adopted as the site uppermost geology consists predominantly of sandy clay.

TABLE 4 Assessment Criteria				
Element / Compound	Health-based Investigation levels (mg/kg)			
1,2,3	Residential A	Residential B	Recreational C	**Commercial / Industrial D**
Metals				
Arsenic	100	500	300	**3,000**
Organochlorine Pesticides				
DDT+DDE+DDD	240	600	400	**3600**
Aldrin & Dieldrin	6	10	10	**45**
Chlordane	50	90	70	**530**
Endosulfan	270	400	340	**2,000**
Endrin	10	20	20	**100**
Heptachlor	6	10	10	**50**
HCB	10	15	10	**80**
Methoxychlor	300	500	400	**2,500**
Toxaphene	20	30	30	**160**

Notes: Commercial / Industrial D criteria apply to this site for the purpose of change in land use to commercial industrial.

4.2 Data Quality Objectives

Data quality objectives (DQOs) were developed to define the type and quality of data required to achieve the potential soil contamination assessment and, if required, remediation investigation objectives. Development of the DQOs was based on guidelines in the US EPA *Guidance for the Data Quality Objectives Process* (2000), and with reference to relevant guidelines published by the NSW EPA (1997 and 1998), ANZECC 2000, and NEPC 2013, which define minimum data requirements and quality control procedures.

The DQO process comprises a seven-step planning approach. Using this approach, CSI Aus has developed the sampling design for data collection activities that support the objectives of the soil investigation and facilitate decision-making. Table 5 below lists the seven steps and identifies the sections within this report that addresses those steps.

4.3 Data Quality indicators

TABLE 5 Data Quality Objectives Process	
DQO Step	**Discussion and Detailed description**
1. Define the problem	Some cattle dip chemicals have been identified around the former cattle dip and the lateral distribution of these chemicals in surface soil away from the dip is currently unknown.
2. Identify the decision	If identified contaminants are detected in surface soils exceed Tier 1 Risk Assessment Criteria. If the 95% UCL does not exceed Tier 1 Risk Assessment Criteria a human health pathway is considered to not exist.
3. Identify the inputs of the decision	Correct collection of soil samples, sample preservation and use of a NATA accredited laboratory. Surface soil samples collected from locations selected judgmentally across the site. Analysis of soil samples for persistent pesticides Tier 1, and if required Tier 2 Risk Assessment.
4. Define the investigation boundaries	The portion of the site shown in figures 1 and 2 identify the area of the site being investigated
5. Develop a decision rule – analytical approach	Acceptable limits for analytical approach are presented in Data Quality Indicators Table 5 below. The analytical method can achieve detection limits below Tier 1 Risk Assessment Criteria.
6. Specify tolerable limits on decision errors	The limits on decision errors expressed as per cent error for the investigative activities should be no greater than 10 per cent. The aggregate sampling and analysis error may be greater, but error resulting from sampling procedures or the nature of the sample matrix is not quantifiable. By implementing statistically valid sampling plan and adopting the 95% UCL to compare against the Tier 1 / 2 Risk Assessment Criteria we have adopted a 5% level of significance, i.e. adopting a 5% probability we will make the wrong decision (Type 1 / Type 2 error). The data must fall within the range of DQIs to be considered reliable.
7. Optimise the design for obtaining data	Presented in Sections 5 & 6 of this report. All available resources were used to collate historical data. Physical data was obtained by soil sampling.

Quality Assurance and Quality Control QA/QC is tested by review of data against Data Quality Indicators (DQIs) to ensure data precision, accuracy, representativeness, comparability and completeness. A summary of DQIs for samples to be collected as part of the investigation are presented in the table below:

TABLE 6 Data Quality Indicators		
Data Quality Objectives	**Frequency**	**Data Quality Indicator**
Precision		
Duplicate samples	1 per 10 samples	RPD <50%
Accuracy		
Laboratory control samples	1 per day	General analytes recovery of 70–130%
Analysis blank	1 per day	Non-detect
Representativeness		
Samples analysed within specified holding times	Soil and Water Samples	<30 days & <14 days Within specific analyte holding times
Samples transported under COC conditions	N/A	All samples will be transported under chain of custody documentation
Reliability of field measured data	N/A	
Comparability		
Industry best practise for all sample media	All samples, all analytes	Experienced staff
Consistent sampling techniques	All samples all analytes	Same staff and method for the project
Appropriate laboratory reporting limits	All samples, all analytes	-
Completeness		
Appropriate sample design to meet objectives	N/A	-

4.4 Field Data QA/QC Acceptance Criteria

For all samples, field sample QA/QC was be conducted in accordance with AS 4482.1–2005 (Australian Standard, 2005) and consist of the following:

AS 4482.1–2005 (Australian Standard, 2005) indicate an acceptable RPD range of 30-50%, and that the variation can be expected to be higher for organic analysis than inorganics, and for low concentrations of analytes.

Field and Laboratory Quality Control/Quality Assurance (QA/QC) procedures were conducted in accordance with NEPC (2013) and AS 4482.1–2005.

All soil samples were collected in new sample media jars provided by the laboratory and the soil sampling trowel was thoroughly washed between sample locations to prevent cross contamination. Samples were not composited but rather individual samples taken from each location identified in Figure 2.

The acceptance criteria for QA/QC samples are detailed in Table 5 above:

4.5 Laboratory QA/QC

- At least one analysis blank per batch
- Duplicate analysis at a rate of one per batch or one per ten samples, whichever is smaller
- Laboratory Control Samples at a rate of one per batch

The nominated laboratory must comply with the minimum QA procedures documented in Schedule B(3) in NEPC (2013) National Environmental Protection (Assessment of Site Contamination) Measure and include, but not be limited to:

- Matrix spikes, and
- Surrogate Spikes

A review of Envirolabs quality report in Appendix 2 indicates that all QA procedures were satisfactory and no significant outliers were reported.

In the event the acceptance criteria are not met, the variation is taken into consideration and its implications assessed in regard to the context of the investigation.

4.6 Transporting Samples

Before sample transportation, appropriate methods for test specific handling requirements were reviewed. Samples were transported and delivered within documented holding times using ice bricks to preserve samples. To avoid breakages, all glass containers were well cushioned. Samples were transported under chain of custody documentation directly to the laboratory. The original chain-of-custody record accompanied the samples to the analytical laboratory, see Appendix 2.

4.7 Sampling Rationale

The desktop assessment identified the cattle dip area as being likely to have impacted soil. In order to make an assessment of the sites' contamination status and suitability for commercial industrial use, fourteen primary soil samples were collected and analysed.

If these samples detect concentrations of the COPC above the commercial criteria, further investigation would be required.

Surface soil sample locations have been judgementally selected to target the portion of the site previously used as a cattle dip in order to understand the lateral spread away from the cattle dip.

Soil Sample identification is as follows;

- Cattle Dip Samples are identified as CD01 to CD14

See Figures 2 and 3 for sample location and indentification.

5 Conceptual Site Model (CSM)

National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (NEPC 2013) identifies a conceptual site model (CSM) as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The development of a CSM is an essential part of all site assessments.

NEPC (2013) identified the essential elements of a CSM as including:

1. Known and potential sources of contamination and contaminants of concern including the mechanism(s) of contamination;
    - For the portion of the site being investigated, the potential sources of contamination would be cattle farming and agriculture.

2. Potentially affected media (soil, sediment, groundwater, surface water, indoor and ambient air);
    - Affected media is expected to be limited to the surface soils and soils at depth in the vicinity of the cattle dip. The potential for contamination to groundwater, surface water and sediment also exists.

3. Human and ecological receptors;
    - Human receptors would be unlikely given that the proposed future use is commercial/ industrial with limited access to soil.
    - Ecological receptors have limited significance as the site does not have significant contaminating activities close to an ecosystem with sensitive or dependant species.

4. Potential and complete exposure pathways;
    - Direct contact with contaminated soil (complete in the vicinity of the cattle dip).
    - Ingestion or dermal contact with contaminated groundwater/surface water (potential - unlikely)
    - Inhalation of vapours from volatiles in soil or groundwater (incomplete and unlikely).
    - Migration of contaminated groundwater to surface water discharge point (unlikely).

5. Any potential preferential pathways for vapour migration.
    - No known or expected volatile contaminant use onsite therefore this pathway does not exist.

6. Data Gaps
    - The surface soil around the cattle dip portion of the site has been investigated to gain a better understanding of an appropriate exclusion zone distance.

6 Results

The results for soil analysis have been summarised in Table 7 below. Laboratory certificate of analysis and QA/QC assessment is provided at the end of this report in Appendix 2.

TABLE 7 Soil Analytical Results Summary																
Soil Concentrations in mg/kg																
Analyte	Criteria[1]	CD01	CD02	CD03	CD04	CD05	CD06	CD07	CD08	CD09	CD10	CD11	CD12	CD13	CD14	DUP
Arsenic	3,000	5	9	<4	6	<4	<4	<4	<4	<4	7	<4	<4	<4	<4	<4
OCP – Total positive (DDT+DDD+DDE)	3,600	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
OPP	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Notes: 1: NEPC (2013) – Interim Health Investigation Levels. Residential Setting D. (Commercial Industrial).
ND = Non-Detect
NT = Not tested
OCP/OPP = Organochlorine and Organophosphate Pesticides
BOLD TEXT = Exceedance of relevant criteria

6.1 Discussion

As can be seen from the data summary table above, there were no exceedances of the commercial / industrial criteria for metals or pesticides in the samples collected from >10 m away from the dip area. Some pesticides were identified in the three soil samples that were collected within 5 m of the dip as presented in the PSI report (CSI Aus dated July 2021).

CSI Aus considers that with the non-detection of pesticides in the surface soils at a distance of 10 m from the dip, an exclusion zone of 15 m around the dip and holding pens is appropriate for the proposed site use. A physical barrier/fence should be erected around the dip and associated holding pens to prevent access to the area. The remainder of the site, outside of this exclusion area is considered to be suitable for its intended use as a light industrial business park.

6.2 QA/QC Review

CSI Aus has completed a review of the Quality Assurance (QA) steps and Quality Control (QC) results, according to the data quality objectives defined in Section 5.6 and the following documents:

- NEPC, National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council (1999).
- US EPA Guidance on Environmental Data Verification and Data Validation (2002).

This included examining holding times, laboratory accreditation, sample preservation methods, a review of field quality control sample results and a review of laboratory quality control sample results.

Envirolab (Sydney), was the chosen NATA accredited laboratory for soil analysis. The primary sample was identified as CD11 and the duplicate was identified as Dup. As be seen from Table 7 above, all relative percentage difference (RPD) values meet the +/-50% acceptance criteria between the primary and the duplicate sample. All compounds reported the same non-detection of the compounds tested for the primary and duplicate.

Based on the DQI criteria being met, all data collected in this investigation is considered to be representative of site conditions at the time of sampling and satisfactory for use in this assessment.

7 Concluding Comments

CSI Aus has undertaken a surface soil Investigation around the former cattle dip on the site in order understand what is an appropriate exclusion zone around the dip. The PSI report identified some minor concentrations of OCP in surface soils and at 1 m depth within 5 m of the dip. The Non-detection of pesticides and low concentrations of arsenic in the samples collected and analysed, indicates that contamination does not spread very far away from the dip.

Although surface soil samples were not impacted at 10 m distance from the dip, to ensure that future occupants of the site do not have access to the former dip area, and by adopting a conservative approach, an exclusion perimeter should be erected at a distance of approximately >15m from the dip infrastructure.

Additional investigation of the southern portion of the site is *not* considered to be warranted and the land is suitable for commercial and industrial use.

7.1 Unexpected Finds

During the construction phase of development roads, sub-terranean services infrastructure and general earthworks, *if* unexpected finds are uncovered (old pipe work, storage tanks etc) work should cease until an experienced environmental scientist can inspect the material and make an assessment of the significance for site contamination. This would include any human-made structures uncovered during development. This PSI has been limited to desk top study and minor surface soil sampling.

8 Limitations

The findings of this report are based on the objectives and scope of work outlined above. CSI Aus performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment industry. No warranties or guarantees, express or implied, are made. Subject to the scope of work, CSI Aus' 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 process 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 CSI Aus or was not sourced by CSI Aus 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 CSI Aus has used reasonable care to avoid reliance on data and information that is inaccurate or unsuitable, CSI Aus 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 CSI Aus personnel and information provided by the Client. Samples were collected at specific locations and should be considered to be an approximation of the condition of the sample. All conclusions regarding the property area are the professional opinions of CSI Aus personnel involved with the project, subject to the qualifications made above.

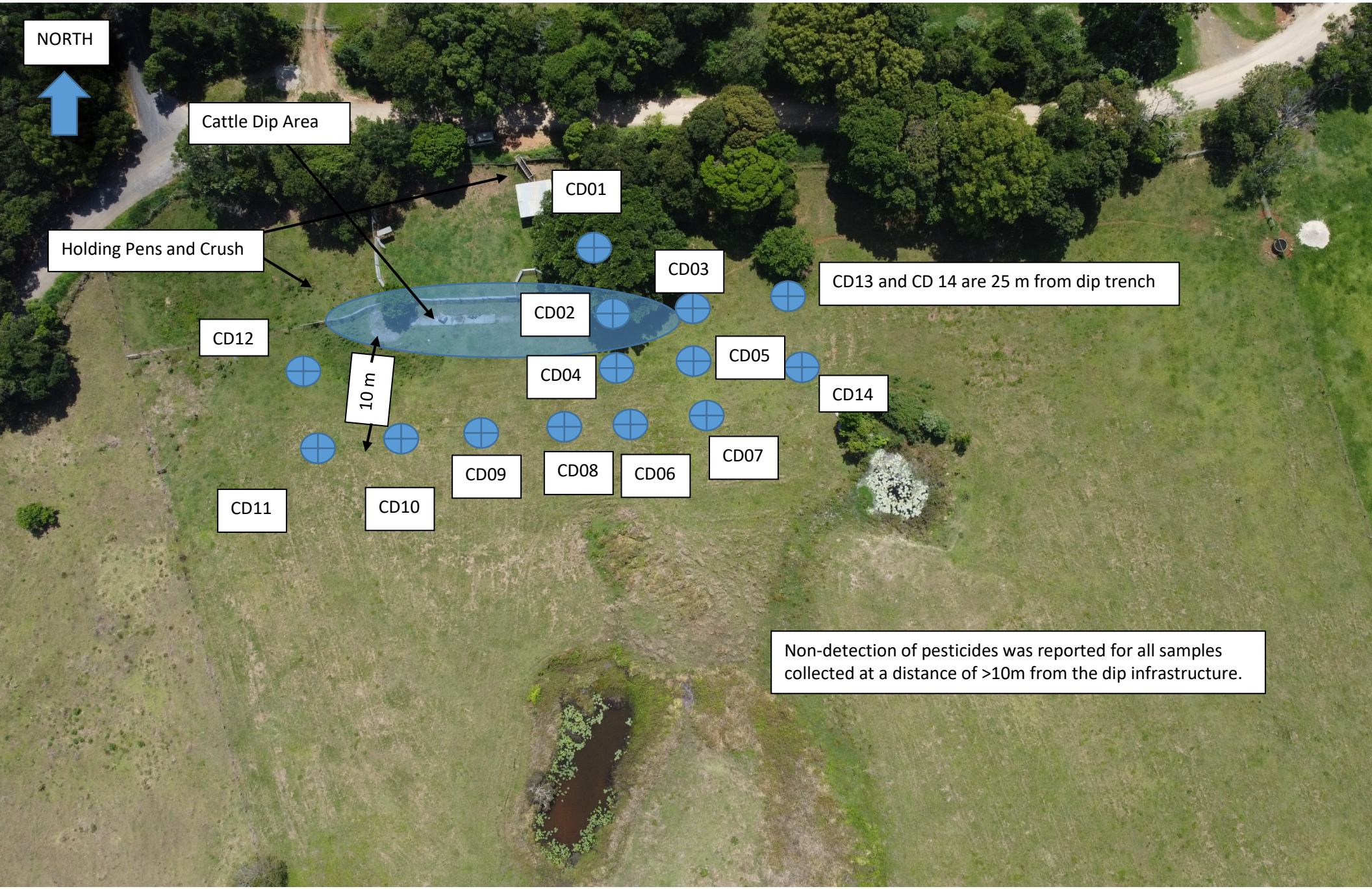
While normal assessments of data reliability have been made, CSI Aus assumes no responsibility or liability for errors in any data obtained from regulatory agencies, information from sources outside of CSI Aus. CSI Aus accepts no responsibility for any loss or damage suffered howsoever arising to any person or corporation who may use or rely on this document for a purpose other than that described above.

APPENDIX 1 – FIGURES

CSI Australia
CONTAMINATED SITE INVESTIGATIONS

Report Number	2138.Rev0
Project ID	Brunswick Heads Cattle Dip
Date	10 November 2021

Figure 1: Site Location and Setting



CSI Australia
CONTAMINATED SITE INVESTIGATIONS

Report Number	2138.Rev0
Project ID	Brunswick Heads
Date	8 Nov 2021

Figure 2: Soil Sample Locations

CSI Australia
CONTAMINATED SITE INVESTIGATIONS

Report Number	2138.Rev0
Project ID	Brunswick Heads
Date	10 November 2021

Figure 3: Previous Cattle Dip Sample Locations

APPENDIX 2 – LABORATORY REPORTS

CHAIN OF CUSTODY & ANALYSIS REQUEST

Page _1___ of _2___

Contaminated Site Investigations Australia Pty Ltd

Company Name:	CSI Australia P/L	Project Name/No:	2138 Brunswick Heads
Address:	933 Wardell Rd Meerschaum Vale	Purchase Order No:	
		Results Required By:	Normal TAT
		Telephone:	0499 859 528
Contact Name:	Dane Egelton	Facsimile:	
		Email Results:	dane@csiaus.com.au

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	ARSENIC	OCP/OPP
CD01	30/10/21	1		✓			✓	✓
CD02	30/10/21	2		✓			✓	✓
CD03	30/10/21	3		✓			✓	✓
CD04	30/10/21	4		✓			✓	✓
CD05	30/10/21	5		✓			✓	✓
CD06	30/10/21	6		✓			✓	✓
CD07	30/10/21	7		✓			✓	✓
CD08	30/10/21	8		✓			✓	✓
CD09	30/10/21	9		✓			✓	✓

ENVIROLAB

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 281780
Date Received: 2/11/21
Time Received: 1430
Received By: JHAN
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished By: Dane Egelton	Date/Time: 1 November 2021 10am	Received By: Aus Post	Date/Time 2/11/21 1430
Relinquished By:	Date/Time:	Received By: TSHAN	Date/Time
Samples Intact: Yes/ No	Temperature: Ambient / Chilled	Sample Cooler Sealed: Yes/ No	Laboratory Quotation No:
	Comments		

CHAIN OF CUSTODY & ANALYSIS REQUEST

Contaminated Site Investigations Australia Pty Ltd

Company Name:	CSI Australia P/L	Project Name/No:	2138 Brunswick Heads
Address:	933 Wardell Rd Meerschaum Vale	Purchase Order No:	
		Results Required By:	Normal TAT
		Telephone:	0499 859 528
Contact Name:	Dane Egelton	Facsimile:	
		Email Results:	dane@csiaus.com.au

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	ARSENIC	OCP/OPP
CD10	30/10/21	10		✓			✓	✓
CD11	30/10/21	11		✓			✓	✓
CD12	30/10/21	12		✓			✓	✓
CD13	30/10/21	13		✓			✓	✓
CD14	30/10/21	14		✓			✓	✓
Dup	30/10/21	15		✓			✓	✓

Relinquished By: Dane Egelton	Date/Time: 1 November 2021 10am	Received By: Aus Post	Date/Time 2/11/21 1430
Relinquished By:	Date/Time:	Received By: TSHAW	Date/Time
Samples Intact: Yes/ No	Temperature: Ambient / Chilled	Sample Cooler Sealed: (Yes)/ No	Laboratory Quotation No:
	Comments		#281780

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	CSI Australia
Attention	Dane Egelton

Sample Login Details

Your reference	2138, Brunswick Heads
Envirolab Reference	281780
Date Sample Received	02/11/2021
Date Instructions Received	02/11/2021
Date Results Expected to be Reported	09/11/2021

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	15 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	23
Cooling Method	None
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:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	Acid Extractable metalsin soil
CD01	✓	✓	✓
CD02	✓	✓	✓
CD03	✓	✓	✓
CD04	✓	✓	✓
CD05	✓	✓	✓
CD06	✓	✓	✓
CD07	✓	✓	✓
CD08	✓	✓	✓
CD09	✓	✓	✓
CD10	✓	✓	✓
CD11	✓	✓	✓
CD12	✓	✓	✓
CD13	✓	✓	✓
CD14	✓	✓	✓
DUP	✓	✓	✓

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.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 281780

Client Details

Client	CSI Australia
Attention	Dane Egelton
Address	PO Box 389, ALSTONVILLE, NSW, 2477

Sample Details

Your Reference	**2138, Brunswick Heads**
Number of Samples	15 Soil
Date samples received	02/11/2021
Date completed instructions received	02/11/2021

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	09/11/2021
Date of Issue	09/11/2021

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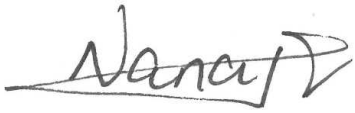
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Dragana Tomas, Senior Chemist
Jaimie Loa-Kum-Cheung, Senior Chemist
Manju Dewendrage, Prep Team Leader

Authorised By



Nancy Zhang, Laboratory Manager

Organochlorine Pesticides in soil						
Our Reference		281780-1	281780-2	281780-3	281780-4	281780-5
Your Reference	UNITS	CD01	CD02	CD03	CD04	CD05
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		30/10/2021	30/10/2021	30/10/2021	30/10/2021	30/10/2021
Date extracted	-	03/11/2021	03/11/2021	03/11/2021	03/11/2021	03/11/2021
Date analysed	-	04/11/2021	04/11/2021	04/11/2021	04/11/2021	04/11/2021
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	95	98	94	95	95

Organochlorine Pesticides in soil						
Our Reference		281780-6	281780-7	281780-8	281780-9	281780-10
Your Reference	UNITS	CD06	CD07	CD08	CD09	CD10
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		30/10/2021	30/10/2021	30/10/2021	30/10/2021	30/10/2021
Date extracted	-	03/11/2021	03/11/2021	03/11/2021	03/11/2021	03/11/2021
Date analysed	-	04/11/2021	04/11/2021	04/11/2021	04/11/2021	04/11/2021
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	93	96	93	95	93

Organochlorine Pesticides in soil						
Our Reference		281780-11	281780-12	281780-13	281780-14	281780-15
Your Reference	UNITS	CD11	CD12	CD13	CD14	DUP
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		30/10/2021	30/10/2021	30/10/2021	30/10/2021	30/10/2021
Date extracted	-	03/11/2021	03/11/2021	03/11/2021	03/11/2021	03/11/2021
Date analysed	-	04/11/2021	04/11/2021	04/11/2021	04/11/2021	04/11/2021
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	93	93	93	90	94

Organophosphorus Pesticides in Soil						
Our Reference		281780-1	281780-2	281780-3	281780-4	281780-5
Your Reference	UNITS	CD01	CD02	CD03	CD04	CD05
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		30/10/2021	30/10/2021	30/10/2021	30/10/2021	30/10/2021
Date extracted	-	03/11/2021	03/11/2021	03/11/2021	03/11/2021	03/11/2021
Date analysed	-	05/11/2021	05/11/2021	05/11/2021	05/11/2021	05/11/2021
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	95	98	94	95	95

Organophosphorus Pesticides in Soil						
Our Reference		281780-6	281780-7	281780-8	281780-9	281780-10
Your Reference	UNITS	CD06	CD07	CD08	CD09	CD10
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		30/10/2021	30/10/2021	30/10/2021	30/10/2021	30/10/2021
Date extracted	-	03/11/2021	03/11/2021	03/11/2021	03/11/2021	03/11/2021
Date analysed	-	05/11/2021	05/11/2021	05/11/2021	05/11/2021	05/11/2021
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	93	96	93	95	93

Organophosphorus Pesticides in Soil						
Our Reference		281780-11	281780-12	281780-13	281780-14	281780-15
Your Reference	UNITS	CD11	CD12	CD13	CD14	DUP
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		30/10/2021	30/10/2021	30/10/2021	30/10/2021	30/10/2021
Date extracted	-	03/11/2021	03/11/2021	03/11/2021	03/11/2021	03/11/2021
Date analysed	-	05/11/2021	05/11/2021	05/11/2021	05/11/2021	05/11/2021
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	93	93	93	90	94

Acid Extractable metals in soil						
Our Reference		281780-1	281780-2	281780-3	281780-4	281780-5
Your Reference	UNITS	CD01	CD02	CD03	CD04	CD05
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		30/10/2021	30/10/2021	30/10/2021	30/10/2021	30/10/2021
Date prepared	-	08/11/2021	08/11/2021	08/11/2021	08/11/2021	08/11/2021
Date analysed	-	08/11/2021	08/11/2021	08/11/2021	08/11/2021	08/11/2021
Arsenic	mg/kg	5	9	<4	6	<4

Acid Extractable metals in soil						
Our Reference		281780-6	281780-7	281780-8	281780-9	281780-10
Your Reference	UNITS	CD06	CD07	CD08	CD09	CD10
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		30/10/2021	30/10/2021	30/10/2021	30/10/2021	30/10/2021
Date prepared	-	08/11/2021	08/11/2021	08/11/2021	08/11/2021	08/11/2021
Date analysed	-	08/11/2021	08/11/2021	08/11/2021	08/11/2021	08/11/2021
Arsenic	mg/kg	<4	<4	<4	<4	7

Acid Extractable metals in soil						
Our Reference		281780-11	281780-12	281780-13	281780-14	281780-15
Your Reference	UNITS	CD11	CD12	CD13	CD14	DUP
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		30/10/2021	30/10/2021	30/10/2021	30/10/2021	30/10/2021
Date prepared	-	08/11/2021	08/11/2021	08/11/2021	08/11/2021	08/11/2021
Date analysed	-	08/11/2021	08/11/2021	08/11/2021	08/11/2021	08/11/2021
Arsenic	mg/kg	<4	<4	<4	<4	<4

Moisture						
Our Reference		281780-1	281780-2	281780-3	281780-4	281780-5
Your Reference	UNITS	CD01	CD02	CD03	CD04	CD05
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		30/10/2021	30/10/2021	30/10/2021	30/10/2021	30/10/2021
Date prepared	-	03/11/2021	03/11/2021	03/11/2021	03/11/2021	03/11/2021
Date analysed	-	04/11/2021	04/11/2021	04/11/2021	04/11/2021	04/11/2021
Moisture	%	30	33	39	31	37

Moisture						
Our Reference		281780-6	281780-7	281780-8	281780-9	281780-10
Your Reference	UNITS	CD06	CD07	CD08	CD09	CD10
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		30/10/2021	30/10/2021	30/10/2021	30/10/2021	30/10/2021
Date prepared	-	03/11/2021	03/11/2021	03/11/2021	03/11/2021	03/11/2021
Date analysed	-	04/11/2021	04/11/2021	04/11/2021	04/11/2021	04/11/2021
Moisture	%	34	38	38	35	33

Moisture						
Our Reference		281780-11	281780-12	281780-13	281780-14	281780-15
Your Reference	UNITS	CD11	CD12	CD13	CD14	DUP
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		30/10/2021	30/10/2021	30/10/2021	30/10/2021	30/10/2021
Date prepared	-	03/11/2021	03/11/2021	03/11/2021	03/11/2021	03/11/2021
Date analysed	-	04/11/2021	04/11/2021	04/11/2021	04/11/2021	04/11/2021
Moisture	%	39	38	30	33	31

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-022	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. 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-4	281780-2
Date extracted	-			03/11/2021	1	03/11/2021	03/11/2021		03/11/2021	03/11/2021
Date analysed	-			05/11/2021	1	04/11/2021	04/11/2021		05/11/2021	05/11/2021
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	90
HCB	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	121	93
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	77	79
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	93	100
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	92	95
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	92	101
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	98	105
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	80	88
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	82	92
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	98
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	94	1	95	97	2	93	94

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	03/11/2021	03/11/2021		[NT]	[NT]
Date analysed	-			[NT]	11	04/11/2021	04/11/2021		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	11	93	88	6	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	281780-2
Date extracted	-			03/11/2021	1	03/11/2021	03/11/2021		03/11/2021	03/11/2021
Date analysed	-			05/11/2021	1	05/11/2021	05/11/2021		05/11/2021	05/11/2021
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	70	76
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	85	95
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	63	79
Malathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	108	117
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	98
Parathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	66	80
Bromophos-ethyl	mg/kg	0.1	Org-022	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	74	87
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	94	1	95	97	2	93	94

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	03/11/2021	03/11/2021		[NT]	[NT]
Date analysed	-			[NT]	11	05/11/2021	05/11/2021		[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	11	93	88	6	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	[NT]
Date prepared	-			08/11/2021	1	08/11/2021	08/11/2021		08/11/2021	[NT]
Date analysed	-			08/11/2021	1	08/11/2021	08/11/2021		08/11/2021	[NT]
Arsenic	mg/kg	4	Metals-020	<4	1	5	<4	22	104	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	08/11/2021	08/11/2021		[NT]	[NT]
Date analysed	-			[NT]	11	08/11/2021	08/11/2021		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	11	<4	<4	0	[NT]	[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.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

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 (not SPOCAS); 60-140% for organics/SPOCAS (+/-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.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.