Preliminary contamination investigation
230 Tilga Street, Canowindra NSW

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Summary report

Introduction

A twenty-two lot residential subdivision is proposed for 230 Tilga Street, Canowindra NSW. The proposed lots range in size from 700m^2 to 1170.8m^2. The site has an agricultural land-use history of grazing and cultivation and potential exists for contaminating activities to have been undertaken on-site. A preliminary contamination assessment of the site is required to determine the suitability for residential land-use.

Objectives of investigation

The objective of the investigation was to determine suitability of the site for the proposed land-use.

Scope

The scope was to identify past potentially contaminating activities, identify potential contamination types, discuss the site condition, provide an assessment of site contamination and assess the need for remediation or suitability for residential land-use. The scope of works included site inspection, review of available information, soil sampling and analysis.

Summary

An inspection of the site was made on the 23 February 2023. The site is currently vacant pasture and has an agricultural land-use history of grazing and cultivation.

Vegetation on the site was unmaintained and dominated by wheat grass, Phalaris, prickly lettuce, fleabane and skeleton weed. Juncus spp. were associated with a depression in the central western section.

No reported mining occurrences were evident on the site. No evidence of orchards, sheep dips, mixing sheds or contaminating industrial activities are known to have been located on the site from the review of site history or site walkover. The use of agricultural pesticides over the area in the past is expected to be low.

The soil sampling program did not detect elevated levels of analysed heavy metals or OCP. The levels of BTEXN, PAH and TRH were below the adopted thresholds in the sample collected from the area of environmental concern. The levels of all substances evaluated were below the adopted thresholds for residential land-use with access to soil.

Recommendations

The site is suitable for residential land-use.

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1. Introduction

A twenty-two lot residential subdivision is proposed for 230 Tilga Street, Canowindra NSW. The proposed lots range in size from 700m^2 to 1170.8m^2. The site has an agricultural land-use history of grazing and cultivation and potential exists for contaminating activities to have been undertaken on-site. A preliminary contamination assessment of the site is required to determine the suitability for residential land-use.

2. Objectives

The objective of the investigation was to determine suitability of the site for the proposed land-use.

3. Scope of work

Envirowest Consulting Pty Ltd was commissioned by Samantha Dickinson to undertake a preliminary contamination assessment, in accordance with the contaminated land management planning guidelines, from the *Contaminated Land Management Act 1997* and the *State Environmental Planning Policy (Resilience and Hazards) 2021*, for 230 Tilga Street, Canowindra NSW. The scope of works included site inspection, review of available information, soil sampling and analysis.

4. Site identification

Address	230 Tilga Street Canowindra NSW 2804
Deposited plans	Lot 1292 DP1247534
Latitude and longitude	-33.55^o 148.67^o
Geographic coordinates	55H 654845.22 m E 6286446.65m S
Client	Samantha Dickinson
Owner	Samantha Dickinson
Current occupier	Vacant
Area	Approximately 2ha
Local government area	Cabonne Shire Council
Current zoning	R5: Large Lot Residential (Cabonne LEP 2012)
Trigger for investigation	Change in land-use
Locality map	Figure 1

5. Site history

5.1 Land-uses

The site is currently vacant pasture and has an agricultural land-use history of grazing and cultivation.

5.2 Summary of council records
None known.

5.3 EPA databases
The site is not listed on the NSW EPA register of contaminated sites (16 February 2023) or sites notified to the EPA (10 January 2023).

No sites listed on NSW EPA register of contaminated sites or sites notified to the EPA have been identified within 1km of the site.

5.4 SafeWork NSW Storage of hazardous chemicals
A search of the SafeWork dangerous goods database was not considered necessary as no use of fuels was indicated from the searches and past land-uses.

5.5 POEO public register
The site is not listed on the NSW EPA POEO public register.

One licence listed on the NSW EPA POEO public register has been identified within 1km of the site. Licence number 1750 has been issued to Cabonne Shire Council for sewage treatment at the Canowindra sewage treatment plant located at Wenz Lane. The licence includes the utilisation of the Canowindra Golf course, showgrounds and Canowindra Oval as effluent re-use areas. The effluent re-use areas are located approximately 100m south east and 400m south of the site. Effluent reuse activities are not expected to be impacting on the contamination status of the site. The sewage treatment plant is located outside the 1km buffer.

5.6 Other government agency databases
The site is not listed on the following databases:

- National Waste Management Facilities database
- National Liquid Fuel Facilities database
- The NSW Government PFAS Investigation Program
- Defence PFAS Investigation Program
- Defence PFAS Management Program
- Airservices Australia National PFAS Management Program

No sites listed on government agency databases have been identified within 1km of the investigation area.

5.7 Sources of information
Site inspection 23 February 2023 by Envirowest Consulting Pty Ltd
NSW EPA records of public notices under the CLM Act 1997
Soil and geological maps
Historical aerial photographs (1964, 1973, 1982, 1989, 1993, 1998, 2005, 2011, 2014, 2015, 2016, 2018, 2020, 2021) including NSW Government historical imagery and Google Earth.
Cabonne LEP 2012

5.8 Review of historic aerial photographs, maps and plans

Year	Visual observations on site	Surrounding area
1964	The site is cleared agricultural land. No infrastructure and trees are located on the site.	Cropping is occurring to the west. Dwellings are sparsely located to the east and north. Cleared land is located to the south. The cemetery is located to the north east and showground to the south east. Longs Corner Road is evident to the south and Tilga Street evident to the west.
1973	The site appears the be fenced into four even paddocks.	Additional rural-residential dwellings are located to the east.
1982	The southern section of the site appears to be cultivated.	No obvious changes are evident in the surrounding area.
1989	The southern and northern sections appear to be managed separately. The site is potentially fenced in three paddocks.	Rural-residential dwellings have been constructed to the west.
1993	A significant bare area is located in the central eastern section. The remainder of the site is well vegetated.	Ground disturbance is evident north east of the site.
1998	The site appears dry due to climatic stress.	The surrounding area appears dry due to climatic stress.
2005	The southern and northern sections appear to be managed separately.	No obvious changes are evident in the surrounding area.
2011	The site is fenced in two paddocks (north and south)	Infrastructure has been developed to the north.
2014	Two significant areas of disturbance are located in the central eastern section.	No obvious changes are evident in the surrounding area.
2015	Variability in surface conditions is evident in the central eastern section.	No obvious changes are evident in the surrounding area.
2016	The site is well vegetated	A residential dwelling has been constructed to the south.
2018	An entrance has been constructed in the south west. A track appears to follow the central fence line from east to west. Variation in surface condition remains in central eastern section. A small bare area is evident in the central section.	A dwelling to the south is under construction
2020	Poor vegetation growth is evident in the north eastern section.	No obvious changes are evident in the surrounding area.
2021	The eastern section of the site is bare. Vegetation in the northern paddock is dry. The eastern section appears cultivated (Oct). The southern section appears slashed.	No obvious changes are evident in the surrounding area.

5.8.2 Topographic maps

The Canowindra (1978) map produced from 1975 aerial photography and 1977 field revision depicts a building in the south west of the site the remainder of the site is vacant.

The current topographic map (Six Maps) depicts the site as vacant.

5.8.3 Historical parish maps

The site carries the notation 13th Feb 91 and is marked reserve from lease and sale on the 1892 historical parish map. The locality carries the notation Canowindra Gold Field Proclaimed Mar 79.

The 1899 map references the site on the *Vide Village Map.*

The 1909 to 1915 historical maps indicate the site was part of portion 129. The portion and portions to the north and south carries the notation *Under miners right.* The 1923 to 1933 historical parish maps indicate the site in within an urban release area. No owner details are given.

No owner details listed for portion 129 on the 1891 town map of Canowindra. The 1921 to 1967 Town map of Canowindra indicates portion 129 is owned by Joseph Lord

5.8.4 Title deeds

Date of Acquisition	Registered Proprietor(s) & Occupations where available
02.09.1913	Joseph Lord (Retired Farmer)
17.10.1925	Public Trustee
17.10.1925	Herbert Keyte (Labourer)
25.02.1928	Amy Grace Keyte (Married Woman)
03.10.1947	William Henry Lawson (Labourer)
04.06.1951	Arthur Thomas Hughes (Refreshment Room Proprietor)
25.03.1961	John Bernard Marsh (Labourer)and June Francis Marsh (Married Woman)
25.01.1968	Ronald Leslie Thomas (Labourer) and Norma Eileen Thomas (Married Woman)
10.10.1974	Donald Frederick Lawrence (Water Operator) and Gweneth Joy Lawrence (Married Woman)
22.10.1979	Francis Frederick Read (Labourer) and Lilliam Maureen Read (Married Woman)
24.09.2003	Mervyn Douglas Stenhouse and Anne Maree Stenhouse
05.03.2019	Brock Anthony White and Annah Kate White
21.12.2021	Jindalee Constructions Pty Ltd

5.9 Heritage Listings

The site is not listed on the following government heritage databases:

- Commonwealth Heritage List
- National Heritage List
- State Heritage List
- Local Environmental Plan (Cabonne LEP 2012)

The site is identified as being within 1km of three general items listed on the Cabonne LEP (2012). The sites of local significance are the Railway Station, goods shed, signals tanks and yard (I26), Morris Park (I48) and Canowindra Cemetery (I47). The historical site is not expected to have impacted on the contamination status of the site.

No items listed on the Commonwealth Heritage List, National Heritage List or State Heritage List are located within 1km of the site.

5.10 Chronological list of site uses

The site is cleared agricultural land historically used for grazing and cultivation. No reported mining occurrences were evident on the site. No orchard, sheep dips, mixing shed, underground storage tanks

(UST) or contaminating industrial activities have been identified as occurring on the site from the site history.

5.11 Buildings and infrastructure

No buildings are located on the site. A fence line is present traversing the site from east to west. A bore is located on the south west of the site. No infrastructure has historically been located on the site from review of aerial imagery.

5.12 Spills, losses or discharges

No records for spills or losses on the site were available. No records for discharges to land, water or air were available.

5.13 Relevant complaint history

Nil

5.14 Previous investigations

No previous contamination investigations are known to have been undertaken.

A site classification was undertaken by Envirowest Consulting Pty Ltd in 2021. No fill was identified in the boreholes constructed.

5.15 Historical neighbouring land-use

North –Rural-residential, rural
South – Rural, residential
East – Rural-residential, rural
West – Tilga Street, rural

Historical neighbouring land-uses may have resulted in application of pesticides and contaminants to the site by spray drift in the general management of crops.

5.16 Contaminant sources

Potential exists for contaminating activities to have been undertaken on-site which may impact on the suitability for the proposed land-use. Agricultural land-use may have resulted in application of organochlorine pesticides in the routine management of pastures. Fertilisers applied may contain heavy metals contaminants. No bio solids are known to have been applied to the site. One area of potential environmental concern was identified in the central eastern section of the site. The area contained a foreign materials stockpile and has historically been associated with soil disturbance and variability is surface conditions.

The site is within the *Canowindra Gold Field.* No reported mining occurrences were evident on the site from review of the Cowra 1: 100,000 geological map.

5.17 Contaminants of concern

Based on historical activities and site inspection the potential contaminants of concern associated with the site are:

- Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc)
- Organochlorine pesticides (OCP)

Based on historical activities and site inspection the contaminants of concern associated with the variation, foreign materials stockpile and soil disturbance are:

- Heavy metals (arsenic, cadmium, chromium, copper, nickel, lead, zinc and mercury)
- Total recoverable hydrocarbons (TRH)

- Benzene, toluene, ethylbenzene, xylenes, naphthalene (BTEXN)
- Polycyclic aromatic hydrocarbons (PAH)
- Organochlorine pesticides (OCP)

5.18 Integrity assessment
The site history was obtained from a site inspection and history review. The information is consistent with the current site condition and to the best of the assessor's knowledge is accurate.

6. Site condition and surrounding environment
6.1 Site inspection
The site was inspected by an environmental scientist of Envirowest Consulting Pty Ltd on 23 February 2023.

6.2 Land-use
The site is in a rural-residential setting. The site was vacant pasture on the day of inspection.

6.3 Current neighbouring land-use
North – Rural-residential
South – Longs Corner Road, rural-residential
East – Rural-residential
West – Tilga Street, rural-residential, grazing

Current neighbouring land-uses are not expected to be impacting the contamination status of the site.

6.4 Surface cover and vegetation
Surface cover was generally 100% and dominated by pastural grasses, wheat grass, Phalaris, prickly lettuce, fleabane, skeleton weed, white clover, scotch thistle, black thistle, Paterson's curse and geranium spp. Vegetation in the north eastern section was showing signs of die off.

Juncus spp. were associated with a depression in the central western section.

6.5 Evidence of visible contamination
One area of potential environmental concern was identified on-site. A small foreign materials stockpile was identified on the central east of the site. Significant disturbance and variability in surface conditions was identified in the same location in the 2014, 2015 and 2018 aerial imagery. The stockpile contained timber, building materials and a chair. A discrete sample was collected for analysis.

No other signs of visible contamination such as discolouration or staining was identified on the surface of the site. No signs of settlement or subsidence was identified on the site.

6.6 Topography
The site is located on a mid-slope to depression, with a slope of 2 to 4% to the west. Elevation is 322m above sea level.

6.7 Soils and geology
The site is within the Canowindra Soil Landscape. Soil in the Canowindra Soil Landscape consists of non-calcic brown soils and yellow solodic soil. Non-calcic brown soils comprise of dark reddish brown to brown loamy sand, sandy loam, fine sandy loam, loam or loam, fine sandy over a reddish brown loamy sand, sandy loam or sandy clay loam. Subsoil is comprised of reddish brown sandy clay loam to light medium clay.

The geological unit is undifferentiated, Canowindra Porpyry, alluvial and Kenyu Formation. Parent materials consist of *in situ* materials or colluvium-alluvial deposits of quartz felspar porphyry with sparse garnets, shale, limestone and alluvium (eSPADE 2023).

6.8 Water

6.8.1 Surface water

Surface water on the site is expected to mostly infiltrate. Any excess water flows will follow topography on-site to a depression located in the central west section of the site. The local stormwater system is located along Tilga Street.

6.8.2 Groundwater

A bore located in the south western corner of the site was not identified on the Water NSW website (2023). No information was available for the bore.

Six registered water abstraction bores were identified within a 500m radius of the site on the NSW Government Water NSW website (2023). The bores for which information was available have an unconsolidated water bearing zones between 12.2m to 13.7m and 60m to 69m in clay and granite. Standing water levels range from 7.6m to 15m.

Groundwater No.	Date drilled	Location	SWL (m)	Use	Status
GW703771	31/03/2003	250m S	-	Domestic	Supply obtained
GW053694	01/06/1981	250m S	-	Irrigation	-
GW702162	08/01/2004	250m NW	-	Stock, domestic	Supply obtained
GW058947	01/03/1983	350m S	-	Domestic	Current, supply obtained
GW701983	20/01/2004	350m NW	15	Stock, domestic	Supply obtained
GW067173	-	400m S	7.6	Stock, domestic	Current, supply obtained

6.9 Evidence of possible naturally occurring contaminants

No natural sources of PAH were identified.

The site is not mapped as an acid sulphate soil risk (NSW SEED Portal accessed 17 February 2023).

The site is not mapped as a geological unit with asbestos potential (NSW Dept. Planning & Environment accessed 17 February 2023).

6.10 Environmentally sensitive features or habitats

The site is located in a developing rural-residential area of Canowindra. No environmentally sensitive features or habitat are located in the site or surrounding area.

6.11 Integrity assessment

The site history was obtained from a site inspection and history review. The information is consistent with the current site condition and to the best of the assessor's knowledge is accurate.

7. Conceptual site model

7.1 Contaminant sources

Potential exists for contaminating activities to have been undertaken on-site which may impact on the suitability for the proposed land-use. Agricultural land-use may have resulted in application of organochlorine pesticides in the routine management of pastures. Fertilisers applied may contain heavy metals contaminants.

7.2 Contaminants of concern

Based on historical activities and site inspection the potential contaminants of concern associated with the site are:

- Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc)
- Organochlorine pesticides (OCP)

Based on historical activities and site inspection the contaminants of concern associated with the variation, foreign materials stockpile and soil disturbance are:

- Heavy metals (arsenic, cadmium, chromium, copper, nickel, lead, zinc and mercury)
- Total recoverable hydrocarbons (TRH)
- Benzene, toluene, ethylbenzene, xylenes, naphthalene (BTEXN)
- Polycyclic aromatic hydrocarbons (PAH)
- Organochlorine pesticides (OCP)

7.3 Potential receptors

The proposed land-use of the site is residential. A twenty-two lot residential subdivision is proposed for the site. Each proposed lot is expected to include a residential dwelling and hard surface areas comprising driveways and landscaped areas. The site has historically been used for grazing and cropping.

Human receptors include:

- Residents (adults and children)
- Visitors (adults and children)
- Site workers
- Construction workers
- Intrusive maintenance workers

Ecological receptors include

- Flora and fauna on the site and adjacent to the site
- Aquatic flora and fauna receptors off-site

7.4 Exposure pathways

Pathways for exposure to contaminants are:

- Dermal contact following soil disturbance
- Ingestion and inhalation after soil disturbance
- Surface water and sediment runoff into waterways
- Leaching of contaminants into the groundwater
- Direct contact of flora and fauna with the soil

7.5 Source receptor linkages

Potential source pathway receptor linkages are identified to enable evaluation of any adverse impact on human health or ecology.

Residential land-use is proposed on-site and human receptors to the investigation area are likely. Proposed users of the site may have a risk of exposure if contaminants are present and the soil is disturbed. Residents, visitors, construction workers and intrusive maintenance workers to the site may potentially be receptors to soil contaminants through direct contact to soil which includes ingestion and dermal contact.

Inhalation may occur as a result of soil disturbance and dust production. Major soil disturbance before and after the development of the site is considered unlikely. Soil disturbance during construction and development of the site is expected to be accompanied by erosion control measures which will reduce the incidence of dust production.

Vegetation on the site may be potential receptors to soil contamination through direct uptake of contaminants.

The source receptor linkage to aquatic organisms and ecosystems is considered incomplete as the site is well vegetated and movement of sediments from the site will be unlikely. During construction work it is expected that erosion control measures will be implemented and movement of sediment off-site will be unlikely. Following development of the site it is expected that vegetation will be re-established or hard surfaces constructed which will control sediment movement from the site. The nearest waterway to the site is an unnamed drainage line located approximately 500m south east of the site. The drainage line is considered to be a moderately disturbed ecosystem.

Groundwater is not identified as a potential receptor to contamination. Contaminants are expected to originate from the soil surface. A clay subsoil layer restricts infiltration of water through the soil profile.

Source/contaminant	Transport mechanisms	Potential exposure pathways	Potential receptors
☒ Pesticides and fertilisers Heavy metals OCP	☒Wind ☐Sedimentation ☐Groundwater ☐Surface water ☐Volatilisation	☒Direct contact (ingestion and absorption) (human and environment) ☒Inhalation ☐Runoff ☐Leaching	☒Residents (adults and children) ☒Visitors (adults and children) ☒Construction workers ☒Intrusive maintenance workers ☒Vegeatation ☐Aquatic flora and fauna
☒ Foreign materials stockpile, soil disturbance and variability Heavy metals TRH BTEXN PAH OCP	☒Wind ☐Sedimentation ☐Groundwater ☐Surface water ☐Volatilisation	☒Direct contact (ingestion and absorption) (human and environment) ☒Inhalation ☐Runoff ☐Leaching	☒Residents (adults and children) ☒Visitors (adults and children) ☒Construction workers ☒Intrusive maintenance workers ☒Vegetation ☐Aquatic flora and fauna

☒Potential, ☐unknown/unlikely

8. Data quality objectives (DQO)

8.1 State the problem

Residential land-use is proposed for the site. The site is cleared agricultural land used for grazing and intermittent cultivation which may have resulted in the application of pesticides, fertilisers and contaminating activities to the site during the general management of pasture.

8.2 Identify the decision

The land-use proposed is residential and the levels of contaminants should be suitable for residential based criteria and less than the thresholds listed in Section 11. The decision problem is, do the levels of potential contaminants exceed the assessment criteria and thresholds listed in Section 11.

8.3 Identify the inputs decision

Investigations of the site is required to identify any potential contaminants from the historical land-use. The inputs include:

- Field observation of aesthetic impacts of visible contamination
- Soil samples across the site
- Inspection of the condition of the site

8.4 Define the boundaries of the study

The investigation area is 230 Tilga Street, Canowindra.

8.5 Develop a decision rule

Data collected for the purpose of the contamination investigation must be sufficiently accurate in representativeness. The accuracy will be assessed by determination of:

- Current and historical land-use to describe potential contamination sources
- Site setting, potential receptors and pathways
- Soil samples to characterise the extent of contamination and analysis in accredited laboratories

The adopted criteria is the suitability for residential land-use including the health and ecological investigation levels listed in Schedule B1 of the NEPM (1999) *Guideline on Investigation Levels for Soil and Groundwater*. The data must be sufficiently representative to identify the extent of contamination.

The decision rule for the investigation is:

- If the contamination levels were less than the adopted levels, are potential risks low and acceptable
- If the levels were equal or greater that the investigations level, will exceedances affect the suitability for the proposed land-use

8.6 Specify acceptable limits on the decision errors

A decision error in the context of the decision rule would lead to either underestimation or over estimation of the risk level associated with the site. Decision errors include:

- Limitations in available site history information
- Constraints associated with the ability to access certain areas of a site
- Errors in the sampling plan
- Data quality including comparability, representativeness and accuracy for data collection and analysis
- Analytic data validation

Where sample analysis is undertaken the quality of the data collected will be assessed on a range of factors including:

- Documentation and data completeness
- Reference to relevant guidance documents
- Consistency of methodology
- Data quality including comparability, representativeness and accuracy for data collection and analysis
- Analytical data validation
- Satisfactory acceptance limits are the 95% upper confidence limit of samples collected is less than the threshold levels, the standard deviation of results should be less than 50% of the relevant investigation or screening level and the levels are less than 250% the relevant thresholds.

8.7 Optimize the design for obtaining data

The methodology presented in Section 9 presents a framework for the contamination investigation which has been designed to meet the scope objectives and the nominated DQO.

Optimisation of the data collection process will be informed by a review of historical information and observations made at the time of site inspection. The sampling will be used to inform the potential contamination status of the site. The scope of work will be undertaken to a level of accuracy and confidence in the ASC NEPM (NEPC 1999).

Analytes included heavy metals (arsenic, cadmium, total chromium, copper, lead, mercury, nickel, zinc) and organochlorine pesticides.

A potential area of environmental concern located at the foreign materials stockpile was analysed for heavy metals, mercury, TRH (C6-C40), BTEXN and OCP.

9. Sampling analysis plan and sampling methodology

9.1 Sampling strategy

9.1.1 Sampling design

Visual inspections were undertaken over the site for indicators of contamination.

A systematic sampling pattern was adopted to assess the probable location of contamination. Uniform management practices are expected to have occurred across the site. The site has been historically managed as part of a single unit and is expected to have been treated similarly.

A judgemental sampling pattern was adopted to assess potential areas of environmental concern.

9.1.2 Sampling locations

Discrete soil samples were collected from the site on an approximate 36m grid pattern. Four selected discrete samples were analysed for OCP. One additional sample was collected from an area of potential environmental concern. The sampling locations are described in Figure 2.

9.1.3 Sampling density

The sampling density can detect a potential hot spot across the site with a radius of 21m at a 95% level of confidence. The samples taken are expected to be representative of the site as a whole. The sampling frequency is less than the minimum recommended by EPA (2022) but expected to be sufficient due to uniform management of the site and the preliminary nature of the investigation. Sampling density of areas of environmental concern is sufficient to enable preliminary characterisation.

9.1.4 Sampling depth

Any heavy metals or persistent pesticides present are generally immobile and expected to be contained in the 0 to 100mm soil depth which was the target sampling depth as minimal soil disturbance has occurred.

Samples from potential areas of environmental concern were collected from the 50 to 100mm soil layer to enable assessment of volatile hydrocarbons. Potential contaminants are expected to be top down.

9.2 Analytes

Discrete soil samples collected from the site was evaluated for arsenic, cadmium, total chromium, copper, lead, mercury, nickel and zinc. Selected discrete soil samples collected were evaluated for OCP (Table 1). Heavy metals and OCP were identified as the contaminants of concern potentially present as a result of routine pasture management.

A discrete soil sample collected from an area of environmental concern was analysed for arsenic, cadmium, chromium, copper, lead, nickel, zinc, mercury, TRH (C6-C40), BTEXN, PAH and OCP.

9.3 Sampling methods

Soil samples were taken using a stainless-steel hand shovel. Soil was taken at each individual sampling location below the vegetated and detrital layer. Discrete soil samples were transferred directly to a solvent rinsed glass jar with a Teflon lid for chemical analysis.

Tools were decontaminated between sampling locations to prevent cross contamination by rinsing with clean water and drying or brushing clean with a clean towel. Soil sampling protocols are outlined in Appendix 1.

10. Quality assurance and quality control

10.1 Sampling design

The sampling program is intended to provide data as to the presence and levels of contaminants.

Soil samples were collected from the site on a systematic grid pattern of approximately 36 metres. This sampling density will enable the detection of an area with an elevated concentration on a radius of 21m with a 95% confidence level. The number of sampling locations was less than the recommended density in the EPA sampling guidelines but expected to be sufficient given uniform land-use, management and preliminary investigation.

10.2 Field

The collection of samples was undertaken in accordance with accepted standard protocols (NEPC 1999). The discrete samples were analysed for arsenic, cadmium, total chromium, copper, lead, nickel and zinc. Selected discrete soil samples were also analysed for OCP. Soil samples collected from the area of environmental concern was analysed for arsenic, cadmium, chromium, copper, lead, nickel, zinc, mercury, TRH (C6-C40), BTEXN, PAH and OCP.

Sampling equipment was decontaminated between each sampling event. The appropriate storage conditions and duration were observed between sampling and analysis. A chain of custody form accompanied the samples to the laboratory (Appendix 3).

A single sampler was used to collect the samples using standard methods. Soil collected was a fresh sample from a hand shovel. After collection the samples were immediately placed in new glass sampling jars and placed in a cooler.

One duplicate sample was collected. The frequency of field duplicates is greater than the NEPM (1999) recommendation of 5%. No field blank, rinsate, trip blank or matrix spikes were submitted for analysis. Some samples from all batches did not contain contaminants which confirm the absence of cross contamination during transport and storage.

A field sampling log is presented in Appendix 2.

Table 1. Schedule of samples and analyses

Sample ID	Location (Figure 2)	Depth (mm)	Analysis undertaken
TC001	1	0-100	Arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), nickel (Ni), zinc (Zn), Organochlorine pesticides (OCP)
TC002	2	0-100	As, Cd, Cr, Cu, Pb, Ni, Zn
TC003	3	0-100	As, Cd, Cr, Cu, Pb, Ni, Zn
TC004	4	0-100	As, Cd, Cr, Cu, Pb, Ni, Zn
TC005	5	0-100	As, Cd, Cr, Cu, Pb, Ni, Zn, OCP
TC006	6	0-100	As, Cd, Cr, Cu, Pb, Ni, Zn
TC007	7	0-100	As, Cd, Cr, Cu, Pb, Ni, Zn
TC008	8	0-100	As, Cd, Cr, Cu, Pb, Ni, Zn, OCP
TC009	9	0-100	As, Cd, Cr, Cu, Pb, Ni, Zn
TC010	10	0-100	As, Cd, Cr, Cu, Pb, Ni, Zn
TC011	11	0-100	As, Cd, Cr, Cu, Pb, Ni, Zn
TC012	12	0-100	As, Cd, Cr, Cu, Pb, Ni, Zn
TC013	13	0-100	As, Cd, Cr, Cu, Pb, Ni, Zn
TC014	14	0-100	As, Cd, Cr, Cu, Pb, Ni, Zn
TC015	15	0-100	As, Cd, Cr, Cu, Pb, Ni, Zn, OCP

HS1	HS1	50-100	As, Cd, Cr, Cu, Pb, Ni, Zn, mercury (Hg), total recoverable hydrocarbons (TRH C6-C40), benzene, toluene, ethylbenzene, xylene, naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAH), OCP

10.3 Laboratory

Chemical analysis was conducted by SGS Laboratories, Alexandria, which is NATA accredited for the tests undertaken. The laboratories have quality assurance and quality control programs in place, which include internal replication and analysis of spike samples and recoveries.

Method blanks, matrix duplicates and laboratory control samples were within acceptance criteria. The quality assurance and quality control report is presented together with the laboratory report as Appendix 4.

10.4 Data evaluation

The laboratory quality control report indicates the data variability is within acceptable industry limits. The data is considered representative and usable for the purposes of the investigation. Data quality indicators are presented in Appendix 1.

11. Assessment criteria

The main reference for environmental site assessment in Australia is the ASC NEPM (NEPC 1999 rev 2013). This document includes criteria for use in evaluating potential risk to human health and ecosystems from chemical impacts, which are presented as generic investigation levels appropriate to a Tier 1 risk-based assessment applicable for site assessment. The application of these investigation levels is subject to a range of limitations, and their selection and use must be in the context of a conceptual site model (CSM) relating to the nature and distribution of impacts and potential exposure pathways.

The proposed land-use is residential and appropriate initial criteria are described in *Guideline on Investigation Levels for Soil and Groundwater* (NEPC 1999). The site is expected to comprise twenty-two dwellings, landscaped areas for outdoor recreational use and hard surfaces.

The criteria lists health investigation levels (HIL) for a range of land-uses. The appropriate initial comparison for the site is residential (HIL A).

The NEPC (1999) also provides health screening levels (HSL) for hydrocarbons in soil. The HSLs have been developed to be protective of human health for soil types, depths below surface and apply to exposure to hydrocarbons through the predominant vapour exposure pathway. The appropriate HSL for the site is listed in Table 4. TRH>16 have physical properties which make the TRH fractions non-volatiles and therefore these TRH fractions are not applicable for vapour intrusion.

Ecological investigation levels (EIL) have been developed for the protection of terrestrial ecosystems for selected metals and organic substances in the soil in the guideline (NEPC 1999). Ecological screening levels (ESL) assess the risk to terrestrial ecosystems from petroleum hydrocarbons in the soil. The EILs and ESLs consider the properties of the soil and contaminants and the capacity of the local ecosystem to accommodate increases in contaminant levels.

Management limits have been developed to assess petroleum hydrocarbons following evaluation of human health and ecological risks (NEPC 1999). Management limits are applicable as screening levels after consideration of relevant ESLs and HSLs. The appropriate management limits for the site are listed in Table 4.

Typical CEC value for the site is >5 to 10cmol(+)/kg, clay content of >15 to 20%, pH values of between 5 and 5.5 and organic carbon of >05 to 1% (eSPADE, 2023). The proposed land-use is residential. The contaminants have been identified in the soil for at least two years and are considered aged.

EILs vary with land-use and apply to contaminants up to 2m in depth below the surface. The ASC NEPM EIL calculation spreadsheet was used to determine the EIL. Default ambient background concentrations (ABC) were adopted. The EILs for residential land-use are listed in Table 2.

Table 2. EIL Calculation sheet, residential land-use

Analyte	Rationale	EIL (mg/kg)
Arsenic	Generic	100
Chromium (III)	Clay content 20%	510
Copper	CEC 10cmol/kg, pH 5.5, organic carbon 1%	150
Lead	Generic	1,100
Nickel	CEC 10cmol/kg	170
Zinc	CEC 10cmol/kg, pH 5.5	350
DDT	Generic	180
Naphthalene	Generic	170

The aesthetic state of sites is required to be assessed in PSI. Aesthetic issues generally relate to the presence of materials with a negligible risk or non-hazardous inert foreign material in soil or fill resulting from human activity. Sites that have been assessed as being acceptable from a human health and environmental perspective may still contain such foreign material. An assessment of the site aesthetics requires consideration of the natural state of soil on any given site, and a comparison between it and the soil encountered during investigation works. Soils on site should not exhibit discolouration (staining), amalodorous nature (odours) or abnormal consistency (rubble and asbestos).

Chromium is analysed as total chromium which is the sum of chromium (III) and chromium (VI). Chromium (VI) is a potential contaminant from industrial processes including ferrochrome production, electroplating, pigment production and tanning (WHO 1998). Chromium (VI) is reduced to chromium (III) when it comes into contact with organic matter in biota, soil and water. Chromium in the environment is present in the trivalent state (WHO 1998).

Table 3. Soil assessment criteria – Hydrocarbons (mg/kg) (NEPC 1999) for residential land-use

Analyte	HIL A Residential	HSL A Residential (clay soil)	EIL Residential	ESL Residential (fine soil)	Management limits Residential (fine soil)
		0m to <1m			
Arsenic	100	-	100	-	-
Cadmium	20	-	-	-	-
Chromium (total)	100[1]	-	510	-	-
Copper	6,000	-	150	-	-
Lead	300	-	1,100	-	-
Nickel	400	-	170	-	-
Zinc	7,400	-	350	-	-
Mercury	40	-	-	-	-
OCP (total)	-	-	-	-	-
DD's	240	-	180	-	-
TRH (C6-C10)	-	50	-	180	800
TRH (>C10-C16)	-	280	-	120	1,000
TRH (>C16-C34)	-	NA	-	1,300	3,500
TRH (>C34-C40)	-	NA	-	5,600	10,000
Benzene	-	0.7	-	65	-
Toluene	-	480	-	105	-
Ethylbenzene	-	NL	-	125	-
Xylenes	-	110	-	45	-
Naphthalene	-	5	170	-	-
PAH (total)	300	-	-	-	-
Carcinogenic PAH	3	-	-	-	-
Benzo(a)pyrene	-	-	-	0.7	-

HSL – health screening level, EIL – ecological investigation level, ESL – ecological screening level, NL – non limiting, NA – not applicable

12. Results and discussion

The site is currently vacant pasture with an agricultural land-use history comprising grazing and cultivation. Surface cover was generally 100% and dominated by pastural grasses, wheat grass, Phalaris, prickly lettuce, fleabane and skeleton weed. Juncus spp. were associated with a depression in the central western section.

A small foreign materials stockpile was identified in the central eastern section. The stockpile contained timber, building materials and a chair. No asbestos containing materials were identified in the stockpile. Significant disturbance and variability in surface conditions was identified in the same location in aerial imagery.

No surface staining or odours were detected on-site. No reported mining occurrences were evident on the site. No evidence of orchard, sheep dips, mixing sheds or contaminating industrial activities were identified on the site from the review of site history or site inspection.

Levels of all heavy metals analysed were less than the adopted residential thresholds for human health and environment in all soil samples collected from the site (Table 4).

Levels of OCP in all site soil samples were less than the adopted thresholds for human health and environment (Table 4).

Levels of TRH, BTEXN and PAH in the sample from the area of environmental concern was less than the adopted thresholds for human health and environment (Table 5).

Table 4. Analytical results and threshold concentrations for metals (mg/kg)

Sample ID	Depth (mm)	Arsenic	Cadmium	Chromium (total)	Copper	Lead	Nickel	Zinc	Mercury	OCP (total)	DD's
TC001	0-100	3	<0.3	21	9.2	12	8.0	17	-	<1	<0.6
TC002	0-100	3	<0.3	20	8.7	11	6.4	20	-	-	-
TC003	0-100	3	<0.3	23	11	11	6.6	29	-	-	-
TC004	0-100	3	<0.3	22	8.0	9	6.2	16	-	-	-
TC005	0-100	3	<0.3	21	7.9	9	5.8	18	-	<1	<0.6
TC006	0-100	3	<0.3	22	11	16	6.7	48	-	-	-
TC007	0-100	3	<0.3	22	10	13	7.2	35	-	-	-
TC008	0-100	3	<0.3	26	10	13	7.8	30	-	<1	<0.6
TC009	0-100	3	<0.3	19	9.8	13	7.7	21	-	-	-
TC010	0-100	3	<0.3	22	9.1	12	7.9	19	-	-	-
TC011	0-100	3	<0.3	23	9.6	12	8.4	19	-	-	-
TC012	0-100	3	<0.3	21	9.3	13	8.5	19	-	-	-
TC013	0-100	3	<0.3	20	10	15	7.7	24	-	-	-
TC014	0-100	3	<0.3	21	9.2	11	8.4	21	-	-	-
TC015	0-100	2	<0.3	21	7.9	9	5.6	21	-	<1	<0.6
HS1	50-100	3	<0.3	21	12	18	7.6	45	<0.05	<1	<0.6
HIL A – Residential		*100*	*20*	*100[1]*	*6,000*	*300*	*400*	*7,400*	*40*	*-*	*240*
EIL – Urban residential		*100*	*-*	*510[2]*	*150*	*1,100*	*170*	*350*	*-*	*-*	*180*

[1] Chromium (VI), [2] Chromium (III), Bold = exceeding one or more adopted thresholds.

Table 5. Analytical results and threshold concentrations for hydrocarbons (mg/kg)

Sample ID	Depth (mm)	TRH (C6-10)	TRH (>C10-C16)	TRH (>C16-C34)	TRH (>C34-C40)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PAH	Carcinogenic PAH	Benzo(a)pyrene
HS1	50-100	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<0.3	<0.1
HSL A – Residential (clay soil)													
	0m to <1m	*50*	*280*	*NA*	*NA*	*0.7*	*480*	*NL*	*110*	*5*	*-*	*-*	*-*
HIL A – Residential													
		-	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*300*	*3*	*-*
EIL – Urban residential													
		-	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*170*	*-*	*-*	*-*
ESL – residential (fine soi)													
		180	*120*	*1,300*	*5,600*	*65*	*105*	*125*	*45*	*-*	*-*	*-*	*0.7*
Management limits – Residential (fine soil)													
		800	*1,000*	*3,500*	*10,000*	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*-*

NA – not applicable, NL – Not limiting

13. Site characterisation

13.1 Environmental contamination

Not applicable as no contamination was detected

13.2 Chemical degradation production

Not applicable as no contamination was detected.

13.3 Exposed population

Not applicable as no contamination was detected.

14. Conclusions and recommendations

14.1 Summary

An inspection of the site was made on the 23 February 2023. The site is currently vacant pasture and has an agricultural land-use history of grazing and cultivation.

Vegetation on the site was unmaintained and dominated by wheat grass, Phalaris, prickly lettuce, fleabane and skeleton weed. Juncus spp. were associated with a depression in the central western section.

No reported mining occurrences were evident on the site. No evidence of orchards, sheep dips, mixing sheds or contaminating industrial activities are known to have been located on the site from the review of site history or site walkover. The use of agricultural pesticides over the area in the past is expected to be low.

The soil sampling program did not detect elevated levels of analysed heavy metals or OCP. The levels of BTEXN, PAH and TRH were below the adopted thresholds in the sample collected from the area of environmental concern. The levels of all substances evaluated were below the adopted thresholds for residential land-use with access to soil.

14.2 Assumptions in reaching the conclusions

It is assumed the sampling sites are representative of the site. An accurate history has been obtained and typical past farming practices were adopted.

14.3 Extent of uncertainties

The analytical data relates only to the locations sampled. Soil conditions can vary both laterally and vertically and it cannot be excluded that unidentified contaminants may be present. The sampling density was designed to detect a 'hot spot' in the proposed building envelope within a radius of approximately 21 metres and with a 95% level of confidence.

14.4 Suitability for proposed use of the site

The site is suitable for residential land-use.

14.5 Limitations and constraints on the use of the site

No constraints are recommended.

14.6 Recommendation for further work

Nil.

15. Report limitations and intellectual property

This report has been prepared for the use of the client to achieve the objectives given the clients requirements. The level of confidence of the conclusion reached is governed by the scope of the investigation and the availability and quality of existing data. Where limitations or uncertainties are known, they are identified in the report. No liability can be accepted for failure to identify conditions or issues which arise in the future and which could not reasonably have been predicted using the scope of the investigation and the information obtained.

The investigation identifies the actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing is interpreted by geologists, engineers or scientists who then render an opinion about overall subsurface conditions, the nature and extent of the contamination, its likely impact on the proposed development and appropriate remediation measures. Actual conditions may differ from those inferred to exist, because no professional, no matter how well qualified, and no sub-surface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock or time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. It is thus important to understand the limitations of the investigation and recognise that we are not responsible for these limitations.

16. References

Environment Protection Authority (2020) *Consultants reporting on contaminated land* (NSW Environment Protection Authority, Chatswood)

Environment Protection Authority (2022) *Sampling design guidelines for contaminated land* (NSW Environment Protection Authority, Chatswood)

NEPC (1999 revised 2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999* (National Environment Protection Council Service Corporation, Adelaide)

NSW Department of Planning & Environment (nd) *Naturally occurring asbestos in NSW,* viewed February 2023 (https://trade.maps.arcgis.com/apps/PublicInformation/index.html?appid=87434b6ec7dd4aba8cb664d8e646fb06)

State Government of NSW and Department of Planning, Industry and Environment (1998) *Acid sulphate soils risk,* viewed February 2022 (datasets.seed.nsw.gov.au/dataset/ acid-sulfate-soils-risk0196c)

State of NSW and Department of Planning, Industry and Environment 2023. *Modelled soil properties, Soil landscapes* from espade.environment.nsw.gov.au

Figures

Legend

Investigation area

Figure 1. Locality map		
230 Tilga Street, Canowindra NSW		
	Envirowest Consulting Pty Ltd	
Job: R15344c	Drawn by: TS	Date: 15/02/2023

Legend

⊗ Approximate sampling locations

Slope

Fence line

Lot boundary

Bore

Approximate Scale 1: 1,000

0 10 20 40m

Figure 2. Sampling locations		
230 Tilga Street, Canowindra NSW		
	Envirowest Consulting Pty Ltd	
Job: R15344c	Drawn by: TS	Date: 09/03/2023

Figure 3. Photographs of the site

Looking north over western section of the site

Looking east over southern section of the site

Appendices

Appendix 1. Sample analysis, quality assurance and quality control (QAQC) report

1. Data quality indicators (DQI) requirements

1.1 Completeness

A measure of the amount of usable data for a data collection activity. Greater than 95% of the data must be reliable based on the quality objectives. Where greater than two quality objectives have less reliability than the acceptance criterion the data may be considered with uncertainty.

1.1.1 Field

Consideration	Requirement
Locations and depths to be sampled	Described in the sampling plan. The acceptance criterion is 95% data retrieved compared with proposed. Acceptance criterion is 100% in crucial areas.
SOP appropriate and compiled	Described in the sampling plan.
Experienced sampler	Sampler or supervisor
Documentation correct	Sampling log and chain of custody completed

1.1.2 Laboratory

Consideration	Requirement
Samples analysed	Number according to sampling and quality plan
Analytes	Number according to sampling and quality plan
Methods	EPA or other recognised methods with suitable PQL
Sample documentation	Complete including chain of custody and sample description
Sample holding times	Metals 6 months, OCP 14 days

1.2 Comparability

The confidence that data may be considered to be equivalent for each sampling and analytical event. The data must show little or no inconsistencies with results and field observations.

1.2.1 Field

Consideration	Requirement
SOP	Same sampling procedures to be used
Experienced sampler	Sampler or supervisor
Climatic conditions	Described as may influence results
Samples collected	Sample medium, size, preparation, storage, transport

1.2.2 Laboratory

Consideration	Requirement
Analytical methods	Same methods, approved methods
PQL	Same
Same laboratory	Justify if different
Same units	Justify if different

1.3 Representativeness

The confidence (expressed qualitatively) that data are representative of each media present on the site.

1.3.1 Field

Consideration	Requirement
Appropriate media sampled	Sampled according to sampling and quality plan or in accordance with the EPA (2022) sampling guidelines.
All media identified	Sampling media identified in the sampling and quality plan. Where surface water bodies on the site sampled.

1.3.2 Laboratory

Consideration	Requirement
Samples analysed	Blanks

1.4 Precision

A quantitative measure of the variability (or reproduced of the data). Is measured by standard deviation or relative percent difference (RPD). An RPD analysis is calculated and compared to the adopted criteria of 30%

Data not conforming to the acceptance criterion will be examined for determination of suitability for the purpose of site characterisation.

1.4.1 Field

Consideration	Requirement
Field duplicates	Frequency of 5%, results to be within RPD or discussion required indicate the appropriateness of SOP

1.4.2 Laboratory

Consideration	Requirement
Laboratory and inter lab duplicates	Frequency of 5%, results to be within RPD or discussion required. Inter laboratory duplicates will be one sample per batch.
Field duplicates	Frequency of 5%, results to be within RPD or discussion required
Laboratory prepared volatile trip spikes	One per sampling batch, results to be within RPD or discussion required

1.5 Accuracy

A quantitative measure of the closeness of the reported data to the true value.

1.5.1 Field

Consideration	Requirement
SOP	Complied
Inter laboratory duplicates	Frequency of 5%. Analysis criterion – 30%

1.5.2 Laboratory

Recovery data (surrogates, laboratory control samples and matrix spikes) data subject to the following control limits:

- 60-140% acceptable data
- 20-60% discussion required, may be considered acceptable
- 10-20% data should considered as estimates
- 10% data should be rejected

Consideration	Requirement
Field blanks	Frequency of 5%, <5 times the PQL, PQL may be adjusted
Rinsate blanks	Frequency of 5%, <5 times the PQL, PQL may be adjusted
Method blanks	Frequency of 5%, <5 times the PQL, PQL may be adjusted
Matrix spikes	Frequency of 5%, results to be within +/-40% or discussion required
Matrix duplicates	Sample injected with a known concentration of contaminants with tested. Frequency of 5%, results to be within +/-40% or discussion required
Surrogate spikes	QC monitoring spikes to be added to samples at the extraction process in the laboratory where applicable. Surrogates are closely related to the organic target analyte and not normally found in the natural environment. Frequency of 5%, results to be within +/-40% or discussion required
Laboratory control samples	Externally prepared reference material containing representative analytes under investigation. These will be undertaken at one per batch. It is to be within +/-40% or discussion required
Laboratory prepared spikes	Frequency of 5%, results to be within +/-40% or discussion required

2. Laboratory analysis summary

One analysis batch was undertaken over the preliminary investigation program. Samples were collected on 23 February 2023. A total of 16 samples were submitted for analytical testing. The samples were collected in the field by an environmental scientist from Envirowest Consulting Pty Ltd and placed into laboratory prepared receptacles as recommended in NEPM (1999). The samples preservation and storage was undertaken using standard industry practices. A chain of custody form accompanied transport of the samples to the laboratory.

The samples were analysed at the laboratories of SGS Laboratories, Alexandria NSW which is National Association of Testing Authorities (NATA) accredited for the tests undertaken. The analyses undertaken, number of samples tested and methods are presented in the following tables:

Laboratory analysis schedule

Sample id.	Number of samples	Duplicate	Analyses	Date collected	Substrate	Laboratory report
TC002, TC003, TC004, TC006, TC007, TC009, TC010, TC011, TC012, TC013, TC014	11	1	Arsenic (As), cadmium (Cd), total chromium (Cr), copper (Cu), lead (Pb), nickel (Ni), zinc (Zn)	23/02/2023	Soil	SE243727
TC001, TC005, TC008, TC015	4	-	As, Cd, Cr, Cu, Pb, Ni, Zn, Organochlorine pesticides (OCP)	23/02/2023	Soil	SE243727
HS1	1	-	As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene, Xylenes, Naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAH), OCP	23/02/2023	Soil	SE243727

Analytical methods

Analyte	Extraction	Laboratory methods
Metals	USEPA 200.2 Mod	APHA USEPA SW846-6010
Chromium (III)	-	APHA 3500 CR-A&B & 3120 and USEPA SW846-3060A
Chromium (VI)	USEPA SW846-3060A	USEPA SW846-3060A
Mercury	USEPA 200.2 Mod	APHA 3112
OC Pesticides	Tumbler extraction of solids	USEPA SW 846-8270B

3. Field quality assurance and quality control

One intra laboratory duplicate samples were collected for the investigation. The frequency was 6% which was in accordance with the recommended frequency of 5%. Table A1 outlines the samples collected and differences in replicate analyses. Relative differences were deemed to pass if they were within the acceptance limits of +/- 30% for replicate analyses or less than 5 times the detection limit.

Field duplicate frequency

Sample id.	Number of samples	Duplicate	Frequency (%)	Date collected	Substrate	Laboratory report
TC001, TC002, TC003, TC004, TC005, TC006, TC007, TC008, TC009, TC010, TC011, TC012, TC013, TC014, TC015, HS1	16	1	6	23/02/2022	Soil	SE243727

Table A1. Relative differences for intra laboratory duplicates

			TC001, TCDA	
	TC001	TCDA	Relative difference (%)	Pass/Fail
Arsenic	3	3	0	Pass
Cadmium	<0.3	<0.3	NA	NA
Chromium	21	22	5	Pass
Copper	9.2	9.2	0	Pass
Lead	12	11	9	Pass
Nickel	8.0	8.6	7	Pass
Zinc	17	17	0	Pass

NA – relative difference unable to be calculated as results are less than laboratory detection limits, * results less than 5 times laboratory detection limits

No trip blanks or spikes were submitted for analysis. This is not considered to create significant uncertainty in the analysis results because of the following rationale:

- The fieldwork was completed within a short time period and consistent methods were used for soil sampling.
- Soil samples were placed in insulated cooled containers after sampling to ensure preservation during transport and storage.
- The samples were placed in single use jars using clean sampling tools and disposable gloves from material not in contact with other samples. This reduces the likelihood of cross contamination.
- Samples in the analysis batch contain analytes below the level of detection. It is considered unlikely that contamination has occurred as a result of transport and handling.

4. Laboratory quality assurance and quality control

Sample holding times are recommended in NEPM (1999). The time between collection and extraction was generally less than the criteria listed below:

Analyte	Maximum holding time
Metals	6 months
Mercury	28 days
BTEXN, TRH, PAH, OCP	14 days

The laboratory interpretative reports are presented with individual laboratory report. Assessment is made of holding time, frequency of control samples and quality control samples. The laboratory report also contains a detailed description of preparation methods and analytical methods.

The results, quality report, interpretative report and chain of custody are presented in the attached appendices. The quality report contains the laboratory duplicates, spikes, laboratory control samples, blanks and where appropriate matrix spike recovery (surrogate).

5. Data quality indicators (DQI)

5.1 Completeness

A measure of the amount of usable data for a data collection activity (total to be greater than 90%)

5.1.1 Field

Consideration	Accepted	Comment
Locations to be sampled	Yes	In accordance with sampling methodology, described in the report.
SOP appropriate and compiled	Yes	In accordance with sampling methodology
Experienced sampler	Yes	Environmental scientist
Documentation correct	Yes	Chain of custody completed

5.1.2 Laboratory

Consideration	Accepted	Comment
Samples analysed	Yes	In accordance with chain of custody and analysis plan.
Analytes	Yes	In accordance with chain of custody and analysis plan.
Methods	Yes	Analysed in NATA accredited laboratory with recognised methods and suitable PQL
Sample documentation	Yes	Completed including chain of custody and sample results and quality results
Sample holding times	Yes	Metals < 6 months Mercury < 28 days OCP, PAH, TRH, BTEXN < 14 days

5.2 Comparability

The confidence that data may be considered to be equivalent for each sampling and analytical event.

5.2.1 Field

Consideration	Accepted	Comment
SOP	Yes	Same sampling procedures used and sampled on one date
Experienced sampler	Yes	Experienced environmental scientist
Climatic conditions	Yes	Sampling log
Samples collected	Yes	Suitable size and storage

5.2.2 Laboratory

Consideration	Accepted	Comment
Analytical methods	Yes	Same methods all samples
PQL	Yes	Suitable for analytes
Same laboratory	Yes	-
Same units	Yes	-

5.3 Representativeness

The confidence (expressed qualitatively) that data are representative of each media present on the site.

5.3.1 Field

Consideration	Accepted	Comment
Appropriate media sampled	Yes	Sampled according to sampling and quality plan
All media identified	Yes	Soil sampling media identified in the sampling and quality plan

5.3.2 Laboratory

Consideration	Accepted	Comment
Samples analysed	Yes	Undertaken in NATA accredited laboratory. Samples in the analysis batch contain analytes below the level of detection. It is considered unlikely that contamination has occurred as a result of transport and handling.

5.4 Precision

A quantitative measure of the variability (or reproduced of the data)

5.4.1 Field

Consideration	Accepted	Comment
SOP	Yes	Complied
Field duplicates	Yes	Collected

5.4.2 Laboratory

Consideration	Accepted	Comment
Laboratory duplicates	Yes	Frequency of 5%, results to be within +/-30% or discussion required.
Field duplicates (intra and inter laboratory)	Yes	Frequency of 5%, results to be within +/-30% or discussion required.
Laboratory prepared volatile trip spikes	NA	Frequency of 5%, results to be within +/-30% or discussion required.

5.5 Accuracy

A quantitative measure of the closeness of the reported data to the true value.

5.5.1 Field

Consideration	**Accepted**	**Comment**
SOP	Yes	Complied
Field blanks	No	Not collected

5.5.2 Laboratory

Consideration	**Accepted**	**Comment**
Method blanks	Yes	Frequency of 5%, <5 times the PQL, PQL may be adjusted
Matrix spikes	Yes	Frequency of 5%, results to be within +/-40% or discussion required.
Matrix duplicates	No	RPD failed acceptance criteria due to sample heterogeneity.
Surrogate spikes	Yes	Frequency of 5%, results to be within +/-40% or discussion required.

Laboratory control samples	Yes	Frequency of 5%, results to be within +/-40% or discussion required.
Laboratory prepared spikes	Yes	Frequency of 5%, results to be within +/-40% or discussion required.

No trip blanks, field spikes or sample rinsates were submitted for analysis. This is not considered to create significant uncertainty in the analysis results because of the following rationale:

- The fieldwork methods used for soil sampling were consistent throughout the project with all in situ samples collected from material which had not been subject to exposure.

- The fieldwork was completed within a short time period and consistent methods were used for soil sampling.

- Soil samples were placed in insulated cooled containers as quickly as possible, with the containers filled to minimize headspace. The sample containers were sealed immediately after the sample was collected and chilled in an esky containing ice.

- The samples were stored in a refrigerator and transported with ice bricks to ensure preservation during transport and storage.

- The samples were placed in single use jars using clean sampling tools and disposable gloves from material not in contact with other samples. This reduces the likelihood of cross contamination.

- Samples in the analysis batches contained analytes below the level of detection. It is considered unlikely that contamination has occurred as a result of transport and handling.

6. Conclusion

All media appropriate to the objectives of this investigation have been adequately analysed and no area of significant uncertainty exist. It is concluded the data is usable for the purposes of the investigation.

Appendix 2. Field sampling log

Sampling log

Client Samantha Dicksinson

Contact Claire Johnstone

Job number 15344

Location 230 Tilga Street, Canowindra NSW

Date 23/02/2023

Investigator Tiffany Skinner

Weather conditions Fine and sunny

Sample ID	Matrix	Date	Analysis required	Observations/comments
TC001	Soil	23/02/2023	Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Nickel (Ni), Zinc (Zn), Organochlorine pesticides (OCP)	
TC002	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn	
TC003	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn	
TC004	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn	
TC005	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn, OCP	
TC006	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn	
TC007	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn	
TC008	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn, OCP	
TC009	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn	
TC010	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn	
TC011	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn	
TC012	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn	
TC013	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn	
TC014	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn	
TC015	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn, OCP	
HS1	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Hg, Ni, Zn, Mercury (Hg), Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene, Xylenes, Naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAH), OCP	Area of environmental concern located at foreign materials stockpile, soil disturbance and variability
TSDA	Soil	23/02/2023	As, Cd, Cr, Cu, Pb, Ni, Zn	Duplicate of TC001

Appendix 3. Soil analysis results – SGS report number SE243727 and chain of custody form

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Tiffany Skinner
Client	ENVIROWEST CONSULTING PTY LIMITED
Address	PO BOX 8158 NSW 2800
Telephone	61 2 63614954
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Email	tiffany@envirowest.net.au
Project	**15344**
Order Number	**15344**
Samples	17

LABORATORY DETAILS

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SGS Reference	**SE243727 R1**
Date Received	28/2/2023
Date Reported	9/3/2023

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

This report cancels and supersedes the report No.SE243727 R0 dated 06/03/23 issued by SGS Environment, Health and Safety due to amended sampling dates as per COC.

SIGNATORIES

Akheeqar BENIAMEEN
Chemist

Bennet LO
Senior Chemist

Kamrul AHSAN
Senior Chemist

Ly Kim HA
Organic Section Head

Shane MCDERMOTT
Inorganic/Metals Chemist

VOC's in Soil [AN433] Tested: 28/2/2023

PARAMETER	UOM	LOR	HS1 SOIL - 23/2/23 14:00 SE243727.016
Benzene	mg/kg	0.1	<0.1
Toluene	mg/kg	0.1	<0.1
Ethylbenzene	mg/kg	0.1	<0.1
m/p-xylene	mg/kg	0.2	<0.2
o-xylene	mg/kg	0.1	<0.1
Total Xylenes*	mg/kg	0.3	<0.3
Total BTEX*	mg/kg	0.6	<0.6
Naphthalene (VOC)*	mg/kg	0.1	<0.1

Volatile Petroleum Hydrocarbons in Soil [AN433] Tested: 28/2/2023

PARAMETER	UOM	LOR	HS1 SOIL - 23/2/23 14:00 SE243727.016
TRH C6-C9	mg/kg	20	<20
Benzene (F0)	mg/kg	0.1	<0.1
TRH C6-C10	mg/kg	25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25

TRH (Total Recoverable Hydrocarbons) in Soil [AN403] Tested: 28/2/2023

PARAMETER	UOM	LOR	HS1 SOIL - 23/2/23 14:00 SE243727.016
TRH C10-C14	mg/kg	20	<20
TRH C15-C28	mg/kg	45	<45
TRH C29-C36	mg/kg	45	**66**
TRH C37-C40	mg/kg	100	<100
TRH >C10-C16	mg/kg	25	<25
TRH >C10-C16 - Naphthalene (F2)	mg/kg	25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90
TRH >C34-C40 (F4)	mg/kg	120	<120
TRH C10-C36 Total	mg/kg	110	<110
TRH >C10-C40 Total (F bands)	mg/kg	210	<210

PAH (Polynuclear Aromatic Hydrocarbons) in Soil [AN420] Tested: 28/2/2023

PARAMETER	UOM	LOR	HS1 SOIL - 23/2/23 14:00 SE243727.016
Naphthalene	mg/kg	0.1	<0.1
2-methylnaphthalene	mg/kg	0.1	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1
Fluorene	mg/kg	0.1	<0.1
Phenanthrene	mg/kg	0.1	<0.1
Anthracene	mg/kg	0.1	<0.1
Fluoranthene	mg/kg	0.1	<0.1
Pyrene	mg/kg	0.1	<0.1
Benzo(a)anthracene	mg/kg	0.1	<0.1
Chrysene	mg/kg	0.1	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.1	<0.1
Benzo(a)pyrene	mg/kg	0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1
Dibenzo(ah)anthracene	mg/kg	0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1	<0.1
Carcinogenic PAHs, BaP TEQ <LOR=0*	TEQ (mg/kg)	0.2	<0.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR*	TEQ (mg/kg)	0.3	<0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2*	TEQ (mg/kg)	0.2	<0.2
Total PAH (18)	mg/kg	0.8	<0.8
Total PAH (NEPM/WHO 16)	mg/kg	0.8	<0.8

OC Pesticides in Soil [AN420] Tested: 28/2/2023

PARAMETER	UOM	LOR	TC001 SOIL - 23/2/23 14:00 SE243727.001	TC005 SOIL - 23/2/23 14:00 SE243727.005	TC008 SOIL - 23/2/23 14:00 SE243727.008	TC015 SOIL - 23/2/23 14:00 SE243727.015	HS1 SOIL - 23/2/23 14:00 SE243727.016
Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane (gamma BHC)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Delta BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDE*	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Gamma Chlordane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Chlordane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDE	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o,p'-DDD*	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT*	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta Endosulfan	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
p,p'-DDD	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin aldehyde	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin ketone	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Isodrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total CLP OC Pesticides	mg/kg	1	<1	<1	<1	<1	<1
Total OC VIC EPA	mg/kg	1	<1	<1	<1	<1	<1

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES [AN040/AN320] Tested: 28/2/2023

PARAMETER	UOM	LOR	TC001 SOIL - 23/2/23 14:00 SE243727.001	TC002 SOIL - 23/2/23 14:00 SE243727.002	TC003 SOIL - 23/2/23 14:00 SE243727.003	TC004 SOIL - 23/2/23 14:00 SE243727.004	TC005 SOIL - 23/2/23 14:00 SE243727.005
Arsenic, As	mg/kg	1	3	3	3	3	3
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	21	20	23	22	21
Copper, Cu	mg/kg	0.5	9.2	8.7	11	8.0	7.9
Lead, Pb	mg/kg	1	12	11	11	9	9
Nickel, Ni	mg/kg	0.5	8.0	6.4	6.6	6.2	5.8
Zinc, Zn	mg/kg	2	17	20	29	16	18

PARAMETER	UOM	LOR	TC006 SOIL - 23/2/23 14:00 SE243727.006	TC007 SOIL - 23/2/23 14:00 SE243727.007	TC008 SOIL - 23/2/23 14:00 SE243727.008	TC009 SOIL - 23/2/23 14:00 SE243727.009	TC010 SOIL - 23/2/23 14:00 SE243727.010
Arsenic, As	mg/kg	1	3	3	3	3	3
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	22	22	26	19	22
Copper, Cu	mg/kg	0.5	11	10	10	9.8	9.1
Lead, Pb	mg/kg	1	16	13	13	13	12
Nickel, Ni	mg/kg	0.5	6.7	7.2	7.8	7.7	7.9
Zinc, Zn	mg/kg	2	48	35	30	21	19

PARAMETER	UOM	LOR	TC011 SOIL - 23/2/23 14:00 SE243727.011	TC012 SOIL - 23/2/23 14:00 SE243727.012	TC013 SOIL - 23/2/23 14:00 SE243727.013	TC014 SOIL - 23/2/23 14:00 SE243727.014	TC015 SOIL - 23/2/23 14:00 SE243727.015
Arsenic, As	mg/kg	1	3	3	3	3	2
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	23	21	20	21	21
Copper, Cu	mg/kg	0.5	9.6	9.3	10	9.2	7.9
Lead, Pb	mg/kg	1	12	13	15	11	9
Nickel, Ni	mg/kg	0.5	8.4	8.5	7.7	8.4	5.6
Zinc, Zn	mg/kg	2	19	19	24	21	21

PARAMETER	UOM	LOR	HS1 SOIL - 23/2/23 14:00 SE243727.016	TCDA SOIL - 23/2/23 14:00 SE243727.017
Arsenic, As	mg/kg	1	3	3
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	21	22
Copper, Cu	mg/kg	0.5	12	9.2
Lead, Pb	mg/kg	1	18	11
Nickel, Ni	mg/kg	0.5	7.6	8.6
Zinc, Zn	mg/kg	2	45	17

Mercury in Soil [AN312] Tested: 28/2/2023

PARAMETER	UOM	LOR	HS1 SOIL - 23/2/23 14:00 SE243727.016
Mercury	mg/kg	0.05	<0.05

Moisture Content [AN002] Tested: 28/2/2023

PARAMETER	UOM	LOR	TC001 SOIL - 23/2/23 14:00 SE243727.001	TC002 SOIL - 23/2/23 14:00 SE243727.002	TC003 SOIL - 23/2/23 14:00 SE243727.003	TC004 SOIL - 23/2/23 14:00 SE243727.004	TC005 SOIL - 23/2/23 14:00 SE243727.005
% Moisture	%w/w	1	2.9	4.1	2.9	3.7	2.8

PARAMETER	UOM	LOR	TC006 SOIL - 23/2/23 14:00 SE243727.006	TC007 SOIL - 23/2/23 14:00 SE243727.007	TC008 SOIL - 23/2/23 14:00 SE243727.008	TC009 SOIL - 23/2/23 14:00 SE243727.009	TC010 SOIL - 23/2/23 14:00 SE243727.010
% Moisture	%w/w	1	3.9	9.9	10.7	5.7	4.7

PARAMETER	UOM	LOR	TC011 SOIL - 23/2/23 14:00 SE243727.011	TC012 SOIL - 23/2/23 14:00 SE243727.012	TC013 SOIL - 23/2/23 14:00 SE243727.013	TC014 SOIL - 23/2/23 14:00 SE243727.014	TC015 SOIL - 23/2/23 14:00 SE243727.015
% Moisture	%w/w	1	5.2	5.3	13.9	12.2	6.1

PARAMETER	UOM	LOR	HS1 SOIL - 23/2/23 14:00 SE243727.016	TCDA SOIL - 23/2/23 14:00 SE243727.017
% Moisture	%w/w	1	3.5	2.7

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN040/AN320	A portion of sample is digested with nitric acid to decompose organic matter and hydrochloric acid to complete the digestion of metals. The digest is then analysed by ICP OES with metals results reported on the dried sample basis. Based on USEPA method 200.8 and 6010C.
AN040	A portion of sample is digested with Nitric acid to decompose organic matter and Hydrochloric acid to complete the digestion of metals and then filtered for analysis by ASS or ICP as per USEPA Method 200.8.
AN312	Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid , mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser . Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). F2 is reported directly and also corrected by subtracting Naphthalene (from VOC method AN433) where available.
AN403	Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Recoverable Hydrocarbons - Silica (TRH-Si) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents .
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN420	(SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D). Total PAH calculated from individual analyte detections at or above the limit of reporting .
AN420	SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols in soils, sediments and waters are determined by GCMS /ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
AN433	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
		NVL	Not validated.	LOR	Limit of Reporting.
**	Indicative data, theoretical holding time exceeded.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		
***	Indicates that both * and ** apply.				

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

STATEMENT OF QA/QC PERFORMANCE

SE243727 R1

CLIENT DETAILS

Contact	Tiffany Skinner
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Email	tiffany@envirowest.net.au
Project	**15344**
Order Number	**15344**
Samples	17

LABORATORY DETAILS

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SGS Reference	**SE243727 R1**
Date Received	28 Feb 2023
Date Reported	09 Mar 2023

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Duplicate	Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES	2 items

SAMPLE SUMMARY

Sample counts by matrix	17 Soil	Type of documentation received	COC
Date documentation received	28/2/2023	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	21.1C
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	Yes
Complete documentation received	Yes		

HOLDING TIME SUMMARY

SE243727 R1

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HS1	SE243727.016	LB272640	23 Feb 2023	28 Feb 2023	23 Mar 2023	28 Feb 2023	23 Mar 2023	02 Mar 2023

Moisture Content

Method: ME-(AU)-[ENV]AN002

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TC001	SE243727.001	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TC002	SE243727.002	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TC003	SE243727.003	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TC004	SE243727.004	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TC005	SE243727.005	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TC006	SE243727.006	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TC007	SE243727.007	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TC008	SE243727.008	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TC009	SE243727.009	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TC010	SE243727.010	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TC011	SE243727.011	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TC012	SE243727.012	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TC013	SE243727.013	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TC014	SE243727.014	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TC015	SE243727.015	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
HS1	SE243727.016	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023
TCDA	SE243727.017	LB272643	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	05 Mar 2023	02 Mar 2023

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TC001	SE243727.001	LB272628	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	09 Apr 2023	02 Mar 2023
TC005	SE243727.005	LB272628	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	09 Apr 2023	02 Mar 2023
TC008	SE243727.008	LB272628	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	09 Apr 2023	02 Mar 2023
TC015	SE243727.015	LB272628	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	09 Apr 2023	02 Mar 2023
HS1	SE243727.016	LB272628	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	09 Apr 2023	02 Mar 2023

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HS1	SE243727.016	LB272622	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	09 Apr 2023	02 Mar 2023

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
TC001	SE243727.001	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TC002	SE243727.002	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TC003	SE243727.003	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TC004	SE243727.004	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TC005	SE243727.005	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TC006	SE243727.006	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TC007	SE243727.007	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TC008	SE243727.008	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TC009	SE243727.009	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TC010	SE243727.010	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TC011	SE243727.011	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TC012	SE243727.012	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TC013	SE243727.013	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TC014	SE243727.014	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TC015	SE243727.015	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
HS1	SE243727.016	LB272635	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023
TCDA	SE243727.017	LB272638	23 Feb 2023	28 Feb 2023	22 Aug 2023	28 Feb 2023	22 Aug 2023	02 Mar 2023

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HS1	SE243727.016	LB272622	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	09 Apr 2023	03 Mar 2023

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref

HOLDING TIME SUMMARY

SE243727 R1

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the

VOC's in Soil (continued)

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HS1	SE243727.016	LB272619	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	09 Mar 2023	02 Mar 2023

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HS1	SE243727.016	LB272619	23 Feb 2023	28 Feb 2023	09 Mar 2023	28 Feb 2023	09 Mar 2023	02 Mar 2023

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Tetrachloro-m-xylene (TCMX) (Surrogate)	TC001	SE243727.001	%	60 - 130%	90
	TC005	SE243727.005	%	60 - 130%	89
	TC008	SE243727.008	%	60 - 130%	91
	TC015	SE243727.015	%	60 - 130%	89
	HS1	SE243727.016	%	60 - 130%	90

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
2-fluorobiphenyl (Surrogate)	HS1	SE243727.016	%	70 - 130%	106
d14-p-terphenyl (Surrogate)	HS1	SE243727.016	%	70 - 130%	94
d5-nitrobenzene (Surrogate)	HS1	SE243727.016	%	70 - 130%	123

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	HS1	SE243727.016	%	60 - 130%	89
d4-1,2-dichloroethane (Surrogate)	HS1	SE243727.016	%	60 - 130%	92
d8-toluene (Surrogate)	HS1	SE243727.016	%	60 - 130%	90

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	HS1	SE243727.016	%	60 - 130%	89
d4-1,2-dichloroethane (Surrogate)	HS1	SE243727.016	%	60 - 130%	92
d8-toluene (Surrogate)	HS1	SE243727.016	%	60 - 130%	90

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Number	Parameter	Units	LOR	Result
LB272640.001	Mercury	mg/kg	0.05	<0.05

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result
LB272628.001		Alpha BHC	mg/kg	0.1	<0.1
		Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1
		Beta BHC	mg/kg	0.1	<0.1
		Lindane (gamma BHC)	mg/kg	0.1	<0.1
		Delta BHC	mg/kg	0.1	<0.1
		Heptachlor	mg/kg	0.1	<0.1
		Aldrin	mg/kg	0.1	<0.1
		Isodrin	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
		Alpha Endosulfan	mg/kg	0.2	<0.2
		p,p'-DDE	mg/kg	0.1	<0.1
		Dieldrin	mg/kg	0.2	<0.2
		Endrin	mg/kg	0.2	<0.2
		Beta Endosulfan	mg/kg	0.2	<0.2
		p,p'-DDD	mg/kg	0.1	<0.1
		Endrin aldehyde	mg/kg	0.1	<0.1
		Endosulfan sulphate	mg/kg	0.1	<0.1
		p,p'-DDT	mg/kg	0.1	<0.1
		Endrin ketone	mg/kg	0.1	<0.1
		Methoxychlor	mg/kg	0.1	<0.1
		Mirex	mg/kg	0.1	<0.1
	Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	87

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result
LB272622.001		Naphthalene	mg/kg	0.1	<0.1
		2-methylnaphthalene	mg/kg	0.1	<0.1
		1-methylnaphthalene	mg/kg	0.1	<0.1
		Acenaphthylene	mg/kg	0.1	<0.1
		Acenaphthene	mg/kg	0.1	<0.1
		Fluorene	mg/kg	0.1	<0.1
		Phenanthrene	mg/kg	0.1	<0.1
		Anthracene	mg/kg	0.1	<0.1
		Fluoranthene	mg/kg	0.1	<0.1
		Pyrene	mg/kg	0.1	<0.1
		Benzo(a)anthracene	mg/kg	0.1	<0.1
		Chrysene	mg/kg	0.1	<0.1
		Benzo(a)pyrene	mg/kg	0.1	<0.1
		Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1
		Dibenzo(ah)anthracene	mg/kg	0.1	<0.1
		Benzo(ghi)perylene	mg/kg	0.1	<0.1
		Total PAH (18)	mg/kg	0.8	<0.8
	Surrogates	d5-nitrobenzene (Surrogate)	%	-	114
		2-fluorobiphenyl (Surrogate)	%	-	94
		d14-p-terphenyl (Surrogate)	%	-	107

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR	Result
LB272635.001	Arsenic, As	mg/kg	1	<1
	Cadmium, Cd	mg/kg	0.3	<0.3
	Chromium, Cr	mg/kg	0.5	<0.5
	Copper, Cu	mg/kg	0.5	<0.5
	Nickel, Ni	mg/kg	0.5	<0.5
	Lead, Pb	mg/kg	1	<1

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES (continued)

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number		Parameter	Units	LOR	Result
LB272635.001		Zinc, Zn	mg/kg	2	<2
LB272638.001		Arsenic, As	mg/kg	1	<1
		Cadmium, Cd	mg/kg	0.3	<0.3
		Chromium, Cr	mg/kg	0.5	<0.5
		Copper, Cu	mg/kg	0.5	<0.5
		Nickel, Ni	mg/kg	0.5	<0.5
		Lead, Pb	mg/kg	1	<1
		Zinc, Zn	mg/kg	2	<2

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Number		Parameter	Units	LOR	Result
LB272622.001		TRH C10-C14	mg/kg	20	<20
		TRH C15-C28	mg/kg	45	<45
		TRH C29-C36	mg/kg	45	<45
		TRH C37-C40	mg/kg	100	<100
		TRH C10-C36 Total	mg/kg	110	<110

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result
LB272619.001	Monocyclic Aromatic	Benzene	mg/kg	0.1	<0.1
	Hydrocarbons	Toluene	mg/kg	0.1	<0.1
		Ethylbenzene	mg/kg	0.1	<0.1
		m/p-xylene	mg/kg	0.2	<0.2
		o-xylene	mg/kg	0.1	<0.1
	Polycyclic VOCs	Naphthalene (VOC)*	mg/kg	0.1	<0.1
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	88
		d8-toluene (Surrogate)	%	-	98
		Bromofluorobenzene (Surrogate)	%	-	85
	Totals	Total BTEX*	mg/kg	0.6	<0.3

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result
LB272619.001		TRH C6-C9	mg/kg	20	<20
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	88

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243774.001	LB272640.014	Mercury	mg/kg	0.05	<0.05	<0.05	200	0
SE243788.003	LB272640.021	Mercury	mg/kg	0.05	<0.05	<0.05	200	0

Moisture Content

Method: ME-(AU)-[ENV]AN002

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243727.010	LB272643.011	% Moisture	%w/w	1	4.7	4.9	51	2
SE243727.017	LB272643.019	% Moisture	%w/w	1	2.7	2.8	67	4

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243727.016	LB272628.009	Alpha BHC	mg/kg	0.1	<0.1	<0.1	200	0
		Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1	200	0
		Beta BHC	mg/kg	0.1	<0.1	<0.1	200	0
		Lindane (gamma BHC)	mg/kg	0.1	<0.1	<0.1	200	0
		Delta BHC	mg/kg	0.1	<0.1	<0.1	200	0
		Heptachlor	mg/kg	0.1	<0.1	<0.1	200	0
		Aldrin	mg/kg	0.1	<0.1	<0.1	200	0
		Isodrin	mg/kg	0.1	<0.1	<0.1	200	0
		Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1	200	0
		Gamma Chlordane	mg/kg	0.1	<0.1	<0.1	200	0
		Alpha Chlordane	mg/kg	0.1	<0.1	<0.1	200	0
		Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2	200	0
		o,p'-DDE*	mg/kg	0.1	<0.1	<0.1	200	0
		p,p'-DDE	mg/kg	0.1	<0.1	<0.1	200	0
		Dieldrin	mg/kg	0.2	<0.2	<0.2	200	0
		Endrin	mg/kg	0.2	<0.2	<0.2	200	0
		Beta Endosulfan	mg/kg	0.2	<0.2	<0.2	200	0
		o,p'-DDD*	mg/kg	0.1	<0.1	<0.1	200	0
		p,p'-DDD	mg/kg	0.1	<0.1	<0.1	200	0
		Endrin aldehyde	mg/kg	0.1	<0.1	<0.1	200	0
		Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1	200	0
		o,p'-DDT*	mg/kg	0.1	<0.1	<0.1	200	0
		p,p'-DDT	mg/kg	0.1	<0.1	<0.1	200	0
		Endrin ketone	mg/kg	0.1	<0.1	<0.1	200	0
		Methoxychlor	mg/kg	0.1	<0.1	<0.1	200	0
		Mirex	mg/kg	0.1	<0.1	<0.1	200	0
		trans-Nonachlor	mg/kg	0.1	<0.1	<0.1	200	0
		Total CLP OC Pesticides	mg/kg	1	<1	<1	200	0
		Total OC VIC EPA	mg/kg	1	<1	<1	200	0
	Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.13	0.13	30	6

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243774.001	LB272622.014	Naphthalene	mg/kg	0.1	<0.1	<0.1	200	0
		2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	0
		1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	0
		Acenaphthylene	mg/kg	0.1	<0.1	<0.1	200	0
		Acenaphthene	mg/kg	0.1	<0.1	<0.1	200	0
		Fluorene	mg/kg	0.1	<0.1	<0.1	200	0
		Phenanthrene	mg/kg	0.1	<0.1	<0.1	200	0
		Anthracene	mg/kg	0.1	<0.1	<0.1	200	0
		Fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
		Pyrene	mg/kg	0.1	<0.1	<0.1	200	0
		Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	200	0
		Chrysene	mg/kg	0.1	<0.1	<0.1	200	0
		Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
		Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
		Benzo(a)pyrene	mg/kg	0.1	<0.1	<0.1	200	0
		Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	200	0

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may

PAH (Polynuclear Aromatic Hydrocarbons) in Soil (continued)

Method: ME-(AU)-[ENV]AN420

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243774.001	LB272622.014		Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	200	0
			Carcinogenic PAHs, BaP TEQ <LOR=0*	mg/kg	0.2	<0.2	<0.2	200	0
			Carcinogenic PAHs, BaP TEQ <LOR=LOR/2*	mg/kg	0.2	<0.2	<0.2	175	0
			Carcinogenic PAHs, BaP TEQ <LOR=LOR*	mg/kg	0.3	<0.3	<0.3	134	0
			Total PAH (18)	mg/kg	0.8	<0.8	<0.8	200	0
		Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.6	0.6	30	0
			2-fluorobiphenyl (Surrogate)	mg/kg	-	0.5	0.5	30	5
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.6	0.6	30	2
SE243788.003	LB272622.021		Naphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	0
			Acenaphthylene	mg/kg	0.1	<0.1	<0.1	200	0
			Acenaphthene	mg/kg	0.1	<0.1	<0.1	200	0
			Fluorene	mg/kg	0.1	<0.1	<0.1	200	0
			Phenanthrene	mg/kg	0.1	<0.1	<0.1	200	0
			Anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Chrysene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(a)pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	200	0
			Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1	200	0
			Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	200	0
			Carcinogenic PAHs, BaP TEQ <LOR=0*	mg/kg	0.2	<0.2	<0.2	200	0
			Carcinogenic PAHs, BaP TEQ <LOR=LOR/2*	mg/kg	0.2	<0.2	<0.2	175	0
			Carcinogenic PAHs, BaP TEQ <LOR=LOR*	mg/kg	0.3	<0.3	<0.3	134	0
			Total PAH (18)	mg/kg	0.8	<0.8	<0.8	200	0
		Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.6	0.6	30	2
			2-fluorobiphenyl (Surrogate)	mg/kg	-	0.5	0.5	30	6
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.6	0.6	30	6

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243727.010	LB272638.014	Arsenic, As	mg/kg	1	3	3	65	7
		Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	200	0
		Chromium, Cr	mg/kg	0.5	22	17	33	22
		Copper, Cu	mg/kg	0.5	9.1	9.1	35	0
		Nickel, Ni	mg/kg	0.5	7.9	8.3	36	4
		Lead, Pb	mg/kg	1	12	13	38	7
		Zinc, Zn	mg/kg	2	19	19	41	0
SE243727.017	LB272638.021	Arsenic, As	mg/kg	1	3	3	65	6
		Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	200	0
		Chromium, Cr	mg/kg	0.5	22	19	32	14
		Copper, Cu	mg/kg	0.5	9.2	9.1	35	1
		Nickel, Ni	mg/kg	0.5	8.6	8.1	36	5
		Lead, Pb	mg/kg	1	11	11	39	3
		Zinc, Zn	mg/kg	2	17	17	42	1
SE243774.001	LB272635.014	Arsenic, As	mg/kg	1	1	1	126	4
		Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	200	0
		Chromium, Cr	mg/kg	0.5	2.2	2.4	52	6
		Copper, Cu	mg/kg	0.5	1.4	1.6	64	13
		Nickel, Ni	mg/kg	0.5	1.1	1.2	72	8
		Lead, Pb	mg/kg	1	5	5	52	1
		Zinc, Zn	mg/kg	2	4	5	77	10
SE243788.003	LB272635.021	Arsenic, As	mg/kg	1	7	6	46	12
		Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	200	0
		Chromium, Cr	mg/kg	0.5	19	13	33	41 ②

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES (continued)

Method: ME-(AU)-[ENV]AN040/AN320

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243788.003	LB272635.021		Copper, Cu	mg/kg	0.5	12	13	34	1
			Nickel, Ni	mg/kg	0.5	9.0	9.5	35	5
			Lead, Pb	mg/kg	1	22	14	36	44 ②
			Zinc, Zn	mg/kg	2	43	33	35	28

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243774.001	LB272622.014		TRH C10-C14	mg/kg	20	<20	<20	200	0
			TRH C15-C28	mg/kg	45	<45	<45	200	0
			TRH C29-C36	mg/kg	45	<45	<45	200	0
			TRH C37-C40	mg/kg	100	<100	<100	200	0
			TRH C10-C36 Total	mg/kg	110	<110	<110	200	0
			TRH >C10-C40 Total (F bands)	mg/kg	210	<210	<210	200	0
		TRH F Bands	TRH >C10-C16	mg/kg	25	<25	<25	200	0
			TRH >C10-C16 - Naphthalene (F2)	mg/kg	25	<25	<25	200	0
			TRH >C16-C34 (F3)	mg/kg	90	<90	<90	200	0
			TRH >C34-C40 (F4)	mg/kg	120	<120	<120	200	0
SE243788.003	LB272622.021		TRH C10-C14	mg/kg	20	<20	<20	200	0
			TRH C15-C28	mg/kg	45	<45	<45	167	0
			TRH C29-C36	mg/kg	45	<45	47	129	5
			TRH C37-C40	mg/kg	100	<100	<100	200	0
			TRH C10-C36 Total	mg/kg	110	<110	<110	200	0
			TRH >C10-C40 Total (F bands)	mg/kg	210	<210	<210	200	0
		TRH F Bands	TRH >C10-C16	mg/kg	25	<25	<25	200	0
			TRH >C10-C16 - Naphthalene (F2)	mg/kg	25	<25	<25	200	0
			TRH >C16-C34 (F3)	mg/kg	90	<90	<90	167	0
			TRH >C34-C40 (F4)	mg/kg	120	<120	<120	200	0

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243774.002	LB272619.014	Monocyclic Aromatic	Benzene	mg/kg	0.1	<0.1	<0.1	200	0
			Toluene	mg/kg	0.1	<0.1	<0.1	200	0
			Ethylbenzene	mg/kg	0.1	<0.1	<0.1	200	0
			m/p-xylene	mg/kg	0.2	<0.2	<0.2	200	0
			o-xylene	mg/kg	0.1	<0.1	<0.1	200	0
		Polycyclic	Naphthalene (VOC)*	mg/kg	0.1	<0.1	<0.1	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	mg/kg	-	8.1	8.3	50	2
			d8-toluene (Surrogate)	mg/kg	-	8.1	8.7	50	7
			Bromofluorobenzene (Surrogate)	mg/kg	-	8.8	8.4	50	4
		Totals	Total BTEX*	mg/kg	0.6	<0.6	<0.3	200	0
			Total Xylenes*	mg/kg	0.3	<0.3	<0.3	200	0
SE243788.003	LB272619.020	Monocyclic Aromatic	Benzene	mg/kg	0.1	<0.1	<0.1	200	0
			Toluene	mg/kg	0.1	<0.1	<0.1	200	0
			Ethylbenzene	mg/kg	0.1	<0.1	<0.1	200	0
			m/p-xylene	mg/kg	0.2	<0.2	<0.2	200	0
			o-xylene	mg/kg	0.1	<0.1	<0.1	200	0
		Polycyclic	Naphthalene (VOC)*	mg/kg	0.1	<0.1	<0.1	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	mg/kg	-	7.8	7.8	50	0
			d8-toluene (Surrogate)	mg/kg	-	8.5	8.2	50	3
			Bromofluorobenzene (Surrogate)	mg/kg	-	8.2	8.1	50	1
		Totals	Total BTEX*	mg/kg	0.6	<0.6	<0.3	200	0
			Total Xylenes*	mg/kg	0.3	<0.3	<0.3	200	0

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243774.002	LB272619.014		TRH C6-C10	mg/kg	25	<25	<25	200	0
			TRH C6-C9	mg/kg	20	<20	<20	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	mg/kg	-	8.1	8.3	30	2
			d8-toluene (Surrogate)	mg/kg	-	8.1	8.7	30	7
			Bromofluorobenzene (Surrogate)	mg/kg	-	8.8	8.4	30	4
		VPH F Bands	Benzene (F0)	mg/kg	0.1	<0.1	<0.1	200	0
			TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	200	0

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may

Volatile Petroleum Hydrocarbons in Soil (continued) — **Method: ME-(AU)-[ENV]AN433**

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE243788.003	LB272619.020		TRH C6-C10	mg/kg	25	<25	<25	200	0
			TRH C6-C9	mg/kg	20	<20	<20	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	mg/kg	-	7.8	7.8	30	0
			d8-toluene (Surrogate)	mg/kg	-	8.5	8.2	30	3
			Bromofluorobenzene (Surrogate)	mg/kg	-	8.2	8.1	30	1
		VPH F Bands	Benzene (F0)	mg/kg	0.1	<0.1	<0.1	200	0
			TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	200	0

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272640.002	Mercury	mg/kg	0.05	0.19	0.2	70 - 130	95

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272628.002		Delta BHC	mg/kg	0.1	0.2	0.2	60 - 140	89
		Heptachlor	mg/kg	0.1	0.2	0.2	60 - 140	89
		Aldrin	mg/kg	0.1	0.2	0.2	60 - 140	91
		Dieldrin	mg/kg	0.2	<0.2	0.2	60 - 140	89
		Endrin	mg/kg	0.2	<0.2	0.2	60 - 140	88
		p,p'-DDT	mg/kg	0.1	0.2	0.2	60 - 140	85
	Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.12	0.15	40 - 130	82

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272622.002		Naphthalene	mg/kg	0.1	4.4	4	60 - 140	111
		Acenaphthylene	mg/kg	0.1	4.5	4	60 - 140	112
		Acenaphthene	mg/kg	0.1	4.2	4	60 - 140	106
		Phenanthrene	mg/kg	0.1	4.1	4	60 - 140	103
		Anthracene	mg/kg	0.1	4.3	4	60 - 140	108
		Fluoranthene	mg/kg	0.1	4.7	4	60 - 140	117
		Pyrene	mg/kg	0.1	4.1	4	60 - 140	102
		Benzo(a)pyrene	mg/kg	0.1	4.4	4	60 - 140	110
	Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.6	0.5	40 - 130	120
		2-fluorobiphenyl (Surrogate)	mg/kg	-	0.5	0.5	40 - 130	99
		d14-p-terphenyl (Surrogate)	mg/kg	-	0.5	0.5	40 - 130	100

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272635.002	Arsenic, As	mg/kg	1	350	318.22	80 - 120	110
	Cadmium, Cd	mg/kg	0.3	4.3	4.81	70 - 130	89
	Chromium, Cr	mg/kg	0.5	39	38.31	80 - 120	102
	Copper, Cu	mg/kg	0.5	320	290	80 - 120	111
	Nickel, Ni	mg/kg	0.5	190	187	80 - 120	100
	Lead, Pb	mg/kg	1	92	89.9	80 - 120	103
	Zinc, Zn	mg/kg	2	280	273	80 - 120	102
LB272638.002	Arsenic, As	mg/kg	1	370	318.22	80 - 120	116
	Cadmium, Cd	mg/kg	0.3	4.3	4.81	70 - 130	88
	Chromium, Cr	mg/kg	0.5	42	38.31	80 - 120	109
	Copper, Cu	mg/kg	0.5	330	290	80 - 120	115
	Nickel, Ni	mg/kg	0.5	210	187	80 - 120	111
	Lead, Pb	mg/kg	1	99	89.9	80 - 120	110
	Zinc, Zn	mg/kg	2	290	273	80 - 120	108

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272622.002		TRH C10-C14	mg/kg	20	44	40	60 - 140	110
		TRH C15-C28	mg/kg	45	<45	40	60 - 140	97
		TRH C29-C36	mg/kg	45	<45	40	60 - 140	79
	TRH F Bands	TRH >C10-C16	mg/kg	25	43	40	60 - 140	108
		TRH >C16-C34 (F3)	mg/kg	90	<90	40	60 - 140	94
		TRH >C34-C40 (F4)	mg/kg	120	<120	20	60 - 140	77

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272619.002	Monocyclic	Benzene	mg/kg	0.1	4.8	5	60 - 140	96
	Aromatic	Toluene	mg/kg	0.1	4.5	5	60 - 140	91
		Ethylbenzene	mg/kg	0.1	5.1	5	60 - 140	102
		m/p-xylene	mg/kg	0.2	11	10	60 - 140	109
		o-xylene	mg/kg	0.1	5.4	5	60 - 140	109
	Surrogates	d4-1,2-dichloroethane (Surrogate)	mg/kg	-	9.8	10	70 - 130	98
		d8-toluene (Surrogate)	mg/kg	-	10.3	10	70 - 130	103

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

VOC's in Soil (continued)

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272619.002	Surrogates	Bromofluorobenzene (Surrogate)	mg/kg	-	9.9	10	70 - 130	99

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB272619.002		TRH C6-C10	mg/kg	25	73	92.5	60 - 140	79
		TRH C6-C9	mg/kg	20	66	80	60 - 140	83
	Surrogates	d4-1,2-dichloroethane (Surrogate)	mg/kg	-	9.8	10	70 - 130	98
		Bromofluorobenzene (Surrogate)	mg/kg	-	9.9	10	70 - 130	99
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	mg/kg	25	42	62.5	60 - 140	68

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub -sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE243726.001	LB272640.004	Mercury	mg/kg	0.05	0.19	<0.05	0.2	90

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE243726.001	LB272622.004		Naphthalene	mg/kg	0.1	4.2	<0.1	4	105
			2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	-	-
			1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	-	-
			Acenaphthylene	mg/kg	0.1	4.3	<0.1	4	109
			Acenaphthene	mg/kg	0.1	4.1	<0.1	4	103
			Fluorene	mg/kg	0.1	<0.1	<0.1	-	-
			Phenanthrene	mg/kg	0.1	4.0	<0.1	4	100
			Anthracene	mg/kg	0.1	4.1	<0.1	4	104
			Fluoranthene	mg/kg	0.1	4.4	<0.1	4	109
			Pyrene	mg/kg	0.1	4.0	<0.1	4	101
			Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	-	-
			Chrysene	mg/kg	0.1	<0.1	<0.1	-	-
			Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1	-	-
			Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	-	-
			Benzo(a)pyrene	mg/kg	0.1	4.2	<0.1	4	104
			Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	-	-
			Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1	-	-
			Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	-	-
			Carcinogenic PAHs, BaP TEQ <LOR=0*	TEQ (mg/kg)	0.2	4.2	<0.2	-	-
			Carcinogenic PAHs, BaP TEQ <LOR=LOR/2*	TEQ (mg/kg)	0.2	4.2	<0.2	-	-
			Carcinogenic PAHs, BaP TEQ <LOR=LOR*	TEQ (mg/kg)	0.3	4.3	<0.3	-	-
			Total PAH (18)	mg/kg	0.8	33	<0.8	-	-
		Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.6	0.6	-	114
			2-fluorobiphenyl (Surrogate)	mg/kg	-	0.5	0.5	-	109
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.5	0.5	-	98

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE243726.001	LB272635.004	Arsenic, As	mg/kg	1	51	7	50	89
		Cadmium, Cd	mg/kg	0.3	45	<0.3	50	89
		Chromium, Cr	mg/kg	0.5	57	11	50	92
		Copper, Cu	mg/kg	0.5	52	6.3	50	92
		Nickel, Ni	mg/kg	0.5	51	4.9	50	92
		Lead, Pb	mg/kg	1	51	6	50	91
		Zinc, Zn	mg/kg	2	57	13	50	89
SE243727.001	LB272638.004	Arsenic, As	mg/kg	1	50	3	50	95
		Cadmium, Cd	mg/kg	0.3	47	<0.3	50	95
		Chromium, Cr	mg/kg	0.5	69	21	50	97
		Copper, Cu	mg/kg	0.5	60	9.2	50	101
		Nickel, Ni	mg/kg	0.5	58	8.0	50	100
		Lead, Pb	mg/kg	1	59	12	50	94
		Zinc, Zn	mg/kg	2	67	17	50	99

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE243726.001	LB272622.004		TRH C10-C14	mg/kg	20	42	<20	40	105
			TRH C15-C28	mg/kg	45	<45	<45	40	107
			TRH C29-C36	mg/kg	45	<45	<45	40	92
			TRH C37-C40	mg/kg	100	<100	<100	-	-
			TRH C10-C36 Total	mg/kg	110	<110	<110	-	-
			TRH >C10-C40 Total (F bands)	mg/kg	210	<210	<210	-	-
		TRH F Bands	TRH >C10-C16	mg/kg	25	42	<25	40	106
			TRH >C10-C16 - Naphthalene (F2)	mg/kg	25	42	<25	-	-
			TRH >C16-C34 (F3)	mg/kg	90	<90	<90	40	117
			TRH >C34-C40 (F4)	mg/kg	120	<120	<120	-	-

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub -sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE243726.001	LB272619.004	Monocyclic Aromatic	Benzene	mg/kg	0.1	5.0	<0.1	5	99
			Toluene	mg/kg	0.1	5.1	<0.1	5	101
			Ethylbenzene	mg/kg	0.1	4.8	<0.1	5	95
			m/p-xylene	mg/kg	0.2	9.7	<0.2	10	97
			o-xylene	mg/kg	0.1	4.9	<0.1	5	97
		Polycyclic	Naphthalene (VOC)*	mg/kg	0.1	<0.1	<0.1	-	-
		Surrogates	d4-1,2-dichloroethane (Surrogate)	mg/kg	-	9.5	8.3	10	95
			d8-toluene (Surrogate)	mg/kg	-	10.3	8.7	10	103
			Bromofluorobenzene (Surrogate)	mg/kg	-	9.1	8.8	10	91
		Totals	Total BTEX*	mg/kg	0.6	29	<0.6	-	-
			Total Xylenes*	mg/kg	0.3	15	<0.3	-	-

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE243726.001	LB272619.004		TRH C6-C10	mg/kg	25	85	<25	92.5	92
			TRH C6-C9	mg/kg	20	80	<20	80	99
		Surrogates	d4-1,2-dichloroethane (Surrogate)	mg/kg	-	9.5	8.3	10	95
			d8-toluene (Surrogate)	mg/kg	-	10.3	8.7	10	103
			Bromofluorobenzene (Surrogate)	mg/kg	-	9.1	8.8	-	91
		VPH F Bands	Benzene (F0)	mg/kg	0.1	5.0	<0.1	-	-
			TRH C6-C10 minus BTEX (F1)	mg/kg	25	56	<25	62.5	89

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the

No matrix spike duplicates were required for this job.

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here: https://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

*	NATA accreditation does not cover the performance of this service.
**	Indicative data, theoretical holding time exceeded.
***	Indicates that both * and ** apply.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.
①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to relevant report comments for further information.

Chain of Custody Form – Ref 15344

SGS EHS Sydney COC

SE243727

Ref:	**15012-3**
Investigator:	Envirowest Consulting 9 Cameron Place PO Box 8158 ORANGE NSW 2800
Telephone:	(02) 6361 4954
Email:	tiffany@envirowest.net.au
Contact Person:	Tiffany Skinner
Invoice:	accounts@envirowest.net.au
Laboratory:	SGS SYDNEY 16/33 Maddox Street ALEXANDRIA NSW 2015
Quotation #:	Envir_70119_2019
Courier/CN:	

			Sample matrix						**Analysis**				
									SGS Method Code				
									CL1T	**CL10**	**OCP**		
	Sample ID	**Container***	**Sampling Date/Time**	Water	Soil	Sludge	Cool	HNO3/HCl	Unpre-served	CL1T (7 metals)	TRH,BTEX,PAH. 8 metals	OCP		
1	TC001	A	23/02/2023		X		X			X		X		
2	TC002	A	23/02/2023		X		X			X				
3	TC003	A	23/02/2023		X		X			X				
4	TC004	A	23/02/2023		X		X			X				
5	TC005	A	23/02/2023		X		X			X		X		
6	TC006	A	23/02/2023		X		X			X				
7	TC007	A	23/02/2023		X		X			X				
8	TC008	A	23/02/2023		X		X			X		X		
9	TC009	A	23/02/2023		X		X			X				
10	TC010	A	23/02/2023		X		X			X				
11	TC011	A	23/02/2023		X		X			X				
12	TC012	A	23/02/2023		X		X			X				
13	TC013	A	23/02/2023		X		X			X				
14	TC014	A	23/02/2023		X		X			X				
15	TC015	A	23/02/2023		X		X			X		X		
16	HS1	A	23/02/2023		X		X				X	X		
17	TCDA	A	23/02/2023		X		X			X				

Investigator: I attest that the proper field sampling procedures were used during the collection of these samples.

Sampler name: Tiffany Skinner
Date: 23/02/2023 Time: 14:00

Relinquished by: (print and signature) Virginia Bragg Date: 27/02/2023 Time 1500

Received by: (print and signature) Date 28/02/23 Time @ 7:05

Please return completed form to Envirowest Consulting, *A = Solvent rinsed glass jar with Teflon lined lid and green label, B= Plastic with green label, C= Amber with green label, D= Vial with white label, E= Plastic with red label

Yin, Emily (Sydney)

From: Tiffany Skinner <tiffany@envirowest.net.au>
Sent: Tuesday, 28 February 2023 11:27 AM
To: AU.Environmental.Sydney, AU (Sydney)
Cc: AU.SampleReceipt.Sydney, AU (Sydney)
Subject: [EXTERNAL] RE: SGS Sample Receipt Advice (Ref: 15012-3, Lab Ref: SE243727)

Morning SGS,

Can you please amend to ensure our reference is 15344, sorry it wasn't clear on the COC.

Thanks

Tiffany

From: AU.Samplereceipt.Sydney@SGS.com <AU.Samplereceipt.Sydney@SGS.com>
Sent: Tuesday, February 28, 2023 11:17 AM
To: Tiffany Skinner <tiffany@envirowest.net.au>; admin <admin@envirowest.net.au>
Subject: SGS Sample Receipt Advice (Ref: 15012-3, Lab Ref: SE243727)

Dear Tiffany Skinner,

Please be advised we have received samples for analysis as detailed in the attached documentation.

Please provide any feedback you have on our service via this link https://sgs.surveymonkey.com/r/F92B32Q

Best regards,
SGS Alexandria Sample Administration Team
SGS Australia Pty Ltd
Phone: +61 (0)2 8594 0400
Fax: +61 (0)2 8594 0499

Appendix 4. Soil sampling protocols

1. Sampling

The samples will be collected from the auger tip, mattock, hand auger or excavator bucket immediately on withdrawal.

The time between retrieval of the sample and sealing of the sample container will be kept to a minimum.

The material will be collected using single use disposal gloves or a stainless-steel spade which represented material which has not been exposed to the atmosphere prior to sampling.

All sampling jars will be filled as close to the top as possible to minimise the available airspace within the jar.

2. Handling, containment and transport

Daily sampling activities will be recorded including sampling locations, numbers, observations, measurements, sampler, date and time and weather condition.

The sampling jars will be new sterile glass jars fitted with plastic lid and airtight Teflon seals, supplied by the laboratories for the purpose of collecting soil samples for analysis. Sample containers will be marked indelibly with the sample ID code to waterproof labels affixed to the body of the container.

All samples will be removed from direct sunlight as soon as possible after sampling and placed in insulated containers. Samples will be stored in a refrigerator at 4°C prior to transportation to the laboratory in insulated containers with ice bricks in accordance with AS4482.1.

Handling and transportation to the laboratory will be accompanied with a chain of custody form to demonstrate the specimens are properly received, documents, processed and stored.

Maximum holding time for extraction (AS4482.1) are:

Analyte	Maximum holding time
Metals	6 months
Mercury	28 days
Sulfate	7 days
Organic carbon	7 days
OCP, OPP, PCB	14 days
TRH, BTEX, PAH, phenols	14 days

3. Decontamination of sampling equipment

Sampling tools will be decontaminated between sampling locations by:

- Removing soil adhering to the sampling equipment by scraping, brushing or wiping
- Washing with a phosphate-free detergent
- Rinsing thoroughly with clean water
- Repeating if necessary
- Collect rinsate per sampling time and preserve according to AS 2031.1
- Dry equipment with disposable towels or air