# Preliminary contamination investigation

99 Mount Pleasant Lane, Buckaroo NSW

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## Summary report


### Background
Five accommodation cabins are proposed for 99 Mount Pleasant Lane, Buckaroo NSW. The development area is approximately 3,600m$^2$. The development area has a mixed-use agricultural history comprising pasture and vineyard.

An investigation of the development area is required to determine soil contamination status and suitability for the proposed land-use.

### Objectives of investigation
The objective of the investigation was to determine suitability of the development area 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 development area was made on the 16 June 2022. The development area was vacant pasture on the day of inspection with a mixed agriculture land-use history comprising grazing and vineyard.

Soil samples were collected from the development area from the 0-100mm soil depth for analysis of metals and organochlorine pesticides.

No building or infrastructure was located on the development area. Vegetation on the development area was 100% and dominated by slender rats tail grass, clover and paspalum. No signs of visible contamination such as discolouration or staining was identified on the surface of the development area. Vegetation on the development area was not showing signs of stress.

The historical parish maps include the notation “Gulgong Gold Fields” on the development area. No evidence of mining activities was identified on the development area in historical imagery or during the site inspection. No evidence of fill, sheep dips, mixing sheds or contaminating industrial activities were identified at the development area.

Levels of copper in one soil sample slightly exceeded the ecological investigation level. No impact was observed on potential receptors.

The soil sampling program did not detect elevated levels of other analysed metals across the development area. OCP were not detected in the soil samples collected. The levels of all substances evaluated were below the adopted thresholds for residential land-use with access to soil.

### Recommendations
The development area is suitable for residential land-use including accommodation cabins.

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## 1. Introduction

Five accommodation cabins are proposed for 99 Mount Pleasant Lane, Buckaroo NSW. The development area is approximately 3,600m$^2$. The development area has a mixed-use agricultural history comprising pasture and vineyard.

An investigation of the development area is required to determine soil contamination status and suitability for the proposed land-use.

## 2. Objectives

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

## 3. Scope of work

Envirowest Consulting Pty Ltd was commissioned by Michael and Emma Ferris to undertake a preliminary contamination investigation, in accordance with the contaminated land management planning guidelines, from the *Contaminated Land Management Act 1997* and the *State Environmental Policy No. 55 (SEPP 55)*, of the proposed development area at 99 Mount Pleasant Lane, Buckaroo NSW. The scope of works included site inspection, review of available information, soil sampling and analysis.

## 4. Site identification

| | |
|---|---|
| Address | 99 Mount Pleasant Lane<br>Buckaroo NSW |
| Deposited plans | Lot 147 DP755418 |
| Latitude and longitude | -32.56$^o$ 149.63$^o$ |
| Geographic coordinates | 55H E746503m N6393903m |
| Client | Michael and Emma Ferris |
| Owner | Michael and Emma Ferris |
| Current occupier | Michael and Emma Ferris |
| Area | Lot 11.5ha<br>Development area approximately 3,600m$^2$ |
| Local government area | Mid-Western Regional Council |
| Current zoning | RU4 – Primary Production Small Lots (Mid-Western Regional LEP 2012) |
| Trigger for investigation | Change in land-use |
| Locality map | Figure 1 |

# 5. Site history

## 5.1 Land-uses

The development area is currently vacant pasture. The development area has a mixed-use agricultural history comprising grazing and vineyard.

## 5.2 Summary of council records

The development area is identified as an area of vulnerable groundwater on the Groundwater Vulnerability Map (Mid-Western LEP 2012).

## 5.3 EPA databases

The site is not listed on the NSW EPA register of contaminated sites (7 July 2022) or sites notified to the EPA (7 July 2022).

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 considered not 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. No sites listed on NSW EPA POEO public register have been identified within 1km of the site.

## 5.6 Other government agency databases

The site is not listed on the following databases:

- National Liquid Fuel Facilities database
- The NSW Government PFAS Investigation Program
- Defence PFAS Investigation Program
- Defence PFAS Management Program
- Defence 3 Year Regional Contamination Investigation 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 16 June 2022 by Leah Desborough of Envirowest Consulting Pty Ltd
NSW EPA records of public notices under the CLM Act 1997
Soil and geological maps
Historical aerial photographs (1964, 1971,1980, 1988, 1990, 1994, 2003, 2009, 2013, 2015, 2017, 2018, 2020, 2021) including NSW Government historical imagery and Google Earth
Mid-Western Regional LEP 2012

## 5.8 Review of historic aerial photographs, maps and plans

### 5.8.1 Aerial photographs

| Year | Comment |
|---|---|
| 1964 | Scattered trees are located on the development area. The development area appears to be part of a larger holding extending to the south and east. The land-use appears agricultural potentially grazing. |
| 1971 | No significant changes to the development area. |
| 1980 | No significant changes to the development area. |
| 1988 | No significant changes to the development area. |
| 1990 | No significant changes to the development area. |
| 1994 | No significant changes to the development area. The development area and locality appear dry due to climatic stress |
| 2003 | Scattered trees have been removed. Intensive agriculture assumed vineyard is located on the development and surrounding area. |
| 2009 | No significant changes to the development area. |
| 2013 | No significant changes to the development area. |
| 2015 | No significant changes to the development area. |
| 2017 | No significant changes to the development area. |
| 2018 | No significant changes to the development area. |
| 2020 | No significant changes to the development area. |
| 2021 | Vineyard has been removed. Small areas of disturbance are located in the development area assumed due to removal of vineyard infrastructure. |

### 5.8.2 Topographic maps

The 1979 topographic map based in 1971 aerial and field revision in 1977 depicts the development area as scattered timber. The 1987 topographic map based on 1980 field revision depicts the development area as agricultural with a power transmission line traversing the site north to south.

The current topographic map (Six Maps) depicts the development areas as horticultural.

### 5.8.3 Historical parish maps

The 1884 historical parish map indicates the development area was part of a temporary common.

The 1895, 1905, 1911 and 1921 historical parish map indicates the development area was part of 30 acres owned by Joseph Boyling Jr. The portion and surrounding area include the notation “Gulgong Gold Fields”.

The 1931 historical parish map indicates the development area was part of 30 acres sold by Joseph Boyling Jr and purchased by Abernathy. The 1961 and 1967 historical parish maps show the site is owned by Percy Abernathy. The portion and surrounding area include the notation “Gulgong Gold Fields”.

## 5.9 Chronological list of site uses

The current owner purchased the property in approximately 1995. The site was reportedly cleared and grape vines were planted soon after the purchase of the property. In 2006, the decision was made to stop maintaining, irrigating and spraying the vines in the development and surrounding areas. The vines and associated irrigation infrastructure were removed in 2020. The development area was vacant pasture on the day of inspection.

No mining infrastructure was identified.

No sheep dips, mixing sheds, underground storage tanks (UST) or contaminating industrial activities have been identified as occurring on the site from the site history.

### 5.10 Heritage listings

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

- Commonwealth Heritage List
- National Heritage List
- State Heritage Register
- Local Environmental Plan (Mid-Western LEP 2012)

The development area is identified as being within 1km of one general item being the Mudgee Cemetery (I376) on the Mid-Western LEP (2012) heritage map. 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 Register are located within 1km of the site.

### 5.11 Buildings and infrastructure

No buildings or infrastructure were identified in the development area.

### 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

None expected

### 5.14 Previous investigations

A previous investigation was undertaken in 2021 on the neighbouring parcel to the east (Envirowest Consulting Pty Ltd report number R12670c). The parcels are considered part of the one property. The 2021 investigation recommended the building envelope is suitable for the proposed residential land-use.

No previous investigations are known have been undertaken on 99 Mount Pleasant Lane.

### 5.15 Historical neighbouring land-use

North – Grape vines
South – Grape vines
East – Grape vines
West – Grape vines, Mudgee Cemetery

Historical neighbouring land-uses may have impacted on the site.

### 5.16 Contaminant sources

The historic vineyard land-use is likely to have resulted in application of pesticides and fertilisers in routine management. Fertilisers applied may contain heavy metal contaminants. Organochlorine pesticides may have been applied in general management of vineyard and pastures. No bio solids are known to have been applied to the site.

The historical parish maps include the notation “Gulgong Gold Fields” on the development area. No evidence of mining activities was identified on the development area during the site inspection.

### 5.17 Contaminants of concern

Based on historical activities and site inspection the contaminants of concern associated with the development area:

- Heavy metals (arsenic, cadmium, chromium, copper, nickel, lead and zinc)
- 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 Leah Desborough, Senior Environmental Scientist with Envirowest Consulting Pty Ltd on 16 June 2022.

### 6.2 Land-use

The development area was vacant pasture at the time of inspection.

### 6.3 Current neighbouring land-use

North –Grazing
South – Grazing
East – Grazing
West – Grazing, Mudgee Cemetery

### 6.4 Surface cover and vegetation

Vegetation cover on the development area was 100% dominated by slender rates tail grass, clover and paspalum.

### 6.5 Evidence of visible contamination

No signs of visible contamination such as discolouration or staining was identified on the surface of the development area. Vegetation on the development area was not showing signs of stress.

No evidence of mining activities was identified on the development area during the site inspection.

No evidence of fill, sheep dips, mixing sheds or contaminating industrial activities was identified at the development area.

No signs of settlement or subsidence was identified on the development area.

### 6.6 Topography

The morphology on-site is a mid-slope. The site was very gently inclined slope of 1% to the south west. Elevation is approximately 478 to 480 metres above sea level.

### 6.7 Soils and geology

The site is within the Craigmore Soil Landscape (NSW Government nd). Soils in the Craigmore Soil Landscape are dominated by non-calcic brown soils occurring on the alluvial terraces with Red Earths co-dominant. Non-calcic brown soils comprise dark reddish brown fine sandy loam to loam topsoil with a clear change to reddish brown light clay subsoil.

The geological unit is Cainozoic Undifferentiated unconsolidated quartz and quartz lithic gravel, sand, silt, clay (NGMA 2000). Sources of alluvium are mostly metasediments of the Capertee Rise ((NSW Government nd).

### 6.8 Water

#### 6.8.1 Surface water

Surface water is expected to infiltrate or flow south west.

#### 6.8.2 Groundwater

No groundwater bores were located on the development area. One registered groundwater bore identified within 500m of the development area on the NSW Government Water NSW website (2020). The bore is licenced for irrigation. Water-bearing zone (WBZ) was from 61m and standing water level was at 28m.

| No. | Date drilled | Location | SWL (m) | Use | Status |
|---|---|---|---|---|---|
| GW800941 | 1997 | 200m SW | 28 | Irrigation | - |

### 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 (State Government of NSW and Department of Planning, Industry and Environment 1998).

The site is not mapped as a geological unit with asbestos potential (State Government of NSW and Department of Regional New South Wales 2015).

### 6.10 Environmentally sensitive features or habitats

The development area is identified as an area of vulnerable groundwater on the Groundwater Vulnerability Map (Mid-Western LEP 2012). No additional environmentally sensitive features or habitats are located on the development area.

Vegetation along Mt Pleasant Lane is identified as high biodiversity sensitivity on the Sensitivity Biodiversity Map (Mid-Western LEP 2012).

### 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 the development area which may impact on the suitability for the proposed land-use. The historic mixed agricultural land-use comprising vineyard and pasture may have resulted in application of pesticides, fertilisers and contaminating activities to the development area.

### 7.2 Contaminants of concern

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

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

### 7.3 Potential receptors

The proposed land-use of the site is five accommodation cabins and is expected to include hard surface areas comprising driveways and landscaped areas. The proposed land-use is considered residential in accordance with NEPM (1999). The site has historically been used for mixed agriculture.

Human receptors include:

- 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.

The proposed land-use of the site is residential 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. Construction workers, residents, visitors 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 is 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 which will control sediment movement from the site.

Groundwater is not identified as a potential receptor to contamination. Contaminants are expected to originate from the soil surface and groundwater levels in the locality are at depths greater than 28m below the soil surface. A clay subsoil layer reduces infiltration of water through the soil profile.

| Source/contaminants | Transport | Potential exposure pathways | Receptors |
|---|---|---|---|
| ☒ Use of pesticides and fertilisers (heavy metals and OCP) | ☐Wind<br>☐Sedimentation<br>☐Groundwater<br>☐Surface water<br>☐Volatilisation | ☒Direct contact (ingestion and absorption) (human and environment)<br>☒Inhalation<br>☒Runoff<br>☒Leaching | ☒Visitors (adults and children)<br>☒Construction workers<br>☒Intrusive maintenance workers<br>☒Terrestrial flora and fauna<br>☐Aquatic flora and fauna |

☒Potential, ☐unknown/unlikely

# 8. Data quality objectives (DQO)

## 8.1 State the problem

Five accommodation cabins are proposed for the development area. Accommodation cabins with areas of garden and hard surfaces are expected. The site has historically been used for mixed agriculture which may have resulted in application of pesticides, fertilisers and contaminating activities to the development area.

## 8.2 Identify the decision

Five accommodation cabins are proposed for the development area. Residential land-use is considered the most appropriate land-use and the levels of contaminants should be less than the thresholds listed in Section 11. The decision problem is, do the levels of potential contaminants exceed the assessment criteria listed in Section 11.

## 8.3 Identify the inputs decision

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

## 8.4 Define the boundaries of the study

The investigation area is a 3,600m$^2$ development area located at 99 Mount Pleasant Lane, Buckaroo NSW.

## 8.5 Develop a decision rule

The initial guidelines for soil were the health and ecological investigation levels for residential land-use (NEPC 1999).

If soil contamination was identified then the contaminant source and extent of contamination was determined.

## 8.6 Specify acceptable limits on the decision errors.

The 95% upper confidence limit of average levels of samples collected is less than the threshold levels and the results are less than 250% of relevant thresholds.

## 8.7 Optimize the design for obtaining data

The site was investigated by collecting soil samples from the nominated development area on an approximate 20m grid pattern and combine to form composite samples. Composite samples were analysed for heavy metals and discrete soil samples were analysed for organochlorine pesticides (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 development area. The development area has been historically managed as part of a single unit and is expected to have been treated similarly.

### 9.1.2 Sampling locations

Discrete soil samples were collected from the development area on the site on an approximate 20m grid pattern. Four discrete samples were combined to form a composite soil sample. A total of twelve discrete soil samples were collected and combined to form three composite samples for analysis of heavy metals. Three discrete samples were analysed for OCP.

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 12m at a 95% level of confidence.

The sampling frequency is in accordance with the minimum recommended by EPA (1995).

### 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 which was the target sampling depth as minimal soil disturbance has occurred.

## 9.2 Analytes

Composite soil samples collected from the development area were evaluated for arsenic, cadmium, chromium, copper, lead, nickel and zinc. Discrete soil samples were evaluated for organochlorine pesticides (OCP). Heavy metals and OCP were identified as the contaminants of concern possibly present as a result of historical mixed agricultural activities.

## 9.3 Sampling methods

Soil samples were taken using a stainless steel hand spade. Soil was taken at each individual sampling location below the vegetative and detrital layer.

The soil was transferred to a clean plastic bag, mixed and transferred to a solvent rinsed glass jar with a Teflon lid. Four discrete samples were combined to create each composite sample for chemical analysis. Discrete soil samples were transferred directly to a solvent rinsed glass jar with a Teflon lid.

Tools were decontaminated between sampling locations to prevent cross contamination by: brushing to remove caked or encrusted material, rinsing with clean tap water and allowing to air dry or using a clean towel.

Soil sampling protocols are outlined in Appendix 4.

# 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.

Discrete soil samples were collected from the development area on a systematic grid pattern of approximately 20 metres. This sampling density will enable the detection of an area with an elevated concentration on a radius of 12m with a 95% confidence level.

The number of sampling locations is in accordance with the recommended density in the EPA sampling guidelines.

## 10.2 Field

The collection of samples was undertaken in accordance with accepted standard protocols (NEPC 1999). Composite sampling was undertaken to reduce the cost of chemical analysis. Combining equal amounts from four discrete samples created the composite samples. A composite sample represents the average concentration of the sub-sample.

The rules for composite sampling were observed (EPA 1995). All composite samples were analysed for arsenic, cadmium, chromium, copper, lead, nickel and zinc. Selected discrete soil samples collected from the development area were analysed for 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 drill tip. After collection the samples were immediately placed in new glass sampling jars and placed in a cooler.

One duplicate sample was collected. 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. Some samples in the sampling batch did not form part of the investigation.

A field sampling log is presented in Appendix 2.

**Table 1.** Schedule of samples and analyses

| Sample ID | Discrete sample ID | Depth (mm) | Analysis undertaken |
|---|---|---|---|
| MF1 | 11, 12, 13, 14 | 0-100 | Arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), nickel (Ni), zinc (Zn) |
| MF2 | 21, 22, 23, 24 | 0-100 | As, Cd, Cr, Cu, Pb, Ni, Zn |
| MF3 | 31, 32, 33, 34 | 0-100 | As, Cd, Cr, Cu, Pb, Ni, Zn |
| MF11D | 11 | 0-100 | Organochlorine pesticides (OCP) |
| MF21D | 21 | 0-100 | OCP |
| MF31D | 31 | 0-100 | 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 3.

### 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 proposed land-use is accommodation cabins. The laboratory results were assessed against the proposed land-use of residential (HIL A) which is considered the most appropriate land-use category. The health-based investigation levels of contaminants in the soil for residential sites, for the substances for which criteria are available, are listed in Table 3, as recommended in the NEPC (1999).

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). The EILs consider the properties of the soil and contaminants and the capacity of the local ecosystem to accommodate increases in contaminant levels.

Typical CEC value for the site is >10 to 20cmol(+)/kg, clay content of 40%, pH values of between 4.5 and 5 and organic carbon of 4% (NSW Government nd). The proposed land-use is residential (urban residential areas and open space). 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 depth below the surface. The EILs for residential land-use are listed in Table 3.

The investigation threshold was adjusted to enable the detection of an individual location being diluted in the composting process (EPA 1995). For composite sampling, the analyte result was divided against the number of discrete samples making up the composite. This is based on a worst-case scenario in which one sample has a high concentration whilst other discrete samples have zero concentration. This is a conservative approach.

**Table 2.** EIL Calculation sheet, residential land-use

| Analyte | Rationale | EIL (mg/kg) |
|---|---|---|
| Arsenic | Generic | 100 |
| Chromium (III) | Clay content 40% | 580 |
| Copper | CEC 20cmol/kg, pH 5, organic carbon 4% | 150 |
| Lead | Generic | 1,100 |
| Nickel | CEC 20cmol/kg | 350 |
| Zinc | CEC 20cmol/kg, pH 5 | 350 |

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 investigation levels (mg/kg) (NEPC 1999) for residential land-use

| Analyte | HIL A Residential | | EIL Urban Residential and public open space | |
|---|---|---|---|---|
| | Composite | Discrete | Composite | Discrete |
| Arsenic | 25 | 100 | 25 | 100 |
| Cadmium | 5 | 20 | - | - |
| Chromium (total) | 25[1] | 100[1] | 160[2] | 640[2] |
| Copper | 1,500 | 6,000 | 25 | 100 |
| Lead | 75 | 300 | 275 | 1,100 |
| Nickel | 100 | 400 | 67.5 | 270 |
| Zinc | 1,850 | 7,400 | 65 | 260 |
| OCP (total) | - | - | - | - |
| DD's | - | 240 | - | 180 |

HIL – health investigation level, EIL – ecological investigation level, [1] Threshold for Chromium (VI), [2] Threshold for Chromium (III)

## 12. Results and discussion

The development area was vacant pasture on the day of inspection. The development area has a historical mixed agricultural land-use comprising grazing and vineyard.

No building or infrastructure was located on the development area. Vegetation on the development area was 100% and dominated by slender rats tail grass, clover and paspalum. No signs of visible contamination such as discolouration or staining was identified on the surface of the development area. Vegetation on the development area was not showing signs of stress.

The historical parish maps include the notation "Gulgong Gold Fields" on the development area. No evidence of mining activities was identified on the development area in historical imagery or during the site inspection.

No evidence of fill, sheep dips, mixing sheds or contaminating industrial activities were identified at the development area.

Levels of copper in composite sample MF2C was 30mg/kg which is above the ecological investigation level of 25mg/kg (Table 4). Vegetation was identified in the conceptual site model as a potential receptor to contamination. Vegetation on the development area was 100% and not showing signs of impact from elevated copper levels or stress. Levels of copper in the soil are not expected to be impacting on vegetation. No other ecological receptors were identified.

Levels of remaining heavy metals in all samples collected from the development area were near environmental background levels and less than the adopted thresholds for human health and the environment (Table 4).

The level of OCP in all soil samples collected from the site were below the level of detection and less than the adopted thresholds for human health and environment (Table 4).

**Table 4.** Analytical results and threshold concentrations, metals and OCP (mg/kg)

| Sample ID Figure 3 | Sample Type | Arsenic | Cadmium | Chromium (total) | Copper | Lead | Nickel | Zinc | OCP (total) | DD' s |
|---|---|---|---|---|---|---|---|---|---|---|
| MF1C | Composite | 3 | <0.3 | 20 | 11 | 9 | 4.4 | 8 | - | - |
| MF2C | Composite | 3 | <0.3 | 17 | **30** | 6 | 3.2 | 14 | - | - |
| MF3C | Composite | 3 | <0.3 | 21 | 20 | 9 | 4.8 | 15 | - | - |
| MF11D | Discrete | - | - | - | - | - | - | - | <1 | <0.6 |
| MF21D | Discrete | - | - | - | - | - | - | - | <1 | <0.6 |
| MF31D | Discrete | - | - | - | - | - | - | - | <1 | <0.6 |
| ***Health Investigation Level- Residential land-use threshold (NEPC 1999)*** | | | | | | | | | | |
| *Composite* | | 25 | 5 | 25 | 1,500 | 75 | 100 | 1,850 | - | - |
| *Discrete* | | *100* | *20* | *100*[1] | *6,000* | *300* | *400* | *7,400* | - | *240* |
| ***Ecological Investigation Level-* Urban residential and public open space land-use threshold (NEPC 1999)** | | | | | | | | | | |
| *Composite* | | *25* | - | *160* | *25* | *275* | *67.5* | *65* | - | - |
| *Discrete* | | *100* | - | *640* | *100* | *1,100* | *270* | *260* | - | *180* |

[1] Chromium (IV), [2] Chromium (III)

# 13. Site characterisation

## 13.1 Environmental contamination

Levels of copper exceeded the EIL for residential land-use.

## 13.2 Chemical degradation production

Heavy metals do not degrade.

## 13.3 Exposed population

### 13.3.1 Human health

All potential contaminants were less than the HIL.

### 13.3.2 Ecological

Potential ecological receptors identified in the conceptual site model was vegetation. Vegetation on the site was 100% and dominated by slender rats tail grass, clover and paspalum. No adverse indicators of exposure to elevated copper in the soil was observed in the vegetation. The levels of copper are not expected to be impacting on vegetation growth. No other ecological receptors were identified.

# 14. Conclusions and recommendations

## 14.1 Summary

An inspection of the development area was made on the 16 June 2022. The development area was vacant pasture on the day of inspection with a mixed agriculture land-use history comprising grazing and vineyard.

Soil samples were collected from the development area from the 0-100mm soil depth for analysis of metals and organochlorine pesticides.

No building or infrastructure was located on the development area. Vegetation on the development area was 100% and dominated by slender rats tail grass, clover and paspalum. No signs of visible

contamination such as discolouration or staining was identified on the surface of the development area. Vegetation on the development area was not showing signs of stress.

The historical parish maps include the notation “Gulgong Gold Fields” on the development area. No evidence of mining activities was identified on the development area in historical imagery or during the site inspection. No evidence of fill, sheep dips, mixing sheds or contaminating industrial activities were identified at the development area.

Levels of copper in one soil sample slightly exceeded the ecological investigation level. No impact was observed on potential receptors.

The soil sampling program did not detect elevated levels of other analysed metals across the development area. OCP were not detected in the soil samples collected. 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 relate 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’ with a radius of approximately 12m and with a 95% level of confidence.

### 14.4 Suitability for proposed use of the site

The development area is suitable for residential land-use including accommodation cabins.

### 14.5 Limitations and constraints on the use of the site

No constraints are recommended.

### 14.6 Recommendation for further work

No further investigations are required.

## 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.

This report, including data contained and its findings and conclusions, remains the intellectual property of Envirowest Consulting Pty Ltd. A licence to use the report for the specific purpose identified is granted for the persons identified in that section after full payment for the services involved in preparation of the report. This report should not be used by persons or for purposes other than those stated and should not be reproduced without the permission of Envirowest Consulting Pty Ltd.

## 16. References

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

EPA (2017) *Contaminated Sites: Guidelines for the NSW Site Auditors Scheme* (NSW Department of Environment and Conservation, Chatswood)

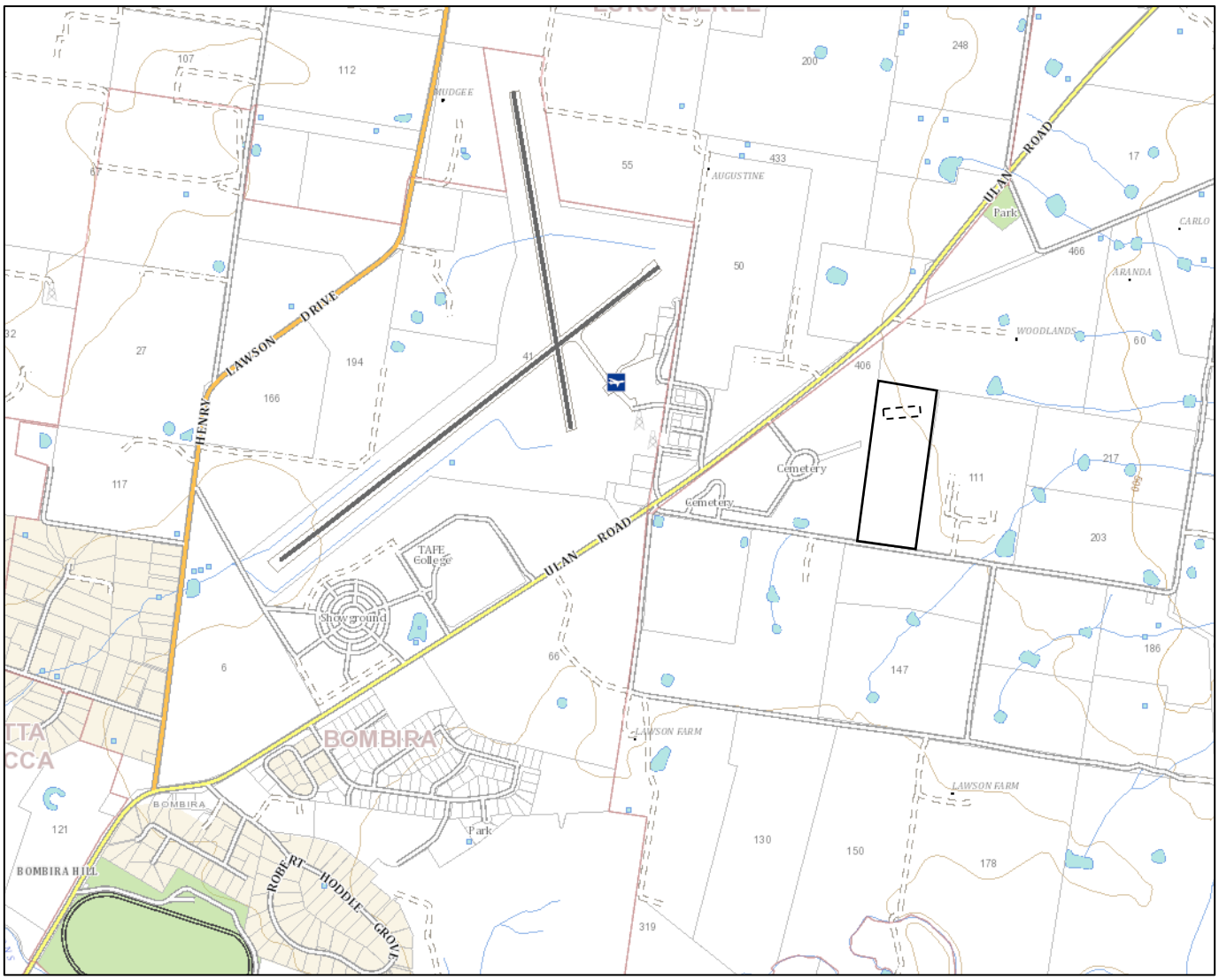
NEPC (1999 revised 2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999* (National Environment Protection Council Service Corporation, Adelaide)

NSW Government (nd) *eSpadev2* (https://www.environment.nsw.gov.au/eSpade2WebApp)

State Government of NSW and Department of Regional New South Wales (2015) *Naturally occurring asbestos,* viewed 8 June 2022 (datasets.seed.nsw.gov.au/dataset/naturally-occurring-asbestos)

State Government of NSW and Department of Planning, Industry and Environment (1998) *Acid sulphate soils risk,* viewed 8 June 2022 (datasets.seed.nsw.gov.au/dataset/ acid-sulfate-soils-risk0196c)

## Figures




## Legend

Lot boundary

Development area

| **Figure 1.** Site locality | | |
|---|---|---|
| 99 Mount Pleasant Lane, Buckaroo NSW | | |
| | Envirowest Consulting Pty Ltd | |
| Job: R14453c | Drawn by: TS | Date: 06/07/2022 |


**Legend**

Lot boundary

Development area

⊗ Sampling location

**Approximate Scale 1: 2500**

0 25 50 100m

| **Figure 2.** Site layout and sampling locations | | |
|---|---|---|
| 99 Mount Pleasant Lane, Buckaroo NSW | | |
| | Envirowest Consulting Pty Ltd | |
| Job: R14453c | Drawn by: TS | Date: 06/07/2022 |

**Figure 4.** Photographs of the site

Photograph taken looking south west

# 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 (1995) 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 practical quantitation limit (PQL) or absolute difference AD.

- Levels greater than 10 times the PQL the RPD is 50%
- Levels between 5 and 10 times the PQL the RPD is 75%
- Levels between 2 and 5 times the PQL the RPD is 100%
- Levels less than 2 times the PQL, the AD is less than 2.5 times the PQL

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%.<br>Analysis criterion<br>60% RPD for levels greater than 10 times the PQL<br>85% RPD for levels between 5 to 10 times the PQL<br>100% RPD at levels between 2 to 5 times the PQL<br>Absolute difference, 3.5 times the PQL where levels are, 2 times PQL |

### 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 16 June 2022. A total of 17 samples were submitted for analytical testing. The batch contained samples which did not form part of the investigation. The samples were collected in the field by an environmental scientist from Envirowest Consulting Pty Ltd, 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 |
|---|---|---|---|---|---|---|
| MF1C, MF2C, MF3C, MF4C, MF5C, MF6C, MF7C, MF8C | 8 | 1 | Arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), nickel (Ni), zinc (Zn) | 16/06/2022 | Soil | SE233323 |
| MF11D, MF21D, MF31D, MF41D, MF51D, MF61D, MF71D, MF81D | 8 | 0 | Organochlorine pesticides (OCP) | 16/06/2022 | Soil | SE233323 |

**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 |
| TRH(C6-C9) | USPEA SW846-5030A | USPEA SW 846-8260B |
| TRH(C10-C40), PAH | Tumbler extraction of solids | USEPA SW 846-8270B |
| PCB | Tumbler extraction of solids | USEPA SW 846-8270B |
| BTEX | Tumbler extraction of solids | USEPA SW 846-8260B |
| OC Pesticides | Tumbler extraction of solids | USEPA SW 846-8270B |

## 3. Field quality assurance and quality control

One intra laboratory duplicate sample was 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 +/- 40% 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 |
|---|---|---|---|---|---|---|
| MF1C, MF2C, MF3C, MF4C, MF5C, MF6C, MF7C, MF8C, MF11D, MF21D, MF31D, MF41D, MF51D, MF61D, MF71D, MF81D | 16 | 1 | 6 | 16/06/2022 | Soil | SE233323 |

**Table A1.** Relative differences for intra laboratory duplicates

| | MF2C, MFA | | | |
|---|---|---|---|---|
| | MF2C | MFA | Relative difference (%) | Pass/Fail |
| Arsenic | 3 | 2 | 40 | Pass |
| Cadmium | <0.3 | <0.3 | NA | - |
| Chromium | 17 | 14 | 19 | Pass |
| Copper | 30 | 29 | 3 | Pass |
| Lead | 6 | 5 | 18 | Pass |
| Nickel | 3.2 | 2.6 | 20 | Pass |
| Zinc | 14 | 16 | 13 | Pass |

NA – relative difference unable to be calculated as results are less than laboratory detection limit, [1] Result less than 5 times the detection limit, [2] where an exceedance has occurred the higher result was used in the results

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.
- Target analytes were not volatile

# 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, OPP | 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. No outliers exist for the sampling batch. 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<br>Mercury < 28 days<br>OCP, OPP, PAH, TRH, PCB, 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 +/-40% or discussion required |
| Field duplicates (intra and inter laboratory) | Yes | Frequency of 5%, results to be within +/-40% or discussion required. |
| Laboratory prepared volatile trip spikes | NA | Frequency of 5%, results to be within +/-40% 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 | No | Frequency of 5%, results to be within +/-40% or discussion required. Recovery failed acceptance criteria due to matrix interference. |
| Matrix duplicates | No | Frequency of 5%, results to be within +/-40% or discussion required. 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.

- Target analytes were not volatile

## 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 | Michael and Emma Ferris |
| Contact | Michael Ferris |
| Job number | 14453 |
| Location | 99 Mount Pleasant Lane, Buckaroo |
| Date | 16 June 2022 |
| Investigator | Leah Desborough |
| Weather conditions | Cool and fine |

| Sample ID | Matrix | Date | Analysis required | Observations/comments |
|---|---|---|---|---|
| MF1C | Soil | 16/06/2022 | Arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), nickel (Ni), zinc (Zn) | |
| MF2C | Soil | 16/06/2022 | As, Cd, Cr, Cu, Pb, Ni, Zn | |
| MF3C | Soil | 16/06/2022 | As, Cd, Cr, Cu, Pb, Ni, Zn | |
| MF4C | Soil | 16/06/2022 | - | Sample did not form part of investigation |
| MF5C | Soil | 16/06/2022 | - | Sample did not form part of investigation |
| MF6C | Soil | 16/06/2022 | - | Sample did not form part of investigation |
| MF7C | Soil | 16/06/2022 | - | Sample did not form part of investigation |
| MF8C | Soil | 16/06/2022 | - | Sample did not form part of investigation |
| MF11D | Soil | 16/06/2022 | Organochlorine pesticides (OCP) | |
| MF21D | Soil | 16/06/2022 | OCP | |
| MF31D | Soil | 16/06/2022 | OCP | |
| MF41D | Soil | 16/06/2022 | - | Sample did not form part of investigation |
| MF51D | Soil | 16/06/2022 | - | Sample did not form part of investigation |
| MF61D | Soil | 16/06/2022 | - | Sample did not form part of investigation |
| MF71D | Soil | 16/06/2022 | - | Sample did not form part of investigation |
| MF81D | Soil | 16/06/2022 | - | Sample did not form part of investigation |
| MFA | Soil | 16/06/2022 | | Duplicate of DF5 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Appendix 3.** Soil analysis results – SGS report number SE233323 and chain of custody form

# ANALYTICAL REPORT

Accreditation No. 2562

## CLIENT DETAILS

| | |
|---|---|
| Contact | Leah Desborough |
| Client | ENVIROWEST CONSULTING PTY LIMITED |
| Address | PO BOX 8158<br>ORANGE NSW 2800 |
| Telephone | 61 2 63614954 |
| Facsimile | (Not specified) |
| Email | leah@envirowest.net.au |
| Project | **14453** |
| Order Number | **14453** |
| Samples | 17 |

## LABORATORY DETAILS

| | |
|---|---|
| Manager | Huong Crawford |
| Laboratory | SGS Alexandria Environmental |
| Address | Unit 16, 33 Maddox St<br>Alexandria NSW 2015 |
| Telephone | +61 2 8594 0400 |
| Facsimile | +61 2 8594 0499 |
| Email | au.environmental.sydney@sgs.com |
| SGS Reference | **SE233323 R0** |
| Date Received | 21/6/2022 |
| Date Reported | 28/6/2022 |

## COMMENTS

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

## SIGNATORIES

**Bennet LO**
Senior Chemist

**Dong LIANG**
Metals/Inorganics Team Leader

**Huong CRAWFORD**
Production Manager

**Shane MCDERMOTT**
Inorganic/Metals Chemist

## OC Pesticides in Soil [AN420] Tested: 24/6/2022

| PARAMETER | UOM | LOR | MF11D SOIL - 16/6/22 13:00 SE233323.009 | MF21D SOIL - 16/6/22 13:00 SE233323.010 | MF31D SOIL - 16/6/22 13:00 SE233323.011 | MF41D SOIL - 16/6/22 13:00 SE233323.012 | MF51D SOIL - 16/6/22 13:00 SE233323.013 |
|---|---|---|---|---|---|---|---|
| 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 | 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 |

## OC Pesticides in Soil [AN420] Tested: 24/6/2022 (continued)

| PARAMETER | UOM | LOR | MF61D SOIL - 16/6/22 13:00 SE233323.014 | MF71D SOIL - 16/6/22 13:00 SE233323.015 | MF81D SOIL - 16/6/22 13:00 SE233323.016 |
|---|---|---|---|---|---|
| Hexachlorobenzene (HCB) | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Alpha BHC | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Lindane | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Heptachlor | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Aldrin | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Beta BHC | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Delta BHC | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Heptachlor epoxide | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| o,p'-DDE | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Alpha Endosulfan | mg/kg | 0.2 | <0.2 | <0.2 | <0.2 |
| Gamma Chlordane | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Alpha Chlordane | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| trans-Nonachlor | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| p,p'-DDE | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Dieldrin | mg/kg | 0.2 | <0.2 | <0.2 | <0.2 |
| Endrin | mg/kg | 0.2 | <0.2 | <0.2 | <0.2 |
| o,p'-DDD | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| o,p'-DDT | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Beta Endosulfan | mg/kg | 0.2 | <0.2 | <0.2 | <0.2 |
| p,p'-DDD | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| p,p'-DDT | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Endosulfan sulphate | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Endrin Aldehyde | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Methoxychlor | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Endrin Ketone | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Isodrin | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Mirex | mg/kg | 0.1 | <0.1 | <0.1 | <0.1 |
| Total CLP OC Pesticides | mg/kg | 1 | <1 | <1 | <1 |
| Total OC VIC EPA | mg/kg | 1 | <1 | <1 | <1 |

## Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES [AN040/AN320] Tested: 27/6/2022

| PARAMETER | UOM | LOR | MF1C SOIL - 16/6/22 13:00 SE233323.001 | MF2C SOIL - 16/6/22 13:00 SE233323.002 | MF3C SOIL - 16/6/22 13:00 SE233323.003 | MF4C SOIL - 16/6/22 13:00 SE233323.004 | MF5C SOIL - 16/6/22 13:00 SE233323.005 |
|---|---|---|---|---|---|---|---|
| Arsenic, As | mg/kg | 1 | 3 | 3 | 3 | 3 | 5 |
| Cadmium, Cd | mg/kg | 0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Chromium, Cr | mg/kg | 0.5 | 20 | 17 | 21 | 19 | 26 |
| Copper, Cu | mg/kg | 0.5 | 11 | 30 | 20 | 68 | 36 |
| Lead, Pb | mg/kg | 1 | 9 | 6 | 9 | 9 | 8 |
| Nickel, Ni | mg/kg | 0.5 | 4.4 | 3.2 | 4.8 | 3.0 | 3.5 |
| Zinc, Zn | mg/kg | 2 | 8 | 14 | 15 | 15 | 14 |

| PARAMETER | UOM | LOR | MF6C SOIL - 16/6/22 13:00 SE233323.006 | MF7C SOIL - 16/6/22 13:00 SE233323.007 | MF8C SOIL - 16/6/22 13:00 SE233323.008 | MFA SOIL - 16/6/22 13:00 SE233323.017 |
|---|---|---|---|---|---|---|
| Arsenic, As | mg/kg | 1 | 2 | 4 | 2 | 2 |
| Cadmium, Cd | mg/kg | 0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Chromium, Cr | mg/kg | 0.5 | 12 | 17 | 13 | 14 |
| Copper, Cu | mg/kg | 0.5 | 12 | 17 | 7.9 | 29 |
| Lead, Pb | mg/kg | 1 | 7 | 13 | 7 | 5 |
| Nickel, Ni | mg/kg | 0.5 | 1.3 | 3.7 | 2.1 | 2.6 |
| Zinc, Zn | mg/kg | 2 | 6 | 9 | 5 | 16 |

## Moisture Content [AN002] Tested: 24/6/2022

| PARAMETER | UOM | LOR | MF1C SOIL - 16/6/22 13:00 SE233323.001 | MF2C SOIL - 16/6/22 13:00 SE233323.002 | MF3C SOIL - 16/6/22 13:00 SE233323.003 | MF4C SOIL - 16/6/22 13:00 SE233323.004 | MF5C SOIL - 16/6/22 13:00 SE233323.005 |
|---|---|---|---|---|---|---|---|
| % Moisture | %w/w | 1 | 16.6 | 17.1 | 19.1 | 17.1 | 19.2 |

| PARAMETER | UOM | LOR | MF6C SOIL - 16/6/22 13:00 SE233323.006 | MF7C SOIL - 16/6/22 13:00 SE233323.007 | MF8C SOIL - 16/6/22 13:00 SE233323.008 | MF11D SOIL - 16/6/22 13:00 SE233323.009 | MF21D SOIL - 16/6/22 13:00 SE233323.010 |
|---|---|---|---|---|---|---|---|
| % Moisture | %w/w | 1 | 17.5 | 21.1 | 20.4 | 16.3 | 16.8 |

| PARAMETER | UOM | LOR | MF31D SOIL - 16/6/22 13:00 SE233323.011 | MF41D SOIL - 16/6/22 13:00 SE233323.012 | MF51D SOIL - 16/6/22 13:00 SE233323.013 | MF61D SOIL - 16/6/22 13:00 SE233323.014 | MF71D SOIL - 16/6/22 13:00 SE233323.015 |
|---|---|---|---|---|---|---|---|
| % Moisture | %w/w | 1 | 16.7 | 20.6 | 23.4 | 16.7 | 20.1 |

| PARAMETER | UOM | LOR | MF81D SOIL - 16/6/22 13:00 SE233323.016 | MFA SOIL - 16/6/22 13:00 SE233323.017 |
|---|---|---|---|---|
| % Moisture | %w/w | 1 | 17.2 | 19.2 |

| 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. |
| 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). |

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.

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# STATEMENT OF QA/QC PERFORMANCE

**SE233323 R0**

## CLIENT DETAILS

| | |
|---|---|
| Contact | Leah Desborough |
| Client | ENVIROWEST CONSULTING PTY LIMITED |
| Address | PO BOX 8158<br>ORANGE NSW 2800 |
| Telephone | 61 2 63614954 |
| Facsimile | (Not specified) |
| Email | leah@envirowest.net.au |
| Project | **14453** |
| Order Number | **14453** |
| Samples | 17 |

## LABORATORY DETAILS

| | |
|---|---|
| Manager | Huong Crawford |
| Laboratory | SGS Alexandria Environmental |
| Address | Unit 16, 33 Maddox St<br>Alexandria NSW 2015 |
| Telephone | +61 2 8594 0400 |
| Facsimile | +61 2 8594 0499 |
| Email | au.environmental.sydney@sgs.com |
| SGS Reference | **SE233323 R0** |
| Date Received | 21 Jun 2022 |
| Date Reported | 28 Jun 2022 |

## 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 |
| Matrix Spike | Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES | 1 item |

## SAMPLE SUMMARY

| | | | |
|---|---|---|---|
| Samples clearly labelled | Yes | Complete documentation received | Yes |
| Sample container provider | SGS | Sample cooling method | Ice Bricks |
| Samples received in correct containers | Yes | Sample counts by matrix | 17 Soil |
| Date documentation received | 21/6/2022 | Type of documentation received | COC |
| Samples received in good order | Yes | Samples received without headspace | Yes |
| Sample temperature upon receipt | 10.4°C | Sufficient sample for analysis | Yes |
| Turnaround time requested | Standard | | |

# HOLDING TIME SUMMARY

SE233323 R0

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

**Moisture Content** — Method: ME-(AU)-[ENV]AN002

| Sample Name | Sample No. | QC Ref | Sampled | Received | Extraction Due | Extracted | Analysis Due | Analysed |
|---|---|---|---|---|---|---|---|---|
| MF1C | SE233323.001 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF2C | SE233323.002 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF3C | SE233323.003 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF4C | SE233323.004 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF5C | SE233323.005 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF6C | SE233323.006 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF7C | SE233323.007 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF8C | SE233323.008 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF11D | SE233323.009 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF21D | SE233323.010 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF31D | SE233323.011 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF41D | SE233323.012 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF51D | SE233323.013 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF61D | SE233323.014 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF71D | SE233323.015 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MF81D | SE233323.016 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |
| MFA | SE233323.017 | LB251800 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 29 Jun 2022 | 28 Jun 2022 |

**OC Pesticides in Soil** — Method: ME-(AU)-[ENV]AN420

| Sample Name | Sample No. | QC Ref | Sampled | Received | Extraction Due | Extracted | Analysis Due | Analysed |
|---|---|---|---|---|---|---|---|---|
| MF11D | SE233323.009 | LB251788 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 03 Aug 2022 | 28 Jun 2022 |
| MF21D | SE233323.010 | LB251788 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 03 Aug 2022 | 28 Jun 2022 |
| MF31D | SE233323.011 | LB251788 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 03 Aug 2022 | 28 Jun 2022 |
| MF41D | SE233323.012 | LB251788 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 03 Aug 2022 | 28 Jun 2022 |
| MF51D | SE233323.013 | LB251788 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 03 Aug 2022 | 28 Jun 2022 |
| MF61D | SE233323.014 | LB251788 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 03 Aug 2022 | 28 Jun 2022 |
| MF71D | SE233323.015 | LB251788 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 03 Aug 2022 | 28 Jun 2022 |
| MF81D | SE233323.016 | LB251788 | 16 Jun 2022 | 21 Jun 2022 | 30 Jun 2022 | 24 Jun 2022 | 03 Aug 2022 | 28 Jun 2022 |

**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 |
|---|---|---|---|---|---|---|---|---|
| MF1C | SE233323.001 | LB251873 | 16 Jun 2022 | 21 Jun 2022 | 13 Dec 2022 | 27 Jun 2022 | 13 Dec 2022 | 28 Jun 2022 |
| MF2C | SE233323.002 | LB251873 | 16 Jun 2022 | 21 Jun 2022 | 13 Dec 2022 | 27 Jun 2022 | 13 Dec 2022 | 28 Jun 2022 |
| MF3C | SE233323.003 | LB251873 | 16 Jun 2022 | 21 Jun 2022 | 13 Dec 2022 | 27 Jun 2022 | 13 Dec 2022 | 28 Jun 2022 |
| MF4C | SE233323.004 | LB251873 | 16 Jun 2022 | 21 Jun 2022 | 13 Dec 2022 | 27 Jun 2022 | 13 Dec 2022 | 28 Jun 2022 |
| MF5C | SE233323.005 | LB251873 | 16 Jun 2022 | 21 Jun 2022 | 13 Dec 2022 | 27 Jun 2022 | 13 Dec 2022 | 28 Jun 2022 |
| MF6C | SE233323.006 | LB251873 | 16 Jun 2022 | 21 Jun 2022 | 13 Dec 2022 | 27 Jun 2022 | 13 Dec 2022 | 28 Jun 2022 |
| MF7C | SE233323.007 | LB251873 | 16 Jun 2022 | 21 Jun 2022 | 13 Dec 2022 | 27 Jun 2022 | 13 Dec 2022 | 28 Jun 2022 |
| MF8C | SE233323.008 | LB251873 | 16 Jun 2022 | 21 Jun 2022 | 13 Dec 2022 | 27 Jun 2022 | 13 Dec 2022 | 28 Jun 2022 |
| MFA | SE233323.017 | LB251873 | 16 Jun 2022 | 21 Jun 2022 | 13 Dec 2022 | 27 Jun 2022 | 13 Dec 2022 | 28 Jun 2022 |

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) | MF11D | SE233323.009 | % | 60 - 130% | 105 |
| | MF21D | SE233323.010 | % | 60 - 130% | 101 |
| | MF31D | SE233323.011 | % | 60 - 130% | 106 |
| | MF41D | SE233323.012 | % | 60 - 130% | 102 |
| | MF51D | SE233323.013 | % | 60 - 130% | 109 |
| | MF61D | SE233323.014 | % | 60 - 130% | 105 |
| | MF71D | SE233323.015 | % | 60 - 130% | 106 |
| | MF81D | SE233323.016 | % | 60 - 130% | 103 |

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.

## OC Pesticides in Soil

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

| Sample Number | | Parameter | Units | LOR | Result |
|---|---|---|---|---|---|
| LB251788.001 | | Hexachlorobenzene (HCB) | mg/kg | 0.1 | <0.1 |
| | | Alpha BHC | mg/kg | 0.1 | <0.1 |
| | | Lindane | mg/kg | 0.1 | <0.1 |
| | | Heptachlor | mg/kg | 0.1 | <0.1 |
| | | Aldrin | mg/kg | 0.1 | <0.1 |
| | | Beta BHC | mg/kg | 0.1 | <0.1 |
| | | Delta BHC | mg/kg | 0.1 | <0.1 |
| | | Heptachlor epoxide | mg/kg | 0.1 | <0.1 |
| | | Alpha Endosulfan | mg/kg | 0.2 | <0.2 |
| | | Gamma Chlordane | mg/kg | 0.1 | <0.1 |
| | | Alpha Chlordane | mg/kg | 0.1 | <0.1 |
| | | 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 |
| | | p,p'-DDT | mg/kg | 0.1 | <0.1 |
| | | Endosulfan sulphate | mg/kg | 0.1 | <0.1 |
| | | Endrin Aldehyde | mg/kg | 0.1 | <0.1 |
| | | Methoxychlor | mg/kg | 0.1 | <0.1 |
| | | Endrin Ketone | mg/kg | 0.1 | <0.1 |
| | | Isodrin | mg/kg | 0.1 | <0.1 |
| | | Mirex | mg/kg | 0.1 | <0.1 |
| | Surrogates | Tetrachloro-m-xylene (TCMX) (Surrogate) | % | - | 93 |

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

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

| Sample Number | Parameter | Units | LOR | Result |
|---|---|---|---|---|
| LB251873.001 | 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 |

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

## Moisture Content

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

| Original | Duplicate | Parameter | Units | LOR | Original | Duplicate | Criteria % | RPD % |
|---|---|---|---|---|---|---|---|---|
| SE233323.010 | LB251800.011 | % Moisture | %w/w | 1 | 16.8 | 19.0 | 36 | 12 |
| SE233343.003 | LB251800.022 | % Moisture | %w/w | 1 | 43.2 | 42.0 | 32 | 3 |
| SE233498.008 | LB251800.031 | % Moisture | %w/w | 1 | 41.4 | 34.9 | 33 | 17 |

## OC Pesticides in Soil

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

| Original | Duplicate | | Parameter | Units | LOR | Original | Duplicate | Criteria % | RPD % |
|---|---|---|---|---|---|---|---|---|---|
| SE233498.006 | LB251788.026 | | Hexachlorobenzene (HCB) | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Alpha BHC | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Lindane | 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 |
| | | | Beta BHC | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Delta BHC | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Heptachlor epoxide | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | o,p'-DDE | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Alpha Endosulfan | mg/kg | 0.2 | <0.2 | <0.2 | 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 |
| | | | trans-Nonachlor | 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 |
| | | | o,p'-DDD | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | o,p'-DDT | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Beta Endosulfan | mg/kg | 0.2 | <0.2 | <0.2 | 200 | 0 |
| | | | p,p'-DDD | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | p,p'-DDT | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Endosulfan sulphate | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Endrin Aldehyde | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Methoxychlor | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Endrin Ketone | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Isodrin | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Mirex | 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 | - | 0.17 | 0.17 | 30 | 3 |
| SE233498.008 | LB251788.024 | | Hexachlorobenzene (HCB) | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Alpha BHC | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Lindane | 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 |
| | | | Beta BHC | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Delta BHC | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Heptachlor epoxide | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | o,p'-DDE | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Alpha Endosulfan | mg/kg | 0.2 | <0.2 | <0.2 | 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 |
| | | | trans-Nonachlor | 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 |
| | | | o,p'-DDD | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | o,p'-DDT | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Beta Endosulfan | mg/kg | 0.2 | <0.2 | <0.2 | 200 | 0 |
| | | | p,p'-DDD | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | p,p'-DDT | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Endosulfan sulphate | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Endrin Aldehyde | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Methoxychlor | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Endrin Ketone | 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

**OC Pesticides in Soil (continued)** — **Method: ME-(AU)-[ENV]AN420**

| Original | Duplicate | | Parameter | Units | LOR | Original | Duplicate | Criteria % | RPD % |
|---|---|---|---|---|---|---|---|---|---|
| SE233498.008 | LB251788.024 | | Isodrin | mg/kg | 0.1 | <0.1 | <0.1 | 200 | 0 |
| | | | Mirex | 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 | - | 0.17 | 0.16 | 30 | 2 |

**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 % |
|---|---|---|---|---|---|---|---|---|
| SE233401.001 | LB251873.014 | Arsenic, As | mg/kg | 1 | 4 | 4 | 55 | 6 |
| | | Cadmium, Cd | mg/kg | 0.3 | <0.3 | <0.3 | 200 | 0 |
| | | Chromium, Cr | mg/kg | 0.5 | 9.7 | 7.2 | 36 | 29 |
| | | Copper, Cu | mg/kg | 0.5 | 16 | 9.5 | 34 | 53 ② |
| | | Nickel, Ni | mg/kg | 0.5 | 4.5 | 4.0 | 42 | 14 |
| | | Lead, Pb | mg/kg | 1 | 22 | 26 | 34 | 15 |
| | | Zinc, Zn | mg/kg | 2 | 23 | 25 | 38 | 10 |
| SE233498.008 | LB251873.024 | Arsenic, As | mg/kg | 1 | <1 | 1 | 141 | 29 |
| | | Cadmium, Cd | mg/kg | 0.3 | <0.3 | <0.3 | 200 | 0 |
| | | Chromium, Cr | mg/kg | 0.5 | 2.7 | 3.6 | 46 | 26 |
| | | Copper, Cu | mg/kg | 0.5 | 1.2 | <0.5 | 97 | 79 |
| | | Nickel, Ni | mg/kg | 0.5 | 0.5 | <0.5 | 135 | 4 |
| | | Lead, Pb | mg/kg | 1 | 4 | 4 | 54 | 9 |
| | | Zinc, Zn | mg/kg | 2 | 15 | 8 | 48 | 59 ② |

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.

## OC Pesticides in Soil

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

| Sample Number | | Parameter | Units | LOR | Result | Expected | Criteria % | Recovery % |
|---|---|---|---|---|---|---|---|---|
| LB251788.002 | | Heptachlor | mg/kg | 0.1 | 0.2 | 0.2 | 60 - 140 | 87 |
| | | Aldrin | mg/kg | 0.1 | 0.2 | 0.2 | 60 - 140 | 86 |
| | | Delta BHC | mg/kg | 0.1 | 0.1 | 0.2 | 60 - 140 | 61 |
| | | Dieldrin | mg/kg | 0.2 | <0.2 | 0.2 | 60 - 140 | 88 |
| | | Endrin | mg/kg | 0.2 | <0.2 | 0.2 | 60 - 140 | 97 |
| | | p,p'-DDT | mg/kg | 0.1 | 0.2 | 0.2 | 60 - 140 | 87 |
| | Surrogates | Tetrachloro-m-xylene (TCMX) (Surrogate) | mg/kg | - | 0.14 | 0.15 | 40 - 130 | 92 |

## 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 % |
|---|---|---|---|---|---|---|---|
| LB251873.002 | Arsenic, As | mg/kg | 1 | 330 | 318.22 | 80 - 120 | 103 |
| | Cadmium, Cd | mg/kg | 0.3 | 4.6 | 4.81 | 70 - 130 | 96 |
| | Chromium, Cr | mg/kg | 0.5 | 37 | 38.31 | 80 - 120 | 97 |
| | Copper, Cu | mg/kg | 0.5 | 310 | 290 | 80 - 120 | 105 |
| | Nickel, Ni | mg/kg | 0.5 | 190 | 187 | 80 - 120 | 99 |
| | Lead, Pb | mg/kg | 1 | 93 | 89.9 | 80 - 120 | 103 |
| | Zinc, Zn | mg/kg | 2 | 280 | 273 | 80 - 120 | 101 |

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.

## OC Pesticides in Soil

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

| QC Sample | Sample Number | | Parameter | Units | LOR | Result | Original | Spike | Recovery% |
|---|---|---|---|---|---|---|---|---|---|
| SE233323.009 | LB251788.004 | | Hexachlorobenzene (HCB) | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | Alpha BHC | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | Lindane | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | Heptachlor | mg/kg | 0.1 | 0.2 | <0.1 | 0.2 | 96 |
| | | | Aldrin | mg/kg | 0.1 | 0.2 | <0.1 | 0.2 | 95 |
| | | | Beta BHC | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | Delta BHC | mg/kg | 0.1 | 0.2 | <0.1 | 0.2 | 102 |
| | | | Heptachlor epoxide | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | o,p'-DDE | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | Alpha Endosulfan | mg/kg | 0.2 | <0.2 | <0.2 | - | - |
| | | | Gamma Chlordane | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | Alpha Chlordane | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | trans-Nonachlor | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | p,p'-DDE | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | Dieldrin | mg/kg | 0.2 | <0.2 | <0.2 | 0.2 | 95 |
| | | | Endrin | mg/kg | 0.2 | 0.2 | <0.2 | 0.2 | 106 |
| | | | o,p'-DDD | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | o,p'-DDT | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | Beta Endosulfan | mg/kg | 0.2 | <0.2 | <0.2 | - | - |
| | | | p,p'-DDD | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | p,p'-DDT | mg/kg | 0.1 | 0.2 | <0.1 | 0.2 | 100 |
| | | | Endosulfan sulphate | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | Endrin Aldehyde | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | Methoxychlor | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | Endrin Ketone | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | Isodrin | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | Mirex | mg/kg | 0.1 | <0.1 | <0.1 | - | - |
| | | | Total CLP OC Pesticides | mg/kg | 1 | 1 | <1 | - | - |
| | | | Total OC VIC EPA | mg/kg | 1 | 1 | <1 | - | - |
| | | Surrogates | Tetrachloro-m-xylene (TCMX) (Surrogate) | mg/kg | - | 0.15 | 0.16 | - | 99 |

## 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% |
|---|---|---|---|---|---|---|---|---|
| SE233323.001 | LB251873.004 | Arsenic, As | mg/kg | 1 | 49 | 3 | 50 | 91 |
| | | Cadmium, Cd | mg/kg | 0.3 | 42 | <0.3 | 50 | 84 |
| | | Chromium, Cr | mg/kg | 0.5 | 66 | 20 | 50 | 93 |
| | | Copper, Cu | mg/kg | 0.5 | 80 | 11 | 50 | 138 ④ |
| | | Nickel, Ni | mg/kg | 0.5 | 49 | 4.4 | 50 | 90 |
| | | Lead, Pb | mg/kg | 1 | 58 | 9 | 50 | 99 |
| | | Zinc, Zn | mg/kg | 2 | 59 | 8 | 50 | 101 |

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. |

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source: Sydney.pdf page: 3 SGS Ref: SE233323_COC

# Chain of Custody Form – Ref 14453




**Ref:** 14453
Investigator: Envirowest Consulting
9 Cameron Place
PO Box 8158
ORANGE NSW 2800
Telephone: (02) 6361 4954

**Email:** leah@envirowest.net.au
Contact Person: Leah Desborough
Invoice: accounts@envirowest.net.au

**Laboratory:** SGS SYDNEY
16/33 Maddox Street
ALEXANDRIA NSW 2015

**Quotation #:** Envir_70119_2019
**Courier/CN:** Grants Express


| | Sample ID | Container* | Sampling Date/Time | Sample matrix: Water | Soil | Sludge | Sample preservation: Cool | HNO3/HCl | Unpre-served | Analysis: SGS Method Code: CL1T (CL1T (7 metals)) | CL10 (CL10 (TRH, BTEXN, PAH, 8 metals)) | OCP (OCP) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | MF1C | A | 16/6/2022 | | X | | X | | X | X | | | | | |
| 2 | MF2C | A | 16/6/2022 | | X | | X | | X | X | | | | | |
| 3 | MF3C | A | 16/6/2022 | | X | | X | | X | X | | | | | |
| 4 | MF4C | A | 16/6/2022 | | X | | X | | X | X | | | | | |
| 5 | MF5C | A | 16/6/2022 | | X | | X | | X | X | | | | | |
| 6 | MF6C | A | 16/6/2022 | | X | | X | | X | X | | | | | |
| 7 | MF7C | A | 16/6/2022 | | X | | X | | X | X | | | | | |
| 8 | MF8C | A | 16/6/2022 | | X | | X | | X | X | | | | | |
| 9 | MF11D | A | 16/6/2022 | | X | | X | | X | | | X | | | |
| 10 | MF21D | A | 16/6/2022 | | X | | X | | X | | | X | | | |
| 11 | MF31D | A | 16/6/2022 | | X | | X | | X | | | X | | | |
| 12 | MF41D | A | 16/6/2022 | | X | | X | | X | | | X | | | |
| 13 | MF51D | A | 16/6/2022 | | X | | X | | X | | | X | | | |
| 14 | MF61D | A | 16/6/2022 | | X | | X | | X | | | X | | | |
| 15 | MF71D | A | 16/6/2022 | | X | | X | | X | | | X | | | |
| 16 | MF81D | A | 16/6/2022 | | X | | X | | X | | | X | | | |
| 17 | MFA | A | 16/6/2022 | | X | | X | | X | X | | | | | |

SGS EHS Sydney COC
**SE233323**

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

Sampler name: Leah Desborough
Date: 16/6/2022 Time: 13:00

Relinquished by: (print and signature) Virginia Bragg Date: 20/6/2022 Time 1300

Received by: (print and signature) Date 21/06/22 Time @ 7:30

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

**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