Phase 2 Environmental Site Assessment, Parcel 8

Prepared for:
Hydro Aluminium Kurri Kurri Pty Ltd

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Specific assumptions and limitations identified by ENVIRON as being relevant are set out in the report. The methodology adopted and sources of information used by ENVIRON are outlined in our scope of work. ENVIRON has made no independent verification of this information beyond the agreed scope of works.

This report should be read in full.

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Acronyms and Abbreviations

ACM	Asbestos Containing Materials
AHD	Australian Height Datum
ALS	Australian Laboratory Services
BGL	Below Ground Level
BTEX	Benzene, toluene, ethyl benzene, xylenes
CT	Certificate of Title
DEC	NSW Department of Environment and Conservation, now EPA
DP	Deposited Plan
DQI	Data Quality Indicator
DQO	Data Quality Objective
EIL	Ecological Investigation Level
EPA	NSW Environment Protection Authority
ESA	Environmental Site Assessment
F	Fluoride
GMU	Groundwater Management Unit
GPS	Global Positioning System
Ha	Hectare
HIL	Health Investigation Level
HSL	Health Screening Level
HRA	Health Risk Assessment
km	Kilometres
LOR	Limit of Reporting
m	Metres
m^3	Cubic metres
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
m AHD	Metres relative to the Australian Height Datum
m BGL	Metres below ground level
mg/L	Micrograms per Litre
ML	Mega litres, 100000L
NATA	National Association of Testing Authorities
ND	Not Detected
NEHF	National Environmental Health Forum
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NSW	New South Wales
n	Number of Samples
OH&S	Occupational Health & Safety
OPP	Organophosphate pesticides
OCP	Organochloro pesticides
PAH	Polycyclic aromatic hydrocarbons
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percent Difference
TPH	Total Petroleum Hydrocarbon
UCL	Upper Confidence Limit
µg/L	Micrograms per Litre
VENM	virgin excavated natural material
-	On tables is "not calculated", "no criteria" or "not applicable"

Executive Summary

This report presents the findings of a Phase 2 Environmental Site Assessment undertaken on part of the Hydro Aluminium Kurri Kurri (Hydro) owned land known as Parcel 8. Parcel 8 is a rural property comprising approximately 54ha and is accessed from Bishops Bridge Road, Loxford and located within the buffer zone and to the west of the Hydro Aluminium Kurri Kurri Smelter. Parcel 8 comprises bushland, with one area of disturbed land and limited tree cover in the centre of the parcel. A dirt bike racing track has been constructed in this cleared area.

In 2012, Hydro suspended operations at the Kurri Kurri Smelter and implemented care and maintenance until permanent site closure was announced in May 2014. Environmental investigations commenced at the time of suspension to assess site remediation requirements and the potential for land divestment. This work was undertaken in conjunction with the development of a Rezoning Masterplan, which identified possible end land use scenarios.

The objectives of this Phase 2 ESA assessment were to identify, review and report on the potential for contamination at Parcel 8 based on historical and current landuse and to assess the suitability of Parcel 8 for the proposed environmental conservation (E2) land use.

A Phase 1 ESA has previously been completed for the Hydro owned lands including Parcel 8 (ENVIRON (22 October 2013) Phase 1 ESA, Hydro Kurri Kurri Aluminium Smelter). The Phase 1 identified that contamination of Parcel 8 may have occurred from dust deposition due to the proximity of the Hydro smelter, illegal dumping due to the remoteness of the area, the former presence of a hobby farm and localised soil contamination from the use of a dirt bike track.

To assess for potential contaminants of concern on Parcel 8, a site walkover was completed and surface soil samples were collected from across the parcel. Surface soil samples were also collected from a number of soil stockpiles located around the dirt bike track.

Intrusive investigations into stockpiles associated with the dirt bike track identified disturbed topsoil underlain by yellow/brown clay. No waste materials and no contamination associated with heavy metals, petroleum hydrocarbons (TPH/BTEX), Polycyclic Aromatic Hydrocarbons (PAHs), Organochlorine Pesticides (OCPs), Organophsphorous Pesticides (OPPs) and asbestos were identified within the disturbed topsoil fill material.

An old car body and an area of illegally dumped asbestos containing materials (ACM) and other wastes including tile, house brick and concrete pieces, was identified adjacent to Bishops Bridge Road in the north eastern corner of Parcel 8. No other soil contamination issues were identified at Parcel 8.

Parcel 8 is considered suitable for the current landuse and the proposed environmental conservation (E2) landuse.

Hydro has separately engaged a NSW EPA-accredited Site Auditor to issue a Site Audit Statement certifying that the site is suitable for the proposed use.

ENVIRON considers that interim management is required to remove illegally dumped wastes and secure the site, as follows:

- An appropriately licensed asbestos removal contractor be engaged to remove and dispose of the asbestos waste. Validation of the area following removal should be undertaken by an appropriately qualified consultant and documented.
- For aesthetic reasons, the car body should be removed from the site and recycled as appropriate.

1 Introduction

1.1 Background

This report presents the findings of a Phase 2 Environmental Site Assessment undertaken on part of the Hydro Aluminium Kurri Kurri Pty Limited (Hydro) owned land known as Parcel 8. Parcel 8 is located off Bishops Bridge Road, Loxford, New South Wales (2326). The location of Parcel 8 is shown in **Figure 1**.

The work has been performed at the request of Hydro Aluminium Kurri Kurri Pty Limited (the "Client").

Hydro is currently evaluating options for the divestment of land parcels for a range of land uses following the closure of the site in May 2014. A Rezoning Masterplan has been developed that identifies Parcel 8 to comprise land suitable for environmental conservation (E2) land use.

A Phase 1 Environmental Site Assessment has previously been prepared for all Hydro owned lands and evaluated the potential for contamination. The Phase 1 identified that contamination of Parcel 8 may have occurred from dust deposition due to the proximity of the Hydro smelter, illegal dumping due to the remoteness of the area, activities of a former hobby farm and localised soil contamination from the use of a dirt bike track.

It is noted that at the time of the fieldwork, this land parcel was named Employment Land Subarea 8 and as such the soil samples reference this name. Prior to the completion of this report, a Masterplan was completed for Hydro-owned land and the name of the land parcel as referenced in this report subsequently changed to Parcel 8.

The location of Parcel 8 in the context of the Rezoning Masterplan is shown in **Figure 2**.

1.2 Objectives and Scope of Work

The objectives of the assessment were to assess the potential for contamination at Parcel 8 based on historical and current land use and to assess the suitability of Parcel 8 for the proposed environmental conservation (E2) land use.

The scope of work performed to meet the objectives comprised:

- A review of available information relating to land use to assess the potential for soil, groundwater or surface water contamination arising from historic and current activities;
- A review of published geological, hydrogeological and hydrological data to establish the environmental setting and sensitivity;
- Field work comprising:
  - Collection of surface soil samples to provide a coarse grid assessment of potential dust deposition from the smelter operations;
  - A site walkover to evaluate other potential locations of buried waste or illegal dumping;
  - Use of a back hoe to excavate into soil stockpiles and collect samples for analysis of potential contaminants of concern.

- Data interpretation including comparison against relevant guidelines and a discussion of the findings in terms of human health and environment risk under the current and future land use scenarios.
- Review of options available for remediation or management to render Parcel 8 suitable for the proposed land use.

2 Site Description

2.1 Site Location

Parcel 8 is owned by Hydro Aluminium Kurri Kurri Pty Limited and is located approximately 35km north west of the city of Newcastle and 150km north of Sydney, in the suburb of Loxford, Kurri Kurri, New South Wales, Australia. Parcel 8 is accessed from Bishops Bridge Road. The location of Parcel 8 is shown in **Figure 1**.

Parcel 8 is located within the Buffer Zone of the Hydro Aluminium Kurri Kurri Smelter, to the west of the smelter. The Buffer Zone is an area of land surrounding the smelter that provides a buffer between the smelter and surrounding communities. Parcel 8 generally comprises bushland, with a large area of disturbed land and limited tree cover in the centre of the parcel. A dirt bike racing track has been constructed in this cleared area.

Parcel 8 is located within the Cessnock Local Government Area and is zoned RU2 – Rural Landscape under the Cessnock Local Environment Plan.

Parcel 8 is approximately 54 hectares (ha) and comprises the lot numbers in the deposited plans (DP) listed in **Table 1**:

Table 1: Lot and Deposited Plans for Parcel 8.

Subarea	Lot/ DP	Area (ha)	Total Area (ha)
Parcel 8	Lot 13 DP1082775 Pt 1 Lot 14 DP1082775 Lot 15 DP1082775 Pt 1	0.7 22.8 1.3	25.2

Land uses surrounding Parcel 8 are as follows:

- North: Dense bushland;
- South: Hunter Expressway then bushland and farmland;
- East: Bishops Bridge Road then bushland and the smelter;
- West: Hunter Expressway then bushland.

2.2 Site Setting

2.2.1 Topography

Parcel 8 is located in an area of the Buffer Zone that is of higher elevation at approximately 17 mAHD. The topography of Parcel 8 is relatively flat, with a gentle slope to the south east. The natural topography slopes towards the centre of Parcel 8, where a tributary of Black Waterholes Creek bisects the parcel.

2.2.2 Regional Geology

According to the review of the regional geology described on the Sydney Basin Geological Sheet, Parcel 8 is underlain by siltstone, marl and minor sandstone from the Permian aged Rutherford Formation (Dalwood Group) in the Sydney Basin.

Undifferentiated Quaternary alluvium occurs on the surface of Parcel 8 associated with surface water bodies. Quaternary sediments which are associated with Black Waterholes Creek, a tributary of which bisects Parcel 8; Swamp Creek (approximately 400m south east of Parcel 8) and the Hunter River consist of gravel, sand, silt and clay.

2.2.3 Site Hydrology

Surface water from Parcel 8 discharges primarily via infiltration and overland flow to a tributary of Black Waterholes Creek located in the centre of the parcel. Black Waterholes Creek discharges into Wentworth Swamp, which in turn discharges to the Hunter River approximately 11km northeast of Parcel 8 near Maitland.

The Wentworth Swamp system is within the Fishery Creek Catchment, where declining stream water quality and a reduction in diversity of native plants and animals has occurred due to population growth and development pressures in the last ten years (Hunter-Central Rivers Catchment Management Authority 2000).

2.2.4 Regional Hydrogeology

Regional groundwater is expected to follow topography and flow northeast towards the surface water bodies that discharge to the Hunter River. Locally, groundwater beneath Parcel 8 is expected to flow north east and south west towards the tributary of Black Waterholes Creek located in the centre of the parcel.

According to the NSW Office of Environment and Heritage (Natural Resource Atlas), there are 11 licensed groundwater abstractions (bores) located within 1km of Parcel 8. The majority of the groundwater bores are located within the aluminium smelter and buffer zone. Information for 11 bores located in a 1km radius from Parcel 8 has been included in Appendix A. The bores are used for monitoring purposes. No further information, such as depth to water or logging information was provided.

The Hunter River Alluvium Groundwater Management Unit (GMU) is an important groundwater resource to the region. Groundwater extraction for irrigation, urban supply, drought supply, stock, domestic and commercial/ industrial use occurs, with volumes in excess of 10,000ML per annum extracted from the Hunter River Alluvium GMU. Aquifer storage and recovery is also an important use of this GMU. It is noted that the Hunter River GMU is not the primary drinking water supply in the region, although the protection of drinking water is a water quality objective for the Hunter River (NSW Water Quality and River Flow Objectives) (www.environment.nsw.gov.au/ieo/Hunter/index.htm).

2.3 Site Sensitivity

The sensitivity of Parcel 8 with respect to surface water and groundwater is considered to be moderate based on the following:

- Surface water and groundwater discharge into an unnamed tributary of Black Waterholes Creek, located in the centre of Parcel 8, which discharges to the Hunter

River via Wentworth Swamp within the Fishery Creek Catchment, approximately 11km northeast of Parcel 8 near Maitland.

- Declining stream water quality and a reduction in diversity of native plants and animals has occurred within the Fishery Creek Catchment and water quality down gradient of Parcel 8 has been impacted by historical coal mining;
- The Hunter River GMU is used for irrigation, urban supply, drought supply, stock, domestic and commercial/ industrial use but it is not the main drinking water supply in the region.

3 Site History

Site history investigations included in the Phase 1 ESA for the Hydro Aluminium Kurri Kurri Smelter, dated 26 August 2013, provided the following historical information relevant to Parcel 8:

- Earliest records (aerial photograph in 1951) showed the hobby farm in the centre of Lot 14. The hobby farm comprised three small buildings, which were demolished in the late 1980s. No further buildings are evident since this time. The remainder of Parcel 8 was observed to be bushland.

- The 2006 aerial photograph shows the presence of the dirt bike racing track that was constructed in the cleared area of the former hobby farm after 2001. The racing track was used as a practice track by one Hydro employee and is no longer in use. No soil was imported to Parcel 8 to construct the track. Information on the dirt bike track was provided by Mr Kerry McNaughton, Hydro employee.

- Additionally, Parcel 8 is located approximately 1km from the smelter boundary and may be impacted from smelter dust deposition.

- The remoteness of Parcel 8 and surrounding bushland may also give rise to illegal dumping though it is noted that the buffer zone area is fenced and regularly monitored by Hydro personnel.

A site plan showing the location of the hobby farm is included in **Figure 3**. Photos are presented in **Appendix C**.

4 Sampling and Analytical Quality Plan

4.1 Potential Areas and Contaminants of Concern

Based on Parcel 8 historical information as discussed in **Section 3**, the following areas of concern were identified:

- Debris from the demolition of the hobby farm.
- Use of the former hobby farm area as a farm (grazing) and later as a dirt bike track.
- Smelter dust deposition.
- Illegal dumping.

Potential contaminants of concern associated with the range of previous site activities are:

- Asbestos;
- Fluoride;
- Total Petroleum Hydrocarbons (TPH);
- Benzene, Toluene, Ethyl benzene, Xylene (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Organochlorine Pesticides (OCPs) and Organophosphorous Pesticides (OPPs);
- Illegally dumped materials.

Impacts to surface water and groundwater could occur from soluble contaminants where these are present above background concentrations. Historical site information does not suggest that impacts to surface water and groundwater have occurred and evaluation of these media has not been included at this time. Further evaluation can be undertaken where contaminants in soil are present at levels that are likely to result in impacts to surface water or groundwater.

4.2 Data Quality Objectives and Data Quality Indicators

Data quality objectives (DQOs) and Data Quality Indicators (DQIs) were developed by ENVIRON using the US EPA seven-step DQO process. Completing the seven-step process helps to define the purpose of the assessment and the type, quality and quantity of data needed to inform decisions relating to the assessment of site contamination.

The seven-step DQO process and DQIs are included in **Appendix F**.

4.3 Sampling Design

The sampling design was optimised following the development of DQOs and DQIs. The sampling design is outlined below. ENVIRON notes that the historical site activities indicate potential contamination to surface soils only. Where fill was identified during the site walkover, a second round of field investigations was completed to assess subsurface soils. No potential contamination sources to surface water or groundwater have been identified.

4.3.1 Fluoride

To assess the potential for fluoride in soil from dust deposition from the Hydro Aluminium Kurri Kurri Smelter, surface soil samples were collected at a rate of one sample per 5Ha.

The sample density is lower than that suggested in Table A of NSW EPA (1995) Contaminated Sites: Sampling Design Guidelines. The density is considered adequate for the purposes of this investigation for the following reasons:

- aerial dust deposition is likely to be relatively consistent over the surface of the parcel and therefore sampling on a low density will allow for identification of whether or not dust deposition is an issue; and

- in the event that elevated or variable fluoride concentrations are identified, additional sampling will be completed.

Samples were collected by trowel from surface soils in accessible areas of Parcel 8. As Parcel 8 comprises inaccessible dense bushland, samples were collected around the perimeter of the bushland and in open areas, where accessible. Sample locations were logged by GPS.

Soil samples were placed into laboratory-supplied paper bags and stored in an ice-filled cooler for transportation to the laboratory. Soil samples were transported to the laboratory under chain of custody conditions. Intra-laboratory duplicate soil samples were collected at a rate of 10%.

Soil samples were analysed for soluble fluoride, as this is the portion of total fluoride that is available for uptake in receptors including biota, flora, fauna and humans. The laboratory was NATA accredited for the analysis.

4.3.2 Asbestos

To assess the potential for asbestos and other illegally dumped wastes to be present at Parcel 8, a site walkover of accessible areas was completed. ENVIRON consider that dense bushland that is not readily accessible by foot is unlikely to have been accessed for waste dumping.

The location and type of dumped wastes were detailed on Field Information Sheets and logged by GPS. Where asbestos was confidently identified by the field personnel, no sampling was completed. If not, a sample of potential asbestos containing material (ACM) was collected for laboratory analysis. ACM fragments were collected into a zip-lock bag using dedicated disposable gloves.

ACM fragments were analysed for asbestos identification by a laboratory NATA accredited for the analysis.

4.3.1 Potential Fill

The site walkover identified the potential for fill material at Parcel 8 associated with the dirt bike track. Initially, soil samples were collected from the surface of six of the stockpiles for analysis. Following this, a second round of fieldwork was completed including excavation into the stockpiles to assess the potential for fill material.

A back hoe was used to excavate five test pits into areas of potential fill identified at Parcel 8. The test pits were logged by an ENVIRON environmental scientist and soil samples were collected for analysis.

Soil samples were collected into laboratory-supplied acid-rinsed glass jars using dedicated disposable gloves. The soil samples were stored in an ice-filled cooler for transportation to the laboratory. Soil samples were transported to the laboratory under chain of custody conditions. Intra-laboratory duplicate soil samples were collected at a rate of 10%.

Soil samples were analysed for a range of potential contaminants, including heavy metals, total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphorous pesticides (OPPs) and asbestos. The laboratory was NATA accredited for the analysis.

5 Basis for Assessment Criteria

5.1 Soil

The criteria proposed for the assessment of soil contamination were sourced from the following references:

- NEPC (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM).

The variation to the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM 2013) was approved on 19 June 2013 by the NSWEPA under the *Contaminated Land Management Act 1997*. NEPM (2013) provide revised health-based soil investigation levels (HILs) and ecological-based investigation levels (EILs) for various land uses. The NEPM 2013 also introduces health-based and ecological screening levels and management limits for petroleum hydrocarbons (HSLs and ESLs). The levels have been derived from recent assessments that more accurately define the exposure mechanisms and risks from sites contaminated with petroleum hydrocarbons.

The guidelines adopted for the site from the NEPM are as follows:

- HIL D – Health investigation level for commercial/industrial such as shops, offices, factories and industrial sites. The HILs are applicable for assessing human health risk via all relevant pathways of exposure. The HILs are generic to all soil types and apply generally to a depth of 3 m below the surface for industrial use.
- HSLs for commercial/industrial use - Health screening levels for soil vapour intrusion from petroleum hydrocarbons are guidelines that prevent accumulation of vapours at concentrations that may represent a health risk. The HSLs are derived for various depths and are for the same generic land uses as for the HILs. The guidelines are relevant were soils are beneath building or structures such as confined spaces;
- EIL for commercial/ industrial use – ecological investigations levels applicable for assessing risk to terrestrial ecosystems. EILs depend on specific soil physicochemical properties and generally apply to the top 2 m of soil.
- ESLs for commercial/ industrial use – ecological screening levels developed for selected petroleum hydrocarbon compounds and fractions and are applicable for assessing risk to terrestrial ecosystems. These are also generally applicable to the top 2m of soil.
- Management Limits where concentrations above these limits may indicate poor aesthetics, high odour and potentially explosive vapour. Management limits are to be applied after consideration of relevant ESLs and HSLs.

The applicable assessment criteria for heavy metals and PAHs in soil are presented in **Table 2**:

Table 2: Soil Assessment Criteria (mg/kg) – Health and Ecological Investigation Levels		
	HIL D	**EIL**
Arsenic	3000	160
Cadmium	900	-
Chromium (VI)	3600	320 (CR III, 1% clay)
Copper	240 000	35
Lead	1500	1800
Nickel	6000	6
Zinc	400 000	120
Mercury (inorganic)	730	-
Fluoride	Ref Table 5	Ref Table 5
Cyanide (free)	1500	-
Carcinogenic PAHs (as BaP TEQ)	40	-
Naphthalene	-	370
Total PAHs	4000	-
DDT+DDE+DDD	3600	
Aldrin +dieldrin	45	
Chlordane	530	
Endosulfan	2000	
Endrin	100	
Heptachlor	50	
Methoxychlor	2500	
Chlorpyrifos	2000	

1 EILs represent the added contaminant limit plus the average background concentration. As a first screening assessment only the ACL has been incorporated in the EIL above. Where concentrations are in excess of the ACL, then evaluation d of the ABC would be undertaken. ACLs were calculated using the NEPM (2013) EIL Calculation Spreadsheet.

The applicable assessment criteria for petroleum hydrocarbons in soil are presented in **Table 3** and **Table 4**:

Table 3: Soil Assessment Criteria for Vapour Intrusion - HSL D (mg/kg) - Sand				
	0 to <1m	**1m to <2m**	**2m to <4m**	**4m+**
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	230	NL	NL	NL
Naphthalene	NL	NL	NL	NL
Benzene	3	3	3	3
F1(4)	260	370	630	NL
F2(5)	NL	NL	NL	NL

1 The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the

derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

2 (For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit>50% respectively, as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out.

3 To obtain F1 subtract the sum of BTEX concentrations from the C6-C10 fraction.

4 To obtain F2 subtract naphthalene from the >C10-C16 fraction.

Table 4: ESLs and Management Limits for Petroleum Hydrocarbons in Soil

TPH fraction	Soil texture	ESLs (mg/kg dry soil)	Management Limits[1] (mg/kg dry soil)
		Commercial and Industrial	Commercial and Industrial
F1 C6- C10	Fine	215*	800
F2 >C10-C16	Fine	170*	1000
F3 >C16-C34	Fine	2500	5000
F4 >C34-C40	Fine	6600	10 000
Benzene	Fine	95	-
Toluene	Fine	135	-
Ethylbenzene	Fine	185	-
Xylenes	Fine	95	-
Benzo(a)pyrene	Fine	1.4	-

1 Management limits are applied after consideration of relevant ESLs and HSLs.

2 Separate management limits for BTEX and naphthalene are not available hence these should not be subtracted from the relevant fractions to obtain F1 and F2.

3 ESLs are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability.

4 To obtain F1, subtract the sum of BTEX from C6-C10 fraction.

The HSLs for asbestos are applicable for assessing human health risk via the exposure pathway of inhalation of airborne asbestos and are presented in **Table 5**. The HSLs are generic to all soil types.

Table 5. Health screening levels for asbestos contamination in soil Health Screening Level (w/w)

Form of asbestos	Residential A[1]	Residential B[2]	Recreational C[3]	Commercial/ Industrial D[4]
Bonded ACM	0.01%	0.04%	0.02%	0.05%
FA and AF[1] (friable asbestos)	0.001%			
All forms of asbestos	No visible asbestos for surface soil			

1. The screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded/friable asbestos) only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres.

NEPM (2013) do not provide criteria for fluoride in soils in Australia. Therefore, ENVIRON (2013) conducted a preliminary level Human Health Risk Assessment (HRA) specific to fluoride in order to derive a specific preliminary screening level for fluoride for the Hydro

Aluminium Kurri Kurri Smelter . The screening levels are protective of the range of human receptors and are provided in **Table 6**:

Table 6: Site Specific Soil Assessment Guidelines (mg/kg) for Fluoride	
Preliminary screening levels	
Land Use	**Preliminary screening level**
Commercial/ industrial - soil	F 17000mg/kg

Consistent with the guidance provided in the NEPM, the data was assessed against the above adopted site guidelines by:

- Comparing individual concentrations against the relevant guidelines and if discrete samples are in excess of the relevant guideline then;
- Comparing the 95% upper confidence limit of mean against the relevant guideline also ensuring that:
    - the standard deviation of the results is less than 50% of the relevant investigation or screening level, and
    - no single value exceed 250% of the relevant investigation or screening level.

6 Results

6.1 Site Walkover

A site walkover was completed to identify areas of concern, such as illegally dumped wastes and fill at Parcel 8. The entrance to Parcel 8 is from Bishops Bridge Road, which borders the eastern boundary of Lot 14 and Lot 15. There are no roadways within Lot 13, Lot 14 or Lot 15.

The north western (Lot 13) and south eastern (Lot 15) portions of Parcel 8 comprised of dense bushland that appears undisturbed.

The central portion (Lot 14) of Parcel 8 comprised predominantly dense bushland with a cleared area at the location of the former hobby farm. A dirt bike track was constructed from site won soils on a cleared area of Lot 14 between 2001 and 2006 and is no longer in use. A fire trail extends from the south east corner of Parcel 8 to the southern extent of the bike track. A rusted car body was identified near the south western boundary adjacent to the Hunter Expressway. Numerous small soil stockpiles covered in grass were identified near the dirt bike track. These stockpiles ranged in size from $10m^3$ to $70m^3$. A small stockpile of building waste, including tiles, house bricks, concrete pieces and asbestos containing materials (ACM) fragments, was identified near the north eastern corner of Parcel 8 adjacent to Bishops Bridge Road. The origin of the waste stockpile is unknown.

No other signs of disturbed land or of land filling were observed during the walkover.

Photographs are included in **Appendix B**. Field Information Sheets are included in **Appendix C**.

6.2 Soil Investigations

6.2.1 Fluoride

Five surface soil samples were collected from across Parcel 8 at a rate of one sample per 5Ha to assess the potential for fluoride in soil from dust deposition from the Hydro Aluminium Kurri Kurri Smelter as shown in **Figure 3**. A generalised lithology of the surface soils encountered at Parcel 8 is as follows:

- Topsoil: Sandy silt, orange/ brown with some cobbles, dry.

6.2.2 Fill Material

Six surface soil samples were collected from small (generally $<15m^3$) soil stockpiles identified during the site walkover. This sampling was targeted sampling, completed on an area of environmental concern identified during the site walkover. These soil samples were collected by trowel from the surface of each stockpile and were analysed for petroleum hydrocarbons (TPH/BTEX) and polycyclic aromatic hydrocarbons (PAHs). It is noted that two of these samples, SP7 and SP8, were collected outside of the parcel boundary in an area of land acquired for the Hunter Expressway. This occurred as the parcel boundary is not clear in the field.

Following the surface soil sampling, intrusive investigations were completed to confirm that no fill material or wastes were present within the stockpiles. Five test pits were excavated

into five separate stockpiles and soils samples were collected from a range of depths up to 1.3m. Four samples were analysed for asbestos, heavy metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethyl benzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs) and organophosphorous pesticides (OPPs).The soil stockpiles were observed to comprise disturbed topsoil, generally brown silty sand, underlain by yellow/ brown clay.

The location of the test pits and surface soil samples are shown in **Figure 3**. Test pit logs are included in **Appendix C**.

6.3 Soil Results

A summary of the soil results is presented in **Table 7**. Laboratory tables are included in **Appendix D** and laboratory reports are included in **Appendix E**.

Table 7: Summary of Soil Results

Analyte	No. of Samples	Maximum Concentration (mg/kg)	No. exceeding Site Criteria	Criteria Exceeded (mg/kg)
Fluoride	5	6	0	-
Arsenic	4	<5	0	-
Cadmium	4	<1	0	-
Chromium	4	4	0	-
Copper	4	<5	0	-
Lead	4	15	0	-
Nickel	4	<2	0	-
Zinc	4	18	0	-
Mercury	4	<0.1	0	-
BaP	10	<0.5	0	-
BaP TEQ	10	<0.5	0	-
Total PAHs	10	<9	0	-
Benzene	10	<0.2	0	-
Toluene	10	<0.5	0	-
Ethyl benzene	10	<0.5	0	-
Xylene	10	<0.5	0	-
TRH C6-C10	10	<10	0	-
TRH >C10-C16	10	<50	0	-
TRH >C16-C34	10	<100	0	-
TRH >C34-C40	10	<100	0	-
OCPs	4	<0.2	0	-
OPPs	4	<0.2	0	-
Asbestos	4	None	0	-

The results of surface soil sampling for fluoride demonstrate that surface soils at Parcel 8 have not been impacted by stack particulate fallout from the Hydro Aluminium Smelter.

The results of fill sampling indicate that stockpiled soil has not been impacted by heavy metals, TPH, BTEX, PAHs, OCPs, OPPs and asbestos.

6.4 Quality Assurance/ Quality Control

A quality assurance assessment for this report is presented in **Appendix F**. An assessment was made of data completeness, comparability, representativeness, precision and accuracy based on field and laboratory considerations, as outlined in NSW DEC (2006) and NSW EPA (2007) guidelines. Overall it is considered that the completed investigation works and the data are of suitable quality to meet the project objectives.

7 Site Characterisation

7.1 Conceptual Site Model

Parcel 8 consists of predominantly undisturbed bushland with a cleared area at the location of a former hobby farm. Parcel 8 is bounded by the Hunter Expressway on the south western boundary, Bishops Bridge Road on the eastern boundary and bushland on the northern boundary. Parcel 8 is located in the western portion of the Buffer Zone of the Hydro Aluminium Kurri Kurri Smelter.

The hobby farm was developed on the central portion (Lot 14) of Parcel 8 in the early 1950s. The hobby farm comprised three small buildings, which were demolished in the late 1980s. Remnant brick footings were identified in the cleared area during the site walkover. The remainder of Parcel 8 remained undeveloped bushland and no evidence of development was identified during the site walkover, aside from the dirt bike track at the location of the former hobby farm. The dirt bike track was constructed by a Hydro employee using soil from on site and it is no longer in use.

Numerous soil stockpiles were identified around the dirt bike track, most with grass growing over them. Intrusive investigations of these stockpiles indicate they comprised sandy fill similar to surrounding soils and were pushed up during the construction of the dirt bike track. The results of fill sampling indicate that stockpiled soil has not been impacted by heavy metals, TPH, BTEX, PAHs, OCPs, OPPs and asbestos.

The identification of an old, rusted car body on the south western boundary close to the Hunter Expressway and a small stockpile of dumped building waste, including tiles, house bricks, concrete pieces and ACM fragments, near the north eastern corner of Parcel 8 adjacent to Bishops Bridge Road, indicate that accessible areas of Parcel 8 are susceptible to illegal dumping. It is noted that the ACM fragments were not analysed for asbestos. However, based on the results of asbestos analysis of similar materials from other parcels in the Buffer Zone, the fragments are considered to contain asbestos.

Parcel 8 has not been affected by dust deposition of fluoride from the Hydro Aluminium Kurri Kurri Smelter, with fluoride concentrations in surface soils below the preliminary screening level for commercial/ industrial land use. It is noted that there is currently no source of aerial fluoride emissions, as the smelter is in a care and maintenance mode.

Concentrations of potential contaminants of concern were not identified at levels that are likely to impact on surface water or groundwater. No analysis of these media is warranted.

7.2 Waste Characterisation and Disposal

The ACM fragments observed in a small stockpile of building waste on Bishops Bridge Road classify as Asbestos Waste. The ACM fragments should be collected by an appropriately licenced contractor and appropriately managed or disposed. Other wastes should be disposed of or recycled where appropriate. Alternatively, planning permission could be sought for emplacement of the waste building materials in a containment cell within the Hydro site.

8 Conclusions and Recommendations

This report presents the findings of a Phase 2 Environmental Site Assessment undertaken on part of the Hydro Aluminium Kurri Kurri (Hydro) owned land known as Parcel 8. Parcel 8 is a rural property comprising approximately 54ha and is accessed from Bishops Bridge Road, Loxford and located within the buffer zone and to the west of the Hydro Aluminium Kurri Kurri Smelter.

Parcel 8 comprises bushland, with one area of disturbed land and limited tree cover in the centre of the parcel. A dirt bike racing track has been constructed in this cleared area.

In 2012, Hydro suspended operations at the Kurri Kurri Smelter and implemented care and maintenance until permanent site closure was announced in May 2014. Environmental investigations commenced at the time of suspension to assess site remediation requirements and the potential for land divestment. This work was undertaken in conjunction with the development of a Rezoning Masterplan, which identified possible end land use scenarios.

The objectives of this Phase 2 ESA assessment were to identify, review and report on the potential for contamination at Parcel 8 based on historical and current landuse and to assess the suitability of Parcel 8 for the proposed environmental conservation (E2) land use.

A Phase 1 ESA has previously been completed for the Hydro owned lands including Parcel 8 (ENVIRON (22 October 2013) Phase 1 ESA, Hydro Kurri Kurri Aluminium Smelter). The Phase 1 identified that contamination of Parcel 8 may have occurred from dust deposition due to the proximity of the Hydro smelter, illegal dumping due to the remoteness of the area, the former presence of a hobby farm and localised soil contamination from the use of a dirt bike track.

To assess for potential contaminants of concern on Parcel 8, a site walkover was completed and surface soil samples were collected from across the parcel. Surface soil samples were also collected from a number of soil stockpiles located around the dirt bike track.

Intrusive investigations into stockpiles associated with the dirt bike track identified disturbed topsoil underlain by yellow/brown clay. No waste materials and no contamination associated with heavy metals, petroleum hydrocarbons (TPH/BTEX), Polycyclic Aromatic Hydrocarbons (PAHs), Organochlorine Pesticides (OCPs), Organophsphorous Pesticides (OPPs) and asbestos were identified within the disturbed topsoil fill material.

An old car body and an area of illegally dumped asbestos containing materials (ACM) and other wastes including tile, house brick and concrete pieces, was identified adjacent to Bishops Bridge Road in the north eastern corner of Parcel 8. No other soil contamination issues were identified at Parcel 8.

Parcel 8 is considered suitable for the current landuse and the proposed environmental conservation (E2) landuse.

Hydro has separately engaged a NSW EPA-accredited Site Auditor to issue a Site Audit Statement certifying that the site is suitable for the proposed use.

ENVIRON considers that interim management is required to remove illegally dumped wastes and secure the site, as follows:

- An appropriately licensed asbestos removal contractor be engaged to remove and dispose of the asbestos waste. Validation of the area following removal should be undertaken by an appropriately qualified consultant and documented.
- For aesthetic reasons, the car body should be removed from the site and recycled as appropriate.

9 References

ANZECC & NHMRC (1992) Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites;

ENVIRON (2013) Preliminary Screening Level, Health Risk Assessment for Fluoride and Aluminium, Part of the Kurri Kurri Aluminium Smelter, Hart Road, Loxford;

ENVIRON (2013) Phase 1 ESA, Hydro Kurri Kurri Aluminium Smelter;

Hunter Catchment Management Trust (2000) Wallis and Fishery Creeks Total Catchment Management Strategy;

NEPC (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure (NEPM);

NSW DEC (2006) Guidelines for the NSW Site Auditor Scheme (Second Edition);

NSW DEC (2007) Guidelines for the Assessment and Management of Groundwater Contamination;

NSW DECC (2008) Waste Classification Guidelines.

10 Limitations

ENVIRON Australia prepared this report in accordance with the scope of work as outlined in our proposal to Hydro Aluminium Kurri Kurri Pty Ltd dated 18 September 2013 and in accordance with our understanding and interpretation of current regulatory standards.

A representative program of sampling and laboratory analyses was undertaken as part of this investigation, based on past and present known uses of Parcel 8. While every care has been taken, concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. We cannot therefore preclude the presence of materials that may be hazardous.

Site conditions may change over time. This report is based on conditions encountered at Parcel 8 at the time of the report and ENVIRON disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent ENVIRON's professional judgment based on information made available during the course of this assignment and are true and correct to the best of ENVIRON's knowledge as at the date of the assessment.

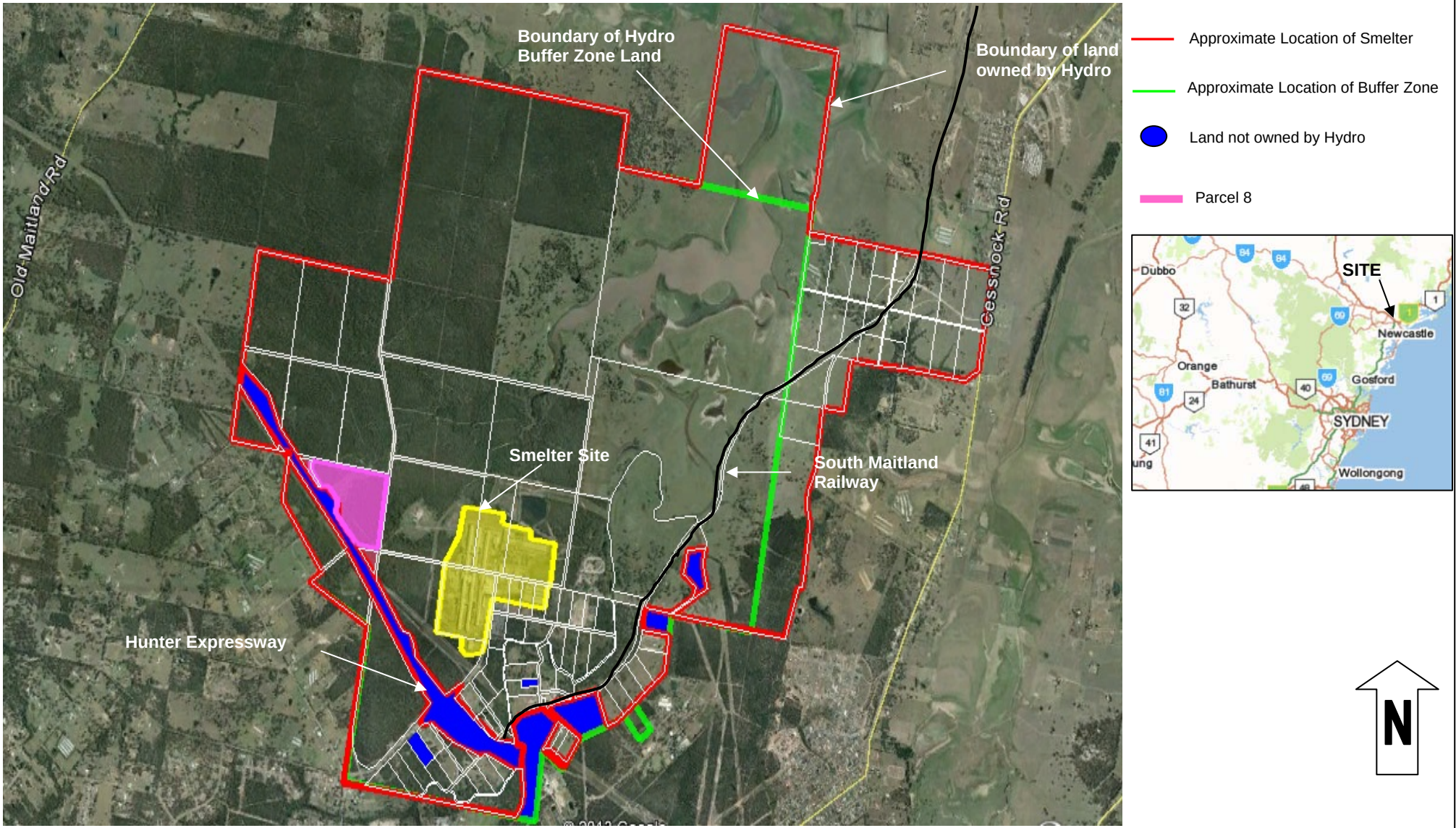
ENVIRON did not independently verify all of the written or oral information provided to ENVIRON during the course of this investigation. While ENVIRON has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to ENVIRON was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

10.1 User Reliance

This report has been prepared exclusively for Hydro Aluminium Kurri Kurri Pty Ltd and may not be relied upon by any other person or entity without ENVIRON's express written permission.

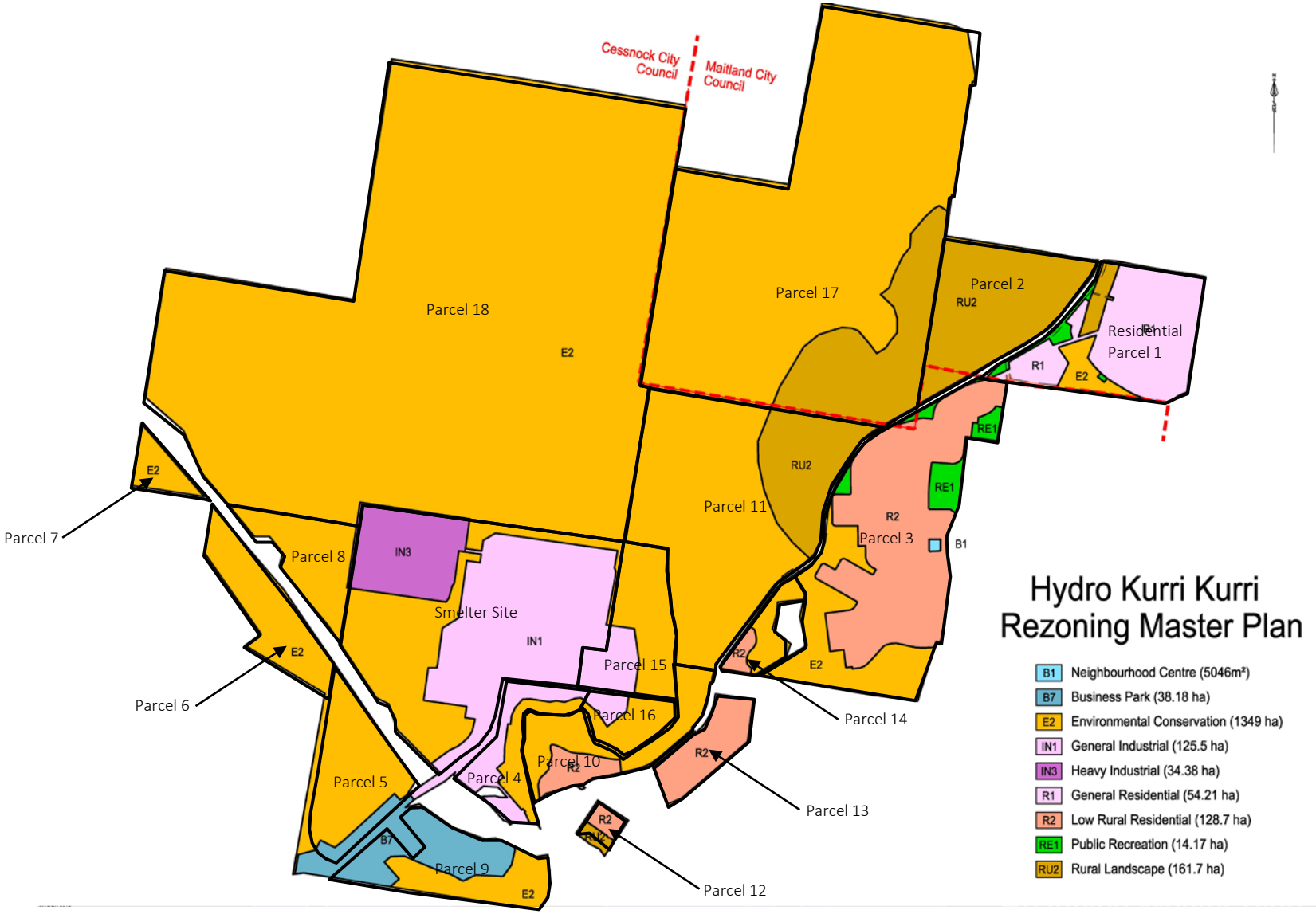
Figures



Google Earth Pro: Licence valid till 5/2/15.

Hydro Aluminium Kurri Kurri – Phase 2 Environmental Site Assessment	Site Location

ENVIRON | JOB NO: AS130348 | DATE: February 2014 | FIGURE 1



Proposed Land Zonings taken from
Hydro Kurri Kurri Preliminary Masterplan dated 26/3/15

Hydro Aluminium Kurri Kurri – Phase 2 Buffer Zone investigations

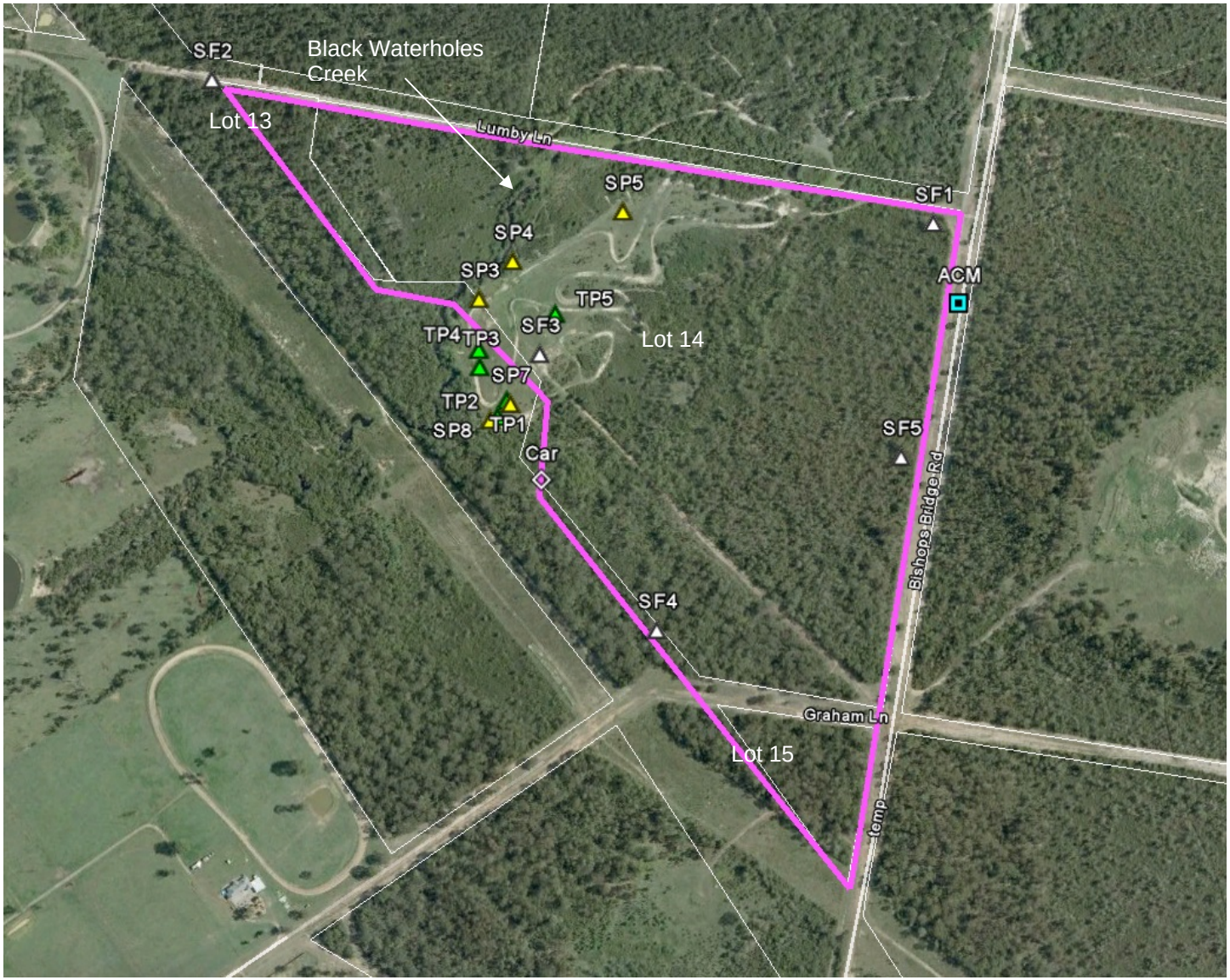
Land Parcels and Proposed Land Zoning

ENVIRON

JOB NO: AS 130348

DATE: March 2015

FIGURE 2



KEY:

- Site Boundary
- SF — Soil Sample for Fluoride Analysis
- SP — Stockpile Sample
- TP — Test Pits
- ACM — ACM Stockpile
- Car body

N

Google Earth Pro: Licenced til 5/2/15

Hydro Aluminium Kurri Kurri – Phase 2 Environmental Site Assessment

Parcel 8 – Soil Sampling Locations

ENVIRON

JOB NO: AS130348

DATE: April 2014

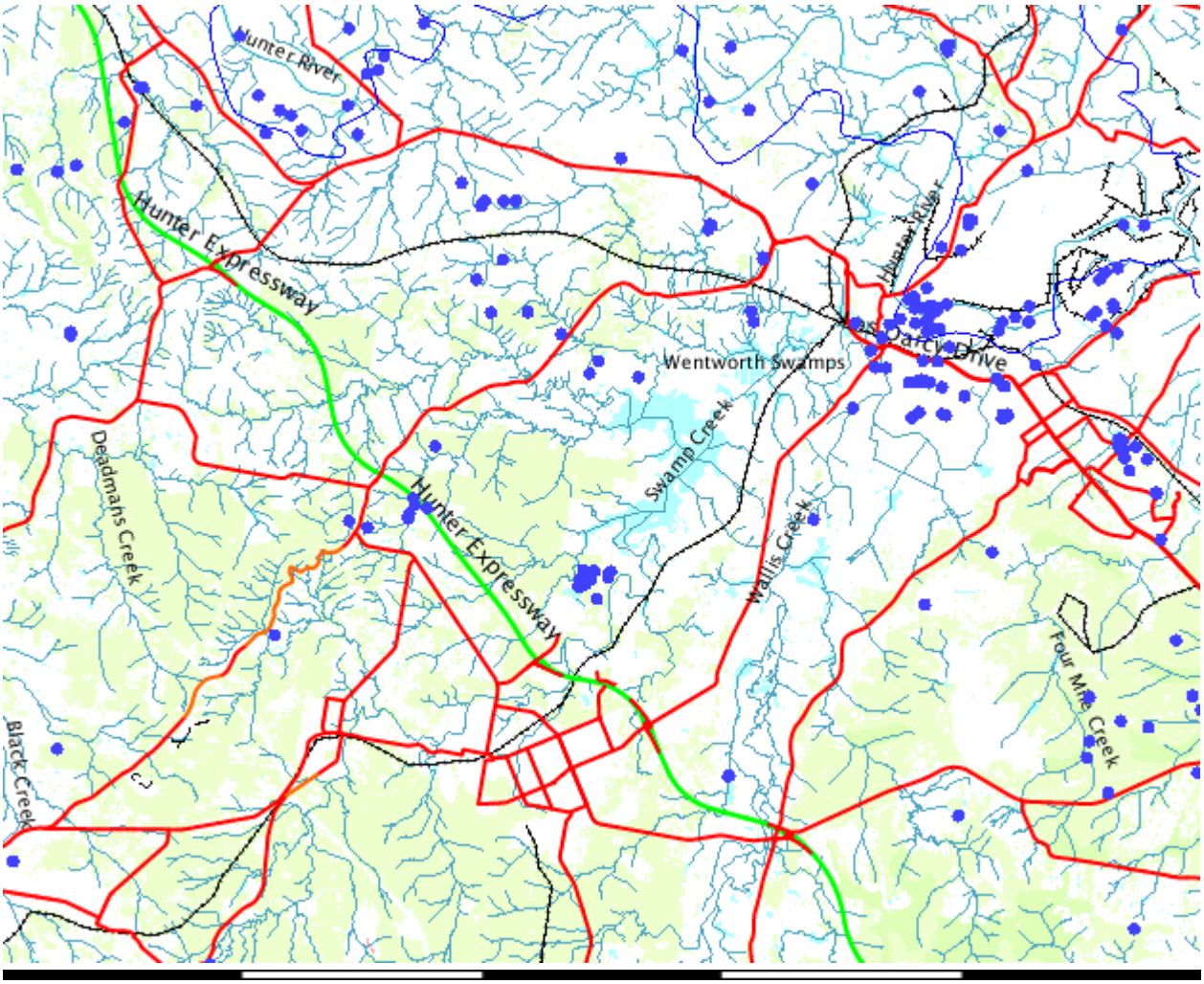
FIGURE 3

Appendix A

Surrounding Groundwater Bores

Registered groundwater bores in the vicinity of the site

Map created with NSW Natural Resource Atlas - http://www.nratlas.nsw.gov.au
Tuesday, April 29, 2014



0 24 Km

Legend

Symbol	Layer	Custodian
	Cities and large towns	
Cowra	Populated places	
	Towns	
	Groundwater Bores	
	Catchment Management Authority boundaries	
	Major rivers	
Primary/arterial road Motorway/freeway Railway Runway Contour Background	Topographic base map	

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079088

Works Details (top)

GROUNDWATER NUMBER	GW079088
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371306.00
EASTING	358054.00
LATITUDE	32 47' 13"
LONGITUDE	151 29' 3"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079090

Works Details (top)

GROUNDWATER NUMBER	GW079090
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371368.00
EASTING	358105.00
LATITUDE	32 47' 11"
LONGITUDE	151 29' 5"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079092

Works Details (top)

GROUNDWATER NUMBER	GW079092
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371429.00
EASTING	358078.00
LATITUDE	32 47' 9"
LONGITUDE	151 29' 4"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
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Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079093

Works Details (top)

GROUNDWATER NUMBER	GW079093
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371460.00
EASTING	358078.00
LATITUDE	32 47' 8"
LONGITUDE	151 29' 4"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079094

Works Details (top)

GROUNDWATER NUMBER	GW079094
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371462.00
EASTING	358234.00
LATITUDE	32 47' 8"
LONGITUDE	151 29' 10"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079096

Works Details (top)

GROUNDWATER NUMBER	GW079096
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371707.00
EASTING	358152.00
LATITUDE	32 47' 0"
LONGITUDE	151 29' 7"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079097

Works Details (top)

GROUNDWATER NUMBER	GW079097
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371679.00
EASTING	358335.00
LATITUDE	32 47' 1"
LONGITUDE	151 29' 14"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079099

Works Details (top)

GROUNDWATER NUMBER	GW079099
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371003.00
EASTING	358448.00
LATITUDE	32 47' 23"
LONGITUDE	151 29' 18"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079101

Works Details (top)

GROUNDWATER NUMBER	GW079101
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371680.00
EASTING	358387.00
LATITUDE	32 47' 1"
LONGITUDE	151 29' 16"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079102

Works Details (top)

GROUNDWATER NUMBER	GW079102
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371685.00
EASTING	358725.00
LATITUDE	32 47' 1"
LONGITUDE	151 29' 29"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Monday, January 6, 2014

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW079103

Works Details (top)

GROUNDWATER NUMBER	GW079103
LIC-NUM	
AUTHORISED-PURPOSES	
INTENDED-PURPOSES	
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	(Unknown)
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	
GW-ZONE	
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6371530.00
EASTING	358675.00
LATITUDE	32 47' 6"
LONGITUDE	151 29' 27"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	
REMARK	

Form-A (top)

no details

Licensed (top)

no details

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Appendix B

Site Photographs

Photo 1: Photograph of the cleared area at the location of the former hobby farm on Lot 14.

Photo 2: Photograph of the remnant footing on Lot 14.

Photo 3: Photograph of grassed soil stockpiles near the dirt bike track on Lot 14.

Photo 4: Photograph of hummocky ground near the dirt bike track on Lot 14.

Photo 5: Photograph of building waste, including ACM fragments, near Bishops Bridge Road.

Appendix C

Field Investigation Sheets and test pit logs

TEST PIT NUMBER TP1

ENVIRON

CLIENT Hydro Aluminium Kurri Kurri **PROJECT NAME** Phase 2 Environmental Site Assessment

PROJECT NUMBER AS130348 **PROJECT LOCATION** Parcel 8, Lot 14

DATE STARTED 19/3/14 **COMPLETED** 19/3/14 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT _____ **TEST PIT LOCATION** _____

TEST PIT SIZE _____ **LOGGED BY** SC **CHECKED BY** KG

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0.5			FILL; Silty SAND, brown, fine grained, moist (disturbed topsoil)		
			1.0			Silty SAND; brown		
						CLAY; red brown, medium-high plasticity		
			1.5			Borehole TP1 terminated at 1.2m		
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

TEST PIT NUMBER TP2

ENVIRON

CLIENT Hydro Aluminium Kurri Kurri **PROJECT NAME** Phase 2 Environmental Site Assessment

PROJECT NUMBER AS130348 **PROJECT LOCATION** Parcel 8, Lot 14

DATE STARTED 19/3/14 **COMPLETED** 19/3/14 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT _____ **TEST PIT LOCATION** _____

TEST PIT SIZE _____ **LOGGED BY** SC **CHECKED BY** KG

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0.5			FILL; Silty SAND, light brown, fine grained with clay lumps, wood fragments (trace).		
						TOPSOIL		
			1.0			CLAY; yellow-brown, medium plasticity		
			1.5			Borehole TP2 terminated at 1.3m		
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

TEST PIT NUMBER TP3

ENVIRON

CLIENT Hydro Aluminium Kurri Kurri **PROJECT NAME** Phase 2 Environmental Site Assessment

PROJECT NUMBER AS130348 **PROJECT LOCATION** Parcel 8, Lot 14

DATE STARTED 19/3/14 **COMPLETED** 19/3/14 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT _____ **TEST PIT LOCATION** _____

TEST PIT SIZE _____ **LOGGED BY** SC **CHECKED BY** KG

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0.5			FILL; Silty SAND and clay lumps (undisturbed natural)		
			1.0			FILL; Silty SAND		
						Borehole TP3 terminated at 1m		
			1.5					
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

TEST PIT NUMBER TP4

ENVIRON

CLIENT Hydro Aluminium Kurri Kurri **PROJECT NAME** Phase 2 Environmental Site Assessment

PROJECT NUMBER AS130348 **PROJECT LOCATION** Parcel 8, Lot 14

DATE STARTED 19/3/14 **COMPLETED** 19/3/14 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT _____ **TEST PIT LOCATION** _____

TEST PIT SIZE _____ **LOGGED BY** SC **CHECKED BY** KG

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0.5			FILL; Sity SAND and clay lumps (undisturbed natural)		
						TOPSOIL; Silty SAND		
						CLAY; yellow-brown, medium plasticity		
			1.0			Borehole TP4 terminated at 0.9m		
			1.5					
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

TEST PIT NUMBER TP5

ENVIRON

CLIENT Hydro Aluminium Kurri Kurri **PROJECT NAME** Phase 2 Environmental Site Assessment

PROJECT NUMBER AS130348 **PROJECT LOCATION** Parcel 8, Lot 14

DATE STARTED 19/3/14 **COMPLETED** 19/3/14 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT _____ **TEST PIT LOCATION** _____

TEST PIT SIZE _____ **LOGGED BY** SC **CHECKED BY** KG

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0.5			FILL; Silty SAND and clay lumps (undisturbed natural)		
			1.0			CLAY		
						Borehole TP5 terminated at 1m		
			1.5					
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

Site Walkover Checklist

Project No.:	AS130348	**Date and Time:**	1/11/13
Land Parcel:	ELP8 Lot 14	**Weather:**	sunny, warm, partially cloudy
Lot and DP:	Lot 14	**Environ Personnel:**	KW & Glen (Hydro)

Site Description

Topography	
Surface Geology	
Fill evident?	small stockpiles near creek & along firetrails in bush → & in bike trail area
Hummocky ground?	yes around bike trail area
Structures on site?	bike trail
Location of structures	as per historical aerials – former structures now clear bike trail area → all hummocky
Building materials used in structures	–
Asbestos debris on site?	Not sighted
Location of asbestos debris?	–
Volume of asbestos debris?	–

Abbey grounds → old car body → 32.78538°S, 151.46605°E & small stockpile 151.46773°E 32.78711°S

GPS Locations of Interest

Point of Interest	Easting	~~Northing~~ S
Small stockpile (1) (old, grass covered)	151.46975°E	32.78719°S (6m accuracy)
Stockpiles N along BBRd. (E site boundary)	151.46995	32.78632°S
travelling →	151.47011 &	32.78564
Small clearing & stockpile (2)	151.47037	32.78298°S

bush stockpiles

Description of Photographs Taken

old stockpile (soil & tree timber) → 151.46946°E, 32.78720°S

old stockpile (firetrail) → 151.46653, 32.78473°S

Bike trail, cleaning near creek * Stockpile (3) → 151.46537°E, 32.78366°S (PTO)

* stockpile (4) (10m³) Sample SP3 → sandy silt, brown, no odour

SP3A

bush stockpile → N site boundary → Stockpile (6) → PTO also. ~~bush stockpile~~ 151.46570°E | 151.46705 32.78242

bush stockpiles 32.78318°S

Miscellaneous Field Comments

Small bush stockpiles in vicinity → 151.46713°E, 32.78520°S

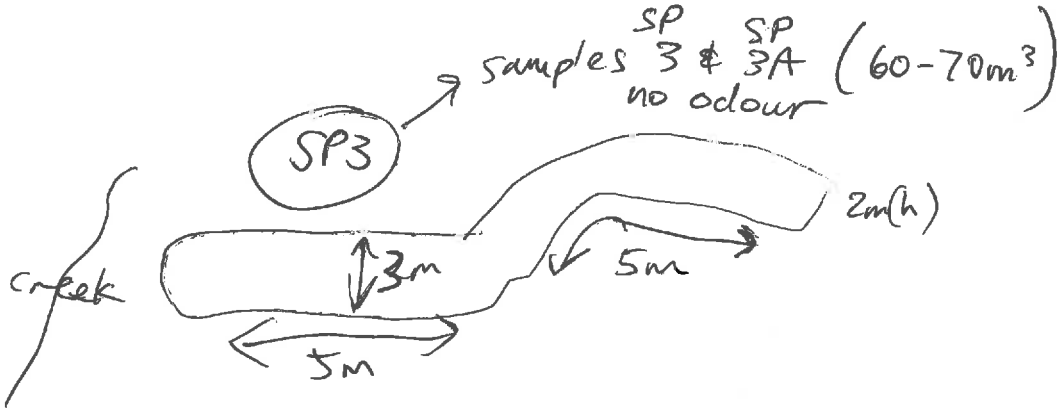
Small ~~dirt~~ soil stockpiles (old & grass covered) all along E site boundary

F sample – SF1 → 151.47036°E, 32.78296°S → Silty clay, orange/brown moist with small cobbles

10x10m grid mid point on cleared area near old brick footing → 151.46602°E, 32.78423°S (4m accuracy)

F sample – SF2 → 151.46250°E 32.78168°S → topsoil, very fine silt, light brown, dry small cobbles.

F sample SF3 → 151.46604°E 32.78417°S → topsoil, sandy silt, orange/brown



SP4 approx (10m³) → 151.46574°E
32.78331°S
sample SP4 & SP QA1 → ~~silty sand~~
sandy silt, brown, smoist
no odour

SP5 approx (10m³) → 151.46695°E
32.78285°S
Sample SP5 → sandy silt, very fine, light brown/grey
no odour, slightly moist.

ACM dumped location
& tiles, bricks, concrete pieces
→ 151.47063°E
32.78371°S
Sample taken

SP6 <10m³ → 151.46252°E
32.78174°S
Sample SP6 — silt, light brown, no odour
very fine, small cobbles, dry

SP7 approx 15m³ → 151.46572°E (5m accuracy)
Sample SP7 32.78463°S
→ silt, light brown, very fine
no odour

SP8 approx 5 x 2.5 x 3m → <100m³
32.78478°S
151.46550°E → Sandy silt, orange/light brown
fine, no odour

F-Sample SF4 → 151.46733°E, 32.78671°S (4m accuracy)
cobbly, sandy silt, ~~topsoil~~, slightly moist
brown with fine ash, small cobbles

F-Sample SF5 → 151.47000°E, 32.78512°S (6m accuracy)
topsoil, silt, brown, with small cobbles

Appendix D

Results Tables

TABLE A: Soil Analytical Results - Grid Sampling

Sample Depth: 0.0m - 0.01m

Sampling Date: 1/11/13

Laboratory PQL: 5 mg/kg

Site Specific HIL - Fluoride: 17000mg/kg

Sample Identification	Soluble Fluoride mg/kg (1:5 soil:water)
S1	<5
S2	2
S3	<2
S4	6
S5	5

TABLE B: Soil Analytical Results - Infill Areas

Sample Identification	PQL	Guideline					SP3	SP4	SP5	SP7	SP8	P8 TP1	P8 TP2	P8 TP3	P8 TP5
Sample Depth (m)												0.2-0.5	0.2-0.5	0.2-0.5	0.1-0.3
Date		HIL 'D' [A]	HSL 'D' Silt 0m to 1m	EIL Industrial [B]	ESL Industrial (Coarse Soil)	Mgt Limits Industrial	1/11/2013	1/11/2013	1/11/2013	1/11/2013	1/11/2013	19/03/2014	19/03/2014	19/03/2014	19/03/2014
Sample Profile							FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL
Sample collected by							KW	KW	KW	KW	KW	SC	SC	SC	SC
Asbestos															
Asbestos Identification							-	-	-	-	-	No	No	No	No
Heavy Metals															
Arsenic	5	3000					-	-	-	-	-	<5	<5	<5	<5
Cadmium	1	900					-	-	-	-	-	<1	<1	<1	<1
Chromium	1	3600					-	-	-	-	-	2	4	2	4
Copper	5	240,000					-	-	-	-	-	<5	<5	<5	<5
Lead	5	1500					-	-	-	-	-	6	15	7	8
Nickel	2	6000					-	-	-	-	-	<2	<2	<2	<2
Zinc	2	400,000					-	-	-	-	-	12	9	14	18
Mercury	0.1	730					-	-	-	-	-	<0.1	<0.1	<0.1	<0.1
Polycyclic Aromatic Hydrocarbons (PAH)															
Naphthalene	0.1			370			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	0.1						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	0.1						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	0.1						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	0.1						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	0.1						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	0.1						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	0.1						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	0.1						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	0.1						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)&(k)fluoranthene	0.2						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a) pyrene	0.05				0.7		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	0.1						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a,h)anthracene	0.1						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	0.1						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ	0.5	40					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve	--	4000					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Recoverable Hydrocarbons (TRH) - NEPM (2013)															
TRH C6 - C10	25		250		215	700	<25	<25	<25	<25	<25	<25	<25	<25	<25
vTPH C6 - C10 less BTEX	25		NL		-	-	<25	<25	<25	<25	<25	<25	<25	<25	<25
TRH >C10-C16	50		NL		170	1000	<50	<50	<50	<50	<50	<50	<50	<50	<50
TRH >C16-C34	100		NL		1700	3500	<100	<100	<100	<100	<100	<100	<100	<100	<100
TRH >C34-C40	100		NL		3300	10000	<100	<100	<100	<100	<100	<100	<100	<100	<100
BTEX															
Benzene	0.2		4		75		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	0.5		NL		135		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	1		NL		165		<1	<1	<1	<1	<1	<1	<1	<1	<1
m+p-xylene	2		NL		180		<2	<2	<2	<2	<2	<2	<2	<2	<2
o-Xylene	1		NL		180		<1	<1	<1	<1	<1	<1	<1	<1	<1

All results are in mg/kg

[A] HIL D - Commercial/ Industrial landuse

[D] EILs represent the most conservative value possible as the lowest value for added contaminant limit (ACL) was used, irrespective of soil properties and ambient background concentration.

Results shaded grey are in excess of the investigation criteria.

Benzo(a)pyrene TEQ is indicative of carcinogenic PAHs: the HIL is based on the 8 carcinogenic PAHs and their TEFs (potency relative to B(a)P) adopted by CCME 2008. The B(a)P TEQ is calculated by multiplying the concentration of each carcinogenic PAH in the sample by its B(a)P TEF and sumr

TABLE B: Soil Analytical Results - Infill Areas

Sample Identification	PQL	Guideline			
Sample Depth (m)					
Date		HIL 'D' [A]	HSL 'D' Silt 0m to 1m	EIL Industrial [B]	ESL Industrial (Coarse Soil)
Sample Profile					
Sample collected by					
Asbestos					
Asbestos Identification					
Heavy Metals					
Arsenic	5	3000			
Cadmium	1	900			
Chromium	1	3600			
Copper	5	240,000			
Lead	5	1500			
Nickel	2	6000			
Zinc	2	400,000			
Mercury	0.1	730			
Polycyclic Aromatic Hydrocarbons (PAH)					
Naphthalene	0.1			370	
Acenaphthylene	0.1				
Acenaphthene	0.1				
Fluorene	0.1				
Phenanthrene	0.1				
Anthracene	0.1				
Fluoranthene	0.1				
Pyrene	0.1				
Benz(a)anthracene	0.1				
Chrysene	0.1				
Benzo(b)&(k)fluoranthene	0.2				
Benzo(a) pyrene	0.05				0.7
Indeno(1,2,3-c,d)pyrene	0.1				
Dibenz(a,h)anthracene	0.1				
Benzo(g,h,i)perylene	0.1				
Benzo(a)pyrene TEQ	0.5	40			
Total +ve	--	4000			
Total Recoverable Hydrocarbons (TRH) - NEPM (2013)					
TRH C6 - C10	25		250		215
vTPH C6 - C10 less BTEX	25		NL		-
TRH >C10-C16	50		NL		170
TRH >C16-C34	100		NL		1700
TRH >C34-C40	100		NL		3300
BTEX					
Benzene	0.2		4		75
Toluene	0.5		NL		135
Ethylbenzene	1		NL		165
m+p-xylene	2		NL		180
o-Xylene	1		NL		180

All results are in mg/kg

[A] HIL D - Commercial/ Industrial landuse

[D] EILs represent the most conservative value possible as the lowest value for added contaminant limit (ACL) was use

Results shaded grey are in excess of the investigation criteria.

Benzo(a)pyrene TEQ is indicative of carcinogenic PAHs: the HIL is based on the 8 carcinogenic PAHs and their TEFs ning these products.

TABLE C: Soil Quality Assurance/ Quality Control Results

Sample Identification	SP4	SPQA1	RPD %
Sample Depth (m)	Fill soil matrix		
Duplicate Type	Intralaboratory		
Sample Profile	TOPSOIL		
Sample collected by	KW		
Polycyclic Aromatic Hydrocarbons (PAH)			
Naphthalene	<0.5	<0.5	NC
Acenaphthylene	<0.5	<0.5	NC
Acenaphthene	<0.5	<0.5	NC
Fluorene	<0.5	<0.5	NC
Phenanthrene	<0.5	<0.5	NC
Anthracene	<0.5	<0.5	NC
Fluoranthene	<0.5	<0.5	NC
Pyrene	<0.5	<0.5	NC
Benz(a)anthracene	<0.5	<0.5	NC
Chrysene	<0.5	<0.5	NC
Benzo(b)&(k)fluoranthene	<0.5	<0.5	NC
Benzo(a) pyrene	<0.5	<0.5	NC
Indeno(1,2,3-c,d)pyrene	<0.5	<0.5	NC
Dibenz(a,h)anthracene	<0.5	<0.5	NC
Benzo(g,h,i)perylene	<0.5	<0.5	NC
Benzo(a)pyrene TEQ	<0.5	<0.5	NC
Total +ve	<0.5	<0.5	NC
Total Recoverable Hydrocarbons (TRH) - NEPM (2013)			
TRH C6 - C10	<25	<25	NC
vTPH C6 - C10 less BTEX	<25	<25	NC
TRH >C10-C16	<50	<50	NC
TRH >C16-C34	<100	<100	NC
TRH >C34-C40	<100	<100	NC
BTEX			
Benzene	<0.2	<0.2	NC
Toluene	<0.5	<0.5	NC
Ethylbenzene	<1	<1	NC
m+p-xylene	<2	<2	NC
o-Xylene	<1	<1	NC

Note all units in mg/kg

BOLD identifies where RPD results

intralaboratory	interlaboratory	
>50	>60	where both sample results exceed ten x PQL
>75	>85	where both sample results are within 5 to 10 x PQL
>100	>100	where both sample results are within 2 to 5 x PQL
AD>2.5 * PQL		where one or both sample results are <2 x PQL

BOLD identified where blanks >0

Where results are within two of the above ranges the most conservative criteria have been used to assess duplicate performance

Appendix E

Laboratory Reports

CERTIFICATE OF ANALYSIS

Work Order	: **ES1323785**	Page	: 1 of 8
Client	: **ENVIRON AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE CADMAN	Contact	: Client Services
Address	: PO BOX 560 NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: scadman@environcorp.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 99548114	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: AS130348	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 04-NOV-2013
Sampler	: KW	Issue Date	: 11-NOV-2013
Site	: ----		
		No. of samples received	: 14
Quote number	: SY/446/12	No. of samples analysed	: 11

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EA200 Legend**
- **EA200 'Am' Amosite (brown asbestos)**
- **EA200 'Ch' Chrysotile (white asbestos)**
- **EA200 'Cr' Crocidolite (blue asbestos)**
- **EA200 'Trace' - Asbestos fibres detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres**
- **EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.**
- **EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.**
- **EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Client sample ID	ELP8 LOT 14 SP8	ELP8 LOT 14 SP3	ELP8 LOT 14 SP7	ELP8 LOT 14 SP5	ELP8 LOT 14 SPQA1
				Client sampling date / time	01-NOV-2013 15:00	01-NOV-2013 15:00	01-NOV-2013 15:00	01-NOV-2013 15:00	01-NOV-2013 15:00
					ES1323785-002	ES1323785-004	ES1323785-005	ES1323785-006	ES1323785-007
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		5.9	4.8	2.7	5.3	5.8
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	>C10_C16	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	ELP8 LOT 14 SP8	ELP8 LOT 14 SP3	ELP8 LOT 14 SP7	ELP8 LOT 14 SP5	ELP8 LOT 14 SPQA1
				Client sampling date / time	01-NOV-2013 15:00	01-NOV-2013 15:00	01-NOV-2013 15:00	01-NOV-2013 15:00	01-NOV-2013 15:00
Compound	CAS Number	LOR	Unit		ES1323785-002	ES1323785-004	ES1323785-005	ES1323785-006	ES1323785-007
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**87.3**	**101**	**84.4**	**93.7**	**90.2**
2-Chlorophenol-D4	93951-73-6	0.1	%		**100**	**101**	**100**	**97.4**	**94.2**
2.4.6-Tribromophenol	118-79-6	0.1	%		**112**	**100**	**109**	**90.2**	**88.0**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**91.9**	**98.9**	**99.9**	**93.1**	**90.8**
Anthracene-d10	1719-06-8	0.1	%		**85.0**	**84.2**	**81.0**	**86.7**	**83.1**
4-Terphenyl-d14	1718-51-0	0.1	%		**94.0**	**112**	**95.3**	**82.6**	**79.5**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**101**	**93.4**	**75.3**	**95.2**	**110**
Toluene-D8	2037-26-5	0.1	%		**109**	**95.6**	**73.9**	**98.1**	**108**
4-Bromofluorobenzene	460-00-4	0.1	%		**104**	**99.4**	**74.3**	**99.7**	**109**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Client sample ID	ELP8 LOT 14 SP4	ELP8 LOT 14 SF4	ELP8 LOT 14 SF1	ELP8 LOT 14 SF3	ELP8 LOT 14 SF5
				Client sampling date / time	01-NOV-2013 15:00	01-NOV-2013 15:00	01-NOV-2013 15:00	01-NOV-2013 15:00	01-NOV-2013 15:00
					ES1323785-008	ES1323785-010	ES1323785-011	ES1323785-012	ES1323785-013
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		5.3	2.8	12.4	4.6	1.7
EK040: Fluoride									
Fluoride	16984-48-8	1	mg/kg		----	6	<5	<2	5
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg		<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg		<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg		<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg		<100	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	ELP8 LOT 14 SP4	ELP8 LOT 14 SF4	ELP8 LOT 14 SF1	ELP8 LOT 14 SF3	ELP8 LOT 14 SF5
				Client sampling date / time	01-NOV-2013 15:00	01-NOV-2013 15:00	01-NOV-2013 15:00	01-NOV-2013 15:00	01-NOV-2013 15:00
					ES1323785-008	ES1323785-010	ES1323785-011	ES1323785-012	ES1323785-013
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 - Continued									
>C10 - C16 Fraction	>C10_C16	50	mg/kg		<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		<100	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg		<100	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		<50	----	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	----	----	----
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	----	----	----	----
^ **Total Xylenes**	1330-20-7	0.5	mg/kg		<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg		<1	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**93.2**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%		**97.5**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%		**90.8**	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**93.7**	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%		**85.5**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%		**82.0**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**88.0**	----	----	----	----
Toluene-D8	2037-26-5	0.1	%		**88.2**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		**86.0**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	ELP8 LOT 14 SF2	----	----	----	----
				Client sampling date / time	01-NOV-2013 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1323785-014	----	----	----	----
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		**1.5**	----	----	----	----
EK040: Fluoride									
Fluoride	16984-48-8	1	mg/kg		**2**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	72.8	133.2
Toluene-D8	2037-26-5	73.9	132.1
4-Bromofluorobenzene	460-00-4	71.6	130.0

QUALITY CONTROL REPORT

Work Order	: **ES1323785**	Page	: 1 of 7
Client	: **ENVIRON AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE CADMAN	Contact	: Client Services
Address	: PO BOX 560 NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: scadman@environcorp.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 99548114	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: AS130348	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 04-NOV-2013
Sampler	: KW	Issue Date	: 11-NOV-2013
Order number	: ----		
		No. of samples received	: 14
Quote number	: SY/446/12	No. of samples analysed	: 11

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

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

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 3147356)									
ES1323625-010	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	25.4	23.8	6.6	0% - 20%
ES1323785-008	ELP8 LOT 14 SP4	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	5.3	6.0	12.3	No Limit
EK040S: Fluoride Soluble (QC Lot: 3144606)									
ES1323625-008	Anonymous	EK040S: Fluoride	16984-48-8	1	mg/kg	6	6	0.0	No Limit
ES1323784-005	Anonymous	EK040S: Fluoride	16984-48-8	1	mg/kg	4	4	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3143842)									
ES1323785-002	ELP8 LOT 14 SP8	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3143841)									
ES1323785-002	ELP8 LOT 14 SP8	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3145986)									
ES1323785-002	ELP8 LOT 14 SP8	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES1324094-004	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QC Lot: 3143841)									
ES1323785-002	ELP8 LOT 14 SP8	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QC Lot: 3143841) - continued									
ES1323785-002	ELP8 LOT 14 SP8	EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QC Lot: 3145986)									
ES1323785-002	ELP8 LOT 14 SP8	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES1324094-004	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080: BTEXN (QC Lot: 3145986)									
ES1323785-002	ELP8 LOT 14 SP8	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES1324094-004	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

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

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

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EK040S: Fluoride Soluble (QCLot: 3144606)								
EK040S: Fluoride	16984-48-8	1.0	mg/kg	<1	25.0 mg/kg	116	69	117
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3143842)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	4 mg/kg	101	80	124
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	4 mg/kg	94.3	77	123
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	4 mg/kg	96.3	79	123
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	4 mg/kg	92.8	77	123
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	4 mg/kg	96.5	79	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	4 mg/kg	95.3	79	123
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	4 mg/kg	93.6	79	123
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	4 mg/kg	94.8	79	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	4 mg/kg	93.4	73	121
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	4 mg/kg	95.1	81	123
EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	4 mg/kg	82.6	70	118
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4 mg/kg	86.8	77	123
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	4 mg/kg	95.4	76	122
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	4 mg/kg	84.1	71	113
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	4 mg/kg	88.3	71.7	113
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	4 mg/kg	86.0	72.4	114
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3143841)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	93.9	71	131
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	300 mg/kg	91.3	74	138
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	84.9	64	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3145986)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	84.1	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3143841)								
EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	250 mg/kg	96.1	70	130
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	87.6	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----
		50	mg/kg	----	150 mg/kg	76.1	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3145986)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	87.6	68.4	128
EP080: BTEXN (QCLot: 3145986)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	82.1	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	76.9	62	128

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080: BTEXN (QCLot: 3145986) - continued								
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	91.2	58	118
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	87.7	60	120
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	93.6	60	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	94.7	62	138

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EK040S: Fluoride Soluble (QCLot: 3144606)							
ES1323625-008	Anonymous	EK040S: Fluoride	16984-48-8	50 mg/kg	108	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3143842)							
ES1323785-002	ELP8 LOT 14 SP8	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	82.0	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	79.6	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3143841)							
ES1323785-002	ELP8 LOT 14 SP8	EP071: C10 - C14 Fraction	----	640 mg/kg	85.3	73	137
		EP071: C15 - C28 Fraction	----	3140 mg/kg	84.6	53	131
		EP071: C29 - C36 Fraction	----	2860 mg/kg	71.9	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3145986)							
ES1323785-002	ELP8 LOT 14 SP8	EP080: C6 - C9 Fraction	----	32.5 mg/kg	86.8	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3143841)							
ES1323785-002	ELP8 LOT 14 SP8	EP071: >C10 - C16 Fraction	>C10_C16	850 mg/kg	109	73	137
		EP071: >C16 - C34 Fraction	----	4800 mg/kg	77.1	53	131
		EP071: >C34 - C40 Fraction	----	2400 mg/kg	56.7	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3145986)							
ES1323785-002	ELP8 LOT 14 SP8	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	87.0	70	130
EP080: BTEXN (QCLot: 3145986)							
ES1323785-002	ELP8 LOT 14 SP8	EP080: Benzene	71-43-2	2.5 mg/kg	74.8	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	73.2	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	80.5	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	75.4	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	80.5	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080: BTEXN (QCLot: 3145986) - continued							
ES1323785-002	ELP8 LOT 14 SP8	EP080: Naphthalene	91-20-3	2.5 mg/kg	80.1	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

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

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3143841)										
ES1323785-002	ELP8 LOT 14 SP8	EP071: C10 - C14 Fraction	----	640 mg/kg	85.3	----	73	137	----	----
		EP071: C15 - C28 Fraction	----	3140 mg/kg	84.6	----	53	131	----	----
		EP071: C29 - C36 Fraction	----	2860 mg/kg	71.9	----	52	132	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3143841)										
ES1323785-002	ELP8 LOT 14 SP8	EP071: >C10 - C16 Fraction	>C10_C16	850 mg/kg	109	----	73	137	----	----
		EP071: >C16 - C34 Fraction	----	4800 mg/kg	77.1	----	53	131	----	----
		EP071: >C34 - C40 Fraction	----	2400 mg/kg	56.7	----	52	132	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3143842)										
ES1323785-002	ELP8 LOT 14 SP8	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	82.0	----	70	130	----	----
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	79.6	----	70	130	----	----
EK040S: Fluoride Soluble (QCLot: 3144606)										
ES1323625-008	Anonymous	EK040S: Fluoride	16984-48-8	50 mg/kg	108	----	70	130	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3145986)										
ES1323785-002	ELP8 LOT 14 SP8	EP080: C6 - C9 Fraction	----	32.5 mg/kg	86.8	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3145986)										
ES1323785-002	ELP8 LOT 14 SP8	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	87.0	----	70	130	----	----
EP080: BTEXN (QCLot: 3145986)										
ES1323785-002	ELP8 LOT 14 SP8	EP080: Benzene	71-43-2	2.5 mg/kg	74.8	----	70	130	----	----
		EP080: Toluene	108-88-3	2.5 mg/kg	73.2	----	70	130	----	----
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	80.5	----	70	130	----	----
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	75.4	----	70	130	----	----
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	80.5	----	70	130	----	----
		EP080: Naphthalene	91-20-3	2.5 mg/kg	80.1	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES1323785**	Page	: 1 of 6
Client	: ENVIRON AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR STEVE CADMAN	Contact	: Client Services
Address	: PO BOX 560 NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: scadman@environcorp.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 99548114	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: AS130348	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 04-NOV-2013
Sampler	: KW	Issue Date	: 11-NOV-2013
Order number	: ----		
		No. of samples received	: 14
Quote number	: SY/446/12	No. of samples analysed	: 11

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

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

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

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

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content							
Pulp Bag (EA055-103)							
ELP8 LOT 14 SF4, ELP8 LOT 14 SF1, ELP8 LOT 14 SF3, ELP8 LOT 14 SF5, ELP8 LOT 14 SF2	**01-NOV-2013**	**----**	----	----	**08-NOV-2013**	15-NOV-2013	✓
Soil Glass Jar - Unpreserved (EA055-103)							
ELP8 LOT 14 SP8, ELP8 LOT 14 SP3, ELP8 LOT 14 SP7, ELP8 LOT 14 SP5, ELP8 LOT 14 SPQA1, ELP8 LOT 14 SP4	**01-NOV-2013**	**----**	----	----	**08-NOV-2013**	15-NOV-2013	✓
EK040: Fluoride							
Pulp Bag (EK040S)							
ELP8 LOT 14 SF4, ELP8 LOT 14 SF1, ELP8 LOT 14 SF3, ELP8 LOT 14 SF5, ELP8 LOT 14 SF2	**01-NOV-2013**	**06-NOV-2013**	08-NOV-2013	✓	**08-NOV-2013**	04-DEC-2013	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013							
Soil Glass Jar - Unpreserved (EP071)							
ELP8 LOT 14 SP8, ELP8 LOT 14 SP3, ELP8 LOT 14 SP7, ELP8 LOT 14 SP5, ELP8 LOT 14 SPQA1, ELP8 LOT 14 SP4	**01-NOV-2013**	**06-NOV-2013**	15-NOV-2013	✓	**07-NOV-2013**	16-DEC-2013	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
ELP8 LOT 14 SP8, ELP8 LOT 14 SP3, ELP8 LOT 14 SP7, ELP8 LOT 14 SP5, ELP8 LOT 14 SPQA1, ELP8 LOT 14 SP4	**01-NOV-2013**	**06-NOV-2013**	15-NOV-2013	✓	**08-NOV-2013**	16-DEC-2013	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
ELP8 LOT 14 SP8, ELP8 LOT 14 SP3, ELP8 LOT 14 SP7, ELP8 LOT 14 SP5, ELP8 LOT 14 SPQA1, ELP8 LOT 14 SP4	**01-NOV-2013**	**07-NOV-2013**	15-NOV-2013	✓	**07-NOV-2013**	15-NOV-2013	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013							
Soil Glass Jar - Unpreserved (EP080)							
ELP8 LOT 14 SP8, ELP8 LOT 14 SP3, ELP8 LOT 14 SP7, ELP8 LOT 14 SP5, ELP8 LOT 14 SPQA1, ELP8 LOT 14 SP4	**01-NOV-2013**	**07-NOV-2013**	15-NOV-2013	✓	**07-NOV-2013**	15-NOV-2013	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Fluoride - Soluble	EK040S	2	19	**10.5**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Moisture Content	EA055-103	2	19	**10.5**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	1	6	**16.7**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	6	**16.7**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	17	**11.8**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Fluoride - Soluble	EK040S	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	1	6	**16.7**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	6	**16.7**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	17	**5.9**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Fluoride - Soluble	EK040S	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	1	6	**16.7**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	6	**16.7**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	17	**5.9**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Fluoride - Soluble	EK040S	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	1	6	**16.7**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	6	**16.7**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	17	**5.9**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Fluoride - Soluble	EK040S	SOIL	APHA 21st ed., 4500 F--C Soluble Fluoride is determined after a 1:5 soil/water extract using an ion selective electrode.
TPH - Semivolatile Fraction	EP071	SOIL	(USEPA SW 846 - 8015A) Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM (2013) Schedule B(3) (Method 506.1)
PAH/Phenols (SIM)	EP075(SIM)	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TPH Volatiles/BTEX	EP080	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 501)

Preparation Methods	Method	Matrix	Method Descriptions
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of distilled water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids (Option B - Non-concentrating)	ORG17B	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 20mL 1:1 DCM/Acetone by end over end tumble. The solvent is transferred directly to a GC vial for analysis.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

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

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

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

CERTIFICATE OF ANALYSIS

Work Order	: **ES1408818**	Page	: 1 of 8
Client	: **ENVIRON AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: STEVE CADMAN	Contact	: Client Services
Address	: Eastpoint Complex | Suite 19B, Level 2 50 Glebe Road | PO Box 435 | The Junction NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
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Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: HYDRO BUFFER ZONE INVESTIGATION	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: AS130348		
C-O-C number	: ----	Date Samples Received	: 20-MAR-2014
Sampler	: KW, SC	Issue Date	: 29-APR-2014
Site	: ----		
		No. of samples received	: 4
Quote number	: SY/433/13	No. of samples analysed	: 4

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

Signatories

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

Signatories	Position	Accreditation Category
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Client sample ID	P8 TP1 0.2-0.5	P8 TP2 0.2-0.5	P8 TP3 0.2-0.5	P8 TP5 0.1-0.3	----
				Client sampling date / time	19-MAR-2014 15:00	19-MAR-2014 15:00	19-MAR-2014 15:00	19-MAR-2014 15:00	----
					ES1408818-001	ES1408818-002	ES1408818-003	ES1408818-004	----
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		----	4.7	----	----	----
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		5.4	3.8	1.7	5.8	----
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples									
Asbestos Detected	1332-21-4	0.1	g/kg		No	No	No	No	----
Asbestos Type	1332-21-4	-	--		-	-	-	-	----
Sample weight (dry)	----	0.01	g		35.2	38.4	42.2	38.9	----
APPROVED IDENTIFIER:	----	-	--		S.SPOONER	S.SPOONER	S.SPOONER	S.SPOONER	----
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	0.2	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g		----	0.4	----	----	----
Exchangeable Potassium	----	0.1	meq/100g		----	<0.1	----	----	----
Exchangeable Sodium	----	0.1	meq/100g		----	<0.1	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g		----	0.7	----	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	----
Chromium	7440-47-3	2	mg/kg		2	4	2	4	----
Copper	7440-50-8	5	mg/kg		<5	<5	<5	<5	----
Lead	7439-92-1	5	mg/kg		6	15	7	8	----
Nickel	7440-02-0	2	mg/kg		<2	<2	<2	<2	----
Zinc	7440-66-6	5	mg/kg		12	9	14	18	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	----
EP004: Organic Matter									
Organic Matter	----	0.5	%		----	1.3	----	----	----
Total Organic Carbon	----	0.5	%		----	0.8	----	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg		<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	P8 TP1 0.2-0.5	P8 TP2 0.2-0.5	P8 TP3 0.2-0.5	P8 TP5 0.1-0.3	----
			Client sampling date / time	19-MAR-2014 15:00	19-MAR-2014 15:00	19-MAR-2014 15:00	19-MAR-2014 15:00	----
Compound	CAS Number	LOR	Unit	ES1408818-001	ES1408818-002	ES1408818-003	ES1408818-004	----
EP068A: Organochlorine Pesticides (OC) - Continued								
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ Sum of DDD + DDE + DDT	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	P8 TP1 0.2-0.5	P8 TP2 0.2-0.5	P8 TP3 0.2-0.5	P8 TP5 0.1-0.3	----
			Client sampling date / time	19-MAR-2014 15:00	19-MAR-2014 15:00	19-MAR-2014 15:00	19-MAR-2014 15:00	----
Compound	CAS Number	LOR	Unit	ES1408818-001	ES1408818-002	ES1408818-003	ES1408818-004	----
EP068B: Organophosphorus Pesticides (OP) - Continued								
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	P8 TP1 0.2-0.5	P8 TP2 0.2-0.5	P8 TP3 0.2-0.5	P8 TP5 0.1-0.3	----
			Client sampling date / time	19-MAR-2014 15:00	19-MAR-2014 15:00	19-MAR-2014 15:00	19-MAR-2014 15:00	----
Compound	CAS Number	LOR	Unit	ES1408818-001	ES1408818-002	ES1408818-003	ES1408818-004	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	----
>C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	<50	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
^ Total Xylenes	1330-20-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	113	101	104	119	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	105	90.9	89.5	104	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	101	87.9	93.3	107	----
2-Chlorophenol-D4	93951-73-6	0.1	%	101	101	97.6	109	----
2.4.6-Tribromophenol	118-79-6	0.1	%	67.1	71.6	68.9	73.8	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	85.2	83.5	101	90.5	----
Anthracene-d10	1719-06-8	0.1	%	104	103	103	111	----
4-Terphenyl-d14	1718-51-0	0.1	%	77.8	76.7	74.8	79.4	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	116	119	126	118	----
Toluene-D8	2037-26-5	0.1	%	102	98.4	107	94.2	----
4-Bromofluorobenzene	460-00-4	0.1	%	90.5	89.2	97.8	86.4	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples		
EA200: Description	P8 TP1 0.2-0.5 - 19-MAR-2014 15:00	Mid brown sandy soil with some grey rocks plus a trace of vegetation.
EA200: Description	P8 TP2 0.2-0.5 - 19-MAR-2014 15:00	Mid yellow clay soil with grey rocks plus a trace of vegetation.
EA200: Description	P8 TP3 0.2-0.5 - 19-MAR-2014 15:00	Mid brown sandy soil with grey and orange rocks plus some vegetation.
EA200: Description	P8 TP5 0.1-0.3 - 19-MAR-2014 15:00	Mid brown sandy soil with grey rocks plus some vegetation.

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	72.8	133.2
Toluene-D8	2037-26-5	73.9	132.1
4-Bromofluorobenzene	460-00-4	71.6	130.0

QUALITY CONTROL REPORT

Work Order	: **ES1408818**	Page	: 1 of 7
Client	: **ENVIRON AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: STEVE CADMAN	Contact	: Client Services
Address	: Eastpoint Complex | Suite 19B, Level 2 50 Glebe Road | PO Box 435 | The Junction NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: scadman@environcorp.com	E-mail	: sydney@alsglobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: HYDRO BUFFER ZONE INVESTIGATION	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 20-MAR-2014
Sampler	: KW, SC	Issue Date	: 29-APR-2014
Order number	: AS130348		
		No. of samples received	: 4
Quote number	: SY/433/13	No. of samples analysed	: 4

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

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

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Signatories

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

Signatories	Position	Accreditation Category
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002 : pH (Soils) (QC Lot: 3400690)									
ES1408818-002	P8 TP2 0.2-0.5	EA002: pH Value	----	0.1	pH Unit	4.7	4.4	6.6	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3403155)									
ES1408817-001	Anonymous	ED008: Exchangeable Calcium	----	0.1	meq/100g	4.8	4.8	0.0	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.5	2.5	0.0	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.3	0.3	0.0	0% - 20%
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.1	0.1	0.0	0% - 20%
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	7.7	7.7	0.0	0% - 20%
EP004: Organic Matter (QC Lot: 3402744)									
ES1408817-001	Anonymous	EP004: Organic Matter	----	0.5	%	<0.5	<0.5	0.0	No Limit
		EP004: Total Organic Carbon	----	0.5	%	<0.5	<0.5	0.0	No Limit

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

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

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED008: Exchangeable Cations (QCLot: 3403155)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	1 meq/100g	100	90	128
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.67 meq/100g	100	86	120
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.51 meq/100g	100	85	135
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.87 meq/100g	100	86	128
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	----	----	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3400304)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	114	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	108	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	105	80	136
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	112	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	106	86	124
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.0 mg/kg	109	93	131
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	115	81	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3400305)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	91.1	70	105
EP004: Organic Matter (QCLot: 3402744)								
EP004: Organic Matter	----	0.5	%	<0.5	4.58 %	94.5	85	105
EP004: Total Organic Carbon	----	0.5	%	<0.5	2.66 %	94.4	84	106
EP068A: Organochlorine Pesticides (OC) (QCLot: 3399558)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	88.8	71	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	93.0	66	122
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	92.6	69	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	89.0	71	115
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	82.5	65	113
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	92.1	68	116
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	90.3	68	118
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	93.6	68	116
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	107	68	120
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	90.7	69	119
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	93.0	67	121
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	90.3	66	118
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	93.8	69	117
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	96.8	67	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	93.6	76	120

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 3399558) - continued								
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.4	76	120
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	66.4	57.3	115
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	81.9	60	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	95.1	67	127
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	83.1	65	123
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	90.0	65	129
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3399558)								
EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	0.5 mg/kg	87.1	56	126
EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	84.0	64	128
EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	0.5 mg/kg	78.0	54	122
EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	0.5 mg/kg	80.7	64	124
EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	0.5 mg/kg	81.5	73	117
EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	0.5 mg/kg	90.5	55	119
EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	0.5 mg/kg	76.2	69	123
EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	0.5 mg/kg	87.9	70	120
EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	0.5 mg/kg	86.6	71	115
EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	0.5 mg/kg	96.5	68	114
EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	0.5 mg/kg	89.1	68	122
EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	0.5 mg/kg	97.6	69	115
EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	0.5 mg/kg	86.8	70	118
EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	0.5 mg/kg	91.6	68	116
EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	0.5 mg/kg	92.1	64	120
EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	0.5 mg/kg	93.9	68	116
EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	0.5 mg/kg	91.8	70	118
EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	0.5 mg/kg	93.1	67	123
EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	0.5 mg/kg	62.3	42	126
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3399562)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	4 mg/kg	91.0	80	124
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	4 mg/kg	92.9	77	123
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	4 mg/kg	89.9	79	123
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	4 mg/kg	93.0	77	123
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	4 mg/kg	92.2	79	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	4 mg/kg	90.3	79	123
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	4 mg/kg	93.2	79	123
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	4 mg/kg	93.9	79	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	4 mg/kg	86.8	73	121
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	4 mg/kg	91.0	81	123
EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	4 mg/kg	85.4	70	118
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4 mg/kg	97.3	77	123

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3399562) - continued								
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	4 mg/kg	83.3	76	122
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	4 mg/kg	82.6	71	113
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	4 mg/kg	80.9	71.7	113
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	4 mg/kg	82.8	72.4	114
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3399559)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	90.1	68.4	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3399561)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	96.0	71	131
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	300 mg/kg	104	74	138
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	105	64	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3399559)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	84.5	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3399561)								
EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	250 mg/kg	96.8	70	130
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	106	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----
		50	mg/kg	----	150 mg/kg	101	63	131
EP080: BTEXN (QCLot: 3399559)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	86.1	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	84.3	62	128
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	78.7	58	118
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	79.2	60	120
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	79.7	60	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	91.9	62	138

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP004: Organic Matter (QCLot: 3402744)							
ES1408817-001	Anonymous	EP004: Organic Matter	----	4.58 %	104	----	----
		EP004: Total Organic Carbon	----	2.66 %	103	----	----

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

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

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	*Spike Recovery (%)*		*Recovery Limits (%)*		*RPDs (%)*	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*MSD*	*Low*	*High*	*Value*	*Control Limit*
EP004: Organic Matter (QCLot: 3402744)										
ES1408817-001	Anonymous	EP004: Organic Matter	----	4.58 %	104	----	----	----	----	----
		EP004: Total Organic Carbon	----	2.66 %	103	----	----	----	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES1408818**	Page	: 1 of 8
Client	: ENVIRON AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: STEVE CADMAN	Contact	: Client Services
Address	: Eastpoint Complex | Suite 19B, Level 2 50 Glebe Road | PO Box 435 | The Junction NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
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Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: HYDRO BUFFER ZONE INVESTIGATION	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 20-MAR-2014
Sampler	: KW, SC	Issue Date	: 29-APR-2014
Order number	: AS130348		
		No. of samples received	: 4
Quote number	: SY/433/13	No. of samples analysed	: 4

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

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

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

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

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002 : pH (Soils)							
Soil Glass Jar - Unpreserved (EA002)							
P8 TP2 0.2-0.5	**19-MAR-2014**	**22-APR-2014**	26-MAR-2014	×	**25-MAR-2014**	22-APR-2014	✓
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103)							
P8 TP1 0.2-0.5, P8 TP2 0.2-0.5, P8 TP3 0.2-0.5, P8 TP5 0.1-0.3	**19-MAR-2014**	**----**	----	----	**25-MAR-2014**	02-APR-2014	✓
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples							
Snap Lock Bag (EA200)							
P8 TP1 0.2-0.5, P8 TP2 0.2-0.5, P8 TP3 0.2-0.5, P8 TP5 0.1-0.3	**19-MAR-2014**	**---**	15-SEP-2014	----	**23-APR-2014**	20-OCT-2014	✓
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008)							
P8 TP2 0.2-0.5	**19-MAR-2014**	**24-APR-2014**	16-APR-2014	×	**26-MAR-2014**	16-APR-2014	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
P8 TP1 0.2-0.5, P8 TP2 0.2-0.5, P8 TP3 0.2-0.5, P8 TP5 0.1-0.3	**19-MAR-2014**	**22-APR-2014**	15-SEP-2014	✓	**22-APR-2014**	15-SEP-2014	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
P8 TP1 0.2-0.5, P8 TP2 0.2-0.5, P8 TP3 0.2-0.5, P8 TP5 0.1-0.3	**19-MAR-2014**	**22-APR-2014**	16-APR-2014	×	**22-APR-2014**	16-APR-2014	×
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004)							
P8 TP2 0.2-0.5	**19-MAR-2014**	**23-APR-2014**	16-APR-2014	×	**28-MAR-2014**	16-APR-2014	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068)							
P8 TP1 0.2-0.5, P8 TP2 0.2-0.5, P8 TP3 0.2-0.5, P8 TP5 0.1-0.3	**19-MAR-2014**	**24-MAR-2014**	02-APR-2014	✓	**19-APR-2014**	03-MAY-2014	✓
EP068B: Organophosphorus Pesticides (OP)							
Soil Glass Jar - Unpreserved (EP068)							
P8 TP1 0.2-0.5, P8 TP2 0.2-0.5, P8 TP3 0.2-0.5, P8 TP5 0.1-0.3	**19-MAR-2014**	**24-MAR-2014**	02-APR-2014	✓	**19-APR-2014**	03-MAY-2014	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013							
Soil Glass Jar - Unpreserved (EP071)							
P8 TP1 0.2-0.5, P8 TP2 0.2-0.5, P8 TP3 0.2-0.5, P8 TP5 0.1-0.3	**19-MAR-2014**	**24-MAR-2014**	02-APR-2014	✓	**20-APR-2014**	03-MAY-2014	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
P8 TP1 0.2-0.5, P8 TP2 0.2-0.5, P8 TP3 0.2-0.5, P8 TP5 0.1-0.3	**19-MAR-2014**	**24-MAR-2014**	02-APR-2014	✓	**19-APR-2014**	03-MAY-2014	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
P8 TP1 0.2-0.5, P8 TP2 0.2-0.5, P8 TP3 0.2-0.5, P8 TP5 0.1-0.3	**19-MAR-2014**	**24-MAR-2014**	02-APR-2014	✓	**28-APR-2014**	02-APR-2014	×
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013							
Soil Glass Jar - Unpreserved (EP080)							
P8 TP1 0.2-0.5, P8 TP2 0.2-0.5, P8 TP3 0.2-0.5, P8 TP5 0.1-0.3	**19-MAR-2014**	**24-MAR-2014**	02-APR-2014	✓	**28-APR-2014**	02-APR-2014	×

Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Exchangeable Cations with pre-treatment	ED008	1	3	**33.3**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Organic Matter	EP004	1	3	**33.3**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
pH (1:5)	EA002	1	3	**33.3**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Exchangeable Cations with pre-treatment	ED008	1	3	**33.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Organic Matter	EP004	1	3	**33.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Exchangeable Cations with pre-treatment	ED008	1	3	**33.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Organic Matter	EP004	1	3	**33.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Organic Matter	EP004	1	3	**33.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	(APHA 21st ed., 4500H+) pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in bulk solids	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples
Exchangeable Cations with pre-treatment	ED008	SOIL	Rayment & Higginson (1992) Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (2013) Schedule B(3) (Method 301)
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Organic Matter	EP004	SOIL	AS1289.4.1.1 - 1997., Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM (2013) Schedule B(3)
Pesticides by GCMS	EP068	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)
TPH - Semivolatile Fraction	EP071	SOIL	(USEPA SW 846 - 8015A) Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM (2013) Schedule B(3) (Method 506.1)
PAH/Phenols (SIM)	EP075(SIM)	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TPH Volatiles/BTEX	EP080	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 501)

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	Rayment & Higginson (1992) method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of distilled water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.

Preparation Methods	Method	Matrix	Method Descriptions
Organic Matter	EP004-PR	SOIL	AS1289.4.1.1 - 1997., Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM (2013) Schedule B(3) (Method 105)
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids (Option A - Concentrating)	ORG17A	SOIL	In-house, Mechanical agitation (tumbler). 20g of sample, Na2SO4 and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Tumbler Extraction of Solids (Option B - Non-concentrating)	ORG17B	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 20mL 1:1 DCM/Acetone by end over end tumble. The solvent is transferred directly to a GC vial for analysis.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002 : pH (Soils)						
Soil Glass Jar - Unpreserved						
P8 TP2 0.2-0.5	22-APR-2014	26-MAR-2014	**27**	----	----	----
ED008: Exchangeable Cations						
Soil Glass Jar - Unpreserved						
P8 TP2 0.2-0.5	24-APR-2014	16-APR-2014	**8**	----	----	----
EG035T: Total Recoverable Mercury by FIMS						
Soil Glass Jar - Unpreserved						
P8 TP1 0.2-0.5, P8 TP2 0.2-0.5, P8 TP3 0.2-0.5, P8 TP5 0.1-0.3	22-APR-2014	16-APR-2014	**6**	22-APR-2014	16-APR-2014	**6**
EP004: Organic Matter						
Soil Glass Jar - Unpreserved						
P8 TP2 0.2-0.5	23-APR-2014	16-APR-2014	**7**	----	----	----
EP080/071: Total Petroleum Hydrocarbons						
Soil Glass Jar - Unpreserved						
P8 TP1 0.2-0.5, P8 TP2 0.2-0.5, P8 TP3 0.2-0.5, P8 TP5 0.1-0.3	----	----	----	28-APR-2014	02-APR-2014	**26**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013						
Soil Glass Jar - Unpreserved						
P8 TP1 0.2-0.5, P8 TP2 0.2-0.5, P8 TP3 0.2-0.5, P8 TP5 0.1-0.3	----	----	----	28-APR-2014	02-APR-2014	**26**

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EP080: BTEXN						
Soil Glass Jar - Unpreserved						
P8 TP1 0.2-0.5, P8 TP2 0.2-0.5, P8 TP3 0.2-0.5, P8 TP5 0.1-0.3	----	----	----	28-APR-2014	02-APR-2014	**26**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

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

Appendix F

QA/QC Assessment

APPENDIX F

DATA QUALITY OBJECTIVES

To ensure that reliable data of adequate type was collected and assessed for the investigation, the seven-step Data Quality Objective (DQO) approach, endorsed in the NSW DEC (2006) Guidelines for the NSW Site Auditor Scheme 2nd Edition, will be adopted. The DQOs set quality assurance and quality control parameters for the field and laboratory programs to ensure data of appropriate reliability will be used to assess the environmental conditions at Parcel 8.

ENVIRON has developed DQOs in accordance with the seven-step process, which is presented below.

Step 1 – State the Problem

Based on the information available from the Phase 1 ESA, uses of Parcel 8 appear to be limited to a hobby farm, which was demolished and this area then used as a dirt bike track. The remainder of Parcel 8 has not been developed and remains dense bushland. These uses of Parcel 8 require confirmation via a site walkover and judgemental sampling. In addition, the potential for fluoride in surface soils from dust deposition from the Hydro smelter requires assessment.

Step 2 – Identification of the Goals (Decisions) of the Study

The following decisions are to be made from this study:

- Are the current and former uses of Parcel 8 consistent with site observations?
- Has Parcel 8 been impacted by fluoride from dust deposition from the Hydro smelter?
- Has Parcel 8 been impacted by other contaminants from historical site use?
- Is Parcel 8 suitable for the purposes of environmental conservation (E2) landuse?

Step 3 – Identify Information Inputs to the Decision or Goal of the Study

The inputs required to make the above decisions are listed below:

- A site walkover, including collection of field notes and photographs;
- Results of surface soil samples collected for fluoride analysis;
- Results of other soil samples from fill/ hummocky ground collected for suitable analysis during the site walkover;

- Proposed land use;
- Appropriate NSW contamination guidelines.

Step 4 – Define the Study Boundaries

Spatial boundaries - the study boundaries have been defined as the spatial boundary of Parcel 8, as shown on Figure 1.

Vertical boundaries – as areas of concern at Parcel 8 are restricted to surface soils, the vertical boundary of the study is the top 200mm unless subsurface contamination issues are identified during the site walkover.

Temporal boundaries – the temporal boundary is limited to the data collected during the investigation works.

Constraints within the study boundaries – This investigation does not require investigation of subsurface soils or groundwater unless impacts to subsurface soils or groundwater are considered likely to have occurred from the historical site activities

Step 5 – Develop a Decision Rule

The decision rules for this investigation are as follows:

- If it is determined that the data generated through this investigation is reliable for use in producing a site conceptual model and assessing the suitability of Parcel 8 for environmental conservation (E2) landuse, then an assessment of the suitability of Parcel 8 for environmental conservation (E2) landuse will be made;
- If it is determined that the data generated through this investigation is not suitable, comprehensive or reliable for use in producing a site conceptual model, then further investigations may be recommended prior to the development of a site conceptual model and assessment of the suitability of Parcel 8 for environmental conservation (E2) landuse.

Step 6 – Specify Performance or Acceptance Criteria that the Data need to Achieve

Acceptable limits on decision errors have been developed based on the Data Quality Indicators (DQIs) of precision, accuracy, representativeness, comparability and completeness. The DQIs for this investigation are outlined below.

The potential for significant decision errors were minimized by:

- Completion of a QA/QC assessment of the investigation data to assess if the data satisfies the DQIs;
- Assessment of whether appropriate sampling and analytical densities were completed for the purpose of the investigation; and

- Ensuring that the criteria set for the investigation were appropriate for the proposed use of Parcel 8.

Minimization of the potential for significant decision errors limits the potential that a conclusive statement may be incorrect.

Step 7 – Optimisation of the Design of Collection of Data

The collection of data was optimized by the completion of a Phase 1 ESA, data gap review and development of a sampling design, which is included in Section 4.3. Attainment of the DQOs has been assessed by reference to the DQIs, presented below.

DATA QUALITY INDICATORS

The project Data Quality Indicators (DQIs) have been established to set acceptance limits on field and laboratory data collected as part of this investigation. Field and laboratory procedures acceptance limits are set at different levels for different projects and by different laboratories. Non-compliances with acceptance limits are to be documented and discussed in the report. The DQIs are presented in Table A.

Table A: Data Quality Indicators

DQI	Field	Laboratory	Acceptability Limits
Completeness	All critical locations sampled, including targeted sampling of areas of environmental concern identified during the site walkover. Fluoride soil sampling completed on a reduced density to identify if fluoride in surface soils is an issue. All samples collected Experienced sampler Documentation correct	All critical samples analysed and all analytes analysed according to Standard Operating Procedures (SOPs) Appropriate Practical Quantitation Limits (PQLs) Sample documentation complete Sample holding times for critical analysis were complied with	As per NEPM (2013)
Comparability	Experienced sampler In the event of multiple sampling events: Same types of samples collected Same sampling methodologies used Climatic conditions	Same analytical methods used Same PQLs Same units Same primary and secondary laboratories	As per NEPM (2013)
Representativeness	Appropriate media sampled Relevant media sampled	All samples analysed according to SOPs	

Precision	Collection of duplicate samples Sampling methodologies appropriate and complied with	Analysis of: Blind duplicate samples at rate of 1 in 10 samples Split duplicate samples at rate of 1 in 20 samples Laboratory duplicate samples	 RPD of 30 to 50% RPD of 30 to 50% RPD of 30 to 50%
Accuracy	Sampling methodologies appropriate and complied with.	Analysis of: Method blanks Matrix spikes Surrogate spikes Laboratory control samples Reagent blanks Reference material	 Non-detect 70 to 130% 70-130% 70 to 130%

QUALITY ASSURANCE AND QUALITY CONTROL

A quality assurance assessment for this report is presented in Table B and C below. An assessment was made of data completeness, comparability, representativeness, precision and accuracy based on field and laboratory considerations, as outlined in NSW DEC (2006) and NSW EPA (2007) guidelines.

Table B: QA/QC – Sampling and Analysis Methodology Assessment

Sampling Methodology	Methodology
Sampling Pattern and Locations	Surface soil sampling was undertaken around the edges of Parcel 8 to assess the impact of particulate fallout from Hydro Aluminium Smelter. The centre of Parcel 8 was not accessible for sampling due to dense bushland. Soil samples were also collected from soil stockpiles on a targeted basis.
Sampling Density	Five soil samples were collected from around the edges of Parcel 8 which is approximately 54 ha. The purpose of the sampling was to assess for impacts from smelter particulate fallout and therefore is considered suitable in density and spatial layout. It is noted that sample locations are near to access roads due to dense bush on the property. These sampling location, are considered to provide a reasonable assessment of the site despite being on the periphery due to their location adjacent to the track and potential for greater levels of fallout due to the absence of a tree canopy. One soil sample was collected per targeted stockpile. The stockpiles ranged in size from $10m^3$ to $70m^3$.
Sample depths	Surface soil samples were collected from a grid across the entire of Parcel 8 from surface soils. Soil samples from the stockpile were collected from 0.05m to 0.1m from within the stockpile.
Sample Collection Method	Surface soil samples across Parcel 8 were collected directly from the ground surface using using dedicated disposable gloves and a hand trowel. The hand trowel was brushed clean

Table B: QA/QC – Sampling and Analysis Methodology Assessment	
Sampling Methodology	**Methodology**
	prior to sample collection. Soil samples were collected into laboratory supplied, acid rinsed glass jars.
Decontamination Procedures	Surface soil samples across Parcel 8 were collected directly from the ground surface using using dedicated disposable gloves and a hand trowel. The hand trowel was generally used to loosen the soil prior to sample collection and was brushed clean between sample locations.
Sample handling and containers	All soil samples were placed into laboratory-supplied glass jars. Soil and water samples were placed on ice following collection and during transportation to the laboratory.
Chain of Custody	Samples were transported to the laboratory under chain of custody conditions. The chain of custody forms were signed by the laboratory on receipt of the samples.
Detailed description of field screening protocols	Field screening for volatiles was not completed during soil sampling as volatile contaminants were not the main chemical of concern.
Calibration of field equipment	No field equipment requiring calibration was used.
Sampling Logs	The lithology of surface soil samples was documented on the field information sheets, which are included in Appendix C.

Table C: QA/QC – Field and Lab Quality Assurance and Quality Control	
Field and Lab QA/QC	**ENVIRON Comments**
Field quality control samples	Intra-laboratory duplicate soil samples were analysed at a ratio of 1:6 for TPH, BTEX and PAHs analysed for the grid samples across the entire of Parcel 8. No rinsate blank samples were collected.
Field quality control results	Intra-laboratory duplicate results are presented in Table C. There were no RPD exceedences for the intra-laboratory duplicates collected for this assessment.
NATA registered laboratory and NATA endorsed methods	ALS was used as the primary laboratory. ALS laboratory certificates are NATA stamped and the lab is accredited for the analyses performed for this assessment.
Analytical methods	A summary of analytical methods were included in the laboratory test certificates.
Holding times	Review of the COCs and laboratory certificates indicate that holding times were met.
Practical Quantitation Limits (PQLs)	PQLs for all soil analytes were below Parcel 8 assessment criteria.
Laboratory quality control	Laboratory quality control samples including duplicates, laboratory control samples, matrix spikes, surrogate spikes and

Table C: QA/QC – Field and Lab Quality Assurance and Quality Control	
Field and Lab QA/QC	**ENVIRON Comments**
samples	blanks were undertaken by the laboratories at appropriate frequencies.
Laboratory quality control results	All results for laboratory soil duplicates, laboratory control samples, matrix spikes and surrogates were acceptable and no detections were made in blank samples.

Overall it is considered that the completed investigation works and the data obtained adequately complied with the requirements of NSW DEC (2006) and NSW EPA (2007) guidelines and that the data is of suitable quality to meet the project objectives.