

WILPINJONG COAL PROJECT

APPENDIX O

Land Contamination Assessment



Australasian Groundwater & Environmental



REPORT on



WILPINJONG COAL PROJECT

LAND CONTAMINATION ASSESSMENT



prepared for
WILPINJONG COAL PTY LIMITED



Project Number G1245
April 2005



ABN:64 080 238 642

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EXECUTIVE SUMMARY

The proposed Wilpinjong Coal Project (the Project) is situated approximately 40 kilometres (km) north-east of Mudgee in central New South Wales. The area is currently cleared and predominantly grazed by cattle and sheep. It is proposed that an open cut mine would be constructed at the site to produce coal for domestic electricity generation and export markets.

Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) was commissioned by Wilpinjong Coal Pty Limited to undertake a land contamination assessment, Stage 1 – Preliminary Investigation, on the Project Development Application area (the study area) prior to the change in landuse.

The objectives of the Stage 1 Preliminary Investigation were to identify any past or present potentially contaminating activities, provide a preliminary assessment of any site contamination and, if required, provide a basis for a more detailed investigation. To achieve these objectives, the scope of work for the Preliminary Investigation included:

- consultation with previous landowners to determine the history of the site;
- consultation with the Mid-Western Regional Council;
- conducting an inspection of the site to identify potentially contaminating activities;
- collection of soil samples from potentially contaminated areas for laboratory analysis;
- interpretation of chemical data; and
- formulation of future management recommendations for contaminated areas.

The upland areas at the site are not inhabited and only used for grazing and no significant contamination is considered likely in these areas of the study area. The land contamination assessment therefore focussed on the lowland areas which have predominantly been used for sheep grazing since the area began to be opened up in the late 1800s. No intensive agricultural activities that require large inputs of chemicals were undertaken within the study area.

Areas inspected included dwellings, three sheep dips, workshops, fuel and chemical storage areas, machinery sheds and fertiliser storage areas. Soil samples were collected from three selected locations within the study area, namely, two of the disused sheep dips and one former fertiliser storage area. The two sampled sheep dips have been filled with general waste and soil to ground level. Soil samples were collected with a hand auger and analysed for Organochlorine and Organophosphorus (OC/OP) pesticides and metals. The laboratory analyses indicated the concentrations of metals including arsenic were within background levels and pesticides were not detected. The presence of shallow bedrock at the site restricted the depth of investigation to a maximum of 0.5 m below ground level.

Only relatively small amounts of diesel fuel and oils were stored on the properties within the study and only minor surface staining was noted at several sites. No evidence of illegal dumping was evident during the site inspection or in recent aerial photographs.

The soil sampling undertaken during the Preliminary Investigation did not detect the presence of contaminated soils within the study area. On the basis of these findings, the study area is considered suitable for the landuse change from agriculture to the development of the Wilpinjong Coal Project. However, it is recommended that during the construction stage when earthmoving equipment is available on-site that a Stage 2 investigation be undertaken at the three sheep dips. As part of this investigation the general waste should be removed from the dips and additional soil samples be collected. If contaminated soils are detected, appropriate management measures for the soils should be developed, which may include disposal with Coal Handling and Preparation Plant (CHPP) tailings.

The visual inspection indicated that the volume of soil contaminated by fuel and oil storages within the study area is very low. However, if during topsoil stripping, hydrocarbon contaminated soils become evident, it is recommended that they be relocated to a suitable location within the study area for bioremediation or disposal with CHPP tailings if bioremediation is not feasible.

O1 INTRODUCTION

The proposed Wilpinjong Coal Project (herein referred to as the Project) is situated approximately 40 kilometres (km) north-east of Mudgee in central New South Wales (NSW) (Figure O-1). The area is currently cleared and predominantly grazed by cattle and sheep. It is proposed that an open cut mine would be constructed at the site to produce coal for domestic electricity generation and export markets.

The Project Development Application (DA) area is shown on Figure O-2.

Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) was commissioned by Wilpinjong Coal Pty Limited to undertake a land contamination assessment, Stage 1 – Preliminary Investigation on the Project DA area prior to the change in landuse.

O1.1 OBJECTIVES AND SCOPE OF WORK

The objectives of the Stage 1 – Preliminary Investigation were to identify any past or present potentially contaminating activities, provide a preliminary assessment of any site contamination and, if required, provide a basis for a more detailed investigation. To achieve these objectives, the scope of work for the Preliminary Investigation included:

- consultation with previous landowners to determine the history of the site;
- consultation with the Mid-western Regional Council;
- conducting an inspection of the site to identify potentially contaminating activities;
- collection of soil samples from potentially contaminated areas for laboratory analysis;
- interpretation of chemical data; and
- formulation of future management recommendations for contaminated areas.

The Preliminary investigation was undertaken in accordance with guidance in:

- Department of Urban Affairs and Planning/Environmental Protection Authority (EPA) (1998) – *Managing Land Contamination, Planning Guidelines, SEPP 55 – Remediation of Land*.
- EPA (1997) – *Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Sites*.

O2 SITE IDENTIFICATION

In accordance with SEPP 55, the study area for the land contamination assessment was the Project DA area (Figure O-2). The study area is situated wholly within the former Mudgee local government area (LGA) (now part of the Mid-western Regional LGA) and on land classified as Zone 1(a) (General Rural) by the *Mudgee Local Environmental Plan 1998* under the *Environmental Planning and Assessment Act, 1979*. Further detail on the zoning of the study area is provided in Section 1 of the Project Environmental Impact Statement (EIS). The Project DA includes a list of the portions of land (including the lot and deposited plan numbers) located within the Project DA area.

The study area is located within the valleys of Wilpinjong and Cumbo Creeks (Figure O-2). The northern boundary of the study area adjoins the southern escarpments of the Goulburn River National Park, whereas elevated uplands of the Munghorn Gap Nature Reserve and a section of Wollar Road adjoin the southern study area boundary (Figure O-2). The Gulgong-Sandy Hollow railway line and the Ulan-Wollar Road cross the northern part of the study area to the south of Wilpinjong Creek (Figure O-2).

The majority of land within the study area is cleared and predominantly grazed by cattle and sheep with limited cropping. Undisturbed natural vegetation is restricted to the steep hills and sandstone ranges along the study area boundary.

All land within the study area, other than Crown land, road reserves and rail reserves is owned by Cumbo Land Pty Limited, a wholly owned subsidiary of Excel Coal Limited.

O3 SITE HISTORY

The history of the site was developed from consultation with former property owners, the Mid-western Regional Council records and review of historical reports. The consultation undertaken is outlined in Section O3.1 and a summary of the site history is provided in Section O3.2.

O3.1 SITE HISTORY CONSULTATION

To establish the site history, consultation was undertaken with:

- *Mr Lloyd Coleman* – Mr Coleman was a resident of the area and the former owner of the property *Keylah* from the mid-1960s.
- *Mr Richard Webb* – Mr Webb was, until recently, the owner of the property *Cumbo Creek*, one of the largest properties in the study area. Mr Webb currently resides in Gloucester, NSW.
- *Mr Kevin Dorahy* – Former owner of the property *Pine Park* and currently resides at that property.
- *Ms Daphne Power* – The Power family was a pioneering family in the district. They were the previous owners of the property *Spring Flat*, which is currently untenanted.
- *Mr Richard and Mrs Sally Nagel* – former owners of the property *Wyangle* and currently reside at that property.
- *Messrs Eric and Jack Robinson* – owners of the property *Castlevue*, which is adjacent to the study area, and were former owners of part of the study area.
- *Ms Catherine Van Laeren* – Senior Planner with the Mid-western Regional Council.

Several other former property owners could not be contacted during the on-site visit.

O3.2 SITE HISTORY SUMMARY

The following site history summary is based on all of the information collected during consultation, although largely on information supplied by Mr Lloyd Coleman. Land in the area was cleared during the late 1800s and early 1900s and primarily used for grazing sheep and cattle. Sheep grazing dominated with some dairy cattle run on the more productive alluvial areas around the creeks in the 1950s.

Small areas of land around the creeks were planted with lucerne and other stock feeds, however as bedrock is relatively shallow or, in some areas outcrops at the surface, establishment of crops was difficult on the poor soils. Some wheat was grown sparingly throughout the valley at times of high wheat prices or low cattle/wool prices. At no time did the area support intensive irrigation or market gardens.

In the 1970s a recession in the wool market resulted in a gradual change to cattle grazing and some of the properties were subdivided into smaller allotments (eg. *Keylah* and *Bungulla*). No cattle dips were reported to have been constructed in the area.

The Mid-western Regional Council advised that they hold no records or reports of environmental incidents associated with any of the properties within the study area. However, the council also advised that there may have been illegal dumping incidents within the study area of which they were unaware.

O4 SITE CONDITION AND SURROUNDING ENVIRONMENT

Further to the site description provided below, a detailed description of the existing environment is provided in Section 3 of the Project EIS.

O4.1 TOPOGRAPHY AND DRAINAGE

Topographically the study area, and its immediate environs, can be divided into two terrain types:

- *Rugged upland areas* bordering the study area to the north and south. These areas consist of ridges, valleys and dissected plateau remnants rising rapidly some 100 m to 150 m above the valley floor. These areas have generally not been cleared and are mostly densely vegetated with eucalypt woodlands. This terrain type is predominantly within the Goulburn River National Park in the north, and within the Munghorn Gap Nature Reserve in the south.
- *Undulating lowlands* consisting of broad valleys of Wilpinjong, Cumbo, Bens, Narrow, Spring and Planters Creeks. These valleys have predominantly been cleared for cattle and sheep grazing with scattered trees and small remnants remaining. This terrain type is predominant within the study area.

O4.2 CURRENT LANDUSE

The study area is sparsely populated with some 6 inhabited dwellings. The majority of land within the study area is freehold agricultural land used for grazing, cropping and small farming (Attachment OA, Photograph A).

O5 GEOLOGY AND HYDROGEOLOGY

Appendix B of the EIS includes a hydrogeological assessment. Test bores were drilled, pumping tests undertaken and the data interpreted to provide hydraulic parameters. A groundwater study for the dryland salinity investigation within the Wollar Creek catchment was conducted by DIPNR (DIPNR, 2003). The DIPNR (2003) study described the geology and hydrogeology of the Wollar Creek catchment area. Based on this work, five aquifer types have been identified in the study area, including:

- alluvial and colluvial deposits;
- sandstones and siltstones of Narrabeen Group;
- Illawarra Coal Measures overlying the Ulan Seam;
- Ulan Seam; and
- Marrangaroo Sandstone.

Appendix B of the Project EIS provides further detail on the hydrogeology of the study area. Local geology is also described in Appendix B and Section 3 of the EIS and includes the following:

- Rhyolite Volcanics;
- Shoalhaven Group;
- Illawarra Coal Measures;
- Narrabeen Group;
- Mesozoic Igneous Rocks;
- Tertiary Basalts; and
- Quaternary Alluvium.

O6 SITE INSPECTION

An inspection of the study area was undertaken between 2 and 4 March 2005. The purpose of the site inspection was to confirm the study area history details and to identify possible sources of contamination. The visit included inspection of the dwellings, machinery sheds, storage sheds, workshops, disused dips and areas of current or former agricultural use. Photographs taken during the site inspection are provided in Attachment OA and their locations provided on Figure O-2.

The potentially contaminated areas identified and inspected during the site inspection are summarised in Table O-1 and discussed in Sections, O6.1 to O6.5.

Table O-1
Potentially Contaminated Areas within the Study Area

Features of Area	Potential Contaminants
Sheep dips	Arsenic and pesticides
Workshops, fuel and chemical storage	Hydrocarbons, lead, herbicides and pesticides
Machinery sheds	Hydrocarbons, metals
Fertiliser storage areas	Metals, herbicides and pesticides

O6.1 DWELLINGS

Dwellings within the study area are shown on Figure O-3. Most of the dwellings within the study area are vacant with only *Wyangle*, *Pine Park* and *Mittaville* (north and south) currently occupied. A transportable site office has been established by Wilpinjong Coal Pty Limited at *Cumbo Creek*. All dwellings within the study area, occupied and unoccupied, used or use septic sewage disposal systems for waste water. No waste disposal pits were recorded in the vicinity of the dwellings.

O6.2 SHEEP DIPS

As land was predominantly used for sheep grazing, there are several sheep dips present within the study area that were used until about the mid 1970s (pers. comm., Lloyd Coleman and Kevin Dorahy). Sheep dipping was replaced in the mid 1970s by pour on sheep drenches which are generally regarded as easier to use, more effective and more environmentally 'friendly' (refer Attachment OA, Photograph B).

The three disused sheep dips are located at the woolsheds of the *Pine Park*, *Wyangle* and *Hillview* properties. The locations of the sheep dips are shown in Figure O-2. The sheep dips are constructed from concrete and are now abandoned and, possibly collapsed. Some of the sheep dips have been used for general waste disposal and are now filled to ground level and are barely evident (refer Attachment OA, Photographs C and D).

O6.3 WORKSHOPS, FUEL AND CHEMICAL STORAGE AREAS

Only three properties inspected had functioning workshops with associated fuel and chemical storage areas. These were *Wyangle*, *Pine Park* and *Spring Flat* and are discussed below.

O6.3.1 Wyangle

A diesel generator is present at *Wyangle* which is located on rubber mat flooring about 10 mm thick. Minor oil staining was observed however there was no evidence of major seepage beneath the floor mat. The diesel storage tanks that supplied the generator were in good order and only a small area of surface oil staining was evident that did not appear to extend beyond 50 mm below the surface.

O6.3.2 Pine Park

A small pit for changing oil that has been excavated into silty sandstone is present at *Pine Park*. There was only minor evidence of oil staining in the pit (refer Attachment OA, Photograph E). At the time of the site inspection the oil changing pit was full of water from storm rain two days prior. The accumulation rather than infiltration of water from the pit indicates the low permeability nature of the silty sandstone.

Only small amounts of potentially contaminating chemicals were noted in the *Pine Park* workshops. These chemicals typically consisted of disinfectants, sheep drench, solvents and paint. Generally these chemicals are present in the manufacturer's containers in volumes of 20 L or less and there was no evidence of major spillage or leakage noted during the site inspection.

O6.3.3 Spring Flat

A small diesel generator is present at *Spring Flat* with minor oil staining observed on the concrete floor (refer Attachment OA, Photograph F).

Bags of fertiliser were noted at *Spring Flat*. The fertiliser bags were stored under cover and were intact.

O6.3.4 Other Properties

There is some evidence of former fuel and chemical storage areas on other properties within the study area. Most of the properties have empty above ground fuel storage tanks remaining. The ground beneath these tanks was inspected and no significant fuel or oil staining was noted.

O6.4 MACHINERY SHEDS

As the majority of the properties are managed by absentee landlords, the machinery sheds are often the only regularly used infrastructure on the property. They generally have compacted earth floors and contain tractors, light vehicles and occasionally combine harvesters or hay balers. In some cases (such as at *Keylah* and *Bungulla*) the machinery sheds have not been used for several years and are totally abandoned.

There was no visual evidence of significant oil or chemical spills in any of the machinery sheds inspected during the site visit.

O6.5 FERTILISER STORAGE AREAS

In the 1970s and 1980s two bush airstrips were used for the aerial spreading of superphosphate. These airstrips were located on *Castle View* and *Cumbo Creek*. Superphosphate was stored on-site and picked up by aircraft for subsequent spreading. There is no longer any evidence of the airstrip on *Castle View*. The airstrip on *Cumbo Creek* is still visible (refer Attachment OA, Photograph G).

O7 SOIL SAMPLING

O7.1 SAMPLING PROCEDURE

Soil samples were collected from three selected locations within the study area using a hand auger. A clean steel auger was used, with samples being transferred from the auger directly to 250 mL glass containers with Teflon lids and stored with ice bricks after collection until delivery at the laboratory.

Hand augered boreholes were drilled in the following locations:

- At the exit point of the sheep dip at *Pine Park* – sample WC1A and WC1B.
- At the exit point of the sheep dip at *Wyangle* – sample WC2A and WC2B.
- At the former fertiliser storage area at *Cumby Creek* airstrip – samples WC3A and WC3B.

The locations of the boreholes are shown on Figure O-2. Borehole logs showing the depth of the soil samples collected are provided in Attachment OB.

O7.2 SAMPLE ANALYSIS

All samples were sent to SGS laboratories in Cairns for analysis of:

- Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc).
- Organochlorine and Organophosphorus Pesticides (OC/OP).

The SGS laboratory has NATA accreditation for all the analyses performed.

All samples were collected in 250 mL glass containers with Teflon lids and stored with ice bricks after collection until delivery at the laboratory.

O7.3 SAMPLE REGISTER

A register for each sample specifying the date, time, collection location, matrix, identification, preservation and analysis suite is included in Table O-2.

Table O-2
Sample Register

Sample ID	Date	Time	Location (AGD84 Co-ordinates)	Matrix	Preservation	Analysis Suite
WC1A ¹	4 March 05	0800	772747E, 6416709N	Solid	Ice bricks	OC/OP, metals
WC1B ²	4 March 05	0810	772747E, 6416709N	Solid	Ice bricks	OC/OP, metals
WC2A ³	4 March 05	1430	768146E, 6418409N	Solid	Ice bricks	OC/OP, metals
WC2B ⁴	4 March 05	1440	768146E, 6418409N	Solid	Ice bricks	OC/OP, metals
WC3A ⁵	5 March 05	0700	771775E, 6418179E	Solid	Ice bricks	OC/OP, metals
WC3B ⁶	5 March 05	0710	771775E, 6418179E	Solid	Ice bricks	OC/OP, metals

¹ WC1A: Sheep dip at *Pine Park*, depth of sample 0.1 m

² WC1B: Sheep dip at *Pine Park*, depth of sample 0.3 m

³ WC2A: Sheep dip at *Wyangle*, depth of sample 0.1 m

⁴ WC2B: Sheep dip at *Wyangle*, depth of sample 0.5 m

⁵ WC3A: Airstrip superphosphate dump on *Cumby Creek*, depth of sample 0.1 m

⁶ WC3B: Duplicate of WC3A, depth of sample 0.1 m

O8 RESULTS

O8.1 SOIL TYPES

The hand augered boreholes typically encountered only a very thin layer of soil over bedrock. A thin cover (0.1-0.25 m) of brown organic topsoil was typically present, overlying a subsoil of gravely silt and sand with sandstone gravels. Silty sandstone bedrock was present below the subsoil at depths of between 0.1 m and 0.35 m below ground level. The hand augered holes were terminated when the hard rock was encountered. No groundwater was encountered in any of the boreholes. No odours or staining indicative of chemical contamination were noted in the cuttings. The borehole logs are included in Attachment OB.

O8.2 LABORATORY TESTING

The results of the chemical analyses are provided in full in Attachment OC. The results of the analyses are summarised in Tables O-3 and O-4 below.

Table O-3
Laboratory Analyses – Metals in Soil (mg/kg)

Parameter	WC1A	WC1B	WC2A	WC2B	WC3A	WC3B	HIL ¹	EIL ²
Date	4 Mar 05	4 Mar 05	4 Mar 05	4 Mar 05	5 Mar 05	5 Mar 05	-	-
Depth	0.1 m	0.3 m	0.1 m	0.5 m	0.1 m	0.1 m	-	-
Arsenic	17	<5	<5	7	<5	<5	100	20
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	20	3
Chromium	6	4	9	4	11	12	-	400
Copper	7	6	12	10	13	16	1000	100
Lead	9	6	12	11	18	18	300	600
Nickel	<3	<3	11	6	18	21	600	60
Zinc	26	4	140	22	43	47	7000	200
Mercury	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	15	1

¹ HIL - Health Based Investigation Level A (NEPM, 1999).

² EIL - Interim Urban Levels (NEPM, 1999).

The concentrations of the eight metals in the soil samples analysed were relatively low and within expected background levels. The concentrations of metals were also below the Health Based Investigation Levels for residential landuse and the Ecological Investigation Levels (NEPM, 1999).

The duplicate analysis (WC3B) indicates a Relative Percentage Difference (RPD) of less than 10% for the metals analyses indicating acceptable precision in the sampling and analysis methodologies.

Table O-4
Laboratory Analyses – Pesticides in Soil (mg/kg)

Parameter	WC1A	WC1B	WC2A	WC2B	WC3A	WC3B	HIL ¹	EIL ²
Date	4 Mar 05	4 Mar 05	4 Mar 05	4 Mar 05	5 Mar 05	5 Mar 05	-	-
Depth	0.1 m	0.3 m	0.1 m	0.5 m	0.1 m	0.1 m	-	-
Aldrin + Dieldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10	-
Chlordane	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	50	-
DDT + DDD + DDE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	200	-
Heptachlor	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10	-

¹ HIL - Health Based Investigation Level A (NEPM, 1999).

² EIL - Interim Urban Levels (NEPM, 1999).

The concentrations of selected OC/OP pesticides were all below the level of detection (0.1 mg/kg). Concentrations of selected pesticides (Aldrin+dielldrin, chlordane, DDT+DDD+DDE, heptachlor) were all below the HIL (A) for standard residential landuse.

The duplicate analysis (WC3B) indicates a Relative Percentage Difference (RPD) of 0% for the pesticides analyses indicating acceptable precision in the sampling and analysis methodologies.

09 DISCUSSION AND CONCLUSIONS

The upland areas within the study area are not inhabited and only used for grazing. As such, no significant contamination is considered likely in these areas and the contaminated land investigation focussed on the lowland areas which have predominantly been used for sheep grazing since the area began to be opened up in the late 1800s. No historical or present intensive agricultural activities that require large inputs of chemicals have been undertaken within the study area.

Three concrete lined sheep dips were identified during the site inspections that have not been used since the 1970s. The sheep dips have been filled with general waste and soil to ground level. A disused airstrip superphosphate dump was also identified within the study area. Soil samples were collected from the exit points of two of the dips and the superphosphate dump with a hand auger and analysed for OC/OP pesticides and metals. The laboratory analyses indicated the concentrations of metals including arsenic were within background levels and pesticides were not detected. The presence of shallow bedrock at the site restricted the depth of investigation to a maximum 0.5 m below ground level.

Only relatively small limited amounts of diesel fuel and oils were stored on the properties and only minor surface staining was noted at several sites. No evidence of illegal dumping was evident during the site inspection or in recent aerial photographs.

On the basis of these findings, the study area is considered suitable for the landuse change from agriculture to the development of the Wilpinjong Coal Project.

010 RECOMMENDATIONS

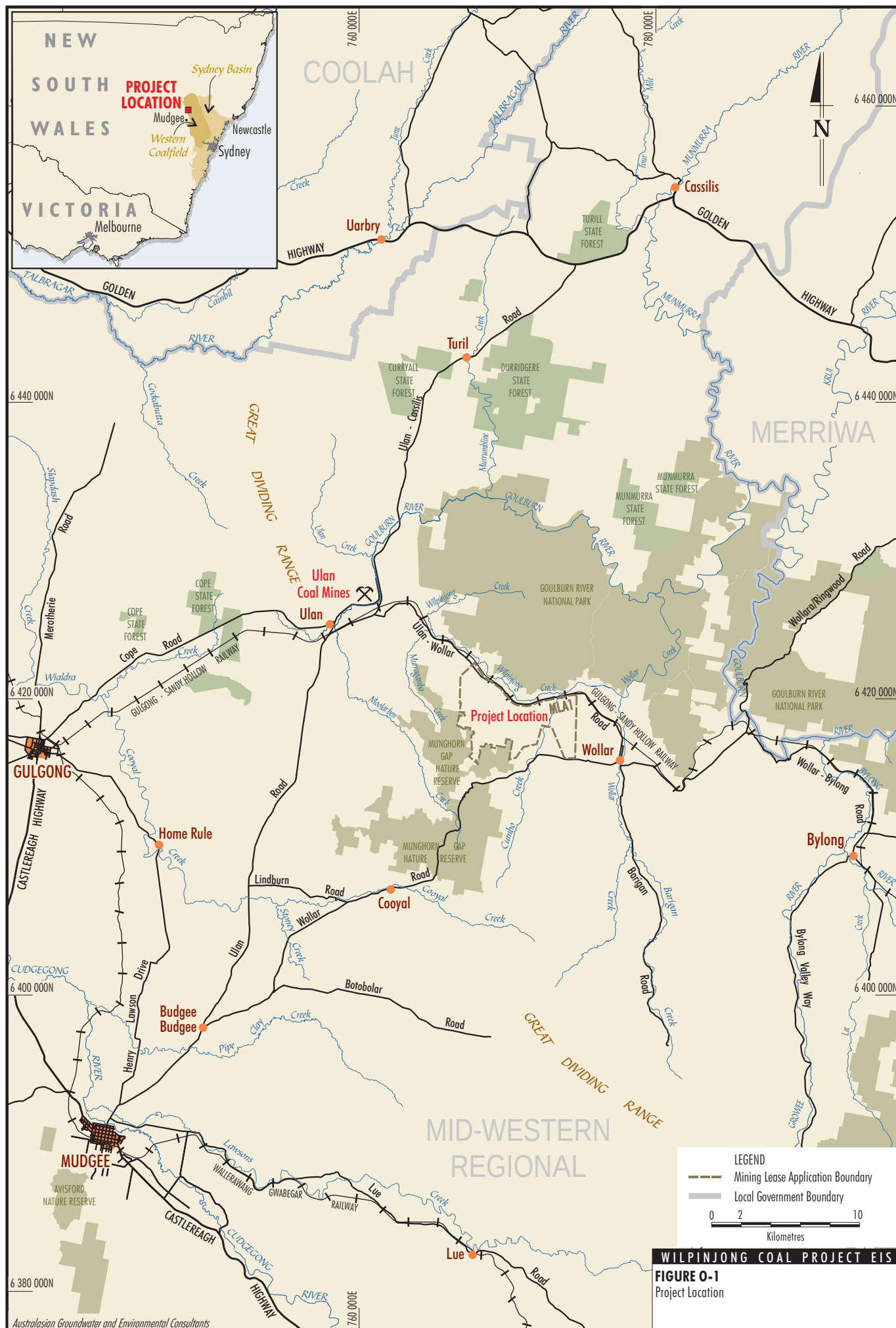
The soil sampling undertaken during the preliminary investigation did not detect the presence of contaminated soils within the study area. However, it is recommended that during the construction stage when earthmoving equipment is available on-site that a Stage 2 investigation be undertaken at the *Pine Park*, *Wyangle* and *Hillview* sheep dips. As part of this investigation the general waste should be removed from the dips and additional soil samples be collected. If contaminated soils are detected, appropriate management measures for the soils should be developed, which may include disposal with Coal Handling and Preparation Plant (CHPP) tailings

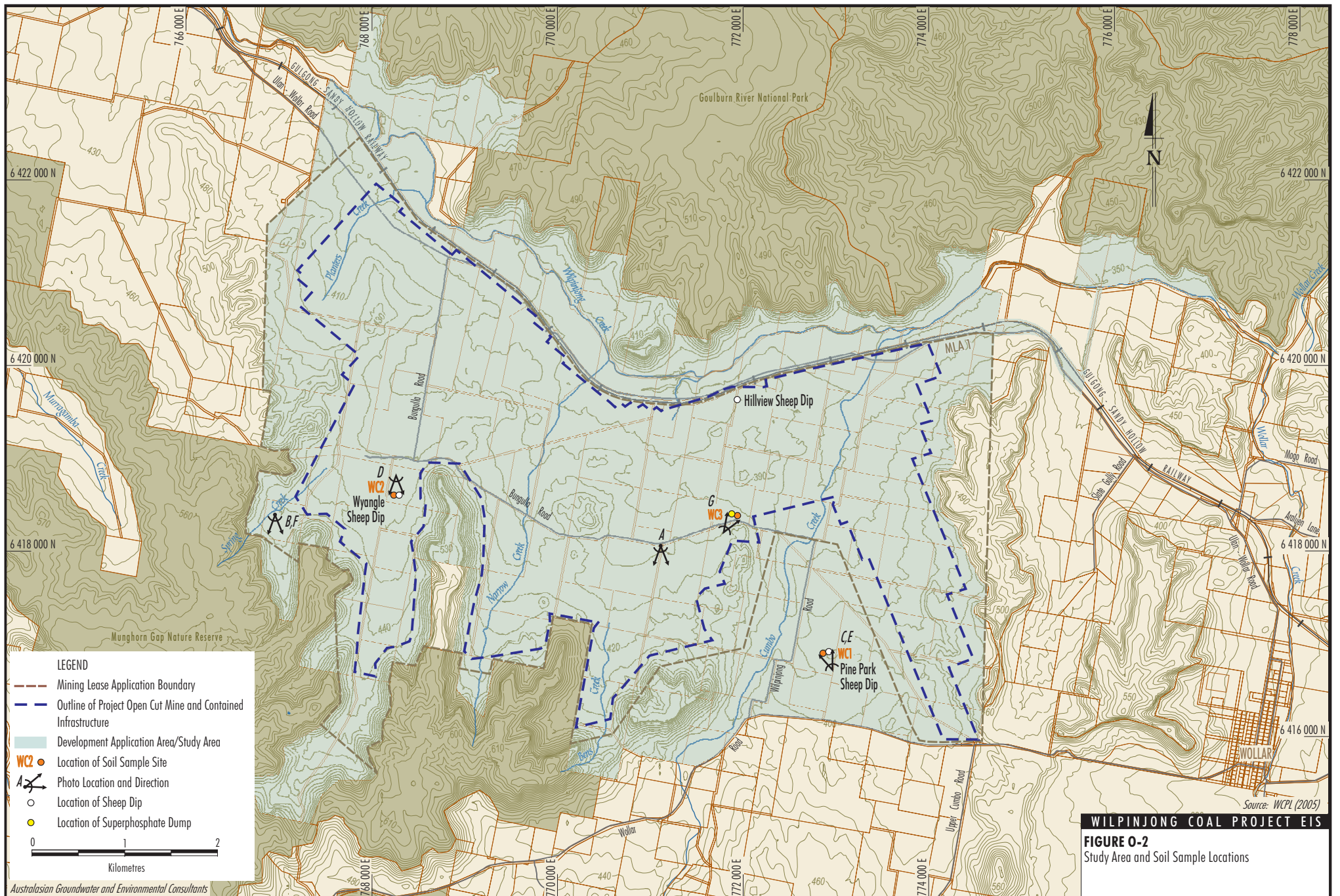
The visual inspection indicated that the volume of soil contaminated by fuel and oil storages within the study area is very low. However, if during topsoil stripping, hydrocarbon contaminated soils become evident, it is recommended that they be relocated to a suitable location within the study area for bioremediation or disposal with CHPP tailings if bioremediation is not feasible.

011 REFERENCES

- Department of Infrastructure, Planning and Natural Resources (DIPNR) (2003) *Greater Wollar Creek Catchment – Dryland Salinity Groundwater Investigation*. NSW, Hunter Region Report No. R3081.
- Department of Urban Affairs and Planning/Environmental Protection Authority (EPA) (1998) *Managing Land Contamination, Planning Guidelines, SEPP 55*.
- Environmental Protection Authority (EPA) (1997) *Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Sites*.
- National Environment Protection Council (NEPM) (1999) *National Environment Protection (Assessment of Site Contamination) Measure 1999. Schedule B (1) Guideline on the Investigation Levels for Soil and Groundwater*.

FIGURES







ATTACHMENT OA

PHOTOGRAPHS



Photograph A: Typical current land use in the study area (Munghorn Gap Nature Reserve is in the background).



Photograph B: Portable sheep drench at Spring Flat.



Photograph C: Disused sheep dip at Pine Park.



Photograph D: Disused sheep dip at Wyangle (outlined in yellow), dip exit and drainage slab in background.



Photograph E: Oil change pit at Pine Park, note presence of fractured rock at surface.



Photograph F: Diesel power generator at Spring Flat, with oil staining on ground.



Photograph G: Former superphosphate storage area at head of airstrip (looking northeast).

ATTACHMENT OB

BOREHOLE LOGS



**Australasian Groundwater & Environmental
Consultants Pty Ltd**

36 Jeays St, Bowen Hills, Queensland 4006

BOREHOLE LOG

BOREHOLE ID: **WC1**

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PROJECT NO. G1293	OPERATOR: Rob Lait	DATUM: AGD84
PROJECT NAME: Wilpinjong Coal	METHOD: Hand Auger	GROUND LEVEL: -
DATE: 4 March 05	MACHINE: N/A	TOP OF CASING LEVEL: N/A
CONTRACTOR: N/A	COORDINATES: 772784mE, 6416709mN	LOGGED BY: RWL

Elevation Depth		Graphic	Lithologic Description	SWL	Sample Depth and ID	Sample Analysis
0.0	0.0		SILTY SAND: brown, fine grained,vegetation material throughout			
0.1	-0.1				Sample ID WC1A	Metals and OC/OP
0.2	-0.2		GRAVELLY SAND: buff, organic, fine to coarse grained gravel - mainly sandstone fragments			
0.3	-0.3				Sample ID WC1B	Metals and OC/OP
0.4	-0.4		SILTY SANDSTONE: buff, hard, silaceous, fractured into slabs			
0.5	-0.5					
0.6	-0.6					
0.7	-0.7					
0.8	-0.8					
0.9	-0.9					



**Australasian Groundwater & Environmental
Consultants Pty Ltd**

36 Jeays St, Bowen Hills, Queensland 4006

BOREHOLE LOG

BOREHOLE ID: **WC2**

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PROJECT NO. G1293	OPERATOR: Rob Lait	DATUM: AGD84
PROJECT NAME: Wilpinjong Coal	METHOD: Hand Auger	GROUND LEVEL: -
DATE: 4 March 05	MACHINE: N/A	TOP OF CASING LEVEL: N/A
CONTRACTOR: N/A	COORDINATES: 768146mE, 6418409mN	LOGGED BY: RWL

Elevation Depth		Graphic	Lithologic Description	SWL	Sample Depth and ID	Sample Analysis
0.0	0.0		SILT: dark brown, organic, vegetation material throughout			
0.1	-0.1				Sample ID WC2A	Metals and OC/OP
0.2	-0.2		GRAVELLY SILT: brown to buff, gravel is fine grained siliceous sandstone			
0.3	-0.3					
0.4	-0.4					
0.5	-0.5				Sample ID WC2B	Metals and OC/OP
0.6	-0.6					
0.7	-0.7					
0.8	-0.8					
0.9	-0.9					



**Australasian Groundwater & Environmental
Consultants Pty Ltd**

36 Jeays St, Bowen Hills, Queensland 4006

BOREHOLE LOG

BOREHOLE ID: **WC3**

Page 1 of 1

PROJECT NO. G1293	OPERATOR: Rob Lait	DATUM: AGD84
PROJECT NAME: Wilpinjong Coal	METHOD: Hand Auger	GROUND LEVEL: -
DATE: 5 March 2005	MACHINE: N/A	TOP OF CASING LEVEL: N/A
CONTRACTOR: N/A	COORDINATES: 771775mE, 6418179mN	LOGGED BY: RWL

Elevation Depth	Graphic	Lithologic Description	SWL	Sample Depth and ID	Sample Analysis
0.0 0.0		SILTY SAND: brown, fine grained, woody vegetation material throughout, becoming gravelly at base			
0.1 -0.1		SANDSTONE: brown, hard, siliceous		Sample ID - WC3A - duplicate - WC3B	Metals and OC/OP
0.2 -0.2					
0.3 -0.3					
0.4 -0.4					
0.5 -0.5					
0.6 -0.6					
0.7 -0.7					
0.8 -0.8					
0.9 -0.9					

ATTACHMENT OC

LABORATORY ANALYSIS

CERTIFICATE OF ANALYSIS

29 March, 2005

Mr Rob Lait
Australasian Groundwater & Environmental Consultants Pty Ltd
PO Box 788
INNISFAIL QLD 4860

Your Order No: G1293

Laboratory Report No: 48880

Your Project:

Dear Sir or Madam:

The following samples were received from you on the date indicated.

Quantity Received:	6
No. of containers:	6
Sample Type:	Soil
Date of Receipt:	7 March 2005
Date of Preliminary Report:	11 March 2005

These samples were analysed in accordance with your instructions.

The results are contained in the following pages of this report.
Unless otherwise stated, solid (soil) samples are analysed on a dry basis
and liquid (water) samples are analysed as received.

Should you have any queries regarding this report, please contact the undersigned.

Please find accompanying this report, Organochloride Pesticides & Organophosphorus
Pesticides results issued by our Sydney Laboratory in their report 35709.

Yours faithfully,

SGS Environmental Services

Jon Dicker
Operations Manager
CAIRNS

Margaret Nankervis
Business Manager
CAIRNS



NATA Accredited Laboratory No: 2562

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RESULTS

<i>SGS Reference</i>	48880-01	<i>R48880-01</i>	48880-02	48880-03	48880-04	48880-05	48880-06	
Your Reference Parameter Units	WC1A	Repeat WC1A	WC1B	WC2A	WC2B	WC3A	WC3B	Limit of Reporting
Arsenic (As) mg/kg	17	18	<5	15	7	<5	<5	5
Cadmium (Cd) mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
Copper (Cu) mg/kg	6	7	4	9	4	11	12	3
Chromium (Cr) mg/kg	7	6	6	12	10	13	16	5
Lead (Pb) mg/kg	9	9	6	12	11	18	18	3
Nickel (Ni) mg/kg	<3	<3	<3	11	6	18	21	3
Zinc (Zn) mg/kg	26	25	4	140	22	43	47	3
Mercury (Hg) mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05

SGS Methods: CEP-001, CEP-003, CEI-200, CEI-201 and CEI-202.

Results determined on a dry basis.



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11 March 2005

TEST REPORT

AGE Consultants

PO Box 788

INNISFAIL

QLD 4860

Your Reference: G1239

Report Number: 35709

Attention: Rob Lait

Dear Rob

The following samples were received from you on the date indicated.

Samples:	Qty.	6 Soils
Date of Receipt of Samples:		09/03/05
Date of Receipt of Instructions:		09/03/05
Date Preliminary Report Faxed:		Not Issued

These samples were analysed in accordance with your written instructions.

A copy of the instructions is attached with the analytical report.

The results and associated quality control are contained in the following pages of this report.

Unless otherwise stated, solid samples are expressed on a dry weight basis (moisture has been supplied for your information only), air and liquid samples as received.

Should you have any queries regarding this report please contact the undersigned.

Yours faithfully

SGS ENVIRONMENTAL SERVICES


Jacinta Hurst
Operations Manager

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NATA Endorsed Test Report

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NATA Accredited Laboratory No. 2562

SGS Australia Pty Ltd
ABN 44 000 964 278

Environmental Services Botany Industrial Park Gate 3, Denison Street, Matraville 2036 NSW Australia
t +61 (0)2 9666 1426 f +61 (0)2 9666 1364 url www.sgs.com

OC Pesticides in Soil Our Reference: Your Reference Sample Type	UNITS ----- -----	35709-1 WC1A soil	35709-2 WC1B soil	35709-3 WC2A soil	35709-4 WC2B soil	35709-5 WC3A soil
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>alpha</i> -BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>gamma</i> -BHC(Lindane)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>beta</i> -BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>delta</i> -BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>o,p'</i> -DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>alpha</i> -Endosulfan	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>trans</i> -Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>cis</i> -Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>trans</i> -Nonachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>p,p'</i> -DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>o,p'</i> -DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>o,p'</i> -DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>beta</i> -Endosulfan	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>p,p'</i> -DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>p,p'</i> -DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Ketone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
<i>Surrogate</i>	%	99	113	99	94	95



OC Pesticides in Soil Our Reference: Your Reference Sample Type	UNITS ----- -----	35709-6 WC3B soil
HCB	mg/kg	<0.1
<i>alpha</i> -BHC	mg/kg	<0.1
<i>gamma</i> -BHC(Lindane)	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
Aldrin	mg/kg	<0.1
<i>beta</i> -BHC	mg/kg	<0.1
<i>delta</i> -BHC	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
<i>o,p'</i> -DDE	mg/kg	<0.1
<i>alpha</i> -Endosulfan	mg/kg	<0.1
<i>trans</i> -Chlordane	mg/kg	<0.1
<i>cis</i> -Chlordane	mg/kg	<0.1
<i>trans</i> -Nonachlor	mg/kg	<0.1
<i>p,p'</i> -DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
<i>o,p'</i> -DDD	mg/kg	<0.1
<i>o,p'</i> -DDT	mg/kg	<0.1
<i>beta</i> -Endosulfan	mg/kg	<0.1
<i>p,p'</i> -DDD	mg/kg	<0.1
<i>p,p'</i> -DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Endrin Ketone	mg/kg	<0.1
<i>Surrogate</i>	%	113



OP Pesticides in Soil Our Reference: Your Reference Sample Type	UNITS ----- -----	35709-1 WC1A soil	35709-2 WC1B soil	35709-3 WC2A soil	35709-4 WC2B soil	35709-5 WC3A soil
Chlorpyrifos	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
Fenitrothion	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
Bromofos Ethyl	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
Ethion	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
<i>Surrogate</i>	%	99	113	99	94	95

OP Pesticides in Soil Our Reference: Your Reference Sample Type	UNITS ----- -----	35709-6 WC3B soil
Chlorpyrifos	mg/kg	<0.10
Fenitrothion	mg/kg	<0.10
Bromofos Ethyl	mg/kg	<0.10
Ethion	mg/kg	<0.10
<i>Surrogate</i>	%	113



Method ID	Methodology Summary
SEO-005	OC/OP/PCB - Determination of a suite of Organochlorine Pesticides, Chlorinated Organo-phosphorus Pesticides and Polychlorinated Biphenyls (PCB's) by sonication extraction using dichloromethane for waters or acetone / hexane for soils followed by Gas Chromatographic separation with Electron Capture Detection (GC /ECD). The surrogate spike used is 2,4,5,6-Tetrachloro-m-xylene.



QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
OC Pesticides in Soil								
HCB	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>alpha</i> -BHC	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>gamma</i> -BHC(Lindane)	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
Heptachlor	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	78 89 RPD: 13
Aldrin	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	80 89 RPD: 11
<i>beta</i> -BHC	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>delta</i> -BHC	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	78 90 RPD: 14
Heptachlor Epoxide	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>o,p'</i> -DDE	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>alpha</i> -Endosulfan	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>trans</i> -Chlordane	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>cis</i> -Chlordane	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>trans</i> -Nonachlor	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>p,p'</i> -DDE	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
Dieldrin	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	80 90 RPD: 12
Endrin	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>o,p'</i> -DDD	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>o,p'</i> -DDT	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>beta</i> -Endosulfan	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>p,p'</i> -DDD	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>p,p'</i> -DDT	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	78 93 RPD: 18
Endosulfan Sulphate	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	84 89 RPD: 6
Endrin Aldehyde	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
Methoxychlor	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
Endrin Ketone	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	Batch	[NT]
<i>Surrogate</i>	%		SEO-005	[NT]	[NT]	[NT]	Batch	91 126 RPD: 32



QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
OP Pesticides in Soil								
Chlorpyrifos	mg/kg	0.1	SEO-005	<0.10	[NT]	[NT]	Batch	81 91 RPD: 12
Fenitrothion	mg/kg	0.1	SEO-005	<0.10	[NT]	[NT]	Batch	[NT]
Bromofos Ethyl	mg/kg	0.1	SEO-005	<0.10	[NT]	[NT]	Batch	[NT]
Ethion	mg/kg	0.1	SEO-005	<0.10	[NT]	[NT]	Batch	[NT]
Surrogate	%		SEO-005	[NT]	[NT]	[NT]	Batch	91 126 RPD: 32



Result Codes

[INS] : Insufficient Sample for this test
[NR] : Not Requested
[NT] : Not tested

[HBG] : Results not Reported due to High Background Interference
* : Not part of NATA Accreditation
[N/A] : Not Applicable

Result Comments

Date Organics extraction commenced: 10/03/05

NATA Corporate Accreditation No. 2562, Site No 4354

Note: Test results are not corrected for recovery (excluding Dioxins/Furans and PAH in XAD and PUF).

Quality Control Protocol

Reagent Blank: Sample free reagents carried through the preparation/extraction/digestion procedure and analysed at the beginning of every sample batch analysis. For larger projects, a reagent blank is prepared and analysed with every 20 samples.

Duplicate: A separate portion of a sample being analysed which is treated the same as the other samples in the batch. A duplicate is prepared at least every 20 samples.

Matrix Spike Duplicates: Sample replicates spiked with identical concentrations of target analyte(s). The spiking occurs during the sample preparation and prior to the extraction/digestion procedure. They are used to document the precision and bias of a method in a given sample matrix. Where there is not enough sample available to prepare a spiked sample, another known soil/sand or water (or Milli-Q water) may be used. A duplicate spiked sample is prepared at least every 20 samples.

Surrogate Spike: Added to all samples requiring analysis for organics (where relevant) prior to extraction. Used to determine the extraction efficiency. They are organic compounds which are similar to the target analyte(s) in chemical composition and behaviour in the analytical process, but which are not normally found in environmental samples.

Internal Standard: Added to all samples requiring analysis for organics (where relevant) after the extraction process; the compounds serve to give a standard of retention time and response, which is invariant from run-to-run with the instruments.

Control Standards: Prepared from a source independent of the calibration standards. At least one control standard is included in each run to confirm calibration validity.

Additional QC Samples: A calibration standard and blank are run after every 20 samples of an instrumental analysis run to assess analytical drift.