

WAMBO COAL PTY LIMITED



SOUTH BATES EXTENSION MODIFICATION ENVIRONMENTAL ASSESSMENT

APPENDIX K Land Contamination Assessment



Wambo Coal Pty Ltd

Stage 1 Preliminary Contamination Investigation
Wambo Coal Mine, Warkworth, NSW 2330

December 2016

Executive Summary

GHD Pty Ltd (GHD) was engaged by Wambo Coal Pty Ltd (WCPL) to undertake a Stage 1 – Preliminary Contamination Investigation on a 130 hectare (ha) portion of land outside of existing mining leases to support the South Bates Extension Modification of the Wambo Coal Mine (hereafter referred to as the “Site”).

The assessment is required under State Environmental Planning Policy 55 – Remediation of Land, as the land use will change from agriculture to mining.

The objectives of the investigation are to detail the existing and potential contamination issues at the Site prior to the commencement of the South Bates Extension Modification.

At the time of the investigations, the Site consisted of cleared former agricultural land (open grassed paddocks) with surrounding undisturbed bushland. Two areas of former occupation of the Site were identified as being the Pingrove Property located in the northern portion of the Site and the Water Tank Area located in the central portion of the Site. Former small buildings/sheds associated with the and previous agricultural activities were present on Site.

Based on the Site history, the Site has been used as been used for agricultural land use since the 1950's. The Pingrove Property appears to have been occupied sometime before 1950 and till sometime after 1992. Between 2001 and sometime after 2008, the Water Tank area appears to have been occupied.

No NSW EPA contaminated land records/notices, POEO licences or WorkCover NSW Dangerous goods licence were reported for the Site.

Based on the available information on the historical use of the Site, the site inspection, and subject to the Scope of Works in Section 1.2 and the limitations presented in Section 7, the overall likelihood for significant chemical contamination to be present within the Site is considered to be low, however there is the potential for chemical contamination associated with:

- The spillage or leakage of oils or fuels historically stored or used within the Site
- Historical use of herbicides or pesticides within the Site
- General storage of materials and waste across the Site
- Fill materials from unknown sources
- The potential use of hazardous building materials such as asbestos, synthetic mineral fibres and lead within buildings on site
- Discharge from former septic system into soil and groundwater

Based on the above assessment the Site is considered to be suitable for the proposed development (underground mining), provided the following measures are undertaken:

- Removal of general building wastes and rubbish with a detailed inspection for potential asbestos containing materials within these areas
- Undertake a hazardous buildings and material survey of structures that may be demolished

List of abbreviations

AHD	Australian Height Datum
ASS	Acid Sulfate Soils
ACM	Asbestos Containing Material
BTEX	Benzene, Toluene, Ethyl benzene, Xylenes
CLM Act	Contaminated Land Management Act 1997
CSM	Conceptual Site Model
DA	Development Application
DP	Deposited Plan
DLWC	Department of Land and Water Conservation
DUAP	Former Department of Urban Affairs and Planning
EPA	Environment Protection Authority
ha	Hectare
LEP	Local Environmental Plan
LGA	Local Government Area
mbgl	Metres below ground level
NEPC	National Environment Protection Council
NEPM	National Environment Protection (Assessment of Site Contamination) Measure
OCP	Organochlorine Pesticide
OPP	Organophosphate Pesticide
OEH	Office of Environment and Heritage
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
POEO Act	Protection of the Environment Operations Act 1997
TRH	Total Recoverable Hydrocarbons
WCPL	Wambo Coal Pty Ltd

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1. Introduction

GHD Pty Ltd (GHD) was engaged by Wambo Coal Pty Ltd (WCPL) to undertake a Stage 1 – Preliminary Contamination Investigation on a 130 hectare (ha) portion of land outside of existing mining leases to support the South Bates Extension Modification of the Wambo Coal Mine (hereafter referred to as the “Site”). The land use is currently agricultural and natural bushland.

The assessment is required under State Environmental Planning Policy 55 – Remediation of Land, as the land use will change from agriculture to mining.

The Site locality plan is presented in Figure 1, Appendix A.

1.1 Objectives

The objectives of the investigation are to detail the existing and potential contamination issues at the Site prior to the commencement of the South Bates Extension Modification.

1.2 Scope of work

The scope of work for the Preliminary Contamination Investigation comprised of a desktop investigation and site inspection including the following:

- Site history review including review of any available existing information including previous soil and groundwater reports, interviews with employees etc.
- Review of NSW WorkCover Dangerous Goods Searches.
- Review of geology, hydrology and topography information for the Site.
- Review of historical aerial photographs.
- A review of NSW EPA notices under the Contaminated Land Management Act 1997 (CLM Act) and a search of Water NSW database on groundwater information for the area.
- A general inspection of the Site to identify areas of potential contamination concern.
- Preparation of this report with reference to the *Managing Land Contamination, Planning Guidelines, SEPP 55 – Remediation of Land* (DUAP/EPA, 1998), the *Guidelines for Consultants Reporting on Contaminated Sites* (OEH, 2011) and the NEPM (NEPC, 2013) summarising the results of the desktop reviews and site inspection, provision of recommendations for further investigations (as required) and a statement of whether the Site is suitable for the proposed use.

2. Site information

2.1 Site identification

A summary of the site identification details are provided in Table 2-1. The Site location is shown on Figure 1 in Appendix A.

Table 2-1 Site identification summary

Information	Details
Street address/location	2337 Jerrys Plains Road, Jerry Plains, NSW 2330 The Site is located to the north west of the current Wambo Coal Mine open cut operations
Lot and DP number	The Site consists of Lots 3-6, 10, 22, 73, 113 and 208 in DP 753817
Site area	Approximately 130 ha
Local Government Area (LGA)	Singleton Council
Land Use Zoning and current LEP	The Site is zoned as Primary Production land under Singleton Local Environmental Plan 2013
Current site use	Agricultural and natural bushland
Proposed Land Use	South Bates Extension Modification – underground coal mine

2.2 Surrounding land uses

Surrounding land uses include:

- **North**– mixture of undisturbed bushland which forms the Wollemi National Park and cleared and partially vegetated agricultural land.
- **South and west** – undisturbed bushland which forms the Wollemi National Park.
- **East** – Cleared and partially vegetated agricultural land which borders the current Wambo Coal Mine open cut operational site.

2.3 Site observations

A GHD environmental scientist completed a site inspection on 19 October 2016. The main site features observed during the walkover are summarised in Table 2-2 below and shown in Figures 2a and 2b, Appendix A with reference to selected photographs as provided in Appendix B.

Table 2-2 Site inspection summary

Items	Comments
Site conditions	<i>Site Use:</i> The Site consisted of cleared former agricultural land (open grassed paddocks) with surrounding undisturbed bushland, various fence lines and gates defining paddocks and unsealed access tracks and fire trails. Two areas of former occupation (farm buildings and miscellaneous items) were identified. <u>Pinegrove Property</u> Located in the northern portion of the Site, north of North Wambo Creek (shown in Figure 1). Features included: - A large timber framed machinery shed with a corrugated metal roof. The shed was open on three sides with the rear (eastern) portion enclosed to form a small room with a fire place. Access was from the eastern end through a boarded up door. No access was available to inspect the interior of the room. The shed was used for storage of cut timber from land clearing. A single empty metal drum was identified lying on its side on the southern side of the shed. No staining was observed associated with it. - A small outbuilding (suspected to have housed a water pump) was located to the south east of the timber shed. It had a concrete floor, a timber frame with fibre cement sheet walls and a roof made out of a fibre glass vehicle canopy. Dark brown/black staining was observed on the floor within this building. Scrap timber was observed in the grass nearby. - To the west of the timber shed was another outbuilding with a timber frame, corrugated metal walls and roof and concrete floor. Scrap metal, fencing wire, shade cloth and an old cupboard were stored within the building and old tools and rusty empty drums were identified around the perimeter of the building. No staining was observed associated with the drums. A concrete drain was observed at the southern corner of this building indicating that it may have been a slaughter shed. - A hen house and small animal hutch were located to the north of the slaughter shed generally consisting of corrugated metal, timber and chicken wire. - Concrete footings and old paving were observed to the north of the timber shed. This may be the location of the former house. - Further to the north was an old tractor left under a tree and timber stock yards. - A concrete dish drain (possibly a former trough) was observed to the east of the timber shed, adjacent to a barbed wire fence. <u>Water Tank Area</u> Located in the central portion of the Site, south of North Wambo Creek (shown in Figure 1). Site features included: - Two concrete water tanks - A fenced off well with concrete surface structures and covered with corrugated metal. - Further south there was an area consisting of building wastes (possibly associated with a former shed). A representative from WCPL inspected this area on 28 October 2016 and provided several photographs that revealed the area consisted of scattered waste materials consisting of corrugated metal, steel, guttering, plastic pipe, potential asbestos containing materials (PACM), black poly pipe, plastic troughs, sections of conveyor belt, fencing wire, rope, tyre rims and star pickets. Four circular patches of concrete with square metal plates and bolts are evident in a photograph which may indicate the former location of an elevated tank. Black poly pipe protrudes from the ground in this area potentially indicating that it may have been a water tank. Another circular patch of concrete was photographed with a section of steel in the centre. - Further north of the scattered building and farm wastes was a small raised stockpile consisting of gravels, plastic and metal wastes and old metal equipment. Near to this was a metal tank that may have been used to store fuel for vehicles.

Items	Comments
	- Further west of the scattered building and farm wastes was an area containing sections of flexible hose/pipe and some old safety cones. It is not known what this was used for.
Ground surface and site drainage	<i>Ground Cover and vegetation:</i> With the exception of some buildings, the Site is mostly unsealed with either grass and scattered trees (former agricultural land) or undisturbed bushland. Vegetation was observed to be in a healthy condition with no signs of stress observed. <i>Site Drainage:</i> No surface water was observed on Site. North Wambo Creek was dry at the time of the inspection. It is assumed that surface water would infiltrate into surface soils and flow with the site topography toward drainage lines and North Wambo Creek. No septic tanks were observed, however these may have been removed/filled in or concealed by vegetation.
Potentially Contaminating Activities	- No evidence as to the presence of underground fuel storage tanks was observed. - Evidence of a former elevated above ground storage tank was observed south of the concrete water tanks. This may have been for water as poly pipe was observed protruding from the ground in this area. - Empty drums were noted around the timber shed and the slaughter shed although no associated staining was evident. An empty vehicle fuel tank was observed just south of the concrete water tanks. No staining was observed. - A narrow piece of metal piping was observed sticking out of the ground on the southern corner of the slaughter shed but it is not understood what this was for. - There may have been a septic tank associated with the former Pinegrove farm house however no evidence of its location was observed. - No potential ACM debris was observed to the ground surface at the Pinegrove farm house area. The pump house was lined with fibre cement sheet. Potential ACM was noted by a WCPL representative in the building wastes scattered to the south of the concrete tanks. No samples were collected for confirmation of the presence of asbestos. No detailed inspections were made for potential hazardous building materials within the site buildings. No access was available for the small annexe at the rear of the timber shed. - There was no evidence of any unauthorised access and fly tipping within the areas of the Site observed. <i>Fill:</i> There was potential for fill materials (based on the isolated nature of the Site, most likely cut from natural local materials) to have been used during levelling of building sites and or construction of roads/tracks. A small raised stockpile consisting of gravels, plastic and metal wastes and old metal equipment was noted within the Water Tank Area.

3. Environmental setting

The following section provides an overview of the environmental setting of the Site obtained from publically available information.

3.1 Topography

The Site is located at approximately 120 m Australian Height Datum (AHD) (Source <http://maps.six.nsw.gov.au/>). The Site topography is undulating in the vicinity of the Pinegrove property and North Wambo Creek, rising towards the west to Jerrys Plains Ridge.

3.2 Soils and geology

Reference to the 1:250,000 *Soil Landscape Sheet of the Singleton Region*, published for the Soil Conservation Service of NSW (Kovac & Lawrie, 1985), indicates that the Site mainly consists of Bulga Soloths soils with Lees Pinch Shallow soils in the south west.

The terrain soil landscape unit (Bulga Soloths) is comprised of Permian sandstone, conglomerate, claystone, shale, mudstone and coal seams. The soil landscape unit occurs on smooth slopes with sandstone colluvium, relief of 20-40 m, slopes up to 10%. The Site may also contain yellow and brown Solodic soils, and brown earths on lower slope. Human activity through agriculture may have caused soil disturbance.

According to the Department of Land and Water Conservation (DLWC, 1998) there is no mapped evidence to suggest the occurrence of acid sulfate soils (ASS). Given that ASS are generally formed in waterlogged conditions, and that the Site is inland, the risk of ASS occurrence is low. Field investigations to assess the potential of ASS have not been conducted at the Site as part of this scope.

3.3 Hydrology

North Wambo Creek cuts across the Site from south west to north east which drains to Wollombi Brook approximately 7 km to the south east. Surface water is assumed to flow with the site topography toward drainage lines and North Wambo Creek.

3.4 Hydrogeology

GHD obtained database information from the NSW Office of Water Groundwater database (<http://allwaterdata.water.nsw.gov.au/water.stm>) on 10 October 2016. The search was conducted to identify registered groundwater boreholes in close proximity to the Site and to record information such as groundwater use and standing water level. The results of this search indicated that there are two registered groundwater wells within the Site boundaries, which are groundwater monitoring sites operated by WCPL. Summary information for the two wells within the Site is provided in Table 3-1 and results are presented in Appendix C.

Table 3-1 Summary of groundwater database search

Bore ID	Approximate Distance to Site	Standing Water Level (mbgl)	Water Bearing Zones (mbgl)	Final Depth (mbgl)	Intended Purpose
GW200831	On site	-	Not listed – However screen is between 6 and 12 m	12	Monitoring well
GW200832	On site	-	Not listed – however screen is between 11 and 14 m	14	Monitoring well

Geological logs for the wells indicated that the geology consists of silt and/or sandy clay to depths between 1.8 and 6.9 mbgl, which was underlain by sandstone/conglomerate/ironstone.

A well was also observed within the Tank Area portion of the Site. The exact nature and purpose of this well is unknown.

Based on site observations and GHD's understanding of the environmental setting of the Site, regional groundwater would generally be expected to flow in an south easterly direction towards Wollombi Brook and is generally greater than 5 mbgl.

Given that the Site is not serviced with reticulated water and the presence of a well within the Tank Area portion of the property, it is possible that groundwater in the area could be used for either stock or domestic purposes.

4. Desk top information

4.1 Historical aerial photographs

A selection of historical aerial photographs was examined in order to assess past activities and land uses at the Site. Photographs were examined from the years 1963, 1971, 1983, 1992, 2001 along with a 2008 photograph from Six Maps (NSW Government, <http://maps.six.nsw.gov.au/>) accessed on 25 October 2016 and a current aerial provided by WCPL.

The historical aerial photographs are provided in Appendix D and a summary of the information gained from their review for the Site and its surrounds are provided in Table 4-1.

Table 4-1 Review of historical aerial photographs

Photograph	Site observations
1963 Type: B & W NSW 1186 5130 Scale 1:38000 26/7/63	The southern and western portions of the Site were heavily vegetated. North Wambo Creek was visible running through the centre of the Site and appear to be lined with trees. Access tracks on the southern and western portions of the Site were visible. Agricultural activities (ploughing, fencing) were noted in the cleared areas of the Site. The Pingrove Property was visible consisting of two large buildings (assumed to be the former house and shed), holding yards (to the south east of the house), and two small outbuildings. A dam was located to the north of the Pingrove Property. An un-vegetated (exposed soil/rock) area was noted to the north of the property. The surrounding area consisted of heavily vegetated bush land to the north, south and west. Cleared and partially agricultural land was located to the further north and to the east. A large vegetated area was located to the north east.
1971 Type: B & W NSW 1954 5078 Scale: 1:82 000 16/10/71	The Site remains generally similar to the previous photograph. North Wambo Creek appears to have more vegetation. The south east portion of the Site is also more vegetated. Three dams are now visible to the north of the Pingrove Property. The area to the west of the former house appears to have been recently ploughed. Holding yards to the south east of the house were not visible. The surrounding area is generally similar to the previous photograph. Clearing of vegetation was noted to have occurred to the north east of the Site.
1983 Type: B & W NSW 3360 5057 Scale : 1:25 000 21/12/83	The Site remains generally similar to the previous photograph. North Wambo Creek appears to have more vegetation. The surrounding area has changed little, with the exception of clearing of vegetation in several areas to the north east of the Site.
1992 Type: Colour NSW 4089 5049 Scale : 1:25 000	The Site remains generally similar to the previous photograph. One of the smaller outbuildings to the west of the Pingrove house is no longer present. The stock holding yards are visible to the east of the house. The surrounding area has changed little, with the exception of a small dam located to the south east of the Site within the dense vegetated area. Farming area to the west appears to have been recently ploughed.
2001 Type: Colour NSW 4580 125 Scale: 1:25,000 29/10/2001	The Site remains generally similar to the previous photograph. Vegetation around North Wambo Creek appears to be less. The Pingrove house is no longer present. The Wambo Coal Mine is present to the east of the Site.

Photograph	Site observations
2008 Source: Six Maps http://maps.six.nsw.gov.au/	The Site is generally similar to the previous photograph. A second small outbuilding is located to the west of the Pinegrove property shed. Two water tanks, water bore and two sheds are located on the Water Tank portion of the Site. A large circular feature is located to the east of the Water Tank area (possibly holding pen). The Wambo Coal Mine is present to the east of the Site.
2016 Source: WCPL Aerial Photograph 4/7/16	The Site remains generally similar to the previous photographs. The Wambo Coal Mine extent has extended further towards the north west.

Based on the review of historical aerial photographs, the Site has generally been used for agricultural land use since the 1950s. The Pinegrove Property appears to have been occupied sometime before 1950 and till sometime after 1992. Between 2001 and sometime after 2008, the Water Tank area appears to have been occupied.

4.2 Previous investigation reports

No previous environmental investigation was provided for review for the Site and surrounding area.

4.3 Council search

A search of the Singleton Council database for Development Applications (DA) was undertaken to assess the type of development/land use that may have occurred either on or within the vicinity of the Site. No application was identified within the vicinity of the Site.

4.4 NSW Environment Protection Authority

A search of the datasets maintained by NSW EPA including notices under the CLM Act and POEO Act Environment Protection License Register was carried out. The search results are summarised below.

Contaminated land record of notices

A site will be on the Contaminated Land: Record of Notices only if the EPA has issued a regulatory notice in relation to the site under the CLM Act.

A search of the EPA record of notices for the Warkworth and Jerrys Plains area revealed no documented contaminated sites to date.

List of NSW contaminated sites notified to EPA

The sites appearing on the EPA “List of NSW contaminated sites notified to the EPA” indicate that the notifiers consider that the sites are contaminated and warrant reporting to EPA. However, the contamination may or may not be significant enough to warrant regulation by the EPA. The EPA needs to review information before it can make a determination as to whether the site warrants regulation.

The search identified two sites within the Warkworth area that have been notified to the NSW EPA the details of which summarised in the following Table 4-2.

Table 4-2 Sites notified to the NSW EPA within suburb of Warkworth

Site Name	Address	Contamination Activity type	Distance from Site	Management Class
United Collieries	134 Jerrys Plains Road	Other industry	5 km north east	Under assessment
Emulsion Plant – Dyno Nobel Asia Pacific Pty Ltd	186 Long Road	Chemical industry	14 km east	Under assessment

POEO licence register

The POEO register identifies premises that are licensed for certain activities under the POEO Act. Information listed on the Register of particular relevance to this assessment includes site location, activity type, relevant clean up notice and non-compliance information. Each licence provides information on potential point and non-point sources of soil and groundwater contamination that may be generated on site through standard operations, accidental spills and leaks.

A search of the register identified five premises with a POEO licence within the Jerrys Plains and Warkworth area. These are summarised in Table 4-3.

Table 4-3 Licensed activities under the POEO Act 1997

Organisation	Name	Address	Activity	Distance	Direction
Wambo Coal Pty Ltd	Wambo Colliery	Jerrys Plains Road, Warkworth	Mining for coal. Coal works	0 km	Adjacent to Site
Biogreen Energy Pty Ltd	Redbank Power Station	112 Longpoint Road, Warkworth	Generation of electrical power from coal. Crushing, grinding or separating coal	13 km	East
Dyno Nobel Asia Pacific Pty Ltd	Dyno Nobel Warkworth Plant	186 Long Point Road, Warkworth	Chemical production and storage, waste generation	14 km	East
Lemington Coal Mines Pty Ltd	Lemington Coal Mine (now part of HVO)	Comleroi Road, Warkworth	Mining for coal	6 km	North east
United Collieries Pty Ltd	United Colliery	134 Jerrys Plains Road, Warkworth	Mining for coal	5 km	North east

4.5 WorkCover NSW Dangerous Goods Database

A search of the WorkCover NSW Dangerous Goods database was undertaken for the Site on 27 October 2016. No records of Dangerous Goods pertaining to the Site were identified.

5. Conceptual site model

A conceptual site model (CSM) was developed to provide an understanding of the potential for exposure to contaminants and impacts to beneficial uses from contamination within the Site. The CSM draws together historical data, specific and regional geological, hydrogeological, hydro-geochemical and contamination information to identify potential contamination sources, migration and exposure pathways and sensitive receptors for the Site.

5.1 Sources

Based on the desktop review and site inspection, the following potential contamination sources have been identified:

- Spillage or leakage of fuels, oils, herbicides or pesticides potentially stored on the Site
- Historical use of herbicides or pesticides across the Site
- Potential spills or leaks of oils or fuels from machinery or vehicles previously used on the Site
- Potential for past burial of household and farming material and presence of materials and waste stored across the Site (scrap metal, building materials etc.)
- Potential for hazardous building materials to be present within buildings on the Site

5.2 Pathways

The primary pathways by which current and future receptors could be exposed to the potential sources of contamination are considered to be:

- Direct contact (including ingestion) with potentially contaminated soil
- Inhalation of potential contaminants in soil, if disturbed (particularly asbestos if present)
- Volatilisation to outdoor air and subsequent inhalation of potential hydrocarbon impacted soil or groundwater
- Lateral migration of potential contaminants to surface water (North Wambo Creek)
- Vertical and horizontal migration of potential contaminants within the groundwater

5.3 Receptors

When evaluating potential adverse health/environmental effects from exposure to a contaminated site, all potentially exposed populations should be considered. For the Site, the key populations or receptors of interest are considered to include:

Human health receptors

- Future occupants of the Site (e.g. workers and subcontractors)
- Visitors to the Site (e.g. members of the public - trespassers)
- Current and future occupants of surrounding properties (e.g. residents, workers and visitors)

Environmental receptors

- Flora and fauna within the Site and surrounding land

- North Wambo Creek
- Groundwater beneath the Site

5.4 Potential for contamination

Table 5-1 summarises the potential areas of environmental concern based on the results of the desk-top review and site inspection.

Table 5-1 Outcomes of desktop review – Potential areas of environmental concern

Description	Rationale/detail	Potential contamination
Storage and use of chemicals.	Storage of oils, fuels, grease, herbicides and pesticides. Spills or leaks during maintenance or re-fuelling activities. Use of fertilisers.	TRH, BTEX, PAHs, phenols, heavy metals, OCPs, OPPs, ammonia, phosphates and nitrates.
Use of machinery and vehicles.	Spills or leaks of fuels, oils or hydraulic fluid from operational machinery and vehicles.	TRH, BTEX, PAHs, phenols, lead.
Site maintenance.	Historical use of herbicides or pesticides across the Site.	Arsenic, OCPs and OPPs.
Buildings and sheds.	Hazardous building materials such as asbestos, lead paint and synthetic mineral fibres.	Asbestos, lead, synthetic mineral fibres.
Storage of materials and waste.	Historical storage of materials and waste.	TRH, BTEX, PAHs, phenols, heavy metals, OCPs and OPPs.
Fill materials/buried waste.	Fill materials from unknown sources. Potential for burial of household and farming materials.	TRH, BTEX, PAHs, phenols, heavy metals, OCPs, OPPs PCBs and asbestos.
Septic tanks.	Potential septic tanks associated with former houses.	Nutrients, faecal coliforms.

Based on the results of the desktop assessment, the overall likelihood for significant chemical contamination to be present within the Site is considered to be low.

6. Conclusions and recommendations

GHD Pty Ltd was engaged by WCPL to undertake a Stage 1 – Preliminary Contamination Investigation on a 130 ha portion of land to support the proposed South Bates Extension Modification of the Wambo Coal Mine.

At the time of the site inspection, the Site consisted of cleared former agricultural land (open grassed paddocks) with surrounding undisturbed bushland. Former small buildings/sheds associated with previous agricultural activities were present on site. Based on the Site history, the Site has been used as been used for agricultural activities.

Based on the available information on the historical use of the Site, the site inspection, and subject to the Scope of Works in Section 1.2 and the limitations presented in Section 7, the following conclusions were made.

The overall likelihood for significant chemical contamination to be present within the Site is considered to be low, however there is the potential for chemical contamination associated with:

- The spillage or leakage of oils or fuels historically stored or used within the Site
- Historical use of herbicides or pesticides within the Site
- General storage of materials and waste across the Site
- Fill materials from unknown sources
- The potential use of hazardous building materials such as asbestos, synthetic mineral fibres and lead within buildings on site
- Discharge from former septic system into soil and groundwater

Based on the above assessment, the Site is considered to be suitable for the proposed development (underground mining), provided the following measures are undertaken:

- Removal of general building wastes and rubbish with a detailed inspection for potential asbestos containing materials within these areas
- Undertake a hazardous buildings and material survey of structures that may be demolished

7. Limitations

This Phase 1 Contaminated Site Assessment ("Report"):

1. Has been prepared by GHD Pty Ltd ("GHD") for Wambo Coal Pty Ltd.
2. May be provided to other third parties but such third parties' use of or reliance on the Report is at their sole risk.
3. May only be used for the purpose as stated in Section 1.1 of the Report (and must not be used for any other purpose).

GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than Wambo Coal Pty Ltd arising from or in connection with this Report.

No representation or warranty, express or implied, is made as to the relevance, accuracy, completeness or fitness for purpose of this document in respect of any particular user's circumstances. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect of, their situation.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report:

- Were limited to those specifically detailed in section 1.2 of this Report and GHD proposal dated 24 October 2016.
- Were undertaken in accordance with current professional practice and by reference to relevant environmental regulatory authority and industry standards, guidelines and assessment criteria in existence as at the date of this Report.
- Did not include the collection of samples for the purpose of laboratory analysis or verification of information obtained from the Site history review.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking the services mentioned above and preparing the Report ("Assumptions"), as specified throughout this Report.

GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.

Subject to the paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation of this Report and are relevant until such times as the Site conditions or relevant legislations changes, at which time, GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with those opinions, conclusions and any recommendations.

GHD has prepared this Report on the basis of information provided by Wambo Coal Pty Ltd, Singleton Council, NSW Office of Water and NSW EPA among others, which GHD has not independently verified or checked ("Unverified Information") beyond the agreed scope of work.

GHD expressly disclaims responsibility in connection with the Unverified Information, including (but not limited to) errors in, or omissions from, the Report, which were caused or contributed to by errors in, or omissions from, the Unverified Information.

Inspections undertaken in respect of this Report are limited to visual inspections only and are constrained by the particular site conditions, such as locations of buildings, services or vegetation.

Except as otherwise expressly stated in this Report, GHD makes no warranty or representation as to the presence or otherwise of asbestos and/or asbestos containing materials ("ACM") on the Site. If fill material has been imported on to the Site at any time, or if any buildings constructed prior to 1970 have been demolished on the Site or material from such buildings disposed of on the Site, the Site may contain asbestos or ACM.

Except as otherwise expressly stated in this Report, GHD makes no warranty, statement or representation of any kind concerning the suitability of the Site for any purpose or the permissibility of any use, development or re-development of the Site.

These Disclaimers should be read in conjunction with the entire Report and no excerpts are taken to be representative of the findings of this Report.

8. References

DLWC (1998), Department of Land and Water Conservation, Guidelines for the use of Acid Sulfate Soil Risk Maps, second edition, March 1998.

DUAP/EPA (1998), *Managing Land Contamination Planning Guidelines*, SEPP 55 – *Remediation of Land*.

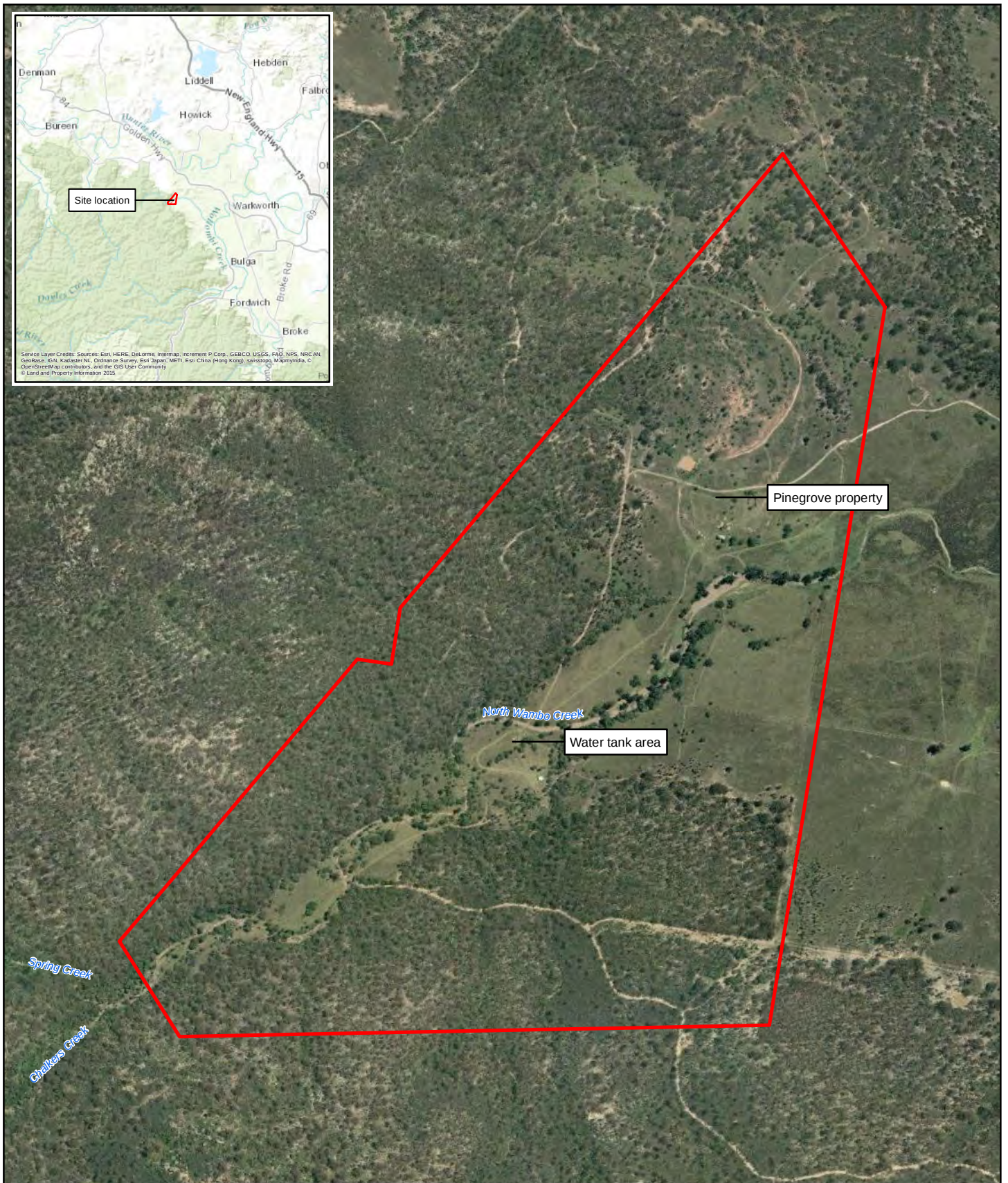
Kovac and Lawrie (1985), *Soil Landscapes Singleton 1:250 000 Sheet*, Published by the Soil Conservation Service of NSW.

NEPC (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended by the National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)*, National Environment Protection Council, May 2013.

OEH (2011) Office of Environment and Heritage, *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*.

Appendices

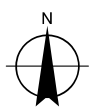
Appendix A – Figures



LEGEND

 Investigation area boundary

Paper Size A4
0 40 80 160 240 320
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Wambo Coal Pty Ltd
Phase 1 Land Contamination Assessment

Job Number 22-18622
Revision A
Date 18 Nov 2016

Site locality

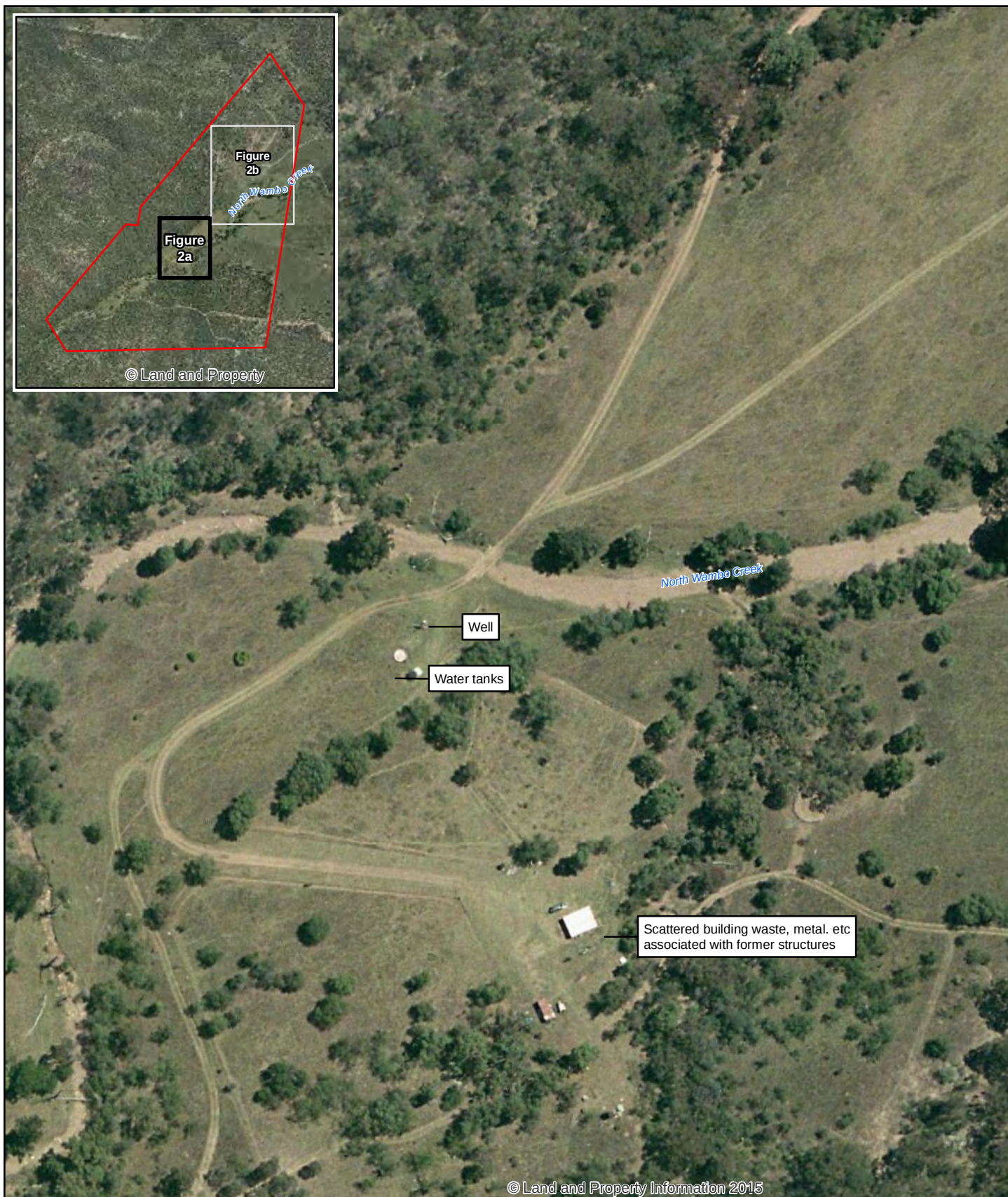
Figure 1

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Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E entlmail@ghd.com W www.ghd.com.au

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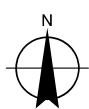
Data source: LPI: Imagery, 2015. Created by: tmorton



LEGEND

-  Investigation area boundary

Paper Size A4
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Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Wambo Coal Pty Ltd
Phase 1 Land Contamination Assessment

Job Number	22-18622
Revision	A
Date	18 Nov 2016

Site features
Water tank area

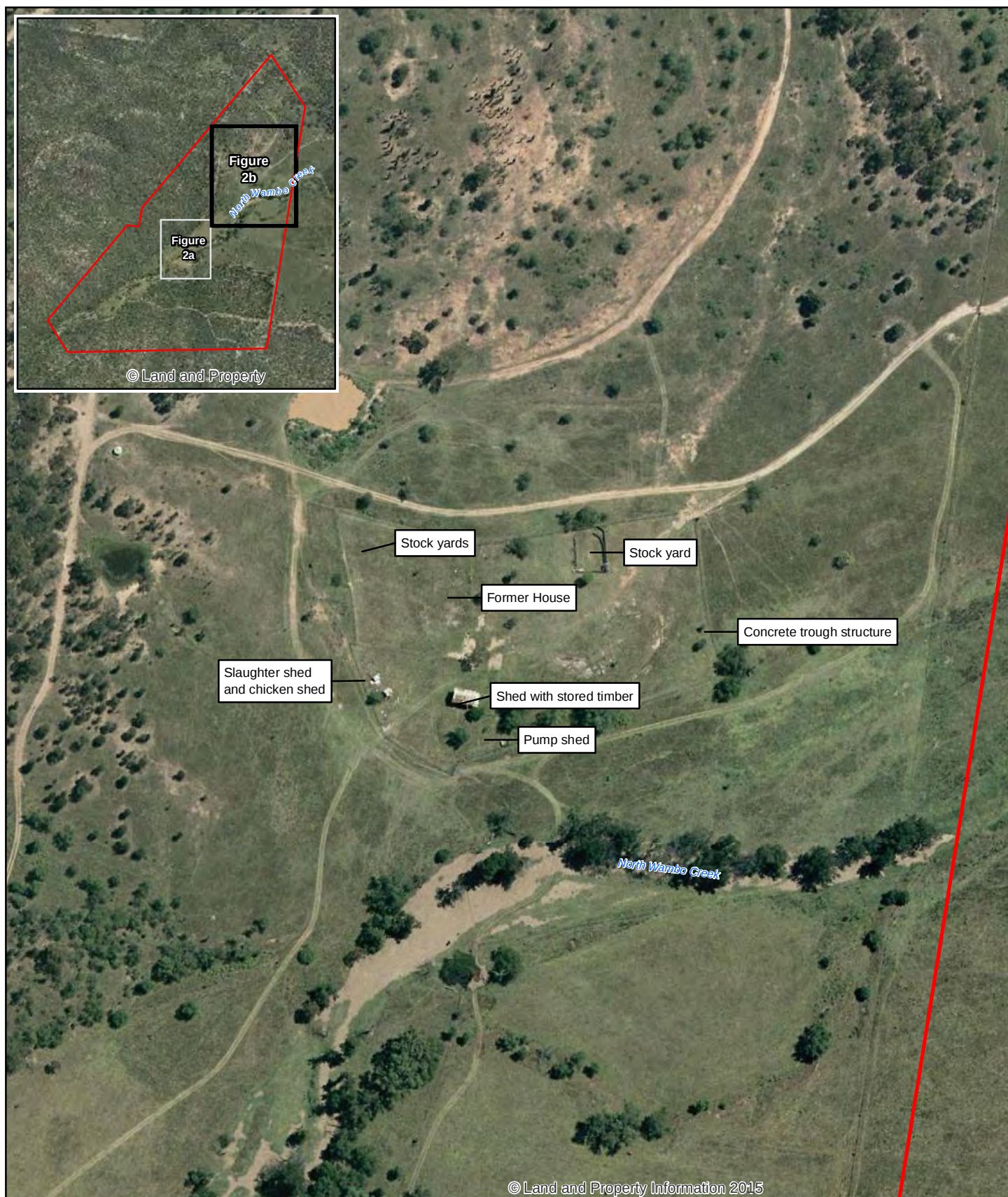
Figure 2a

G:\22\18622\GIS\Maps\Deliverables\2218622_002_SiteFeatures_A.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E entlmail@ghd.com W www.ghd.com.au

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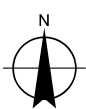
Data source: LPI: Imagery, 2015. Created by: tmorton



LEGEND

 Investigation area boundary

Paper Size A4
0 10 20 40 60 80
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Wambo Coal Pty Ltd
Phase 1 Land Contamination Assessment

Job Number 22-18622
Revision A
Date 18 Nov 2016

Site features
Pinegrove property

Figure 2b

G:\22\18622\GIS\Maps\Deliverables\2218622_002_SiteFeatures_A.mxd

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Data source: LPI: Imagery, 2015. Created by: tmorton

Appendix B – Photographic log



Photograph 1 – Timber shed used for storage of cut timber



Photograph 2 – Timber shed with rear annexe, fire place and water tank. Empty drum visible on left hand side.



Photograph 3 - Structure south east of timber shed (possible pump shed) and scrap metal against fence line



Photograph 4 – Former pump shed with fibre cement sheet walls, concrete base and dark oil staining.



Photograph 5 – Scrap corrugated metal and empty drum against fence line, down gradient of pump shed.



Photograph 6 – Scrap timber and metal debris under tree to east of timber shed.



Photograph 7 – Old tractor body north of timber shed



Photograph 8 – Old linear concrete footings, slabs and paving. Potentially former farmhouse or shed.



Photograph 9 - Looking north towards the timber stockyards



Photograph 10 – Timber stockyards to the far north of the timber shed.



Photograph 11 – Concrete dish drain/spoon drain against eastern fence line. Potentially former trough or feeding structure.



Photograph 12 – Small shed with concrete slab and rear drain. Potential tool or equipment shed or slaughter shed.



Photograph 13 – Interior of slaughter shed with cupboard, scrap metal and fencing wire and shade cloth



Photograph 14 – Outside of slaughter shed indicating scrap metal tools and drums



Photograph 15 – Concrete drain from inside of shed and metal stake (unknown purpose)



Photograph 16 – Two concrete water tanks adjacent to North Wambo Creek



Photograph 17 – Well adjacent to North Wambo Creek and the two concrete water tanks.

Appendix C – Groundwater bore search



Figure C1: Location of groundwater bores (Source: <http://allwaterdata.water.nsw.gov.au/water.stm> accessed on 10 October 2016)

NSW Office of Water

Work Summary

GW200831

Licence: 20BL172242

Licence Status: ACTIVE

Authorised Purpose MONITORING BORE
(s):
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status: Equipped
Construct.Method: Auger
Owner Type: Mines

Commenced Date:
Completion Date: 08/10/2009

Final Depth: 12.00 m
Drilled Depth: 12.00 m

Contractor Name: INTERTEC DRILLING
 SERVICES
Driller: Paul Sheehy
Assistant Driller:

Property: NA JERRYS PLAINS ROAD
 WARKWORTH 2330

Standing Water Level:

GWMA:
GW Zone:

Salinity:
Yield:

Site Details

Site Chosen By:

County
Form A: HUNTE
Licensed:

Parish
 HUNTE.52

Cadastre
 A/33149

Region: 20 - Hunter
River Basin: 210 - HUNTER RIVER
Area/District:

CMA Map: 9032-1N
Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Unknown
Source:

Northing: 6396174.0
Easting: 306639.0

Latitude: 32°33'18.0"S
Longitude: 150°56'26.1"E

GS Map: -**MGA Zone:** 0

Coordinate GPS - Global
Source: Positioning System

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	7.00	170			Auger
1		Hole	Hole	7.00	12.00	120			Down Hole Hammer
1		Annulus	Concrete	0.00	0.10	170	60		PL:Pour ed/Shovel led
1		Annulus	Crushed Aggregate	0.10	3.80	170	60		Ungraded, PL:Pour ed/Shovel led
1		Annulus	Bentonite	3.80	5.50	170	60		PL:Pour ed/Shovel led
1		Annulus	Waterworn/Rounded	5.50	12.00	120	60		Graded, PL:Pour ed/Shovel led
1	1	Casing	Pvc Class 18	-0.40	6.00	60			Driven into Hole, Screw ed
1	1	Opening	Screen	6.00	12.00	60		1	PVC Class 18, Screw ed, A: 0.50mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
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Geologists Log**Drillers Log**

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.80	1.80	Topsoil	Topsoil	
1.80	2.80	1.00	Sandy Clay	Sandy Clay	
2.80	6.90	4.10	Sandy Clay, gravel bands	Sandy Clay	
6.90	12.00	5.10	Sandstone, orange	Sandstone	

Remarks

08/10/2009: Form A Remarks:

Nat Carling, 28-Oct-2010: GPS provided by the driller.

*** End of GW200831 ***

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

NSW Office of Water

Work Summary

GW200832

Licence: 20BL172242

Licence Status: ACTIVE

Authorised Purpose MONITORING BORE
(s):

Intended Purpose(s): MONITORING BORE

Work Type: Bore**Work Status:** Equipped**Construct.Method:** Auger**Owner Type:** Mines**Commenced Date:****Completion Date:** 07/10/2009**Final Depth:** 14.00 m**Drilled Depth:** 14.00 m

Contractor Name: INTERTEC DRILLING
SERVICES

Driller: Paul Sheehy**Assistant Driller:**

Property: NA JERRYS PLAINS ROAD
WARKWORTH 2330

Standing Water Level:**GWMA:****GW Zone:****Salinity:****Yield:**

Site Details

Site Chosen By:

County
Form A: HUNTE
Licensed:

Parish
HUNTE.52

Cadastre
A/33149

Region: 20 - Hunter**CMA Map:** 9032-1N

River Basin: 210 - HUNTER RIVER
Area/District:

Grid Zone:**Scale:****Elevation:** 0.00 m (A.H.D.)**Elevation** Unknown**Source:****Northing:** 6396081.0**Easting:** 306885.0**Latitude:** 32°33'21.2"S**Longitude:** 150°56'35.4"E**GS Map:** -**MGA Zone:** 0

Coordinate GPS - Global
Source: Positioning System

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	2.00	170			Auger
1		Hole	Hole	2.00	14.00	120			Down Hole Hammer
1		Annulus	Concrete	0.00	0.10	170	60		PL:Pour ed/Shovel led
1		Annulus	Crushed Aggregate	0.10	8.50	120	60		Ungraded, PL:Pour ed/Shovel led
1		Annulus	Bentonite	8.50	10.50	120	60		PL:Pour ed/Shovel led
1		Annulus	Waterworn/Rounded	10.50	14.00	120	60		Graded, PL:Pour ed/Shovel led
1	1	Casing	Pvc Class 18	-0.40	11.00	60			Seated on Bottom, Screwed
1	1	Opening	Screen	11.00	14.00	60		1	PVC Class 18, Screwed, A: 0.50mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
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Geologists Log**Drillers Log**

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.10	0.10	Topsoil	Topsoil	
0.10	0.90	0.80	Silt, sandy	Silt	
0.90	1.80	0.90	Clay/Sand	Clay	
1.80	2.20	0.40	Sandstone, grey	Sandstone	
2.20	5.00	2.80	Sandstone/Conglomerate	Sandstone	
5.00	5.50	0.50	Sandstone, grey	Sandstone	
5.50	6.00	0.50	Sandstone/Ironstone	Sandstone	
6.00	14.00	8.00	Sandstone, orange	Sandstone	

Remarks

07/10/2009: Form A Remarks:

Nat Carling, 28-Oct-2010: GPS provided by the driller.

*** End of GW200832 ***

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

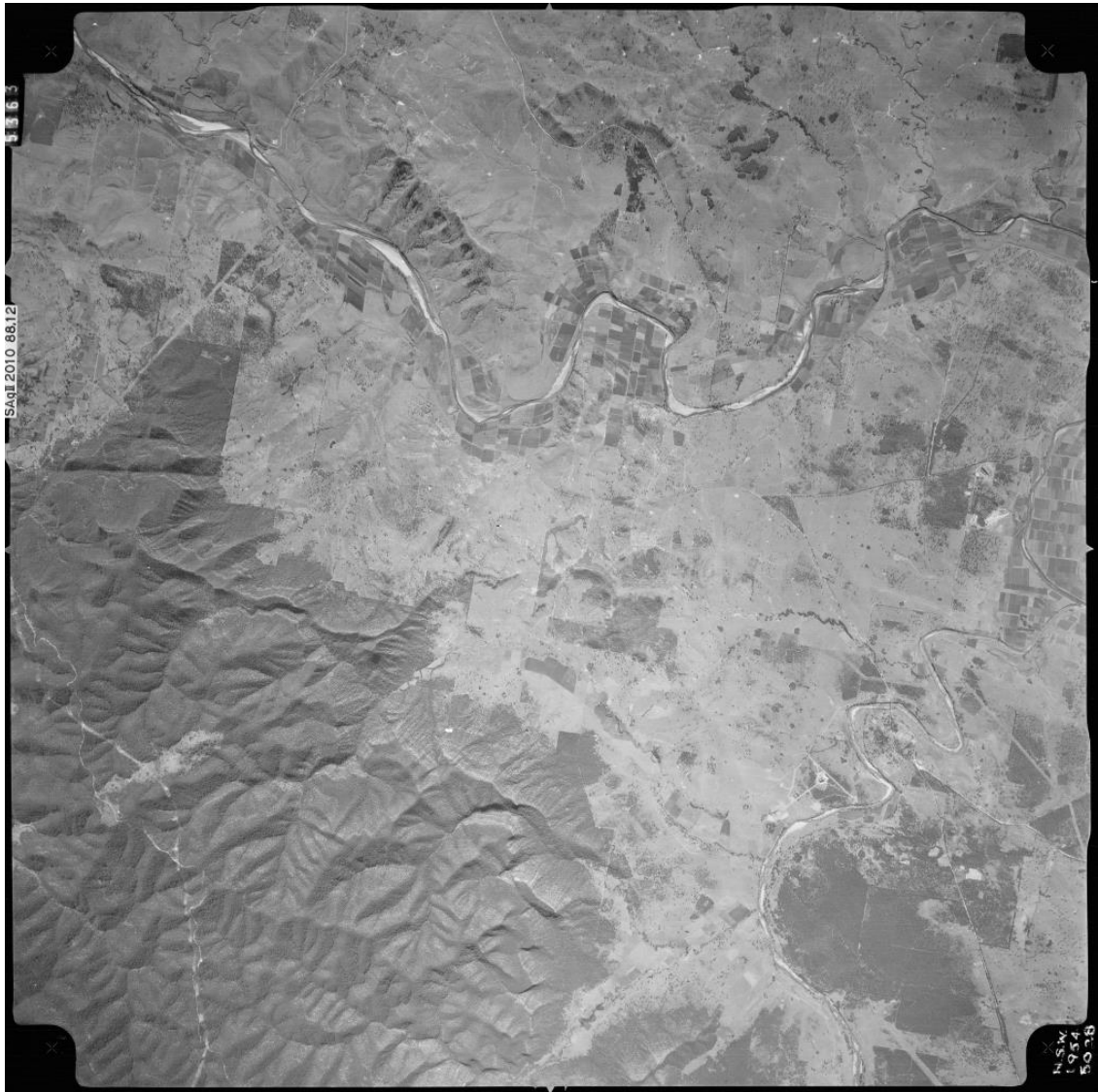
Appendix D – Historical aerial photographs



Aerial 1963 NSW 1186 5130, Scale 1:38000, 26/7/63



Aerial 1963, NSW 1186 5130, Scale 1:38000, 26/7/63 – Close up of Site



Aerial 1971, NSW 1954 5078, Scale: 1:82 000, 16/10/71



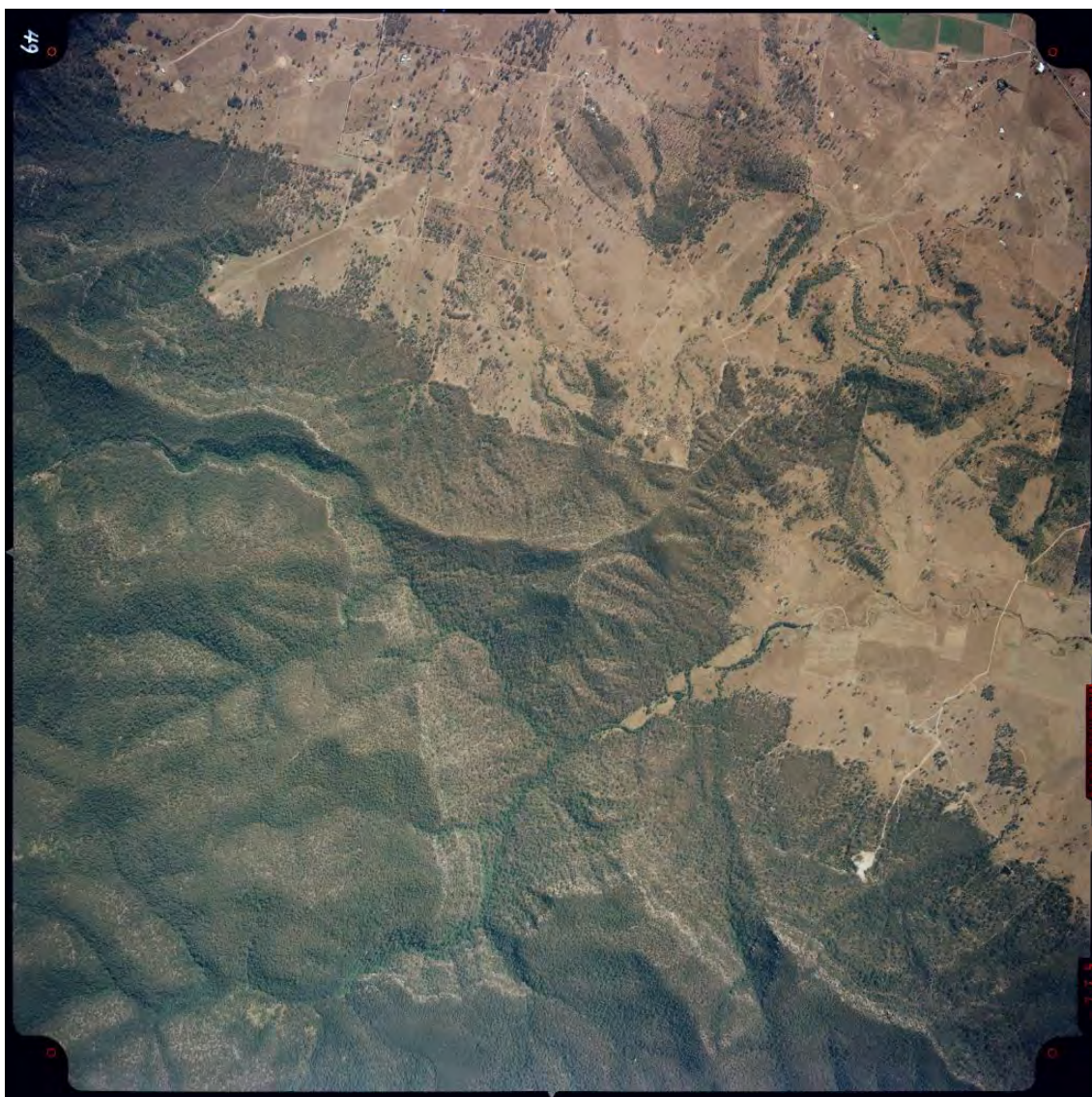
Aerial 1971, NSW 1954 5078, Scale: 1:82 000, 16/10/71 – Close up of Site



Aerial 1983, NSW 3360 5057, Scale : 1:25 000, 21/12/83



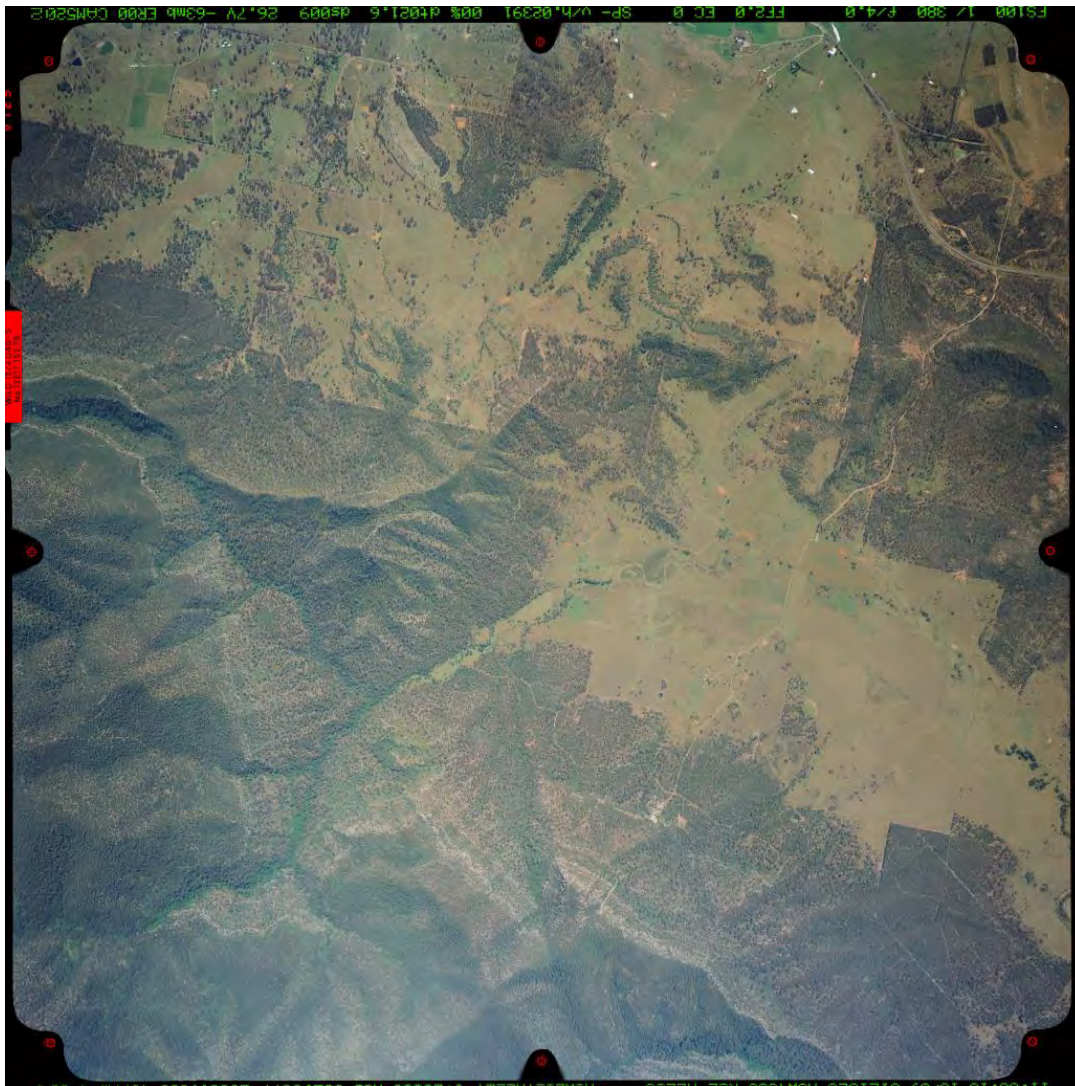
Aerial 1983, NSW 3360 5057, Scale : 1:25 000, 21/12/83 – Close up of Site



Aerial 1992, NSW 4089 5049, Scale : 1:25 000



Aerial 1992, NSW 4089 5049, Scale : 1:25 000 – Close up of Site



Aerial 2001, NSW 4580 125, Scale: 1:25,000, 29/10/2001



Aerial 2001, NSW 4580 125, Scale: 1:25,000, 29/10/2001 – Close up of Site



Aerial 2008- Six Maps <http://maps.six.nsw.gov.au/> - Close up of Site.



Aerial 2016 Peabody Aerial Photograph 4/7/16 – Close up of Site

Appendix E – Dangerous Goods Search



SafeWork NSW

SafeWork NSW

92-100 Donnison Street, Gosford, NSW, 2250

Locked Bag 2906, Lisarow, NSW, 2252 |

Customer Service Centre 13 10 50

licensing@safework.nsw.gov.au | www.safework.nsw.gov.au

Our Ref: D16/697392
Your ref: Alison Monkley

7 November 2016

Attention: Alison Monkley
GHD
Level 3
24 Honeysuckle Dr
Newcastle NSW 2300



Dear Ms Monkley,

RE SITE: 2337 Jerrys Plains Rd Jerrys Plains NSW

I refer to your site search request received by SafeWork NSW on 27 October 2016 requesting information on Storage of Hazardous Chemicals for the above site.

A search of the records held by SafeWork NSW has not located any records pertaining to the above mentioned premises.

For further information or if you have any questions, please call our Customer Service Centre on 13 10 50 or email licensing@safework.nsw.gov.au

Yours sincerely,


Brent Jones
Customer Service Officer
Customer Service Centre - Operations
SafeWork NSW

GHD

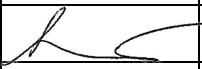
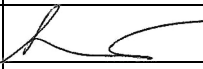
Level 3 GHD Tower 24 Honeysuckle Drive Newcastle NSW 2300
PO Box 5403 Hunter Region Mail Centre NSW 2310
T: (02) 4979 9999 F: (02) 4979 9988 E: ntlmail@ghd.com

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https://projects.ghd.com/OC/Newcastle/wambolandcontaminati/Delivery/Documents/Wambo Phase 1_Report.docx

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	E. Griffin, B. Ashlee	A. Monkley		A. Monkley		21/12/2016

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