

VICKERY EXTENSION PROJECT

ENVIRONMENTAL IMPACT STATEMENT

APPENDIX Q

LAND CONTAMINATION ASSESSMENT



SES
AUSTRALIA
Environment & Soil Sciences

Tier 1 Preliminary Site Investigation Vickery Extension Project


Prepared for:

Whitehaven Coal Limited

August 2018

(Ref: J000255)

Document Record

Revision No.	Reviewed By	Action	Issued To	Date	Release Authorisation Signature
0.1	Andrew Jacovides	Draft Review	Internal	23/10/2017	
1.0	Ryan Jacka	Final Review	Client	24/10/2017	
2.0	Ryan Jacka	Minor Corrections	Client	07/08/2017	

Last Saved:	7 August 2018 10:02 AM
File Name:	J000255 – Preliminary Site Investigation 1.0
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Qualifications:	BSc Env Sc, M Env Sc, MEIANZ, ASSSI, CEnvP
Client:	Whitehaven Coal Limited
Document Title:	Preliminary Site Investigation – Vickery Extension Project
Document Version:	FINAL 2.0
Reference Number:	J000255

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EXECUTIVE SUMMARY

SESL Australia (SESL) was engaged by Whitehaven Coal Limited (Whitehaven) to conduct a Tier 1 Preliminary Site Investigation (PSI) for the Vickery Extension Project (the Project) located approximately 25 kilometres north of Gunnedah, New South Wales (NSW).

The Land Contamination Assessment takes the form of a PSI. The PSI investigation area comprises the Mine Site Investigation Area, Rail Spur Investigation Area and Borefield Investigation Area, collectively referred to as 'the site'.

The PSI was based on a desktop review of available information, a search of historical records and site inspections were undertaken by SESL on 25 January 2017 and 31 August 2017. The site consists predominately of agricultural land used for general farming practices. The Approved Mine is located adjacent to the Mine Site Investigation Area.

The historical account for the site and visual inspection has identified the following sources of impact or Areas of Environmental Concern (AECs):

- AEC 1: Soil contamination associated with an infilled gully containing metal scrap, discarded car parts, storage drums, fencing, chicken wire, glass timber and bottles;
- AEC 2: Soil contamination associated with significantly corroded metal waste on the soil surface;
- AEC 3: Historic use of a generator;
- AEC 4: Soil contamination associated with the observed vegetation stress/bare patch (Feature of Interest 4)
- AEC 5: Potential asbestos-containing material within and lead paints around old farming building structures;
- AEC 6: Potential former use and storage of pesticides from farming practices; and
- AEC 7: Potential for soil contamination from storage of chemicals and machinery in farm sheds.

Based on the site history review and the visual site inspection, the activities of concern at the site include: historical farming, waste storage, waste infilling, fuel/oil storage and handling and degradation of derelict structures.

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Based on this Tier 1 PSI, SESL considers that the following investigation works should be undertaken prior to development that may disturb the features of interest identified in this PSI:

- A Detailed Site Investigation (DSI) should be conducted for Features of Interest 4, 5, 6, 7, 10 and 16 to determine if any land contamination is present that would be disturbed by the Project, and would therefore require remediation. The detail of the additional investigation would vary between each of the Features of Interest, with limited soil sampling required in low risk areas.
- Works associated with dams that require infilling should be conducted in accordance with appropriate erosion and sediment control measures.
- Prior to commencing any demolition of the structures on site, a Hazardous Material Survey should be undertaken to assess the potential for lead paints and asbestos-containing material within building structures to allow management/removal actions to be appropriately implemented.

If the outcome of this investigation indicates that any contamination requiring remediation exists at the site, a Remedial Action Plan (RAP) must be developed by a suitably qualified environmental professional to detail appropriate remediation and validation strategies. These strategies must be implemented by appropriately experienced and qualified contractors, to ensure that the site is suitable for the proposed prior to disturbance.

Through implementation of the recommendations above, as well as the development and implementation of a RAP for any sites requiring remediation, it is considered that the site is suitable for the land use change as proposed by the Project.

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ABBREVIATIONS

ABC	Ambient Background Concentration
ACL	Added Contaminant Limit
AEC	Area of Environmental Concern
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CEC	Cation Exchange Capacity
CLM Act	Contaminated Land Management Act, 1997
CSM	Conceptual Site Model
DEC	NSW Department of Environment and Conservation (now OEH)
DSI	Detailed Site Investigation
EILs	Ecological Investigation Levels
EPA	Environment Protection Authority
ESLs	Ecological Screening Levels
HILs	Health Investigation Levels
HSLs	Health Screening Levels
NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999
NGIS	National Groundwater Information System
NHMRC	National Health and Medical Research Council
OCP	Organochlorine Pesticides
OEH	NSW Office of Environment and Heritage
OPP	Organophosphate Pesticides
PSI	Preliminary Site Investigation
RAP	Remedial Action Plan
SEPP 55	Managing Land Contamination, Planning Guidelines SEPP 55 – Remediation of Land Guidelines
SESL	SESL Australia
TPH	Total Petroleum Hydrocarbon
TRH	Total Recoverable Hydrocarbon
UCL	Upper Confidence Limit

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1 INTRODUCTION

The former Vickery Coal Mine and the former Canyon Coal Mine are located approximately 25 kilometres (km) north of Gunnedah, in New South Wales (NSW) (Figure 1). Open cut and underground mining activities were conducted at the former Vickery Coal Mine between 1986 and 1998. Open cut mining activities at the former Canyon Coal Mine ceased in 2009. The former Vickery and Canyon Coal Mines have been rehabilitated following closure.

The approved Vickery Coal Project (herein referred to as the Approved Mine) is an approved, but yet to be constructed, project involving the development of an open cut coal mine and associated infrastructure, and would facilitate a run-of-mine (ROM) coal production rate of up to approximately 4.5 million tonnes per annum (Mtpa) for a period of 30 years.

Whitehaven Coal Limited (Whitehaven) is seeking a new Development Consent for extension of open cut mining operations at the Approved Mine (herein referred to as the Vickery Extension Project [the Project]). This would include a physical extension to the Approved Mine footprint to gain access to additional ROM coal reserves, an increase in the footprint of waste rock emplacement areas, an increase in the approved ROM coal mining rate and construction and operation of a Project Coal Handling and Preparation Plant (CHPP), train load-out facility and rail spur. This infrastructure would be used for the handling, processing and transport of coal from the Project, as well as other Whitehaven mines.

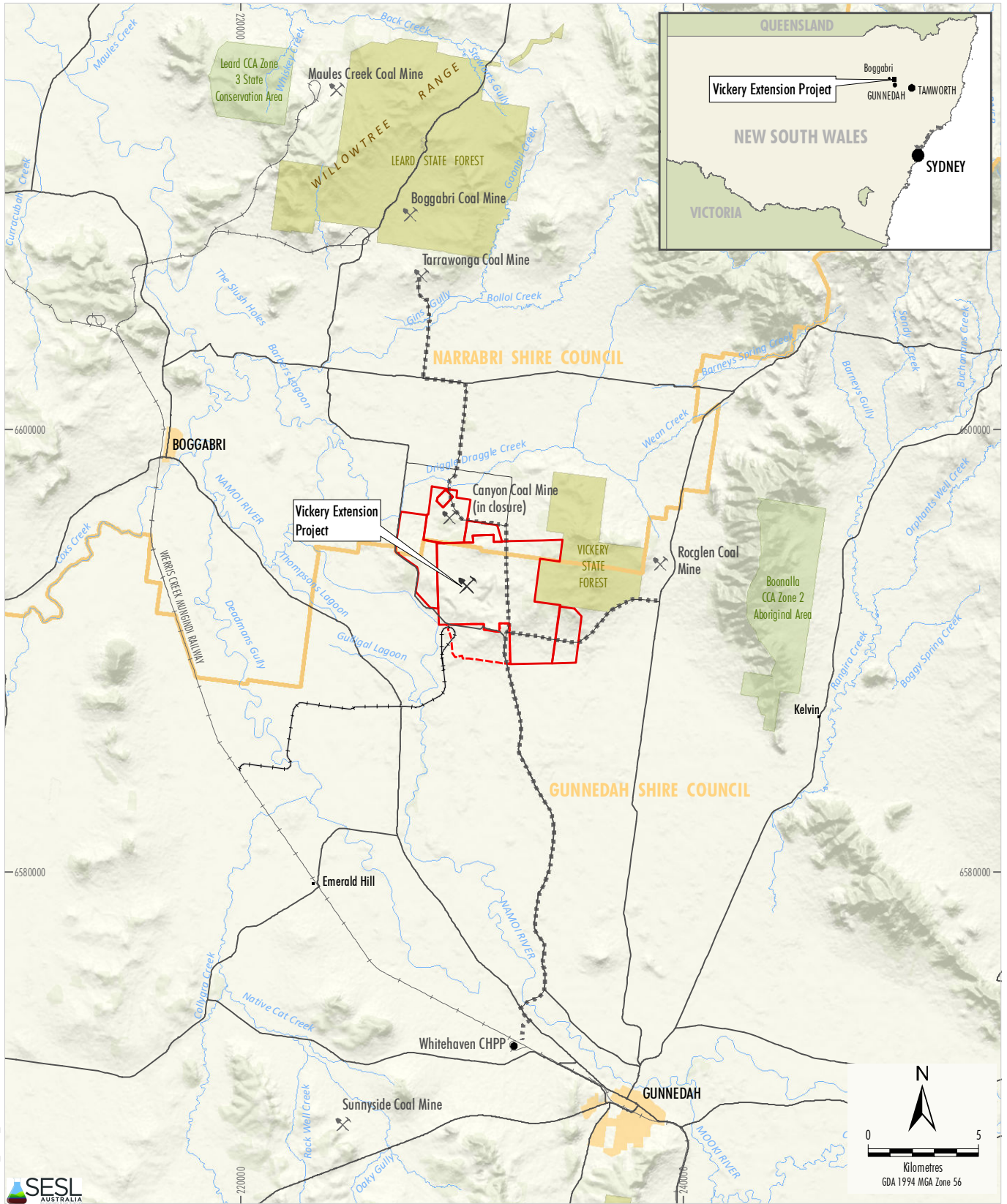
This Land Contamination Assessment forms part of an Environmental Impact Statement (EIS) which has been prepared to accompany a Development Application made for the Project in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act).

A detailed description of the Project is provided in Section 2 of the Main Report of the EIS.

The Land Contamination Assessment takes the form of a Tier 1 Preliminary Site Investigation (PSI). The PSI investigation area comprises the Mine Site Investigation Area, Rail Spur Investigation Area and Borefield Investigation Area, collectively referred to as 'the site' (Figure 2). Inspections of the site were undertaken by SESL Australia (SESL) on 25 January 2017 and 31 August 2017.

Other areas of the Project located within existing Mining Leases, Coal Leases and Authorities have not been assessed in this PSI as they are existing coal mining land use areas and therefore no change of use would occur as a result of the Project.

The Lot and Deposited Plan/s (DPs) within the site are shown on Figure 2 and listed in Table 1.



WHC15-39_Amp_IC_2010



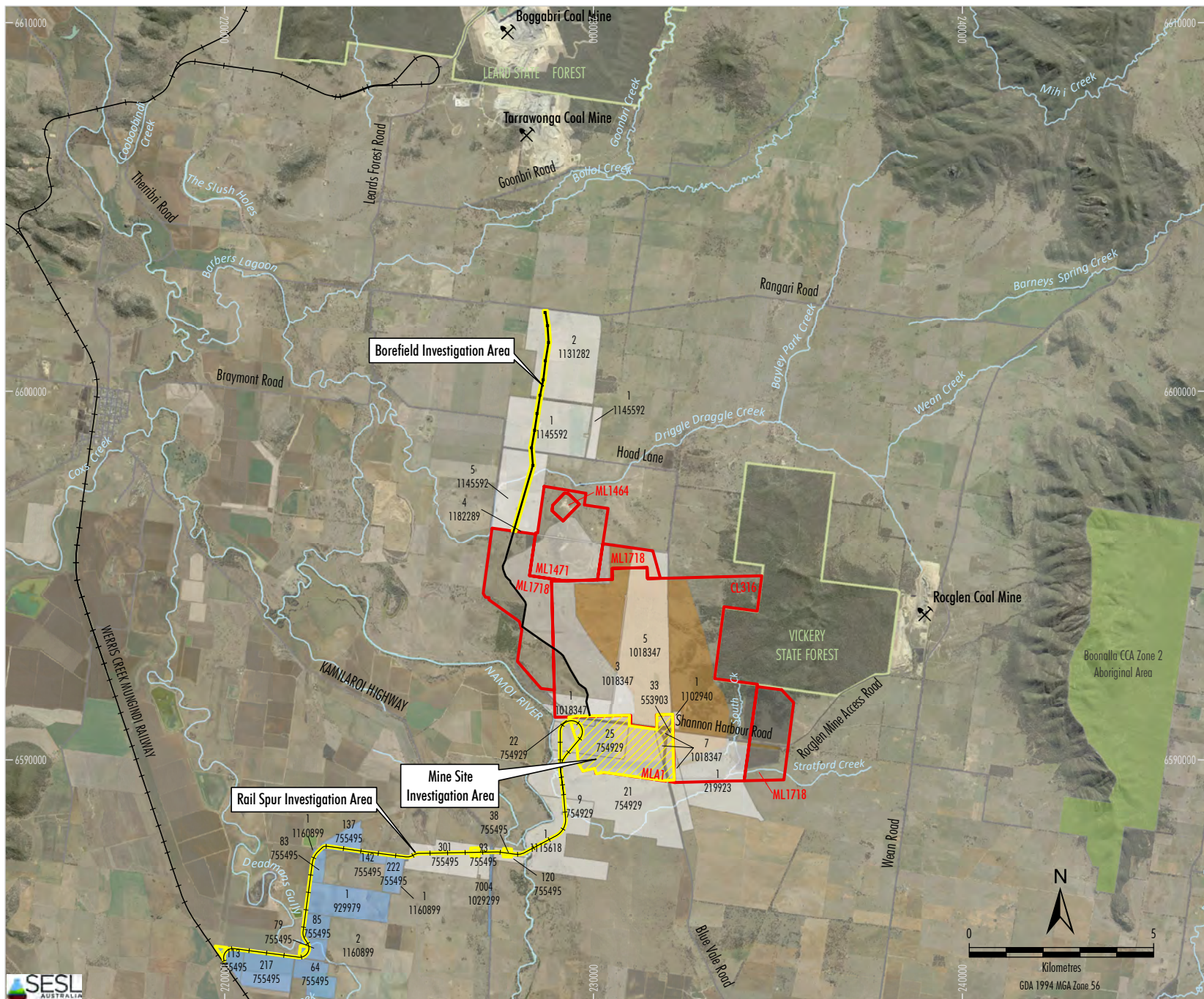
- LEGEND**
- Mining Tenement Boundary (ML and CL)
 - Mining Lease Application (MLA)
 - Local Government Boundary
 - State Forest
 - State Conservation Area, Aboriginal Area
 - Major Roads
 - Railway
 - Approved Road Transport Route
 - Indicative Project Rail Spur

Source: LPMA - Topographic Base (2010); NSW Department of Industry (2015)



VICKERY EXTENSION PROJECT
Project Location

Figure 1



- LEGEND**
- Mining Tenement Boundary (ML and CL)
 - Mining Lease Application (MLA)
 - State Forest
 - State Conservation Area, Aboriginal Area
 - Railway
- Project Components**
- Indicative Extent of Open Cut
 - Indicative Extent of Out of Pit Waste Rock Emplacement
 - Indicative Extent of Infrastructure Area
 - Indicative Extent of Soil Stockpile
 - Indicative Rail Spur Alignment
 - Indicative Location of Groundwater Bores and Pipeline
 - Investigation Area
- Land Ownership**
- Whitehaven Owned Land
 - Privately Owned Land

Source: Orthophoto - Department of Land and Property Information, Aerial Photography Flown (July 2011); Department of Industry (2015); SESL (2017)

VICKERY EXTENSION PROJECT
Site Investigation Area

Figure 2

Table 1 – Land Parcel Summary

Lot	DP	Land Ownership	Lot	DP	Land Ownership
22	754929	Whitehaven	7	1018347	Whitehaven
93	755495	Whitehaven	1	219923	Whitehaven
38	755495	Whitehaven	301	755495	Whitehaven
7004	1029299	The State of NSW	222	755495	Private landowner
64	755495	Private landowner	85	755495	Private landowner
217	755495	Private landowner	15	113293	Private landowner
1	929979	Private landowner	137	755495	Private landowner
9	754929	Whitehaven	79	755495	Private landowner
1	1115618	Whitehaven	113	755495	Private landowner
25	754929	Whitehaven	142	755495	Private landowner
21	754929	Whitehaven	2	1160899	Private landowner
120	755495	Whitehaven	1	1160899	Private landowner
1	1018347	Whitehaven	83	755495	Private landowner
5	1018347	Whitehaven	1	1145592	Whitehaven
3	1018347	Whitehaven	5	1145592	Whitehaven
33	553903	Whitehaven	4	1182289	Whitehaven
1	1102940	Whitehaven	2	1131282	Whitehaven

1.1 Background

The Project would include the redevelopment of predominantly agricultural land (including former mining land) to allow for a physical extension to the Approved Mine, construction of a train load-out facility and Project rail spur, development of a borefield and its associated infrastructure and other Project components.

The PSI investigation area, collectively referred to as ‘the site’, comprises the following:

- Mine Site Investigation Area - the proposed physical extension of the Approved Mine to the south-west and west.
- Rail Spur Investigation Area - The corridor is approximately 14 km long and 40 metres (m) wide and includes laydown areas.

- Borefield Investigation Area - The corridor is approximately 6 km long and 100 m wide.

The site layout is shown on Figure 2.

1.2 Objectives

This PSI achieved the following objectives:

- Prepare a PSI in accordance with the *State Environmental Planning Policy (SEPP) No 55 – Remediation of Land* and relevant guidelines, including the *Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land* (SEPP 55 Guidelines) (Department of Urban Affairs and Planning [DUAP] and the NSW Environment Protection Authority [EPA], 1998) and the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (the NEPM).
- Assess the potential for soil, groundwater and surface water contamination to exist at the site.
- Identify the likelihood and/or extent of contamination occurring from current and previous activities undertaken at the site.
- Recommend management strategies including any additional investigations (if required).

1.3 Regulatory Guidelines

The investigation and preparation of this PSI was undertaken in accordance with the following regulatory guidance documents and standards:

- Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia (ARMCANZ) (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality;
- American Society for Testing and Materials (ASTM) (2000). Standard Practice D2488 90 Description and Identification of Soils (Visual-Manual Procedure);
- Friebel and Nadebaum (2011). Health screening levels for petroleum hydrocarbons in soil and groundwater;
- Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) (2013). Petroleum hydrocarbon vapour intrusion assessment: Australian guidance;
- Enhealth (2012). Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards;
- The NEPM (as amended April 2013);

- National Health and Medical Research (NHMRC) and Natural Resource Management Ministerial Council (NRMMC) (2011). Australian Drinking Water Guidelines (ADWG);
- NSW Department of Environment and Conservation (DEC) (2006). Contaminated Sites: Guidelines for the NSW Site Auditor Scheme;
- NSW DEC (2007). Guidelines for the Assessment and Management of Groundwater Contamination;
- NSW Department of Environment, Climate Change and Water (DECCW) (2010). Vapour Intrusion: Technical Practice Note;
- NSW DUAP (1998). Managing Land Contamination: Planning Guidelines: SEPP 55 Remediation of Land;
- NSW EPA (1995). Contaminated Sites: Sampling Design Guidelines;
- Protection of the Environment Operations (Waste) Regulation 2014;
- NSW EPA (2014a). Technical Note: Investigation of Service Station Sites;
- NSW EPA (2014b). Waste Classification Guidelines (Part 1: Classifying Waste);
- NSW EPA (2015). Guidelines on the Duty to Report Contamination under the *Contaminated Land Management Act, 1997* (CLM Act);
- NSW Office of Environment and Heritage (OEH) (2011). Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites;
- Standards Australia (2017). AS1726-2017. Australian Standard Geotechnical Site investigations;
- Standards Australia (2005). Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds AS4482.1 2005 and Part 2: Volatile substances, AS4482.2 2005;
- United States Environmental Protection Agency (USEPA) (2000). Guidance for the Data Quality Objectives Process, EPAC QA/G-4; and
- Western Australia (WA) Department of Health (DoH) (2009). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

1.4 Scope of Works

The scope of works for this PSI included the following:

- A comprehensive site history review including a review of selected historical aerial photographs (Appendix B) and Certificates of Title (Appendix C).
- Conducting searches for information held by relevant state authorities in relation to contaminated land (Appendix D).
- Obtaining information pertaining to the site’s environmental setting including the proximity of the site to sensitive receptors and information on site geology (Section 3).
- Inspection of the site and immediate surrounds by SESL to support results of the desktop review and to identify site characteristics that may be suggestive of land contamination (Appendix A).
- Development of a Conceptual Site Model (CSM) to identify data gaps that require additional environmental information (Section 7).
- Preparation of this PSI report in accordance with EPA guidelines for contaminated lands assessment.
- Proposal of additional assessments or suitable remedial and validation strategies for the site, if required (Section 8).

1.5 Personnel

SESL’s Senior Environmental Scientist conducted two site visits on 25 January 2017 and 31 August 2017. The personnel involved in the preparation of this report are listed in Table 2.

Table 2 – Report Personnel

Personnel	Position	Report Task
Ryan Jacka B Env Sc, M Env Sc, MEIANZ, ASSSI, CEnvP	Senior Environmental Scientist	<ul style="list-style-type: none"> • Conduct site inspection. • Conduct report review and authorisation.
Andrew Jacovides B Nat Sci (Env Mgt)	Environmental Scientist	<ul style="list-style-type: none"> • Report preparation. • Historical data review. • Conduct desktop review.
Fiona Warden B Env Sc & Mgt	Environmental Scientist	<ul style="list-style-type: none"> • Conduct report drafting. • Historical data review.

2 SITE DESCRIPTION

2.1 Site Location and Access

The site is located approximately 25 km north of Gunnedah, within the Gunnedah Shire Council (GSC) and Narrabri Shire Council (NSC) Local Government Areas (LGAs), in NSW. Access to different areas of the site is via several roads, including the Kamilaroi Highway, Blue Vale Road, Hoad Lane and Emerald Hill Road. The Lots and DPs within the site are shown in Table 1 and Figure 2.

2.2 Site Identification

Table 3 describes the portion of land subject to this PSI.

Table 3 – Site Identification

Site Owner(s)	See Table 1
Site Locality	Approximately 25 km north of Gunnedah
Lot and DP Number	See Table 1
Local Government Areas	NSC and GSC
Current Zoning	RU1 - Primary Production
Site Area (approximately)	Total Investigation Area: 600 hectares
Site Elevation (approximately)	240 m – 280 m Australian Height Datum (AHD)
Locality Map	Figure 1
Site Layout	Figure 2

2.3 Site Layout and Infrastructure

The site layout is shown on Figure 2 and consists of predominately cleared agricultural land. In addition, the site:

- is located adjacent to some mine rehabilitation areas in the southern area;
- traverses several local council and state roads including Hoad Lane;
- traverses the Kamilaroi Highway and Blue Vale Road; and
- traverses the Namoi River, Driggle Draggie Creek and Bollol Creek.

Farm houses and some other buildings within the site are generally connected to local electricity but are expected to have no connection to mains water or sewer lines.

2.4 Surrounding Land Use

The area in the vicinity of the site is primarily cleared open agricultural areas used for cattle grazing on the eastern side of the Namoi River, and grazing and cultivation on the western side of the Namoi River. The Vickery State Forest is located to the east of the Approved Mine. No activities are proposed within the Vickery State Forest as part of the Project.

All lots within and adjacent to the site are zoned RU1 - Primary Production under the NSC and GSC Local Environment Plans. The Rail Spur Investigation Area traverses several roads and watercourses (Section 2.3).

3 ENVIRONMENTAL SETTING

3.1 Topography

On the eastern side of the Namoi River, the topography comprises rolling hills near the Approved Mine, and flattens out in the Borefield Investigation Area and along the Rail Spur Investigation Area.

The elevation across the site undulates from approximately 240 to 280 m AHD.

3.2 Geology and Soil Landscapes

The main geological units at the site are the Maules Creek Formation (which consists of carbonaceous claystone, clay sandstone, minor coal and conglomerate) and undifferentiated sediments.

The site is located on seven distinct Soil Landscape Groups identified in the *Soil and Land Resources of the Liverpool Plains Catchment 1:100 000 sheet* (OEH, 2012) and include:

- Blue Vale – dominated by chromosols underlain by Permian sandstones and conglomerates, mudstone and coal seams of the Permian Black Jack Group and Maules Creek Formation.
- Brentry – Soils are typically very deep and imperfectly drained gravelly loamy Chromosols or brown Sodosols or brown Vertosols. Soils have formed above on Quaternary alluvium derived from Permian quartz sandstones and conglomerates.
- Burburgate – dominated by giant self-mulching brown vertosols (brown clays) or brown/red chromosols. Geology is complex alluvium derived from the range of geologies in the Liverpool Plains catchment ranging from fine sands to clays and gravels.
- Collygra Creek – soil is generally red vertosols (red clays) or black and grey vertosols. Geology is Quaternary alluvium derived from Jurassic and Tertiary basalts and Triassic-Permian sedimentary rocks in the Curlewis Hills.
- Disturbed terrain – areas of disturbed landscapes and or soils including mines, quarries, landfills, rubbish pits and other industrial sites.
- Driggle Draggle – dominated by giant gypsic brown vertosols (brown clays) and grey vertosols (grey clays) underlain by deep Quaternary and Tertiary alluvium derived from the mixed geologies of the Melville Range.
- Top Rock – dominated by deep red and black sodosols. Underlying geology consists of fans and footslopes of colluvium derived from Permian quartz sandstone and conglomerates of the Black Jack Group and Maules Creek Formation.

The Mine Site Investigation Area is located predominately within the Blue Vale and Burburgate Soil Landscape Groups with Disturbed Terrain along the northern boundary and north-eastern corner where a quarry is located (Section 5).

The majority of the Borefield Investigation Area is located within the Driggle Draggles Soil Landscape.

The majority of the Rail Spur Investigation Area is located within the Burburgate Soil Landscape Group.

3.3 Hydrogeology

A groundwater bore search was undertaken using the NSW Department of Primary Industries – Water (2018) Groundwater Maps (DPI, 2018). Groundwater bores in the vicinity of the site are shown in Appendix D.

A detailed description of the groundwater bores (and associated standing water levels) located in the vicinity of the Project is provided in the Project Groundwater Assessment (HydroSimulations, 2018).

3.4 Surface Water

Surface water features in the vicinity of the site generally consist of open gullies and tributaries that flow ultimately into the Namoi River. The site intersects several creeks, lagoons and rivers including Thompsons Lagoon, Deadmans Gully, Namoi River, Driggle Draggles Creek and Bollol Creek. A summary of the surface water features across the investigation area as follows:

- Mine Site Investigation Area - There are no creeks or named drainage features within the Mine Site Investigation Area. The closest water course is the Namoi River located approximately 2 km from the proposed open cut. During high rainfall, surface water runoff on the Mine Site Investigation Area drains directly into the Namoi River via overland flow.
- Borefield Investigation Area – The Borefield Investigation Area intersects Driggle Draggles Creek and several unnamed drainage features. All drainage features ultimately drain west and feed into the Namoi River.

Rail Spur Investigation Area - The Rail Spur Investigation Area intersects Stratford Creek, the Namoi River main channel, Deadmans Gully and other unnamed lagoons and swampy areas associated with the Namoi River. The Namoi River generally flows to the north-west near the site.

A more detailed assessment of surface water impacts associated with the Project is provided in the Project Surface Water Assessment (Advisian, 2018).

3.5 Acid Sulfate Soil

Due to the location and elevation of the site, no acid sulfate soils are anticipated near the site. In addition, eSPADE mapping (OEH, 2018) shows that no acid sulfate soils are present within the vicinity of the Project.

3.6 Proximity to Local Sensitive Environments

There are several local sensitive environments directly within the extent of the site. The most significant of these is the crossing of the named creeks, lagoon and rivers, particularly the Namoi River. The Namoi River is located approximately 2 - 2.5 km from the open cut and is crossed by the Rail Spur Investigation Area.

Several homesteads are located adjacent to or in the vicinity of the site extent. The Vickery State Forest is immediately adjacent to the east of the Approved Mine, however the Project would not involve any activities within the forest.

4 SITE HISTORY

A review of the site history was undertaken to assess the historical use of the area, and in particular to identify activities with potential to contaminate soil, groundwater and surface water. The historical review included:

- current and historical aerial photographs;
- council planning documentation; and
- the EPA Contaminated Lands database.

4.1 Historical Title Search

No search of historical title was conducted for this Tier 1 PSI due to the minimal land use changes since the 1960's and the vast number of lots associated with the site.

4.2 Historical Aerial Photographs

Aerial photographs from 1956, 1975, 1991 and 2001 were obtained from the NSW Land and Property Information Division for review to assess the history of the development of the site. Copies of the aerial photographs are provided in Appendix B.

Aerial photography for the four years listed above and recent imagery (from 2011) indicates the site has historically been used for predominantly farming and agricultural purposes. Mining has also occurred in the broader region.

From the historical and recent aerial photographs, several features of interest were identified within or adjacent to the site extent. These features of interest were identified as having a use potentially different from broad agricultural practices and were identified for inspection during the desktop assessment (Section 5). From the historical photos, these features of interest included a quarry farm dams, farm infrastructure (i.e. sheds, dwellings, silos, tanks) and potential areas of disturbance.

It is noted that land use shown in aerial photos is generally consistent across all photographed years and at the time of inspection, indicating much of the site area has not significantly changed over time.

4.3 Site Zoning and Council Records

Narrabri Local Environmental Plan 2012 and *Gunnedah Local Environment Plan 2012* are the principal planning instruments regulating land use and development in the area. The site is zoned RU-1 Primary Production.

The Section 149 (2) & (5) planning certificates for the lots within the site were requested from the NSC and GSC (Appendix C).

The Section 149 (2) & (5) planning certificates did not identify any contamination issues. No environmental hazards were identified on lots within the Narrabri LGA. Lots located within Gunnedah LGA were affected by preservation of trees and vegetation. Some lots within the Gunnedah LGA were affected by flood related development controls and one lot was identified as Bushfire prone (Lot 5, DP 1018347).

4.4 EPA Contaminated Sites Database

4.4.1 Contaminated Land Record Search

A search of the EPA contaminated land public record was performed to assess if any part of the site or surrounding area has been declared as a contaminated site. It should be noted that this database is not a comprehensive list of all contaminated land in NSW, this record only lists sites regulated under Part 3 of the CLM Act.

Searches undertaken on 24 May 2018 for the GSC and NSC LGAs did not identify any contaminated sites within or adjacent to the site (Appendix D).

4.4.2 Contaminated Sites Notified to the NSW EPA Search

A search of the EPA list of NSW contaminated sites notified to the EPA was performed to assess if the site or surrounding sites have been notified to the EPA as contaminated sites. This record lists sites currently under review by the EPA under section 60 of the CLM Act.

A search undertaken on 24 May 2018 for the suburb of Boggabri, Blue Vale and Gunnedah, did not identify any contaminated sites notified to the EPA within or adjacent to the site.

4.4.3 Environmental Protection Licence Search

A search of the EPA list Environment Protection Licences under the *Protection of the Environment Operations Act 1997*.

A search undertaken on 24 May 2018 for the Gunnedah LGA, identified 17 sites with Protection of the Environmental Operations (POEO) Licences. One licensed premise is located within the site. EPL 12870 is held by Whitehaven Coal Mining Limited for coal works and mining for coal. The activities undertaken at the licensed premise will be similar to the activities within the Approved Mine Area of the site.

4.5 Dangerous Goods Licence Search

Land within the site has been predominately used for agricultural grazing in past, therefore the expected dangerous goods to be stored on site are likely hydrocarbon products (petroleum, diesel, etc.) for machinery, and pesticides for agricultural purpose. In consideration of the size of the site, a dangerous goods licence search with Safework NSW was not conducted for individual lots across the site. These chemicals are expected to be stored in working sheds and/or workshops which were targeted as part of the site inspection (Section 5).

4.6 Previous Environmental Investigations

SESL is unaware of any previous environmental investigations of the site that have been conducted.

4.7 Current Land Use and Associated Practices

The site has historically been used for agricultural purposes. Crops, pasture, woodlands, dams, rural residences and farm sheds are common site features throughout the area.

Activities associated with farming practices that may result in contamination may include, but are not limited to chemical storage, grain storage, maintenance sheds, pesticide use and livestock dips. Contaminants associated with these activities can include heavy metals, organochlorine pesticides (OCPs) and organophosphate pesticides (OPPs). Hazardous building materials including asbestos containing materials and lead paint may be present on site structures and surrounds due to their age. A limited number of features of interest were identified during the site inspection that may pose a risk (Section 5).

4.8 Integrity Assessment

The integrity of information provided in the PSI is considered reliable. The PSI followed appropriate methods of investigation with the desktop survey being consistent with field observations and anecdotal evidence presented. Details regarding the site history and present status of the site have been largely obtained from official records sourced from the GSC, NSC, EPA and NSW Land and Property Information Division. These documents are considered accurate and credible. All information provided, as part of this report was believed to be true, accurate and representative of the past and present status of the site at the time of this investigation.

5 FEATURES OF INTEREST

5.1 Site Reconnaissance

Two inspections of the site were undertaken by SESL on 25 January 2017 and 31 August 2017 to support the findings of the desktop review and identify site characteristics that may be suggestive of site contamination. Some parts of the site were inaccessible, limiting the ability to identify potentially contaminated areas through visual inspection.

The feature of interest inspections were aimed at investigating the features of interest identified from aerial photographs (Section 4.2). Site conditions and any potential for contamination from the visual inspection of each of these features of interest are described below.

The features of interest described below are shown on Figures 3a and 3b. Photographs taken during the site inspections are included in Appendix A.

5.1.1 Feature of Interest One

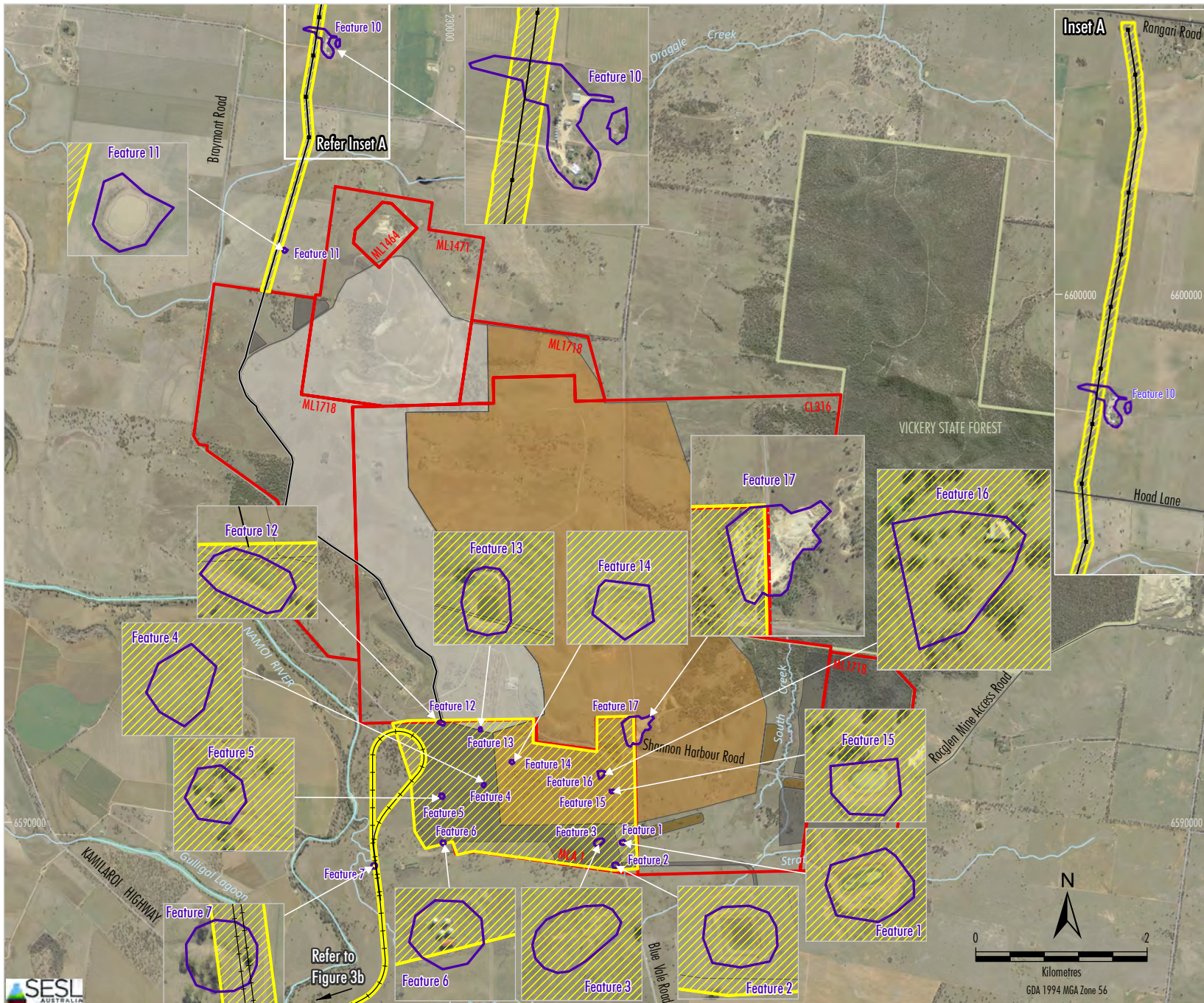
The feature is located inside the site extent (within the Mine Site Investigation Area [Figure 3a]). This feature was selected based on a review of aerial photographs which indicated a dam was present in the area. During the site inspection (31/08/2017) the feature was observed to be a farm dam, likely utilised for agricultural activities. No imported fill or rubbish was observed within the structure or vicinity of the dam. No land contamination concerns were identified.

5.1.2 Feature of Interest Two

The feature is located inside the site extent (within the Mine Site Investigation Area [Figure 3a]). This feature was selected based on a review of aerial photographs which indicated a dam was present in the area. During the site inspection (31/08/2017) the feature was observed to be a farm dam, likely utilised for agricultural activities. No imported fill or rubbish was observed within the structure or vicinity of the dam. No land contamination concerns were identified.

5.1.3 Feature of Interest Three

The feature is located inside the site extent (within the Mine Site Investigation Area [Figure 3a]). This feature was selected based on a review of aerial photographs which indicated a bare patch/vegetation stress within the pasture. During the site inspection (31/08/2017), this area was observed to be a rocky hillside, with cobbles pebbles, and was characterised by limited grass. No land contamination concerns were identified.



- LEGEND**
- Mining Tenement Boundary (ML and CL)
 - Mining Lease Application (MLA)
 - State Forest
 - Railway
- Project Components**
- Indicative Extent of Open Cut
 - Indicative Extent of Out of Pit Waste Rock Emplacement
 - Indicative Extent of Infrastructure Area
 - Indicative Extent of Soil Stockpile
 - Indicative Rail Spur Alignment
 - Indicative Location of Groundwater Bores and Pipeline
 - Investigation Area
 - Extent of Feature of Interest

Source: Orthophoto - Department of Land and Property Information, Aerial Photography Flown (July 2011); Department of Industry (2015); SESL (2018); Google Earth (2016)


VICKERY EXTENSION PROJECT
Features of Interest - Mine Site Investigation Area and Borefield Investigation Area

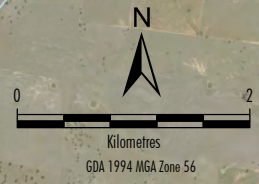
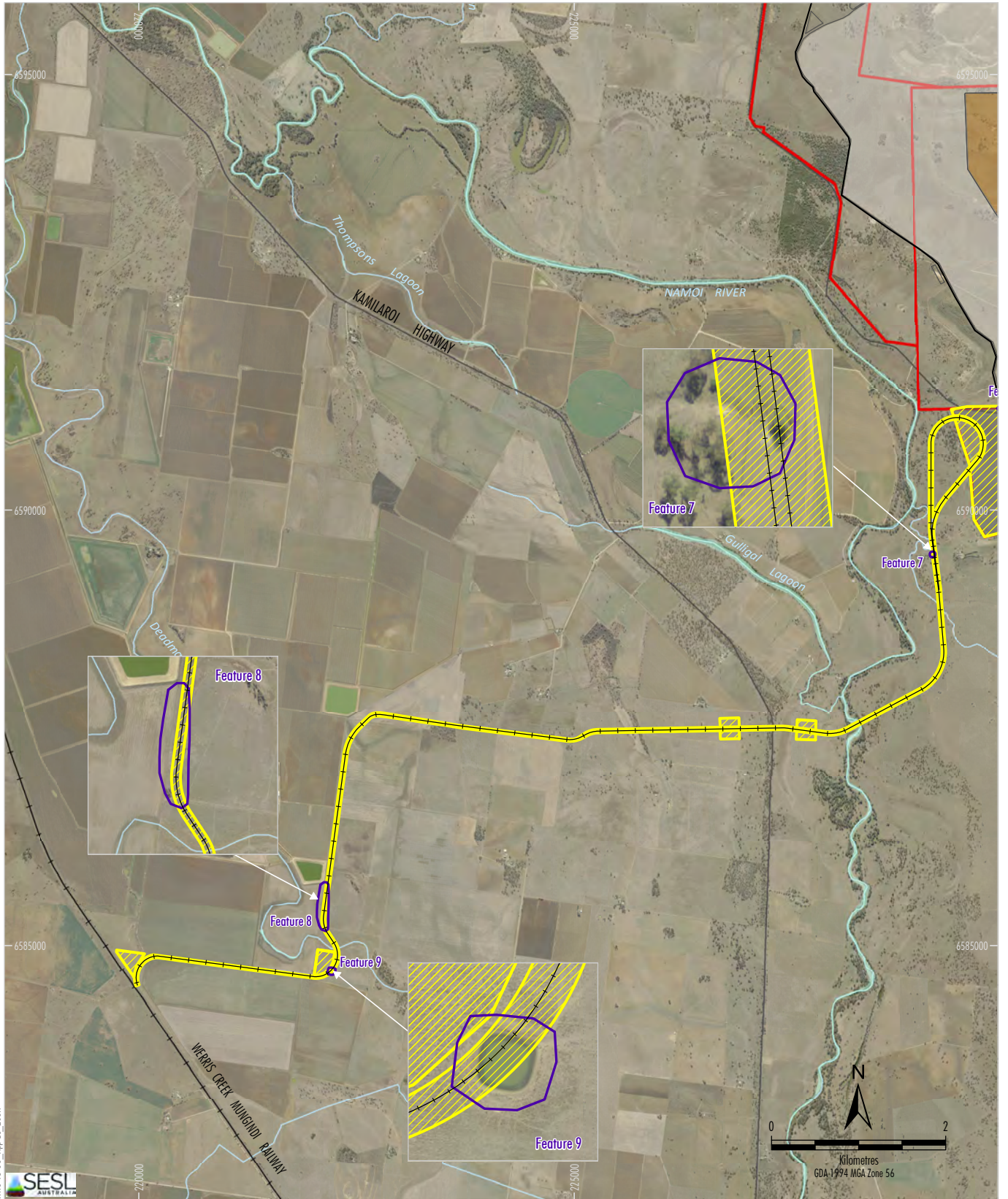


Figure 3a



VHC 15-33_App LC_202H



LEGEND

- Mining Tenement Boundary (ML and CL)
- Project Components**
- Indicative Extent of Open Cut
- Indicative Extent of Out of Pit Waste Rock Emplacement
- Indicative Extent of Infrastructure Area
- Indicative Rail Spur Alignment
- Indicative Location of Groundwater Bores and Pipeline
- Investigation Area
- Extent of Feature of Interest

Source: Department of Industry (2015)
 Orthophoto - Department of Land and Property Information,
 Aerial Photography Flowm (July 2011); SESL (2018);
 Google Earth (2016)



VICKERY EXTENSION PROJECT
Features of Interest -
Rail Spur Investigation Area

Figure 3b

5.1.4 Feature of Interest Four

The feature is located inside the site extent (within the Mine Site Investigation Area [Figure 3a]). This feature was selected based on a review of aerial photographs which showed discolouration from an unknown source. During the site inspection (31/08/2017), this area was observed to be a clear bare patch amongst pastures at the site. It was noted that there was evidence of potential ash and cement slurry within the bare patches. Overall, SESL considers that the risk of any land contamination concerns being present at this Feature of Interest is low. However, limited surface soil analysis is required to confirm an absence of contaminants of concern requiring remediation.

5.1.5 Feature of Interest Five

The feature is located inside the site extent (within the Mine Site Investigation Area [Figure 3a]). This feature was selected based on a review of aerial photographs that indicated that man-made structures exist within the area, likely water tanks or grain storage silos. Inspection of this feature (31/08/2017) identified two tanks, one plastic and one concrete and a windmill. Additionally, various pieces of farming scrap were identified within the vicinity, including scrap metal and wire fencing. Following the site inspection, SESL considers that a Detailed Site Investigation (DSI) of this feature should be conducted to determine if any land contamination requiring remediation is present.

5.1.6 Feature of Interest Six

The feature is located inside the site extent (within the Mine Site Investigation Area [Figure 3a]). This feature was selected based on a review of aerial photographs that indicated that man-made structures exist within the area, likely water tanks or grain storage silos. Inspection of this feature (31/08/2017) identified four derelict grain silos within the area. Metal waste was present on the surface, with significant corrosion observed. Additionally, a generator was observed within the vicinity. Following the site inspection, SESL considers that a DSI of this feature should be conducted to determine if any land contamination requiring remediation is present.

5.1.7 Feature of Interest Seven

The feature is located inside the site extent (within the Rail Spur Investigation Area [Figures 3a and 3b]). This feature was selected based on a review of aerial photographs which showed an unidentifiable impact within the landscape. Inspection of this feature (31/08/2017) identified an in filled gully, where significant volumes of waste had been deposited at an unknown point in time. Wastes present within the gully included metal scrap, discarded car parts, storage drums, fencing, chicken wire, glass timber and bottles. Much of the metal was observed to be significantly corroded. This waste poses a significant risk of contamination within the underlying soils, and requires additional investigation.

Following the site inspection, SESL considers that a DSI of this feature should be conducted to determine if any land contamination requiring remediation is present, and that any waste material is excavated and disposed of off-site.

5.1.8 Feature of Interest Eight

The feature is located partially inside the site extent (within the Rail Spur Investigation Area [Figure 3b]). This feature was selected based on a review of aerial photographs which showed discolouration within the soil/vegetation within the area, when compared with the surrounding landscape. This area was unable to be accessed at the time of the site assessment. However, Whitehaven has indicated that the discolouration in this area is the result of a clear vegetation change. Photographs have been provided that support this, and suggest that the varying vegetation is the result of the drainage regime in the area (Appendix A).

5.1.9 Feature of Interest Nine

The feature is located partially inside the site extent (within the Rail Spur Investigation Area [Figure 3b]). This feature was selected based on a review of aerial photographs which indicated a farm dam was present in the area. This area was unable to be accessed at the time of the site assessment, however Whitehaven has provided a photograph that confirms this is a farm dam. It is understood the Project rail spur alignment would be designed to avoid the farm dam that intersects with Rail Spur Investigation Area. However, if the final Project rail spur alignment was to intersect the farm dam it would require dewatering and infilling in accordance with appropriate erosion and sediment control measures, and an inspection of this dam should be conducted to ensure no contamination issues are present, prior to work being undertaken.

5.1.10 Feature of Interest Ten

The feature is located partially inside the site extent (within the Borefield Investigation Area). This feature consists of a large homestead and ancillary structures (generally sheds) associated with the agricultural activities on the greater property. The site inspection (25/01/18) identified a number of sheds (containing various pieces of farm equipment and other equipment and metal waste), vehicles, farm tools, fuel tanks, a generator and fill material. It is noted that the majority of the structures identified during the site inspection are not within the investigation area or would not be disturbed by the Project. Accordingly, SESL considers that a DSI should be conducted for the area of the feature to be disturbed by the Project, to determine if any land contamination requiring remediation is present.

5.1.11 Feature of Interest Eleven

The feature is located outside the site extent (adjacent to the Borefield Investigation Area [Figure 3a]) and would be avoided by the Project. Inspection of this feature (25/01/2017) identified the expected disturbance as being localised compaction from animal movements around a farm dam. No land contamination concerns were identified during the site inspection of this feature.

5.1.12 Feature of Interest Twelve

The feature is located inside the site extent (within the Mine Site Investigation Area [Figure 3a]). Inspection of this feature (25/01/2017) identified the expected disturbance as being localised compaction from animal movements around a farm dam. No land contamination concerns were identified.

5.1.13 Feature of Interest Thirteen

The feature is located inside the site extent (within the Mine Site Investigation Area [Figure 3a]). Inspection of this feature (25/01/2017) identified the expected disturbance as being localised compaction from animal movements around a farm dam. No land contamination concerns were identified.

5.1.14 Feature of Interest Fourteen

The feature is located inside the site extent (within the Mine Site Investigation Area [Figure 3a]). Inspection of this feature (25/01/2017) identified the expected disturbance as being localised compaction from animal movements around a farm dam. No land contamination concerns were identified.

5.1.15 Feature of Interest Fifteen

The feature is located inside the site extent (within the Mine Site Investigation Area [Figure 3a]). Inspection of this feature (25/01/2017) identified the expected disturbance as being localised compaction from animal movements around a farm dam. No land contamination concerns were identified.

5.1.16 Feature of Interest Sixteen

The feature is located inside the site extent (within the Mine Site Investigation Area [Figure 3a]). Inspection of this feature (25/01/2017) identified an old farm house. The house was of timber construction with metal roof. The walls, particularly internal walls appeared to be of compressed fibre cement, likely asbestos. A broken fragment of the sheeting was observed on the ground surface around the house. Various metal materials were identified around the house, and along the fence line to the west of the house. These items included farm implements and metal roofing, among other unrecognisable materials.

Following the site inspection, SESL considers that a DSI of this feature should be conducted to determine if any land contamination requiring remediation is present.

5.1.17 Feature of Interest Seventeen

The feature is located partially inside the site extent (within the Mine Site Investigation Area [Figure 3a]). Inspection of this feature (25/01/2017) identified a quarry. The quarry is expected to have been a river stone/pebble quarry, based on the quantity of pebbles on the surface of the site. It is also expected to have involved the excavation of shallow rock deposits, as the disturbed areas tended to have only shallow excavations. No equipment associated with quarry activities were observed on the site. No evidence of landfilling was observed. Minor amounts of concrete waste were observed in one location, possibly due to opportunistic dumping, or the removal of former site infrastructure at the cessation of quarry activities. No land contamination concerns were identified.

5.2 Further Investigation of Features of Interest

Based on the features of interest inspected as part of this investigation, SESL recommends that further investigation is required to determine the presence and/or extent of the contamination present within the vicinity of these features. Further investigation should be conducted through the undertaking of a DSI. This investigation should include intrusive soil sampling & analysis, required to investigate the contaminants of potential concern associated with the features, as discussed above. Limited surface soil sampling should be conducted in low risk areas.

6 RELEVANT GUIDELINES FOR CONTAMINATION ASSESSMENT AND MANAGEMENT

6.1 Relevant Guidelines

Assessment criteria will be based on guidelines made or approved by the EPA under section 105 of the CLM Act. These include EPA's Contaminated Sites series of guidelines, and fundamental guideline documents such as the *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites* (ANZECC and NHMRC, 1992) and the NEPM.

The NEPM incorporates a recommended general process for the assessment of site contamination and a set of 9 specific guidelines. The process and guidelines are closely based on previous documentation widely used for assessing site contamination (such as ANZECC/NHRMC [1992] and the various National Environmental Health Forum monographs and proceedings [Imray and Langley, 1999]). Assessment criteria have been drawn from other guidelines and information sources, if not available in the above guidelines.

6.2 Proposed Development

The Project would include the redevelopment of predominantly agricultural land (including former mining land) to allow for a physical extension to the Approved Mine, construction of a train load-out facility and Project rail spur, development of a borefield and its associated infrastructure and other Project components.

6.3 National Environmental Protection (Assessment of Site Contamination) Measure 1999

The NEPM provides a national framework for conducting assessments of contaminated sites in Australia.

The purpose of the NEPM is to establish a nationally consistent approach to the assessment of site contamination to ensure sound environmental management practices by the community which includes regulators, site assessors, environmental auditors, landowners, developers and industry.

The NEPM addresses assessment of contamination, and does not provide specific guidance on prevention of site contamination. The desired environmental outcome for the NEPM is to provide adequate protection of human health and the environment, where site contamination has occurred, through the development of an efficient and effective national approach to the assessment of site contamination.

Schedule A in the NEPM outlines the recommended general process for assessment of site contamination, with reference to Schedules B (1) to B (9) for guidance on each step of the process.

In broad terms, the assessment process as provided in Schedule A can be described as:

- Tier 1 PSI Preliminary investigation, laboratory analysis and interpretation, and assessment of results with reference to investigations levels.
- Tier 1 DSI Where required, detailed investigation, laboratory analysis and interpretation is completed, and the need for risk assessment to derive response levels and/or the need for remediation is evaluated.
- Tier 2 or 3 Site-specific risk assessment to confirm/define appropriate health and Ecological Investigation Levels (EILs).

Overarching guidance is provided on community consultation and risk communication, protection of health and safety during assessment of site contamination, and expected competencies of environmental auditors and related professionals.

The NEPM provides a framework for the use of investigation and screening levels for the protection of human health, ecosystems, groundwater resources and aesthetics. Investigations levels and screening levels are applicable to the Tier 1 site assessment. The adopted investigation and screening levels for this assessment is as follow:

- i) Health Investigation Levels (HILs);
- ii) Health Screening Levels (HSLs);
- iii) EILs; and
- iv) Ecological Screening Levels (ESLs).

Tables from the NEPM relevant to the following sub-sections have been reproduced in Appendix E.

6.3.1 Health Investigation Levels (HILs)

HILs are scientifically based, generic assessment criteria designed to be used in the Tier 1 assessment for assessing human health risk via all relevant pathways of exposure. HILs are designed to be intentionally conservative and based on a reasonable worst-case scenario for the following generic land use settings:

- A Residential with garden/accessible soil (home grown produce contributing less than 10% of vegetable and fruit intake; no poultry) this category includes children’s day-care centres, preschools and primary schools.
- B Residential with minimal opportunities for soil access, including dwellings with fully and permanently paved yard space such as high-rise apartments and flats.
- C Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. It does not include undeveloped public open space (such as urban bushland and reserves), which should be subject to a site-specific assessment where appropriate.
- D Commercial/industrial includes shops and offices as well as factories and industrial sites.

The site is predominantly agricultural land with some residential uses, which are considered a sensitive land use. Future assessments should consider whether a non-residential HIL setting (i.e. less stringent assessment criteria) should be adopted for the Project rail spur given its proposed land use.

The NEPM Schedule B7 defined the HILs as the concentration of a contaminant that if exceeded will require further appropriate investigation and evaluation. It is also stated “levels in excess of the HILs do not imply unacceptability or that a significant health risk is likely to be present”.

The NEPM Schedule B7 states at the very least, the maximum and the 95% upper confidence limit (UCL) of the arithmetic mean contaminant as well as localised elevated values must be compared to the HILs. Two additional (secondary) criteria should also be met, namely that the standard deviation of the results must be <50% of the relevant investigation level and that no single value exceeds 250% of the relevant investigation level.

The NEPM also states that the HILs are not intended to be used as clean-up levels for contaminated sites. The requirement of clean-up should be based on site-specific assessment and risk management options. As no analysis was conducted during this PSI, no HILs have been adopted.

6.3.2 Health Screening Levels (HSLs)

6.3.2.1 Petroleum Hydrocarbon Compounds

The NEPM adopts the HSLs for various petroleum hydrocarbon compounds developed by the CRC CARE. Friebel and Nadebaum (2011) provides the methodology for assessing human health risk via the inhalation and direct contact pathways of selected petroleum compounds and fractions.

The HSLs apply to the same land use scenarios with additional consideration of soil texture and depth to determine the appropriate soil, groundwater and soil vapour criteria.

The NEPM provides HSL fractions and corresponding equivalent carbon range for petroleum hydrocarbon compounds (see Table 4). HSLs are given only for F1, F2 and Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) as the heavier petroleum compounds of F3 and F4 are non-volatile and do not pose a concern for vapour intrusion. However exposure can be via direct contact pathways (dermal contact, incidental oral ingestion and dust in halation). Friebel and Nadebaum (2011) provides the HSLs for direct contact, however for most site assessments, these levels are unlikely to trigger further investigation or site management as the values are substantially higher than most soil screening levels.

Table 4 - HSL Fractions and Corresponding Equivalent Carbon Range

Fraction Number	Equivalent Carbon Number Range
F1	C ₆ – C ₁₀
F2	>C ₁₀ – C ₁₆
F3	>C ₁₆ – C ₃₄
F4	>C ₃₄ – C ₄₀

Source: The NEPM.

As aforementioned, HSLs for soil, groundwater and soil vapor have been developed based on soil texture. The HSLs assume a uniform soil profile and the highest proportion of the soil texture from the soil profile should be used selecting the appropriate HSLs. For Tier 1 soil assessment, the HSL classifications of sand, silt and clay may be broadly applied to soil texture classification in Table A1 of Australian Standard 1726 as follows:

- i) Coarse grained soil: >50% of particles (by weight) <63 millimeters (mm) and >0.075mm:
 - Sand: >50% of particles (by weight) <2.36mm; or
 - Gravel: >50% of particles (by weight) >2.36mm.
- ii) Fine-grained soil: >50% of particles (by weight) <0.075mm:
 - Silts and clays (liquid limit >50%);
 - Silts and clays (liquid limit <50%); or
 - Highly organic soils.

6.3.2.2 Asbestos

The NEPM adopted the HSLs from the WA DoH *Guidelines of Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (WA DoH, 2009). The HSLs are based on scenario-specific likely exposure levels, which include bonded and friable asbestos levels.

Asbestos only poses human health risk when asbestos fibres are made airborne and inhaled. Bonded asbestos is not readily made airborne except through substantial physical damage. The NEPM states “the assessment and management of asbestos contamination should take into account the condition of the asbestos materials and the potential for damage and resulting release of asbestos fibres”.

The HSLs are to be used for Tier 1 assessment, in the event of an exceedance that triggers the need for a Tier 2 site-specific assessment. Site-specific assessments of asbestos contaminated sites should be designed to describe the nature and quantity of asbestos present in the soil that can sufficiently develop a risk management plan for the current and proposed land use of the site.

6.3.3 *Ecological Investigation Levels (EILs)*

EILs have been developed for assessing risk to terrestrial ecosystem for common contaminants in soil (Table 5). The EILs are derived for specified levels of species protection depending on land use and are principally applied to the top 2 m of the soil.

Table 5 – EILs Land Use Criteria and Protection Levels

Land Use	Levels of Protection
Areas of ecological significance	99%
Urban residential areas and public open space (HIL A, B and C)	80%
Commercial and industrial	60%

Schedule B5 of the NEPM provides the EILs for Arsenic, Copper, Trivalent Chromium, DDT, Naphthalene, Nickel, Lead and Zinc. The methodology to derive the EILs considers the physicochemical properties of soil and contaminants and the capacity of the local ecosystem to accommodate increases in contaminant levels above ambient background.

EILs are obtained by summing added ambient background concentration (ABC) and added contaminant limit (ACL). ABC is the soil concentration in a specified locality that is the total of naturally occurring background level and the contaminant levels that have been introduced by general anthropogenic sources. ACL is the added concentration above the ABC of a contaminant which requires further investigation on the impact on ecological values.

The derivation of EILs takes into consideration the ageing of contamination (>2 years) and soil properties as the toxicity of soil contaminants will reduce over time. Values for ACL based on pH, cation exchange capacity (CEC) and exposure scenario are provided for Lead, Zinc, Copper, Nickel and Trivalent Chromium. This method of deriving EILs only applies to metals and metalloids, with the exception of Arsenic.

Methodology for Tier 2 site-specific assessments to determine site-specific EILs is provided in Schedule B5(b) of the NEPM.

6.3.4 Ecological Screening Levels (ESLs)

ESLs haven been developed for selected petroleum hydrocarbon compounds to assess risk to terrestrial ecosystem. The ESLs adopts the same four fractions from the HSLs (Table 4), however the soil texture standards are only divided into two; coarse or fine.

ESLs were adopted based on a review of Canadian guidance, a risk based total petroleum hydrocarbon (TPH) standards for human health and ecological aspects for various land uses in the *Canada-wide Standard for Petroleum Hydrocarbons (PHC) in Soil* (Canadian Council of Ministers of the Environment, 2008).

6.4 Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC/NHMRC, 1992)

The *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites* (ANZECC/NHMRC, 1992) provide a risk management approach consistent with the attainment of environmental outcomes described in the NEPM.

Contamination of land is defined as the presence in, on or under the land of a substance at a concentration above the concentration at which the substance is normally present in, on or under (respectively) land in the same locality, being a presence that presents a risk of harm to human health or any other aspect of the environment¹.

The objectives of contaminated site remediation (ANZECC/NHMRC, 1992) are to:

1. render a site acceptable and safe for the long term continuation of its existing/proposed use;
2. minimise environmental and health risks both on and off site to acceptable levels; and
3. maximise to the extent practicable, the potential future uses of the site.

The ANZECC/NHRMC (1992) guidelines provides two basic approaches in dealing with contaminated sites.

- i) a strict adherence to a set of preferred soil criteria used to define a condition of contamination and to serve as the standard which sites must meet in order to be considered to have been decontaminated; or
- ii) a more flexible use of pre-determined soil criteria used chiefly to provide guidance as to whether a detailed investigation is required, confirm no further action is needed or provide guidance for clean-up in appropriate circumstances. This approach relies on careful consideration of site-specific data to derive acceptable criteria, which will ensure that public health, local amenity and soil, air water and quality are protected.

¹ CLM Act.

The ANZECC/NHRMC (1992) guidelines concluded that the most appropriate approach for Australia is to adopt the combination of both approaches that incorporates, at a national level a general set of management principles and soil quality guidelines which guide site assessment and may guide site clean-up action, eliminating where appropriate, the need to develop costly site specific criteria. This approach also recognises that every site is different and that in many cases site specific acceptable criteria and clean-up technologies will need to be developed which reflect local conditions.

6.5 SEPP 55 Guidelines

The SEPP 55 Guidelines (DUAP and EPA, 1998) establishes the best practice for managing land contamination through the planning and development control process. The planning and development control process as provided for in the EP&A Act plays an important role in the management of land contamination. The integration of land contamination management into the planning and development control process will:

- ensure that changes of land use will not increase the risk to health or the environment;
- avoid inappropriate restrictions on land use; and
- provide information to support decision-making and to inform the community.

The SEPP 55 Guidelines include:

- a) information to assist in the investigation of contamination possibilities;
- b) a decision making process that responds to the information obtained from an investigation;
- c) information on how planning and development control can cover the issues of contamination and remediation;
- d) a suggested policy approach for planning authorities;
- e) discussion of information management systems and notification and notation schemes, including the use of Section 149 planning certificates notations; and
- f) approaches to prevent contamination and reduce the environmental impact from remediation activities.

The SEPP 55 Guidelines provides consistent statewide planning and development controls for the remediation of contaminated land and ensures the following:

- Land use changes do not occur until planning authorities consider whether the land is contaminated and whether it needs to be remediated to make it suitable for the proposed use.
- Remediation of contaminated land is permissible throughout the State.
- Remediation requires consent only where it has the potential for significant environmental impacts or does not comply with a council’s policy for contaminated land.
- Most remediation proposals which require consent are advertised for public comment.
- All remediation is carried out in accordance with appropriate standards and guidelines.
- Applications for remediation are not refused without substantial justification.
- Councils are notified at commencement and completion of remediation.

6.6 Relevant Legislation

NSW has a comprehensive suite of guidelines relating to assessment and management of contamination, administered under the CLM Act and the EP&A Act. These include the following:

- *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (OEH, 2011);
- *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd edition)* (DEC, 2006);
- *Contaminated Sites: Sampling Design Guidelines* (EPA, 1995);
- SEPP 55 Guidelines (DUAP and EPA, 1998); and
- *Waste Classification Guidelines Part 1: Classifying Waste* (EPA, 2014).

Guidelines approved under the CLM Act also include the *Australian Drinking Water Guidelines* (NHMRC, 2011), *Australian and New Zealand Guidelines for Fresh and Marine Water Quality Guidelines* (ANZECC/ARMCANZ, 2000) and *Guidelines for Managing Risk in Recreational Waters* (NHMRC, 2008).

7 CONCEPTUAL SITE MODEL

A CSM was developed based on the information obtained during the investigation process to allow assessment of potential sources of impact, chemicals of concern, transport mechanism and receptors.

7.1 Sources of Impact

In summary, the sources of impact (Areas of Environmental Concern [AECs]) identified in the areas of assessment include:

- AEC 1: Soil contamination associated with an in filled gully containing metal scrap, discarded car parts, storage drums, fencing, chicken wire, glass timber and bottles (Feature of Interest 7);
- AEC 2: Soil contamination associated with significantly corroded metal waste on the soil surface (Features of Interest 5 and 6);
- AEC 3: Historical use of a generator (Feature of Interest 6);
- AEC 4: Soil contamination associated with the observed vegetation stress/bare patch (Feature of Interest 4);
- AEC 5: Potential asbestos-containing material within and lead paints around old farming building structures (Feature of Interest 16);
- AEC 6: Potential former use and storage of pesticides from farming practices (Feature of Interest 10); and
- AEC 7: Potential for soil contamination from storage of chemicals and machinery in farm sheds (Feature of Interest 10).

In addition to these AECs, potential for filling to the north-east of the existing house at Feature 10 was identified. However, the potential filling is located approximately 200 m from the site extent and therefore would not be disturbed by the Project. As such, the potential filling at Feature 10 is not considered further in this report.

7.2 Contaminants of Concern

Based on the potential sources and the findings of the current investigation, the contaminants of concerns include the following:

- Heavy Metals (As, Cd, Cr, Cu, Pb, Ni, Hg, Zn).
- Polycyclic Aromatic Hydrocarbons (Carcinogenic and Total).
- Total Recoverable Hydrocarbons (TRH).

- BTEX and Naphthalene.
- Volatile Organic Compounds.
- OCPs and OPPs.
- Asbestos.

7.3 Fate and Transport

7.3.1 Transport Medium and Control

The anticipated primary transport media for the migration of contaminants of concern are:

- Migration of contaminated material through erosion and dust during construction works:
 - Any identified contaminated soil materials can be managed during a remediation process prior to or during future construction.
- Surface runoff containing contaminants to open water bodies from workshop and storage sheds:
 - All runoff on site can be managed during future development in the water management plan.
- Inhalation of air-borne asbestos fibres during construction work.
 - Should asbestos be identified, personal protective equipment and dust control can be implemented during future development.
- Groundwater migration through permeable soils.
 - Groundwater contamination risk is low based on the current list of AEC. Should soil contamination be confirmed in further investigations, groundwater may be considered a potential medium risk.

7.3.2 Potential Migration Pathways

There are a number of mechanisms by which identified receptors may come into contact with contaminated sources, including the following:

- Incidental dermal contact or ingestion of impacted soils and surface water.
- Generation of impacted dusts, aerosols or sediments from impacted soils.
- Inadvertent use of contaminated groundwater (low risk based on existing information).
- Surface runoff to open water bodies on site.

7.4 Potential Surrounding Receptors

The potential human receptors are as follows:

- Construction workers during construction being exposed to contaminated soil.
- Workers on site.
- Community members living within vicinity of the site or accessing water sources.
- Visitors to the site.
- Future users of the developed site.

8 CONCLUSION

8.1 Site Characterisation

The historical account and visual inspection at the site has identified the following AECs:

- AEC 1: Soil contamination associated with an in filled gully containing metal scrap, discarded car parts, storage drums, fencing, chicken wire, glass timber and bottles (Feature of Interest 7);
- AEC 2: Soil contamination associated with significantly corroded metal waste on the soil surface (Features of Interest 5 and 6);
- AEC 3: Historical use of a generator (Feature of Interest 6);
- AEC 4: Soil contamination associated with the observed vegetation stress/bare patch (Feature of Interest 4);
- AEC 5: Potential asbestos-containing material within and lead paints around old farming building structures (Feature of Interest 16);
- AEC 6: Potential former use and storage of pesticides from farming practices (Feature of Interest 10); and
- AEC 7: Potential for soil contamination from storage of chemicals and machinery in farm sheds (Feature of Interest 10).

This preliminary assessment was limited to surface visual inspection of features of interest that had been identified from desktop review. Features of Interest 8 and 9 were not accessible at the time of inspection, with photographs for these features provided by the client.

8.2 Summary

Based on the site history review and the visual site inspection, the activities of concern at the site include: historical farming, waste storage, waste in filling, fuel/oil storage and handling and degradation of derelict structures.

Based on this Tier 1 PSI, SESL considers that the following investigation works should be undertaken prior to development that may disturb the features of interest identified in this PSI:

- A DSI should be conducted for Features of Interest 4, 5, 6, 7, 10 and 16 to determine if any land contamination is present that would be disturbed by the Project, and would therefore require remediation. The detail of the additional investigation would vary between each of the Features of Interest, with limited surface soil sampling required in low risk areas.

- Works associated with dams that require infilling should be conducted in accordance with appropriate erosion and sediment control measures.
- Prior to commencing any demolition of the structures on site, a Hazardous Material Survey should be undertaken to assess the potential for lead paints and asbestos-containing material within building structures to allow management/removal actions to be appropriately implemented.

If the outcome of this investigation indicates that any contamination requiring remediation exists at the site, a Remedial Action Plan (RAP) must be developed by a suitably qualified environmental professional to detail appropriate remediation and validation strategies. These strategies must be implemented by appropriately experienced and qualified contractors, to ensure that the site is suitable for the proposed prior to disturbance.

Through implementation of the recommendations above, as well as the development and implementation of a RAP for any sites requiring remediation, it is considered that the site is suitable for the land use change as proposed by the Project.

9 LIMITATIONS

This report only covers the site conditions at the time of the inspections on 25 January 2017 and 31 August 2017. Should there be any variation in the site conditions beyond this date, such as imported fill, chemical spillage, illegal dumping, further assessment will be required.

This report is for the use of the client and any relevant authorities that rely on the information for development applications and approval processes. Any reliance on this report by third parties shall be at such parties' sole risk. This report shall only be presented in full and may not be used to support any other objective other than those set out in the report.

SESL's assessment is necessarily based on the result of limited site investigations and upon the restricted program of visual assessment of the surface and consultation of available records. Neither SESL, nor any other reputable consultant, can provide unqualified warranties nor does SESL assume any liabilities for site conditions not observed, or accessible during the time of investigations.

No site investigations can be thorough enough to provide absolute confirmation of the presence or absence of substances, which may be considered contaminating, hazardous or polluting. Similarly, the level of testing undertaken cannot be considered to unequivocally characterise the degree or extent of contamination on site. In addition, regulatory or guideline criteria for the evaluation of environmental soil and groundwater quality are frequently being reviewed and concentrations of contaminants which are considered acceptable at present may in the future be considered to exceed acceptance criteria. Similar conditions may prevail in regard to site remediation standards as different regulatory mechanisms are developed and implemented.

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10 REFERENCES

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Appendix A

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VIC Level 1, 21 Shields St, Flemington VIC 3031
QLD Level 10, 15 Green Square Cl, Fortitude Valley QLD 4006



Site Photographs			
			
Photo 1.	Feature of Interest 1	Photo 2.	Feature of Interest 3
			
Photo 3.	Feature of Interest 4	Photo 4.	Feature of Interest 5

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VIC 3031

QLD
Level 10
15 Green Square Cl
Fortitude Valley
QLD 4006



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Plant Analysis Council

Site Photographs			
			
Photo 5.	Feature of Interest 5	Photo 6.	Feature of Interest 6
			
Photo 7.	Feature of Interest 6	Photo 8.	Feature of Interest 6

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Site Photographs			
			
Photo 9.	Feature of Interest 7	Photo 10.	Feature of Interest 7
			
Photo 11.	Feature of Interest 8 (Provided by Client)	Photo 12.	Feature of Interest 9 (Provided by Client)

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Photo
% "

Feature 10- Woolshed and associated yards.

Photo
% .

Feature 11- Dam



Photo
%

Feature 11- Dam.

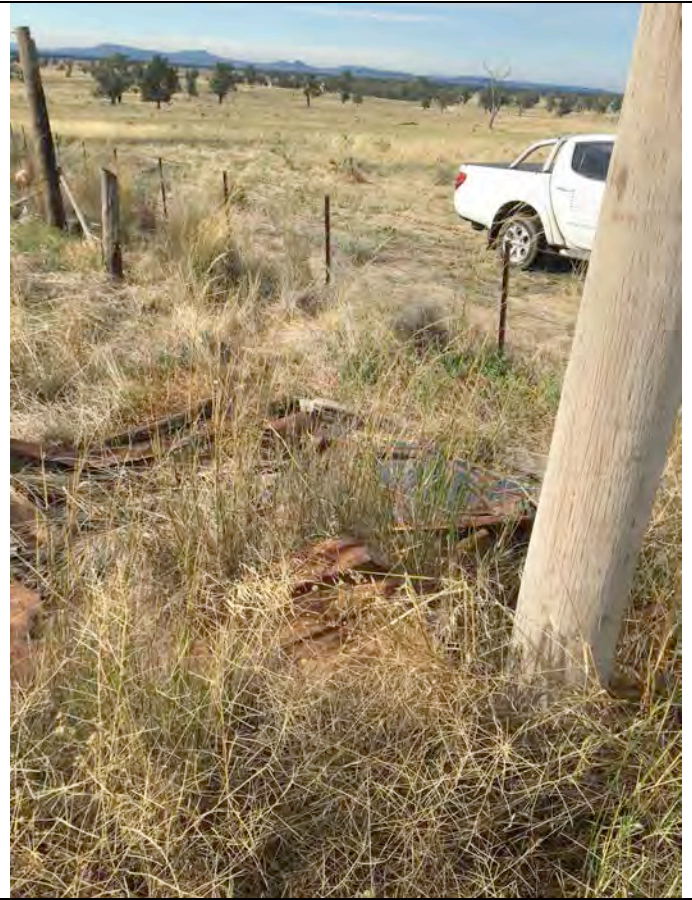


Photo % . Feature 12- Dam

Photo %. Feature -13 Dam.



<p>Photo % .</p>	<p>Feature 14-Dam.</p>	<p>Photo % .</p>	<p>Feature 15- Dam.</p>
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<p>Photo &\$.</p>	<p>Feature 16- Unconsolidated scrap pile-roofing and other material.</p>	<p>Photo &%.</p>	<p>Feature 16- Unconsolidated scrap pile.</p>
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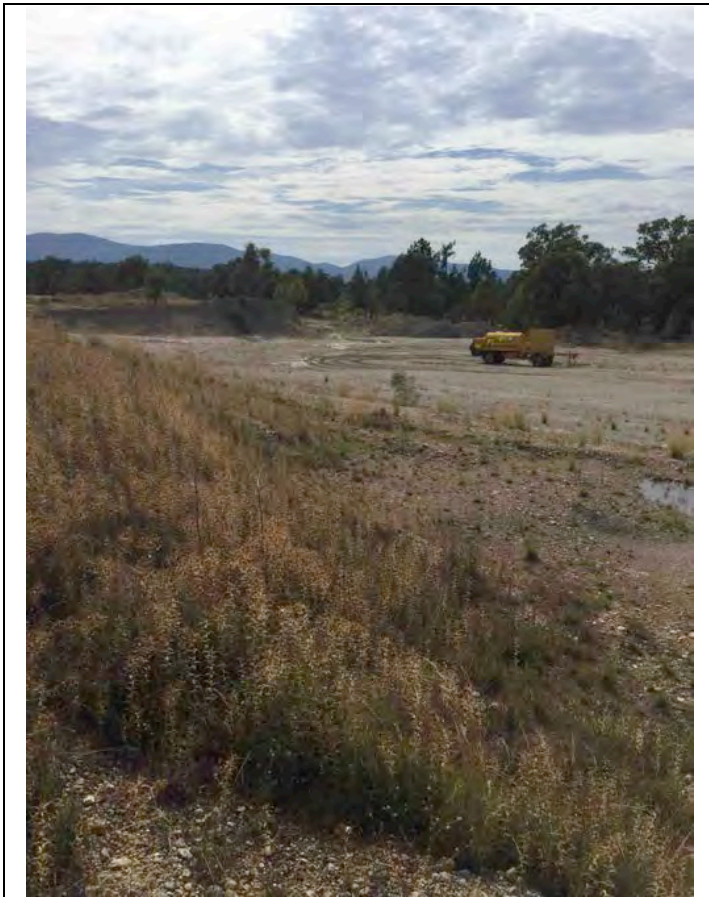
<p>Photo &&</p>	<p>Feature 16- Unconsolidated scrap pile, old agricultural equipment and tank.</p>	<p>Photo & .</p>	<p>Feature 16- Derelict house.</p>
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<p>Photo & .</p>	<p>Feature 16-. Derelict house.</p>	<p>Photo & .</p>	<p>Feature 17- Quarry.</p>
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<p>Photo &*</p>	<p>Feature 17- Quarry.</p>	<p>Photo &+.</p>	<p>Feature 17- Quarry.</p>
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**Photo
& .**

Feature 17-Quarry with tanker trailer

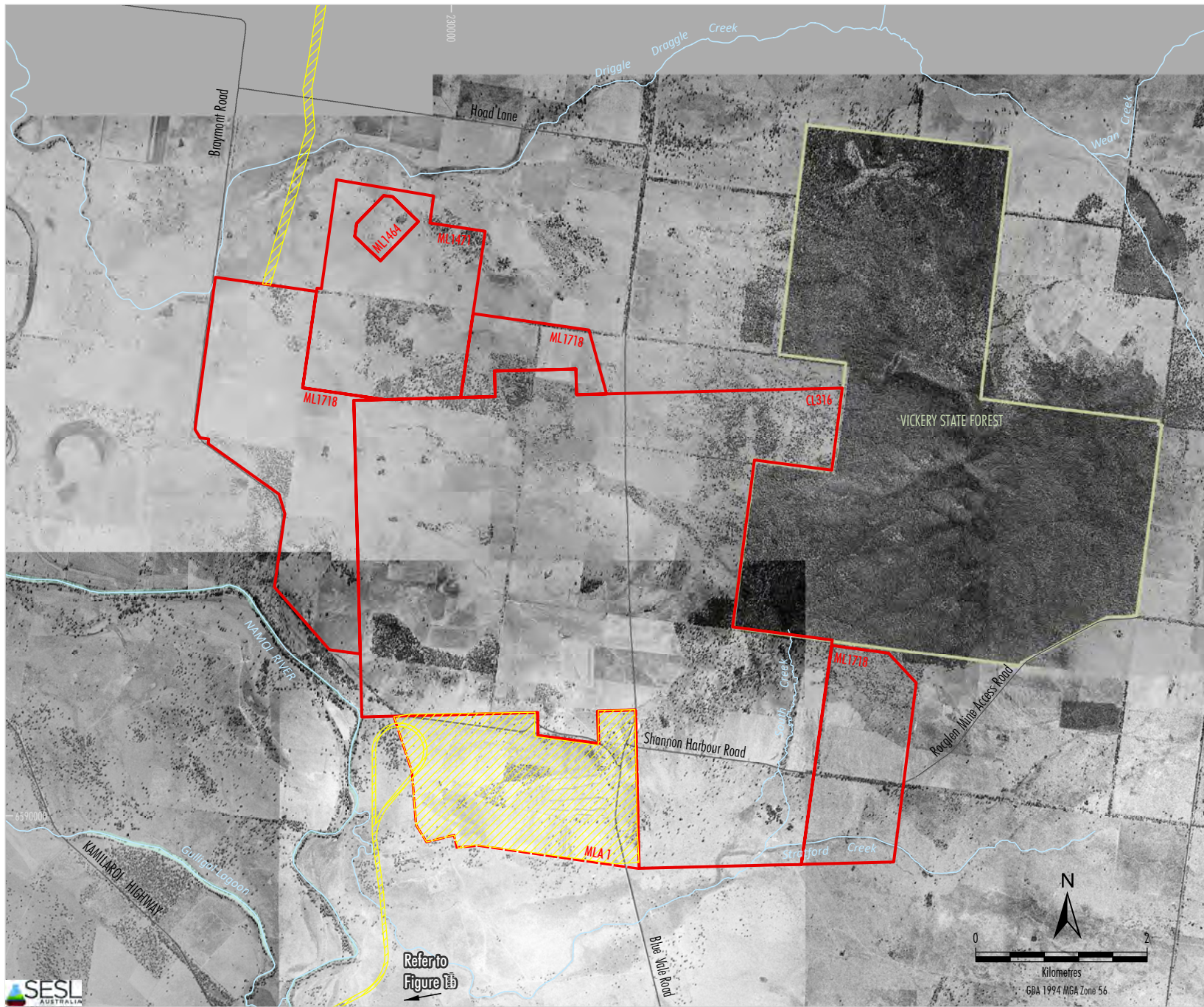
Appendix B

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- LEGEND**
- Mining Tenement Boundary (ML and CL)
 - Mining Lease Application (MLA)
 - State Forest
 - Investigation Area

Source: Orthophoto - Department of Land and Property Information, Aerial Photography Flown (July 2011); Department of Industry (2015); SESL (2018)

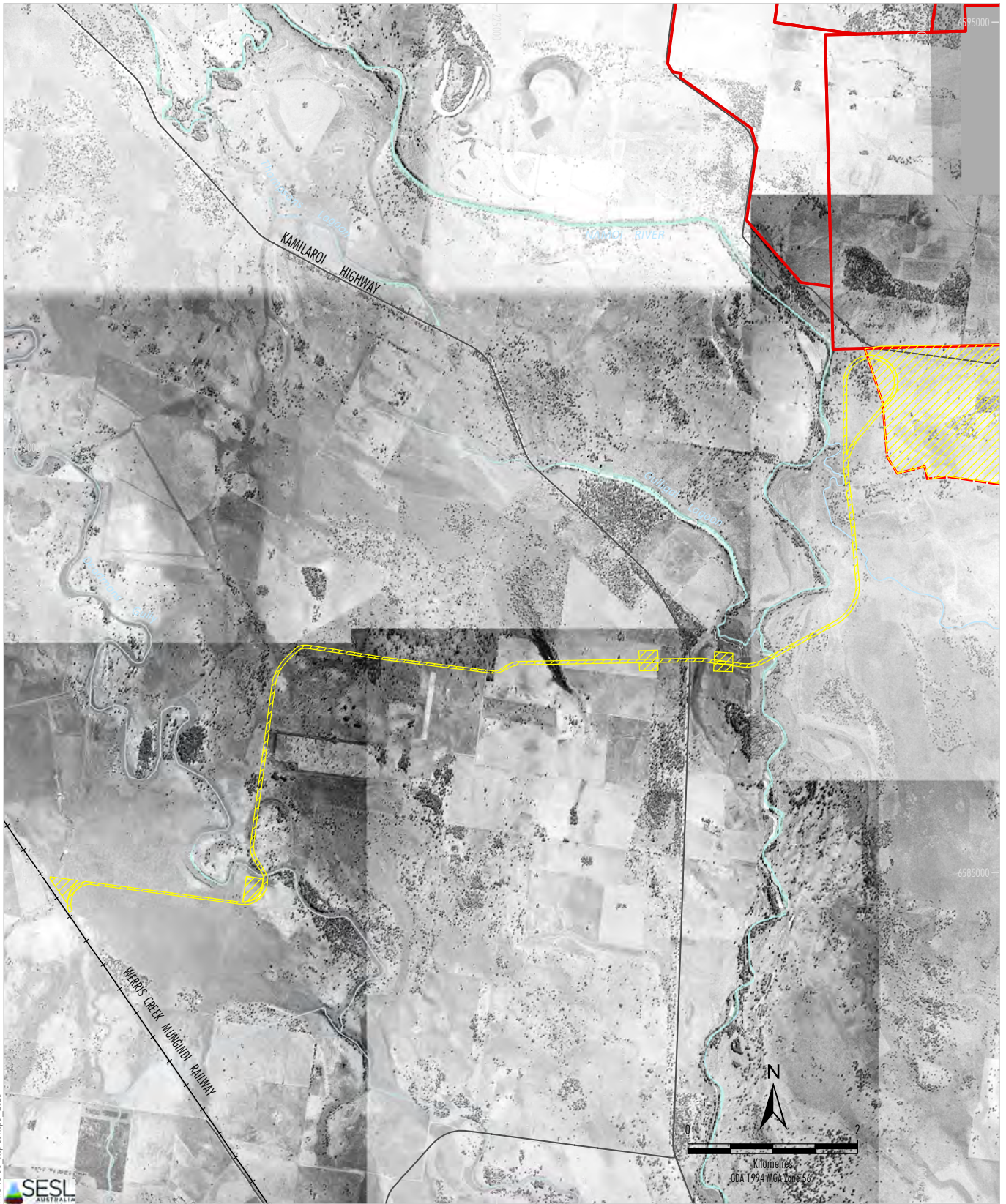


VICKERY EXTENSION PROJECT
 Historic Aerial Photographs
 of the Project Mining Area - 1956



Refer to
 Figure 1b

Figure 1a



WHIC 15-33 App LC April 2020



LEGEND

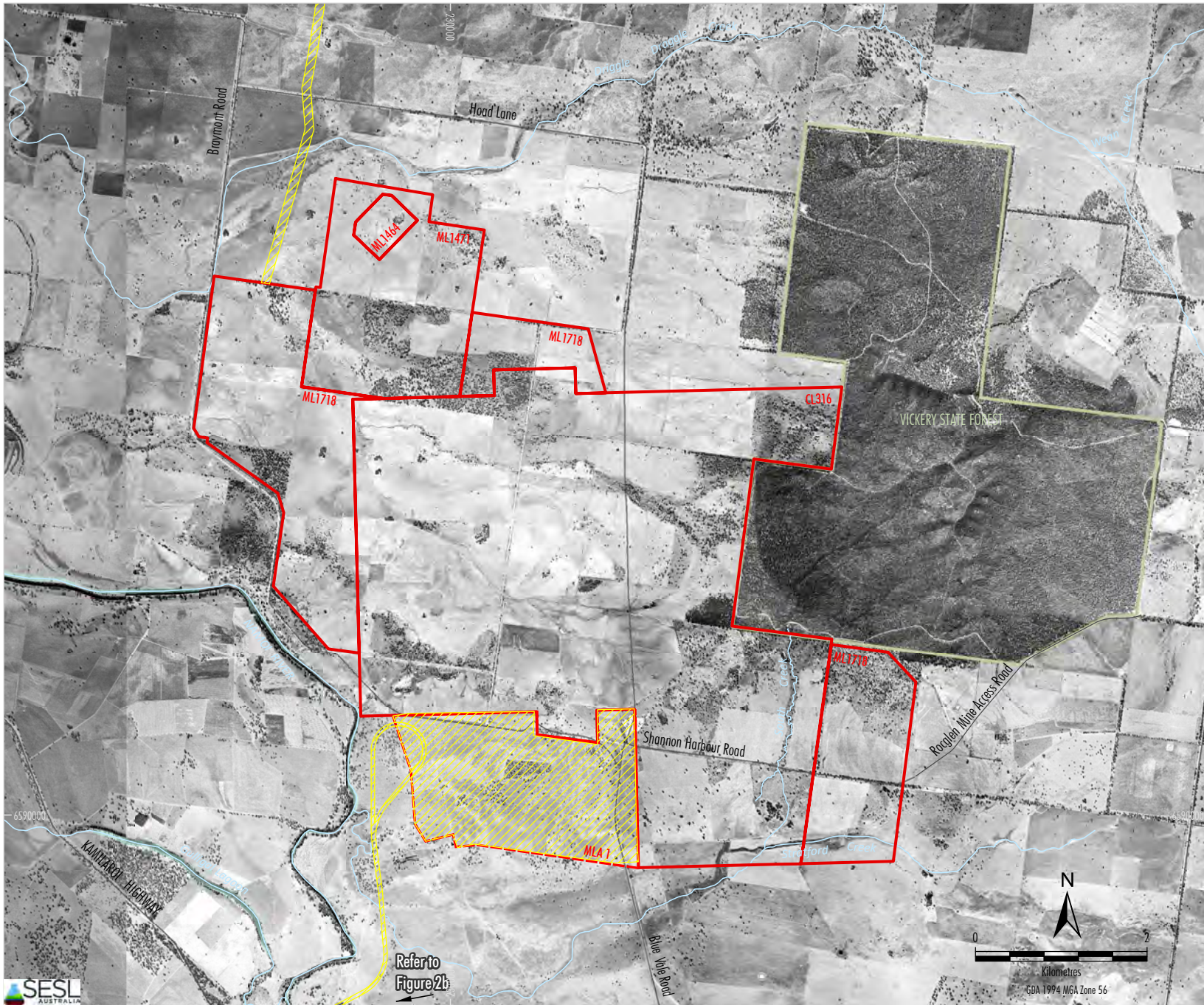
-  Mining Tenement Boundary (ML and CL)
-  Mining Lease Application (MLA)
-  Investigation Area

Source: Department of Land and Property Information, (Aerial Photography); Department of Industry (2015); SESL (2018)



VICKERY EXTENSION PROJECT
Historic Aerial Photographs
along the Project Rail Spur - 1956

Figure 1b



- LEGEND**
- Mining Tenement Boundary (ML and CL)
 - Mining Lease Application (MLA)
 - State Forest
 - Investigation Area

Source: Orthophoto - Department of Land and Property Information, Aerial Photography Flown (July 2011); Department of Industry (2015); SESL (2018)



VICKERY EXTENSION PROJECT
 Historic Aerial Photographs
 of the Project Mining Area - 1975

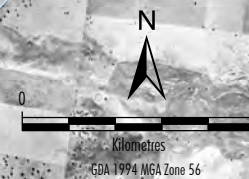
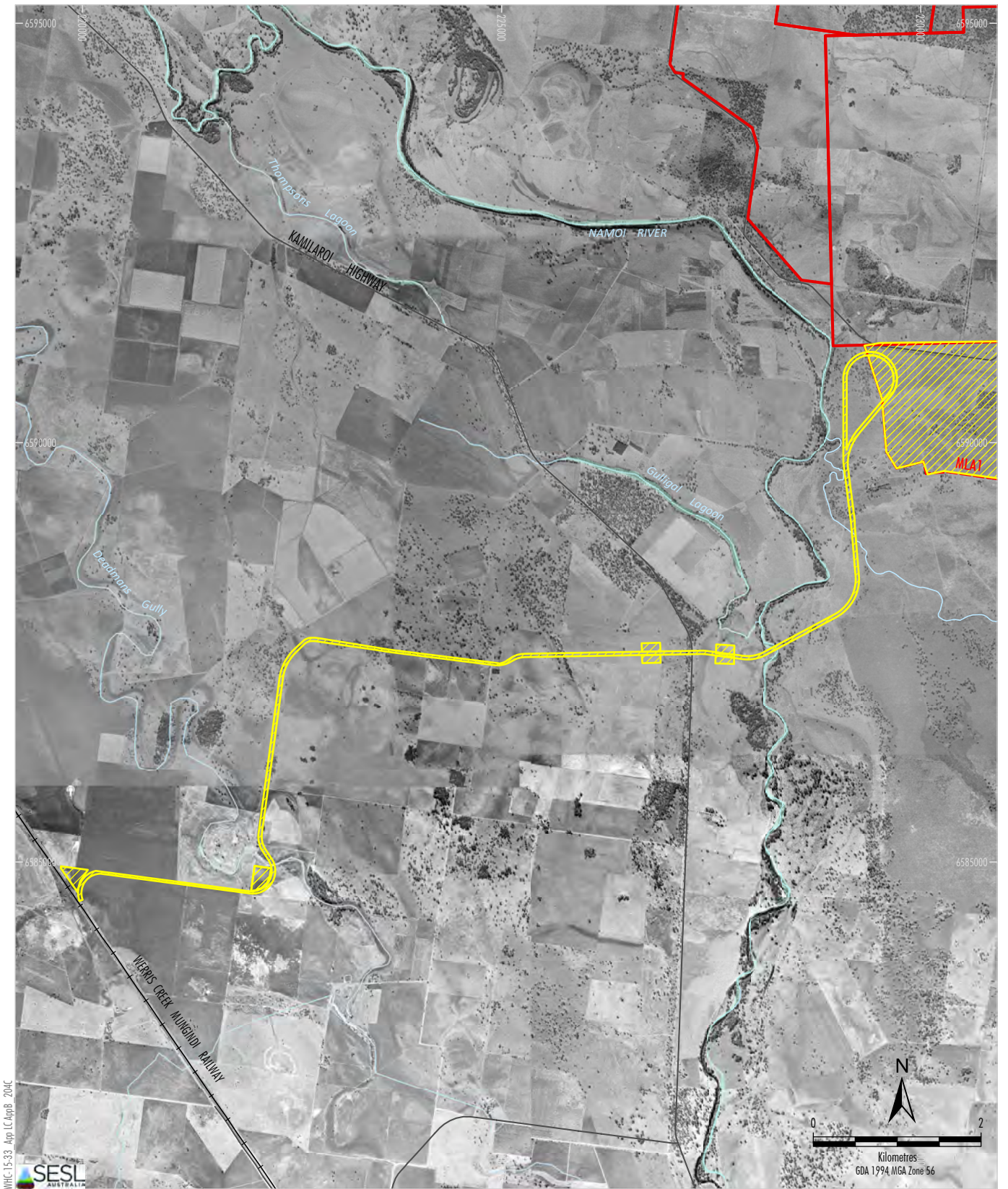


Figure 2a



WHIC 15-33 App LC AppB 201C



LEGEND

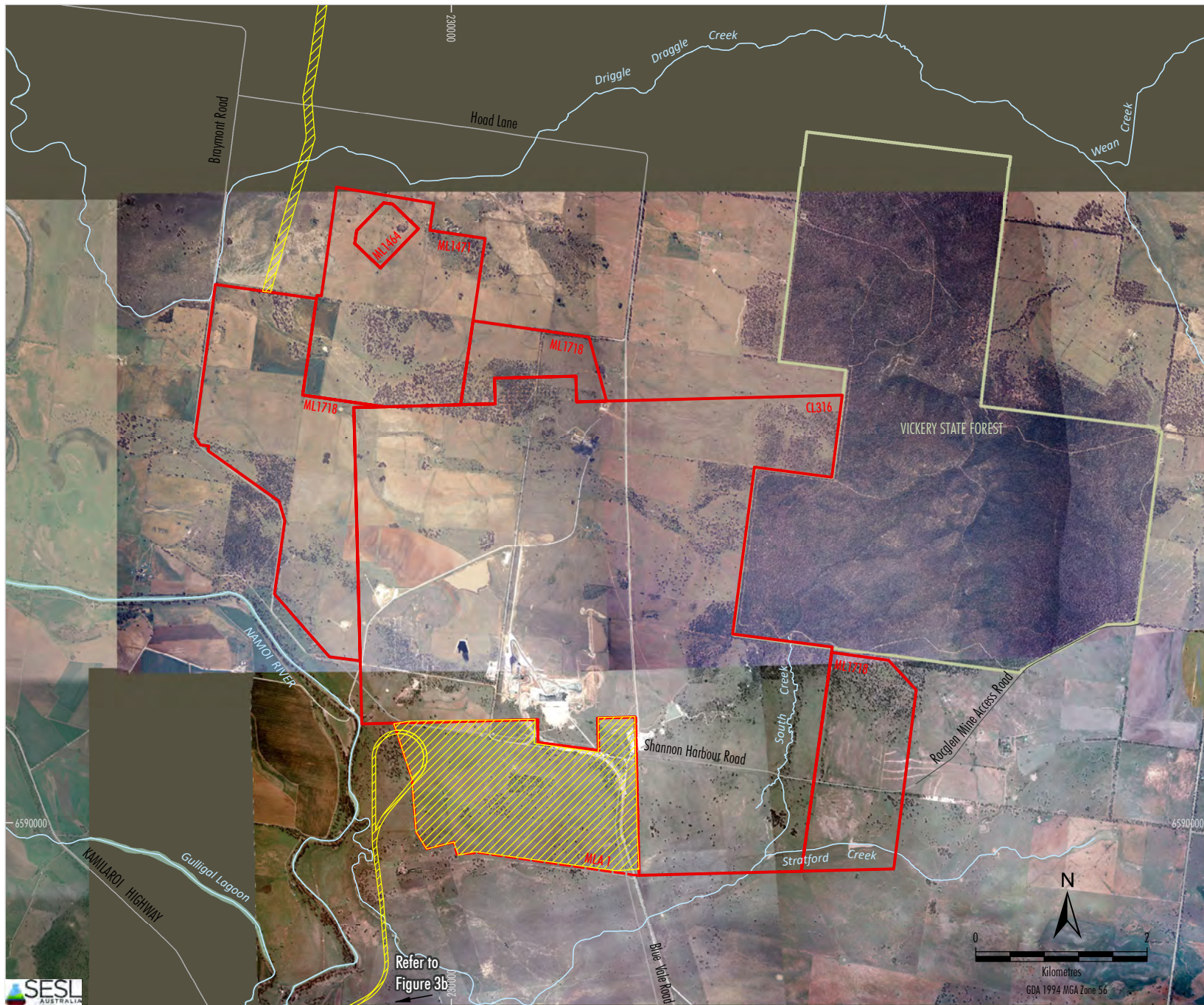
- Mining Tenement Boundary (ML and CL)
- Mining Lease Application (MLA)
- Investigation Area

Source: Department of Land and Property Information, (Aerial Photography); Department of Industry (2015); SESL (2018)



VICKERY EXTENSION PROJECT
 Historic Aerial Photographs
 along the Project Rail Spur - 1975

Figure 2b



- LEGEND**
- Mining Tenement Boundary (ML and CL)
 - Mining Lease Application (MLA)
 - State Forest
 - Investigation Area

Source: Orthophoto - Department of Land and Property Information, Aerial Photography Flown (July 2011); Department of Industry (2015); SESL (2018)



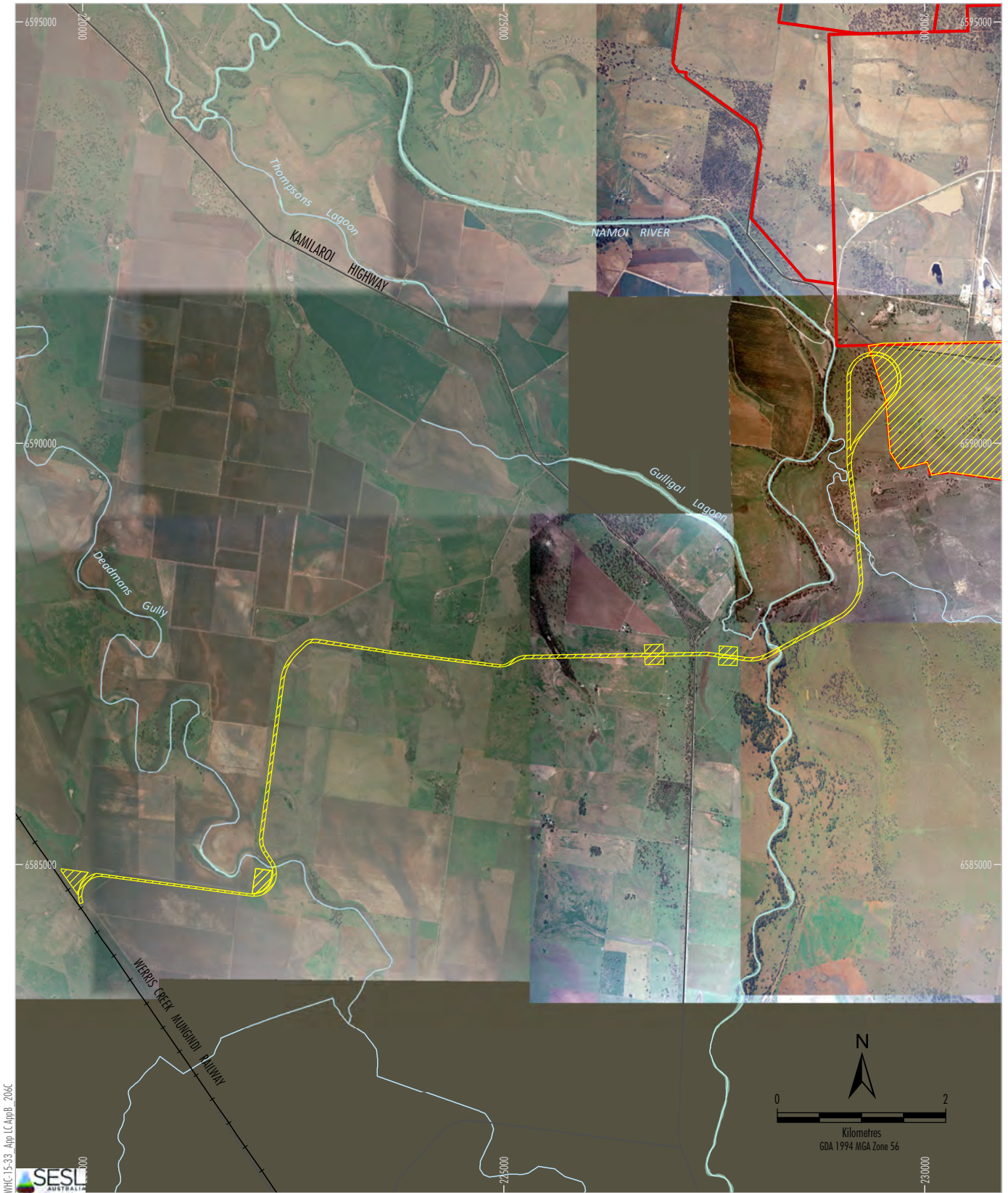
VICKERY EXTENSION PROJECT
 Historic Aerial Photographs
 of the Project Mining Area - 1991



Refer to
 Figure 3b



Figure 3a



WHC 15-33 App LC AppB 206C



LEGEND

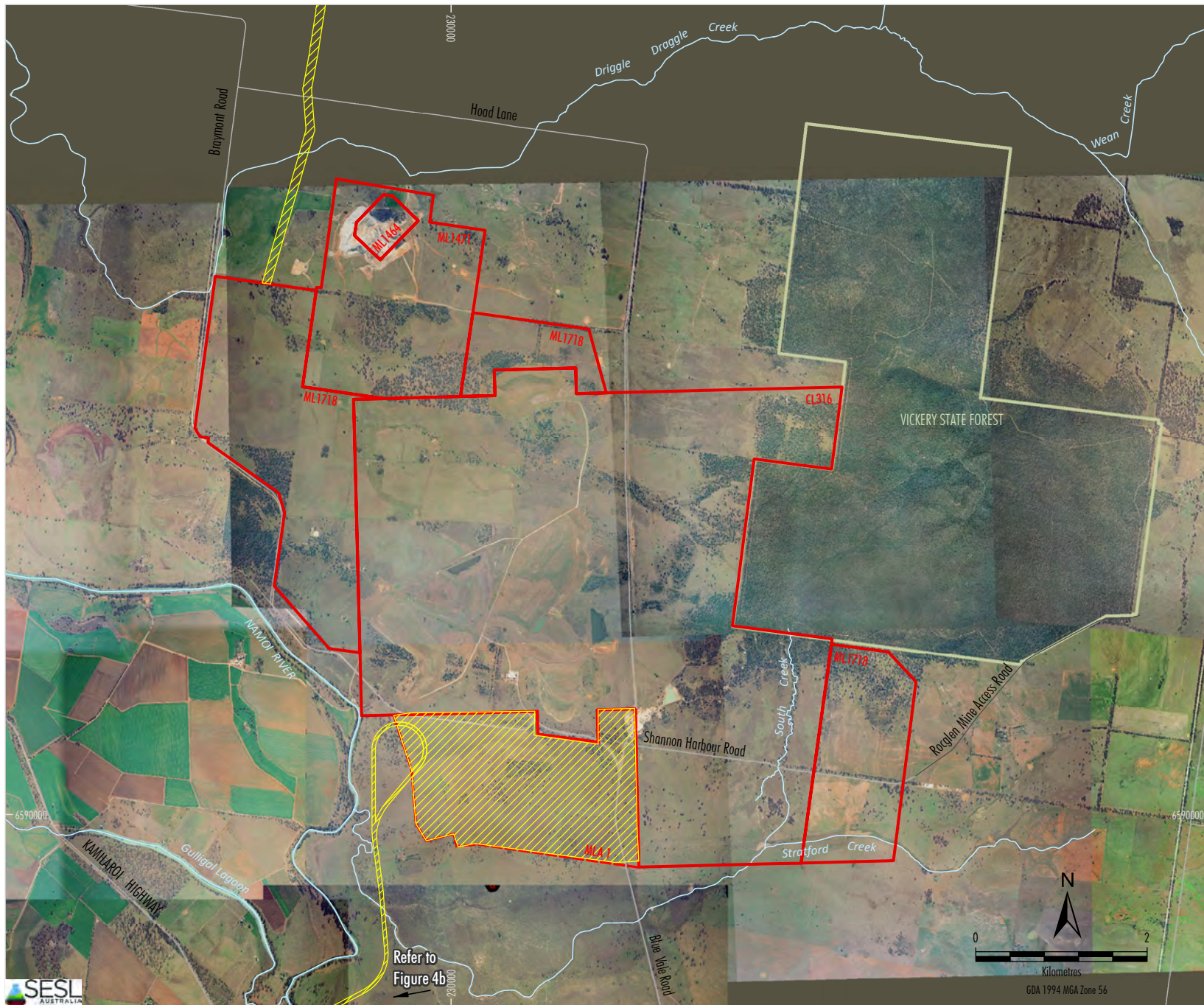
-  Mining Tenement Boundary (ML and CL)
-  Mining Lease Application (MLA)
-  Investigation Area

Source: Department of Land and Property Information, (Aerial Photography); Department of Industry (2015); SESL (2018)



VICKERY EXTENSION PROJECT
Historic Aerial Photographs
along the Project Rail Spur - 1991

Figure 3b



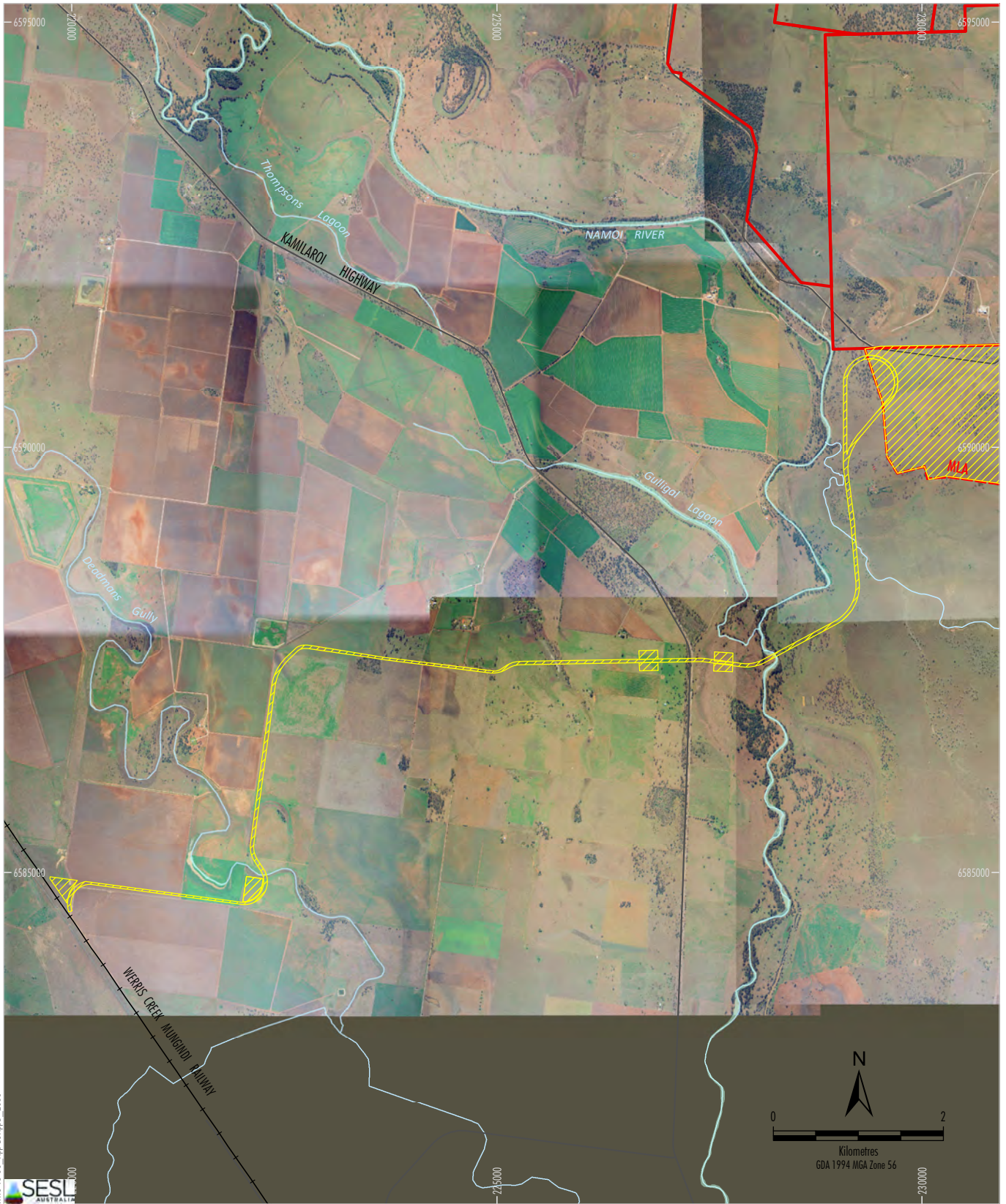
- LEGEND**
- Mining Tenement Boundary (ML and CL)
 - Mining Lease Application (MLA)
 - State Forest
 - Investigation Area

Source: Orthophoto - Department of Land and Property Information, Aerial Photography Flown (July 2011); Department of Industry (2015); SESL (2018)



VICKERY EXTENSION PROJECT
 Historic Aerial Photographs
 of the Project Mining Area - 2001

Figure 4a



WHC 15-33 App LC AppB 200C



LEGEND

-  Mining Tenement Boundary (ML and CL)
-  Mining Lease Application (MLA)
-  Investigation Area

Source: Department of Land and Property Information, (Aerial Photography); Department of Industry (2015); SESL (2018)



VICKERY EXTENSION PROJECT
Historic Aerial Photographs
along the Project Rail Spur - 2001

Figure 4b