



Regional
NSW

South Jerrabomberra Regional Job Precinct

Technical Report - Soils, Geology and
Contamination

26 July 2024

Project No.: 0621304

Document details	
Document title	South Jerrabomberra Regional Job Precinct
Document subtitle	Technical Report - Soils, Geology and Contamination
Project No.	0621304
Date	26 July 2024
Version	03
Author	Sepide Abbasi, Luke Cousins
Client Name	Department of Regional NSW

Document history

Version	Revision	Author	Reviewed by	ERM approval to issue		Comments
				Name	Date	
Draft	01	Sepide Abbasi, Luke Cousins, Anne Ashworth	Peter Lavelle	Mark Davey	14.04.2022	Draft
Final	02	Luke Cousins, Anne Ashworth	Peter Lavelle	Karie Bradfield	19.08.2022	Revised to incorporate comments from stakeholders
Final	03	Jo Woodhouse	Jo Woodhouse	Peter Lavelle	25.07.2024	Update with post-exhibition comments

Signature Page

26 July 2024

South Jerrabomberra Regional Job Precinct

Technical Report - Soils, Geology and Contamination



Sepide Abbasi
Environmental Risk Assessor



Anne Ashworth
Principal Environmental Scientist



Peter Lavelle
Partner

Environmental Resources Management Australia Pty Ltd
Level 14, 207 Kent St
Sydney NSW 2000

© Copyright 2024 by ERM Worldwide Group Ltd and/or its affiliates ("ERM").
All rights reserved. No part of this work may be reproduced or transmitted in any form,
or by any means, without the prior written permission of ERM.

CONTENTS

EXECUTIVE SUMMARY	I
1. INTRODUCTION	1
1.1 Project Background	1
1.2 Investigation Area	1
1.3 Purpose of this report	4
1.4 Objective.....	4
1.5 Scope of Works	4
2. ENVIRONMENT AND PLANNING LEGISLATION	5
2.1 <i>Environmental Planning and Assessment Act 1979 (NSW)</i>	5
2.2 <i>SEPP (Resilience and Hazards) 2021 – replacement of SEPP55</i>	5
2.3 <i>Contaminated Land Management Act</i>	5
3. SITE BACKGROUND REVIEW	6
3.1 Site identification.....	6
3.2 Site Setting	6
3.3 Topography.....	7
3.4 Hydrology.....	7
3.5 Geology	9
3.6 Hydrogeology.....	9
4. PREVIOUS INVESTIGATIONS.....	11
5. SITE INSPECTION	14
6. PRELIMINARY SOIL ASSESSMENT	15
6.1 Soil Landscapes	15
6.2 Salinity and Soil Aggressivity	18
6.2.1 Desktop Review	18
6.2.2 Soil Sampling and Analysis.....	18
6.3 Acid Sulfate Soils.....	18
6.3.1 Desktop Review	18
6.3.2 Soil Sampling and Analysis.....	18
7. PRELIMINARY CONTAMINATION ASSESSMENT	20
7.1 Site History	20
7.1.1 Aerial Photographs	20
7.1.2 Historical Business Records	21
7.2 Past and Present Potentially Contaminating Activities.....	25
7.2.1 NSW EPA Contaminated Land Search.....	25
7.2.2 NSW EPA Contaminated Lands Records of Notice	25
7.2.3 NSW EPA PFAS Investigation Program	25
7.2.4 NSW EPA Former Gaswork Investigation Program	25
7.2.5 National Pollutant Inventory Industrial Facilities.....	25
7.2.6 Licencing under the POEO Act 1997	26
7.2.7 Delicensed Premises Still Regulated by EPA, Licences Surrendered, Clean Up and Penalty Notices	26
7.2.8 Defence / UXO Sites.....	26
7.2.9 Historical Landfills	26
7.2.10 Search of Potentially Contaminating Activities	27
7.2.11 Other Current Potentially Contaminating Activities	27
7.2.12 Derelict Mines and Quarries	28
7.3 Summary of Desktop Review.....	28
7.4 RJP Conceptual site model.....	30

7.4.1	Potential Sources of Contamination.....	30
7.4.2	Potential Pathways	34
7.4.3	Potential Receptors.....	34
7.4.4	Preliminary Conceptual Site Model	35
8.	REVIEW OF MASTERPLAN.....	38
8.1	Review of Masterplan and Potential Constraints	38
8.2	Salinity	38
8.3	Acid Sulfate Soils Potential Constraints	38
8.4	Contamination Potential Constraints.....	38
8.4.1	Potential for Contamination.....	38
8.4.2	Review of the Masterplan	40
9.	CONCLUSIONS AND RECOMMENDATIONS.....	50
APPENDIX A	DESKTOP REVIEW	
APPENDIX B	PHOTOGRAPHIC LOG	

Acronyms and Abbreviations

Name	Description
AHD	Australian Height Datum
AEC	Area of environmental concern
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CHC	Chlorinated Hydrocarbons
CLM	Contaminated Land Management Act 1997
CoPC	Contaminant of Potential Concern
CSM	Conceptual Site Model
DP	Deposited Plan
DPI	Department of Primary Industries
DRNSW	Department of Regional NSW
DSI	Detailed Site Investigation
ERM	Environmental Resources Management Australia Pty Ltd
m	Metre
m bgl	Metres Below Ground Level
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NSW EPA	New South Wales Environment Protection Authority
OCP	Organochlorine Pesticides
OPP	Organophosphorus Pesticides
PACM	Potential Asbestos Containing Material
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated biphenyls
PFAS	Per and Polyfluoroalkyl Substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulphonate
POEO Act	Protection of the Environment Operations Act 1997
PSI	Preliminary Site Investigation
QPRC	Queanbeyan Palerang Regional Council
QPRSC	Queanbeyan Palerang Regional Sports Complex
RJPs	Regional Job Precincts
SAQP	Sampling and Analysis Quality Plan
SVOC	Semi-volatile Organic Compounds
TDS	Total Dissolved Solids
TRH	Total Recoverable Hydrocarbons
VOC	Volatile Organic Compounds

EXECUTIVE SUMMARY

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by the Department of Regional NSW (DRNSW or “the Client”) to undertake a program of environmental and heritage studies to support the development of the South Jerrabomberra Regional Job Precinct (South Jerrabomberra RJP) Masterplan.

This report identifies the constraints and opportunities in relation to the geology, soils and contamination conditions within the RJP within the context of the proposed Masterplan (August 2022). This technical report has been designed to test the preferred structure plan that was developed as part of an Integration Workshop and aims to establish the relevant specifications and requirements to assist in the development of the master plan.

ERM has prepared this technical report based on a desktop review of background information relating to soil salinity, acid sulfate soils and potential for contamination at the site and preliminary investigations including a site inspection.

In summary, the key findings of the assessment were:

Salinity

- Based on regional soil mapping no salinity hazard was identified for the soil landscapes within the investigation area. The salinity, sodicity and aggressivity soil conditions are unlikely to represent a significant constraint on the proposed Masterplan.

Acid Sulfate Soils

- Based on regional soil mapping there is an extremely low to low probability for acid sulfate soils occurring. The potential risk of acid sulfate soils is unlikely to represent a significant constraint on the proposed Masterplan.

Potential Contamination

- Potential contamination was identified based on the desktop review (no sampling was undertaken) at specific sites which are currently (or formerly) operated potentially contaminating industries and/or activities, including:
 - Tralee Sand & Gravel Pit
 - 7-Eleven Jerrabomberra
 - On-site Commercial / Industrial Land Uses
- The remaining land has the broad potential for contamination associated with hazardous building materials (such as asbestos) associated with built structures and/or infrastructure (current or former), chemical storage and use including but not limited to underground or above-ground chemical storage tanks, uncontrolled waste dumping.
- In addition to the above it is important to note that there is a broad potential for contamination on all land across the RJP associated with hazardous building materials, small scale chemical storage and use and uncontrolled waste dumping, which should be assessed further prior to approval of development to prevent potential exposure to contamination hazards.
- Contaminated groundwater associated with known contaminated sites to the north of the RJP. If beneficial re-use of groundwater within the RJP is proposed further investigation would be required to assess potential for draw-down of existing contamination in groundwater associated with contaminated sites outside the RJP. Proposals for beneficial re-use of groundwater should avoid extraction of groundwater near known contaminated sites adjacent to the RJP.

The following recommendations should be considered during the appropriate phases of the planning process:

- The potential impact of existing contaminated groundwater outside the RJP (adjacent industrial sites north of the RJP) on the quality of extraction of groundwater for beneficial re-use should be further investigated concurrent with the hydrogeology assessment.
- The Masterplan proposes some changes to land-use, in most instances these changes are predominantly a change to a similar or less sensitive land-use from a contamination perspective. The exceptions to this are:
 - Areas proposed for recreational use;
- The Masterplan proposes key changes to zoning which may trigger the following key decision points:
 - Where the land is proposed for sensitive land-uses such as recreation and zones which permit child-care centres or educational facilities, further assessment may be triggered under the SEPP; and
 - Where the land is currently used for potentially contaminating activities and change is proposed under the Masterplan to a similar or less sensitive land-use further assessment may not be triggered under the SEPP, but we note that due diligence is advised and consideration should be given to the overarching principles of the SEPP.
- In addition to the above it is important to note that there is broad potential for contamination on all land across the RJP associated with hazardous building materials, small scale chemical storage and use and uncontrolled waste dumping. This potential contamination should be assessed further prior to approval of development to prevent potential exposure to contamination hazards. The guidance provided in Land Contamination Planning Guidelines (Draft) should be considered in relation to the application of due diligence by Council in consideration of a process for assessment of potential for hazardous building materials (e.g. asbestos) and/or uncontrolled waste dumping (e.g. oil drums, asbestos) prior to development commencement. A clear framework for management of these risk is needed for public safety and to mitigate the potential for substantial cost and time delays.
- If further assessment is triggered under the SEPP, this can be undertaken by the proponent at the individual site level during the development application stage. Contamination assessments should be undertaken by suitably qualified and experienced consultants. In some circumstances, a statutory Site Audit may be required (refer to the draft Contaminated Land Planning Guidelines for further information on when a statutory Site Audit is required). The use of suitably qualified and experienced consultants (certified by a scheme currently recognised by NSW EPA) in conducting third-party formal independent review should be considered where a statutory Site Audit is not required and a non-statutory audit may be onerous on the proponent.

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by the Department of Regional NSW (DRNSW or “the Client”) to undertake a program of environmental and heritage studies to support the development of the South Jerrabomberra Regional Job Precinct (South Jerrabomberra RJP) Masterplan. The location and boundaries of the South Jerrabomberra RJP (“the RJP” or “the site”) are illustrated on **Figure 1**.

This report identifies the constraints and opportunities in relation to the geology, soils and contamination conditions within the South Jerrabomberra RJP within the context of the proposed Masterplan.

This technical report has been designed to test the preferred structure plan that was developed as part of a series of Integration Workshops and aims to establish the relevant specifications and requirements to assist in the development of the master plan.

1.1 Project Background

The Regional Job Precincts (RJPs) have been identified by the NSW Government as areas of land that are of local significance based on economic enablers. To attract investors, the NSW Government is seeing to create a place-based planning framework, and enhancing investment certainty.

This investigation seeks to deliver outcomes in the following RJP objectives:

- Remove planning complexity and delays as a barrier to regional economic growth; and
- Focus on outcomes and evidence, rather than compliance and assessment.

DRNSW have identified three (3) precincts for assessment as part of this engagement:

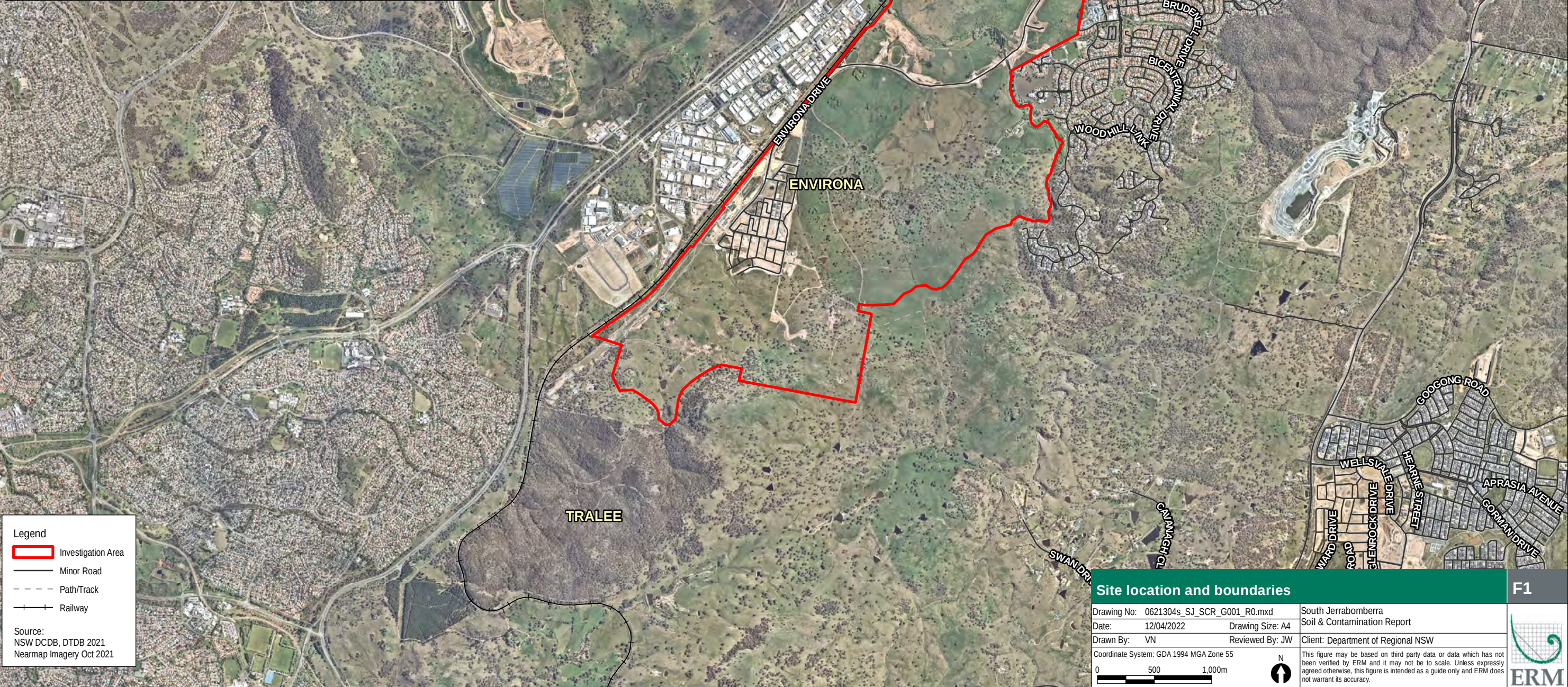
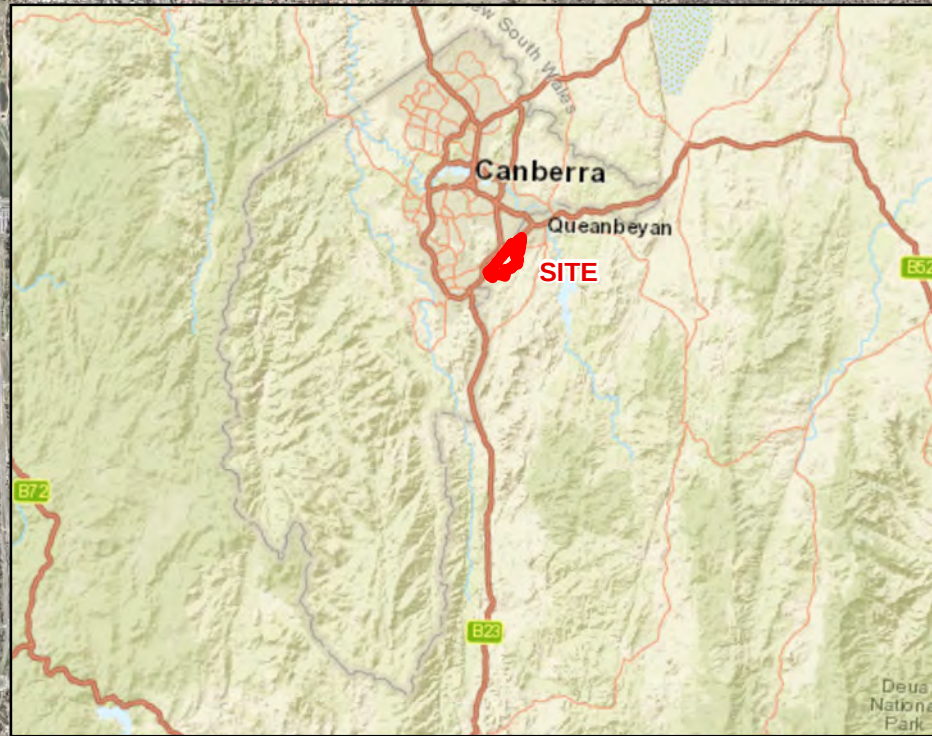
- Albury
- Richmond Valley
- South Jerrabomberra

The purpose of the RJP process is to support regional investment and job creation. This is achieved through the creation of precincts that are attractive to investors and identification of land uses that facilitate complementary businesses, and a whole-of-Government approach to resolution of historic development constraints.

1.2 Investigation Area

The Investigation Area is located in inland NSW, on the eastern border of the ACT, and area includes:

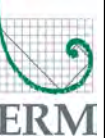
- Area 1 - Poplars Technology Park
- Area 2 - Proposed high school
- Area 3 - Proposed regional sport facility
- Area 4 - Environa
- Area 5 - South Tralee residential development

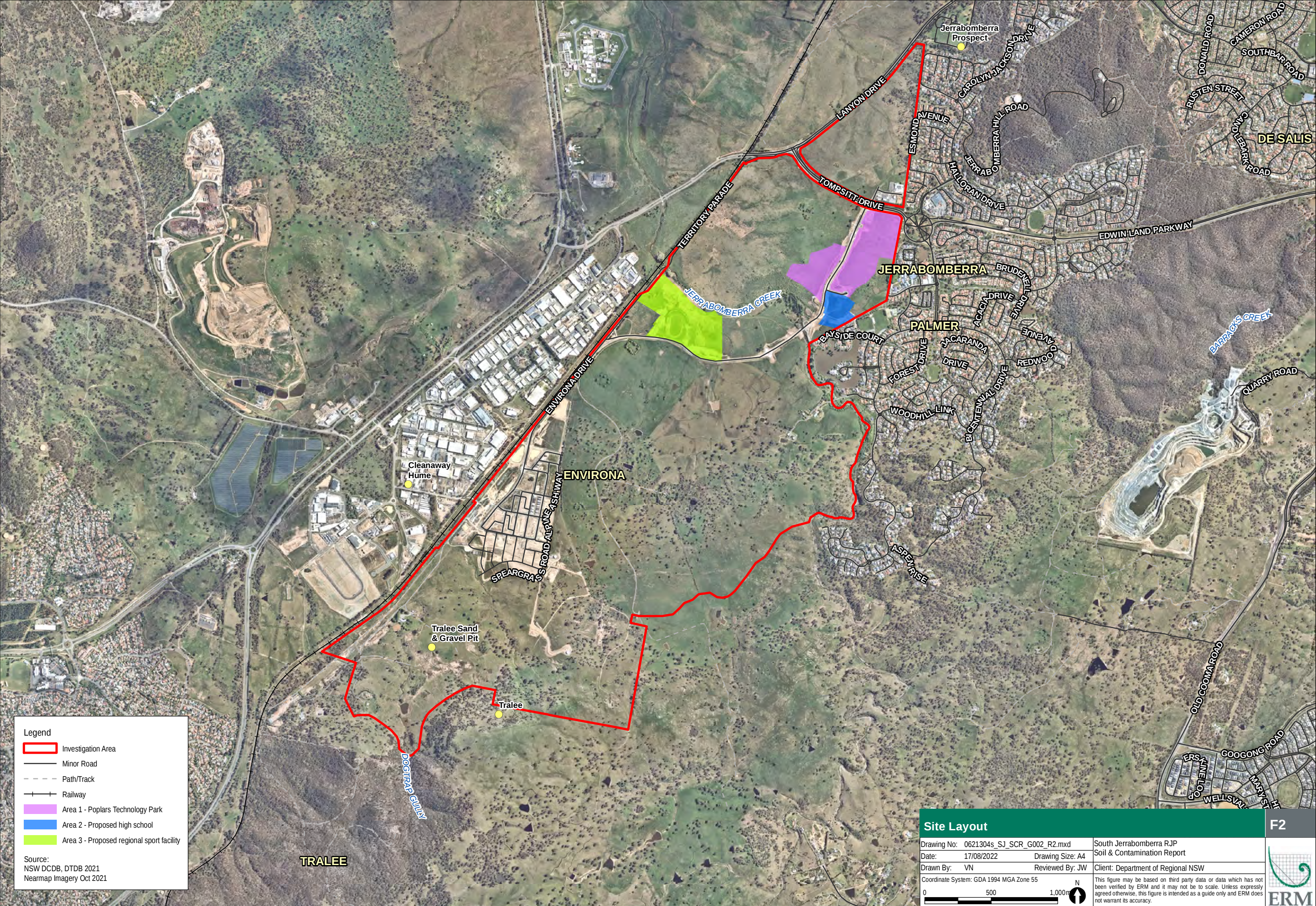


Legend

- Investigation Area
- Minor Road
- - - Path/Track
- + + + Railway

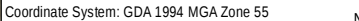
Source:
NSW DCDB, DTDB 2021
Nearmap Imagery Oct 2021

Site location and boundaries		F1
Drawing No: 0621304s_SJ_SCR_G001_R0.mxd	South Jerrabomberra	
Date: 12/04/2022	Soil & Contamination Report	
Drawn By: VN	Reviewed By: JW	
Client: Department of Regional NSW		
Coordinate System: GDA 1994 MGA Zone 55		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
0 500 1,000m		



- Legend
- Investigation Area
 - Minor Road
 - Path/Track
 - Railway
 - Area 1 - Poplars Technology Park
 - Area 2 - Proposed high school
 - Area 3 - Proposed regional sport facility

Source:
NSW DCDB, DTDB 2021
Nearmap Imagery Oct 2021

Site Layout			F2
Drawing No: 0621304s_SJ_SCR_G002_R2.mxd		South Jerrabomberra RJP	
Date: 17/08/2022	Drawing Size: A4	Soil & Contamination Report	
Drawn By: VN	Reviewed By: JW	Client: Department of Regional NSW	
Coordinate System: GDA 1994 MGA Zone 55		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.	
			
			ERM

1.3 Purpose of this report

This Technical Report identifies the constraints and opportunities in relation to the geology, soils and contamination conditions within the RJP within the context of the proposed Masterplan.

A Baseline Analysis Report was prepared by ERM which presented a desktop analysis of soils, contamination and geology issues at the Site to aid the Client in gaining a preliminary understanding of the potential opportunities and constraints to future development associated with these issues within the South Jerrabomberra RJP.

Subsequent to the Baseline Analysis Report ERM has undertaken site inspection and analysis of the interactions between the proposed masterplan and the known opportunities and constraints in relation to soils, geology and contamination. The purpose of this report is to test the preferred structure plan that was developed as part of a series of Integration Workshops and establish the relevant specifications and requirements to assist in the development of the master plan.

1.4 Objective

The objective of these works was to undertake a desktop Preliminary Site Investigation (PSI) that refines the current understanding of soils, geology, potential contamination, salinity and soil aggressivity issues at the Site and aid the Client in gaining a preliminary understanding of the potential opportunities and constraints to future development associated with these issues. This information has then been utilised to test the preferred structure plan that was developed as part of a series of Integration Workshops and aims to establish the relevant specifications and requirements to assist in the development and finalisation of the master plan.

1.5 Scope of Works

To meet the project objective, ERM completed the following scope of works:

- Review of background information relating to the site, including:
 - Previous investigations relating to site contamination;
 - The NSW Environment Protection Authority (EPA) Contaminated Land Register;
 - Historical and recent aerial photographs;
 - Relevant government databases; and
 - Published soil, geology and topographic maps.
- An initial site inspection was undertaken by ERM concurrently with the site familiarisation tour on 8 December 2021 and a further site inspection to identify any potential changes since that time was completed on 7 April 2022.
- Preparation of this report.

Investigation work was conducted with reference to relevant parts of the following guidelines:

- *National Environment Protection (Assessment of Site Contamination) Measure 1999* (ASC NEPM (1999)) (as amended May 2013) – herein referred to as the ASC NEPM (2013);
- NSW EPA (2017). *Guidelines for the NSW Site Auditor Scheme* (3rd edition); and
- NSW EPA (2020) Contaminated Land Guidelines, Consultants Reporting on Contaminated Land (May 2020).

2. ENVIRONMENT AND PLANNING LEGISLATION

In order to facilitate an assessment of the proposed impacts of potential soils / contamination issues on the South Jerrabomberra RJP process and in the context of some recent changes to the planning framework within NSW, the following sections provide a brief overview of the relevant legislative framework that will inform the testing of the preferred structure plan and review of the proposed master plan.

2.1 *Environmental Planning and Assessment Act 1979 (NSW)*

The *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) is the primary instrument under which planning and development is carried out in NSW. The EP&A Act sets out a framework under which the three statutory environmental planning instruments - State Environmental Planning Policies (SEPPs), Regional Environmental Plans (REPs) and Local Environmental Plans (LEPs) are made. The EP&A Act is also the overarching instrument that assigns responsibility for the regulation of contaminated land that is not considered to be contaminated significantly enough to warrant regulation by EPA.

2.2 *SEPP (Resilience and Hazards) 2021 – replacement of SEPP55*

State Environmental Planning Policy (Resilience and Hazards) 2021 (which incorporates, as Chapter 4, guidance formerly included in SEPP No. 55 *Remediation of Land*) is one of the key statutory planning instruments used to regulate contaminated land under the EP&A Act. Specifically, Clause 4.6 of the SEPP (Resilience and Hazards) prohibits a consent authority from approving development on land unless it has discharged its responsibilities with regard to assessing the contamination status of that land.

Importantly, in the context of this report, Clause 4.6 (4) sets out the specific circumstances / lands which would trigger a requirement for further assessment of potential contamination as being:

- (a) *land that is within an investigation area,*
- (b) *land on which development for a purpose referred to in Table 1 to the contaminated land planning guidelines is being, or is known to have been, carried out,*
- (c) *to the extent to which it is proposed to carry out development on it for residential, educational, recreational or child care purposes, or for the purposes of a hospital—land—*
 - (i) *in relation to which there is no knowledge (or incomplete knowledge) as to whether development for a purpose referred to in Table 1 to the contaminated land planning guidelines has been carried out, and*
 - (ii) *on which it would have been lawful to carry out such development during any period in respect of which there is no knowledge (or incomplete knowledge).*

2.3 *Contaminated Land Management Act*

The *Contaminated Land Management Act 1997* (CLM Act) is the legislative instrument in NSW which defines “contamination” as follows:

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 environment.

The stated objective of the CLM Act is to establish a process for investigating and (where appropriate) remediating land that the EPA considers to be contaminated significantly enough to require regulation. Sites at which the contamination is considered “significant enough to warrant regulation” are therefore regulated by the EPA under the CLM Act whilst contamination at other sites (i.e., those where contamination is not considered significant enough to warrant regulation by the EPA) are managed via the land use planning process (normally by the local council). The CLM Act provides the EPA with various responsibilities and powers to enable it to effectively regulate and manage significantly contaminated sites in NSW in order to meet the stated objectives of the CLM Act.

3. SITE BACKGROUND REVIEW

3.1 Site identification

The site identification information is presented within the table below:

Item	Description
Site Address	■ South Jerrabomberra, Jerrabomberra, NSW, 2619
Legal Description	■ Lots IDs are presented in Table 1, Appendix A
Local Government Area	■ Queanbeyan Palerang Regional Council (QPRC)
Current Zoning	There are currently multiple LEPs that cover the investigation area. A consolidated LEP is being proposed for the Queanbeyan-Palerang LGA. The following zoning currently apply within the investigation area: ■ B1 Neighbourhood Centre ■ B4 Mixed Use ■ B7 Business Park ■ DM Deferred Matter (zoned for rural purposes under Queanbeyan LEP 1998) ■ E2 Environmental Conservation ■ IN2 Light Industrial ■ R2 Low Density Residential ■ RE1 Public Recreation ■ RE2 Private Recreation ■ RU2 Rural Landscape Zone ■ SP2 Infrastructure
Geographical Co-Ordinates	■ 35° 23' 31.2" S 149° 10' 48" E (Approximate centre of Site)
Site Location and Site Layouts	■ Figure 1 and Figure 2

3.2 Site Setting

The following sections summarise the information obtained during the site background and history desktop review.

Copies of all database search results are provided in **Appendix A**.

Item	Description
Site area	905 hectares
Current land use	Figure 3 summarises the current land-uses. Primarily rural uses including the activities applicable under the following zoning: ■ B1 Neighbourhood Centre ■ B4 Mixed Use ■ B7 Business Park ■ DM deferred Matter (zoned for rural purposes under Queanbeyan LEP 1998) ■ E2 Environmental Conservation ■ IN2 Light Industrial ■ R2 Low Density Residential ■ RE1 Public Recreation ■ RE2 Private Recreation ■ RU2 Rural Landscape Zone ■ SP2 Infrastructure

Item	Description
Surrounding Land use	The land uses surrounding the site include: ■ North west Reserve Park ■ North east: low density residential area and mine site (approximately 2.2 km from the site boundaries) ■ South east Undeveloped open space ■ East Low density residential area (Jerrabomberra) ■ West: Industrial/ commercial area (Hume, ACT)
Site Elevation	580-860 m relative to Australian Height Datum (AHD)

3.3 Topography

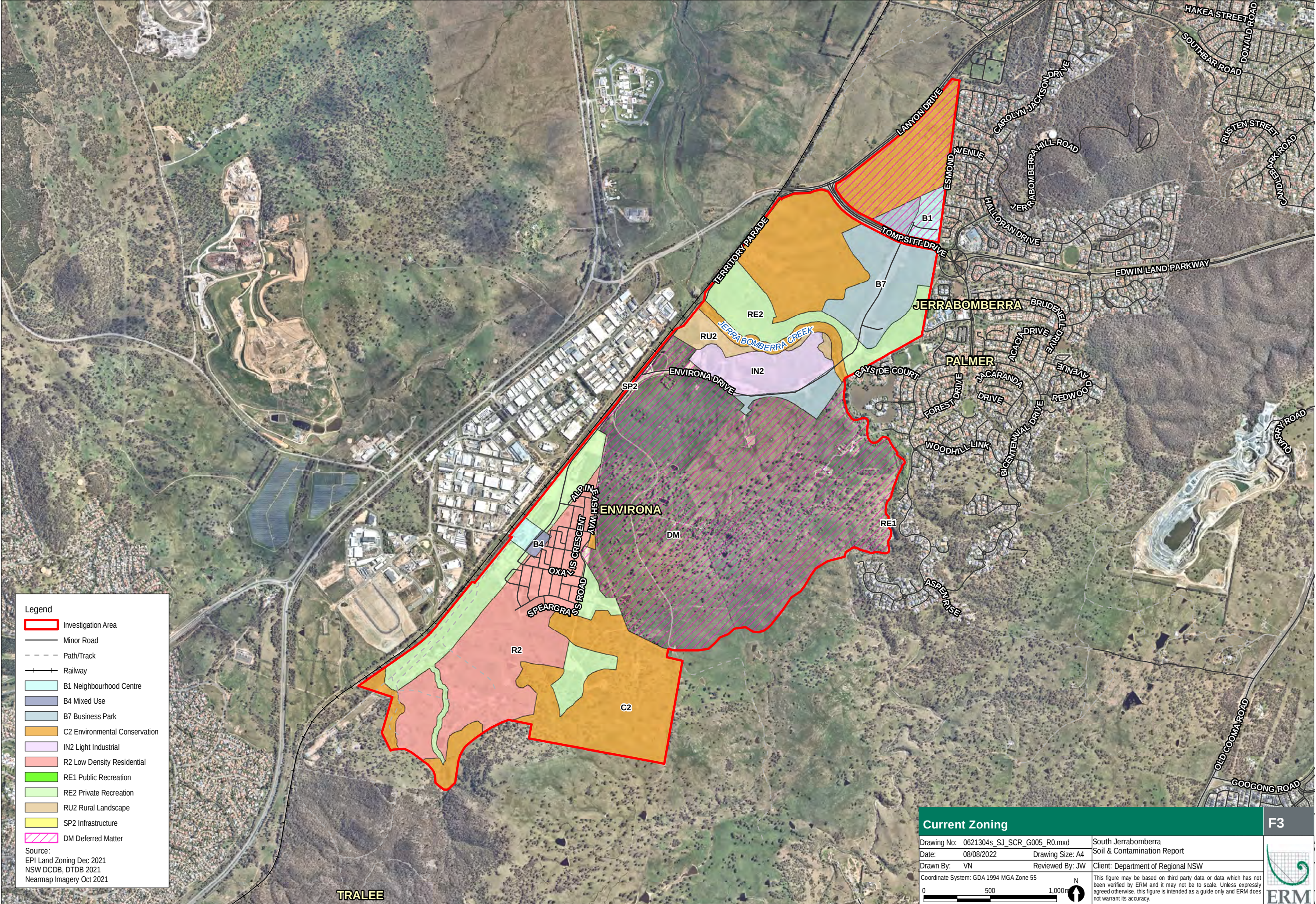
The Site comprises a mix of low-lying lands adjacent to Jerrabomberra Creek, generally gentle sloping land with one minor peak to the north, and gentle to steep sloping lands to the south with a number of peaks and ridgelines.

3.4 Hydrology

Natural surface water bodies at the Site were identified as:

- Jerrabomberra Creek flows through the northern portion of the site and flows from east to west. It forms part of the eastern boundary of the Site (between the Site and the residential areas of Jerrabomberra), forms part of the wider Murrumbidgee catchment, and flows into Lake Burley Griffin in the ACT; and
- Dogtrap Gully flows through the south western portion of the Site and flows from south to north.

A review of aerial imagery also indicates the presence of several ephemeral drainage lines and farm dams located within the Site boundary.



Legend

Investigation Area

Minor Road

Path/Track

Railway

B1 Neighbourhood Centre

B4 Mixed Use

B7 Business Park

C2 Environmental Conservation

IN2 Light Industrial

R2 Low Density Residential

RE1 Public Recreation

RE2 Private Recreation

RU2 Rural Landscape

SP2 Infrastructure

DM Deferred Matter

Source:

EPI Land Zoning Dec 2021

NSW DCDB, DTDB 2021

Nearmap Imagery Oct 2021

Current Zoning

F3

Drawing No: 0621304s_SJ_SCR_G005_R0.mxd

Date: 08/08/2022

Drawn By: VN

Coordinate System: GDA 1994 MGA Zone 55

Drawing Size: A4

Reviewed By: JW

0 500 1,000m

South Jerrabomberra

Soil & Contamination Report

Client: Department of Regional NSW

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

3.5 Geology

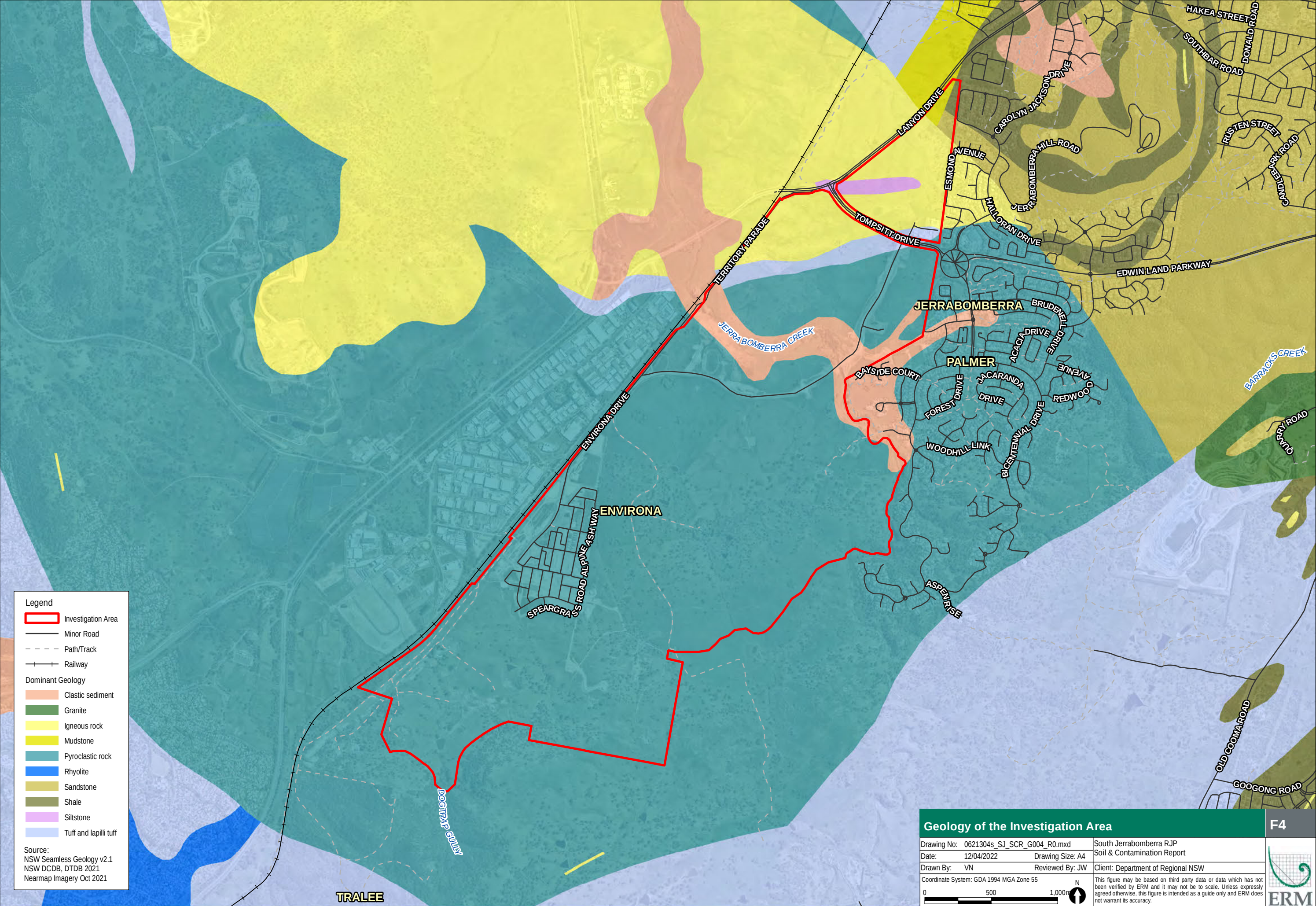
The geology of the investigation area is graphically represented in Figure 4. Geology mapping from the Canberra 1:100 000 Geological Map indicates that the Site is underlain by the following geological units:

- Adaminaby Group sandstone comprising of brown and buff to grey, thin-thick-bedded, fine-to coarse grained mica-quartz (+/- feldspar) sandstone, interbedded with laminated siltstone and mudstone sporadic chert-rich units, from lower Ordovician age and formation of Abercrombie Formation
- Alluvium clastic sediment comprising of unconsolidated grey to brown to beige humic ($\pm$) micaceous silty clay, quartz ($\pm$) lithic silt, fine to medium grained quartz-rich to quartz-lithic sand polymictic pebble to cobble gravel (as sporadic lenses); sporadic palaeosol horizons, from Quaternary age
- Douro Group pyroclastic rock comprising of rhyodacitic ignimbrite and minor volcanoclastic and argillaceous sedimentary rocks, from Upper Silurian age, formation of Deakin Volcanics
- Douro Group ash tuff, lapillistone, and lapilli tuff comprising of unnamed tuff, sandstone and shale, from Upper Silurian age, formation of Deakin Volcanics
- Douro Group fine grained igneous rock comprising of blue and mauve-gray porphyritic rhyodacite, volcanoclastic and epiclastic tuff (as a waterlaid deposit), tuffaceous shale, from Upper Silurian age, formation of Deakin Volcanics
- Douro Group siltstone comprising of tuffaceous siltstone and shale, from Upper Silurian age, formation of Deakin Volcanics
- Ungrouped Cowra-Yass Zone units mudstone comprising of mudstone, siltstone, minor sandstone, limestone, hornfels, dacitic ignimbrite volcanoclastics, minor agglomerate and lithic tuff, from Lower Silurian age and formation of Canberra Formation; and
- Ungrouped Cowra-Yass Zone units shale comprising of shale mudstone, siltstone, minor sandstone, from Lower Silurian age and formation of State Circle Shale

3.6 Hydrogeology

Information provided by NSW Department of Industries – Office of Water indicated the following:

- Groundwater aquifers on the site and surrounding buffer area (2 km) were described extensive low to moderate productive aquifers; with hydrogeologic unit of Palaeozoic and Pre-Cambrian Fractured Rock (low permeability) aquifers;
- A search of registered groundwater bores identified 6 on-site bores and 38 bores within the 2 km search radius. Standing water levels were measured between 7 m bgl to 40 m bgl;
- The registered bores are reported to be used for a mix of household (totally 9 with 3 being on the site), irrigated agriculture (1), water supply (2), recreation (1), exploration or research (1) and unknown purposes;
- Aquatic ecosystem on the site and within 500 m buffer rely highly to moderately on the surface expression of groundwater; and
- Terrestrial ecosystem within 500 m buffer have a low dependency on the subsurface expression of groundwater.



4. PREVIOUS INVESTIGATIONS

The Site and surrounding area have been previously investigated for assessment of potential contaminants of concern. A summary of the investigation areas and results are as follow:

Investigated area	CoPC	Exceedance	Potential sources	Comment & Conclusion
Northern portion of the Site, Poplars 1,5,6,7,8,9,11	■ Arsenic ■ OCPs and OPPs ■ Petroleum hydrocarbons ■ Metals ■ Asbestos ■ Nitrates and pathogens	■ Asbestos ■ Petroleum hydrocarbons ■ Metals ■ OCPs (Aldrin dieldrin)	■ Sheep spray site ■ Fuel dispenser ■ Former piggery	■ Remediation proposed in the Coffey (2018) RAP to address seven potential Areas of Environmental Concern (AECs). The RAP was reviewed and approved by a Site Auditor in 2018. ■ Whilst it is understood that the proposed remediation works have been completed, a validation report and / or Site Audit Statement has not been provided for review.
North Tralee Site²	■ <i>"There is potential for some contamination of the Site"</i>	■ No detailed site investigation report reviewed.	■ No detailed site investigation report reviewed.	■ No investigation reports were available to review the potential for contamination.
South Tralee³	■ Bonded asbestos cement, lead based paints, pesticides	■ not detected in soil	■ Former structures	■ Homestead and Surrounds (no unacceptable risk)
	■ Organophosphates, organochlorines, heavy metals, nitrogen and phosphorus	■ zinc (soil) > ESL ■ hydrocarbons (soil) > ESL	■ termite treatment ■ deposits of sheeting ■ use of galvanised steel in the construction of the woolshed ■ maintenance of farm machinery	■ Sheep Shearing Sheds and Surrounds (low risk)

Investigated area	CoPC	Exceedance	Potential sources	Comment & Conclusion
	■ Arsenic and dieldrin (soil), cadmium, copper, nickel, and zinc (groundwater)	■ arsenic (soil) > standards for the potential land-use ■ cadmium, copper, nickel, zinc (groundwater) > recommended concentration	■ Not identified	■ Sheep Dip (Groundwater contamination, moderate risk to future users of groundwater and that further sampling should be carried out.)
	■ Hydrocarbons (2.0 mbgl), lead	■ lead >ESL ■	■ Refuelling and maintenance of aircraft ■ Leaking above ground storage tank no longer on site.	■ Aircraft Hangar (low risk because the proposed land-use is located within the road alignment)
	■ NA	■ NA	■ unknown	■ Area of Disturbed Soil (borrow pit and/or landfill area)
Regional Sports Complex ⁴	■ Asbestos ■ PCBs ■ Fill material of unknown origin ■ General waste and debris	■ ACM ■ PCBs ■ Potentially others	■ Historical speedway and other commercial / industrial uses of the site and illegal waste disposal.	■ Cardno prepared a Review of Environmental Factors (REF) for preconstruction works on the Regional Sport Complex site. Preconstruction works comprised the following remediation works: ■ Removal of ACM ■ Removal of PCB containing light fittings (13 in total). ■ Excavation of a small former landfill ■ Removal of general waste and debris

Notes:

1. Coffey (16 Sep. 2020), Poplars Developments, Additional Phase 2 Environmental Site Assessment, South Poplars, Proposed Secondary School Site Extension Area, Jerrabomberra, NSW, 754-CBREN278296-R01a
2. Willana (Aug. 2015), Supplementary Report to the North Tralee Local Environmental Study
3. Council assessment report (May – June 2018), citing the South Tralee Detailed Site Investigation report, SMEC reference 3002452-01/RV01 , 20 July 2015. Given this development has now been approved and works commenced it is understood that works to address these issues have been undertaken or are underway, however additional documentation is required to confirm this.
4. Cardno (August 2021) Statement of Environmental Effects Queanbeyan Palerang Regional Sports Complex (QPRSC) citing the Cardno Review of Environmental Factors Queanbeyan-Palerang Regional Sports Complex – Preconstruction Stage
5. Environmental Strategies (February 2012) Interim Advice Number 1 Review of Phase 1 and Phase 2 ESA "The Poplars" 300 Lanyon Drive, Queanbeyan, NSW
6. Coffey (October 2003) Phase 1 Preliminary Land Contamination Study, "The Poplars" 300 Lanyon Drive, Queanbeyan, NSW.
7. Coffey (September 2011) Sampling, Analysis and Quality Plan for the Poplars Development Area, Queanbeyan.
8. Coffey (November 2011) Phase 2 Environmental Site Assessment "The Poplars" 300 Lanyon Drive, Jerrabomberra.
9. Douglas Partners (September 2018) Contamination Testing Lot 6 DP719108, Jerrabomberra
10. Coffey (2018) Remedial Action Plan - Botanical Stage 1 Development (North Poplars) South Jerrabomberra, NSW
Arcadis (February 2018) Updated Interim Advice 3: Review of Remediation Action Plan – Botanical Stage 1 Development (North Poplars) South Jerrabomberra

5. SITE INSPECTION

An initial site inspection was undertaken by ERM concurrently with the site familiarisation tour on 8 December 2021 and a further site inspection to identify any potential changes since that time was completed on 7 April 2022. In addition, observations made by other ERM consultants during heritage fieldworks undertaken on 22-23 March 2022 have also been summarised herein. It is noted that given the scale of the site, access constraints and limited visibility of the ground surface due to thick vegetation / lush grass not all areas of the site were inspected, however a sufficiently broad overview of potential AECs and other contamination issues was gathered to inform this assessment.

In addition to the current and former industrial site uses identified in the PSI and described in further detail in Section 7, the key observations made in relation to potential areas of contamination included:

- 1 x rusted steel drum identified in the vicinity of the former piggery within the Poplars precinct (as discussed in Environmental Strategies, 2012).
- Earthmoving plant laydown / parking and construction compound areas associated with civil works for the South Tralee residential development.

It is also noted that attempts were made to identify / ground truth the location of a “garbage dump” that was identified within the heritage research however this was unable to be located. The dump is described as “PHS8 (Garbage dump) – this is a small garbage dump in a 30 m x 12 m erosion blowout beside a fenceline near the western boundary of South Poplars. Garbage includes a 1940s beer bottle, a 1960s drink can, a green wine bottle and an old metal watering can (CMG Reference: E215690 N592760). (Source Archaeological Heritage Surveys, 2003 ‘*The Poplars*’, *Queanbeyan, NSW: Cultural Heritage Assessment*).

Relevant photographs taken during the ERM field inspections are incorporated in the photographic log included as Appendix B.

6. PRELIMINARY SOIL ASSESSMENT

6.1 Soil Landscapes

Soils within the site are broadly classified into four different type including Kurosols (Yellow Podzolic soil) covering the north and along the western boundary of the site, Kurosols., Nitric in central-southern part of the site and Kurosols (Red Podzolic soil) along the south eastern boundary of the site with some pockets on the north portion of the site and small area (on the central to top of the site) with Rudosols.

Available mapping from the South Jerrabomberra dataset ([eSPADE v2.1 \(nsw.gov.au\)](https://www.nsw.gov.au/eSPADE-v2.1)) indicates that a total of five different soil landscapes are present across the Site as follows:

- Williamsdale
- Burra
- Ginninderra Creek
- Luxor Variant B
- Campbell

A detailed description of the identified soil landscapes within the Investigation Area is presented below and graphically in **Figure 5**.

Soil Landscape	Description
Williamsdale	■ Landscape— undulating rises, fans, valley flats and depressions on Silurian Volcanics of the Canberra Lowlands. Includes significant areas of pediplain. Local relief 5 - 50 m; elevation 550 - 650 m; waning footslopes (<10%). Little or no rock outcrop. The original woodland has been cleared. Grassland areas have been extensively altered ■ Soils — moderately deep, moderately well-drained Yellow Chromosols (Yellow Podzolic Soils) on Red and Brown Kandosols (Red and Yellow Earths) on upper rises and fan elements. Moderately to very deep, poorly to imperfectly drained Sodosols (Solodic Soils and Solodized Solonetz Soils) on lower rises and fan elements ■ Limitations— hardsetting, erodible, dispersible soils (localised). Acidic topsoils. Seasonal waterlogging; complex terrain; flood hazard (localised); run-on; dieback
Burra	■ Landscape— undulating to rolling low hills and alluvial fans on Silurian volcanics. Local relief <90 m; elevation 650 - 900 m; long (>300 m), waning and gently to moderately inclined hillslopes, footslopes and fans (slopes 5 - 30%). Localised terracettes are common. Almost completely cleared woodland. ■ Landscape Variant baa—fans more prevalent, with less rocky and slightly deeper soils than ba. ■ Soils— shallow (<60 cm), well-drained Rudosols (Lithosols) and Tenosols (Lithosols/Earthy Sands) on crests and upper slopes. Moderately deep (<90 cm), moderately well-drained Red Kurosols (Red Podzolic Soils) and Red Kandosols (Red Earths) on midslopes and most lower slopes. Moderately deep (<100 cm), slowly to moderately well-drained Brown Chromosols (Yellow Podzolic Soils) and Brown Kandosols (Yellow Earths) along minor drainage lines and on some lower slopes. ■ Limitations— strongly acid soils with low fertility and low available waterholding capacity. Subsoils have low permeability. Moderate mass movement hazard (terracing); sheet erosion risk; run-on; localised shallow soils

Soil Landscape	Description
Ginninderra Creek	■ Landscape—gently undulating floodplain on Quaternary alluvium. Local relief <10 m; elevation 540 - 680 m; slopes generally <3%. Many imperfectly drained areas. Extensively cleared riparian woodland. ■ Soil— deep (>100 cm), imperfectly drained Sodic Brown Chromosols (Brown and Yellow Podzolic Soils) on margins of the unit. Deep (>100 cm), poorly drained Stratic Rudosols (Alluvial Soils) on floodplain elements. ■ Limitations— infertile, highly erodible soils. Imperfect drainage (localised); flood hazard; run-on; waterlogging; gully erosion risk; wind erosion hazard (aeolian materials); non-cohesive soils (sands); engineering hazard; complex terrain.
LUXOR Variant b	■ Landscape — waning lower slope fans on colluvium. Local relief <30 m; elevation 580 - 670 m; moderately inclined slopes (< 20%). Cleared woodlands with few remaining trees. ■ Landscape Variant lua— layered colluvium with infilled 'lenses' of alluvium/colluvium. ■ Landscape Variant lub— numerous small areas of colluvium interspersed with small ridges of in situ hillslope material. ■ Soils— variable depth (40 - 160 cm), moderately well-drained stony Red Kandosols (Red Earths) on upper margin of the landscape. Deep (>100 cm), imperfectly to poorly drained Magnesic-Natric Kurosols (Yellow Podzolic Soils) on lower slopes. ■ Limitations— saline and dispersible subsoils. Complex terrain (localised); mass movement hazard; run-on (localised); seasonal waterlogging (localised); sheet erosion risk; gully erosion risk; engineering hazard (localised).
CAMPBELL	■ Landscape— rounded steep to rolling volcanic mountains and hills of the Murrumbidgee Valley. Local relief 100 - 350 m; elevation 600 - 1100 m; long hillslopes (>20%), often with terracettes. Rock outcrop is common as tombstone-sized and shaped rows of vertically dipping tuffs. Open-forest to low woodland on exposed crests and frost hollows. Clearing has occurred on lower slopes. ■ Soils— shallow (<30 cm), rapidly drained Rudosols (Lithosols) on crests and near rock outcrops. Moderately deep (<70 cm), moderately well-drained Red Chromosols (Red Podzolic Soils) and Yellow Chromosols (Yellow Podzolic Soils) on sideslopes. Variable depth (usually 60 - 120 cm), imperfectly drained Brown Sodosols (Solodic and Solonized Solonetz Soils) with Grey Chromosols and Hydrosols (Gleyed Podzolic Soils) along drainage lines. ■ Soil Variant caa— finer heavier soils. ■ Soil Variant cab— on sandstone with shallow, stony duplex soils. ■ Soil Variant cac— deep, bleached A2 horizons. ■ Limitations— soils are shallow, infertile and acidic. Subsoils have low permeability and are hardsetting. Steep slopes; rock outcrop; sheet erosion risk; localised waterlogging (springs).

6.2 Salinity and Soil Aggressivity

6.2.1 Desktop Review

Available mapping indicates soil landscapes within the investigation area are subject to a low salinity hazard.

6.2.2 Soil Sampling and Analysis

On this basis, no preliminary soil sampling or laboratory analysis was undertaken for salinity.

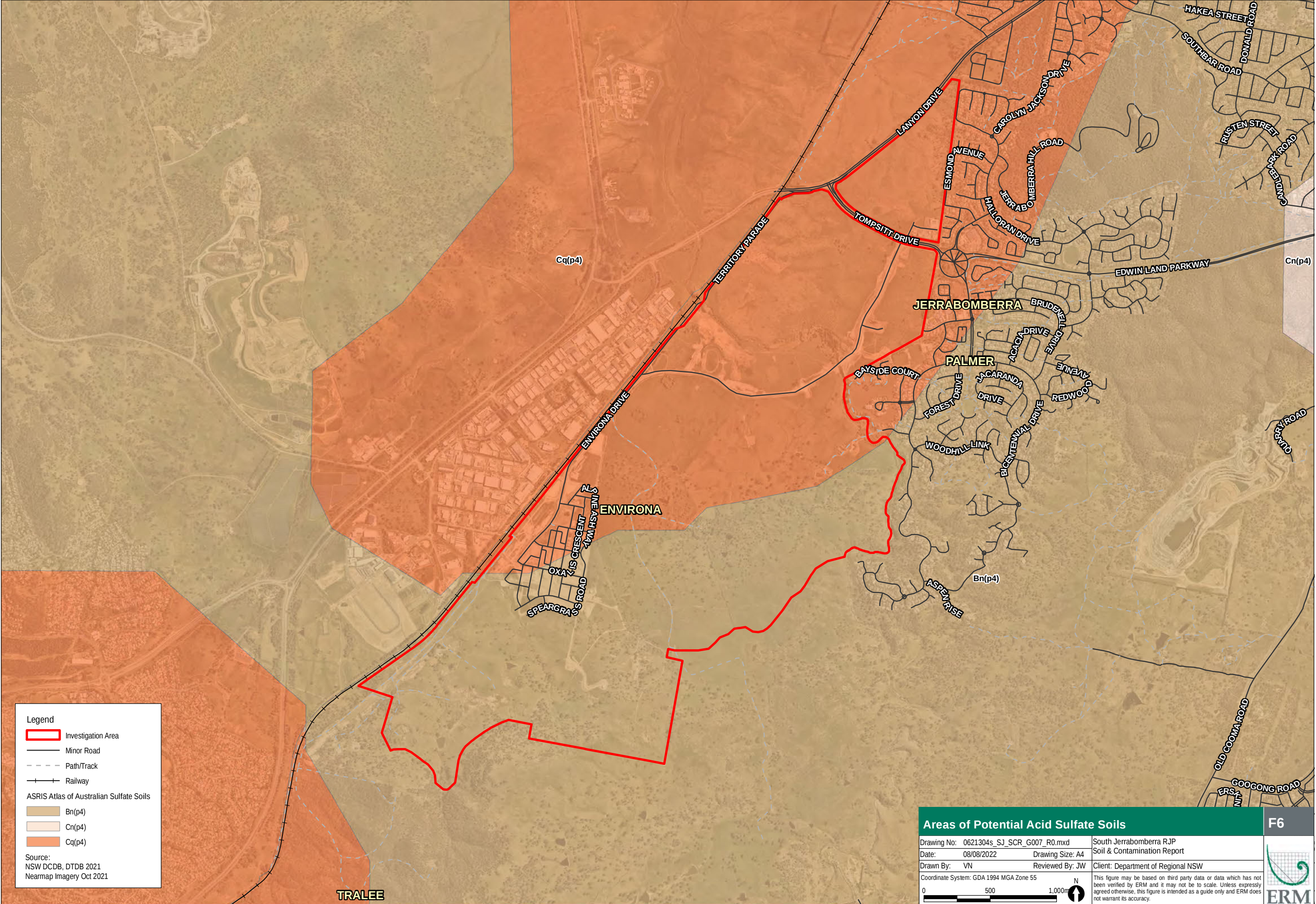
6.3 Acid Sulfate Soils

6.3.1 Desktop Review

Available mapping from the Atlas of Australian Acid Sulfate Soil, as shown on **Figure 6** indicates that there is an extremely low to low potential for acid sulfate soils to be present within the Site.

6.3.2 Soil Sampling and Analysis

On this basis, no preliminary soil sampling or laboratory analysis was undertaken for potential acid sulfate soils.



Legend

Investigation Area

Minor Road

Path/Track

Railway

ASRIS Atlas of Australian Sulfate Soils

Bn(p4)

Cn(p4)

Cq(p4)

Source:
NSW DCDB, DTDB 2021
Nearmap Imagery Oct 2021

Areas of Potential Acid Sulfate Soils

F6

Drawing No: 0621304s_SJ_SCR_G007_R0.mxd	South Jerrabomberra RJP
Date: 08/08/2022	Soil & Contamination Report
Drawn By: VN	Reviewed By: JW
Client: Department of Regional NSW	

Coordinate System: GDA 1994 MGA Zone 55

0 500 1,000m

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

7. PRELIMINARY CONTAMINATION ASSESSMENT

7.1 Site History

7.1.1 Aerial Photographs

Historical aerial photographs (**Appendix A**) were reviewed to assess potential historical land use practices undertaken within and surrounding the site. A summary of information obtained from the review is presented within the table below.

Year	Description
1961 – Black & White	■ Site Area: The site consists of undeveloped/ agricultural land with a house and farm in located on the east side of the Site. A railway line is present along the western boundary of the site. Some roads are within the site, including Tomsitt Drive in north part. Jerrabomberra Creek flow through the northern portion of the Site and Dog Trap Gully through south east corner of the Site. ■ Surrounding Area: The surrounding area is primarily comprised of agricultural land and/or undeveloped land. The Queenbeyan Nature Reserve is located at the north west of the Site. The Lake Jerrabomberra is located at east of the Site. The road Lanyon Drive is adjacent to the north west boundary of the Site.
1968 – Black & White	■ Site Area: No significant changes were observed for the site since previous aerial photography except for the southern portion of the site that shows land disturbance and clearance. ■ Surrounding Area: No significant changes were observed for the land surrounding the site since previous aerial photography.
1976 – Black & White	■ Site Area: A car racing track (the former Tralee Speedway) and associated infrastructure appear on the western boundary to the central portion of the Site with the rest of the Site remaining largely unchanged. ■ Surrounding Area: minor industrial development has occurred on west side of the Site between the Goulburn-Bombala Railway and Monaro Highway.
1985– Black & White	■ Site Area: No significant changes were observed for the site since previous aerial photography ■ Surrounding Area: More industrial development can be observed on west side of the Site.
1995 – Colour	■ Site Area: No significant changes were observed for the site since previous aerial photography ■ Surrounding Area: Development of industrial construction has increased on west side of the Site with establishment of house tracks on south east. Residential development has started in north-east to the east of the Site.
1998 – Colour	■ Site Area: No significant changes were observed for the site since the previous aerial photography ■ Surrounding Area: More industrial and residential development can be observed in west and north east side of the side, respectively.
2008 – Colour	■ Site Area: The Site is generally consistent with previous aerial imagery ■ Surrounding Area: The Alexander Maconochie Centre (a correctional facility), has been developed in north west of the Site with an ambulance helipad (helipad RFS South Pod) to the south of that. In the north east, the residential area has extended more towards the east with an increase on the number of houses. Few houses appear to have pool in their yard.
2010& 2012 – Colour	■ Site Area: No significant changes were observed for the site since the previous aerial photography ■ Surrounding Area: No significant changes were observed for the land surrounding the site.

Year	Description
2015 & 2018 – Colour	■ Site Area: a residence and new road infrastructure have been developed on the centre of the Site. ■ Surrounding Area: Some land disturbance including excavation can be observed on the western part of the site adjacent the Hume industrial area.
2021 – Colour	■ Site Area: new development and land clearance with some associated excavation appears on the western portion of the Site. A new road and bridge has been developed within the site that connects Tomsitt Drive in the north east of the Site to the western portions of the site. ■ surrounding Area: No obvious changes can be observed for land surrounding the Site

7.1.2 Historical Business Records

A search of historical business records and land titles for the site and surrounding area (200 m radius) was undertaken from the 1930s to date. The results of the search are summarised below, and a copy of historical business records is provided within **Appendix A**.

Period	Registered Business Types
1930's	■ No Records
1940's	■ No Records
1950's	■ No Records
1960's	■ No Records
1970s	■ No Records
1980s	■ Carriers-Heavy Industrial Transportation ■ Earth Moving &/or Excavating Contractors ■ Sand Soil & Gravel Retailers ■ Furniture Exterior/Outdoor ■ Graziers ■ Ice Cream Vendors ■ Landscape Gardening services & supplies ■ Primary Metal Products ■ Transport & transportation Services
1990s	■ Steel Fabrication Manufacturers ■ Steel Merchants; ■ Welding ■ Electrical Wholesalers ■ Fuel Merchants& buyer ■ Petroleum and coal Products n.e.c. (not elsewhere classified) ■ Metal Merchants ■ Landscape Gardening Services& Supplies ■ Nurseries-Retail/ Supplier ■ Packing& Filling Contractors ■ Playground Equipment Design & Installation ■ Sand Soil& Gravel Retailers ■ Timber-Retailer/Trader ■ Scaffolding Sale or Hire ■ Builder Handyman Contractor Equipment Sale or Hire ■ Earth Moving &/or Excavating Contractors ■ Sand Soil& Gravel producers & Wholesalers ■ Transport& transportation Services ■ Building Contractors Renovations Alteration& Extension ■ Cabinetry Makers ■ Door& Gate Fitting &Hardware

Period	Registered Business Types
	■ Joinery services ■ Roof Construction Specialists ■ Furniture Storage& Removals
2005s	■ Fencing contractors ■ Kitchen renovations& equipment-new ■ Shop& office fitting design & fit –outs ■ Wedding services ■ Piano tuning& repairs ■ Concrete-form ties formwork& accessories ■ Transit centre ■ Envelope Manufacturers &/or Wholesalers ■ Door& gate fittings hardware ■ Building contractors-general ■ Earth moving&/or excavating contractors ■ Foundation garments& accessories-retailers& repairers ■ Graphite supplies ■ Builder handyman contractor equipment sale/hire ■ Postage meters& franking machines sales service& repair ■ Architect ■ Office& business supplies ■ Sport cards& collectables ■ Building contractors general ■ Building contractors renovation alterations& extensions ■ Roof construction specialists ■ Roof truss& wall frame construction ■ Shop& office fitting design & fit-outs ■ Air conditioning industrial& commercial ■ Air conditioning installations/repairs ■ Electrical power line construction& fittings ■ Furniture Storage& Removals ■ Storage general facility and service ■ Building design and drafting services ■ Train services ■ Fruit & vegetable Wholesalers ■ Hotel restaurant & club supplies ■ Carriers-heavy industrial transportation ■ Ice supplies ■ Home repair and maintenance ■ Graziers ■ Nurseries-retail
2010	■ Carpenters joiners& fitters ■ Balustrades timber& metal ■ Crane& travel tower hire or servicing ■ Paper& plastic container manufacturers & supplies ■ Transport & transportation Services ■ Earth Moving &/or Excavating Contractors ■ Cleaning chemical steam pressure contractors ■ Furniture designer-made order ■ Garden& gardening supplier ■ Kitchen renovation and equipment- new ■ Door& gate equipment automatic

Period	Registered Business Types
	■ Drainers and drainage services ■ Builder handyman contractor sale/ hire ■ Recyclers ■ Bus/ track repairs ■ Carriers-heavy industrial transportation ■ Cold storage refrigeration ■ Engineers-motor & repairers ■ Landscape gardening services and suppliers ■ Glass merchants& installation services glaziers ■ Roof construction specialists ■ Roof truss& wall frame construction ■ Shop& office fitting design & fit-outs ■ welding ■ Nurseries-retail ■ Steel merchant
2015	■ Furniture design made and order ■ Garden& gardening supplier ■ Kitchen renovation and equipment- new ■ Electrical contractors and consultants ■ Gates& fences ■ Couriers ■ Builder handyman contractor sale/ hire ■ Wedding video& DVD services ■ Envelope Manufacturers &/or Wholesalers ■ Transport& transportation Services ■ Concrete-form ties formwork& accessories ■ Scaffolding sale or hire ■ Windows-aluminium & metallic ■ Concrete-form ties formwork & accessories ■ Door and gate fitting ■ Carriers-light transportation ■ Concrete contractors paving specialist ■ Earth moving &/or excavating contractors ■ Telecommunication consultants ■ Bus& truck repair ■ Joinery services ■ Furniture storage and removals ■ Car & truck body trimmers ■ Relocation services & consultants ■ Petrol station and garages ■ Engineers-motor& repairers ■ Carriers-heavy industrial transportation ■ Buildings relocatable/ transportable- commercial ■ Engineering-diesel repair specialist ■ Recyclers ■ Petrol stations & garages ■ Concrete-reinforcing products ■ Scrap metal merchants ■ Doctors and medical practitioners ■ Airport shuttle transit services ■ Alternative health service providers

Period	Registered Business Types
	■ Audio visual equipment sales hire or services ■ Batteries- automotive & marine ■ Brokers-business consultancy ■ Carpenters joiners& fitters ■ Building contractors general ■ Carpenter furniture & upholstery cleaning ■ Cleaning industrial/ commercial contractors ■ Cleaning services-domestic ■ Cloth lines portable & rotary ■ Computer equipment hardware office ■ Computer equipment repairs and upgrade services ■ Concrete gutters& kerbs ■ Dishwashing machines servicing& part ■ Dog and cat grooming ■ Driving school ■ Electrical contractors and consultant ■ Engineers- motor & repairers ■ Entertainment musicians & agents ■ Fashion jewellery& accessories- importers & Wholesalers ■ Fencing contractors ■ Gardening services ■ Glass merchants/ installation services glaziers ■ Hardware retailers ■ Home improvement renovation services ■ Home repairs & maintenance ■ Hot water system sales installation & repairs ■ Insurance- fire marine casualty accident& general ■ Joinery services ■ Landscape design and consultants ■ Lawn cutting & garden maintenance ■ Legal costing & support services ■ Martial arts & self-defence schools& supplier ■ Millinery retailers ■ Musician hire& musicians' agents ■ Pest control services ■ Pet shops & accessories ■ Plumber & gasfitters ■ Roof repair& roof cleaning& maintenance ■ Security alarm system & consultants ■ Signwriters ■ Solar energy equipment & machinery ■ Stone masons stonework& masonry ■ Television antennas retail & installation ■ Tilers-wall& floor ■ Washing machines & dryers- services parts & repairs ■ Windows-aluminium metallic ■ Windscreens new & repairs

7.2 Past and Present Potentially Contaminating Activities

A search of past and present potentially contaminating activities are detailed within the following sections. Figures illustrating the location of identified activities are detailed within **Appendix A**.

7.2.1 NSW EPA Contaminated Land Search

A search of the NSW EPA contaminated land database under the CLM Act 1997 undertaken for the site and a 1 km buffer area indicated the following have been notified to NSW EPA:

Site Name	Address	Activity that caused Contamination	EPA Site Management Class	Distance (m)	Direction
Caltex Service Station	Lanyon Dr Cnr McCrae St (1 Suraci Place) street Queabeyan West	Service Station	Regulation under CLM Act not required	915	North-west

7.2.2 NSW EPA Contaminated Lands Records of Notice

A search of the NSW EPA Contaminated Land Records of Notice database was undertaken for the site and 1 km buffer and indicates there are no Contaminated Land Records of Notice.

7.2.3 NSW EPA PFAS Investigation Program

A search of the NSW EPA PFAS investigation program database indicated no PFAS impact was identified at the site or within the 2 km report buffer area.

7.2.4 NSW EPA Former Gaswork Investigation Program

A search of the NSW EPA PFAS investigation program database indicated no gasworks impact was identified at the site or within the 2 km report buffer area.

7.2.5 National Pollutant Inventory Industrial Facilities

A search of the National Pollutant Inventory (NPI) register indicated the following sites to be located within the 2000 m search buffer area:

Facility Name	Address	Primary ANZSIC Class	Latest Report	Distance from Site (m)	Direction
Koppers, Hume	Tralee St, Hume	Reconstituted Wood Product Manufacturing	2018/2019	90	West
Hume Asphalt Plant	36 Sawmill Circuit Hume	Other Petroleum and coal Product Manufacturing	2018/2019	95	West
Integrated Forest Products (Receivers & Managers Appointed)	2 Tralee St, Hume	Log Sawmilling	2006/2007	550	West
HMAS Harman	Canberra Avenue, Harman	Defence	2015/2016	820	North
Mugga Lane Landfill	Mugga Lane, Canberra	Waste Treatment and Disposal Services	2018/2019	1400	West
Mugga Lane	Mugga La, Symonston	Other Electricity Generation	2018/2019	1400	West
Queanbeyan Quarry	50 Royalla Road, Queanbeyan	Gravel and Sand Quarrying	2018/2019	1700	West

7.2.6 Licencing under the POEO Act 1997

A search of the NSW EPA record of licensed activities under the *Protection of the Environment Operations Act 1997* indicate no licence, approval and notices has been identified for the site and 500 m buffer

7.2.7 Delicensed Premises Still Regulated by EPA, Licences Surrendered, Clean Up and Penalty Notices

No clean-up and penalty notice was identified for the site and a 1 km buffer based on a search of the NSW EPA record of licensed activities under the *Protection of the Environment Operations Act 1997*

7.2.8 Defence / UXO Sites

A search of Department of Defence databases for Defence or UXO impacted sites within the Site or surrounding 2000 m buffer area identified the following

Site Name	Type	Details	Distance (m)	Direction
■ Canberra; HMAS Harman and Bonshaw receiver	■ RCIP*	■ The property covers approximately 250 hectares and comprises office buildings, training facilities, accommodation blocks, workshop, recreational facilities and a former pistol range. ■ Activities for potential sources of contamination include bulk storage and distribution of petrol and diesel in underground storage tanks (USTs). Fill material from unknown origins was used for building. This fill may contain polychlorinated biphenyls (PCBs) due to historical use as a receiving station. ■ The former Pistol firing range was decommissioned in 2009, and also a landfill. The landfill area was investigated and remediated at the base for redevelopment in 2010. Hydrocarbon was identified in groundwater in the vicinity of former USTs, however, concentration were below the adapted investigation level	■ 820	■ North

* RCIP (Regional Contamination Investigation Program), UXO (Unexploded Ordnance Areas)

7.2.9 Historical Landfills

No historical landfills have been identified for the site and 500 m buffer area.

7.2.10 Search of Potentially Contaminating Activities

A search of other current potentially contaminating activities undertaken for the site and 500 m buffer area identified the following sites:

Site Name	Category	Location	Status	Distance (m)	Direction
7-Eleven Jerrabomberra	Petrol station	2 Ferdinand Lane, Jerrabomberra, 2619, NSW	Operational	0	Onsite
Woolworths Caltex Jerrabomberra	Petrol station	2 Limestone Drive, Jerrabomberra	Operational	160	East
Suez Services Centre	Waste management facility	11 Alderson Place, Hume	Operational	250	West
Tralelee (TRAL)	Telephone Exchange	24 Rosewood Glen, Jerrabomberra	Operational	495	East

7.2.11 Other Current Potentially Contaminating Activities

A search for potentially contaminating activities undertaken for the site and 200 m buffer area identified the following sites:

Site Name	Category	Location	Status	Distance (m)	Direction
HDM Metal	Manufacturer	16 Arnott St, Hume ACT 2620	Current	89	West
Acrow Formwork& Scaffolding Pty Ltd	Scaffolding Hire Service	15A Sleigh pl, Hume ACT, 2620	Current	100	West
Irwin & Hartshorn	Demolition contractor	12 Alderson pl, Hume ACT, 2620	Current	110	West
Cummins Canberra	Manufacturer	15 Arnott St, Hume ACT 2620	Current	111	West
Lo Pilato Bros	Landscaping Supply store	13 Arnott St, Hume ACT 2620	Current	113	West
InfraBuild Steel Centre-Canberra	Steel distributor	Johns Pl, Hume ACT 2620	Current	119	West
Pacific Formwork	Industrial building	10 Johns Pl, Hume ACT 2620	Current	122	West
Sodablast Canberra	Sandblasting service	7/23 Raws Cres, Hume ACT 2620	Current	123	West
Reylon	Warehouse	31-45 Raws Cres, Hume ACT 2620	Current	126	West
ShelvMaster	Shelving store	Unit 2/21 Raws Cres, Hume ACT 2620	Current	128	West
HDM Metal	Steel fabricator	27 Raws Cres, Hume ACT 2620	Current	131	West
Adams Bikes	Bicycle Shop	4/21 Raws Cres, Hume ACT 2620	Current	134	West
Coates Hire Hume (P)	Equipment rental agency	47 Alderson Pl, Hume ACT 2620	Current	136	West
Downer Hume Asphalt Plant	Asphalt Plant	36 Sawmill Cct, Hume ACT 2620	Current	139	West

Site Name	Category	Location	Status	Distance (m)	Direction
Waco Kwik form Canberra	Scaffolding Hire Service	17 Sheppard St, Hume ACT 2620	Current	143	West
Toll Express	Logistics service	44-50 Sawmill ACT, Hume ACT 2620	Current	146	West
Statewide Frames& Trusses	License Plate frames supplier	5a/15 Sheppard St, Hume ACT 2620	Current	151	West
Grace Removals Canberra	Removalist	54 Sawmill Circuit, Hume ACT 2620	Current	158	West
Optus	Telecommunication	47 Raws Cresnet, Hume ACT 2620	Current	165	West
Cloud Electrical Pty Ltd	Electrician	Unit 2/3 Sleigh Pl, Hume ACT 2620	Current	167	West
Alto Scaffolding	Scaffolding	15b Sleigh Pl, Hume ACT 2620	Current	173	West
National Storage Hume, Canberra	Self-storage facility	20 Alderson Pl, Hume ACT 2620	Current	188	West

7.2.12 Derelict Mines and Quarries

A search for potential derelict mines and quarries on site and within a 500m buffer area identified the following sites:

Site Name	Description	Distance (m)	Direction
Tralee Sand& Gravel Pit	Location of operation given as Tralee. Property named Tralee is located south of Jerrabomberra Creek near NSW ACT border. Material extracted is sand and river gravel. Exact location unknown, possibly on Jerrabomberra Creek but unlikely	0	Onsite
Tralee	Previously in Yarrowlumla Shire S117, shire boundary changed in 1995. CSR informed NSW in March 1999 that they don't have any intention of developing a quarry on the site and are in the process of relinquishing their leases and caveats.	50	South
Jerrabomberra Prospect	GS1971/653-anomalous stream sediments with follow up rock chips to: 5ppm Ag, 80 ppm Cu, 1400ppm Pb, 5500ppm Zn, 358 ppm As, 3100 ppm Mn. Gossans are located in a picnic area of the municipality of Queanbeyan	287	East

7.3 Summary of Desktop Review

The results of the investigation indicated the following:

- The site is located in an area comprising primarily agricultural and undeveloped land uses with the township of Jerrabomberra located adjacent to the north east of the Site.
- Desktop search results identified a number of potential significant flora / fauna species and ecological communities that may require further consideration during any potential future operational expansion planning.
- The site is underlain by underlain Adaminaby, Alluvium and Douro Group geological formations from the lower Ordovician, Quaternary, and Upper Silurian period. Soil landscapes within the Site were described as including Williamsdale, Burra, Ginninderra Creek, Luxor Variant B, Campbell

-
- Groundwater within the site and surrounding area was measures to be present within underlying aquifers at depths ranging from 7 – 40.2 mbgl. Groundwater bores within the Site and surrounding area were identified to be utilised for a range of uses including monitoring, exploration, irrigate agriculture and domestic water supply.
 - Several surface water dams were located throughout the Site. During periods of rainfall it is the opinion of ERM that surface waters would infiltrate the site surface or flow via overland flow paths / ephemeral drainage lines to onsite dams and / or adjacent surface water receiving bodies located on the northern and western boundary of the Site
 - The site and surrounding area has been primarily agricultural land since the earliest aerial photography records (1961). ERM notes that some minor commercial / industrial land uses have been undertaken within the site and surrounding area however specific details on the nature of these operations is unknown
 - There are known contaminated sites located adjacent to the northern boundary of the RJP where contaminated groundwater is present. Whilst this is unlikely to represent a risk to ongoing use of the land within the RJP, there is potential for draw-down of contamination if groundwater is extracted for beneficial re-use within the RJP.

7.4 RJP Conceptual site model

The following summary of the CSM for the South Jerrabomberra RJP has been prepared based on the desktop assessment, site inspection and preliminary sampling as discussed in the above sections. The location of the potential sources of contamination area is illustrated in Figure 7.

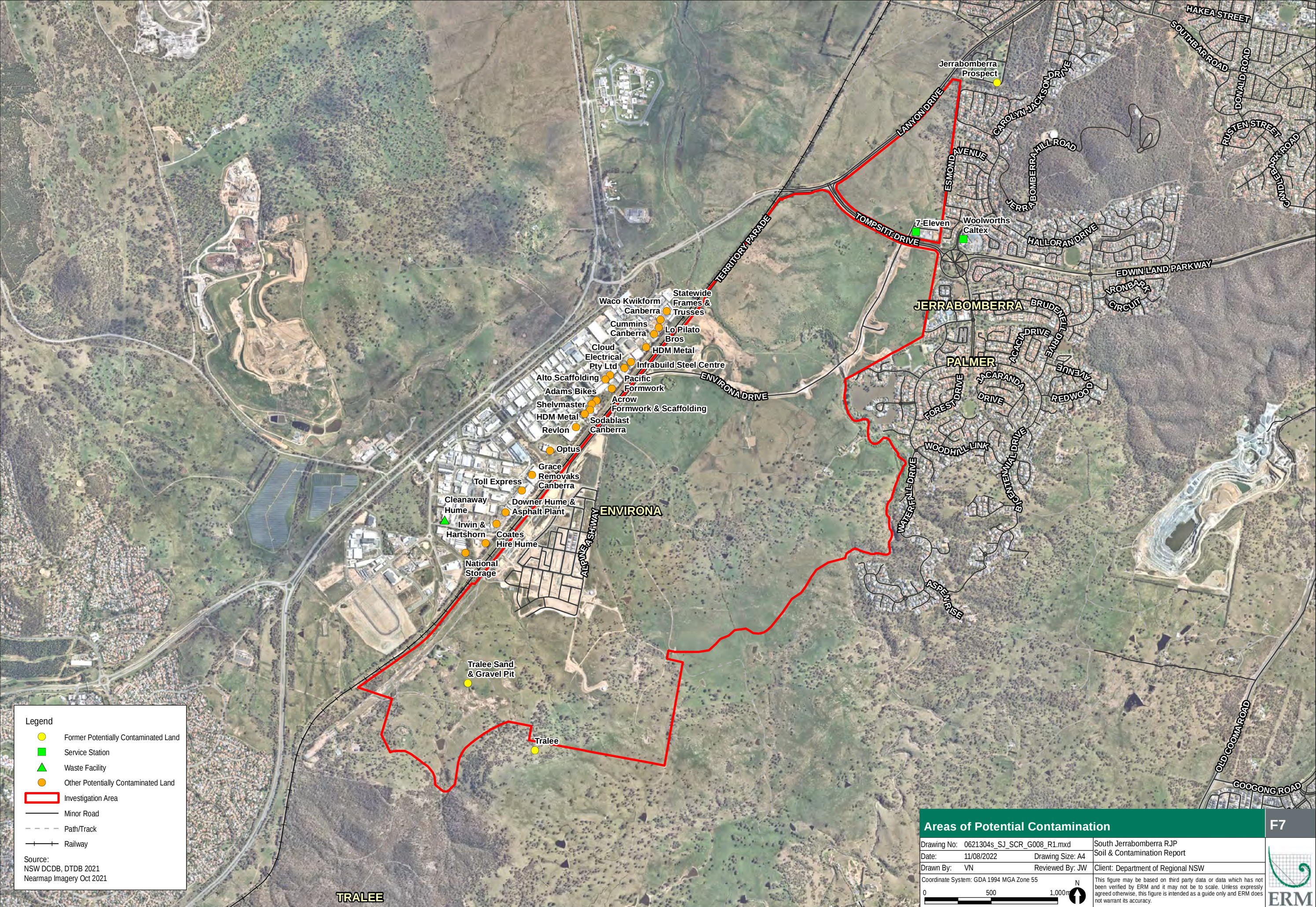
7.4.1 Potential Sources of Contamination

Based on the site history and background data reviewed and ERM's professional experience, the Contaminants of Potential Concern (CoPC) associated with current and historical land uses undertaken in the general area are considered to include the following:

Potential Source	CoPC	Comment
AEC – 1 Tralee Sand & Gravel Pit	■ Petroleum hydrocarbons ■ Polycyclic aromatic hydrocarbons (PAHs) (e.g., creosote, naphthalene) ■ Monocyclic aromatic hydrocarbons benzene, toluene, ethylbenzene and xylenes (BTEX); ■ Asbestos ■ Polychlorinated biphenyls (PCBs) ■ Metals (e.g., copper, lead)	■ Located on the Site ■ Gravel and sand quarrying ■ Potential leaks from waste disposal ■ Onsite fuel and chemical storage ■ Leaks and spills of fuels / chemicals associated with refuelling and maintenance ■ Hazardous materials associated with degrading building structures.
AEC – 2 7-Eleven Jerrabomberra	■ Petroleum hydrocarbons ■ total recoverable hydrocarbons (TRH); ■ semi-volatile organic compounds (SVOCs), ■ Volatile Organic Compounds (VOCs), ■ Total Dissolved Solids (TDS); and ■ Methyl tertiary-butyl ether and other oxygenates ■ Metals (e.g., barium, cadmium, copper, lead, nickel, zinc) ■ Solvents such as trichloroethene (TCE) ■ PAHs & BTEX ■ Heavy Metals ■ Oil and grease	■ Service station and fuel storage facilities located on the site, currently operational ■ Leaks and spills of fuels / chemicals associated with refuelling and maintenance ■ Hazardous materials associated with degrading building structures.

Potential Source	CoPC	Comment
AEC-3 On-site Commercial / Industrial Land Uses	■ TCE ■ PAH & BTEX ■ Metals ■ Ammonia ■ Asbestos ■ TRH ■ VOCs & SVOCs ■ phenols, ■ Landfill gases ■ TDS; and ■ PFAS	■ Onsite fuel and chemical storage ■ Leaks and spills of fuels / chemicals associated with refuelling and maintenance ■ Hazardous materials associated with degrading building structures.
AEC -4 Hazardous Materials Associated with Current and Former Structures / Service Conduits etc.	■ Asbestos, ■ heavy metals; and ■ PCBs	■ Potential building waste from demolition of former building structures located within the Site and adjacent area. ■ Potential redundant service lines / conduits
AEC – 5 Sewer / Septic Lines and Tanks	■ Pathogens (E Coli and Enterococci) ■ Nutrients (Phosphorus, Nitrates, Nitrogen); and ■ Heavy Metals.	■ Potential leaks from current and former sewer lines / septic tanks within the site
AEC – 6 General Site Usage	■ TRH, ■ PAHs & BTEX, ■ Solvents, ■ Chlorinated Hydrocarbons (CHC), ■ Heavy Metals, ■ PFAS, ■ PCBs, ■ OCP/OPP, ■ Herbicides, ■ Phosphates, ■ Nutrients; and ■ Asbestos.	■ Potential use of nutrients / fertilisers within irrigated portions of Site ■ Current and historical agricultural land uses ■ Area of excavation / clearing located within central portion of the Site ■ Current / former farm dams collecting potential contaminated surface water run off

Potential Source	CoPC	Comment
AEC – 7 Surrounding Agricultural and Commercial Industrial Land Uses	■ Ammonia ■ Asbestos, ■ Boron ■ Cresols ■ Landfill gases ■ Metals ■ Methyl tertiary-butyl ether and other oxygenates ■ Nutrients (Phosphorus, Nitrates, Nitrogen) ■ Oil and grease ■ Organochlorine pesticides (OCP) & Organophosphorus Pesticides (OPP) ■ PAHs & BTEX ■ Pathogens ■ Petroleum hydrocarbons ■ PFAS ■ phenols, ■ SVOCs ■ TCE ■ TDS ■ TRH ■ VOCs & SVOCs	■ General use of the site prior to current operational uses and agricultural land uses undertaken within the surrounding area. ■ Hamas Harman (North), Queanbeyan Quarry (east), Koppers, Hume (west), Hume Asphalt Plant (west), Integrated Forest Products (West), Mugga Lane Landfill (west); all are located downstream to the Site ■ Electricity generation ■ Fill material from unknown origin ■ Gravel and sand quarrying ■ Hazardous materials associated with degrading building structures. ■ Leaks and spills of fuels / chemicals associated with refuelling and maintenance ■ Onsite fuel and chemical storage ■ Potential leaks from current and former sewer lines / septic tanks within the site ■ Potential leaks from PFAS and AFFF ■ Waste treatment and disposal



Legend

Former Potentially Contaminated Land

Service Station

Waste Facility

Other Potentially Contaminated Land

Investigation Area

Minor Road

Path/Track

Railway

Source:

NSW DCDB, DTDB 2021

Nearmap Imagery Oct 2021

Areas of Potential Contamination

F7

Drawing No: 0621304s_SJ_SCR_G008_R1.mxd

Date: 11/08/2022

Drawn By: VN

Drawing Size: A4

Reviewed By: JW

South Jerrabomberra RJP

Soil & Contamination Report

Client: Department of Regional NSW

Coordinate System: GDA 1994 MGA Zone 55

0 500 1,000m

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

7.4.2 Potential Pathways

The primary potential exposure pathways of concern at the site are:

- Inhalation of vapour (from soil and/or groundwater) and contaminated dust (from soils).
- Dermal contact and / or incidental ingestion with contaminated surface water and soils / sediments.
- Transport of contamination through surface water flows.
- Transport of contamination to underlying groundwater aquifers.
- Transport of contaminants through mechanical transport (i.e., excavation, tracking during vehicle movement etc.).

7.4.3 Potential Receptors

Key receptors have been identified as:

- Current site users (agricultural, residential and commercial / industrial).
- Future site users (agricultural, residential and commercial / industrial).
- Potential future users of groundwater (identified use of groundwater for a range of purposes).
- Workers carrying out construction, installation or maintenance works within the site.
- Groundwater beneath the site.
- Adjacent sensitive receptors e.g., adjacent residents, cattle (or other grazing animals) and sensitive ecological receptors.

7.4.4 Preliminary Conceptual Site Model

Based on the results of the desktop assessment, site inspection and the potential sources, pathways and receptors identified above ERM developed the below Conceptual Site Model (CSM). A preliminary assessment of the potentially complete pollutant linkages is provided in the table below based on the following risk-based parameters:

- Low – no known or suspected sources
- Low – known or suspected sources but actively being monitored or managed to reduce potential for complete pollutant linkage
- Moderate – potential or known sources of contamination with limited information available to assess and pollutant linkages unlikely to be complete under on-going land-use
- High – known source of contamination and actual or potential for exposure pathways to receptors and/or off-site migration

Potential Sources	Pathways	Potential Receptors	Risk of Potentially Complete Pollutant Linkage
AEC – 1 Tralee Sand & Gravel Pit	■ Dermal contact, inhalation, and / or incidental ingestion with contaminated surface waters / soils.	■ Current and future site users; and ■ Workers carrying out development, installation or maintenance works within the site.	■ Moderate
	■ Transport of contamination through surface water flows.	■ Adjacent sensitive receptors; ■ Current and future site users; and ■ Workers carrying out development, installation or maintenance works within the site.	■ Moderate
	■ Transport of contamination to underlying groundwater aquifers	■ Adjacent sensitive receptors; and ■ Future potential on-site users of groundwater.	■ Moderate
	■ Transport of contaminants through mechanical transport	■ Workers carrying out development, installation or maintenance works within the site.	■ Moderate
AEC – 2 7-Eleven Jerrabomberra	■ Dermal contact, inhalation, and / or incidental ingestion with contaminated surface waters / soils.	■ Current and future site users; and ■ Workers carrying out development, installation or maintenance works within the site.	■ Low
	■ Transport of contamination through surface water flows.	■ Adjacent sensitive receptors; ■ Current and future site users; and ■ Workers carrying out development, installation or maintenance works within the site.	■ Low

Potential Sources	Pathways	Potential Receptors	Risk of Potentially Complete Pollutant Linkage
	■ Transport of contamination to underlying groundwater aquifers	■ Adjacent sensitive receptors; and ■ Future potential on-site users of groundwater.	■ Moderate
	■ Transport of contaminants through mechanical transport	■ Workers carrying out development, installation or maintenance works within the site.	■ Low
AEC-3 On-site Commercial / Industrial Land Uses	■ Dermal contact, inhalation, and / or incidental ingestion with contaminated surface waters / soils.	■ Current and future site users; and ■ Workers carrying out development, installation or maintenance works within the site.	■ Moderate
	■ Transport of contamination through surface water flows.	■ Adjacent sensitive receptors; ■ Current and future site users; and ■ Workers carrying out development, installation or maintenance works within the site.	■ Moderate
	■ Transport of contamination to underlying groundwater aquifers	■ Adjacent sensitive receptors; and ■ Future potential on-site users of groundwater.	■ Moderate
	■ Transport of contaminants through mechanical transport	■ Workers carrying out development, installation or maintenance works within the site.	■ Moderate
AEC – 4 Hazardous Materials Associated with Current and Former Structures / Service Conduits etc.	■ Dermal contact, inhalation, and / or incidental ingestion with contaminated surface waters / soils.	■ Current and future site users; and ■ Workers carrying out development, installation or maintenance works within the site.	■ Moderate - High
	■ Transport of contamination through surface water flows.	■ Adjacent sensitive receptors; ■ Current and future site users; and ■ Workers carrying out development, installation or maintenance works within the site.	■ Low
	■ Transport of contamination to underlying groundwater aquifers	■ Adjacent sensitive receptors; and ■ Future potential on-site users of groundwater.	■ Low
	■ Transport of contaminants through mechanical transport	■ Workers carrying out development, installation or maintenance works within the site.	■ Moderate - High
AEC – 5 Sewer / Septic Lines and Tanks	■ Dermal contact, inhalation, and / or incidental ingestion with contaminated surface waters / soils.	■ Current and future site users; and ■ Workers carrying out development, installation or maintenance works within the site.	■ Moderate

Potential Sources	Pathways	Potential Receptors	Risk of Potentially Complete Pollutant Linkage
	■ Transport of contamination through surface water flows.	■ Adjacent sensitive receptors; ■ Current and future site users; and ■ Workers carrying out development, installation or maintenance works within the site.	■ Moderate
	■ Transport of contamination to underlying groundwater aquifers	■ Adjacent sensitive receptors; and ■ Future potential on-site users of groundwater.	■ moderate
	■ Transport of contaminants through mechanical transport	■ Workers carrying out development, installation or maintenance works within the site.	■ Low
AEC – 6 General Site Usage	■ Dermal contact, inhalation, and / or incidental ingestion with contaminated surface waters / soils.	■ Current and future site users; and ■ Workers carrying out development, installation or maintenance works within the site.	■ Moderate
	■ Transport of contamination through surface water flows.	■ Adjacent sensitive receptors; ■ Current and future site users; and ■ Workers carrying out development, installation or maintenance works within the site.	■ Moderate
	■ Transport of contamination to underlying groundwater aquifers	■ Adjacent sensitive receptors; and ■ Future potential on-site users of groundwater.	■ Moderate
	■ Transport of contaminants through mechanical transport	■ Workers carrying out development, installation or maintenance works within the site.	■ Moderate
AEC – 7 Surrounding Agricultural and Commercial Industrial Land Uses	■ Dermal contact, inhalation, and / or incidental ingestion with contaminated surface waters / soils.	■ Current and future site users; and ■ Workers carrying out development, installation or maintenance works within the site.	■ Low
	■ Transport of contamination through surface water flows.	■ Adjacent sensitive receptors; ■ Current and future site users; and ■ Workers carrying out development, installation or maintenance works within the site.	■ Moderate
	■ Transport of contamination to underlying groundwater aquifers	■ Adjacent sensitive receptors; and ■ Future potential on-site users of groundwater.	■ Moderate – High

8. REVIEW

8.1 Review of Masterplan and Potential Constraints

The following section outlines the potential constraints identified in the review of the proposed Masterplan (August 2022) in light of the preliminary assessment of soil and contamination presented above in this report. The proposed masterplan is presented in Figure 8.

8.2 Salinity

Based on regional soil mapping no salinity hazard was identified for the soil landscapes within the investigation area. The salinity, sodicity and aggressivity soil conditions are unlikely to represent a significant constraint on the proposed Masterplan.

In addition to the above, it is noted that salinity conditions are dependent on several variables, which include surface water infiltration to soil and groundwater levels which may be modified by development in the area. The application of the principles of Water Sensitive Urban Design should be considered in the proposed development areas to mitigate potential changes to soil water levels and salinity conditions in the catchment. The impact of the extraction of groundwater for beneficial re-use on catchment level salinity conditions should also be considered, and groundwater monitoring for salinity should be considered as part of a hydrogeological assessment for beneficial re-use.

8.3 Acid Sulfate Soils Potential Constraints

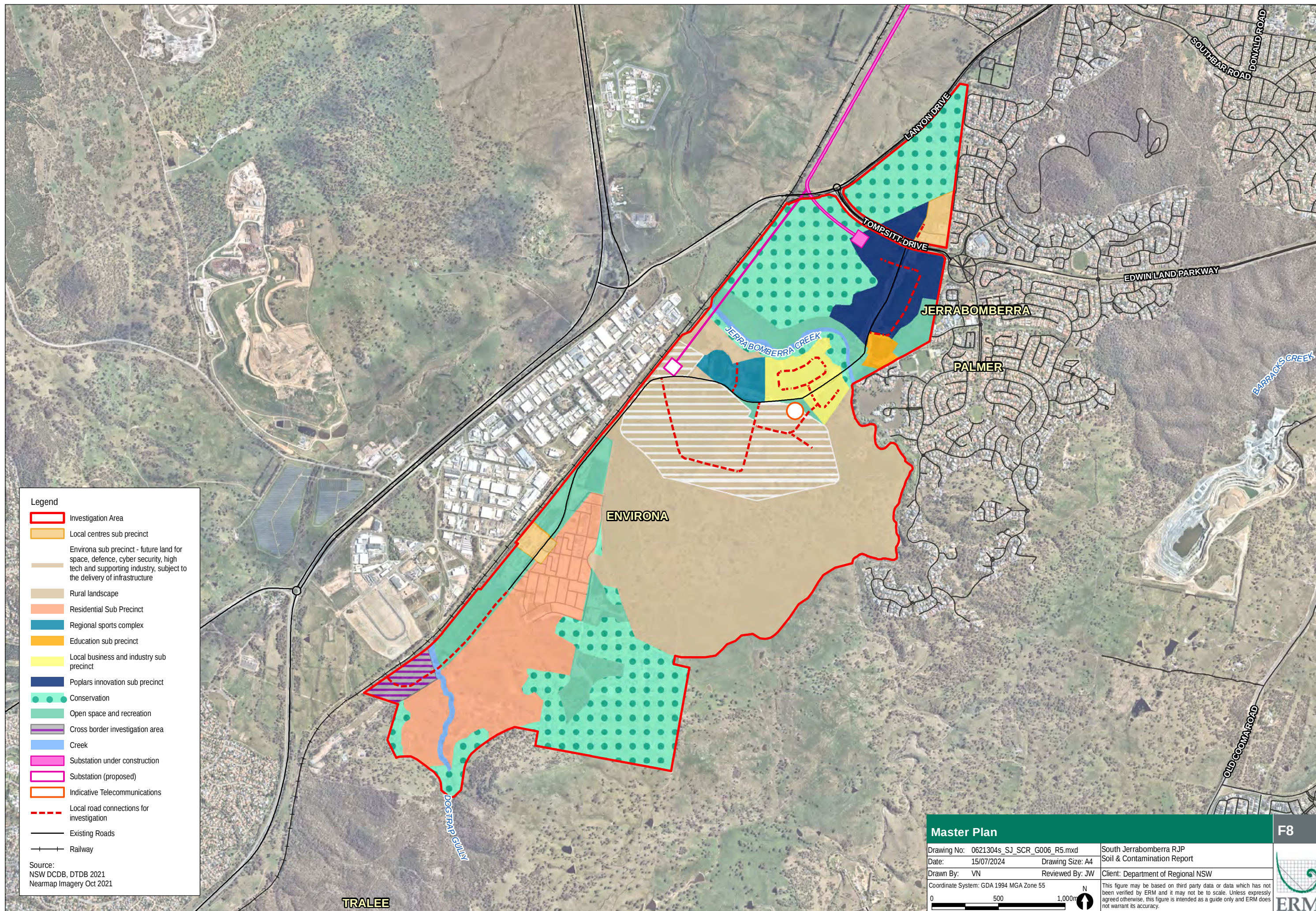
No significant risk of acid sulfate soil was identified within the Site nor within a 200 m buffer zone based on the available Acid Sulfate Soil risk maps. The Atlas of Australian Acid Sulfate Soil indicates that there is an extremely low probability for acid sulfate soils occurring within the Site. The potential risk of acid sulfate soils is unlikely to represent a significant constraint on the proposed Masterplan.

8.4 Contamination Potential Constraints

8.4.1 Potential for Contamination

Based on the findings of the desktop review, the following areas of potential contamination have been identified within the South Jerrabomberra RJP:

- Specific sites which are currently or formerly operated potentially contaminating industries and/or activities (as listed in Appendix 1 of the Land Contamination Planning Guidelines (Draft)), have the potential for contamination to be present:
 - Tralee Sand & Gravel Pit
 - 7-Eleven Jerrabomberra
 - On-site Commercial / Industrial Land Uses
- The remaining land has the broad potential for contamination associated with:
 - Built structures and/or infrastructure (current), which may include hazardous building materials (such as asbestos, lead paints, PCBs) that may pose a risk if demolished in an uncontrolled manner;
 - General rural use sites which may currently or formerly had chemical storage and use including but not limited to underground or above-ground chemical storage tanks; and
 - Remains of built structures and/or infrastructure which have been demolished in an uncontrolled manner, which may include hazardous building materials (such as asbestos);
 - Uncontrolled waste dumping.
- Contaminated groundwater associated with known contaminated sites to the north of the RJP. If beneficial re-use of groundwater within the RJP is proposed further investigation would be required to assess potential for draw-down of existing contamination in groundwater associated with contaminated sites outside the RJP. Proposals for beneficial re-use of groundwater should avoid extraction of groundwater near known contaminated sites adjacent to the RJP.



8.4.2 Review of the Masterplan

The following section reviews the proposed changes to land-use under the Masterplan to inform the planning process. At this stage there is not a proposal to rezone land, however the following discussion is provided as it is relevant to the application of the Contaminated Land Planning Guidelines for proposed changes to land-uses at the strategic planning and rezoning stage.

The NSW Government (2018) Contaminated Land Planning Guidelines (Draft) provide further detail on the application of contamination assessments at the strategic planning and rezoning stage, including the general guidance on when a planning proposal to rezone land must be accompanied by a preliminary site investigation or detailed site investigation. The following table summarises the key aspects which the contaminated land planning guidelines (draft) recommends should be considered when preparing a planning proposal to rezone land:

Table 8-1 Strategic Planning and Rezoning Considerations

Contaminated Land Planning Guidelines	Applicability to RJP:
land is significantly contaminated land within the meaning of the CLM Act	No sites within the RJP has been identified as significantly contaminated within the meaning of the CLM Act.
an activity listed in the SEPP (as reproduced in Table 1 in Appendix 1) is being carried out on the land and is potentially causing contamination	Some activities that may cause contamination include: agricultural/horticultural activities service stations
records show that a potentially contaminating activity has been carried out on the land	Potentially contaminating activities were identified as described in section 7.4.1 and summarised in Section 8.4.1.
there are incomplete records about the use of the land and during the periods not covered by those records, it would have been lawful to carry out a potentially contaminating activity and	Available records have been reviewed.
the proposed rezoning, or proposed change to planning controls, would allow the land to be used for residential, educational, recreational or childcare purposes, or for the purposes of a hospital.	The Masterplan proposes some changes to land-use, in most instances these changes are predominantly a change to a similar or less sensitive land-use from a contamination perspective. The exceptions to this are: ■ Areas proposed for recreational use which currently allow for industrial uses. The proposed changes to more sensitive land-uses are discussed further below and summarised in Table 8.3.

A high-level assessment of the potential for contamination and the proposed land-use changes in the RJP Masterplan has been undertaken to inform the planning process. As described in Section 8.4.1, there is potential for contamination to be present across the RJP associated with specific and non-specific activities and known contamination in groundwater outside the RJP which should be assessed further, as summarised in Figure 9 below.

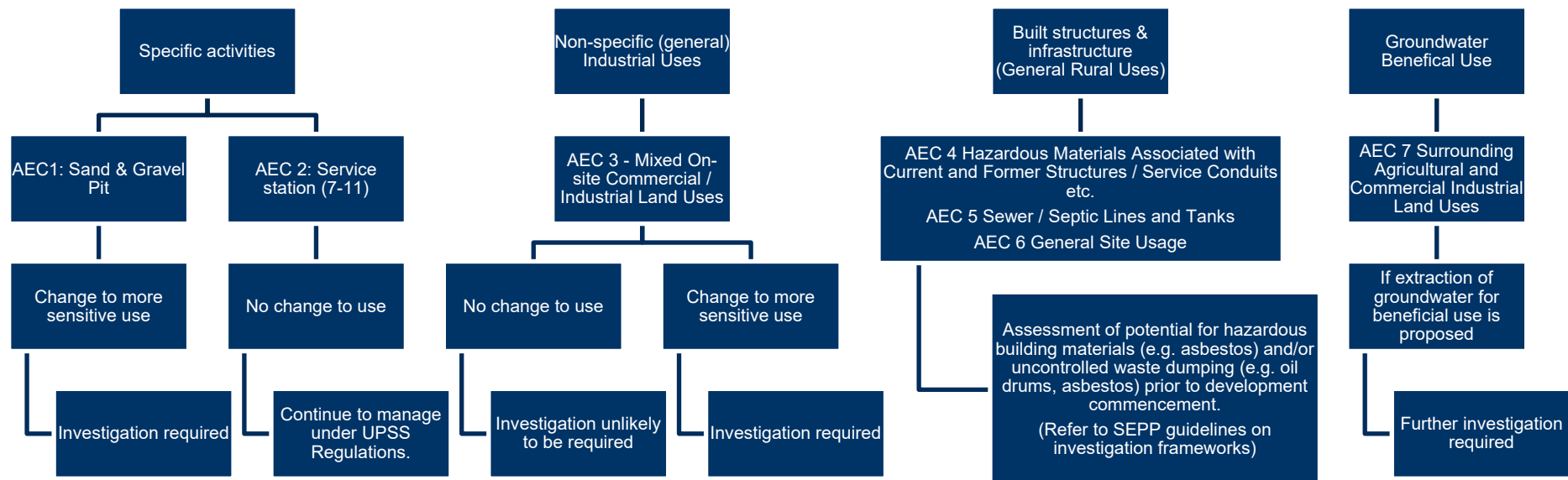


Figure 9 Summary of Likely Further Investigation Triggers

Note: Based on the available information at the time of this assessment on potential contamination and proposed land-use changes.

Based on the information in the preliminary site investigation, if further assessment is required, this can be undertaken by the proponent at the individual site level during the development application stage. Contamination assessments should be undertaken by suitably qualified and experienced consultants. In some circumstances, a statutory Site Audit may be required (refer to the draft Contaminated Land Planning Guidelines for further information on when a statutory Site Audit is required). The use of suitably qualified and experienced consultants (certified by a scheme currently recognised by NSW EPA) in conducting third-party formal independent review should be considered where a statutory Site Audit is not required and a non-statutory audit may be onerous on the proponent.

However, the draft Contaminated Land Planning Guidelines also advise the planning authority to consider whether appropriate provisions may be needed within the relevant environmental planning instrument or development control plan, where potentially contaminated land is suspected, to further investigate before land use changes occur.

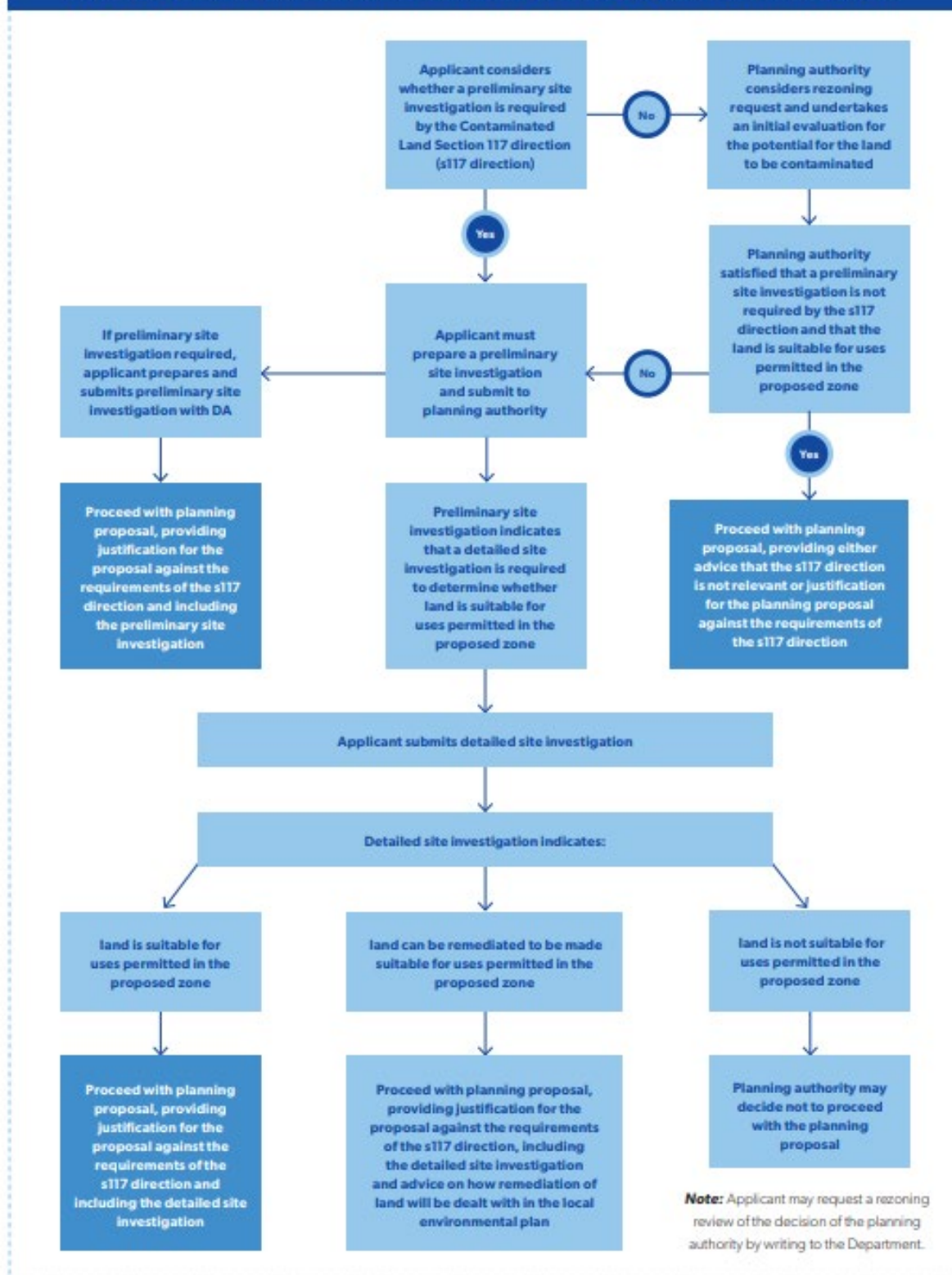
The Masterplan (dated August 2022) proposes some changes to land-use, in most instances these changes are predominantly a change to a similar or less sensitive land-use from a contamination perspective. The exceptions to this are areas proposed for recreational use which currently allow for industrial uses.

The triggers for further assessment of potential contamination are set out in Clause 4.6(4) of the SEPP. Generally, the triggers for further contamination assessment under Clause 4.6(4) of the SEPP would only be met where the proposed changes to land-use under the Masterplan for the RJP are (i) for residential, educational, recreational or child care purposes or for the purpose of a hospital; AND (ii) the land is currently or formerly used for potentially contaminating activities (as listed in Table 1 of Appendix 1 to the contaminated land planning guidelines).

In addition to the above it is important to note that there is broad potential for contamination on all land across the RJP associated with hazardous building materials, small scale chemical storage and use and uncontrolled waste dumping. This potential contamination should be assessed further prior to approval of development to prevent potential exposure to contamination hazards. The guidance provided in Land Contamination Planning Guidelines (Draft) should be considered in relation to the application of due diligence by Council in consideration of a process for assessment of potential for hazardous building materials (e.g., asbestos) and/or uncontrolled waste dumping (e.g., oil drums, asbestos) prior to development commencement. A clear framework for management of these risk is needed for public safety and to mitigate the potential for substantial cost and time delays. Given the staging of the works (over a period of up to 20 years for different precincts), investigations would be best placed as the development/planning progresses to accommodate the likely changes to land that will occur over that time (i.e. ongoing activities may generate change in contamination potential).

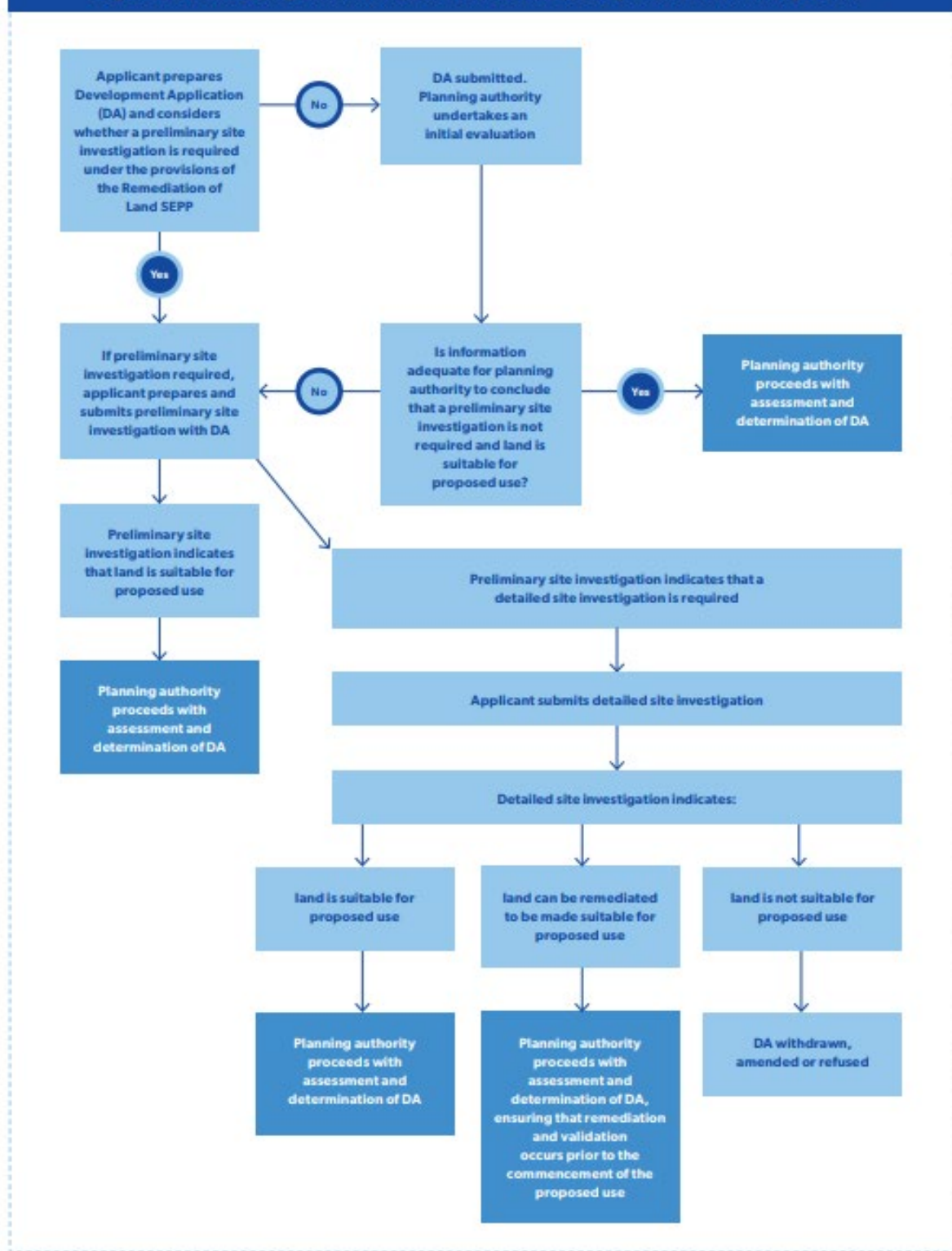
As the planning process for the RJP is ongoing, the assessment of potential contamination should be considered at the relevant stages of the process (through development applications and planning proposals) with consideration of the guidance in the contaminated land planning guidelines, including the considerations for decision making in the planning proposal and rezoning process (Figure 1) and the development assessment process (Figure 2).

Figure 1: Considering contamination issues in the planning proposal and rezoning process



Source: NSW Government (2018) Contaminated Land Planning Guidelines (Draft)

Figure 2: Considering contamination issues in the development assessment process



Source: NSW Government (2018) Contaminated Land Planning Guidelines (Draft)

A high-level summary of the proposed land-use changes under the Masterplan and the triggers under the SEPP is detailed in Table 8-3. We note that the Masterplan describes the sub-precincts' proposed general activities, and that no changes to zoning are specified at this stage such that there is limited detail on permissible uses to inform the understanding of which areas may be used for more sensitive concurrent land-uses. For example, whilst the education precinct has been defined, there is potential that child-care centres may be concurrently located with commercial or residential uses within a sub-precinct at a later stage such as "Local Activity Centre".

The Masterplan proposes sub-precincts with further detail on the specific land-uses and/or permissible activities to be finalised at a later stage of the planning process. In order to support this review, the risk based land-use categories defined in the ASC NEPM for development of the health investigation levels (HILs) have been provisionally applied to assist in developing assumptions for this review. Based on the information in the Masterplan, Table 8-2 below summarises the current understanding of the potential land-uses in the proposed sub-precincts, as they relate to the land-use contexts applied in the risk assessment process of the ASC NEPM.

Table 8-2 Land-use Categories

Masterplan Land-use	ASC NEPM Land-use
Green Infrastructure Conservation	Environmental Conservation – no public access
Open space precinct	Open space—public access for recreational use (Recreational HIL-C)
Local activity Centres Sub Precinct Defence & Technology Sub Precinct Local Business & Industry Sub Precinct High Amenity Business Areas	Commercial/Industrial (HIL-D) If other more sensitive concurrent uses such as child-care centres may be present, residential with no accessible soils (Residential HIL-B) as applicable for educational uses.
Education Sub-Precinct	Residential with accessible soils (Residential HIL-A) or residential with no accessible soils (Residential HIL-B)
Residential Sub-precinct	Residential with accessible soils (HIL-A) or residential with no accessible soils (Residential HIL-B)
Rural Landscape Sub Precinct	Applies to the balance of unplanned lands not proposed for urban development. We assume this means no change to the existing land-use.

Table 8-3 Summary of Proposed Masterplan and Contamination Assessment Triggers in SEPP (Resilience and Hazards)

Potential Contamination	Potential Sources of Contamination from CSM	Current Zoning	Masterplan Proposed Changes to Land Use	Does the Masterplan Trigger Contamination Assessment in accordance with SEPP (Resilience and Hazards)?
Specific activities	Tralee Sand & Gravel Pit	R2 Low Density Residential	Residential Sub Precinct	The area is currently predominantly undeveloped, and the desktop assessment identified a former sand and gravel pit operation, and other areas appear to have been used for general rural industrial uses (truck and stockpile areas). Further assessment should be considered for sensitive land-use change (i.e. residential development). Due diligence to be used to establish a process for assessment of potential for hazardous building materials (e.g., asbestos) prior to development commencement.
	7-Eleven Jerrabomberra	B1 Neighbourhood Centre	No change	No changes proposed under masterplan
Non-specific (general) Industrial Uses	AEC 3 – Mixed On-site Commercial / Industrial Land Uses	B1 Neighbourhood Centre B4 Mixed Use B7 IN2 Light Industrial	Local Activity Centres Sub-Precinct Defence & Technology Sub Precinct High Amenity Business Areas Local Business & Industry Sub Precinct	No change in zoning. Apply principles of SEPP (Resilience and Hazards) Due diligence to be used to establish a process for assessment of potential for hazardous building materials (e.g., asbestos) prior to development commencement. Consideration to be given to assessments for more sensitive land-use changes, such as construction of daycare centre, which are permissible within this zone.
		IN2 Light Industrial	Open Space Sub Precinct	Yes Change to a more sensitive land-use (recreation), which may trigger assessment under SEPP (Resilience and Hazards). Further assessment may be required to assess potential contamination under public recreational uses. Due diligence to be used to establish a process for assessment of potential for hazardous building materials (e.g., asbestos) prior to development commencement.
		RU2 Rural Landscape		

Potential Contamination	Potential Sources of Contamination from CSM	Current Zoning	Masterplan Proposed Changes to Land Use	Does the Masterplan Trigger Contamination Assessment in accordance with SEPP (Resilience and Hazards)?
Built structures & infrastructure (General Rural Uses)	AEC – 4 Hazardous Materials Associated with Current and Former Structures / Service Conduits etc. AEC – 5 Sewer / Septic Lines and Tanks AEC – 6 General Site Usage	DM	Green Infrastructure Conservation Sub Precinct	Proposed for conservation (no development proposed under masterplan). Investigation may be required if visual observations indicate potential for contamination (e.g. unauthorised waste dumping). Consideration to be given to potential contamination investigation if the area is intended for public recreational use.
			Defence & Technology Sub Precinct Local Business & Industry Sub Precinct	Proposed for predominantly commercial and industrial uses which are generally not more sensitive than the current land-use If the land is to be proposed for development of concurrent uses which are more sensitive such as child-care, school or health facility this may trigger assessment under SEPP (Resilience and Hazards). Consider need for further assessment based on the intended use and potential exposure setting and apply principles of SEPP (Resilience and Hazards). Due diligence to be used to establish a process for assessment of potential for hazardous building materials (e.g., asbestos) or uncontrolled waste dumping prior to development commencement.
			Rural Landscape Sub Precinct	Applies to the balance of unplanned lands not proposed for urban development. We assume this means no change to the existing land-use. Depending on the intended specific use, consider need for further assessment based on the intended use and potential exposure setting and apply principles of SEPP (Resilience and Hazards). Due diligence to be used to establish a process for assessment of potential for hazardous building materials (e.g., asbestos) or uncontrolled waste dumping prior to development commencement.
		R2 Low Density Residential	Residential Sub-Precinct	Areas which are currently zoned R2 which are not proposed to change, but which are currently not developed. As this land is currently vacant, consideration should be given to the need for assessment of impacts from built infrastructure and potential uncontrolled waste dumping. Apply principles of SEPP (Resilience and Hazards) Due diligence to be used to establish a process for assessment of potential for hazardous building materials (e.g., asbestos) prior to development commencement.

Potential Contamination	Potential Sources of Contamination from CSM	Current Zoning	Masterplan Proposed Changes to Land Use	Does the Masterplan Trigger Contamination Assessment in accordance with SEPP (Resilience and Hazards)?
		RE2 Private Recreation	Open Space	Areas which are currently zoned RE2 which are not proposed to change, but which are currently not developed. As this land is currently vacant, consideration should be given to the need for assessment of impacts from built infrastructure and potential uncontrolled waste dumping, in particular the areas adjacent to the railway corridor. Apply principles of SEPP (Resilience and Hazards) Due diligence to be used to establish a process for assessment of potential for hazardous building materials (e.g., asbestos) prior to development commencement.
		C2 Environmental Conservation	Conservation	Proposed for conservation (no development proposed under masterplan). Investigation may be required if visual observations indicate potential for contamination (e.g. unauthorised waste dumping). Consideration to be given to potential contamination investigation if the area is intended for public recreational use.
Regional Groundwater	AEC 7 – contaminated groundwater located to the north of the RJP			If groundwater extraction for beneficial re-use is proposed an assessment should be undertaken for draw-down of groundwater contamination associated with industrial land to the north of the RJP.

In summary:

There is potential for contamination to be present across the RJP associated with specific and non-specific activities, and there is broad potential for contamination on all land across the RJP associated with hazardous building materials, small scale chemical storage and use and uncontrolled waste dumping.

Where a change to a more sensitive land-use is proposed, as summarised in Table 8-3, further assessment may be required. This can be undertaken by the proponent at the individual site level during the development application stage. However, it is noted that the draft Contaminated Land Planning Guidelines also advise the planning authority consider whether appropriate provisions may be needed within the relevant environmental planning instrument or development control plan, where potentially contaminated land is suspected, to further investigate before land use changes occur.

Contamination assessments should be undertaken by suitably qualified and experienced consultants. In some circumstances, a statutory Site Audit may be required (refer to the draft Contaminated Land Planning Guidelines for further information on when a statutory Site Audit is required). The use of suitably qualified and experienced consultants (certified by a scheme currently recognised by NSW EPA) in conducting third-party formal independent review should be considered where a statutory Site Audit is not required and a non-statutory audit may be onerous on the proponent.

There is a broad potential for contamination on all land across the RJP associated with hazardous building materials, small scale chemical storage and use and uncontrolled waste dumping, which should be assessed further prior to approval of development to prevent potential exposure to contamination hazards. Given the staging of the works (over a period of up to 20 years for different precincts), investigations would be best placed as the development/planning progresses to accommodate the likely changes to land that will occur over that time (i.e. ongoing activities may generate change in contamination potential). A clear framework for management of these risks is needed for public safety and to mitigate the potential for substantial cost and time delays and can be developed to fit within the planning process framework.

There is known contamination in groundwater outside the RJP which should be assessed further if groundwater extraction for beneficial re-use is proposed. An assessment should be undertaken for draw-down of groundwater contamination associated with industrial land to the north of the RJP. This can be undertaken concurrent with other groundwater investigations for the RJP.

9. CONCLUSIONS AND RECOMMENDATIONS

ERM was engaged by DRNSW to prepare a Technical Report focused on contamination, soils, and geology for the property identified as the South Jerrabomberra RJP (the Site).

This Technical Report provides an analysis of soils, contamination and geology issues at the Site to aid the Client in gaining a preliminary understanding of the potential opportunities and constraints to future development associated with these issues with the South Jerrabomberra RJP. This technical report has been designed to test the preferred structure plan that was developed as part of a series of Integration Workshops and aims to establish the relevant specifications and requirements to assist in the development of the master plan.

In summary, this report has identified the following constraints which should be considered as part of the development of the master plan:

- Based on regional soil mapping no salinity hazard was identified for the soil landscapes within the investigation area. The salinity, sodicity and aggressivity soil conditions are unlikely to represent a significant constraint on the proposed Masterplan.
- Based on regional soil mapping there is an extremely low to low probability for acid sulfate soils occurring. The potential risk of acid sulfate soils is unlikely to represent a significant constraint on the proposed Masterplan.
- Potential contamination was identified based on the desktop review (no sampling was undertaken) at specific sites which are currently (or formerly) operated potentially contaminating industries and/or activities, including:
 - Tralee Sand & Gravel Pit
 - 7-Eleven Jerrabomberra
 - On-site Commercial / Industrial Land Uses
- The remaining land has the broad potential for contamination associated with hazardous building materials (such as asbestos) associated with built structures and/or infrastructure (current or former), chemical storage and use including but not limited to underground or above-ground chemical storage tanks, uncontrolled waste dumping.
- In addition to the above it is important to note that there is a broad potential for contamination on all land across the RJP associated with hazardous building materials, small scale chemical storage and use and uncontrolled waste dumping, which should be assessed further prior to approval of development to prevent potential exposure to contamination hazards.
- Contaminated groundwater associated with known contaminated sites to the north of the RJP. If beneficial re-use of groundwater within the RJP is proposed further investigation would be required to assess potential for draw-down of existing contamination in groundwater associated with contaminated sites outside the RJP. Proposals for beneficial re-use of groundwater should avoid extraction of groundwater near known contaminated sites adjacent to the RJP.

The following recommendations should be considered during the appropriate phases of the planning process:

- The potential impact of existing contaminated groundwater outside the RJP (adjacent industrial sites north of the RJP) on the quality of extraction of groundwater for beneficial re-use should be further investigated concurrent with the hydrogeology assessment.
- The Masterplan proposes some changes to land-use, in most instances these changes are predominantly a change to a similar or less sensitive land-use from a contamination perspective. The exceptions to this are:
 - Areas proposed for recreational use;

-
- The Masterplan proposes key changes to zoning which may trigger the following key decision points:
 - Where the land is proposed for sensitive land-uses such as recreation and zones which permit child-care centres or educational facilities, further assessment may be triggered under the SEPP; and
 - Where the land is currently used for potentially contaminating activities and change is proposed under the Masterplan to a similar or less sensitive land-use further assessment may not be triggered under the SEPP, but we note that due diligence is advised and consideration should be given to the overarching principles of the SEPP.
 - In addition to the above it is important to note that there is broad potential for contamination on all land across the RJP associated with hazardous building materials, small scale chemical storage and use and uncontrolled waste dumping. This potential contamination should be assessed further prior to approval of development to prevent potential exposure to contamination hazards. The guidance provided in Land Contamination Planning Guidelines (Draft) should be considered in relation to the application of due diligence by Council in consideration of a process for assessment of potential for hazardous building materials (e.g. asbestos) and/or uncontrolled waste dumping (e.g. oil drums, asbestos) prior to development commencement. A clear framework for management of these risk is needed for public safety and to mitigate the potential for substantial cost and time delays.
 - If further assessment is triggered under the SEPP, this can be undertaken by the proponent at the individual site level during the development application stage. Contamination assessments should be undertaken by suitably qualified and experienced consultants. In some circumstances, a statutory Site Audit may be required (refer to the draft Contaminated Land Planning Guidelines for further information on when a statutory Site Audit is required). The use of suitably qualified and experienced consultants (certified by a scheme currently recognised by NSW EPA) in conducting third-party formal independent review should be considered where a statutory Site Audit is not required and a non-statutory audit may be onerous on the proponent.

IMPORTANT LIMITATIONS AND CONTEXT

1. This report is based solely on the scope of work described in *RJP Package B – Environmental Assessment at Richmond Valley, Albury and South Jerrabomberra* Procurement Registration Number P21-3009 dated 20th September 2021 (**Scope of Work**) and performed by Environmental Resources Management Australia Pty Ltd (**ERM**) for The Crown in right of the State of New South Wales acting through Regional NSW (ABN 19 948 325 463) (the **Client**). The Scope of Work was governed by a contract between ERM and the Client (**Contract**).
 2. No limitation, qualification or caveat set out below is intended to derogate from the rights and obligations of ERM and the Client under the Contract.
 3. The findings of this report are solely based on, and the information provided in this report is strictly limited to that required by, the Scope of Work. Except to the extent stated otherwise, in preparing this report ERM has not considered any question, nor provides any information, beyond that required by the Scope of Work.
 4. This report was prepared between 13 October 2021 and 14 April 2022 and is based on conditions encountered and information reviewed at the time of preparation. The report does not, and cannot, take into account changes in law, factual circumstances, applicable regulatory instruments or any other future matter. ERM does not, and will not, provide any on-going advice on the impact of any future matters unless it has agreed with the Client to amend the Scope of Work or has entered into a new engagement to provide a further report.
 5. Unless this report expressly states to the contrary, ERM's Scope of Work was limited strictly to identifying typical environmental conditions associated with the subject site(s) and does not evaluate the condition of any structure on the subject site nor any other issues. Although normal standards of professional practice have been applied, the absence of any identified hazardous or toxic materials or any identified impacted soil or groundwater on the site(s) should not be interpreted as a guarantee that such materials or impacts do not exist.
 6. This report is based on one or more site inspections conducted by ERM personnel, the sampling and analyses described in the report, and information provided by the Client or third parties (including regulatory agencies). All conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved. Whilst normal checking of data accuracy was undertaken, except to the extent expressly set out in this report ERM:
 - a) did not, nor was able to, make further enquiries to assess the reliability of the information or independently verify information provided by;
 - b) assumes no responsibility or liability for errors in data obtained from,
the Client, any third parties or external sources (including regulatory agencies).
 7. Although the data that has been used in compiling this report is generally based on actual circumstances, if the report refers to hypothetical examples those examples may, or may not, represent actual existing circumstances.
 8. Only the environmental conditions and or potential contaminants specifically referred to in this report have been considered. To the extent permitted by law and except as is specifically stated in this report, ERM makes no warranty or representation about:
 - a) the suitability of the site(s) for any purpose or the permissibility of any use;
 - b) the presence, absence or otherwise of any environmental conditions or contaminants at the site(s) or elsewhere; or
-

-
- c) the presence, absence or otherwise of asbestos, asbestos containing materials or any hazardous materials on the site(s).
9. Use of the site for any purpose may require planning and other approvals and, in some cases, environmental regulator and accredited site auditor approvals. ERM offers no opinion as to the likelihood of obtaining any such approvals, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environment works.
10. The ongoing use of the site or use of the site for a different purpose may require the management of or remediation of site conditions, such as contamination and other conditions, including but not limited to conditions referred to in this report.
11. This report should be read in full and no excerpts are to be taken as representative of the whole report. To ensure its contextual integrity, the report is not to be copied, distributed or referred to in part only. No responsibility or liability is accepted by ERM for use of any part of this report in any other context.
12. Except to the extent that ERM has agreed otherwise with the Client in the Scope of Work or the Contract, this report:
- a) has been prepared and is intended only for the exclusive use of the Client;
 - b) must not to be relied upon or used by any other party;
 - c) has not been prepared nor is intended for the purpose of advertising, sales, promoting or endorsing any Client interests including raising investment capital, recommending investment decisions, or other publicity purposes;
 - d) does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise in or in relation to the site(s); and
 - e) does not purport to provide, nor should be construed as, legal advice.
-

APPENDIX A DESKTOP REVIEW

APPENDIX B PHOTOGRAPHIC LOG

**ERM has over 160 offices across the following
countries and territories worldwide**

Argentina	The Netherlands
Australia	New Zealand
Belgium	Norway
Brazil	Panama
Canada	Peru
Chile	Poland
China	Portugal
Colombia	Puerto Rico
France	Romania
Germany	Russia
Ghana	Senegal
Guyana	Singapore
Hong Kong	South Africa
India	South Korea
Indonesia	Spain
Ireland	Sweden
Italy	Switzerland
Japan	Taiwan
Kazakhstan	Tanzania
Kenya	Thailand
Malaysia	UAE
Mexico	UK
Mozambique	US
Myanmar	Vietnam

ERM's Sydney Office

Level 14 207 Kent Street
Sydney, NSW, 2000

T: + 61 02 8584 8888

www.erm.com