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Desktop Land Capability Assessment

Shepparton South East Precinct Structure Plan

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Abbreviations and Acronyms

Abbreviation/ Acronym	Description
ACM	Asbestos Containing Material
AST	Above Storage Tank
AEC	Areas of Environmental Concern
As	Arsenic
bgl	below ground level
BTEX	Benzene/Toluene/Ethylbenzene/Xylene
CEC	Cation Exchange Capacity
CoCs	Contaminants of Concern
Cd	Cadmium
Cr	Chromium
Cu	Copper
EPA	Vic Environment Protection Authority
Hg	Mercury
JSA	Job Safety analysis
m	metres
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
Ni	Nickel
OCPs	Organochlorine Pesticides
OPPs	Organophosphate Pesticides
PAHs	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PCBs	Polychlorinated Biphenyls
PSI	Preliminary Site Investigation
SMEC	Snowy Mountains Engineering Corporation
SWMS	Safe Work Method Statements
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
UST	Underground Storage Tanks
VOCs	Volatile Organic Compounds
Zn	Zinc

Executive Summary

Greater Shepparton City Council, in conjunction with the Victorian Planning Authority (VPA) engaged SMEC to conduct a Desktop Land Capability Assessment (LCA) for the Shepparton South East Precinct Structure Plan (PSP).

SMEC understand the Shepparton South East PSP applies to approximately 385 hectares of land located approximately four kilometres south-east of Shepparton CBD.

The PSP is bound by the Midland Highway (Benalla Road) to the north, the Shepparton Alternative Route (Doyles Road) to the east, the Broken River to the south and the existing limit of residential development to the east of Shepparton to the west.

It is envisaged that the PSP will accommodate a population of approximately 6,000 residents and include a mix of the following land uses:

- Low Density Residential
- Commercial (convenience centre)
- Primary School
- Community Facilities
- Wetlands and Waterways
- Open Space
- Drainage Reserves
- Roads and Road Reserves.

The objective of the LCA is to inform the PSP and determine previous land uses and implications for environmental contamination, hydrology and geology.

In addition to the assessment of potential environmental contamination, the LCA also included a high-level desktop assessment of potential geotechnical constraints and appropriate composition of road pavements which will be used to inform the PSP.

Preliminary Contaminated Land Site Investigation Conclusions and Recommendations

Based on the findings of this investigation a risk rating and risk map was developed outlining Areas of Environmental Concern (AEC). The risk map is presented in Appendix A The risk rating was based on the process described in PPN30 (DELWP, 2021).

A number of specific sites were identified within the study area as *high* and *medium* risk sites regarding the potential for contamination, refer to Appendix A . Much of the remaining area was classified as *medium* risk with a small area along the Broken River considered *low* risk.

The *high-risk* rating was applied for two sites where petroleum underground storage tanks were identified and one site where automotive repairs and engine works were identified to be taking place.

This *medium* risk rating was applied as the primary land use was agriculture (orchard-based farming) however a number of incidental (secondary activities) were identified to have taken place including:

- Chemical Storage
- Fuel Storage (Above Ground Storage Tanks);
- Waste Disposal
- Stockpiling of building rubble (potential containing asbestos)

Examples of these activities recorded on site are shown in Appendix K. These land use activities have the potential to impact upon soil and groundwater quality and further intrusive soil and groundwater investigations are required to delineate the nature and extent of any CoPC identified in this Desktop Land Capability Assessment (LCA).

Based on the potential for contamination (i.e. *medium* or *high*) and the proposed land use (sensitive), the majority of the study area will require a PRSA, as a minimum, to assess the suitability for the proposed land use.

In accordance with PPN30 (DELWP, 2021) where the proposed land use is sensitive in nature (e.g. child care, preschool, primary school, dwellings, residential buildings etc.) and where the potential contamination risk is ranked as *high* or *medium*, a PRSA (Preliminary Risk Screen Assessment) or audit option applies.

Based on the finding of the desktop LCA and the proposed sensitive land uses, SMEC recommend that an Environmental Audit be conducted for the *high* risk sites and a PRSA be conducted to determine the suitability of *medium* risk areas for those sites where the intended site use is sensitive (child care centre, preschool or primary school, residential dwellings).

It is recommended, where possible, to update the PSP Plan to place proposed non-sensitive land use areas (such as open space, commercial) in areas assessed as being *high* risk to avoid potentially unnecessary Environmental Audit requirements.For the *high*-risk sites in addition to the requirement to conduct an Environmental Audit, where underground storage tanks are identified there is a requirement for this infrastructure to be decommissioned and validated in accordance with:

- relevant EPA Victoria Publications
- Australian Standard AS4976-2008 *The removal and disposal of underground petroleum storage tanks*
- SAA AS1940–2017, *The storage and handling of flammable and combustible liquids*
- WorkSafe Victoria requirements.

Upon the removal of this infrastructure validation sampling should be conducted under the footprint of this infrastructure to ensure any associate residual contamination is removed and will not pose an ongoing risk to site receptors.

Any stockpiles of rubbish, and areas containing Asbestos Containing Material (ACM) should also be characterised to determine its suitability for offsite disposal to a licensed landfill facility and appropriate validation sampling and analysis undertaken.

Geotechnical Desktop Assessment Conclusions and Recommendations

Based on the geotechnical desktop assessment, it is considered that the geotechnical conditions are unlikely to present a significant constraint to development. The expected geology is typical of a large portion of the Shepparton area where similar structures have been developed and the risks identified could be appropriately managed through proper planning, investigation, design and construction.

The geotechnical assessment presented in this report is based on a desktop review and is intended to identify potential geotechnical risks and constraints to the development only.

Geotechnical site investigations are recommended to determine the sub-surface profile and geotechnical properties of the on-site soils with respect to the proposed development. The investigation would be used to determine the soil suitability for any geotechnical works required on the site and to provide geotechnical parameters for design. It is recommended that the geotechnical investigations include in-situ testing such as Standard Penetration Testing (SPT) and/or Dynamic Cone Penetration (DCP) testing to assess the soil strength and that soil sampling and laboratory testing is undertaken to assess the relevant engineering properties such as plasticity, shrink-swell potential and CBR strength.

Road Pavement Desktop Assessment Recommendations

It is recommended that the following procedures be adopted for the preparation of subgrade beneath pavements:

- Excavate and remove any uncontrolled fill, vegetation and natural thin sand layers to expose the natural subgrade. Also remove any subsoil containing significant organic matter. Grub out any major roots.
- Where required, further excavate to design subgrade level.
- The exposed subgrade should then be scarified and compacted using a heavy vibrating pad foot roller to achieve a dry density ratio of at least 98% Standard compaction and within +/- 3% of Standard Optimum Moisture Content (SOMC).
- Any soft or weak areas identified during the subgrade compaction process, that do not respond to further compaction, should be removed and replaced with select fill in layers not exceeding 200mm loose thickness and each layer compacted to achieve a Dry Density Ratio of at least 98% Standard and within +/- 3% of SOMC in accordance with AS1289 5.1.1, 5.4.1 or 5.7.1. Excavations to remove any soft or weak areas should have side slopes battered not steeper than 1H:1V. Should extensive soft or weak areas be encountered, further geotechnical advice should be sought.
- Where engineered fill is required to raise the subgrade level, it should be placed and compacted as described above.

- Select fill may comprise material such as crushed rock, clayey sand, sandy clay or weathered sedimentary rock. It is recommended that imported fill materials be required to have a maximum particle size after compaction of 50mm and have a liquid limit not exceeding 50%. Alternative materials may be considered but samples should be submitted for approval before use.
- It is recommended that subgrade preparation, fill placement and compaction be performed in the presence of a suitably experienced geotechnical practitioner and the level of compaction checked by field density testing. Subgrade preparation should be carried out during dry weather conditions where possible. Provision should be made for effective diversion and removal of all surface water from the prepared subgrade from any source.

Sodic Soils

Surface soils throughout the site were classified as Sodic with an ESP of 6-15%.

There is no known regulation that would prevent a specific land use due to sodic soils however the site condition may require management on a case-by-case basis to assess how sodic soils will impact any proposed changes in land use.

It is recommended that the sodic soil risk be documented within a Construction Environmental Management Plan (CEMP) which lists the required controls to manage sodic soils, in particular:

- Due to the increased risk of erosion of sodic soils which are present across the study area, it is recommended that soil disturbance be avoided in steeper areas (greater than 5% slope).
- In areas with a slope of greater than 10%, additional erosion protection measures may be required to reduce the risk of erosion of sodic soils across the site.
- Protection measures are likely to involve the establishment of perennial ground cover vegetation and soil amelioration through the application of gypsum and/or organic matter.

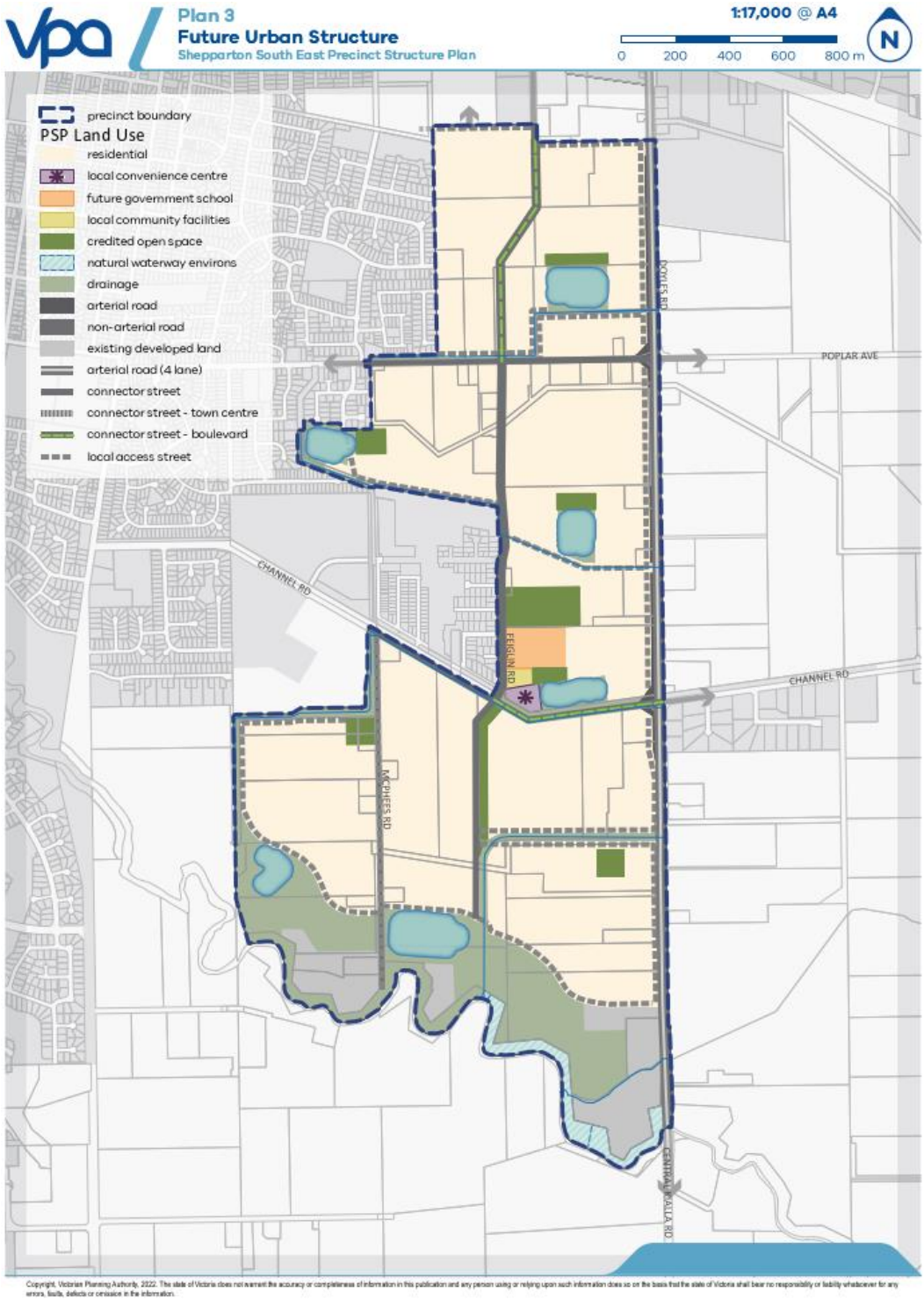
1 Introduction

Greater Shepparton City Council (GSCC), in conjunction with the Victorian Planning Authority (VPA) engaged SMEC to conduct a Desktop Land Capability Assessment (LCA) for the Shepparton South East Precinct Structure Plan (PSP).

1.1 Background

SMEC understand the Shepparton South East PSP applies to approximately 385 hectares of land located approximately four kilometres south-east of Shepparton CBD (Figure 1).

Figure 1-1: Site Investigation Area



Source - VPA

The PSP is bound by the Midland Highway (Benalla Road) to the north, the Shepparton Alternative Route (Doyles Road) to the east, the Broken River to the south and the existing limit of residential development to the east of Shepparton to the west.

The Greater Shepparton 2030 Strategy Plan 2006 and the Greater Shepparton Housing Strategy 2011 consider that a significant portion of residential growth in the short-medium term will be met by the four main corridors identified in the Municipal Strategic Statement of the Greater Shepparton Planning Scheme. The Shepparton South East PSP is the largest of these growth corridors and is of key strategic importance to satisfying the future residential needs of the GSCC.

It is envisaged that the PSP will accommodate a population of approximately 6,000 residents and include a mix of the following land uses:

- Low Density Residential
- Commercial (convenience centre)
- Primary School
- Community Facilities
- Wetlands and Waterways
- Open Space
- Drainage Reserves
- Roads and Road Reserves

1.2 Project Objective

The objective of the LCDA is to inform the PSP and determine previous land uses and implications for environmental contamination, hydrology and geology.

In addition to the assessment of potential environmental contamination the LCA also included a high-level desktop assessment of potential geotechnical constraints and appropriate composition of road pavements which will be used to inform the PSP.

2 Methodology

In accordance with the VPA request for quotation the following methodology was adopted.

2.1 Project Inception Meeting

A project inception meeting between the SMEC project manager, the VPA and a representative from GSCC was conducted on 13 July 2018. The purpose of the meeting was to discuss the requirements of the project, introduce key team members and obtain further information required for successful delivery of the project. In addition, the project site visit, project confidentiality and any other matters that may affect the outcome of the project were discussed.

2.2 Preliminary Contaminated Land Site Investigation

The preliminary contaminated land site investigation was completed in general accordance with the requirements outlined in the *National Environment Protection (Assessment of Site Contamination) Measure, as amended 2013* with reference to *Planning Practice Note 30 – Potentially Contaminated Land* (Department of Environment, Land, Water and Planning (DELWP), 2021) (PPN30).

2.2.1 Desktop Review

The desktop review included:

- An assessment of historical aerial photography for the precinct and surrounding areas.
- Consultation with relevant agencies, including:
    - EPA for review of records including the 'Priority Sites Registry', the list of issued 'Certificates and Statements of Environmental Audit' and records of illegal dumping of waste.
    - GSCC.
    - the Department of Environment, Land, Water and Planning.
    - Shepparton Heritage Centre.
- Soil, geology and hydrogeology conditions desktop review, including survey, mapping and other base data
- Review and summarise any previous or current publicly available reports or studies regarding environmental, geological or ground water conditions, in or within the vicinity of the study area including any drainage and or flood studies undertaken in relation the PSP and its associated catchments
- Compilation of known registered groundwater boreholes and relevant information
- Review of Wetlands databases and sites of National Environmental Significance presented in map format
- Identification of the presence and severity of sodic soils within the precinct based on available reports and mapping
- Review of Australian Heritage Databases specifically for historic uses related to the potential for contamination
- Discussions with GSCC regarding known land uses and previous planning permits in the study area as well as surrounding properties, where relevant.

2.2.2 Site Visit

A site visit of the area of the PSP was conducted by SMEC on Tuesday 31 July 2018. The site visit was coordinated through GSCC and involved discussions with the GSCC representative.

In addition to this an inspection of the broader PSP area was undertaken. This included inspections for a number of properties where potential sources of contamination were identified in the desk top review. Properties where a site inspection was conducted included:

- 180 Channel Road Shepparton;
- 28 McPhees Road Shepparton;
- 27 Feiglin Road Shepparton;
- 32 Feiglin Road Shepparton; and
- 640 Doyles Road Shepparton.

It is noted that no subsequent site visits were undertaken as part of the update of this document in 2022.

2.3 Geotechnical Desktop Assessment

The geotechnical desktop review included:

- A review of google earth and google street view imagery for the precinct and surrounding areas for general site conditions and topography.
- Review of published Geological Survey of Victoria map sheets and publicly available databases to identify geological conditions for the site and surrounding area.
- Review of geotechnical information contained within the driller's logs for registered groundwater bores within the site and surrounding area.
- Review of publicly available reports regarding geological conditions within the vicinity of the study area.
- Review of seismic potential using the Geoscience Australia database.

2.4 Road Pavement Desktop Assessment

The Road Pavement Desktop Assessment was completed having regards to the requirements of GSCC and in particular the design standards and specifications as detailed in Local Government Infrastructure Design Association (LGIDA) Infrastructure Design Manual Ver 5.10.

The desktop review included:

- Soils and geological conditions desktop review.
- Review against requirements of Infrastructure Design Manual Ver 5.10.
- Review of existing and proposed road layout, hierarchy and classification within the PSP.
- Estimation of pavement composition required for each road classification.

3 Results

3.1 General Site Information

Site identification and general site information is summarised below.

Table 3-1: Site Details

Site name:	Shepparton South East Precinct Structure Plan
Site address:	The area bound by the Midland Highway (Benalla Road) to the north, the Shepparton Alternative Route (Doyles Road) to the east, the Broken River to the south and the existing limit of residential development to the east of Shepparton to the west.
Total site area:	385 hectares.
Current zoning:	• Farming Zone – Schedule 1 (FZ1) • Public Use Zone – Services and Utilities (PUZ1) • Urban Floodway Zone (UFZ) • Public Conservation and Resource Zone (PCRZ).

Current site use:	• Agriculture (Orchards, Grazing, Cropping)
	• Agricultural Incidental Land Uses:
	  o Gravel Roads
	  o Storage
	  o Machinery Maintenance
	  o Residential housing
	• Roads and Road Reserves
	• Cold Stores
	• Transport Depot
	• Native Vegetation Riparian Zone.

Proposed site use:	• Low Density Residential • Commercial (convenience centre) • Primary School • Community Facilities • Wetlands and Waterways • Open Space • Drainage Reserves • Roads and Road Reserves.
Previous known environmental investigations/reports:	Mitford Engineering, Environmental Audit Report, Lot 1 Zurcas Lane Shepparton, February 1995.

3.2 Site Description

The site is located approximately four kilometres south east of the Shepparton Central Business District (CBD). The area is bound by the Midland Highway (Benalla Road) to the north, the Shepparton Alternative Route (Doyles Road) to the east, the Broken River to the south and the existing limit of residential development to the east of Shepparton to the west. The surrounding land uses consist of:

- North – A mix of commercial, residential and agriculture land use.
- South – Predominantly agricultural land use.
- East – Predominantly agricultural land use.
- West – Predominantly low-density residential land use.

3.3 Geology

A review of geology and soil conditions for the site area was conducted and is presented in Appendix D Geological and soil conditions are summarised in Table 3-2.

Table 3-2: Geological and Soil Summary

Geological Unit 1	Shepparton Formation (Nws).
Description 1	Clay, sand, silt, poorly-sorted lenticular gravel. Dissected flood plain alluvium: terraces 1-10 metres above present river channels; well developed soil 2-3m thick.
Geological Unit 2	Alluvium (Qa1).
Description 2	Gravel, sand, silt: variably sorted and rounded; generally unconsolidated; includes deposits of low terraces; alluvial floodplain deposits.
Geological Age	Pliocene to Holocene.
Lithology	clay lithology (dominant); sand (significant); silt material (significant); gravel material (significant).
Soil Order 1	Sodosols (*CSIRO* Atlas of Australian Soils). Soils across the site are likely to comprise texture contrast soils with dense sodic (alkaline) subsoils (*VRO*).
Soil Order 2	Vertosols (*CSIRO* Atlas of Australian Soils).
Acid Sulfate Soil Risk	Low Probability of Occurrence.

3.4 Hydrogeology

A desktop review of depth to groundwater was conducted via publicly available information on the DELWP website and is presented in Appendix E . Due to the large size of the site the area was divided into two sections (Section 1 and Section 2).

3.4.1 Groundwater Depth

For Section 1 groundwater across the entire area was identified to be less than five metres deep. For Section 2 groundwater across 72% of the area was identified to be less than five metres deep and for the remaining 28% of the area groundwater was identified to be between five and ten metres deep. It should be noted the depth of groundwater is likely to fluctuate seasonally and these depth ranges are indicative only.

3.4.2 Groundwater Salinity

In accordance with the Environment Reference Standard (ERS, 2021) salinity is used to assess the environmental values of groundwater that should be protected. Groundwater salinity was reviewed based on Total Dissolved Solid (TDS) concentrations and reported for percentages of the site area. For Section 1:

- 42% of the site area reported TDS between 1,000 – 3,500 mg/L
- 27% of the site area reported TDS between 3,500 – 7,000 mg/L
- 31% of the site area reported TDS between 7,000 – 13,000 mg/L.

For Section 2:

- 15% of the site area reported TDS as less than 500 mg/L
- 11% of the site area reported TDS between 500 – 1,000 mg/L
- 57% of the site area reported TDS between 1,000 – 3,500 mg/L
- 16% of the site area reported TDS between 3,500 – 7,000 mg/L.

Based on the review of publicly available data for TDS the environmental values of groundwater to be protected for future potential use are summarised in Table 3-3 and referred to as Segment B.

Table 3-3: Groundwater segments and environmental values

Groundwater Use	Segments (mg/L TDS)						
	A1	A2	B	C	D	E	F
	(0 – 600)	(601 – 1,200)	(1,201 – 3,100)	(3,101 – 5,400)	(5,401 – 7,100)	(7,101 – 10,000)	(>10,000)
Water dependent ecosystems and species	✓	✓	✓	✓	✓	✓	✓
Potable water supply (desirable)	✓						
Potable water supply (acceptable)	✓	✓					
Potable mineral water supply	✓	✓	✓	✓			
Agriculture and irrigation (irrigation)	✓	✓	✓				
Agriculture and irrigation (stock watering)	✓	✓	✓	✓	✓	✓	
Industrial and commercial	✓	✓	✓	✓	✓		
Water based recreation (primary contact recreation)	✓	✓	✓	✓	✓	✓	✓
Traditional Owner cultural values	✓	✓	✓	✓	✓	✓	✓

Buildings and structures	✓	✓	✓	✓	✓	✓	✓
Geothermal properties	✓	✓	✓	✓	✓	✓	✓

3.4.3 Groundwater Extraction

A review of licensed groundwater bores within the site area and the surrounding area was conducted and is presented in Appendix F . Licensed extraction bores within the site area are summarised in Table 3-4.

Table 3-4: Licensed Groundwater Extraction Bores

BORE ID	REGISTERED USE
Section 1	
90966	Domestic
127485	Domestic
90982	Domestic
90981	Domestic
126609	Dewatering, Irrigation
129896	Dewatering, Irrigation
126610	Dewatering, Irrigation
Section 2	
90932	Domestic, Stock
WRK009755	Domestic, Stock

Note – Does not include monitoring bores

Within the site investigation area, four bores were registered for domestic use, two bores were registered for domestic/stock use and three bores were registered for dewatering/irrigation use.

The Goulburn-Murray Water (GMW) *Shepparton Irrigation Region Groundwater Management Area – Local Management Plan* (2015) states the following concerning bore yields in the region:

> *Bore yields across the Shepparton Formation are variable, and depend on whether any sand and gravel aquifers are encountered during the drilling. Bore yields from the sand and gravel aquifers within the Shepparton (sic) can often exceed 1 ML/day, however yields can be unreliable due to falling water levels, either because of drought or where limited aquifers are dewatered.*

The TDS values in the Shepparton region also vary, as discussed in Section 3.4.2, although they are generally greater than 1,000 mg/L (i.e. not typically fresh). As such, bores installed within the Shepparton formation have the potential to support extraction for a range of purposes as listed in Table 3-3, noting that the efficacy can vary substantially based on the conditions outlined above.

3.5 Surface Water

A review of listed wetlands was conducted and is presented in Appendix G . Within the site investigation area, the only natural surface water body of significance was the Broken River which borders the south of the site. Based on observed topography across the site, the area is relatively flat with a gentle slope to the south towards Broken River.

3.6 Sodic Soils

A review of the sodic soils within the study area was conducted to determine the extent of these site features and the potential constraints to the future development of the site.

Soil sodicity is reported as Exchangeable Sodium Percentage (ESP) and is a measure of the exchangeable sodium in relation to other exchangeable cations in soil. A soil with an ESP greater than 6 % is generally considered sodic.

The presence of sodic soils within surface soils represents the following risks to the current and future use of the site:

- reduction in crop production;
- reduction in soil structure; and
- increased erosion risk.

Due to the dispersive nature of sodic soils, these areas are also likely to be prone to waterlogging.

To assess the soil sodicity within the study area, a review of soil mapping from Victorian Resources Online (VRO) was conducted. The extent of sodic soils within the Shepparton South East PSP was also mapped – shown in Appendix H – using data sourced from the Department of Environment, Land, Water, and Planning (DELWP)[1].

Surface soils throughout the Shepparton South East PSP study area (see Appendix H) were classified as Sodic with an ESP of 6-15%.

3.6.1 Management of sodic soils

There is no known regulation that would prevent a specific land use due to sodic soils however the site condition may require management on a case-by-case basis to assess how sodic soils will impact any proposed changes in land use.

During construction works the sodic soil risk should be documented within a Construction Environmental Management Plan (CEMP) which lists the required controls to manage sodic soils.

Due to the increased risk of erosion of sodic soils which are present across the study area, it is recommended that soil disturbance be avoided in steeper areas (greater than 5% slope).

In areas with a slope of greater than 10%, additional erosion protection measures may be required to reduce the risk of erosion of sodic soils across the site. Protection measures are likely to involve the establishment of perennial ground cover vegetation and soil amelioration through the application of gypsum and/or organic matter.

3.7 Cultural Heritage

A review of Cultural Heritage areas within the site investigation area was conducted and is presented in Appendix I. Two distinct areas were identified as areas of Aboriginal Cultural Heritage Sensitivity, with regulatory implications. These areas include the banks of the Broken River and a central area of the site shown in Appendix I. Areas of Aboriginal Cultural Heritage may require further investigation as part of a Cultural Heritage Management Plan (CHMP).

3.8 Previous Contaminated Land Site Investigations

A review of available records was conducted including council and EPA Victoria records. A number of reports were provided by council and are summarised in Table 3-5.

[1] It is noted that the extent of sodic soils presented in the DELWP data is substantially less (i.e. more refined) than the VRO dataset.

Table 3-5: Previous Site Investigations

DOCUMENT TITLE	LOCATION	RELEVANCE
Douglas Partners, *Stage 1 Development Works, 65 Channel Road Shepparton*, 7 March 2008.	65 Channel Road Shepparton.	To the west of the site investigation area and of little relevance.
Douglas Partners, *Waste Categorisation Report, 65 Channel Road Shepparton*, 3 April 2012.	65 Channel Road Shepparton.	To the west of the site investigation area and of little relevance.
Council Dangerous Goods Search Result.	7810 Goulburn Valley Highway.	Approximately 3 kilometres to the south west of the site and of little relevance.
Coffey, *Soil Contamination Investigation, Proposed Subdivision CA22, Section 'E' Parish of Shepparton Victoria*, 24 April 2001.	Fordyce Street Subdivision Shepparton.	Outside of the site investigation area and of little relevance.
BM Civil Engineers, *Investigation for Proposed New Subdivision Roadways*, 30 July 2010.	1-8 Windsor Park Estate Shepparton.	Outside of the site investigation area and of little relevance.
Ecology Partners, *Shepparton South East Growth Corridor Framework Plan Background Reports, Working Paper 2, Environmental Values*, August 2009.	Shepparton South East PSP.	Ecological Investigation of the site area.
GTA Consultants, *Shepparton South East Growth Corridor Precinct Structure Plan Transport Impact Assessment*, July 2021.	Shepparton South East PSP.	Investigation of rail network within the site area.

Given the reports that were reviewed were either not for the site investigation area, or not in relation to the assessment of contamination, they were considered to be of little relevance to this investigation.

3.9 Site History

3.9.1 Historical Aerial Photographs

A review of historical aerial photographs was conducted and is presented in Appendix B The review was undertaken to identify any significant land uses or changes in land use which may have resulted in historical contamination (e.g. landfill activities etc.). Historical aerial photographs were reviewed for the following years:

- 2011
- 2009
- 2001
- 1990
- 1988
- 1986
- 1981
- 1977
- 1971
- 1969
- 1945

During this period of time no significant change in land use on the site was identified, although there was a noted gradual intensification in agricultural operations and an increase in farm buildings. While the land use (i.e.,

agricultural) does not appear to change notably, the type of agriculture being practiced has changed. The older aerial images (i.e. pre 1980's) indicate a greater focus on orchards, which appear to cover most of the observable land during this time. Over time there appears to be a gradual reduction in the area under orchards.

The adjacent area to the west was observed to gradually be developed and converted from agricultural land to residential use.

3.9.2 EPA Victoria Priority Site Register, Pollution Abatement Notices and Environmental Audit Overlays

A review of EPA Victoria records was conducted and is presented in Appendix C As of 18 March 2022 no sites listed on the EPA Victoria Priority Site Register were identified within the site investigation area.

No Groundwater Quality Restricted Use Zones (GQRUZ) were identified for the site area.

No record of currently EPA licensed activities were identified for the site area.

A review of former EPA Priority Site and Pollution Abatement Notices for the site area was conducted and identified a Pollution Abatement Notice to have existed for the site located at:

- 32 Feiglin Road Shepparton.

The site is currently used as a Transport depot.

A review of former EPA Priority Site and Pollution Abatement Notices for the surrounding area identified the following locations outside the site boundary:

- 225 Benalla Road Shepparton (Status: Legacy EPA Database Pollution Notice);
- 2 Fordyce Street Shepparton (Status: Previous Pollution Notice); and
- 2 Fordyce Street Shepparton (Status: Previous Pollution Notice, Air Quality).

No Environmental Audit Overlays or Environmental Audits were identified to exist or have been conducted within the site investigation area.

An Environmental Audit was conducted for a site directly to the north of the site area. A copy of the report is presented in Appendix C and referred to as CMPS&F Environmental, *Mitford Engineering Environmental Audit Report, Lot 1 Zurcas Lane Shepparton*, February 1995.

The audit report for the site located at Lot 1 Zurcas Lane Shepparton, completed in February 1995 concluded "the condition of the land at the site is suitable for residential use".

3.9.3 Dangerous Goods Register

A review of council records did not identify any sites within the site investigation area registered to store Dangerous Goods, refer to Appendix J. However, the site inspection conducted on 31 July 2018 identified the bulk storage of fuel at four of the five sites inspected, refer to Appendix K. No record of the storage of Flammable Goods was identified for these properties, however it is possible the storage of Dangerous and Flammable Goods has historically or is currently occurring on a number of the farming properties within the site area.

3.10 Site Inspection and potential for contamination

The site visit conducted on Tuesday 31 July 2018 included a site inspection of the broader PSP area and a site inspection of certain properties which were identified as potential sources of contamination based on the review of historical aerial photographs. A summary of sites inspected, and site observations is presented in Table 3-6. Photographs of site conditions are presented in Appendix K.

The risk rating listed in Table 3-6 was based on the potential for contamination categories listed within Section 1 and Table 2 of PPN30 (DELWP, 2021).

Table 3-6: Site Inspection Observations and Risk Rating

SITE ID	SITE ADDRESS	CURRENT LAND USE	IDENTIFIED LAND USE AND HISTORICAL POTENTIAL SOURCES OF CONTAMINATION	RISK RATING
Site 1	70 Zurcas Lane Shepparton Vic	Pasture and hay production	**Farm Shed and Workshop Area**	Medium

SITE ID	SITE ADDRESS	CURRENT LAND USE	IDENTIFIED LAND USE AND HISTORICAL POTENTIAL SOURCES OF CONTAMINATION	RISK RATING
			• Likely Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	
Site 2	300 Doyles Road Shepparton Vic	Pasture and hay production	**Farm Shed and Workshop Area** • Likely Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 3	320 Doyles Road Shepparton Vic	Pasture and hay production	**Farm Shed and Workshop Area** • Likely Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 4	125 Poplar Avenue Shepparton Vic	Pasture	**Farm Shed and Workshop Area** • Likely Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 5	189 Poplar Avenue Shepparton Vic	Horticulture, stone fruit production	**Farm Shed and Workshop Area** • Existing Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 6	120 Poplar Avenue Shepparton Vic	Horticulture, stone fruit production	**Farm Shed and Workshop Area** • Likely Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 7	132 Poplar Avenue Shepparton Vic	Horticulture, stone fruit production	**Farm Shed and Workshop Area** • Likely Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 8	2 Feiglin Road Shepparton Vic	Horticulture, stone fruit production	**Farm Shed and Workshop Area** • Likely Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium

SITE ID	SITE ADDRESS	CURRENT LAND USE	IDENTIFIED LAND USE AND HISTORICAL POTENTIAL SOURCES OF CONTAMINATION	RISK RATING
Site 9	180 Poplar Avenue Shepparton Vic	Horticulture, stone fruit production	**Farm Shed and Workshop Area** • Likely Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 10	27 Feiglin Road Shepparton Vic	Horticulture, cool store and transport depot	**Farm Shed and Workshop Area** • Likely Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 11	32 Feiglin Road Shepparton	Cool Store and Transport Depot	**Sheds and Cool Store** • Potential Petroleum Underground Storage Tank (not identified however likely to exist or have existed) • Automotive repair/engine works	High
Site 12	430 Doyles Road Shepparton Vic	Pasture and hay production	**Farm Shed and Workshop Area** • Existing Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 13	75 Feiglin Road Shepparton Vic	Pasture and hay production	**Farm Shed and Workshop Area** • Existing Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 14	480 Doyles Road Shepparton Vic	Pasture and hay production	**Farm Shed and Workshop Area** • Agricultural Chemical Storage • Waste Disposal	Medium
Site 15	480 Doyles Road Shepparton Vic	Pasture and hay production	**Farm Shed and Workshop Area** • Agricultural Chemical Storage • Waste Disposal	Medium
Site 16	28 McPhees Road Shepparton	Pasture and hay production	**Farm Shed and Workshop Area** • Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 17	200 Channel Road Shepparton Vic	Pasture and hay production	**Farm Shed and Workshop Area** • Agricultural Chemical Storage • Waste Disposal	Medium

SITE ID	SITE ADDRESS	CURRENT LAND USE	IDENTIFIED LAND USE AND HISTORICAL POTENTIAL SOURCES OF CONTAMINATION	RISK RATING
Site 18	50 McPhees Road Shepparton Vic	Horticulture, stone fruit production	**Farm Shed and Workshop Area** • Likely Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 19	35 McPhees Road Shepparton Vic	Horticulture, stone fruit production	**Farm Shed and Workshop Area** • Likely Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 20	180 Channel Road Shepparton	Horticulture, stone fruit production and cool store	**Farm Shed, Cool Room and Workshop Area** • Petroleum Underground Storage Tanks • Agricultural Chemical Storage • Waste Disposal	High
Site 21	105 McPhees Road Shepparton Vic	Pasture and hay production	**Farm Shed and Workshop Area** • Agricultural Chemical Storage • Waste Disposal	Medium
Site 22	582 Doyles Road Shepparton Vic	Pasture and hay production	**Farm Shed and Workshop Area** • Agricultural Chemical Storage • Waste Disposal	Medium
Site 23	596 Doyles Road Shepparton Vic	Pasture and hay production	**Farm Shed and Workshop Area** • Likely Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 24	630 Doyles Road Shepparton Vic	Pasture and hay production	**Farm Shed and Workshop Area** • Likely Petroleum Aboveground Storage Tank • Agricultural Chemical Storage • Waste Disposal	Medium
Site 25	640 Doyles Road Shepparton	Cool Store and Former Transport Depot	**Sheds and Cool Store** • Petroleum Underground Storage Tank • Agricultural Chemical Storage • Waste Disposal	High

Note – The risk rating was based on DELWP, *Potentially contaminated Land, Planning Practice Note 30,* July 2021.

For the remaining areas not listed within Table 3-6 (i.e. areas outside the specific sites noted above, but within property boundaries) a risk rating of *medium* was applied, with the exception of areas along the Broken River which are considered *low* risk.

The primary driver for the *medium* risk rating across the remainder of the sites is associated with the historical agricultural use. Historical aerial imagery for the area shows wide-spread farming, namely orchards. Orchards are typically associated with an elevated use of pesticides (i.e. commercial use) which is considered a *medium* risk, as per Table 2 of PPN30 (DELWP, 2021). As such, without site specific soil data to demonstrate a lower risk level, a *medium* risk has been applied across all areas where orchard-based farming has likely been undertaken.

3.11 PRSA and Audit process

With the implementation of the Environment Protection Act 2017 and its subordinate legislation and instruments, there have been changes to the Environmental Audit system, particularly regarding *Ministerial Direction No. 1* and PPN30. The revised Audit process now includes the Preliminary Risk Screen Assessment (PRSA), which is an "assessment similar to a PSI, but with oversight by an EPA Appointed Environmental Auditor and provides a determination on whether an environmental audit is required". The outcome of a PRSA will be a PRSA Statement either recommending an Environmental Audit or indicating that the site is suitable for the proposed sensitive use.

Table 3 of the updated PPN30 indicates that a PRSA is required, as a minimum, for any site that has a *medium* potential for contamination (i.e. *medium* risk rating as per Table 3.2), while an Environmental Audit is recommended for sites with a *high* potential for contamination. An extract of Table 3 of PPN30 is provided below for reference.

Figure 3-1: Investigation requirements based on proposed land use and potential for contamination

Table 3: Recommended approach to assessing potentially contaminated land

Planning Proposal		Potential for Contamination	
		High	**Medium**
Uses defined in *Ministerial Direction No. 1*, the EAO, and clause 13.04-1S			
• Sensitive uses: Residential use, childcare centre, kindergarten, pre-school centre, primary school, even if ancillary to another use. • Children's playground • Secondary school	New use, or buildings and works associated with a new use	A	B
	Buildings and works associated with an existing use	B	B
Other land use			
Open space Agriculture Retail or office Industry or warehouse	New use, or buildings and works associated with a new or existing use	C	D

	Planning Scheme Amendment	Planning Permit Application
A	PRSA or audit option applies Proceeding directly to an audit is recommended.	PRSA or audit option applies Proceeding directly to an audit is recommended.
B	PRSA or audit option applies PRSA to determine need for audit is recommended.	PRSA or audit option applies PRSA to determine need for audit is recommended.
C	PSI to inform need for audit is recommended	PSI to inform need for audit is recommended
D	Planning authority to document consideration of potential for contamination to impact proposal	Responsible authority to document consideration of potential for contamination to impact proposal

Source – PPN30, DELWP, 2021.

Based on the identified risk ratings in Table 3.2 and the proposed land uses under the PSP (as shown in Figure 1-1), it is likely that a significant portion of the site will require a PRSA – i.e. where the proposed land use is sensitive (as defined in Figure 3-1). Where the proposed land use under the PSP is not sensitive (e.g. open space, commercial hub) a PRSA is not required at this stage.

4 Preliminary Conceptual Site Model

The conceptual site model (CSM) is a written representation of the complex relationship between sources, pathways and receptors for potential soil and groundwater contaminants of concern. The CSM can assist with identifying the potential environmental risks associated with the site. A risk is only present when the three components that constitute a risk are present; a contaminant source, a receptor and a pathway to link the source to the receptor.

4.1 Potential Sources

Identified potential sources of contamination are listed within Table 4-1.

Table 4-1: Sources of Contamination

Potential Sources of Contamination	Contaminant of Potential Concern (CoPC)	Potential Effected Matrix
Petroleum Underground and Aboveground Storage Tanks Identified at Farm Sheds	TRH, BTEX, led	Soil Groundwater
Storage of Agricultural Chemicals at and around Farm Sheds	Metals, nitrogen, phosphorous, Pesticides (including fungicides, herbicides and insecticides)	Soil Groundwater
Application of Agricultural Chemical	Metals, nitrogen, phosphorous, Pesticides (including fungicides, herbicides and insecticides)	Soil
Waste Disposal and Burning of Waste around Farm Sheds	PAHs, metals	Soil Groundwater
Demolition Rubble around Farm Sheds	Asbestos, lead, PCBs	Soil Groundwater (lead and PCBs only)
Stock Dips	Metals, OC Pesticides	Soil Groundwater

4.2 Potential Receptors

The receptors considered are based on the proposed site use for residential use, education, public open space and commercial land use and included:

- Construction workers during the development of the site;
- Residential occupants of new and existing houses;
- Students at the proposed primary school;
- Commercial occupants;
- Site maintenance workers for the broader PSP area, including subsurface utility maintenance workers;
- Surface water receptors including Broken River; and
- Groundwater Users.

4.3 Potential Exposure Pathways

For future human health receptors, potential exposure pathways include:

- Soil and groundwater ingestion;
- Dermal contact; and
- Soil vapour.

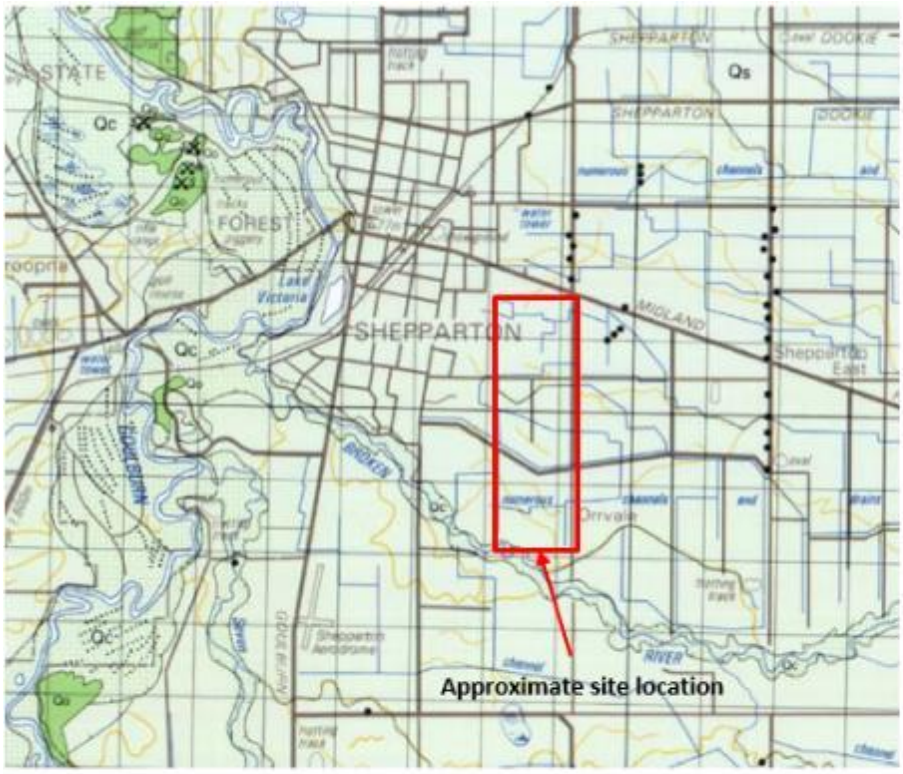
5 Geotechnical Desktop Assessment

5.1 Geological Setting

5.1.1 Published geological information

Reference has been made to published geological maps including the Geological Survey of Victoria 1:250,000 scale 'Bendigo' map sheet and 1:100,000 scale 'Shepparton' map sheet, an extract of which is presented in Figure 5-1. The geological maps indicate that the natural sub-surface material across the site comprises Quaternary age alluvial sediments of the Shepparton Formation (Qs), including clay, sand, silt and minor gravel. The Shepparton Formation is an extensive geological unit which extends across the entire site and surrounding area. Typically, the Shepparton Formation comprises unconsolidated to poorly consolidated mottled variegated clay and silty clay with lenses of fine to coarse grained sand and gravel. The Shepparton Formation deposits may be up to 50 m deep within the Shepparton area. The Shepparton Formation deposits are alluvial in nature having been developed on and near former stream channels across the floodplain, and as such may be highly variable.

Figure 5-1: Extract from Geological Survey of Victoria, Shepparton map sheet (1:100,000 scale)



Shepparton Formation	Qs	Overbank, levee, point bar and channel lag deposits associated with prior phases of the Goulburn, Murray and Broken Rivers and minor streams clay, sandy clay, sand and silt

There are numerous historical groundwater bores located within the site area (divided into Section 1 and Section 2), as included in Appendix F In general, the subsurface conditions of these bores generally agree with the published geological maps and are consistent with the type of alluvial deposits which could be anticipated in this area.

Section 1: A total of 17 bores with relevant geological information were present within Section 1 of the site, with the bores generally having a broad spatial distribution over the entire area and variable investigation depths. Based on a review of these bores, it appears that the sub-surface profile typically comprises silty clay to 20 m (maximum depth investigated, Bore ID '139191') with occasional interbedded sandy clay/gravelly clay layers at variable depths. Six bores all located in the south-west of Section 1 (Bore IDs '125919', '126082', '128467', '127485', '90966' and '90981'), encountered silty clay underlain by a sand layer of up to 3 m thickness, between around 2 m to 5.5 m depth. Two boreholes in the north of Section 1 (Bore IDs '22092' and '22114'), encountered silty clay underlain by a deeper sand layer of about 1 m thickness between 6.5 m to 7.5 m depth.

Section 2: Based on a review of five available boreholes within Section 2 of the site, Bore IDs '125915' and '125916' encountered a silty clay/sandy clay profile to termination depths of 20 m and 15 m depth, respectively. Bore IDs '114991', '125913' and 'WRK009755' encountered silty/sandy clay to approximately 7 m depth, overlying a sand layer to a depth of 9.2 m to 10 m, which was underlain by silty clay in the base of the boreholes at termination depths of 10 m to 11 m.

5.1.2 Groundwater

As described in Section 3.4.1, reasonably shallow groundwater may be expected across the majority of the site, as groundwater has been identified as being less than 5 m below ground level in all areas except in the south-western extent of the site where it has been identified as being 5 m to 10 m below ground level.

5.1.3 Topography

The Shepparton area is part of an extensive flat alluvial floodplain. A review of aerial images indicate that the topography of the site appears to be generally flat, however it is noted that this is a large site and minor undulations within the ground surface would be expected. Significant cut and fill earthworks would typically not be anticipated for the site. The site ground surface ranges from 111 mAHD to 118 mAHD, a topographic map is provided in Figure 5-2.

Figure 5-2: Topographic Map within the site area (indicated by red rectangle)

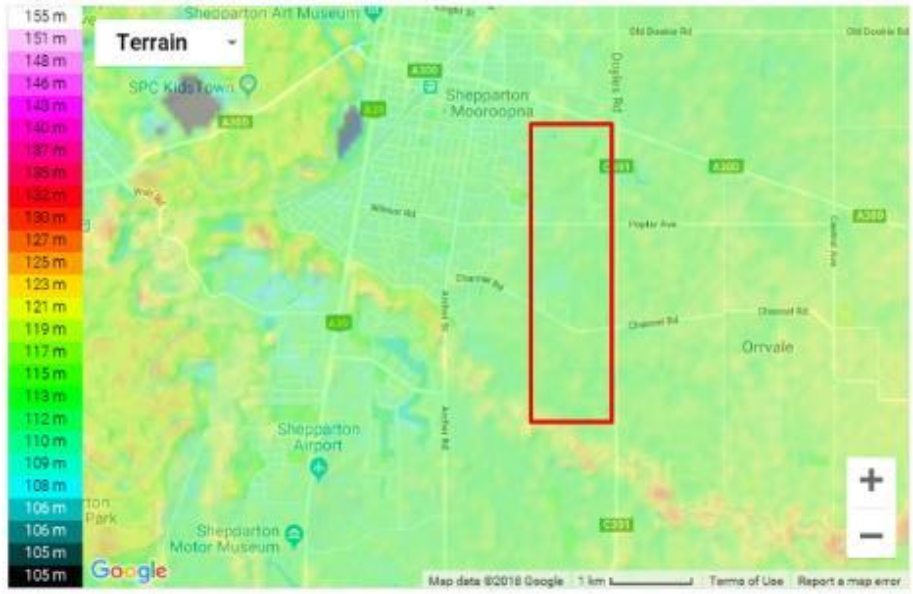


Figure 5-3 shows the typical topography of the farmland west of Doyles Road.

Figure 5-3: Typical topography for the site, looking west from Doyles Road

5.1.4 Seismicity

In recent periods, seismic events have been recorded across Victoria. Geoscience Australia (http://www.ga.gov.au/earthquakes) lists 314 earthquakes of various magnitudes (maximum 4.3) and depths as having occurred within approximately 100 km of the site since 1955. It is noted that no large (magnitude 6 or above) earthquakes have been recorded in Victoria since European settlement (McCue).

Australian Standard AS1170.4-2007 'Earthquake Actions in Australia' indicates that for earthquake design, a hazard factor (z) of 0.09 is recommended for the Shepparton site.

Based on the site geology, the site may be classified a seismic site subsoil "Class C – Shallow soil site" or "Class D – Deep soil site" in accordance with Section 4 of As1170.4-2007 depending on the consistency of the soil as outlined in Table 4.1 of the standard.

5.2 Geotechnical Considerations

5.2.1 Footings

As described in Section 5.1.1, the site is expected to be underlain by Shepparton Formation alluvial deposits, predominantly clay, silty clay and sandy clay with interbedded layers of sand and gravel. Based on the expected geology, there is potential for reactive clay soils to be present on this site. These soils have the potential to undergo large shrink swell movements with varying moisture contents. Shallow footings for structures similar to residential buildings should be designed in accordance with Australian Standard AS2870 'Residential Slabs and Footings' which provides specific requirements for design of footings on reactive clay sites.

Reference to AS2870-2011 indicates that lots within this site would have a broad site classification of M to H2 (moderate to highly reactive site with characteristic surface movements of 20 mm to 70 mm). This broad site classification is due to large area covered by the site, the potential variability within the alluvial deposits and a lack of targeted geotechnical information within the subject area.

The site classifications provided above are indicative only and intended to provide an indication of potential surface movements due to shrinking and swelling of surficial soils. Appropriate site classifications would vary depending on the thickness of natural clay soils below footings/slabs, the nature of any cut and fill or earthworks onsite and proximity to trees and other features which may impact on soil moisture. Individual site classifications would be required for each lot onsite in accordance with AS2870-2011. Targeted geotechnical investigations should be undertaken to assess the shrink-swell potential of the onsite soils.

5.2.2 Excavation Suitability

Based on a review of the available geological information for the site, it is anticipated that excavations at the site would predominantly be through natural alluvial soils comprising clay, sand, silt and gravel. These soils are expected to be reasonably easy to excavate with conventional earthmoving equipment such as backhoes and excavators. Based on a review of the published geological information and existing boreholes within the site area, it is not anticipated that shallow rock would be encountered within excavations for this site development.

As groundwater is expected to within 5 m below ground level, deep excavations may be hampered if they encounter groundwater inflow. Excavations below the groundwater table may possibly encounter difficult conditions, particularly if they are within sandy layers which may be present across the site. Pumping may be necessary to dewater excavations and manage groundwater inflows. It should also be noted that localised flows associated with perched water layers could be a possibility depending on the onsite soils encountered.

5.2.3 Pavements

The soaked California Bearing Ratio (CBR) for use in pavement design would be expected to be variable across the site. The natural subgrade is likely to comprise predominantly clay soils and may be expansive, which would require that appropriate precautions are taken in design to protect against shrink/swell ground movements. Targeted sampling and laboratory testing would be required to determine appropriate CBR values for pavement design.

5.2.4 Other Considerations

Other geotechnical considerations for the site may include:

- Onsite surface clayey material may cause problems with trafficability and workability should this material become wet prior to or during construction. Ideally, construction should be scheduled for the drier summer months to minimise the potential for soft boggy ground conditions during construction.

- The natural clay soils at the site may have the potential to undergo shrink-swell soil movements in response to changes in soil moisture. This can impact on footings and pavements and other aspects of the proposed development, such as underground service connections which should be designed as flexible as possible particularly where they enter/exit buildings.
- Identification of any areas of soft soils which may be present, particularly at the southern end of the site within proximity to the Broken River.
- Identification of any areas of fill which may be present at existing developments or structures within the site area.
- Whilst the Shepparton Formation comprises predominantly alluvial deposits, aeolian (windblown) deposits have been known to occur in some areas, therefore identification of any areas of aeolian deposits which may be in a loose condition may be necessary.

6 Road Pavement Desktop Assessment

6.1 Site Location and Surface Features

The site is located in Shepparton approximately 3km east of centre of Shepparton. Benalla Road (Midland Highway) is located approximately 500m to the north of the site boundary, Broken River to the south, Doyles Road to the east and existing residential development to the west.

The subject site is somewhat rectangular although irregular along the western boundary irregular which borders existing urban development. Poplar Avenue and Channel Road cross the site in an east west direction.

The site is relatively flat and falls from north to south towards Broken River. There are numerous constructed open drains and irrigation channels that cross the site. The site is largely farmland composed of a mixture of orchards and vacant paddocks with associated dwellings and shedding.

6.2 Subgrade Conditions

Topsoil and fill from the previous agricultural use of the site is considered to be an unsuitable subgrade for new pavements. It is also considered unsuitable subgrade for earthworks or placed fill.

Swamp deposits may be encountered adjacent to and within waterways and in low lying areas. Often, material of this type have low CBR and high potential swells. Materials with a CBR of less than 2% may require a subgrade improvement layer comprising 150mm of VicRoads Type A material or similar approved. Pavements should then be design for a CBR of 2% on top of this layer.

Residual soils of the Shepparton Formation (Nws) are likely to comprise the dominant subgrade to pavements for the area. Samples of these soils may give a range of CBR results. VicRoads Code of Practice RC500.20 provides guidelines on CBR selection based on Scale A, B or C assessment. Materials with a CBR of less than 2% may require a subgrade improvement layer comprising 150mm of VicRoads Type A material or similar approved. Pavements should then be design for a CBR of 2% on top of this layer.

Placed engineered fill (as part of the elevating the road alignment). Where roads are to be raised above current site levels and supported on an engineered fill platform or where pavements are supported on a stabilised or treated subgrade, the design CBR of the platform/treated subgrade will depend on fill material or method of treatment and placement. Where site won materials are placed and compacted will have a design CBR as per their source material.

6.3 Pavement Composition

Documents used in the pavement assessment include:

- LGIDA Infrastructure Design Manual version 5.30.
- VicRoads Code of Practice for Selection and Design of Pavements and Surfacing's RC500.22.
- Austroads Guide to Pavement Technology Part 2: Pavement Structural Design.
- Austroads Guide to Pavement Design for Light Traffic.
- GAA Engineering Design and Construction Manual.

No traffic impact assessments reports have been sighted and no traffic counts generated for the subject site. In lieu of this we have adopted Table 24 Typical Design Traffic Data from EDCM.

6.3.1 Access Street (< 1000 VPD) 1.5E+5 DESA

Pavement Material	Details	CBR 2%	CBR 5%
Asphalt Wearing Course	Asphalt Size 14 Type N	30	30
Bituminous Prime	Prime	Required	Required
Base	VicRoads Class 2 Crushed Rock	100	100
Sub Base	VicRoads Class 3 Crushed Rock	270	150

Pavement Material	Details	CBR 2%	CBR 5%
Capping Layer	VicRoads Type A material or approved with CBR ≥ 8%, permeability ≤ 5 x 10-9 m/s	150	Not Required

6.3.2 Access Street (1000 VPD – 2000 VPD) 4.6E+5 DESA

Pavement Material	Details	CBR 2%	CBR 5%
Asphalt Wearing Course	Asphalt Size 14 Type N	30	30
Bituminous Prime	Prime	Required	Required
Base	VicRoads Class 2 Crushed Rock	100	100
Sub Base	VicRoads Class 3 Crushed Rock	310	150
Capping Layer	VicRoads Type A material or approved with CBR ≥ 8%, permeability ≤ 5 x 10-9 m/s	150	Not Required

6.3.3 Connector Street Level 1 (< 3000 VPD) 9.6E+5 DESA

Pavement Material	Details	CBR 2%	CBR 5%
Asphalt Wearing Course	Asphalt Size 14 Type N	30	30
Bituminous Prime	Prime	Required	Required
Base	VicRoads Class 2 Crushed Rock	100	100
Sub Base	VicRoads Class 3 Crushed Rock	340	150
Capping Layer	VicRoads Type A material or approved with CBR ≥ 8%, permeability ≤ 5 x 10-9 m/s	150	Not Required

6.3.4 Connector Street Level 2 (3000 VPD – 7000 VPD) 3.1E+6 DESA

Pavement Material	Details	CBR 2%	CBR 5%
Asphalt Wearing Course	Asphalt Size 14 Type N	30	30
Bituminous Prime	**Prime**	**Required**	**Required**
Base	VicRoads Class 2 Crushed Rock	100	100
Sub Base	**VicRoads Class 3 Crushed Rock**	**570**	**300**

Pavement Material	Details	CBR 2%	CBR 5%
Capping Layer	VicRoads Type A material or approved with CBR ≥ 8%, permeability ≤ 5 x 10-9 m/s	150	Not Required

Note minimum pavement depth is 250mm as per IDM.

7 Conclusions and Recommendations

7.1 Conclusions

7.1.1 Preliminary Contaminated Land Site Investigation

Based on the findings of this investigation a risk rating and risk map were developed outlining Areas of Environmental Concern (AEC). The risk map is presented in Appendix A The risk rating was based on the process described in PPN30 (DELWP, 2021).

A number of specific sites were identified within the study area as *high* and *medium* risk sites concerning the potential for contamination. The majority of the remaining area was classified as *medium* risk with a small area along the Broken River considered *low* risk.

The *high* risk rating was applied for two sites where petroleum underground storage tanks were identified and one site where automotive repairs and engine works were identified to be taking place.

This *medium* risk rating was applied as the primary land use was agriculture (orchard-based farming) however a number of incidental (secondary activities) were identified to have taken place including:

- Chemical Storage
- Fuel Storage (Above Ground Storage Tanks);
- Waste Disposal
- Stockpiling of building rubble (potential containing asbestos)

Examples of these activities recorded on site are shown in Appendix K. These land use activities have the potential to impact soil and groundwater quality and further intrusive soil and groundwater investigations are required to delineate the nature and extent of any CoPC identified in this Desktop Land Capability Assessment (LCA).

Based on the potential for contamination (i.e. *medium* or *high*) and the proposed land use (sensitive), the majority of the study area will require a PRSA, as a minimum, to assess the suitability for the proposed land use.

7.1.2 Geotechnical Desktop Assessment

Based on the geotechnical desktop assessment, it is considered that the geotechnical conditions are unlikely to present a significant constraint to development. The expected geology is typical of a large portion of the Shepparton area where similar structures have been developed and the risks identified could be appropriately managed through proper planning, investigation, design and construction.

The geotechnical assessment presented in this report is based on a desktop review and is intended to identify potential geotechnical risks and constraints to the development only.

7.2 Recommendations

7.2.1 Preliminary Contaminated Land Site Investigation

In accordance with PPN30 (DELWP, 2021) where the proposed land use is sensitive in nature (e.g. child care, preschool, primary school, dwellings, residential buildings etc.) and where the potential contamination risk is ranked as *high* or *medium*, a PRSA (Preliminary Risk Screen Assessment) or audit option applies.

Based on the finding of the desktop LCA and the proposed sensitive land uses, SMEC recommend that an Environmental Audit be conducted for the *high* risk sites and a PRSA be conducted to determine the suitability of *medium* risk areas for those sites where the intended site use is sensitive (child care centre, preschool or primary school, residential dwellings).

It is recommended, where possible, to update the PSP Plan to place proposed non-sensitive land use areas (such as open space, commercial) in areas assessed as being *high* risk to avoid potentially unnecessary Environmental Audit requirements.

For the *high* risk sites in addition to the requirement to conduct an Environmental Audit, where underground storage tanks are identified there is a requirement for this infrastructure to be decommissioned and validated in accordance with:

- relevant EPA Victoria Publications
- Australian Standard AS4976-2008 *The removal and disposal of underground petroleum storage tanks*

- SAA AS1940–2017, *The storage and handling of flammable and combustible liquids*
- WorkSafe Victoria requirements.

Upon the removal of this infrastructure, validation sampling should be conducted under the footprint of this infrastructure to ensure any associate residual contamination is removed and will not pose an ongoing risk to site receptors.

Any stockpiles of rubbish and areas containing Asbestos Containing Material (ACM) should also be characterised to determine their suitability for offsite disposal to a licensed landfill facility and appropriate validation sampling and analysis undertaken.

7.2.2 Sodic Soils

Surface soils in areas throughout the site (see Appendix H) were classified as Sodic with an ESP of 6-15%.

There is no known regulation that would prevent a specific land use due to sodic soils however the site condition may require management on a case-by-case basis to assess how sodic soils will impact any proposed changes in land use.

It is recommended that the sodic soil risk be documented within a Construction Environmental Management Plan (CEMP) which lists the required controls to manage sodic soils, in particular:

- Due to the increased risk of erosion of sodic soils which are present across the study area, it is recommended that soil disturbance be avoided in steeper areas (greater than 5% slope).
- In areas with a slope of greater than 10%, additional erosion protection measures may be required to reduce the risk of erosion of sodic soils across the site.
- Protection measures are likely to involve the establishment of perennial ground cover vegetation and soil amelioration through the application of gypsum and/or organic matter.

7.2.3 Geotechnical Desktop Assessment

Geotechnical site investigations are recommended to determine the sub-surface profile and geotechnical properties of the on-site soils with respect to the proposed development. The investigation would be used to determine the soil suitability for any geotechnical works required on the site and to provide geotechnical parameters for design. It is recommended that the geotechnical investigations include in-situ testing such as Standard Penetration Testing (SPT) and/or Dynamic Cone Penetration (DCP) testing to assess the soil strength and that soil sampling and laboratory testing are undertaken to assess the relevant engineering properties such as plasticity, shrink-swell potential, and CBR strength.

7.2.4 Road Pavement Desktop Assessment

It is recommended that the following procedures be adopted for the preparation of subgrade beneath pavements:

- Excavate and remove any uncontrolled fill, vegetation, and natural thin sand layers to expose the natural subgrade. Also, remove any subsoil containing significant organic matter. Grub out any major roots.
- Where required, further excavate to design subgrade level.
- The exposed subgrade should then be scarified and compacted using a heavy vibrating pad foot roller to achieve a dry density ratio of at least 98% Standard compaction and within +/- 3% of Standard Optimum Moisture Content (SOMC).
- Any soft or weak areas identified during the subgrade compaction process, that do not respond to further compaction, should be removed and replaced with select fill in layers not exceeding 200mm loose thickness, and each layer compacted to achieve a Dry Density Ratio of at least 98% Standard and within +/- 3% of SOMC in accordance with AS1289 5.1.1, 5.4.1 or 5.7.1. Excavations to remove any soft or weak areas should have side slopes battered not steeper than 1H:1V. Should extensive soft or weak areas be encountered, further geotechnical advice should be sought.
- Where engineered fill is required to raise the subgrade level, it should be placed and compacted as described above.
- Select fill may comprise material such as crushed rock, clayey sand, sandy clay, or weathered sedimentary rock. It is recommended that imported fill materials be required to have a maximum particle size after compaction of 50mm and have a liquid limit not exceeding 50%. Alternative materials may be considered but samples should be submitted for approval before use.
- It is recommended that subgrade preparation, fill placement, and compaction be performed in the presence of a suitably experienced geotechnical practitioner and the level of compaction checked by field density

testing. Subgrade preparation should be carried out during dry weather conditions where possible. Provision should be made for effective diversion and removal of all surface water from the prepared subgrade from any source.

8 References

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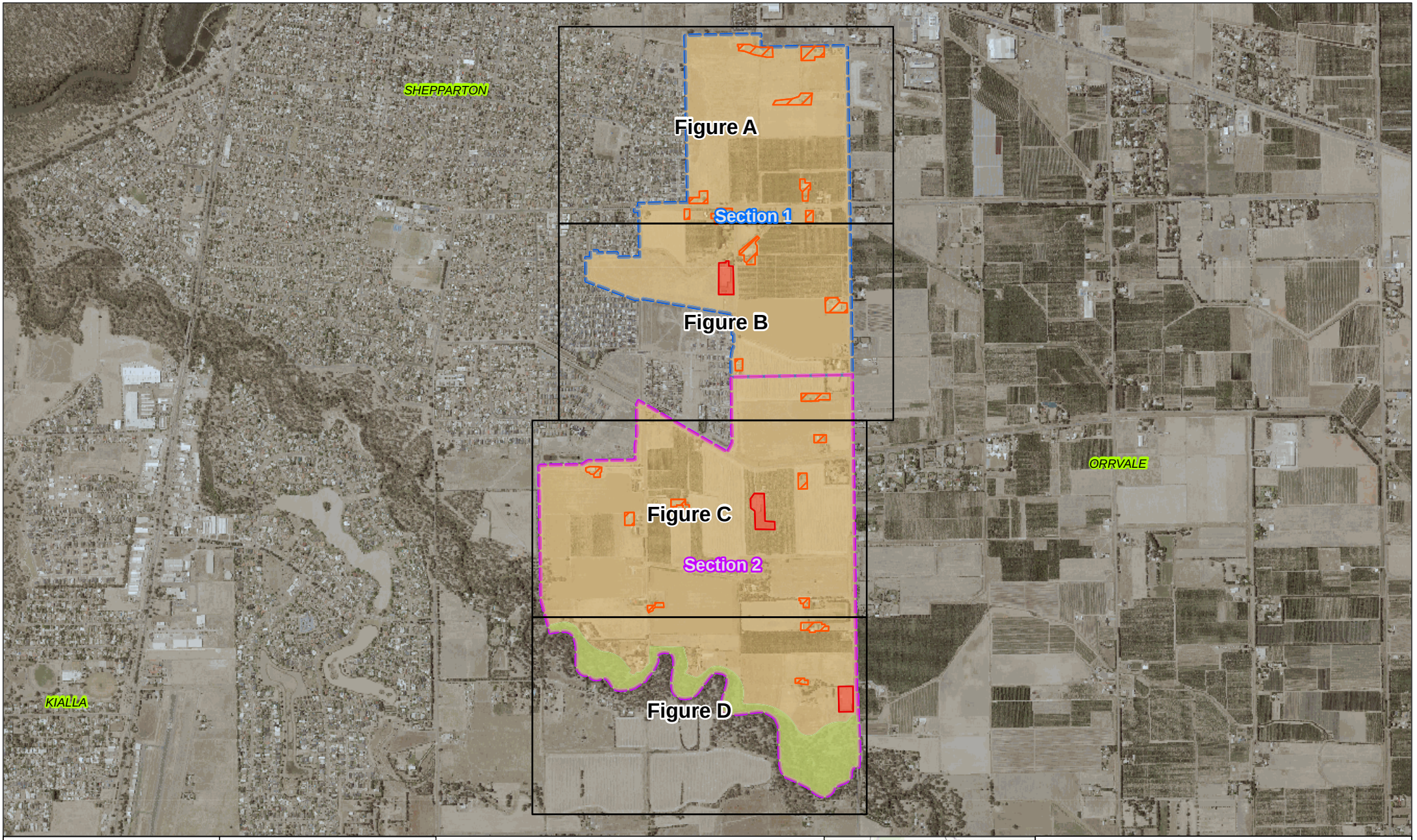
Appendix A Site Plan and Plan of Potential Contamination Risk Areas



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ABN 47 065 475 149

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PROJECT NO:	30042612
FIGURE NO:	1 - Overview
FIGURE TITLE:	Plan of Potential Contamination Areas
CREATED BY:	AP15941
DATE:	7/04/2022
VERSION:	VERSION 1
PAGE SIZE:	A3

LEGEND

Risk Level
- High risk
- Medium risk - site specific
- Medium risk
- Low risk

Site Boundaries
- Section 1
- Section 2
- Figure boundary

0 250 500 750 1000
Meters
Scale: 1:25,000

SOURCES:
1. Basemap © Vicmap Basemaps:
World Topographic Map: Vicmap, Esri, HERE, Garmin, FAO, NOAA, USGS
World Hillshade: Esri, USGS

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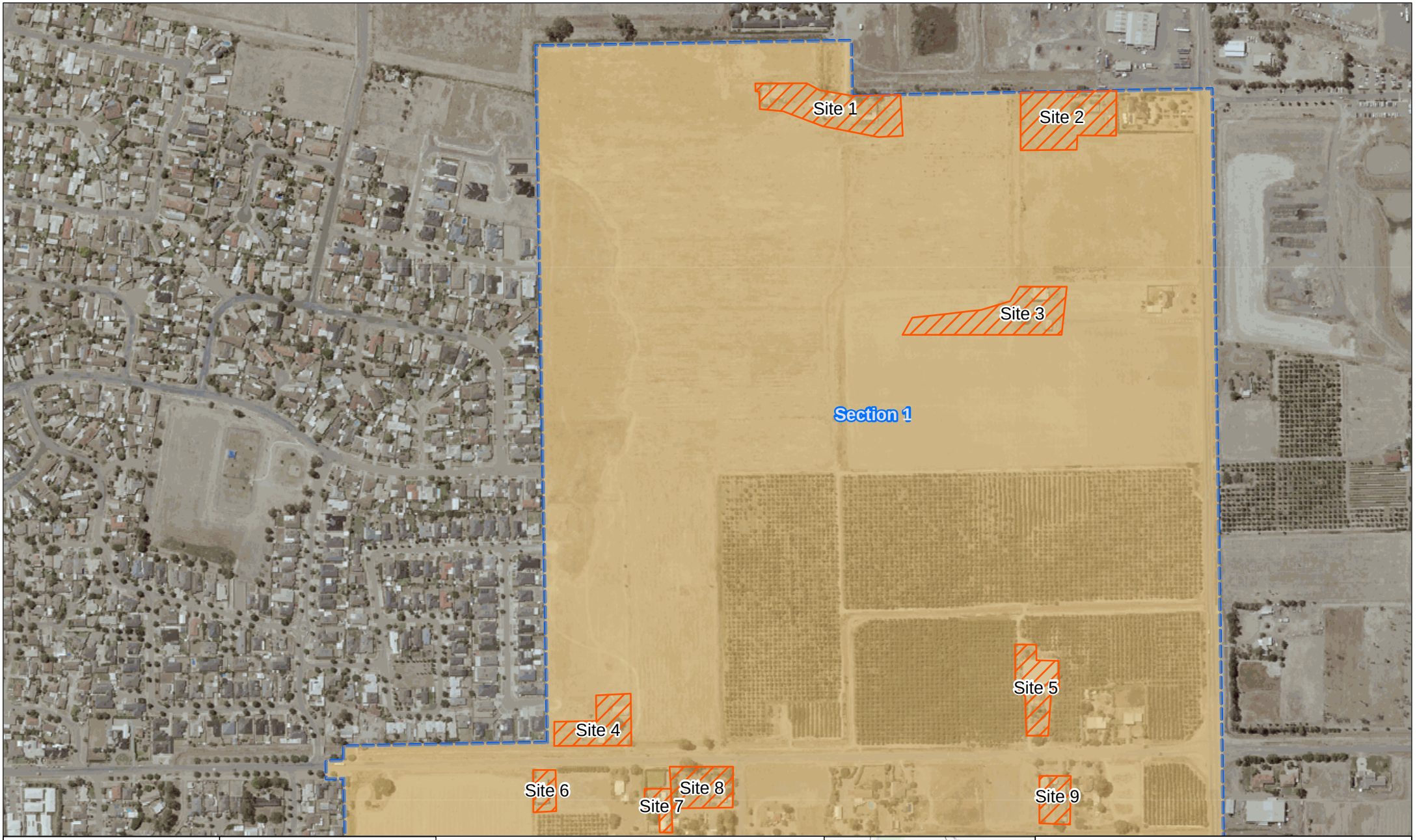

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PROJECT NO:	30042612
FIGURE NO:	1 - A
FIGURE TITLE:	Plan of Potential Contamination Areas
CREATED BY:	AP15941
DATE:	7/04/2022
VERSION:	VERSION 1
PAGE SIZE:	A3

LEGEND

Risk Level

- Medium risk - site specific
- Medium risk

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Meters
Scale: 1:6,000

SOURCES:
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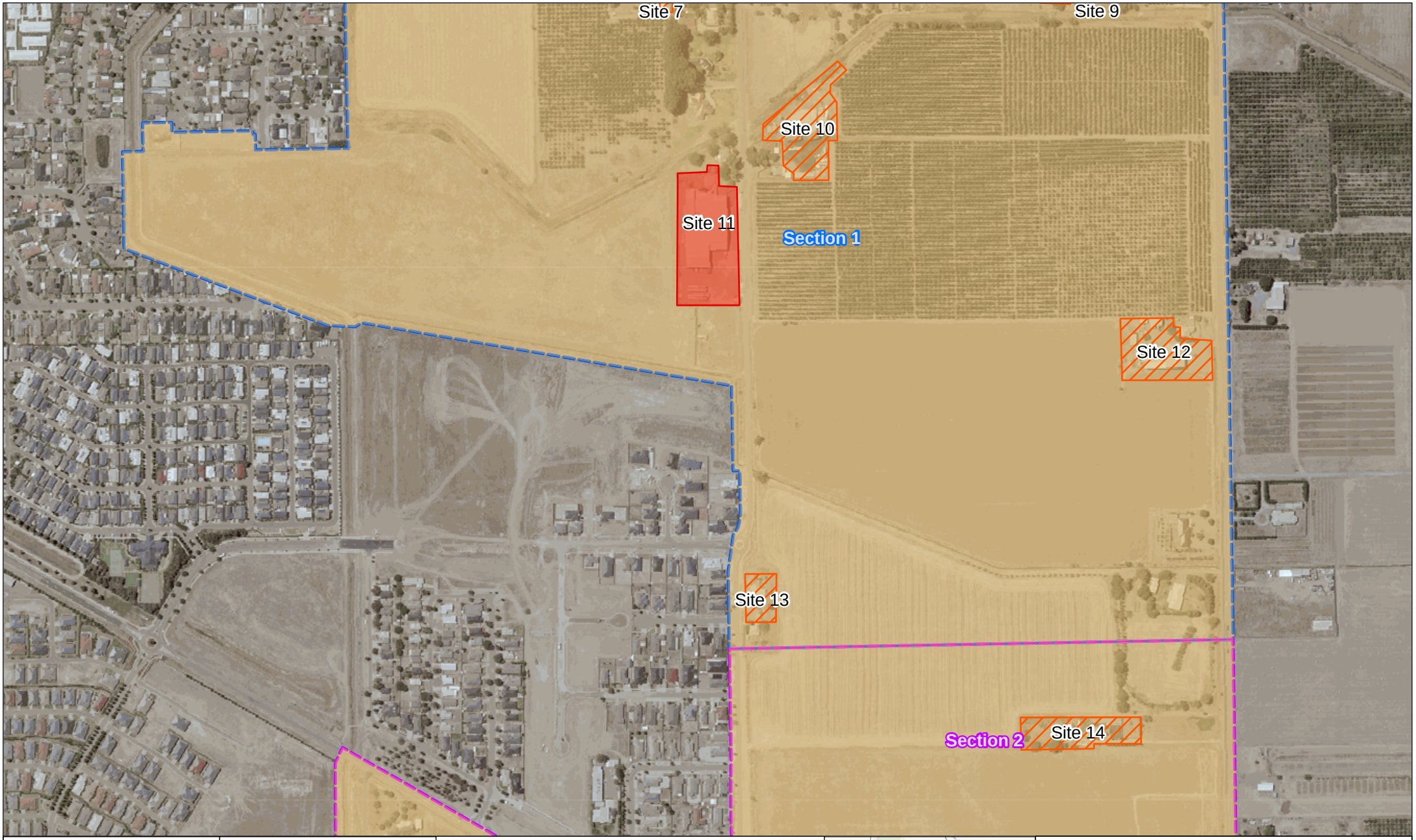

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FIGURE NO:	1 - B
FIGURE TITLE:	Plan of Potential Contamination Areas
CREATED BY:	AP15941
DATE:	7/04/2022
VERSION:	VERSION 1
PAGE SIZE:	A3

LEGEND

Risk Level

- High risk
- Medium risk - site specific
- Medium risk

Key Map

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Meters
Scale: 1:6,000

SOURCES:
1. Basemap © Vicmap Basemaps:
World Topographic Map: Vicmap, Esri, HERE, Garmin, FAO, NOAA, USGS
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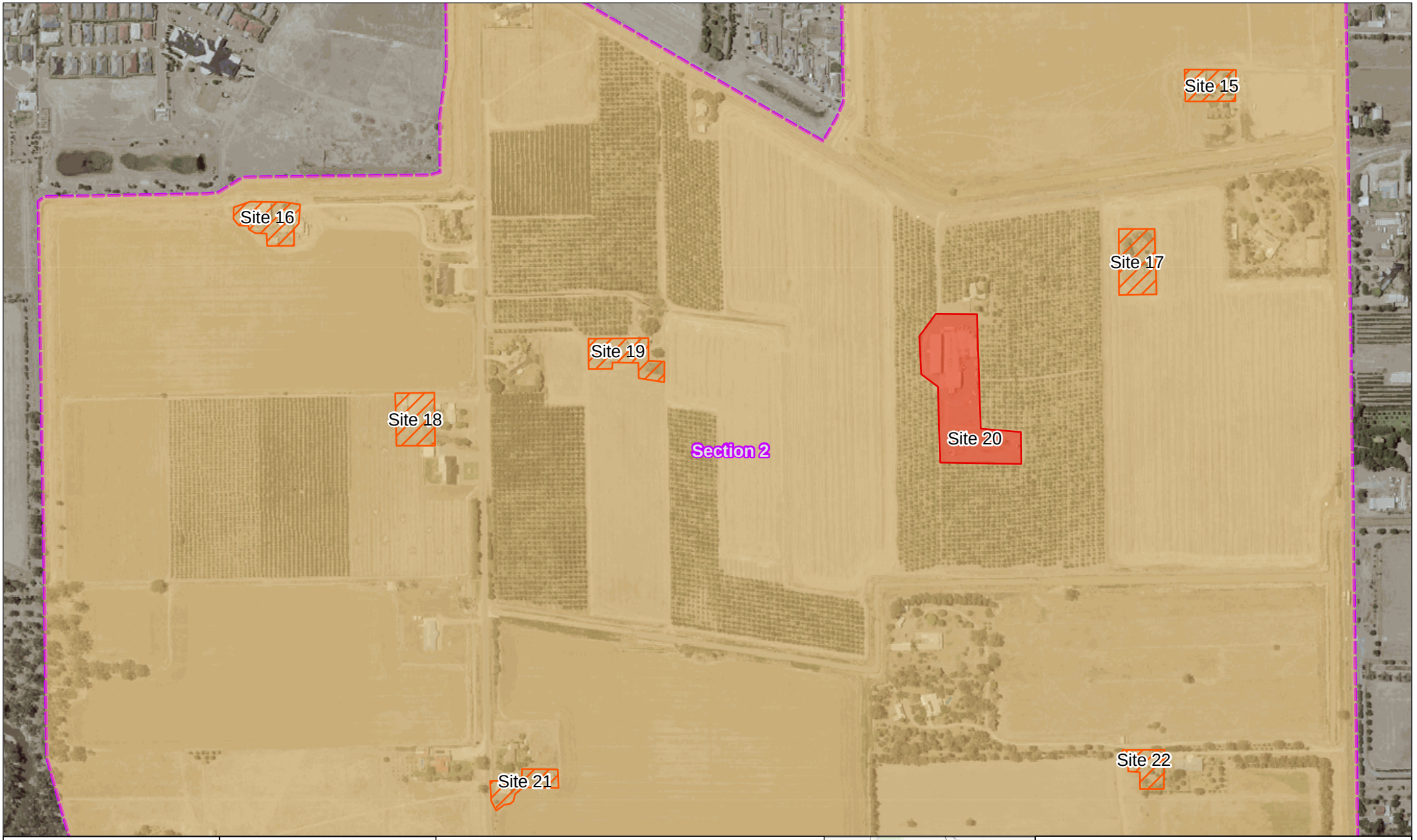

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PROJECT NO:	30042612
FIGURE NO:	1 - C
FIGURE TITLE:	Plan of Potential Contamination Areas
CREATED BY:	AP15941
DATE:	7/04/2022
VERSION:	VERSION 1
PAGE SIZE:	A3

LEGEND

Risk Level

- High risk
- Medium risk - site specific
- Medium risk

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Meters
Scale: 1:6,000

SOURCES:
1. Basemap © Vicmap Basemaps:
World Topographic Map: Vicmap, Esri, HERE, Garmin, FAO, NOAA, USGS
World Hillshade: Esri, USGS

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PROJECT NO:	30042612
FIGURE NO:	1 - D
FIGURE TITLE:	Plan of Potential Contamination Areas
CREATED BY:	AP15941
DATE:	7/04/2022
VERSION:	VERSION 1
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LEGEND

Risk Level

- High risk
- Medium risk - site specific
- Medium risk
- Low risk

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Scale: 1:6,000

SOURCES:
1. Basemap © Vicmap Basemaps:
World Topographic Map: Vicmap, Esri, HERE, Garmin, FAO, NOAA, USGS
World Hillshade: Esri, USGS

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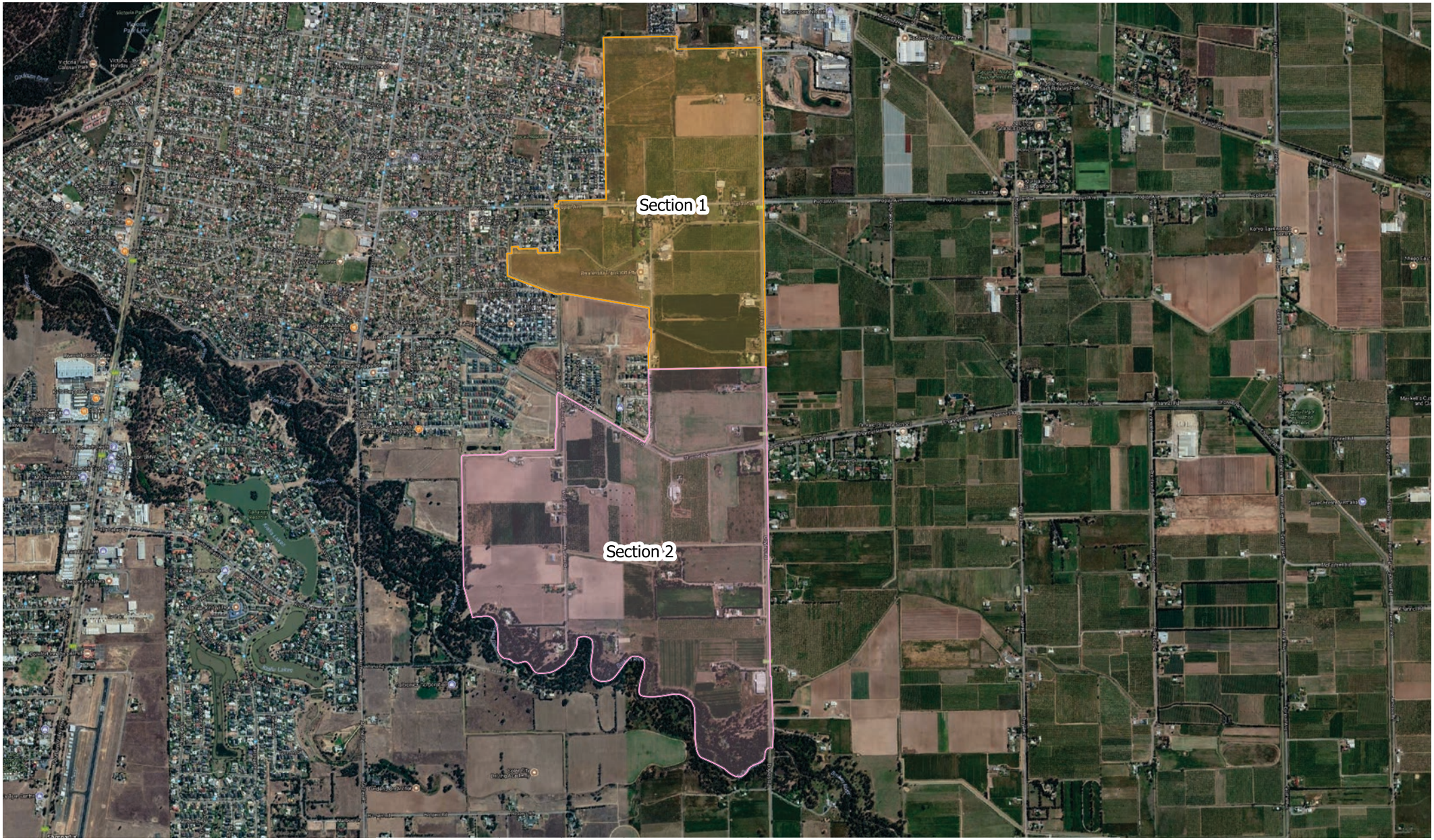
Appendix B Historical Aerial Photographs



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Plan of Sections Note: Aerial imagery sourced from Google Maps	Date: 14/08/2018 N 0 500 1000 1500 m	Project Number: 30041764	

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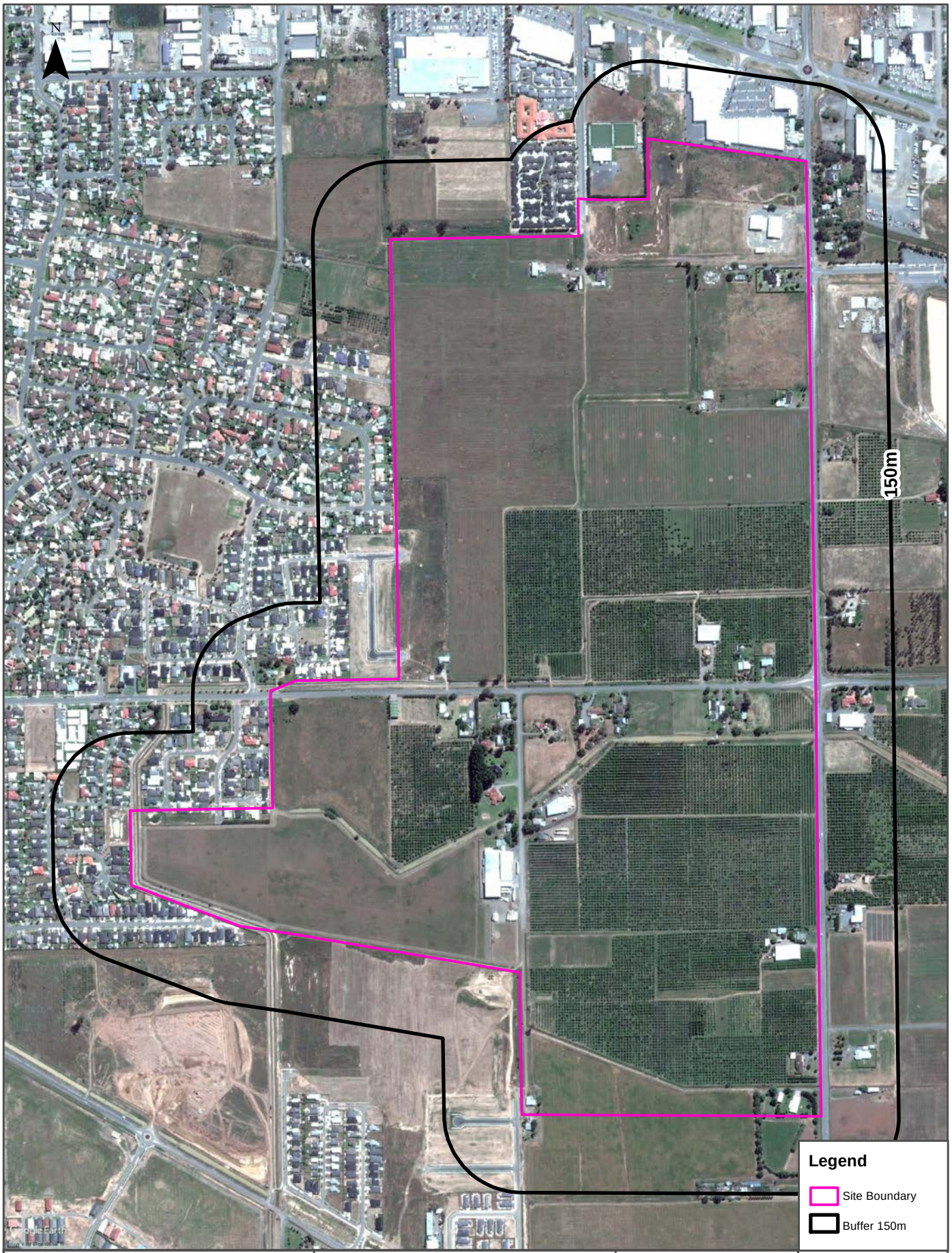

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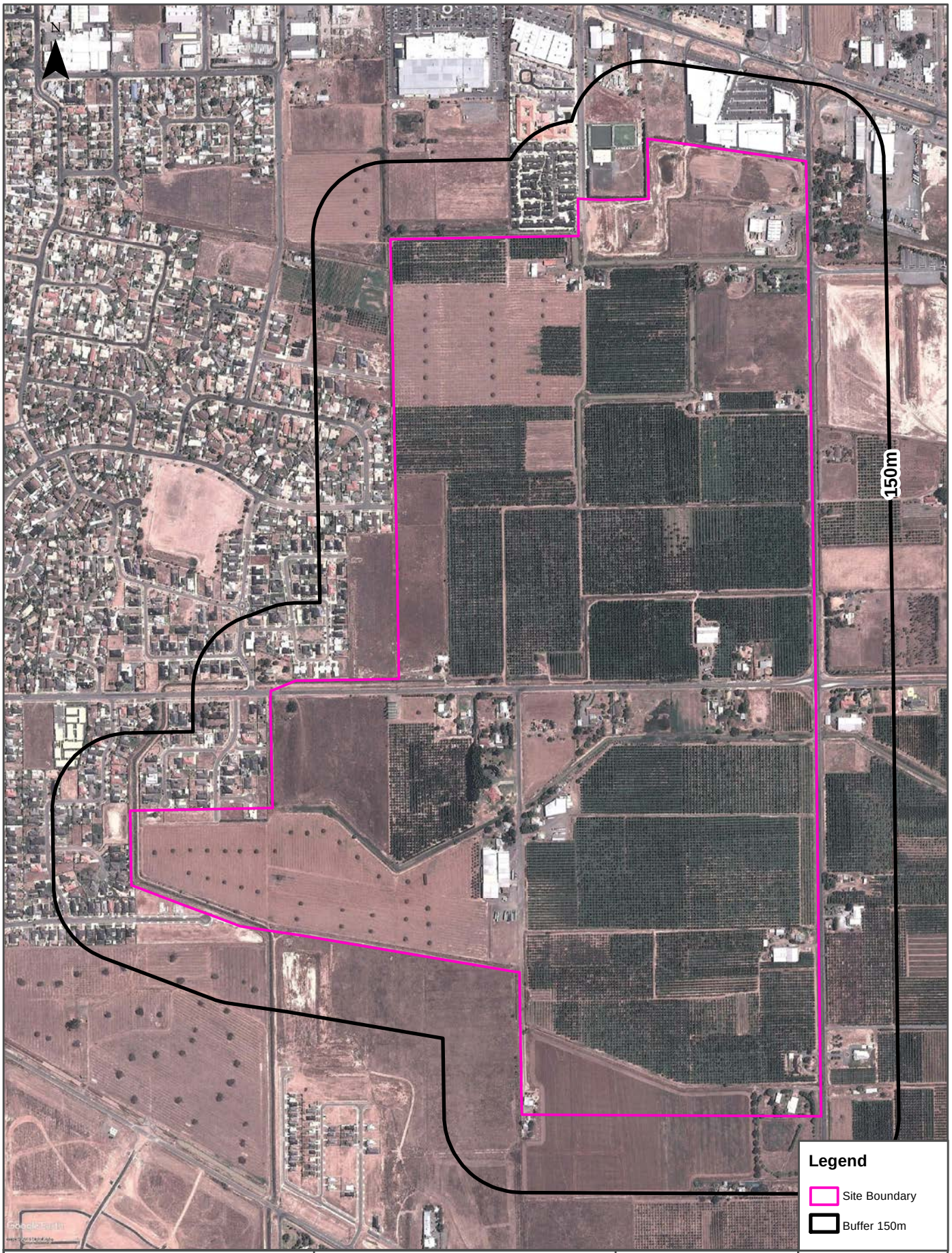

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Data Source Aerial Imagery: © 2018 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.

Coordinate System:
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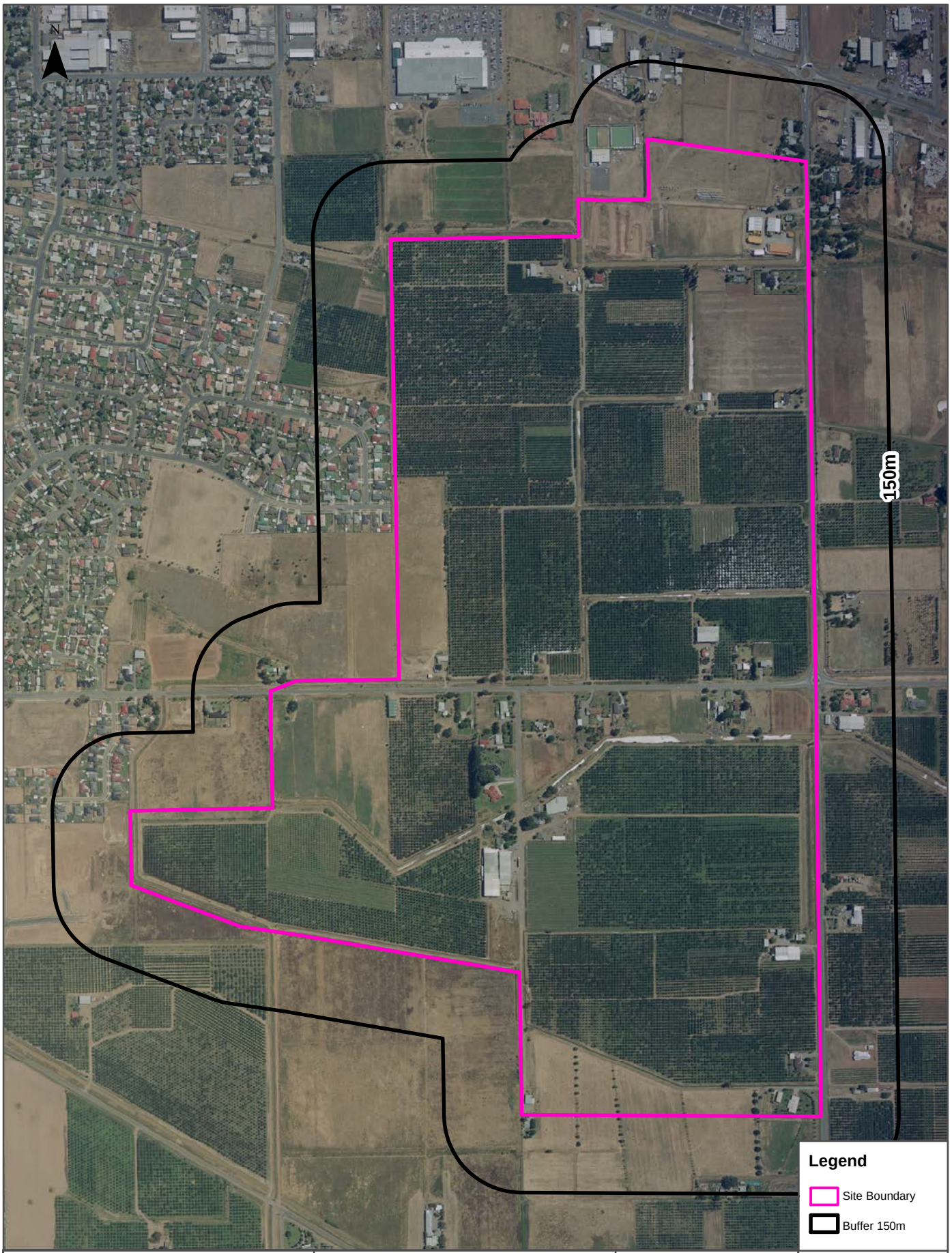

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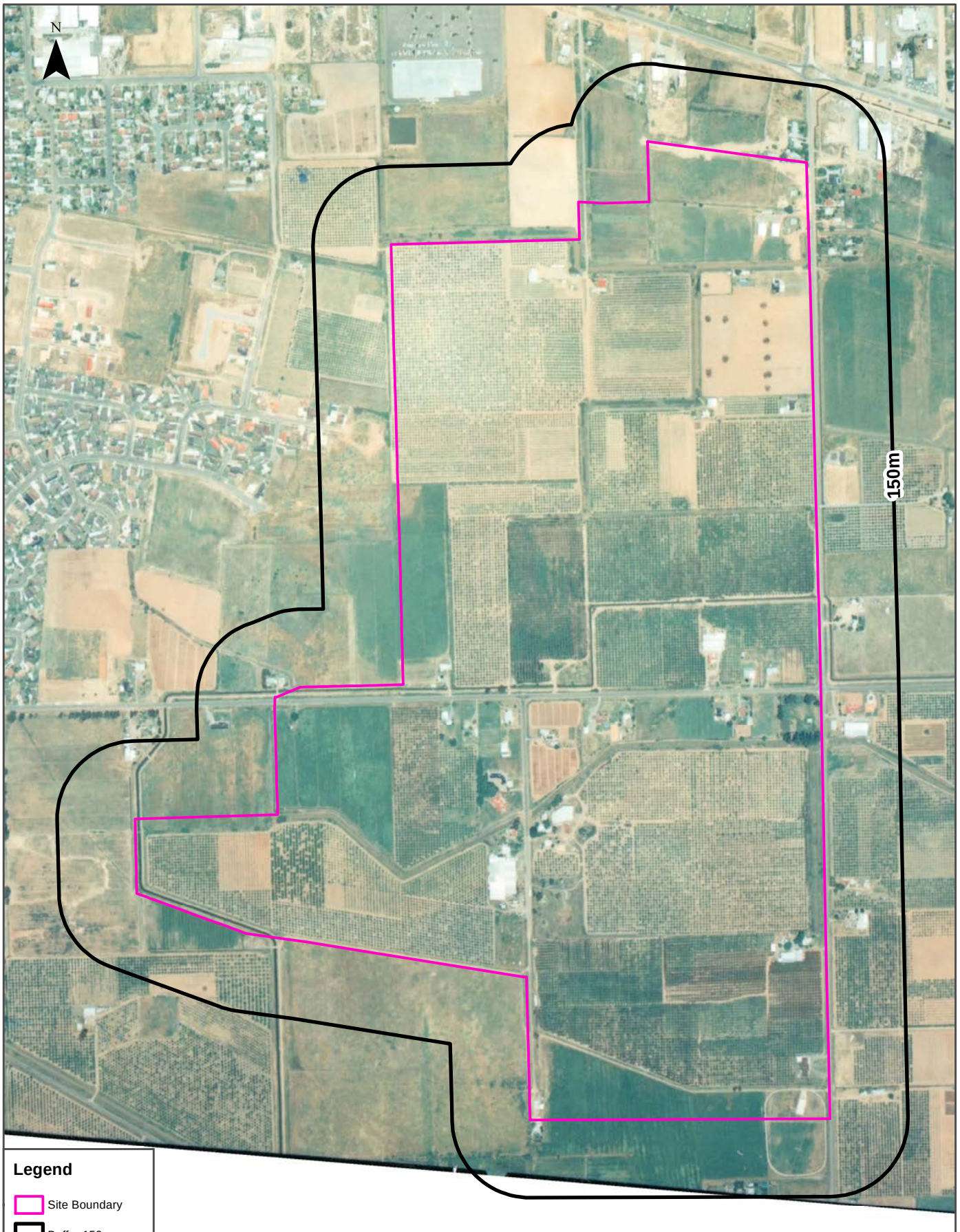

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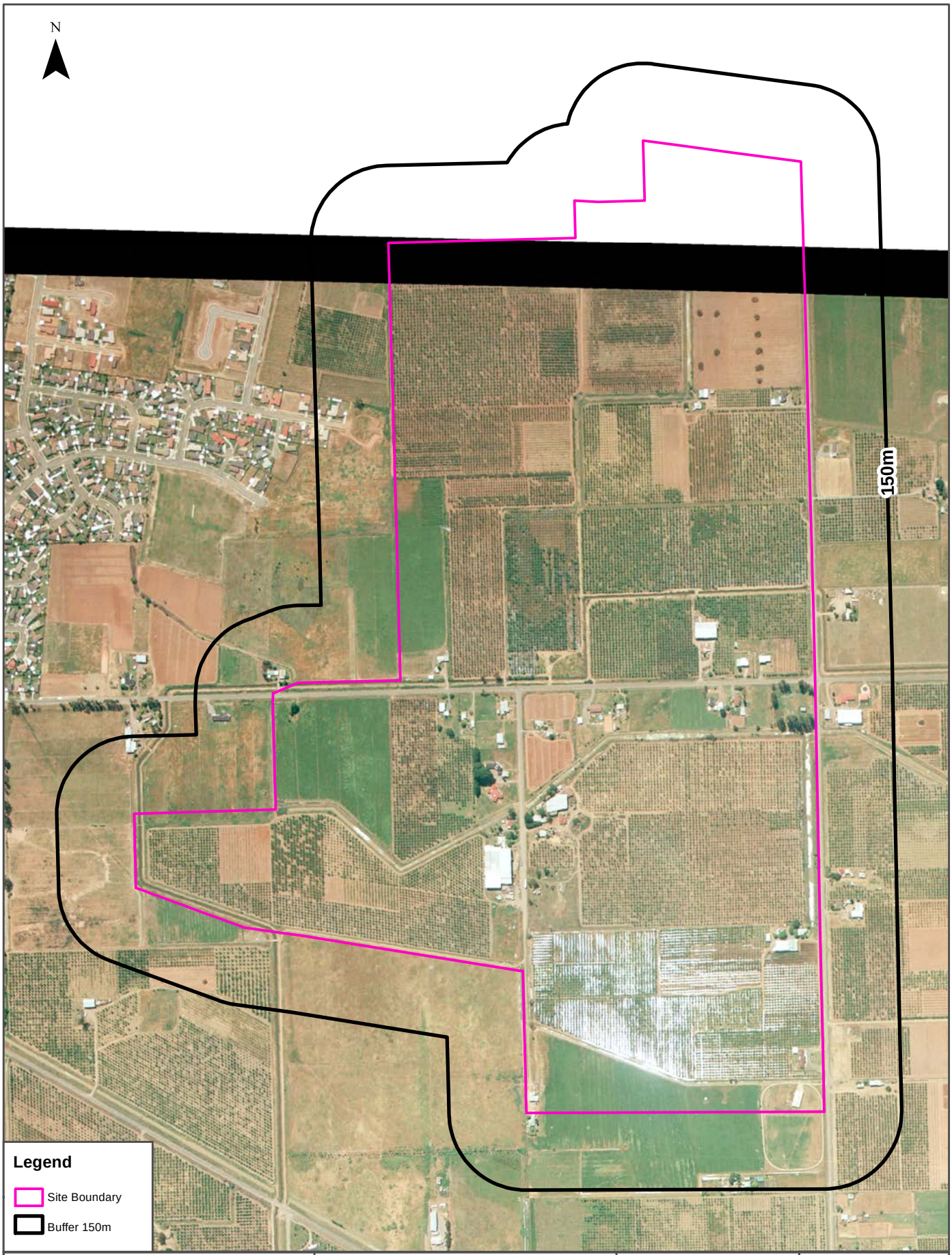

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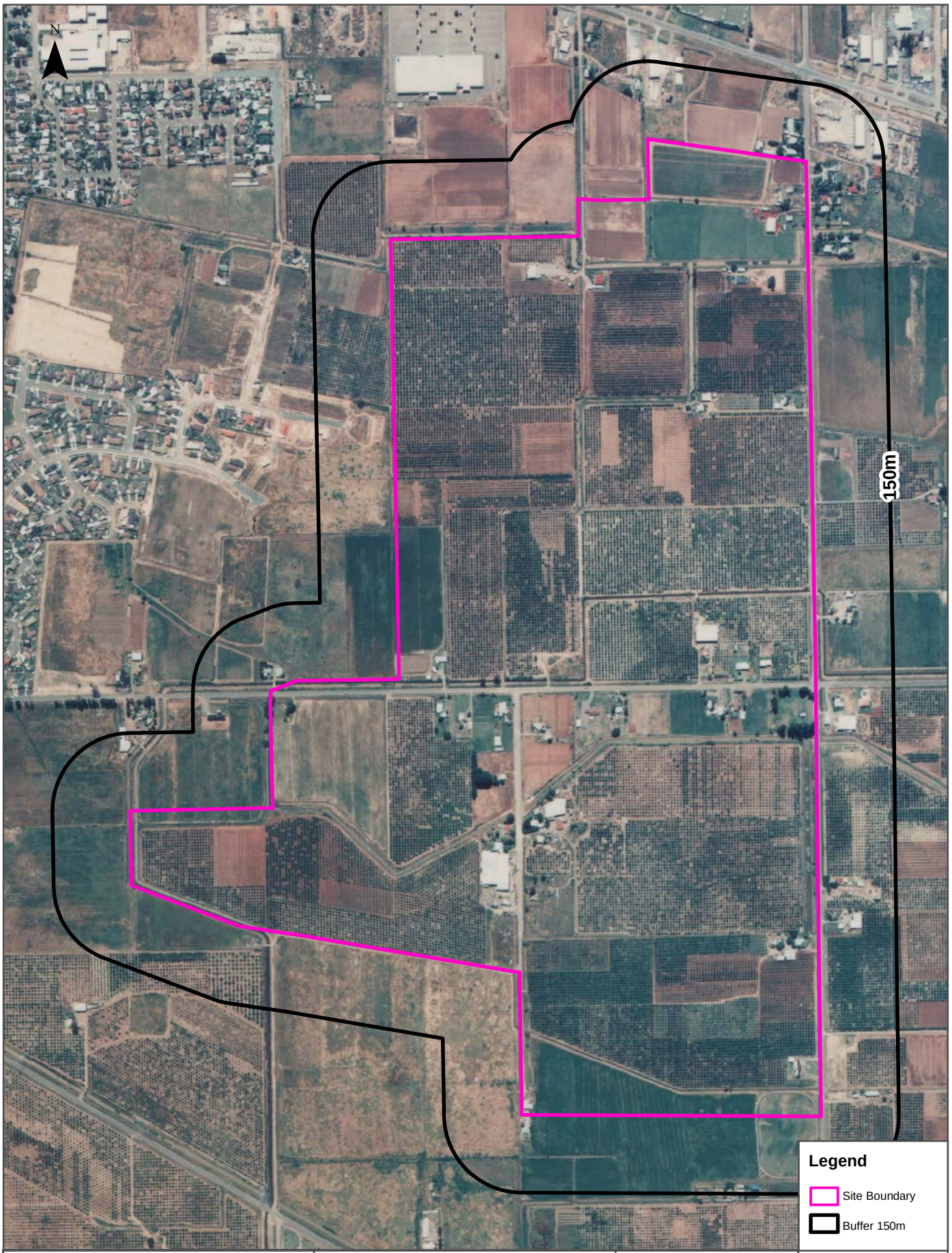

Data Source Aerial Imagery:
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(Vicmap Topographic Mapping Program)

Coordinate System:
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Aerial Imagery 1986

Shepparton South East Precinct Structure Plan (Section 1)

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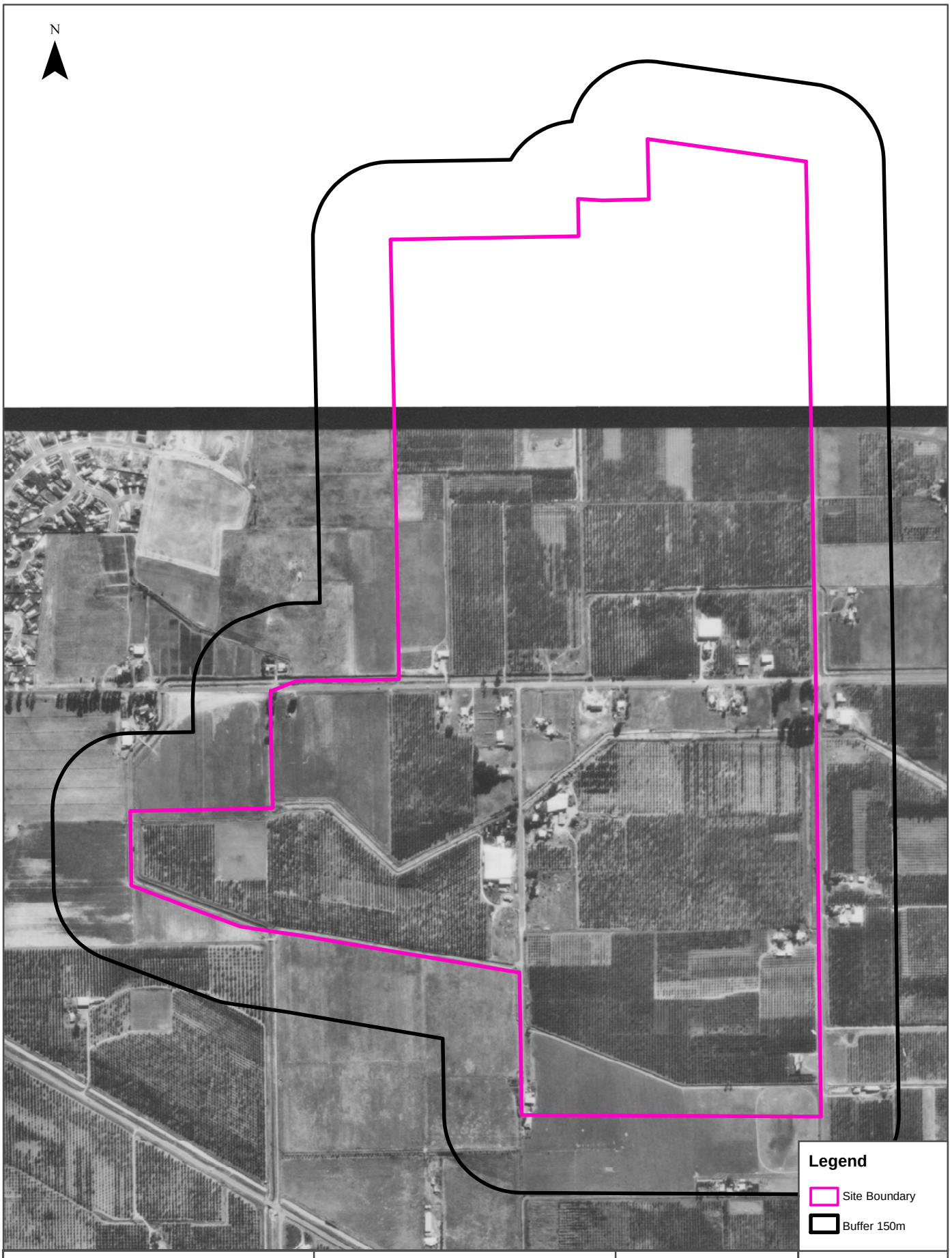

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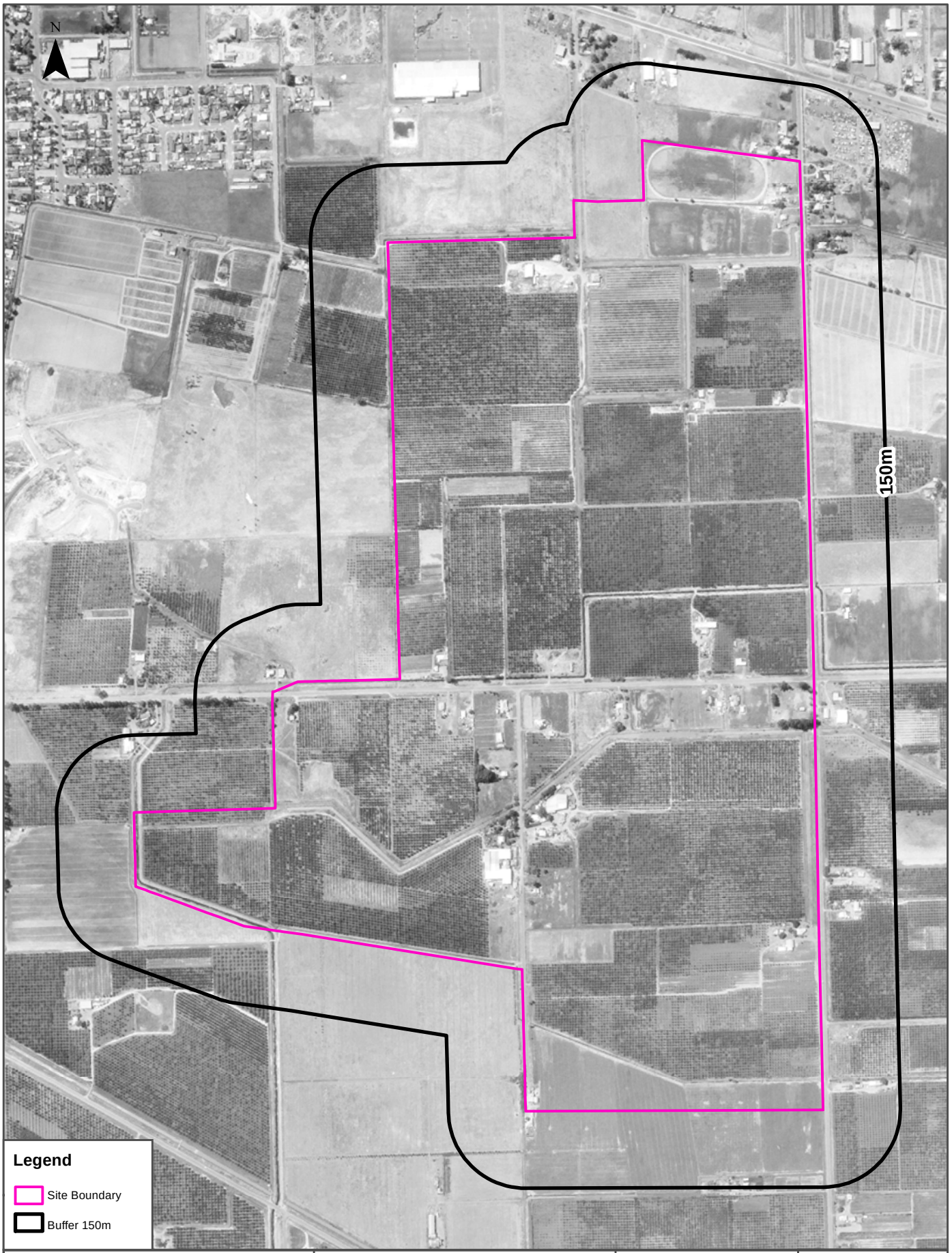

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