

APPENDIX A

Results of Desktop Study

DESKTOP STUDY

The following sets out the results of the desktop study. The information gathered through the course of the desktop study has been used to inform the impact assessment which is set out in this report.

Topographic setting

The topographic setting of the site is presented on Figure 1. The following comments relate to the topography of the site:

- The proposed terminal station sites have a shallow surface gradient towards the east.
- A shallow minor tributary to the Morwell River flows towards the east through both sites. There are two drainage courses on the Option B site, with a confluence between the Option A and Option B sites.
- Varys track which runs between the two sites is an unsealed roadway. There are numerous forestry roads which pass through and around the sites.
- An existing 220kV transmission line runs WNW to ESE to the immediate north of the sites, noting that this is the line which is proposed for connection to the terminal station.
- Both sites are currently used for logging purposes.

Geology and subsurface materials

Regional geology

The 1:63,360 scale geological mapsheet for Mirboo North (GSV, 1967, see Figure 2) shows the surface geology in the broader project area to consist primarily of Tertiary (Oligocene) age Thorpdale Volcanics (formally Thorpdale Volcanic Group), described on the mapsheet as comprising basic lava flows, plugs, dykes and pyroclastics, along with interbedded bands of clay and coal. Limited areas of outcropping Tertiary (Oligocene) age Childers Formation have been recorded beneath the Thorpdale Volcanics near the centre of the project area. The Childers Formation consists of sand, clay, conglomerate, gravel, quartzite and thin brown coal seams. The Tertiary (Pliocene to Miocene) age Latrobe Valley Group is mapped in the north and south of the project area, interbedded with the Thorpdale Volcanics and Childers Formation. Minor areas of Quaternary aged alluvium are mapped within creek channels. Basement rock beneath the site is expected to be of the Cretaceous age Wonthaggi Formation, although this is not mapped as outcropping within the project area. This is composed of sandstone and siltstone with minor conglomerate and black coal.

Site geology

With reference to Figure 2, the proposed terminal station is expected to be underlain by the Pliocene to Miocene age Latrobe Valley Group, which is described on the geological map as sand, silt, gravel and ferruginous sand, interbedded with sand and clay in varying proportion. This unit also hosts coal seams. The Unit 2 Latrobe Valley Group shows some evidence of weathering, including ferruginisation, whereby there is some cementation of sand by iron oxides and occasional very high strength ferricretes.

Localised Quaternary alluvium could be present around water courses. There are drainage courses through the proposed terminal station sites and although geological maps do not indicate the presence of alluvium it could potentially be present under both sites.

There could also be local areas of uncontrolled (i.e. non-engineered) fill associated with past activities on the site including works associated with logging activities.

Two SEC boreholes drilled on the proposed terminal station sites in 1956 (bore 322489) and 1980 (bore 324391) indicate the subsurface materials to comprise:

- Sandy soil to 0.6 m over;
- Clayey soil from 0.6 m to 18.7 m with occasional ironstone bands, over;
- Coal from 18.7 m to 37.5. The coal is described as part of the Morwell 1 seam.

Groundwater

Aquifer units

The main hydrostratigraphic units in the project area and their properties are summarised in Table A1.

Table A1: Summary of regional hydrogeological units

Unit	Thickness (m)	Aquifer type	Typical salinity (TDS, mg/L)	Typical bore yield (L/s)
Thorpdale Volcanics	Up to 60	Unconfined and confined fractured basalt aquifer	Less than 1,000	Variable, less than 4
Childers Formation	40 to 50	Confined sand aquifer	Less than 1,000	Less than 5
Latrobe Valley Group	> 100	Sand and gravel aquifers locally confined by interbedded coal and clay	Less than 900	Up to 150
Wonthaggi Formation	> 100	Fractured rock aquifer	1,000 to 3,500	Less than 5

Sources:

Nott, 2004. Groundwater Occurrence in the Gippsland Basin. Department of Sustainability and Environment, Note No. 5.

Lahey & Tickell, 1980. Explanatory Notes on the Western Port Groundwater Basin 1:100 000 Hydrogeological Map. Geological Survey of Victoria, Report #69.

Australian Stratigraphic Units Database. <https://asud.ga.gov.au/search-stratigraphic-units/>

Groundwater levels

Groundwater levels in the project area estimated as part of state-wide mapping of groundwater levels as part of the Victorian Aquifer Framework are shown in Figure 3. This indicates that depth to groundwater at the proposed terminal station is likely to be between 20 m and 50 m below current ground surface.

A search of registered boreholes on the Water Management Information System (WMIS) maintained by the Department of Environment, Land, Water and Planning (DELWP) was undertaken to identify the monitoring wells for which long term groundwater level monitoring data may be available. Two monitoring wells with groundwater level information (IDs 110731 and 79784) were identified within 5 km of the broader DWF site. The groundwater levels observed in these bores are shown in Plate A1, along with the rainfall residual mass curve. Rainfall data was obtained from the Mirboo North Water Board weather station (BOM station #85282).

Bore 110731, located approximately 4 km to the south of the proposed terminal station, is recorded as 200 m deep, but the screened interval and lithology is not reported. Based on the surface geology and depth, this bore is likely to intersect the Latrobe Valley Group, and is assumed to be the most relevant well to the proposed terminal station site. A declining in groundwater level of approximately 9 m was recorded between 1982, when the well was installed, and 2000. Groundwater level then remained relatively stable from 2000 to 2012, declined by approximately 4 m from 2012 to 2013, then remained relatively stable to 2018. The most recent groundwater level recorded (August 2018) indicates a depth to water of approximately 62 m, corresponding to an elevation of approximately 30 m AHD.

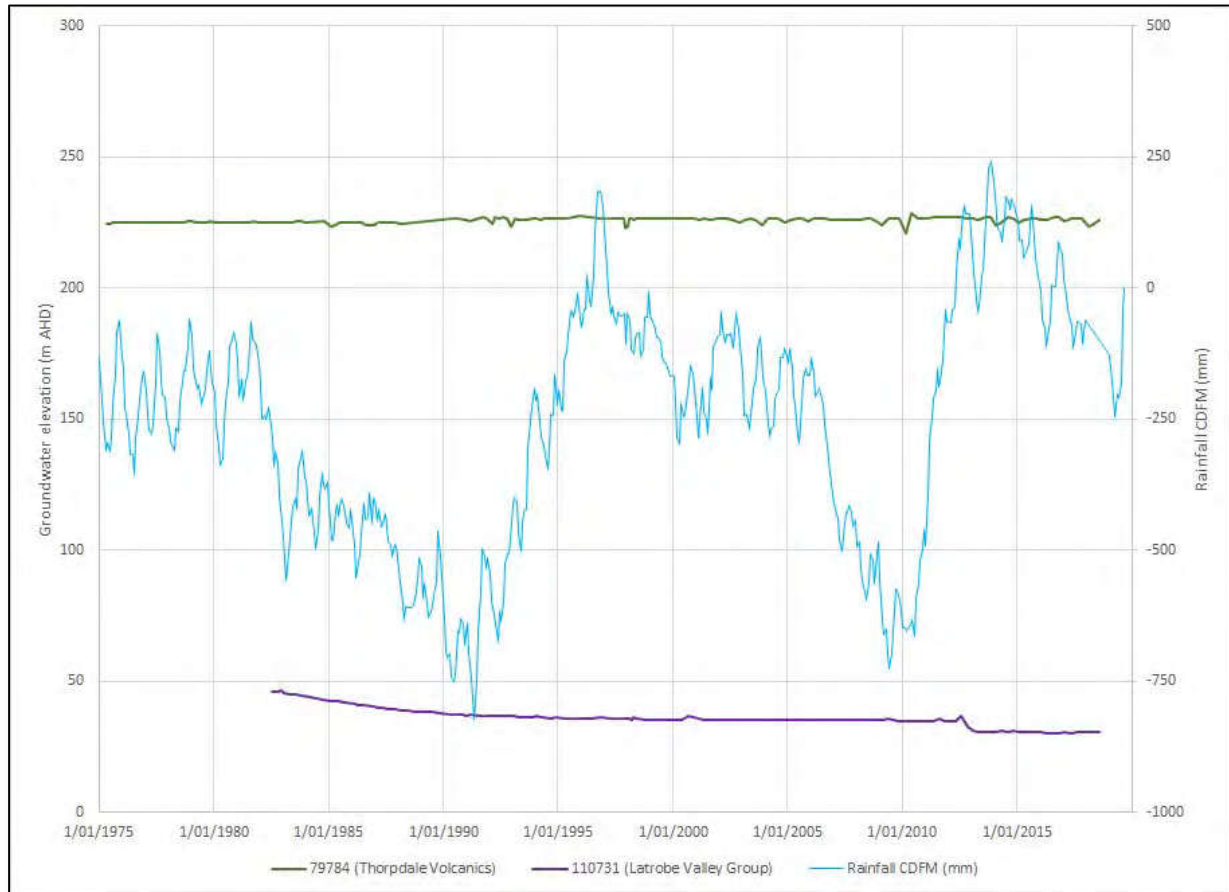


Plate A1: Groundwater level at registered wells

Groundwater flow system and receptors

Surface topography is commonly inferred to be a good indication of a water-table aquifer flow system. Local flow towards streams would be expected, with regional flow at the site to the east towards the Morwell River. The Morwell River and its tributaries, one of which passes through the proposed terminal station site fall within the Central Foothills and Coastal Plains Segment under the State Environment Protection Policy (SEPP Waters) (2018). Waterways within this segment are considered to be slightly to moderately modified, so a 95% level of protection applies when selecting water quality objectives.

A low potential terrestrial groundwater dependent ecosystem is mapped (BOM Groundwater Dependent Ecosystems Atlas) on a small portion of the Option B site as indicated in Figure 4. This area has the potential for vegetation to be reliant on sub-surface groundwater. Notwithstanding this, much of the GDE mapping is based on remote sensing data, and would require confirmation on the ground.

Regionally, groundwater levels and flow within the Latrobe Valley Group aquifers are known to be influenced by dewatering of the Latrobe Valley coal mines (SRW, 2012). The Morwell open cut is located approximately 4 km to the east of the proposed terminal stations, beyond the Morwell River and ground water underlying the site is expected to be influenced by the coal mine.

Groundwater quality

State-wide mapping indicates shallow groundwater in the project area is likely to have salinity of less than 1,000 mg/L.

A review of information on groundwater quality in the project area was undertaken using the information provided in the WMIS database. The nearest well to the proposed terminal station with available data is well 84157 which is located approximately 3 km to the north of the site as shown on Figure 3. A summary of the available data is provided in Table A2. The data indicates non-aggressive groundwater conditions, with reference to AS2159-2009: Exposure classification for steel or concrete piles. However, as the well is not located on the site and the data dates from the 1970's, it is recommended to confirm groundwater chemistry on the site if structures are likely to intersect groundwater.

Table A2: Summary of chemistry results from registered wells

Well ID	pH	EC (μ S/cm)	Total Soluble Salts (mg/L)	Chloride (mg/L)	Sulphate (mg/L)
84157	8.0	795	-	117	-

Earthquake

A review of earthquake epicentre records on the Geovic website indicates there have been earthquakes with magnitude up to 5.4 within about 12 km to the southwest of the proposed terminal stations. Figure 3.2(A) of Australian Standard AS1170.4 – 2007 'Structural design actions Part 4: Earthquake actions in Australia' indicates that the hazard factor (z) for the site is 0.11.

Landslide and slope instability

Review of the digital terrain model by a principal engineering geologist has been undertaken to identify areas within the broader wind farm development that appear to have been subject to previous slope instability. The site of the proposed terminal station is on relatively flat land and was not assessed as having susceptibility to landslide or slope instability.

Sites of geological significance

The GeoVic website does not identify any sites of geological significance within the project boundaries.

Mineral Resources

The Department of Primary industries, Victorian Coal Inventory of Resources, 31 August 2007, (ref: GHD 31/20049/7979) indicates the site is underlain by coal resources. Exploratory boreholes drilled on the site of

the proposed terminal station by the State Electricity Commission (SEC) in 1956 (Borehole 322489) and 1980 (Borehole 324291) indicate the Morwell 1 coal seam is present below the site between depths of about 19 m and 38 m.

Acid sulfate soils

The CSIRO Acid Sulfate Soils Probability map indicates the site to have an “extremely low probability of occurrence” for acid sulfate soils.

Surface hydrology

The GeoVic website indicates that the site of the proposed terminal station is not located within a designated water supply catchment area. The terminal station site does not appear to be within any declared water supply catchment or groundwater water supply protection areas.

Historical aerial photographs

Commercially available historical aerial photographs were obtained for review of the broader wind farm site. The observations from the review are summarised in Table A3 and copies of the historical aerial photographs are provided in Appendix B.

Table A3: Aerial photograph observations

Date of Photograph Run	Notes
1945	The available photograph only covers the central northern portion of the site and does not include the terminal station site. This portion of the site mostly consists of tree covered areas with visible paddocks and roadways across the area. Rural residential dwellings and farm sheds are scattered across the area.
1965	The site mostly consists of tree covered areas with some visible paddocks and roadways. Inferred cropping is evident in the south of the site. The terminal station site appears to comprise open land.
1980s	The available photographs cover limited sections of the site and do not include the terminal station site. The visible areas of the site appear to be generally unchanged from the 1965 photographs.
2010s (NearMap)	The site mostly consists of tree covered areas with some visible paddocks and roadways. Some areas have been cleared of trees since the previous photographs. The terminal station site appears to be covered with a plantation.

Environmental Protection Authority database

Certificates and Statements of Environmental Audit (EPA Victoria)

Certificates and Statements of Environmental Audit are statutory documents that are issued after a statutory environmental audit of a property has been conducted. A *Certificate of Environmental Audit* is issued for property where, following an audit, an environmental auditor believes the environmental condition of the land is suitable for any beneficial use. A *Statement of Environmental Audit* is issued where, following an audit, an environmental auditor believes the land is not suitable for all possible beneficial uses, but is suitable for specific uses or developments; it may contain conditions of clean-up or management of contamination.

A search of the EPA Victoria 'List of Issued Certificates and Statements of Environmental Audit' and Visualising Victoria's Groundwater website did not identify any completed environmental audits within 1 km of the site.

The closest environmental audit to the site boundary is located approximately 7 km east north east from the proposed terminal station site and was completed in 2002 (CARMS No. 47803-1).

Groundwater Quality Restricted Use Zones (EPA Victoria website)

A groundwater quality restricted use zone (GQRUZ) is an EPA declared area where, following an environmental audit, groundwater pollution remains, usually as a result of previous industrial activity. A GQRUZ is implemented when attempts have been made to clean up the groundwater and EPA determines that restrictions should remain on how the water can be used without further treatment.

A search of Visualising Victoria's Groundwater website indicates there are no GQRUZs within 1 km of the site.

EPA Priority Sites Register (EPA Victoria)

The Priority Sites Register lists sites for which the EPA has issued a Clean-Up Notice (CUN) or a Pollution Abatement Notice (PAN) pursuant to sections of the *Environment Protection Act 1970*. The condition of these sites is not compatible with the current or approved use of the site without active management to reduce the risk to human health and the environment. Such management can include clean-up, monitoring and/or institutional controls.

The Priority Sites Register (current to 30 September 2019) does not list the site, or any site within 1 km of the site.

Post Closure Pollution Abatement Notices

Following closure, landfills continue to pose risks to the environment. In order to ensure that the risks are appropriately quantified and managed, owners of closed landfill sites are issued with a Post Closure Pollution Abatement Notices (PC PAN) that requires the closed landfill to be managed so there are no unacceptable risks to the environment.

EPA Victoria maintains a database for locating issued PC PAN documents (EPA Interaction Portal). The database was queried 28 October 2019 and did not list any PC PANs within the townships/localities (Boolarra, Darlimurla, Delburn, Driffield, Hernes Oak, Narracan and Yinnar) that are within the region of the site.

Victorian Landfill Register

Publicly available to all Victorians, the Victorian Landfill Register (VLR) draws information from various sources. It lists all current and known closed landfills in Victoria. Information contained in the VLR is intended to be used only as a guide and is not to be relied upon as being either complete or accurate. The VLR brings together information from:

- EPA landfill licences and post closure pollution abatement notices;
- Regional Waste and Resource Recovery Implementation Plans; and
- Historic landfill records held by EPA.

Sites that are located within 500 m of landfills, or former landfills may require further assessment for potential ground gas risks, such as methane.

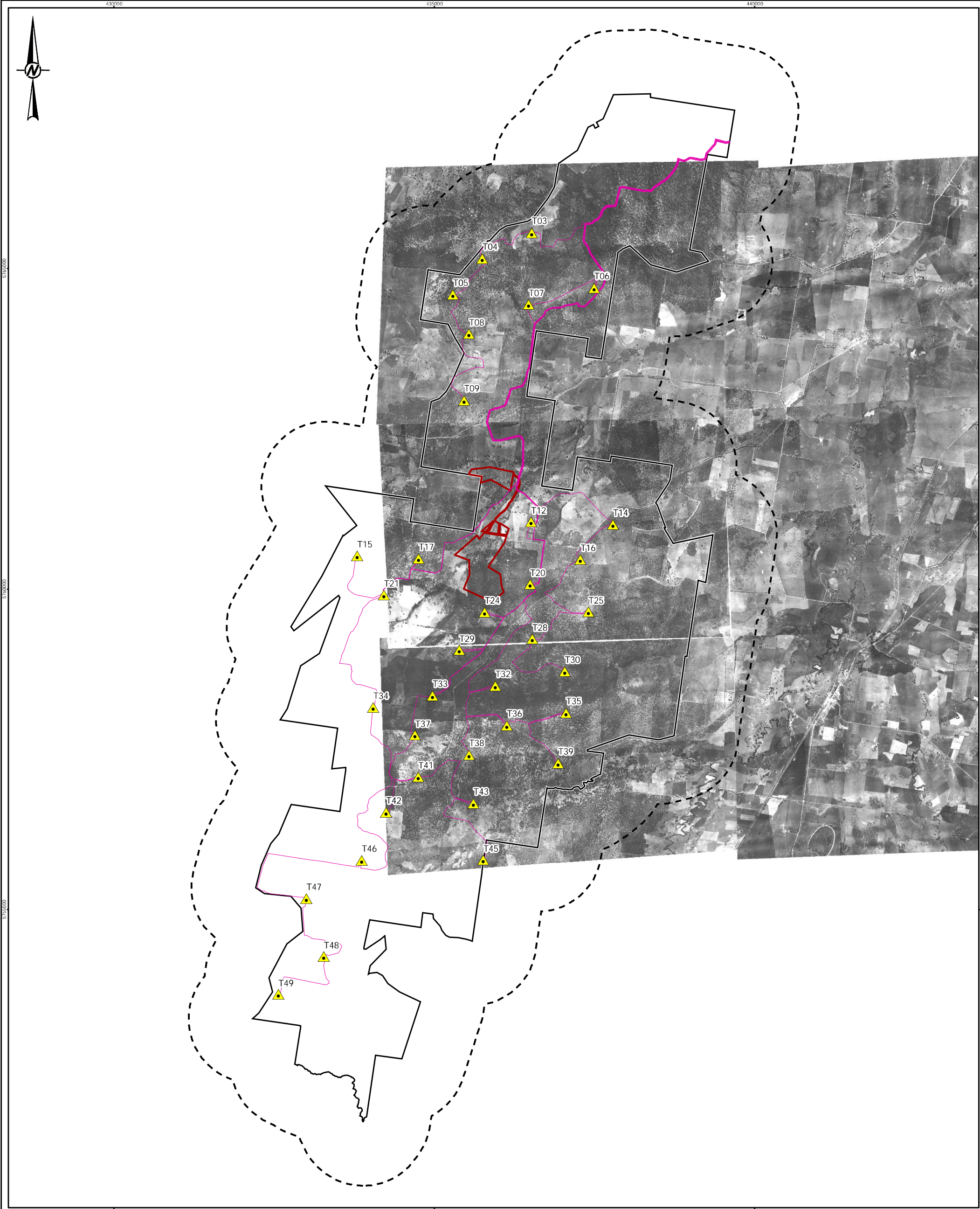
The VLR interactive webpage was queried on 1 September 2020 and shows one closed landfill located about 4 km to the north of the site (at its closest point) which is operated by Latrobe City Council. No other landfills were listed on the register within a 1 km radius of the site.

An interest search of Energy Australia Yallourn Pty Ltd found that Energy Australia Yallourn submitted a Financial Assurance proposal to the Victorian EPA for three operational landfills located at Yallourn. The three landfills include an ash landfill, a hard waste landfill and an asbestos landfill. The Financial Assurance Proposal was approved by EPA in December 2018.

Additionally, the VLR interactive webpage shows that an operational landfill is located at the Hazelwood Power Complex and receives ceramic-based fibres, asbestos and ash waste, the landfill is located approximately 1.7 km south east of the site at its closest point.

APPENDIX B

Historical Aerial Photographs

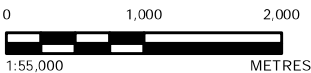


- LEGEND
- WTG Location
 - Reticulation
 - Kennedy Quarry
 - Project Boundary
 - Project Boundary (1km buffer)

DRAFT

NOTE(S)
1. PROJECTION: GDA 1994 MGA ZONE 55

REFERENCE(S)
1. IMAGERY SOURCED FROM GOLDER ARCHIVES.



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OSMI AUSTRALIA

CONSULTANT



YYYY-MM-DD	2019-11-07
DESIGNED	LMA
PREPARED	JPH
REVIEWED	JMW
APPROVED	JMW

PROJECT
DESKTOP ASSESSMENT OF GEOTECHNICAL, CONTAMINATED
LAND AND HYDROLOGICAL CONSTRAINTS

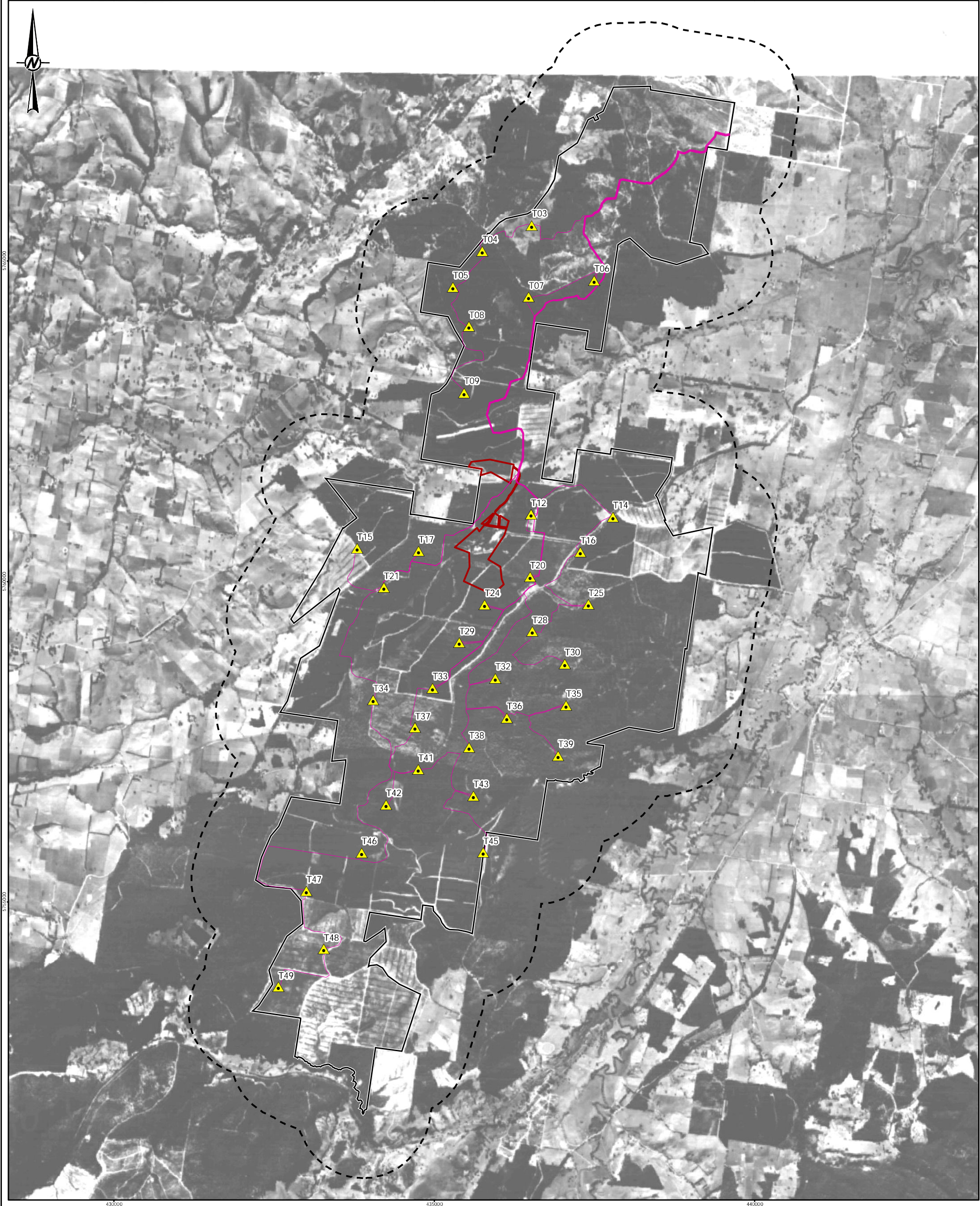
TITLE
1945 AERIAL

PROJECT NO.
19130636

CONTROL
001

REV.
A

FIGURE
B1

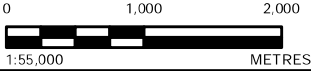


- LEGEND
- WTG Location
 - Reticulation
 - Kennedy Quarry
 - Project Boundary
 - Project Boundary (1km buffer)

DRAFT

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DESKTOP ASSESSMENT OF GEOTECHNICAL, CONTAMINATED
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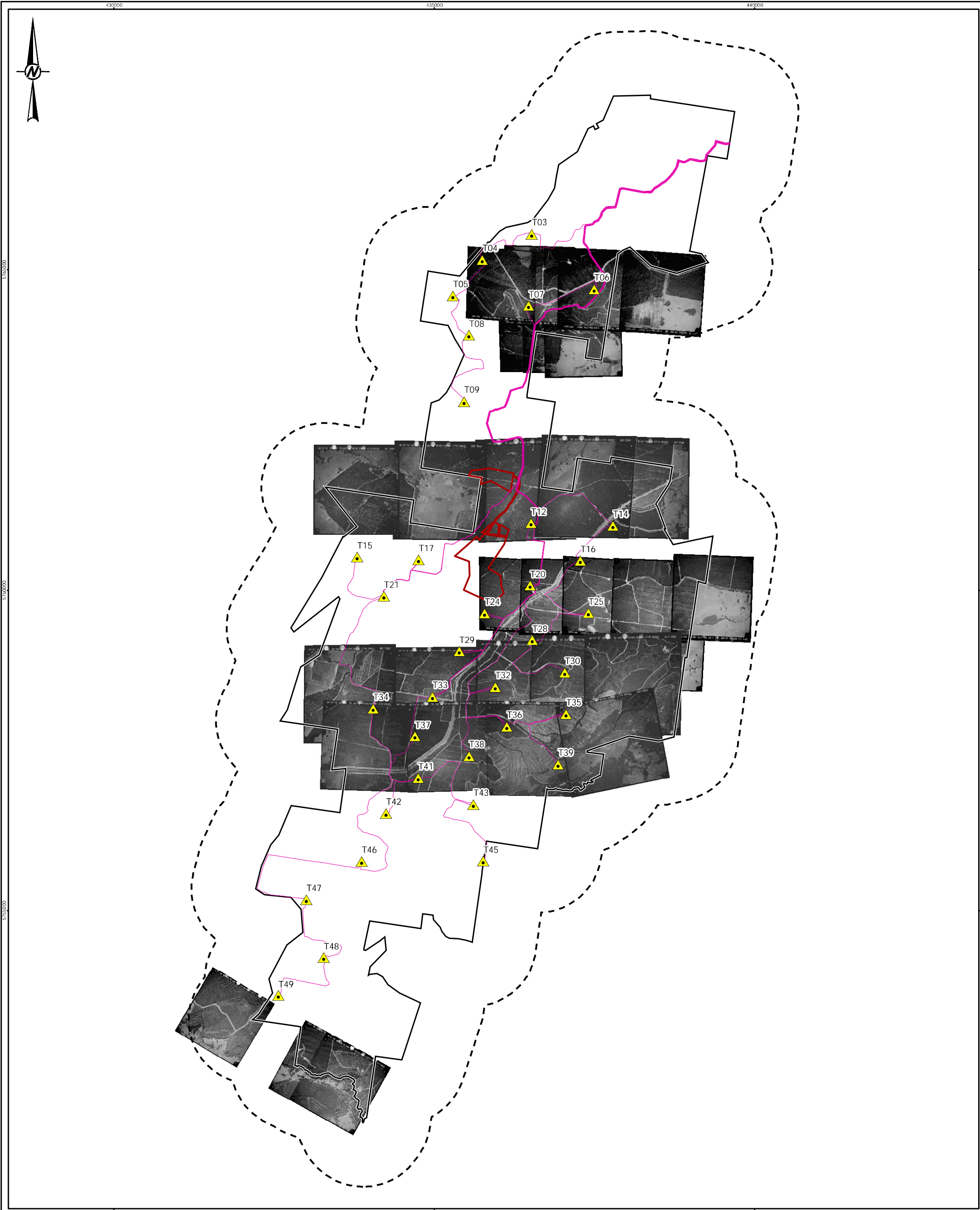
TITLE
1965 AERIAL

PROJECT NO.
19130636

CONTROL
001

REV.
A

FIGURE
B2

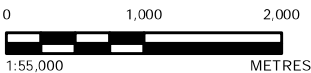


- LEGEND**
- WTG Location
 - Reticulation
 - Kennedy Quarry
 - Project Boundary
 - Project Boundary (1km buffer)

DRAFT

NOTE(S)
1. PROJECTION: GDA 1994 MGA ZONE 55

REFERENCE(S)
1. IMAGERY SOURCED FROM GOLDER ARCHIVES.



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CONSULTANT	YYYY-MM-DD	2019-11-07
	DESIGNED	LMA
	PREPARED	JPH
	REVIEWED	JMW
	APPROVED	JMW



PROJECT
DESKTOP ASSESSMENT OF GEOTECHNICAL, CONTAMINATED
LAND AND HYDROLOGICAL CONSTRAINTS

TITLE
1980 AERIAL

PROJECT NO.	CONTROL	REV.	FIGURE
19130636	001	A	B3

APPENDIX C

**Important information relating to
this report**



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