

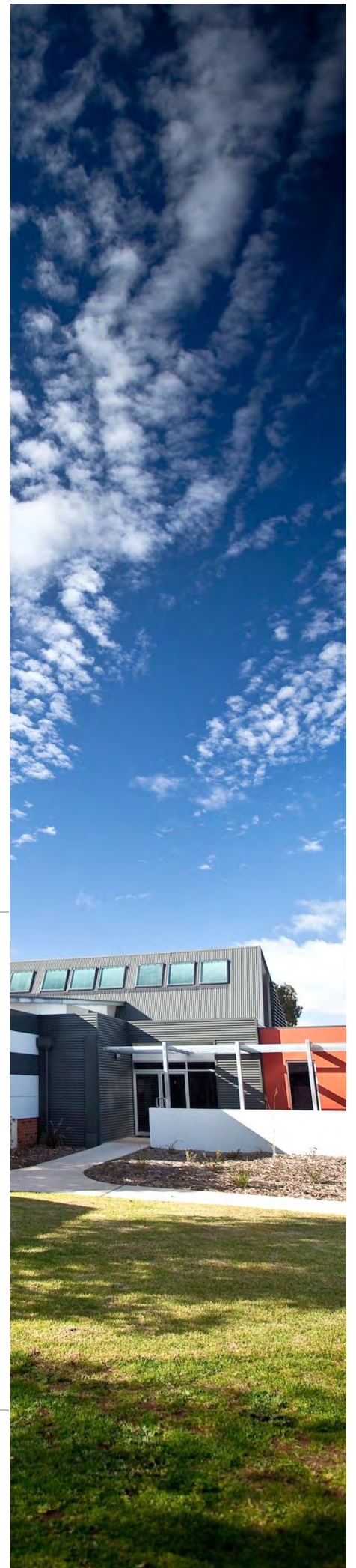


Preliminary Site Contamination Assessment

Darthula 194 Hill End Road
Caerleon, NSW

(Our Reference:30336 ER01)

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Client:	Mr Peter Shearman
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EXECUTIVE SUMMARY

Barnson was engaged by Mr Peter Shearman to undertake a preliminary contaminated site investigation in support of a Planning Proposal for the rezoning and subdivision of multiple lots within 'Darthula' a rural property at 194 Hill End Road, Caerleon, NSW (hereafter referred to as the Subject Site).

The investigation had as its objectives to identify contamination issues that may affect the suitability of the Subject Site for future residential development and assess the need for possible further investigations, remediation or management of any contamination issues identified.

The investigation was based on a desktop review of information available for the Subject Site, as well as the findings of a site inspection and confirmatory sampling and analysis of surface soils collected at the site.

A review of the available historical information, including contaminated sites databases, indicated no recorded activities with the potential to significantly contaminate the site.

Although the potential for *significant* environmental contamination to be present across the site was concluded to be low, activities associated with the current and historical use of the Subject Site were identified as having a potential to contaminate surface soil. The following potential sources and areas of contamination were identified:

- o Historical and current livestock farming and grazing activities;
- o Historical and current feed-crop cultivation; and
- o Use, maintenance and storage of motorised vehicles and equipment.

A site inspection, supplemented with confirmatory sampling and analysis, was conducted to determine the presence and significance of potential contamination associated with the identified sources.

Based on the findings of the desktop review and site investigation it can be stated with a reasonable level of confidence that the areas comprising the Subject Site that may be further developed for residential use, subsequent to the proposed re-zoning and sub-division, are unlikely to be contaminated. This finding is supported with analytical results of surface soil samples collected at the Subject site, in which no contaminants were detected above screening criteria. These areas are therefore considered suitable for the proposed re-development and use for residential purposes.

The site investigation did reveal evidence of localised heavy metal contamination associated with the historical structures in an area of the subject site that will not be available for future development.

Although the concentrations of heavy metals detected in this area of the Subject Site exceed both health and ecological risk-based screening guidelines, it was concluded that the contamination does not represent a risk to the proposed re-zoning and sub-division and future development of the Subject Site, as it does not represent a significant risk to human health or the environment in the location where it is.

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1.0 INTRODUCTION

1.1 Background

Barnson was engaged by Mr Peter Shearman (the Client) to undertake a preliminary contaminated site investigation in support of a Planning Proposal for the rezoning and subdivision of multiple lots at 'Darthula' agricultural property at 194 Hill End Road, Caerleon, NSW (hereafter referred to as the Subject Site).

The Client submitted a planning proposal to Mid-Western Regional Council for portions of the Subject Site to be rezoned for large lot residential development.

In accordance with the State Environmental Planning Policy 55 (Remediation of Land) the consent authority must determine if land is contaminated and, if so, whether it is suitable for the intended purpose or require remediation.

1.2 Objectives

The objectives of the investigation are:

- Identify contamination that may affect the site's suitability for residential development, and;
- Assess the need for possible further investigations, remediation or management of any contamination identified.

1.3 Scope of Work

To meet the objectives, Barnson completed the following scope of work:

- Site identification including a review of site history, site condition, surrounding environment, geology and, where available, hydrogeology.
- Desktop review of site history and assessment of potential sources of contamination.
- Development of a Conceptual Site Model (CSM) with information gathered from the data review and site inspection.
- Site inspection to assess site conditions.
- Collection of confirmatory soil samples and analysis to determine nature of possible contamination.
- Provide conclusions as to the suitability of the site for the intended future land use.
- Preparation of a report.

1.4 Purpose of this report

The purpose of this report is to document, with cognisance of the Guidelines for Consultants Reporting on Contaminated sites (NSW EPA, 2020), works undertaken, in accordance with the scope of works as described in Section 1.3, results of the desktop review and site inspection, and recommendations for further actions required to determine fitness of the site for use.

1.5 Assumptions and Limitations

The following assumptions have been made in preparing this report:

- The future use of the site will be for residential purposes. This assumption forms the basis for the conceptual site model (Section 4).
- All information pertaining to the contamination status of the site has been obtained through public record searches, a preliminary site inspection and analysis of confirmatory samples collected at the Subject Site. All documents and information in relation to the Subject Site, which were obtained from public records, are accepted to be correct and has not been independently verified or checked.

It should be recognised that even the most comprehensive site assessments may fail to detect all contamination on a site. This is because contaminants may be present in areas that were not previously surveyed or sampled or may migrate to areas that showed no signs of contamination when sampled. Investigative works undertaken at the subject site by Barnson identified actual conditions only at those locations in which sampling and analysis were performed. Opinions regarding the conditions of the site have been expressed based on historical information and analytical data obtained and interpreted from previous assessments of the site. Barnson does not take responsibility for any consequences as a result of variations in site conditions.

2.0 SITE DESCRIPTION

2.1 Site Identification

Table 2.1 present a summary of the available information pertaining to the identification of the Subject Site. The Subject Site is comprised of 33 adjoining lots, comprising various zones including primary production (RU1), large lot residential (R5) and environmental management (E3). The lots comprising the Subject Site are listed in Table 2.1 below.

Figure 2.1 presents a map indicating the location of the Subject Site.

Table 2.1: Summary of Subject Site identification details.

Information	Details
Site address	194 Hill End Road, Caerleon NSW 2850
Lot and Deposited Plan No.	Lot 1 DP 104244, Lot 1 DP 510323, Lots 11, 13, 20, 21, 22, 23, 26, 27, 28, 34, 35, 36, 66, 68, 72, 81, 82, 83, 84, 96, 97, 99, 171, 172 DP 756897, Lots 1 and 2 DP 795672, Lots 11 and 12 DP 855845, Lots 3314 DP 1112448 and Lot 410 DP 1112456
Zoning	RU1 – Primary Production R5 - Large Lot Residential E3 - Environmental Management
County	Wellington

Parish	Munna
Local Government Area	Mid-western Regional Council

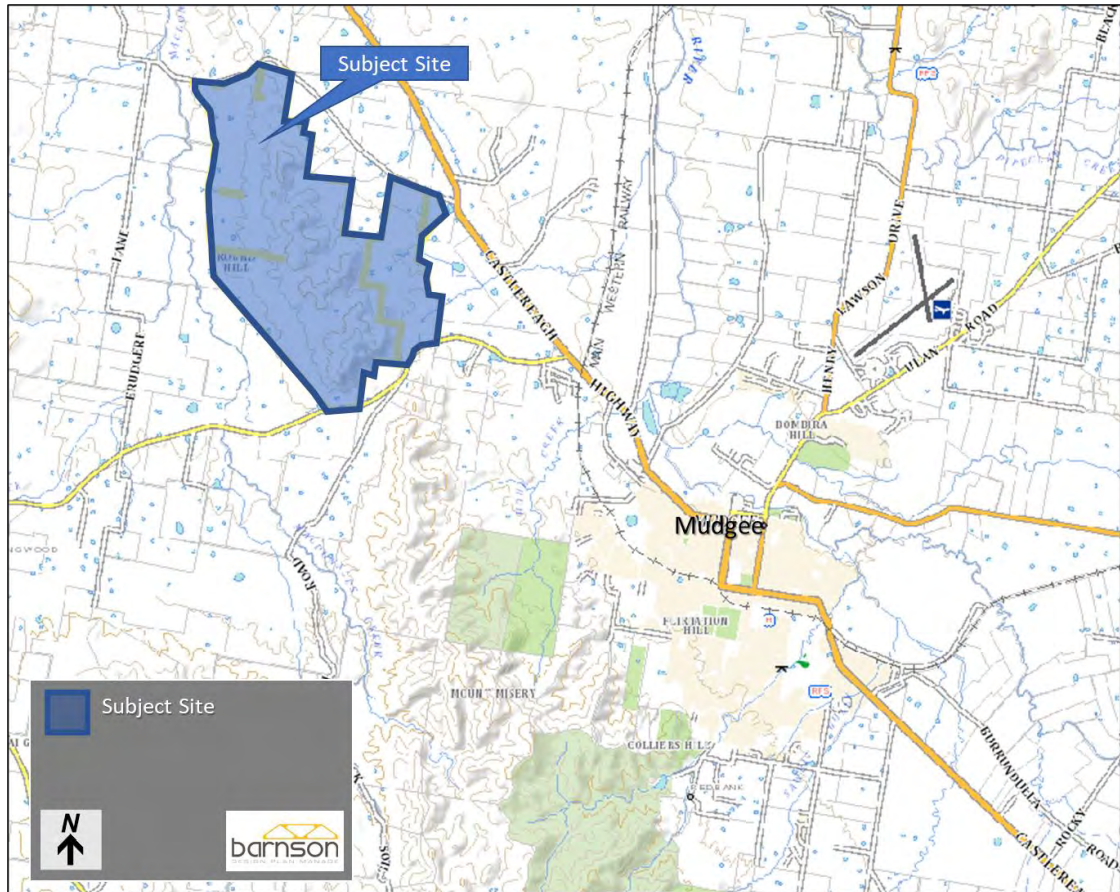


Figure 2.1: Location of the Subject Site.

2.2 Layout and Features

The Subject Site is used for agricultural purposes and is largely unoccupied except for a homestead (on Lot 3315 DP112448) and shearing shed, hay sheds and other smaller farming infrastructure (on Lot 34 DP756897) located on the eastern side of the property.

The Subject Site fronts onto Hill End Road to the south, lower Piambong Road to the north and an unpaved laneway (Gibsons Lane) to the west. The Subject site is covered with maintained grass and there are several earthen farm dams present in the different paddocks on the property. The main feature of the site is a large hill in the centre of the property which essentially separates the property in two parts.

Figure 2.2 presents a plan of the Subject Site with the different comprising lots indicated. The basic layout of the Subject Site is supplemented with photographs showing the different elements of the Site (Figure 2.3 to Figure 2.8). Figure 2.2 includes markers indicating the vantage point and direction of the photographs.

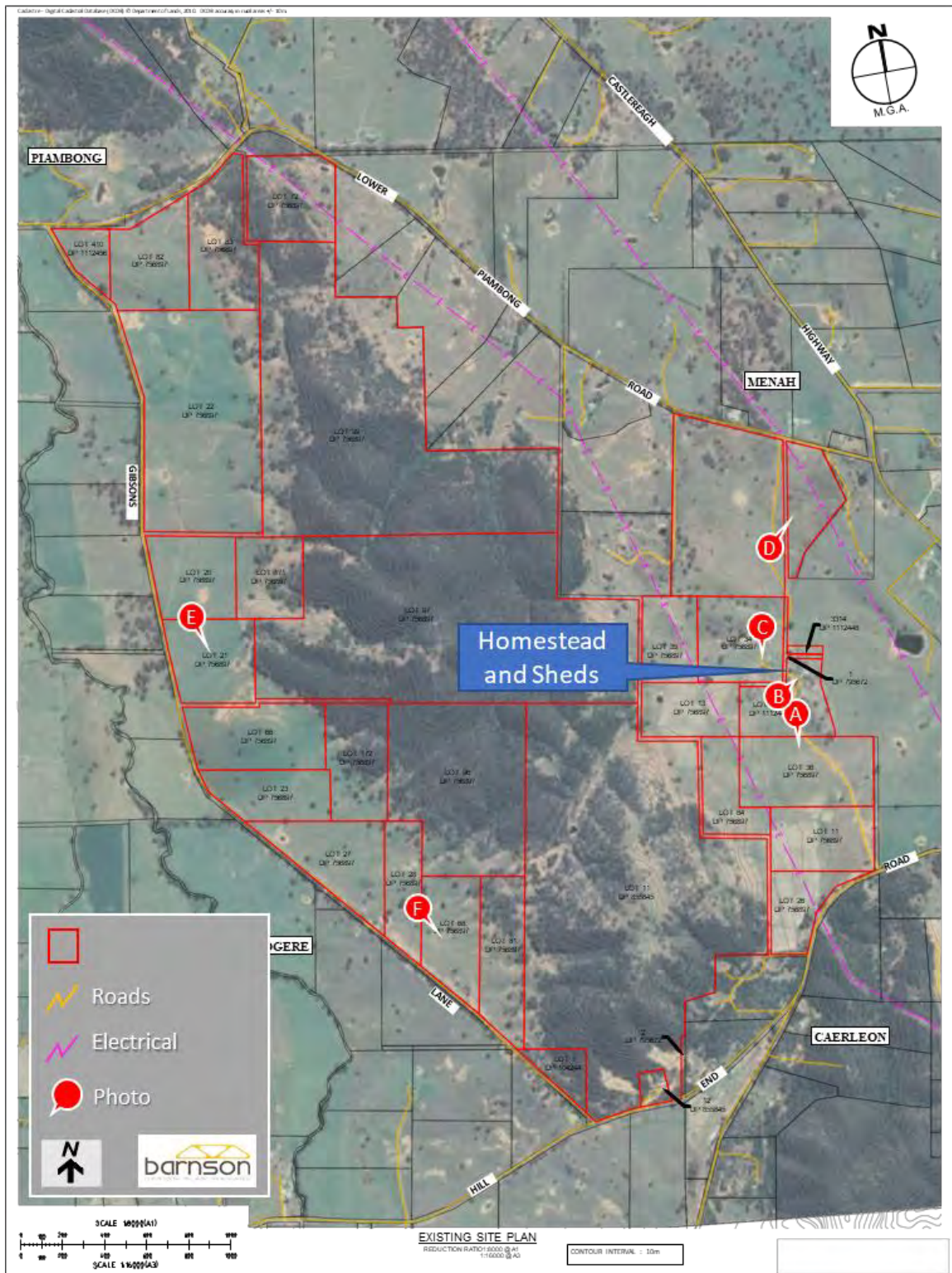


Figure 2.2: Existing Subject Site layout.



Figure 2.3: Photo A –View across the eastern half of the Subject Site from the access road looking (south) towards Hill End Road



Figure 2.4: Photo B – Homestead in east of Subject Site



Figure 2.5: Photo C – Hay shed and feed silos west of homestead



Figure 2.6: Photo D – Ploughed field in north eastern corner of Subject Site



Figure 2.7: Photo E – View of Round Hill in western half of the Subject Site



Figure 2.8: Photo F – View looking south across Lot 68 and 81 DP 56897 in western half of the Subject Site

2.3 Proposed Development

The Mid-Western Regional Council resolved to support the rezoning of three portions of the Subject Site, which are situated close to the Mudgee township and is likely to form part of Council’s future land release strategy. The proposal is to amend the minimum lot size (MLS) for parts the Subject Site from 100 ha to 12ha. This will result in approximately 37 residential lots, each at 12ha MLS. Figure 2.9 present a plan showing the proposed subdivision.

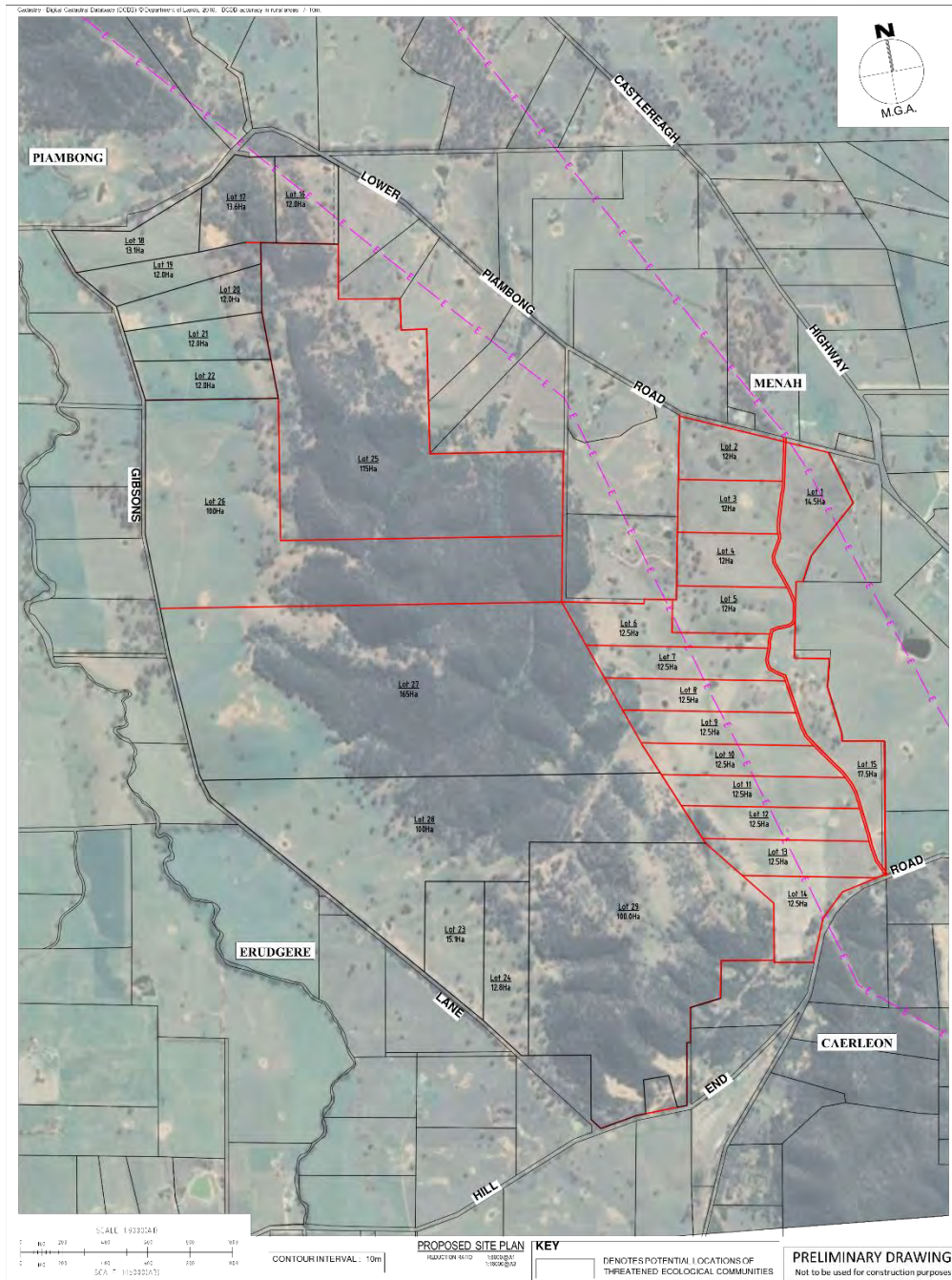


Figure 2.9: Proposed subdivision of the Subject Site.

3.0 SITE SETTING

3.1 Geology

A review of the 1:1000000 Geology map of Mudgee (refer to Figure 3.1) shows that geologically, the Subject Site is underlain by Permean age units of siltstone, sandstone and conglomerate of the Gunnedah Basin, while the hill in the centre of the Site consists of later (Sularian age) quartz and feldspatic units of the Biraganbil Formation. Refer to Figure 3.1.



Figure 3.1: Mudgee 1:100000 geology map showing the location of the Subject Site

An examination of the Geological Survey of NSW maps of Naturally Occurring Asbestos (accessed on 15 April 2021), shows that the geological units underlying the Subject Site has no asbestos potential.

3.2 Soils

The Subject Site is mapped over three soil landscapes namely the Erudgerie, Mullion Creek and Burrendong (see Figure 3.2). In the Erudgerie landscapes, the dominant soil type is yellow pedzolic soils which are described as low fertility with moderate available waterholding capacity (seasonal waterlogging on lower slopes) and moderate to high erosion hazard.

The soils in the Mullion Creek landscape are identified as yellow solodic soil that is described as of low fertility with seasonal waterlogging and including sodic subsoils on lower slopes with high erosion hazard under cultivation. The yellow soloths are further acidic at surface with salinity common on lower slopes. There is consequently a marked difference between the quality of soil between the eastern and western portions of the Subject Site.

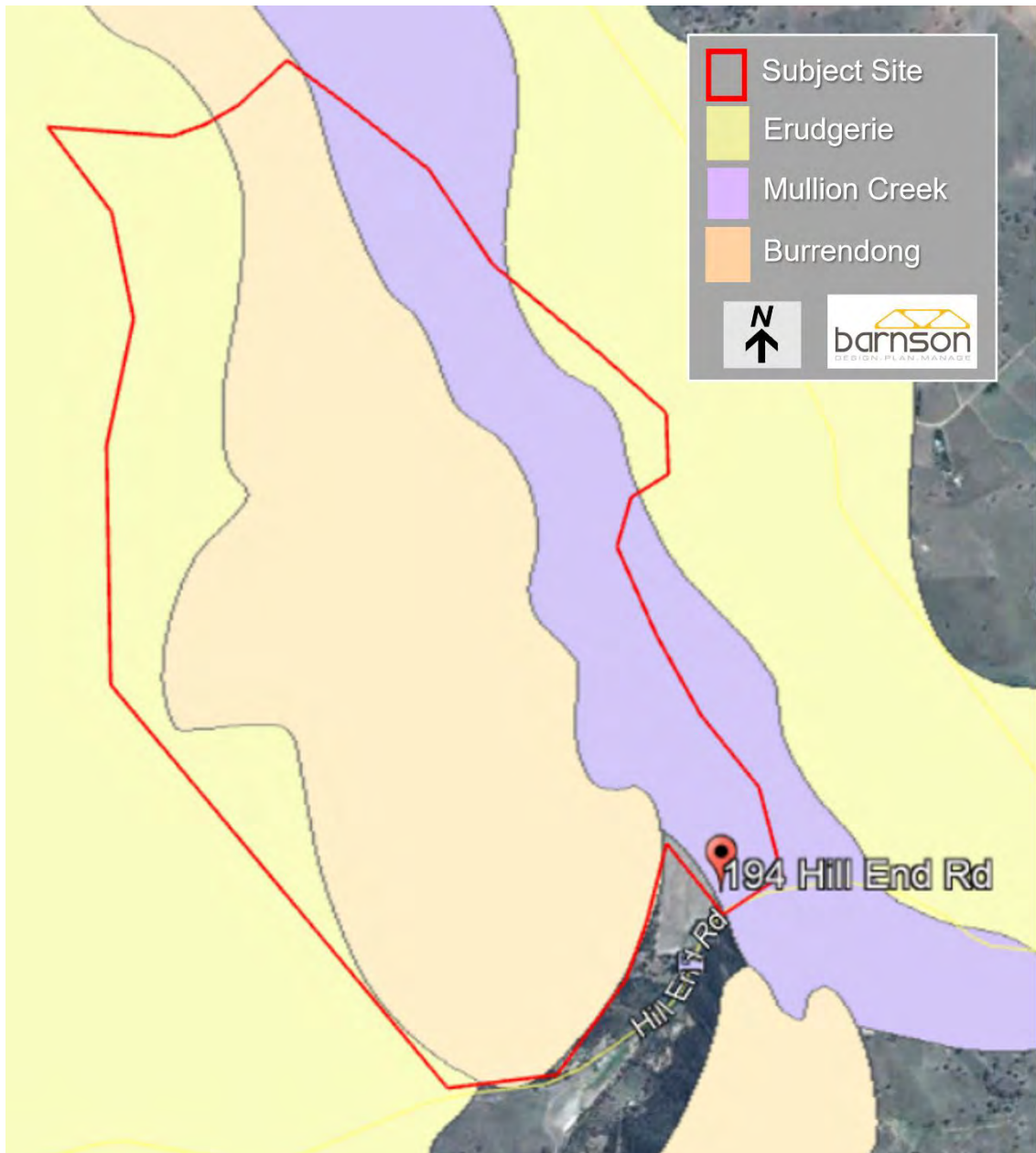


Figure 3.2: Soil Landscapes mapped over the Subject Site.

The Atlas of Australian Acid Sulfate Soil has the subject site in an area of 'low' probability of occurrence (a 6-70% chance of occurrence).

3.3 Topography and Drainage

Figure 2.1 presents topographical information overlain on the map of the Subject Site. The presented data shows that the Subject Site is sloped away from the hill in the centre. Surface water runoff is therefore expected to move in an easterly direction down this slope in the east of the site and in a westerly direction in the west.

The closest natural water body to the Subject Site is the Macdonalds Creek, which at its closest is located at a distance of 200m to the west.

3.4 Groundwater Resources

A review of existing groundwater bore records (WaterNSW, 2021) indicate 2 registered groundwater bores inside the boundary of the Subject Site (one in the eastern half near the dwelling and one on the western half of the site), with several off-site bores registered within 1km of the Subject Site boundary. As summary of groundwater bore locations and recorded data is attached as Appendix A.

The information recorded in the database for the two on-site and closest off-site bores indicate the depth of the bores ranging from 24m to 77m with a standing water level of between 25m and 40m reported for bores to the west of the Subject Site. Two groundwater bores located in proximity to the development are to the west and north-west of the Subject Site, at a distance of 123m and 150m respectively. According to the database entry the bores are used for domestic purposes.

The Mid-Western Regional Council Local Environmental Plan (MWRC LEP, 2011) show the Subject Site inside a zone of groundwater vulnerability (Figure 3.3).

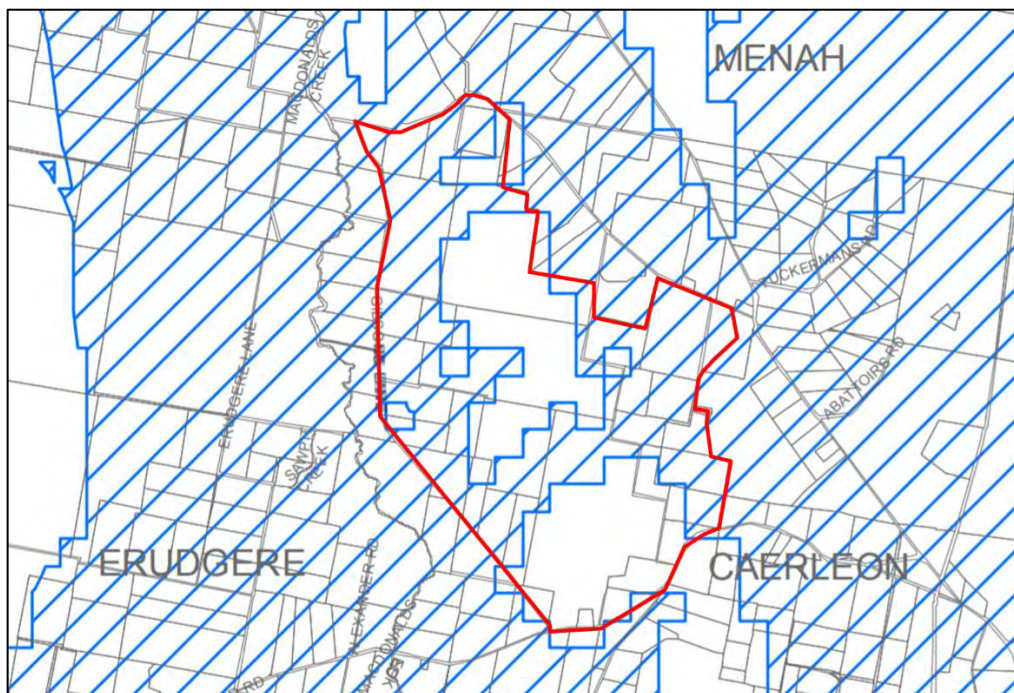


Figure 3.3: Mapped groundwater vulnerability around the Subject Site.

4.0 SITE HISTORY

4.1 Historical Land Use

Historical aerial images show that the Subject Site has been used for agricultural activities, mainly livestock grazing, for an extended period of time. Photos of the western portion of the Site show only the addition of a few dams and formalisation of vehicle paths occurring in this area over the period 1956 to 2009. After 2009, a sand quarry is established in the north-eastern corner of this western portion of the Site. In the eastern portion of the Subject Site the only development visible inside the boundaries of the Subject Site over the period 1956 to 2020 is around the homestead and associated farm buildings. A number of dams are also established over this time and different areas of the site is periodically being ploughed for cropping. Over the period 1956 to 2020 the land use surrounding the subject site slowly changed from vacant land utilised for grazing purposes, to more intensive agricultural activities such as viticulture, while residential dwellings and the subdivision of larger areas of agricultural land become more visible as time goes on.

Aerial photographs of the two portions of the subject Site are attached as Appendix B.

4.2 Historical Record of Site Contamination

Datasets maintained by the Office of Environment and Heritage (OEH) including notices under CLM Act, POEO Environment Protection License Register and environmental incidents were reviewed.

- **List of NSW contaminated sites notified to EPA** – The sites appearing on the OEH "List of NSW contaminated sites notified to the EPA" indicate that the notifiers consider that the sites are contaminated and warrant reporting to EPA. However, the contamination may or may not be significant enough to warrant regulation by the EPA. The EPA needs to review information before it can make a determination as to whether the site warrants regulation. A search of the listing returned no record for the Subject Site.
- **Contaminated Land Record of Notices** – A site will be on the Contaminated Land Record of Notices only if the EPA has issued a regulatory notice in relation to the site under the *Contaminated Land Management Act 1997*. A search of the register in April 2021 returned no record for the Subject Site and indicated no listings for any site within a radius of 1,000m.

There is further no record of the Subject Site or within a radius of 1,000m from these areas, in any of the following databases:

- Former Gasworks database
- EPA PFAS Investigation Program
- Defence PFAS Investigation & Management Program
- Airservices Australia National PFAS Management Program
- Defence 3 Year Regional Contamination Investigation Program

4.3 Previous Site Investigations

No information relating to any previous assessment of contamination at the Subject Site was available for review.

5.0 CONCEPTUAL SITE MODEL

5.1 General

The conceptual site model (CSM) is intended to provide an understanding of the potential for contamination and exposure to contaminants within the investigation areas. The CSM draws together the available historical information for the site, with site specific geological, hydrogeological and hydro-geochemical information to identify potential contaminants, contamination sources, migration and exposure pathways and sensitive receptors.

5.2 Sources

The identification of sources presented here is based on the review of available historical information and photographs, as well as an understanding of current conditions at the Subject Site. The following is a summary of the potentially contaminated areas and sources of contamination identified:

- Historical farming activities.

The shearing shed and other livestock management infrastructure present in both the eastern and western portions of the Subject Site are, and have historically been, used in the operation of the livestock farming activities. Potential sources of contamination associated with these activities include the buildings and associated animal pens and yards, as well as the disposal of animal wastes. Activities associated with the management of animal health, including sheep dip or spraying for the control of parasites could further result in localised contamination. Potential contaminants include pesticides, hydrocarbons, heavy metals, and elevated nutrients.

- Cropping and feed production.

Historical photographs of the Subject Site indicate periodic crop farming activities in the eastern half of the Site. Crop farming in low fertility soils likely required the use of chemicals such as fertilisers and pesticides in the maintenance of the crops. Potential contaminants associated with these chemicals include heavy metals, organochlorine and organophosphate pesticides. Intensive use of fertiliser can also lead to the build-up of heavy metals in surface soil particularly zinc and cadmium, depending on the type and source of the fertiliser.

- Vehicles and equipment.

Operation of farm often involves the use of motorised vehicles and equipment used for a variety of applications such as transport, earth moving or pumping water. The use, storage, maintenance and refuelling of the equipment and vehicles has the potential to contribute to localised contamination of surface soils.

- Use of unclassified fill or uncontrolled disposal of waste.

There is no evidence to suggest that significant quantities of fill material have ever been imported to the Site for levelling or construction purposes. The Subject Site is further fenced and it is unlikely that large quantities of domestic or demolition waste would have been disposed of at the Site. Foreign or potentially hazardous materials or wastes are therefore not considered a potential source.

5.3 Contaminants of Potential Concern

Considering the potential sources relevant to the Subject Site, a wide variety of contaminants may be present. With the historical agricultural activities considered the primary potential source of contamination, the residues of agricultural chemicals such as pesticides and fertilisers are accepted as the most likely contaminants. Of interest here are chlorinated organic compounds which historically have been widely used as insecticides, fungicides, herbicides and soil fumigants in agriculture and which are stable enough in the environment (persistent) to remain in soil for extended periods of time. Inorganic compounds that contain heavy metal including arsenic, copper, lead and mercury were also historically used as pesticides, particularly in the control of external parasites on sheep. The use of fertiliser, although not commonly considered a source of soil contamination, potentially could lead to a build-up of heavy metals such as cadmium in soils in areas where it has been extensively applied.

The potential presence of fuels and lubricants are further potentially relevant to the on-site storage, maintenance or movement of vehicles and equipment in the operation of the farm.

Based on this understanding of the site history and activities, the contaminants of potential concern identified for the investigation of the Subject Site include:

- pesticides (organochlorines, organophosphates);
- hydrocarbons (mainly fuel and lubricants); and
- heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn)

5.4 Pathways

The primary pathways by which receptors could be exposed to the contaminants outlined above include:

- Inhalation of dust or vapours.
- Dermal contact with contaminated soils.
- Incidental ingestion of contaminated soils.
- Surface runoff, sediment transport and discharge to surface waters.
- Vertical and horizontal migration of contamination through the soils into the underlying groundwater.

Of the listed potential pathways, the contamination of water resources through infiltration is considered the most unlikely. Although the Subject Site is indicated as a groundwater vulnerable zone, the depth to groundwater at the site is reported as >10m in the east of the Site and >20m in the west. This depth to groundwater and the slope of the site would limit vertical migration of any contaminants which may be entering the surface soil from above.

5.5 Receptors

Potential receptors may include:

Human receptor populations

- Future residents of the subdivided lots.
- Visitors to the site (e.g. workers conducting maintenance, contractors, members of the public);
- Workers involved in the construction of residential dwellings for future residents of the Subject Site; and
- Workers conducting agricultural activities on the subdivided lots of the Subject Site.

Environmental Receptors

- Local drainage channels and receiving surface water bodies; and
- Groundwater resources beneath the site (negligible likelihood of contamination expected).

5.6 Potential for Contamination

The Development Area is not listed in any of the contaminated land databases. Based on the results of the desktop assessment, the overall likelihood for *significant* chemical contamination to be present within the site is low.

Although former land use and activities at the site is reasoned to have a potential for contaminating surface soils, the type and quantity of contaminants introduced through this land use is not expected to have led to significant contamination.

6.0 SITE INSPECTION

6.1 General

The objective of the investigation is to determine whether there are any environmental risks associated with the Subject Site that could affect the proposed future development and would require further investigation or action to render the site suitable for its intended use.

The desktop evaluation of the site history and current use of the site did not identify any significant risks in this regard but did identify both historical and current land use activities that could contribute to contamination of the surface soils of the Subject Site.

Barnson conducted an inspection of the Subject Site on 27 April 2021. The purpose of the site inspection was to verify the findings of the desktop assessment, as well as to collect confirmatory samples of soil from areas of the Subject Site where development is proposed or contamination is suspected.

Based on the findings of the CSM the inspection and sampling were focussed on the surface soils (50-300mm). The site inspection included all areas of the Subject Site.

During the site inspection the following observations were made:

- The Subject Site is fenced and access to the site is controlled. There are several informal vehicle paths traversing the site and there are access gates and paths from all street frontages.
- At the time Barnson conducted the site inspection, most of the Subject Site was covered with pasture grass (see Figure 6.1). Both the eastern and western portions of the Site was attended by vehicle and all visible open ground and prominent features were inspected. No visible discoloration or staining of open ground or soil, and no obvious discoloration or irregularities in the occurrence of vegetation was observed during the site inspection.



Figure 6.1: Vegetation cover of Subject Site surface with informal vehicle track providing access.

- On lot 81 DP756897, there is a disused earthen dam in which old fencing and posts have been disposed (see Figure 6.2). The disposed materials were visually inspected and no waste other than the timber poles and metal fencing wire was observed.



Figure 6.2: Fencing waste.

- The Subject Site is divided into different paddocks with steel wire fencing and gates allowing access to the different areas. The Subject Site is actively grazed at present with both sheep and cattle observed.



Figure 6.3: Sheep and cattle actively grazing the Subject Site.

- Material excavated on the site has been placed in a water diversion bund along the foot of round hill (Figure 6.4), in the western half of the subject Site. The diversion bund is to the north of the hill.



Figure 6.4: Bund along the foot of round hill.

- There is a cattle yard, race and pens located on Lot 20 DP 756897 near the boundary with Gibson's lane (see Figure 6.5 and Figure 6.6).



Figure 6.5: Cattle pens.



Figure 6.6: Tables used during spraying and treatment of cattle.

- The Mid-Western Regional Council excavates fill material for use off-site from a small quarry site located on Lot 83 DP756897 (see Figure 6.7). The area is fenced off from the rest of the Subject site and has its own access gate from Lower Piambong Road.



Figure 6.7: Mid-Western Regional Council quarry.

- Lot 1 DP510323 as well as Lots 20 and 21 DP756897 are used for cultivating hay and grain crops for animal feed. Lot 1 DP510323 was ploughed just prior to the site inspection (see Figure 2.6).
- The farming infrastructure in the eastern half of the Subject Site (on Lot 34 DP756897) include a hay shed, small feed silos (see Figure 6.8), pens and a shearing shed (see Figure 6.9). These buildings are located approximately 150m west of the residential dwelling.



Figure 6.8: Hay shed and feed silos.



Figure 6.9: Sheep yards and shearing shed.

- The farm buildings and homestead are not included in the proposed re-zoning and subdivision (refer Figure 2.9).
- There is a backfilled sheep dip located just outside the yards at the shearing shed (see Figure 6.10). The dip consists of a concrete lined trench with ramps in and out of the trench with a small dish shaped concrete pad on the exit side to collect water dripping from the dipped sheep and channelling it back into the trench.
- No general waste or any demolition waste was observed in any other part of the Subject Site during the site inspection.



Figure 6.10: Backfilled sheep dip.

6.2 Confirmatory Sampling

The purpose of collecting confirmatory samples as part of the site inspection is to determine if any of the potential contaminants identified from the CSM are present. The samples are not intended for statistically valid characterisation or quantification of contamination levels. The collection of surface soil samples at the site was therefore focussed on areas where contamination of the surface soil could most likely have occurred.

Samples of soil were collected from the paddocks and areas used for crop cultivation as well as the livestock management infrastructure and farm buildings. The fencing disposal area in the south-west of the Subject Site was also specifically investigated with a separate surface soil samples collected. Individual samples collected over large areas were combined into composite samples for analysis. Figure 6.11 presents a map of the Subject Site with the locations of the surface soil samples indicated. Table 6.1 is a summary description of the collected samples as well as indicating which samples were combined for analysis.

Table 6.1 – Summary of sample details.

Reference in Figure 6.11	Description	Composite sample number submitted for analysis
1	Surface soil (50-300mm) sample collected from down slope of the fencing waste disposal area.	Sample submitted as DT-01 for analysis.
2a-2k	Surface soil (50-300mm) samples collected from open paddock areas.	Composite sample prepared of sample 2a to 2k, submitted as composite sample DT-02 for analysis.
3 (multiple)	Three surface soil (50-300mm) samples collected from western cropping area.	Composite sample prepared of sample 3a to 3c, submitted as composite sample DT-03 for analysis.
4	Surface soil (50-300mm) sample collected from cattle yard on western boundary of Subject Site.	Sample submitted as DT-04 for analysis.
5	Three surface soil (50-300mm) samples collected from eastern cropping area.	Composite sample prepared of sample 5a to 5c, submitted as composite sample TD-05 for analysis.
6	Surface soil (50-300mm) samples collected from area around sheep dip at shearing shed.	Composite sample prepared of sample 6a to 6d, submitted as composite sample DT-06 for analysis.
7	Three surface soil (50-300mm) samples collected from areas around shearing shed and hay shed.	Composite sample prepared of sample 7a to 7e, submitted as composite sample DT-07 for analysis.

The pattern followed for the soil sampling can be described as Judgement Sampling, where points are selected on the basis of the investigator’s knowledge of the proposed land use and likely distribution of contaminants at a site. It is an efficient sampling method for confirmatory sampling

that utilises knowledge of the site history and field observations to direct sample collection (NSW EPA, 1995).

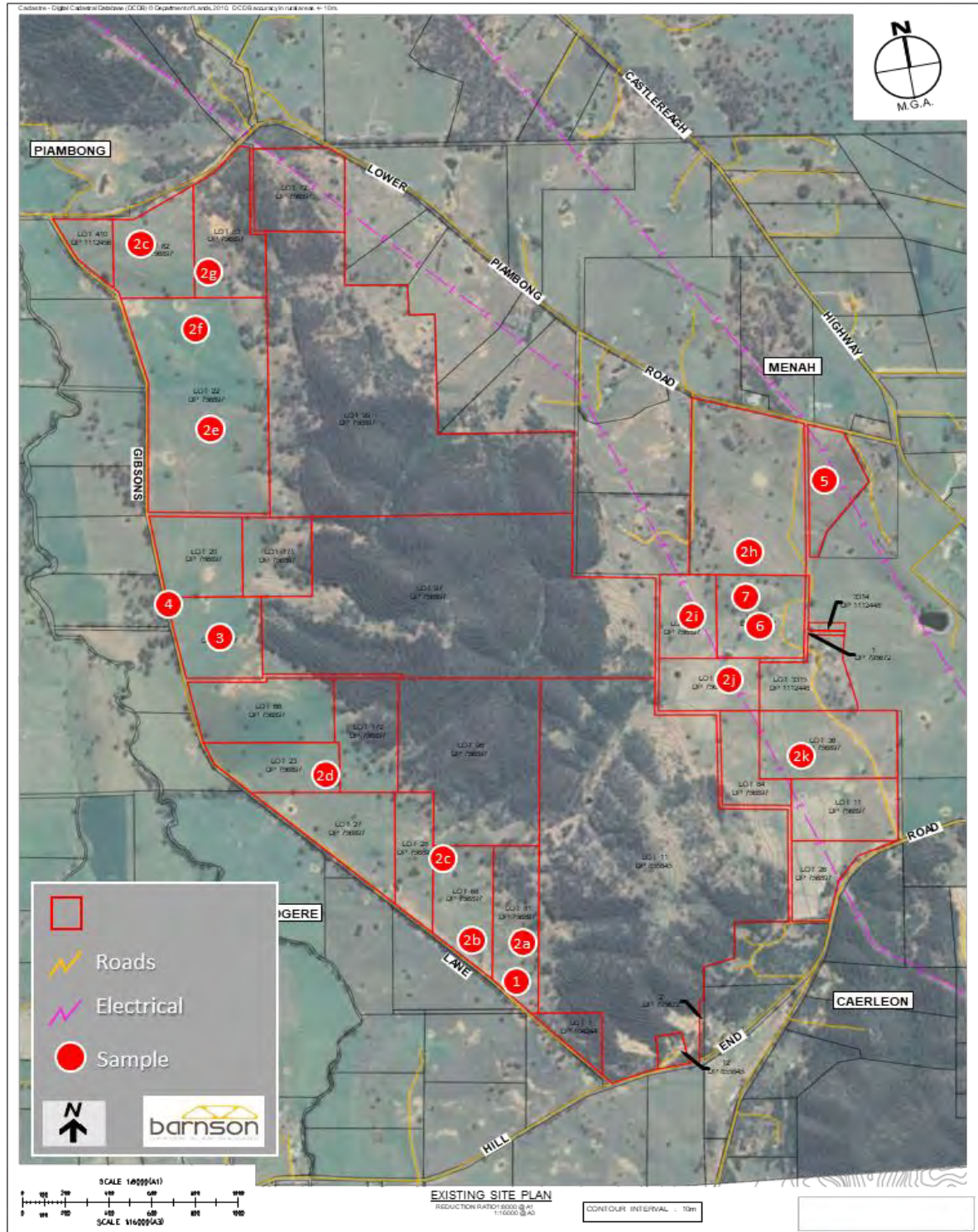


Figure 6.11: Locations of confirmatory surface soil samples.

The individual sample increments collected were combined in a 5 litre bucket, as presented in Table 6.1, and transferred to the Barnson office in Mudgee for sub-sampling and laboratory submission. The volume of soil in each bucket was reduced by following a 'cone-and-quarter' technique. The increments in each bucket were thoroughly mixed by heaping into a cone and turning the cone over to form a new cone until the operation has been carried out three times. The heap is flattened and quartered along two diameters which intersect at a right angle in the centre of the cone (see Figure 6.12).



Figure 6.12: Cone and quartering.

One pair of diagonally opposite quarters are removed and the remainder is scooped into a cone and the procedure repeated until a mass of sample sufficient to fill two 250ml glass jars is produced (see Figure 6.13).

The glass jars were filled, marked as indicated in Table 6.1, placed in a thermally isolated container with ice bricks and transferred to the analytical laboratory. All samples were submitted to the Australian Laboratory Services Pty Ltd (ALS), laboratory in Mudgee, for determination of the following parameters:

- metallic element (cadmium, chromium, copper, lead, nickel and zinc) concentrations, including arsenic and mercury in soil;
- extraction with organic solvent and analysis of Total Recoverable Hydrocarbons (TRH) fractions C6 to C40, benzene, toluene, ethylbenzene and total xylene (BTEX), Polycyclic Aromatic Hydrocarbons (PAHs), polychlorinated biphenyls (PCBs);
- extraction with organic solvent and analysis of Organochlorine (OCP) and Organophosphorus (OPP) Pesticides; and asbestos



Figure 6.13: Sample volume reduction.

Although there is no reason to believe that asbestos contamination may be present in the surface soils of the Subject Site, the composite surface soil sample collected around the farming infrastructure (7) were analysed for the presence of asbestos fibres. The ALS laboratory is NATA accredited for all the analysis indicated above.

6.3 Analytical Results

The ALS laboratory report for the samples is attached as Appendix C. The laboratory report indicates that only metallic elements, were detected in the surface soil samples. In all of the surface soil samples, the concentrations of hydrocarbons (polycyclic aromatic compounds), alkane fractions (straight chain hydrocarbons) as well as persistent pesticide and herbicide compounds are indicated as below the limits of detection.

The metals detected include arsenic (As) chromium (Cr), copper (Cu), lead (Pb), nickel (Ni, and zinc (Zn). Concentrations of, cadmium and mercury were all below detection. The laboratory report further indicate that no asbestos fibres were detected in the sample submitted for analysis. Table 6.2 presents a summary of the analytical results for the elements detected.

Table 6.2 – Summary of metal and metalloid concentrations detected in surface soil samples from the Subject Site.

Element	DT-01	DT -02	DT -03	DT -04	DT -05	DT -06
	mg.kg ⁻¹					
Arsenic (As)	<5	<5	<5	<5	<5	172
Cadmium (Cd)	<1	<1	<1	<1	<1	<1
Chromium (Cr)	15	10	9	9	8	8
Copper (Cu)	<5	<5	8	12	<5	5
Lead (Pb)	16	7	14	36	7	17
Mercury (Hg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel (Ni)	4	7	7	8	2	5
Zinc (Zn)	59	18	26	163	16	40

6.4 Analytical Data Quality

Samples were collected in new, clean containers using cleaned equipment and were placed in glass jars provided by the laboratory that were refrigerated after filling and transported in an insulated container to the laboratory. Chain of custody was recorded for all samples. A copy of the signed sheet is attached as Appendix C.

The analyses were undertaken at a NATA accredited laboratory. The laboratory quality control procedures in the form of duplicates as well as analyte and surrogate spikes were applied to all contaminant classes analysed. The results reported for the duplicate is within the Relative Percent Difference range of the acceptance criteria for a duplicate sample. The analyte spike recoveries reported for the different sets of organic analytes are indicated as within the acceptance criteria (see Appendix C).

All media appropriate to the objectives of this investigation have been adequately analysed and no area of significant uncertainty exist. It is concluded the data is usable for the purposes of the contaminated site investigation.

7.0 ASSESSMENT

7.1 Assessment Criteria - Human Health and Environmental Risk

Screening for human health and ecological risk, utilises published human health investigation levels (HILs) and ecological screening and investigation levels (ESLs & EILs) from the National Environment Protection (Assessment of Site Contamination) Measure (NEPC, 1999) to identify contaminant concentrations in soil that may pose a risk to future residents, people visiting the site, or to ecological receptors.

HILs are scientifically based, generic assessment criteria designed to be used in the screening of potential risks to human health from chronic exposure to contaminants. HIL's are conservatively derived and are designed to be protective of human health under the majority of circumstances,

soil types and human susceptibilities and thus represent a reasonable ‘worst-case’ scenario for specific land-use settings. The HILs selected for evaluation of the Subject Site are those derived for a standard residential scenario (HIL-A) and assumes a residential land use with garden/accessible soil (home grown produce <10% fruit and vegetable intake, and no poultry).

The residential land use category is appropriately conservative and is suitable for the assessment of land intended for education and training purposes.

Although the primary concern in most site assessments is protection of human health, the assessment should also include consideration of ecological risks and protection of groundwater resources that may result from site contamination. EILs provide screening criteria to assess the effect of contaminants on a soil ecosystem and afford species level protection for organisms that frequent or inhabit soil and protect essential soil processes.

Ecological investigation levels (EILs) have been derived for common metallic contaminants in soil. The values selected for the evaluation of the heavy metals detected in the soil samples from the Subject Site considers the physicochemical properties of soil and contaminants and the capacity of the soil to accommodate increases in contaminant levels above natural background while maintaining ecosystem protection for identified land uses.

Table 7.1 presents a summary of the health-risk based criteria and ecological investigation levels selected for assessment of the detected metal concentrations.

Table 7.1: Human health and ecological risk screening levels for metals.

Element	Health-based Investigation Levels	Ecological Investigation Levels (EIL)
	HIL A Residential mg.kg ⁻¹	Residential mg.kg ⁻¹
Arsenic (As)	100	100
Cadmium (Cd)	20	-
Chromium (Cr) (Total)	NR	230
Copper (Cu)	6,000	230
Lead (Pb)	300	1,100
Mercury (Hg)	40	-
Nickel (Ni)	400	270
Zinc (Zn)	7,400	300

Note: NR=not relevant due to low human toxicity of Cr(III). NA=No applicable screening level. EILs selected for urban residential and public open space land use scenario.

It was confirmed that limits of detection reported by the laboratory are below the criteria values. All other contaminants analysed for in the soil samples that are reported below the limit of detection by the laboratory can therefore be excluded from further assessment.

7.2 Findings

Direct comparison of the analytical results presented in Table 6.2 with the assessment criteria (refer Table 7.1) show that metallic element concentrations for all elements in all but one of the samples are well below health-risk based screening values.

The general low concentrations of heavy metals detected in the surface soil samples at the Subject Site suggest naturally occurring element abundance and are most likely not related to contamination. The composite soil sample collected at the sheep dip show elevated levels of arsenic. The elevated arsenic concentrations detected are localised to the areas immediately surrounding the sheep dip. As this sample includes no other contaminants at elevated levels, the arsenic is reasoned to be related to the historical dip activities.

The arsenic concentration detected in Sample DT-06 exceed the health risk criteria for residential and public open space land use as well as ecological investigation levels. No other contaminants evaluated were detected at concentrations exceeding screening criteria.

The confirmatory soil samples thus support the assertion that significant and widespread chemical contamination is unlikely to be present within the Subject Site.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

In accordance with the objectives stated in Section 1.2, and based on the information contained within this assessment, the following conclusions are presented (subject to the limitations noted in Section 1.5):

- Activities associated with the historical and current use of the Subject Site were identified as having a potential to contaminate surface soil at the site.
- The following potential sources of contamination were identified:
 - Historical and current livestock farming and grazing activities;
 - Historical and current feed-crop cultivation; and
 - Use, maintenance and storage of motorised vehicles and equipment.
- A review of the available historical information, including contaminated sites databases and aerial photographs, indicated a low potential for significant environmental contamination to be present across the Subject Site.
- A site investigation and confirmatory sampling revealed evidence of localised contamination at an historical sheep dip associated with the sheep management infrastructure located on Lot 34 DP756897, with concentrations of arsenic exceeding health and ecological risk-based criteria.
- The concentrations of all other contaminants investigated were below screening criteria in all surface soil samples collected. No persistent pesticides or herbicides were detected in any of the samples collected from cropping areas or the sheep and cattle management areas (yards and races). No asbestos fibres were detected in any of the samples.
- The screening criteria used in the evaluation of the contaminant concentrations were appropriately conservative and suitable for assessment of the proposed residential land use categories.

- Based on the findings of the site investigation it is concluded that the heavy metal contamination identified on Lot 34 DP756897 does not represent any potential risk to the proposed future land use as the contaminated area and all the associated buildings fall outside the scope of the proposed re-zoning and subdivision. The elevated concentrations of arsenic detected is further localised to the sheep dip area and was not observed in any of the samples collected near any of the other buildings (i.e. shearing or hay shed and pens). The contaminated soil is therefore accepted to have a very low probability of dispersion to other areas of the site and present no significant risk to human health and the environment.
- No contaminants were detected above health risk or ecological risk screening criteria on any of the areas of the Subject Site identified for re-zoning and subdivision. Based on the findings of the desktop review and site investigation, the Subject Site is considered suitable for the proposed re-development and use.

8.2 Recommendations

- Based on the findings of the desktop review and site investigation it can be stated with a reasonable level of confidence that the Subject Site is suitable for the proposed re-development and land use.
- It is recommended that the contamination identified at the farming infrastructure on Lot 34/DP756897 be investigated further, only in the event of this land being sold or having to be disturbed for further developed. At that time, the level and extent of the heavy metal contamination must be determined and a plan developed for remedial action.

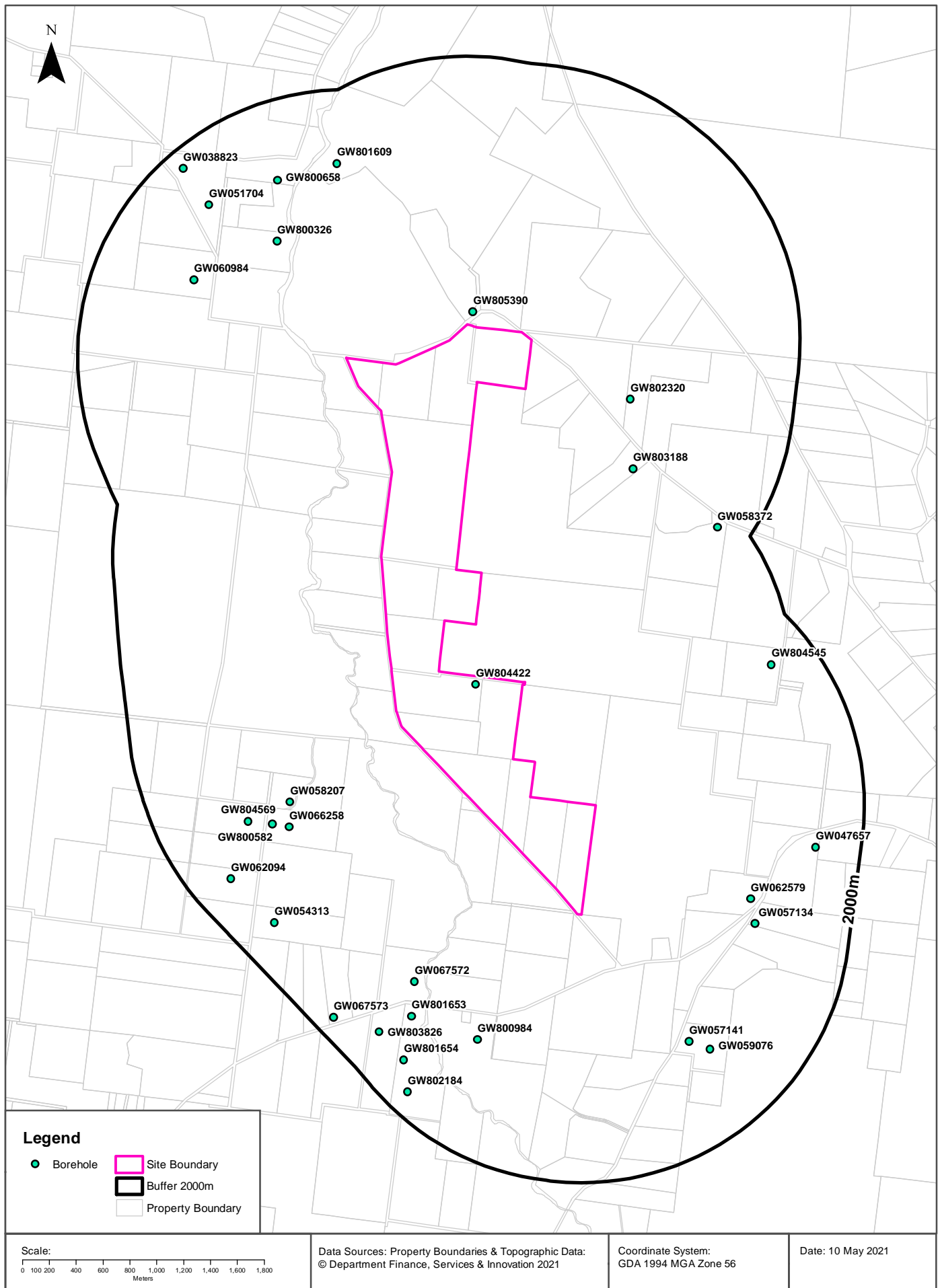
9.0 REFERENCES

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Appendix A - Groundwater Bore Maps and Data

Groundwater Boreholes

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 1)



Hydrogeology & Groundwater

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 1)

Groundwater Boreholes

Boreholes within the dataset buffer:

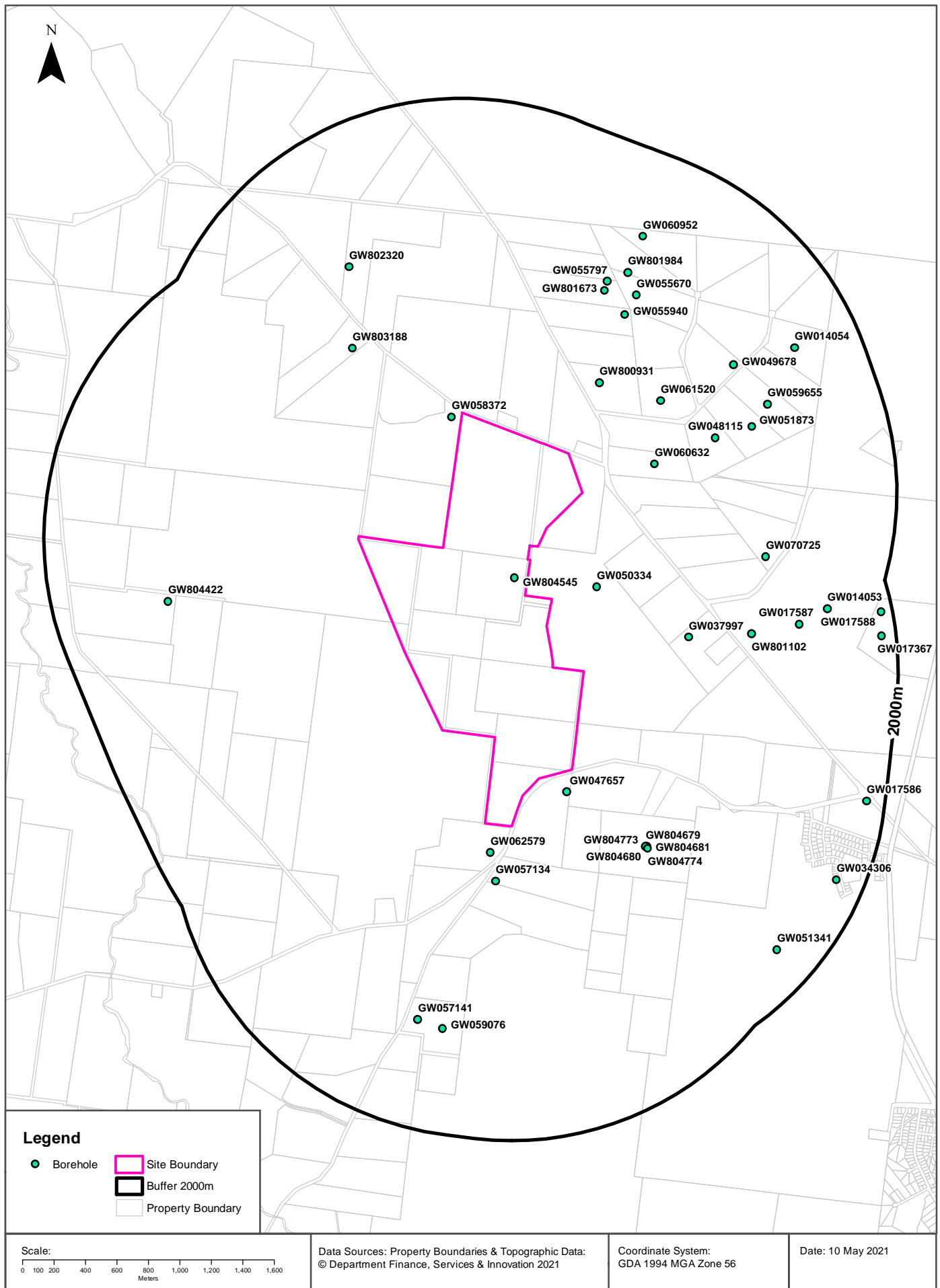
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GW804422	80BL140220	Bore	Private	Domestic, Stock	Test Bore		24/11/1989	31.39	31.39					0m	On-site
GW805390	80WA723129	Bore	Private	Domestic, Stock	Domestic, Stock		12/03/2014	66.00	66.00		46.00	0.300		102m	North
GW802320	80BL238451, 80CA715329	Bore	Private	Domestic, Farming, Irrigation, Stock	Domestic, Farming, Irrigation, Stock		24/11/1989	46.63	46.63	Fresh	25.30	1.154		785m	North East
GW803188	80BL242455	Bore	Private	Domestic, Stock	Domestic, Stock		06/09/2004	90.00	90.00		40.00	0.630		1000m	North East
GW058207	80BL127013, 80WA711283	Bore	Private	Domestic, Stock	Domestic, Stock		01/10/1983	32.00	32.00	Good				1001m	South West
GW800326	80BL237270, 80WA712357	Bore	Private	Domestic, Stock	Domestic, Stock		05/05/1997	22.00	22.00	Good				1007m	North West
GW066258	80BL138094, 80CA715131	Well		Irrigation	Irrigation		01/01/1930	7.40				1.000	500.00	1124m	South West
GW800984	80BL238274, 80CA715353	Bore	Private	Irrigation, Stock	Irrigation, Stock			30.00			25.00			1197m	South
GW800582	80BL237532, 80CA715131	Bore	Private	Irrigation	Irrigation		01/12/1996	10.00	10.00					1206m	South West
GW062579	80BL134327, 80WA711494	Bore	Private	Domestic	Domestic		01/10/1986	39.60	39.60	Fair				1236m	South East
GW057141	80BL124762, 80WA711190	Bore	Private	Stock	Stock		01/07/1982	0.00	23.00					1241m	South East
GW067572	80BL138525, 80WA711640	Bore	Private	Domestic, Stock	Domestic, Stock		24/11/1988	27.40	27.40	Fresh	4.25	3.000		1242m	South
GW060984	80BL132558, 80WA711418	Bore	Private	Domestic, Stock	Domestic, Stock		01/12/1982	45.70	45.70					1272m	North West
GW057134	80BL124752, 80WA711187	Bore open thru rock	Private	Domestic	Domestic		01/04/1983	30.70	30.70	Fresh				1292m	South East
GW804569	80BL238628	Bore	Private	Irrigation	Irrigation		08/11/2011	10.00	10.00			5.000		1343m	South West
GW059076	80BL126995, 80BL139934, 80WA711714	Bore open thru rock	Private	Domestic, Irrigation, Stock	Irrigation		01/07/1982	61.00	61.00	Good				1389m	South East
GW800658	80BL238049, 80WA712484	Bore	Private	Domestic, Stock	Domestic, Stock		06/11/1998	27.00	27.00	2816				1415m	North West

GW No.	Licence No	Work Type	Owner Type	Authorised Purpose	Intended Purpose	Name	Complete Date	Final Depth (m)	Drilled Depth (m)	Salinity (mg/L)	SWL (m bgl)	Yield (L/s)	Elev (AHD)	Dist	Dir
GW801653	80BL236473, 80BL238311	Bore	Private	Domestic, Farming, Irrigation, Stock	Domestic, Farming, Irrigation, Stock		28/04/1995	76.20	76.20					1436m	South
GW801609	80BL239536, 80WA712835	Bore	Private	Domestic, Stock	Domestic, Stock		23/11/2001	18.00	18.00					1447m	North
GW051704	80BL113231, 80WA710708	Bore open thru rock	Private	Stock	Stock		01/02/1981	41.40	41.40	Brackish				1529m	North West
GW047657	80BL114505, 80BL133569, 80WA711460	Bore	Private	Domestic, Irrigation, Stock	Irrigation		01/10/1980	24.40	24.40					1666m	South East
GW804545	80BL140221	Bore	Private	Domestic, Stock	Domestic, Stock		19/10/1989	27.74	27.74	fresh		1.000		1676m	East
GW803826	80BL245239	Bore	Private	Domestic, Stock	Domestic, Stock		21/03/2009	54.00	54.00		31.00	1.000		1689m	South
GW801654	80BL238311, 80CA715333	Bore	Private	Domestic, Farming, Irrigation, Stock	Domestic, Farming, Irrigation, Stock		28/04/1995	54.86	54.86		12.19	5.170		1689m	South
GW054313	80BL115163	Bore	Private	Domestic, Stock	Domestic, Stock		01/07/1980	61.00	61.00					1693m	South West
GW062094		Well	Private		Irrigation		01/07/1986	7.00	7.00					1702m	South West
GW058372	80BL127928, 80WA711293	Bore	Private	Domestic, Stock	Domestic, Stock		01/05/1983	31.10	31.10	Stock				1767m	East
GW802184	80BL238077, 80WA712493	Bore	Private	Domestic, Stock	Domestic, Stock		18/05/1998	48.77	48.77			1.260		1832m	South
GW038823	80BL028901, 80WA709979	Bore open thru rock	Private	Domestic, Stock	Domestic, Stock		01/05/1974	30.40	30.50	1001-3000 ppm				1859m	North West
GW067573	80BL138526, 80BL241747, 80CA715704	Bore open thru rock	Private	Irrigation, Test Bore	Test Bore		24/11/1988	32.00	32.00	Fresh	12.20	4.000		1862m	South

Borehole Data Source : NSW Department of Primary Industries - Office of Water / Water Administration Ministerial Corporation for all bores prefixed with GW. All other bores © Commonwealth of Australia (Bureau of Meteorology) 2015. Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Groundwater Boreholes

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 2)



Hydrogeology & Groundwater

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 2)

Groundwater Boreholes

Boreholes within the dataset buffer:

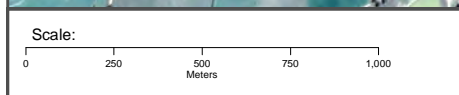
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GW804 545	80BL140 221	Bore	Private	Domestic, Stock	Domestic, Stock		19/10/1989	27.74	27.74	fresh		1.000		0m	On-site
GW058 372	80BL127 928, 80WA71 1293	Bore	Private	Domestic, Stock	Domestic, Stock		01/05/1983	31.10	31.10	Stock				62m	North
GW047 657	80BL114 505, 80BL133 569, 80WA71 1460	Bore	Private	Domestic, Irrigation, Stock	Irrigation		01/10/1980	24.40	24.40					127m	South East
GW062 579	80BL134 327, 80WA71 1494	Bore	Private	Domestic	Domestic		01/10/1986	39.60	39.60	Fair				181m	South
GW050 334	80BL112 134, 80WA71 0606	Well	Private	Stock	Not Known			10.00						297m	East
GW057 134	80BL124 752, 80WA71 1187	Bore open thru rock	Private	Domestic	Domestic		01/04/1983	30.70	30.70	Fresh				359m	South
GW800 931	80BL152 921, 80WA71 2007	Bore	Private	Domestic, Farming, Stock	Domestic, Farming, Stock		01/09/1993	53.34	53.34			1.010		489m	North East
GW060 632	80BL131 943, 80WA71 1373	Bore open thru rock	Private	Domestic, Stock	Domestic, Stock		01/12/1985	45.70	45.70	Fresh				493m	North East
GW061 520	80BL134 044, 80WA71 1484	Bore open thru rock	Private	Domestic, Stock	Domestic, Stock		01/02/1986	77.50	77.50	Fresh				673m	North East
GW804 679	80BL242 383	Bore	Local Govt	Monitoring Bore	Monitoring Bore		23/09/2004	28.50	28.50		13.0 0	0.400		676m	South East
GW804 773	80BL620 223	Bore	Local Govt	Monitoring Bore	Monitoring Bore		15/12/2011	28.00	28.00					676m	South East
GW804 680	80BL242 384	Bore	Local Govt	Monitoring Bore	Monitoring Bore		23/09/2004	17.00	17.00		13.0 0	0.200		680m	South East
GW804 681	80BL242 385	Bore	Local Govt	Monitoring Bore	Monitoring Bore		24/09/2004	50.00	50.00					686m	South East
GW804 774	80BL620 224	Bore	Local Govt	Monitoring Bore	Monitoring Bore		15/12/2011	36.00	36.00					696m	South East
GW037 997	80BL101 197, 80BL133 774, 80WA71 1465	Bore open thru rock	Private	Farming, Irrigation, Stock	Irrigation		01/11/1974	64.00	64.00	Good				704m	East
GW803 188	80BL242 455	Bore	Private	Domestic, Stock	Domestic, Stock		06/09/2004	90.00	90.00		40.0 0	0.630		807m	North West
GW048 115	80BL106 435, 80WA71 0267	Bore	Private	Domestic, Stock	Domestic, Stock		01/11/1977	34.00	34.00	Good				913m	North East
GW055 940	80BL121 299, 80WA71 1037	Bore	Private	Domestic, Stock	Domestic, Stock		01/07/1982	31.10	31.10	Fresh				952m	North East

GW No.	Licence No	Work Type	Owner Type	Authorised Purpose	Intended Purpose	Name	Complete Date	Final Depth (m)	Drilled Depth (m)	Salinity (mg/L)	SWL (m bgl)	Yield (L/s)	Elev (AHD)	Dist	Dir
GW801 673	80BL241 156, 80CA71 5524	Bore	Private	Domestic, Irrigation, Stock	Domestic, Irrigation, Stock		31/12/1990	21.34			4.88	1.009		1050m	North
GW801 102	80BL238 735, 80WA71 2645	Well	Private	Stock	Stock		01/01/1930	10.00	10.00		3.00			1094m	East
GW055 670	80BL120 889, 80WA71 1019	Bore	Private	Domestic, Stock	Domestic, Stock		01/09/1981	23.50	23.70	Fresh				1096m	North East
GW055 797	80BL121 332, 80WA71 1040	Bore	Private	Domestic, Stock	Domestic, Stock			23.70	23.70	Fresh				1110m	North
GW051 873	80BL110 127, 80WA71 0491	Bore open thru rock	Private	Domestic	Domestic		01/12/1979	30.80	30.80	Soft				1156m	North East
GW802 320	80BL238 451, 80CA71 5329	Bore	Private	Domestic, Farming, Irrigation, Stock	Domestic, Farming, Irrigation, Stock		24/11/1989	46.63	46.63	Fresh	25.30	1.154		1172m	North
GW049 678	80BL110 185, 80WA71 0499	Bore open thru rock	Private	Domestic	Domestic		01/06/1979	53.40	53.40	Soft				1190m	North East
GW801 984	80BL241 554, 80WA71 3227	Bore	Private	Domestic, Stock	Domestic, Stock		17/04/1998	53.34	53.34		18.29	0.630		1209m	North
GW070 725	80BL152 364, 80WA71 1995	Bore	Local Govt	Farming, Stock	Farming, Stock		18/05/1993	91.40	91.40	Good	45.70	0.600		1237m	East
GW804 422	80BL140 220	Bore	Private	Domestic, Stock	Test Bore		24/11/1989	31.39	31.39					1271m	West
GW059 655	80BL116 482	Bore	Private	Domestic	Domestic		01/01/1982	50.00	50.00					1297m	North East
GW057 141	80BL124 762, 80WA71 1190	Bore	Private	Stock	Stock		01/07/1982	0.00	23.00					1321m	South
GW059 076	80BL126 995, 80BL139 934, 80WA71 1714	Bore open thru rock	Private	Domestic, Irrigation, Stock	Irrigation		01/07/1982	61.00	61.00	Good				1334m	South
GW017 587	80BL009 629, 80WA70 9116	Bore	Private	Stock	Stock			9.10						1405m	East
GW060 952	80BL132 452, 80WA71 1410	Bore	Private	Domestic, Stock	Domestic, Stock			73.00	73.00					1457m	North
GW014 054	80BL009 628, 80WA70 9115	Bore	Private	Stock	Stock			21.30						1585m	North East
GW014 053	80BL009 630, 80WA70 9117	Well	Private	Stock	Stock			12.10						1603m	East
GW051 341	80BL113 174, 80WA71 0699	Bore open thru rock	Private	Domestic, Stock	Domestic, Stock		01/09/1980	31.30	31.30	Fresh				1736m	South East
GW034 306	80BL027 259, 80WA70 9917	Bore open thru rock	Private	Stock	Stock			39.60	39.60	Brackish				1822m	South East

Appendix B - Historical Aerial Photographs

Aerial Imagery 2020

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 1)



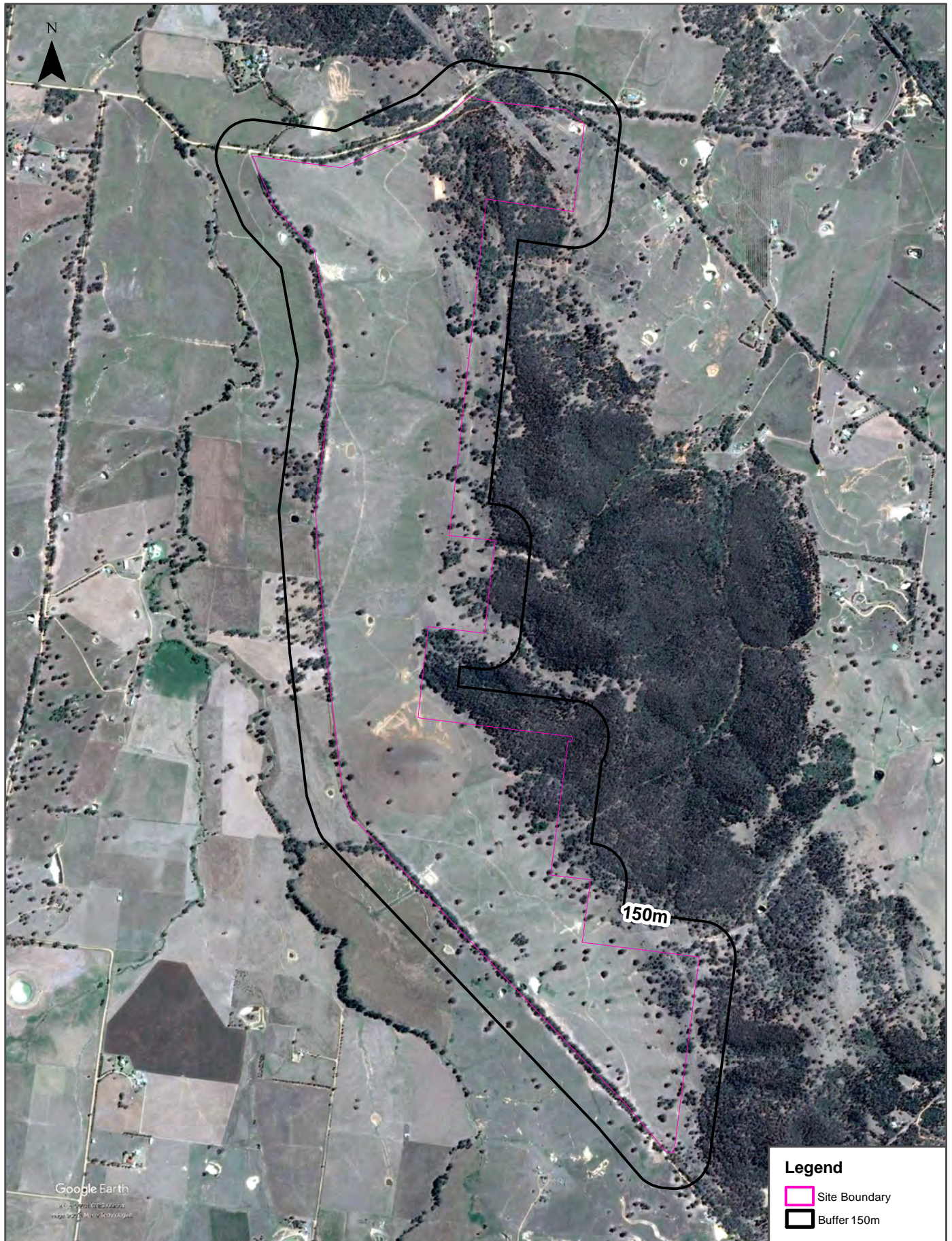
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Coordinate System: GDA 1994 MGA Zone 56

Date: 06 May 2021

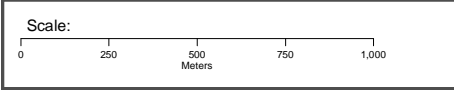
Aerial Imagery 2015

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 1)



Legend

- Site Boundary
- Buffer 150m



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Coordinate System:
GDA 1994 MGA Zone 56

Date: 06 May 2021

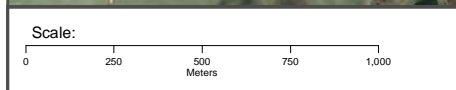
Aerial Imagery 2009

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 1)



Aerial Imagery 2002

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 1)



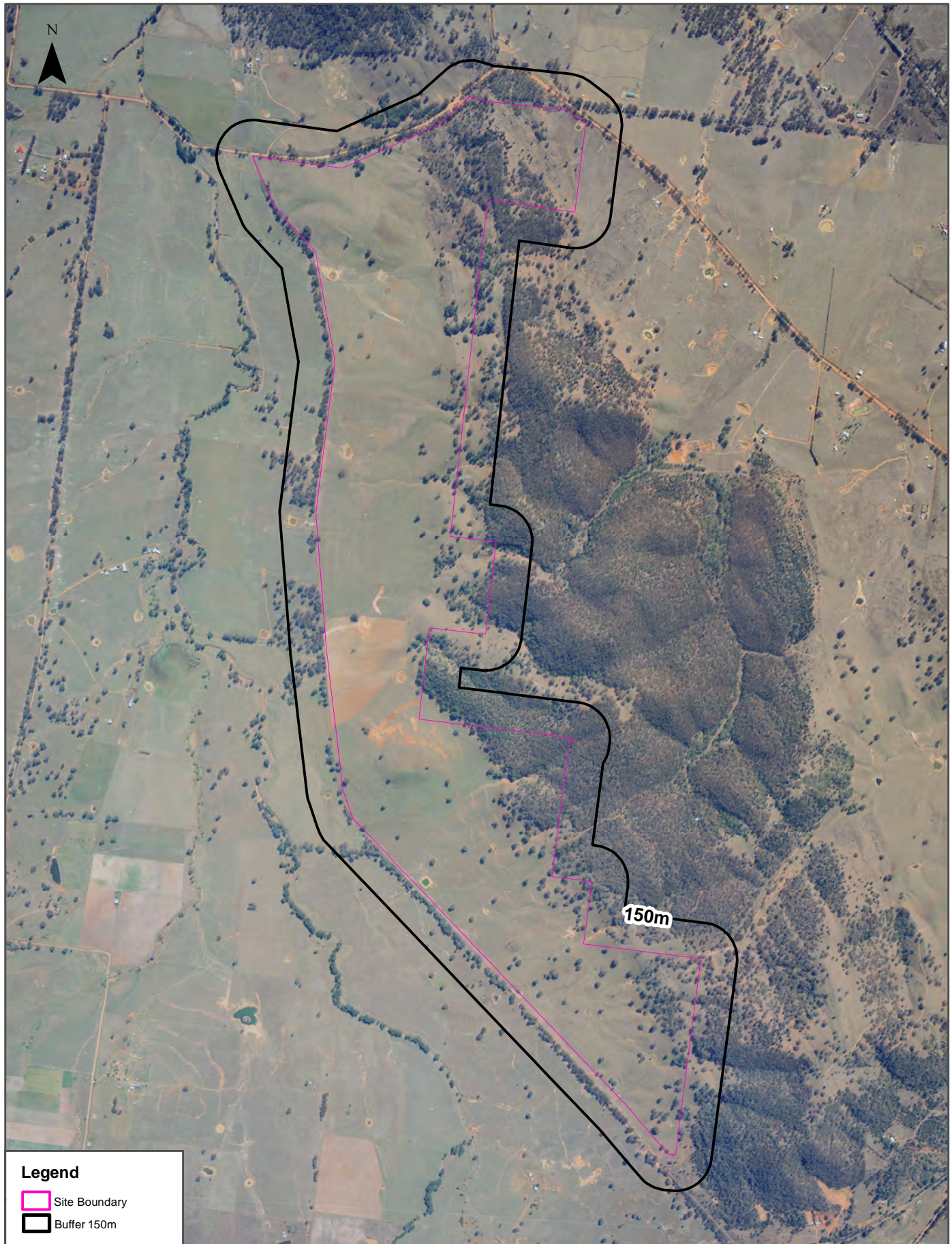
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Coordinate System:
GDA 1994 MGA Zone 56



Date: 06 May 2021

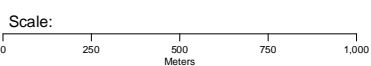
Aerial Imagery 1994

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 1)



Legend

-  Site Boundary
-  Buffer 150m



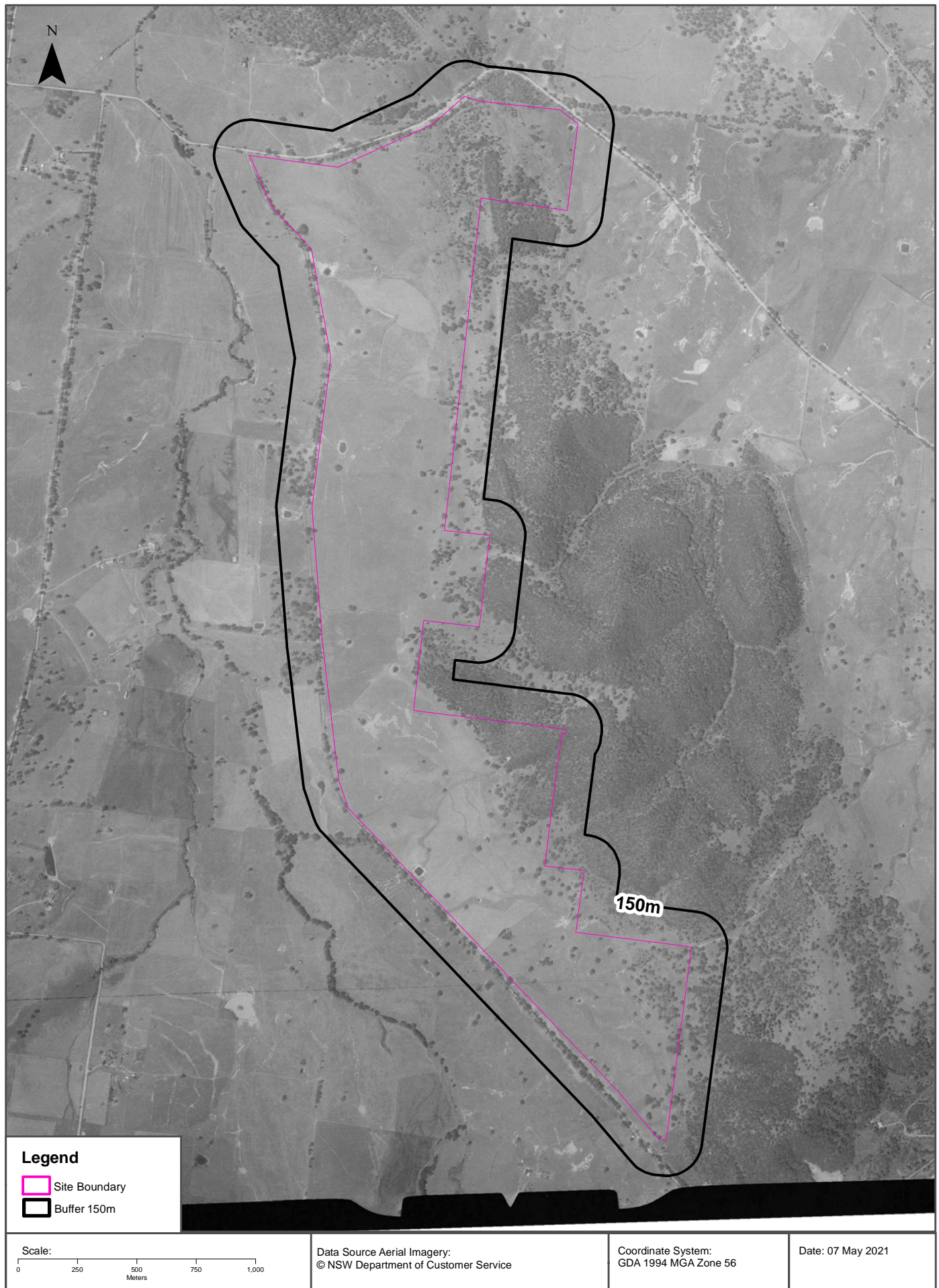
Data Source Aerial Imagery:
© NSW Department of Customer Service

Coordinate System:
GDA 1994 MGA Zone 56

Date: 07 May 2021

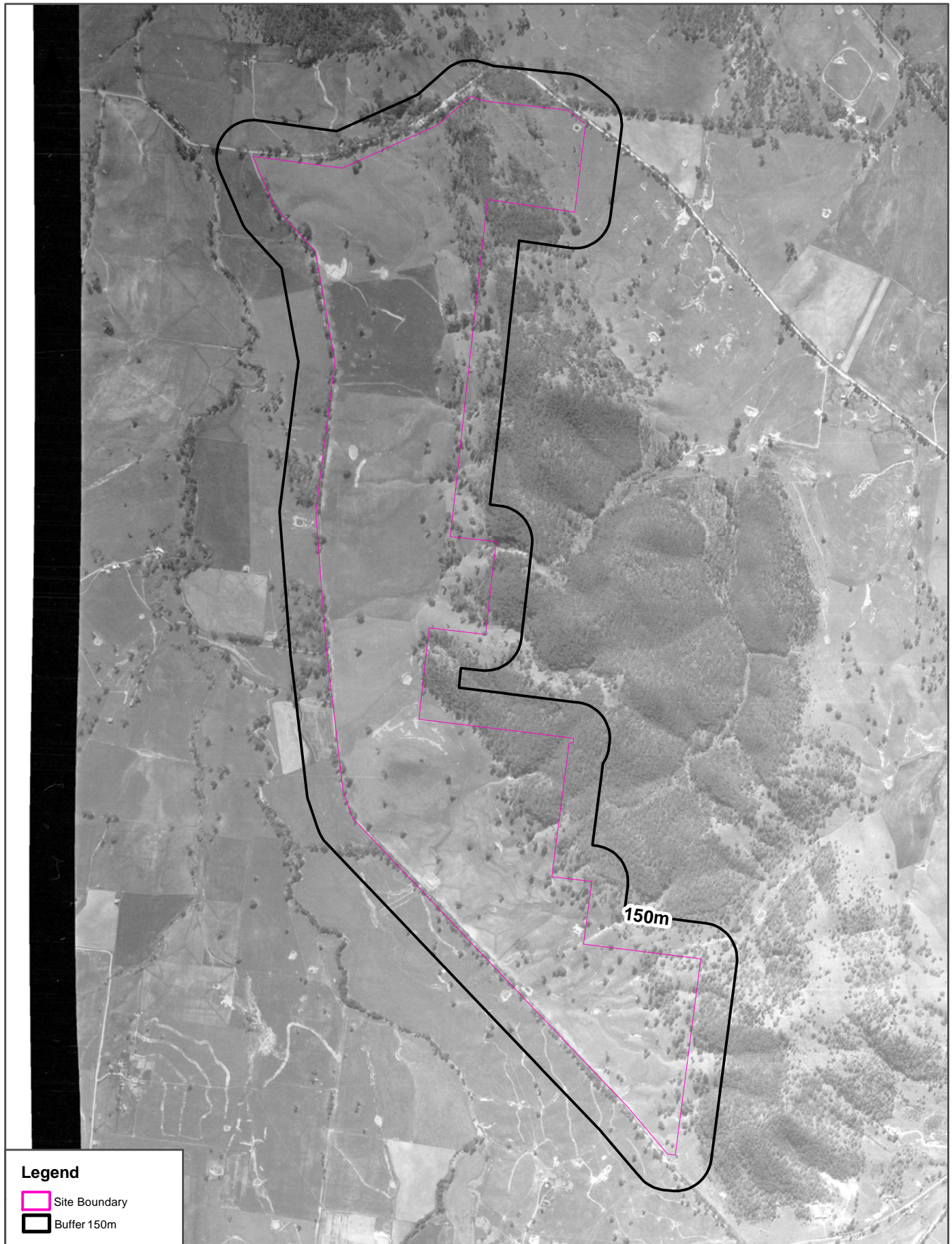
Aerial Imagery 1988

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 1)





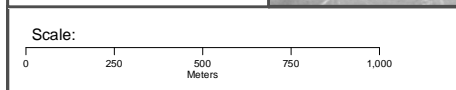
Aerial Imagery 1980

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 1)



Legend

-  Site Boundary
-  Buffer 150m



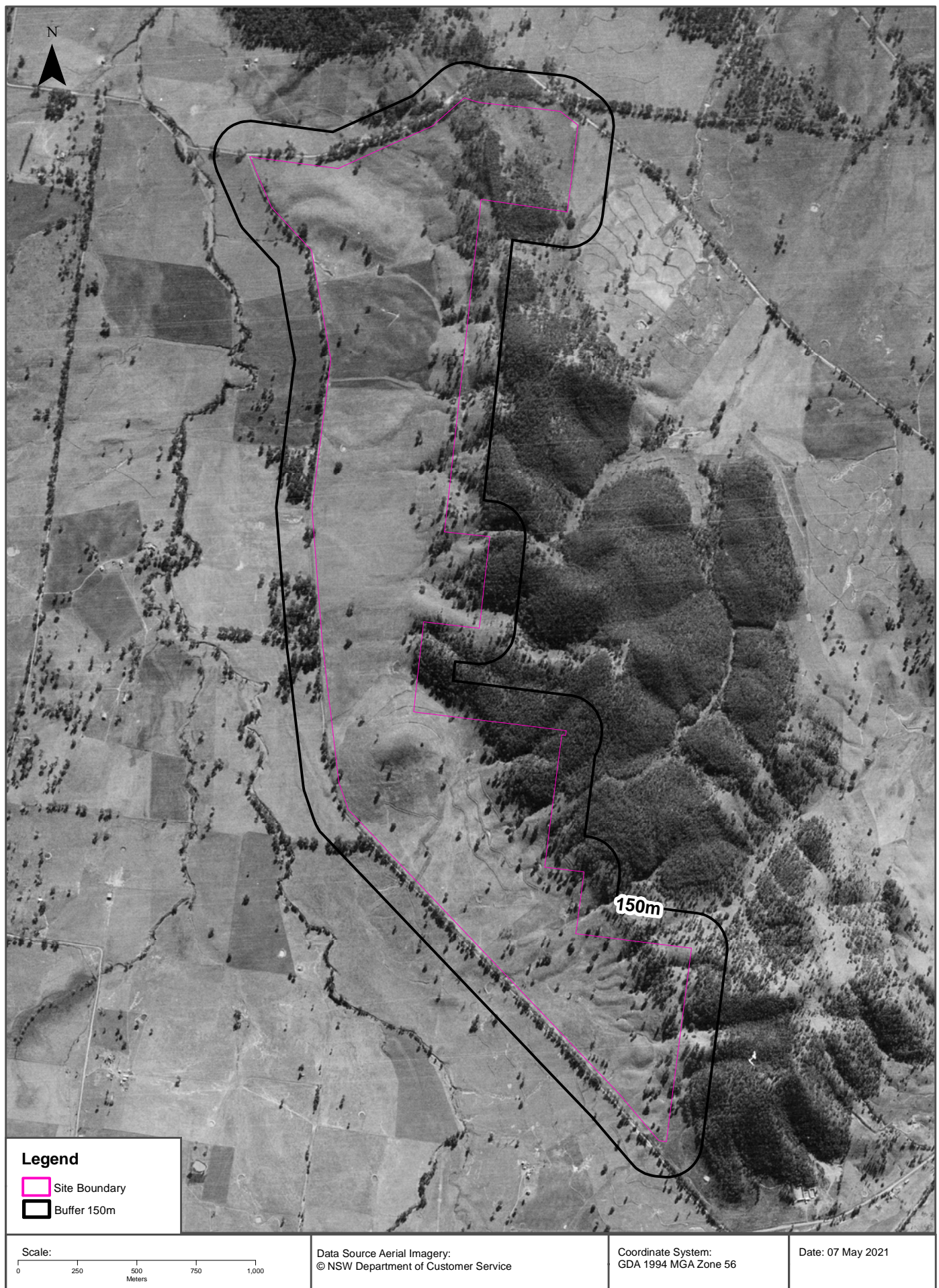
Data Source Aerial Imagery:
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Coordinate System:
GDA 1994 MGA Zone 56

Date: 06 May 2021

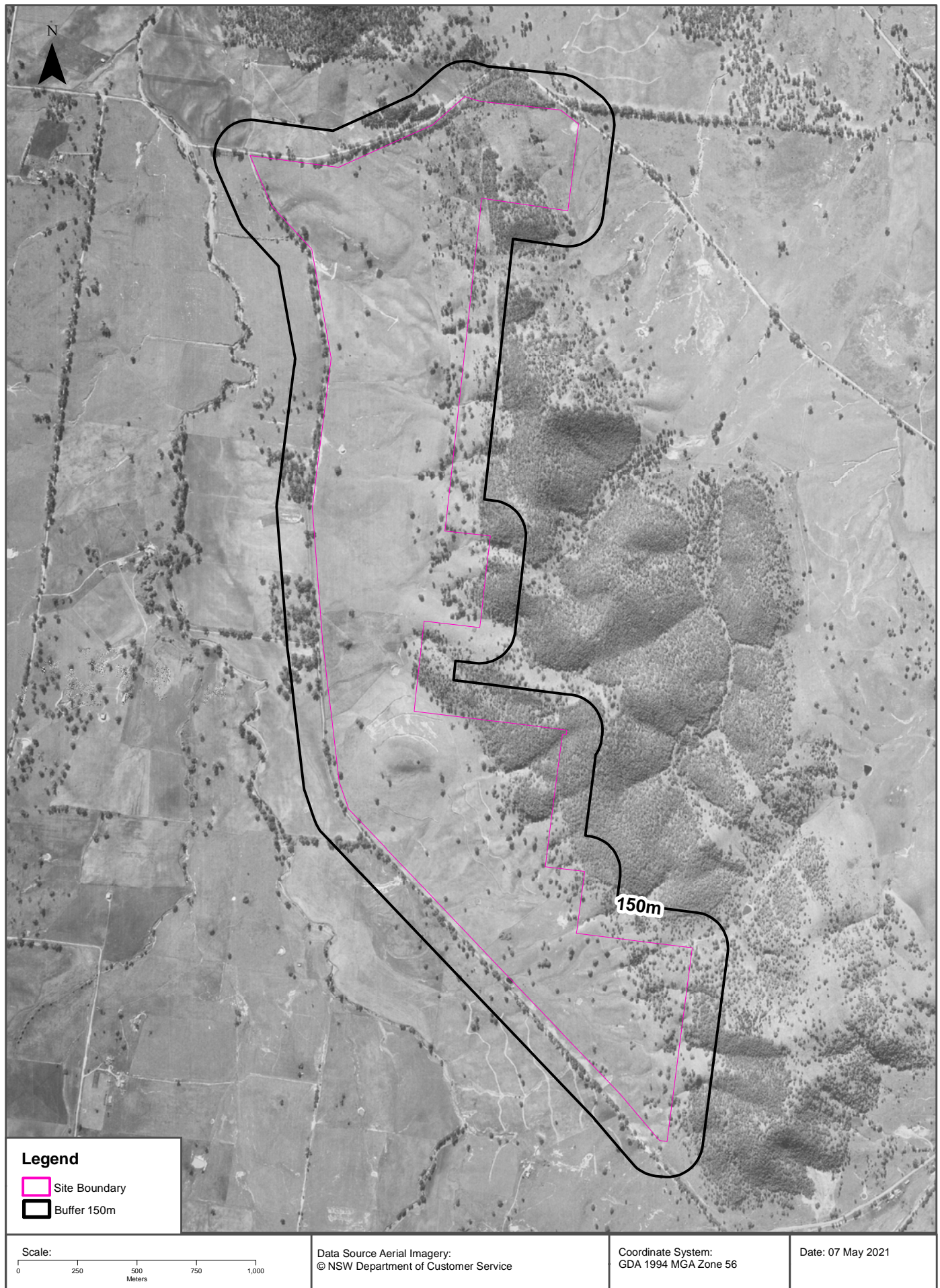
Aerial Imagery 1971

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 1)



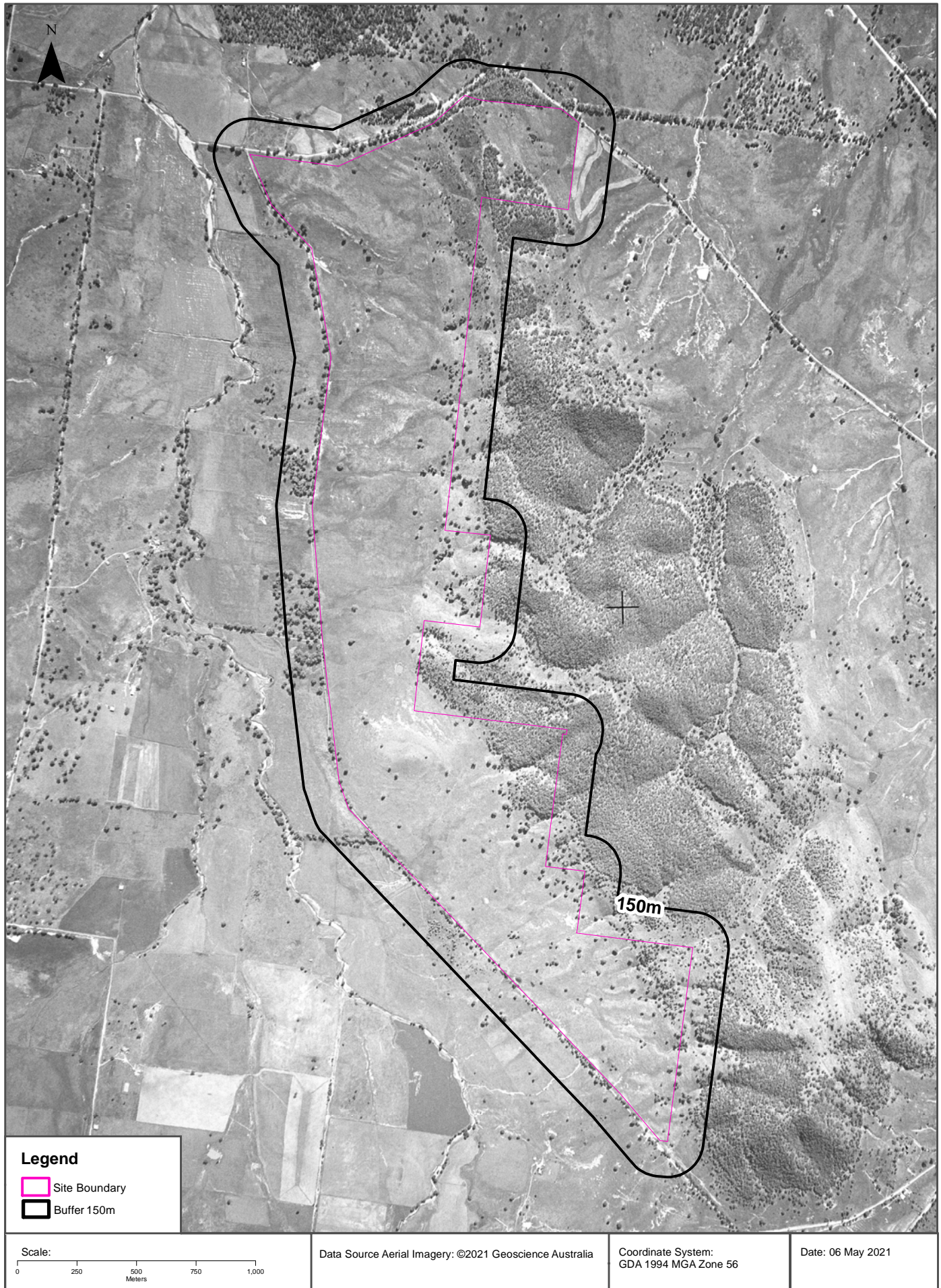
Aerial Imagery 1964

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 1)



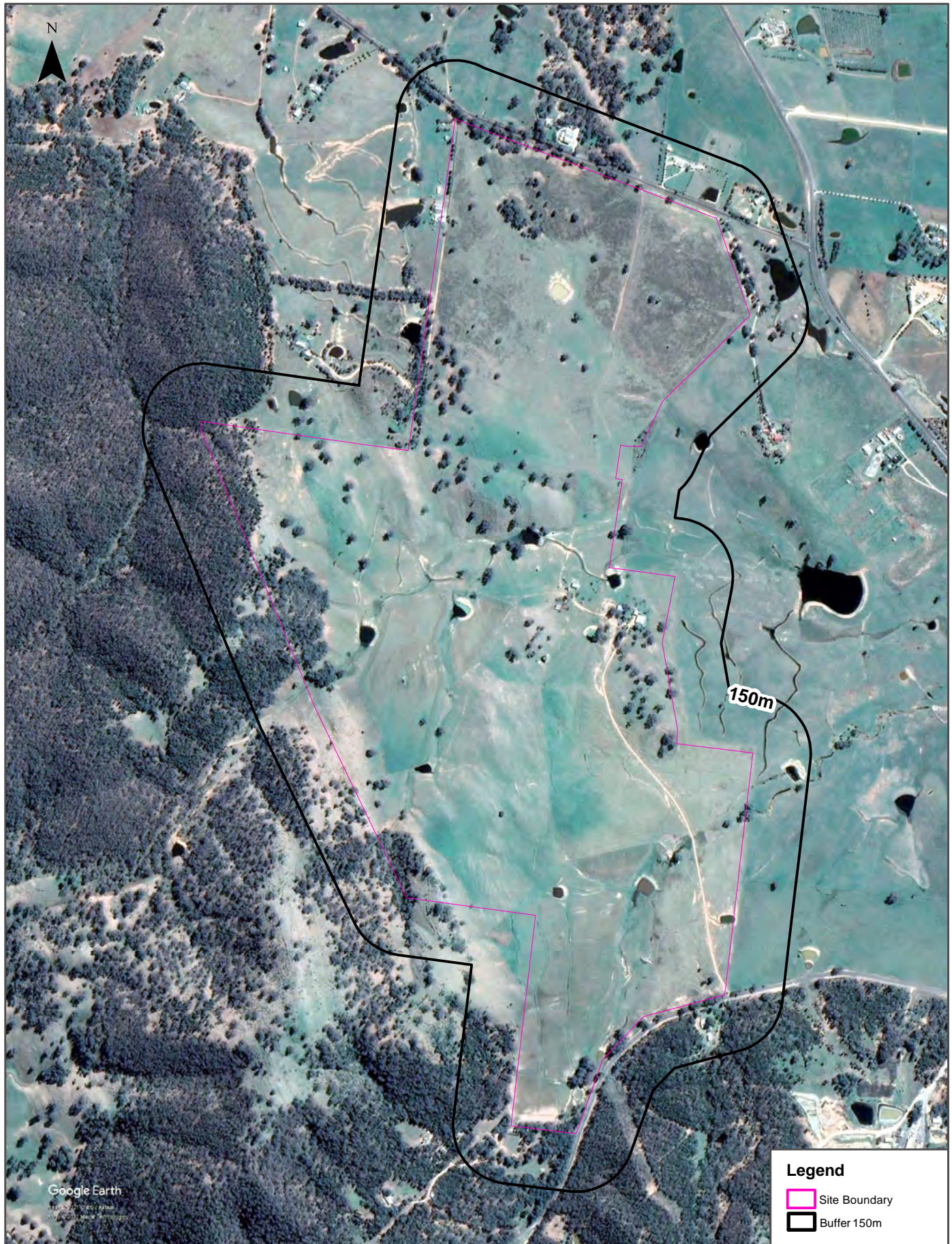
Aerial Imagery 1956

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 1)





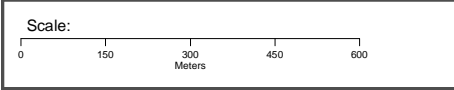
Aerial Imagery 2020

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 2)



Legend

-  Site Boundary
-  Buffer 150m



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Date: 06 May 2021

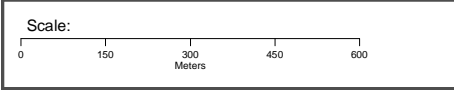
Aerial Imagery 2015

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 2)



Legend

-  Site Boundary
-  Buffer 150m



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Coordinate System:
GDA 1994 MGA Zone 56

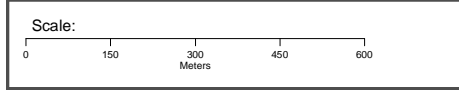
Date: 06 May 2021

Aerial Imagery 2009

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 2)



Legend	
	Site Boundary
	Buffer 150m



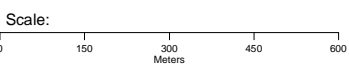
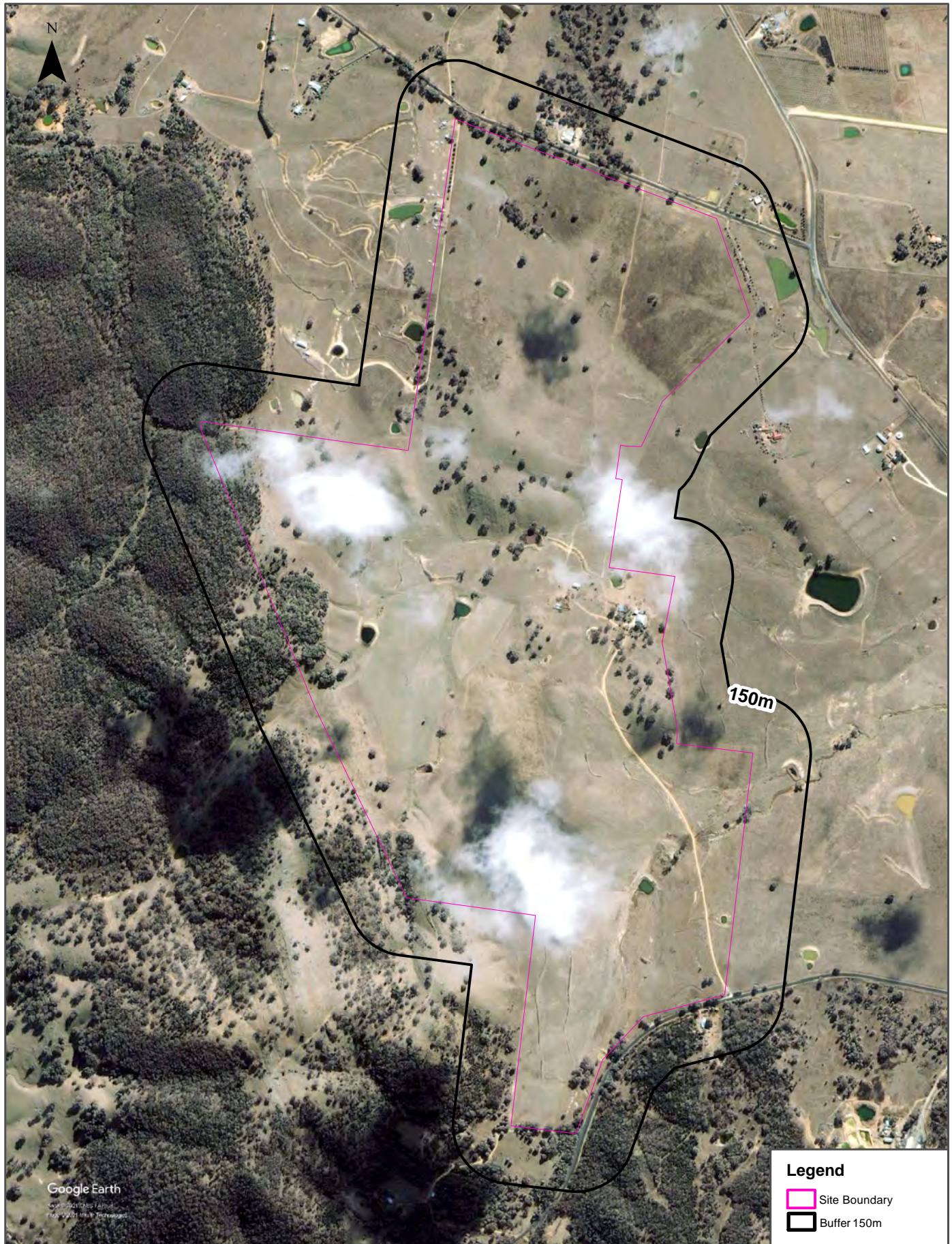
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Coordinate System:
GDA 1994 MGA Zone 56

Date: 06 May 2021

Aerial Imagery 2002

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 2)



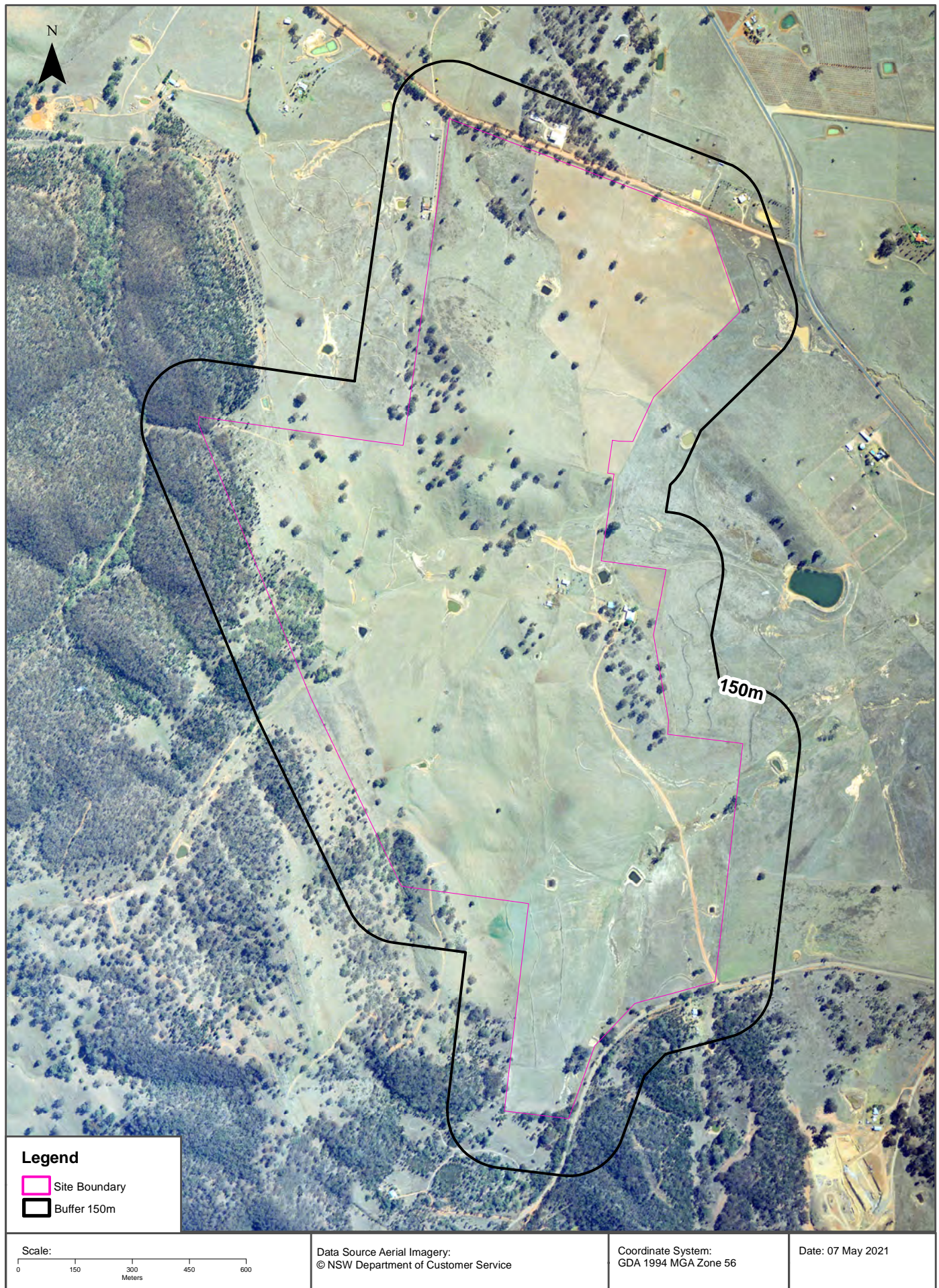
Data Source Aerial Imagery: © 2021 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.

Coordinate System: GDA 1994 MGA Zone 56

Date: 06 May 2021

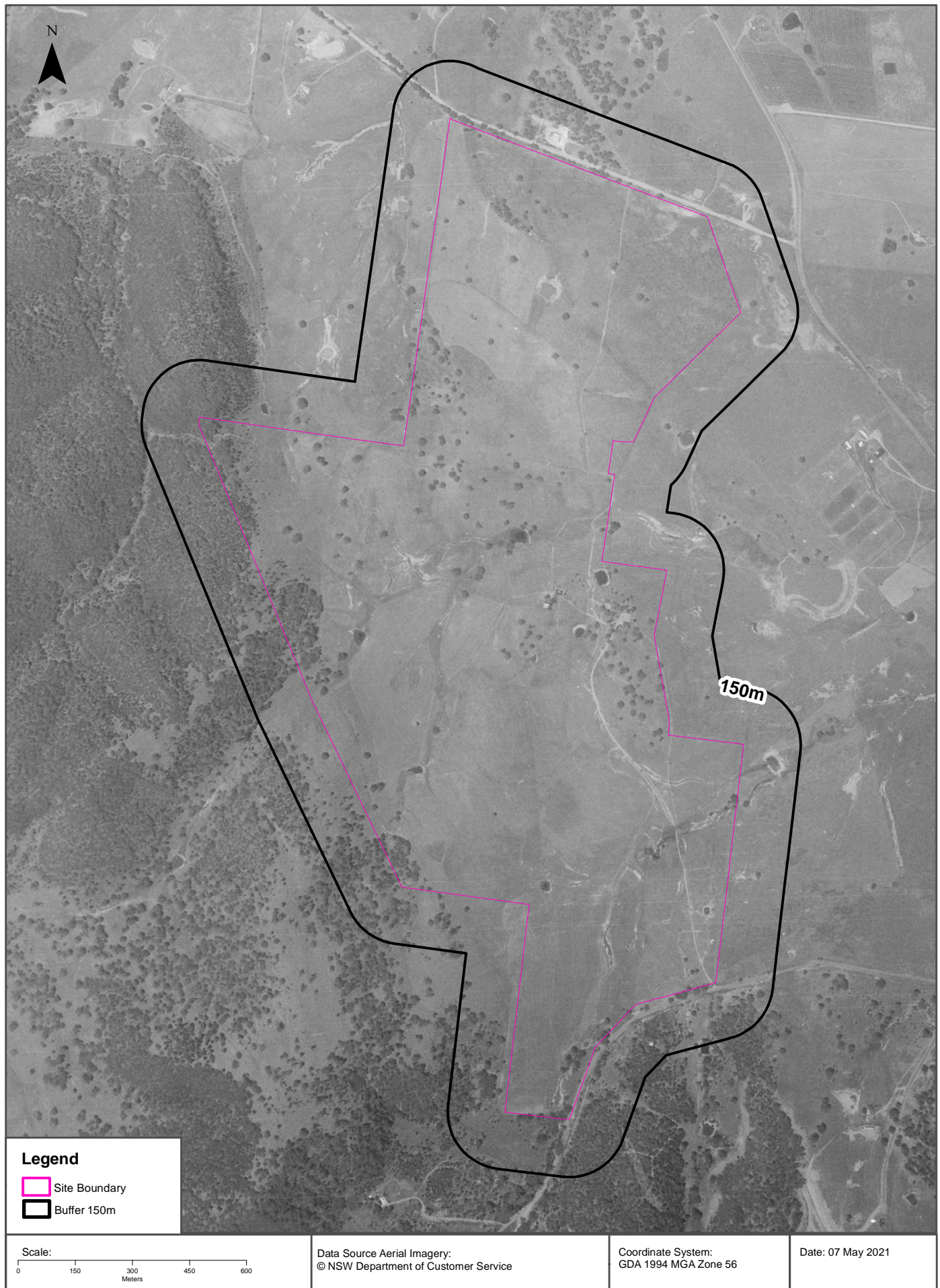
Aerial Imagery 1994

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 2)



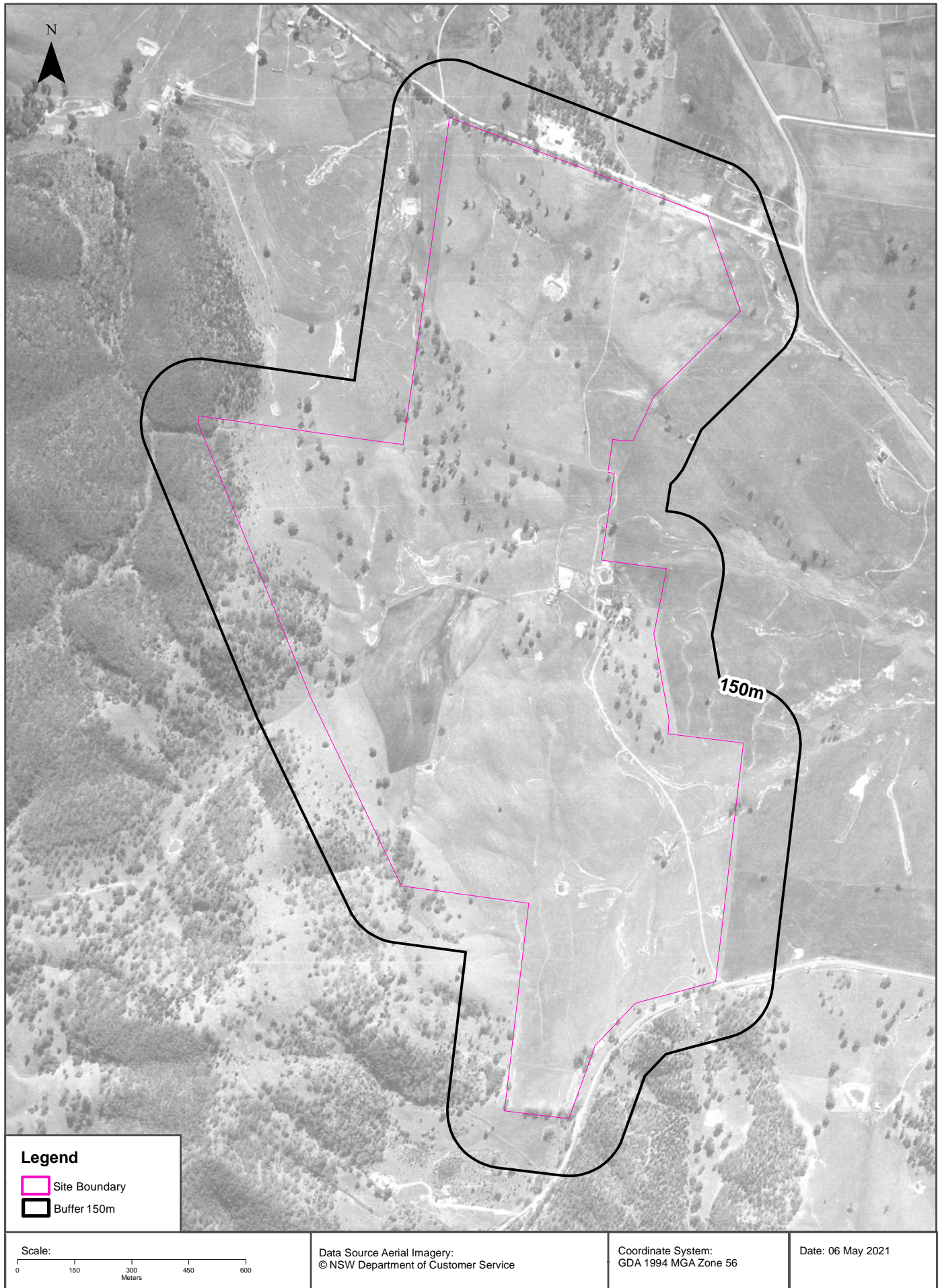
Aerial Imagery 1988

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 2)



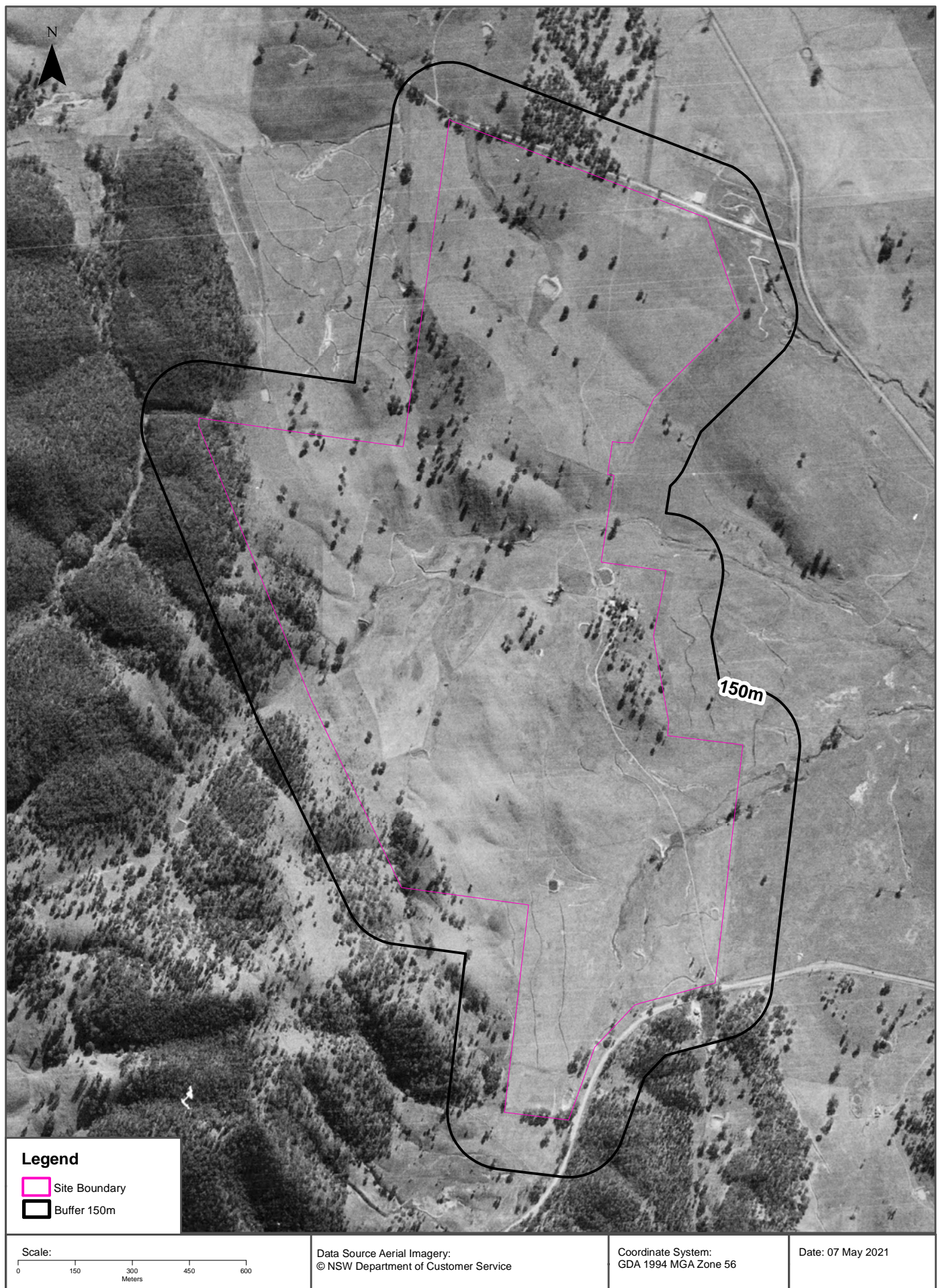
Aerial Imagery 1980

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 2)



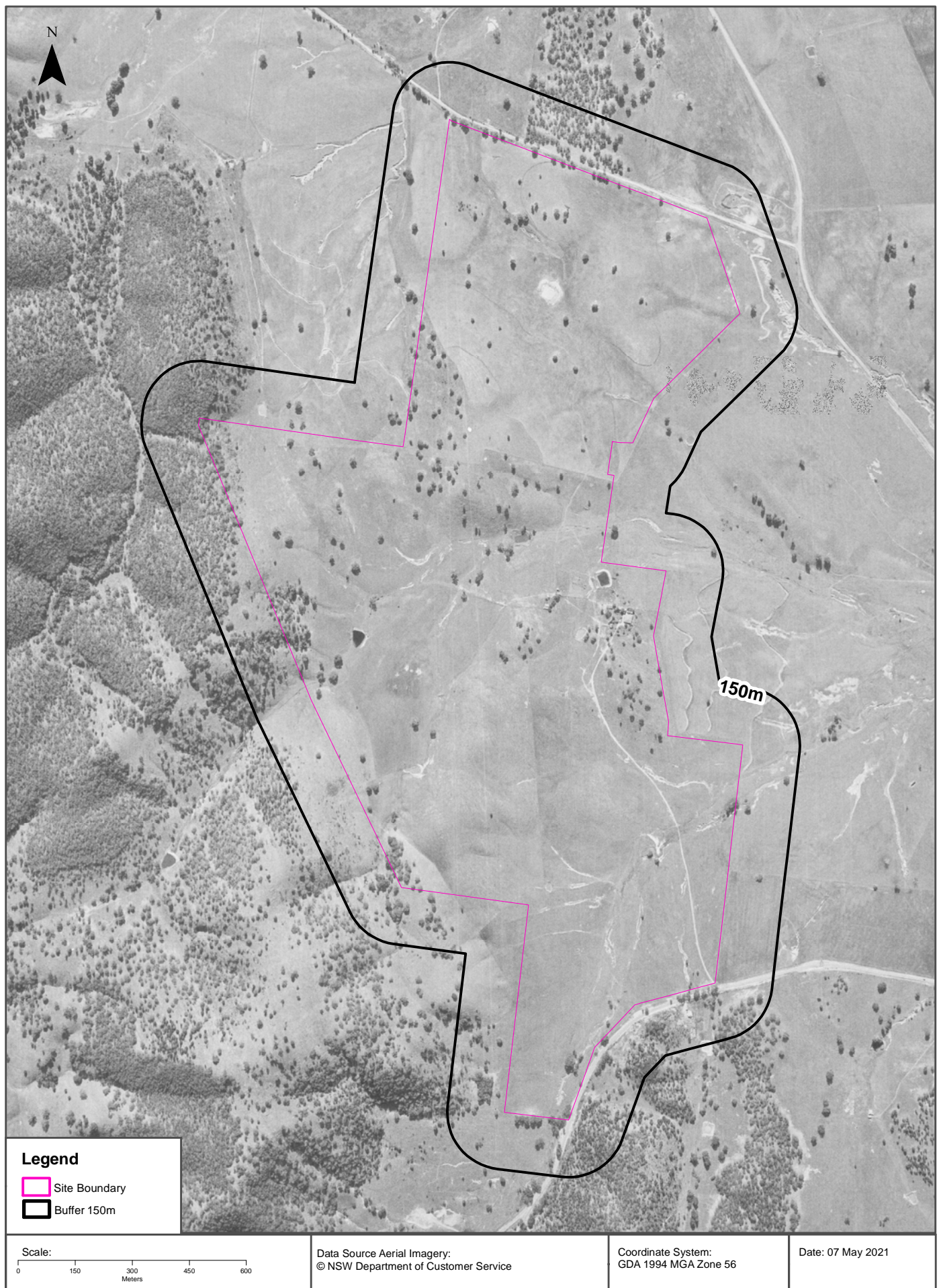
Aerial Imagery 1971

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 2)



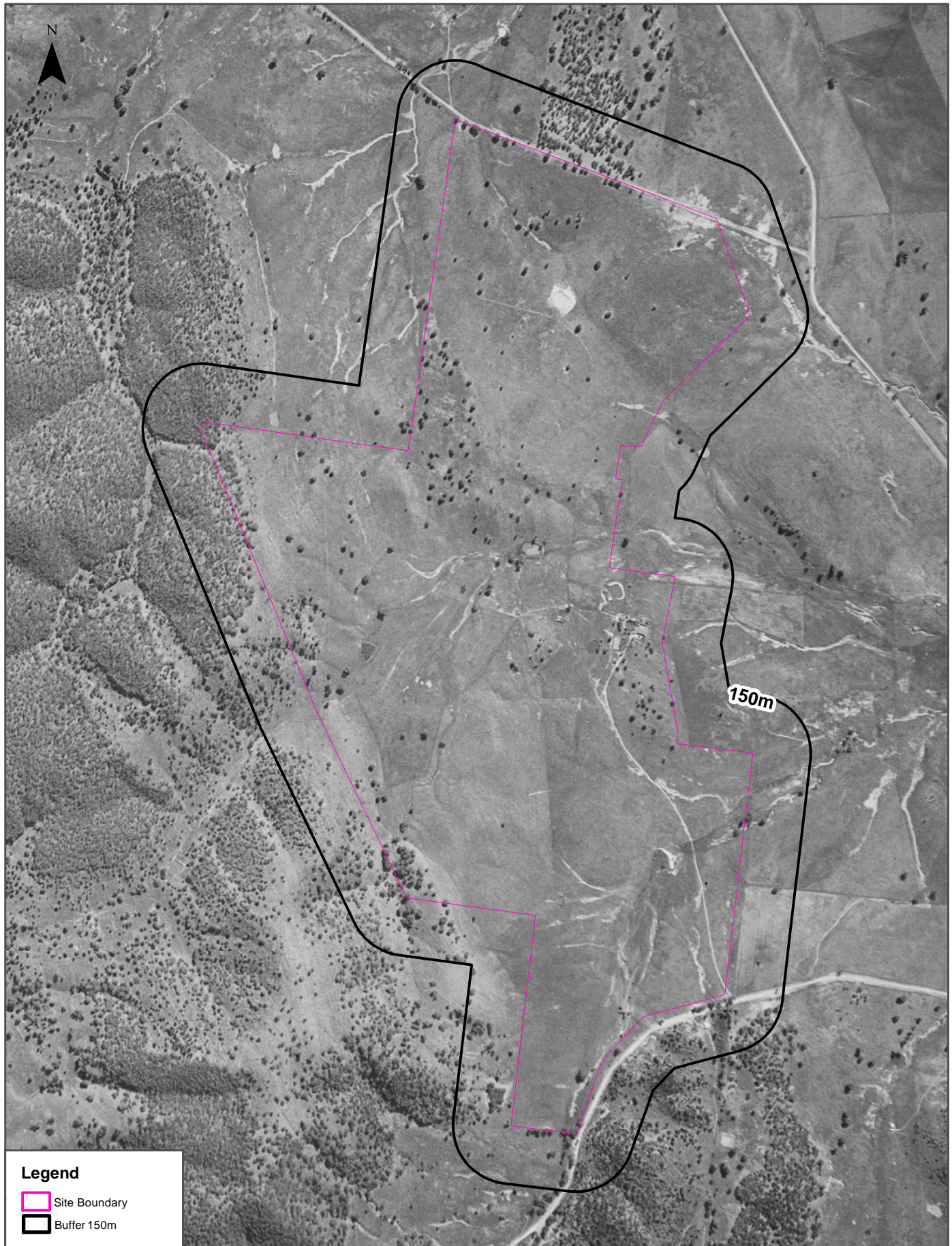
Aerial Imagery 1964

Darhula - 194 Hill End Road, Caerleon, NSW 2850 (Section 2)



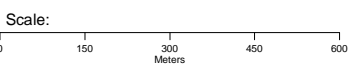
Aerial Imagery 1956

Darthula - 194 Hill End Road, Caerleon, NSW 2850 (Section 2)



Legend

- Site Boundary
- Buffer 150m



Data Source Aerial Imagery: ©2021 Geoscience Australia

Coordinate System:
GDA 1994 MGA Zone 56

Date: 06 May 2021

Appendix C - Chain of Custody and Laboratory Report

CERTIFICATE OF ANALYSIS

Work Order	: ME2100721	Page	: 1 of 14
Client	: BARNSON	Laboratory	: Environmental Division Mudgee
Contact	: Nardus Potgieter	Contact	: Mary Monds (ALS Mudgee Sampler)
Address	: Unit 4 108-110 Market Street MUDGEES NSW 2850	Address	: 1/29 Sydney Road Mudgee NSW Australia 2850
Telephone	: 1300227676	Telephone	: +61 2 6372 6735
Project	: Soil	Date Samples Received	: 28-Apr-2021 14:10
Order number	: ----	Date Analysis Commenced	: 29-Apr-2021
C-O-C number	: ----	Issue Date	: 06-May-2021 09:00
Sampler	: Client Sampler		
Site	: ----		
Quote number	: SY/053/14		
No. of samples received	: 7		
No. of samples analysed	: 7		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Alana Smylie	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a,h)anthracene (1.0), Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				DT01 50-300mm combo from waste area SW corner	DT02 50-300mm combo from paddock areas SW, SE and NE development area	DT03 50-300mm from cropping area 1 western boundary of site	DT04 50-300mm from cattle races	DT05 50-300mm combo from cropping area 2 (NE corner of site)
Sampling date / time				27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00
Compound	CAS Number	LOR	Unit	ME2100721-001	ME2100721-002	ME2100721-003	ME2100721-004	ME2100721-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	2.0	4.3	6.5	12.0	12.0
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	15	10	9	9	8
Copper	7440-50-8	5	mg/kg	<5	<5	8	12	<5
Lead	7439-92-1	5	mg/kg	16	7	14	36	7
Nickel	7440-02-0	2	mg/kg	4	7	7	8	2
Zinc	7440-66-6	5	mg/kg	59	18	26	163	16
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				DT01 50-300mm combo from waste area SW corner	DT02 50-300mm combo from paddock areas SW, SE and NE development area	DT03 50-300mm from cropping area 1 western boundary of site	DT04 50-300mm from cattle races	DT05 50-300mm combo from cropping area 2 (NE corner of site)
Sampling date / time				27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00
Compound	CAS Number	LOR	Unit	ME2100721-001	ME2100721-002	ME2100721-003	ME2100721-004	ME2100721-005
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
4.4'-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
4.4'-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/5 0-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				DT01 50-300mm combo from waste area SW corner	DT02 50-300mm combo from paddock areas SW, SE and NE development area	DT03 50-300mm from cropping area 1 western boundary of site	DT04 50-300mm from cattle races	DT05 50-300mm combo from cropping area 2 (NE corner of site)
Sampling date / time				27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00
Compound	CAS Number	LOR	Unit	ME2100721-001	ME2100721-002	ME2100721-003	ME2100721-004	ME2100721-005
				Result	Result	Result	Result	Result
EP075(SIM)A: Phenolic Compounds - Continued								
2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	<1	<1	<1
2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
2,6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	<2	<2	<2
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	0.6	0.6	0.6



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				DT01 50-300mm combo from waste area SW corner	DT02 50-300mm combo from paddock areas SW, SE and NE development area	DT03 50-300mm from cropping area 1 western boundary of site	DT04 50-300mm from cattle races	DT05 50-300mm combo from cropping area 2 (NE corner of site)
Sampling date / time				27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00
Compound	CAS Number	LOR	Unit	ME2100721-001	ME2100721-002	ME2100721-003	ME2100721-004	ME2100721-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	84.4	77.2	79.5	105	84.9
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	123	97.2	125	130	75.7
EP068T: Organophosphorus Pesticide Surrogate								



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				DT01 50-300mm combo from waste area SW corner	DT02 50-300mm combo from paddock areas SW, SE and NE development area	DT03 50-300mm from cropping area 1 western boundary of site	DT04 50-300mm from cattle races	DT05 50-300mm combo from cropping area 2 (NE corner of site)
Sampling date / time				27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00	27-Apr-2021 00:00
Compound	CAS Number	LOR	Unit	ME2100721-001	ME2100721-002	ME2100721-003	ME2100721-004	ME2100721-005
				Result	Result	Result	Result	Result
EP068T: Organophosphorus Pesticide Surrogate - Continued								
DEF	78-48-8	0.05	%	101	81.9	101	129	77.5
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	82.5	90.1	85.3	84.7	86.7
2-Chlorophenol-D4	93951-73-6	0.5	%	87.3	84.1	88.1	81.7	90.7
2,4,6-Tribromophenol	118-79-6	0.5	%	72.4	65.8	67.0	75.7	85.7
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	92.9	82.2	94.0	95.5	96.5
Anthracene-d10	1719-06-8	0.5	%	110	99.8	102	109	107
4-Terphenyl-d14	1718-51-0	0.5	%	110	102	107	111	102
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.2	%	120	114	122	116	113
Toluene-D8	2037-26-5	0.2	%	103	97.2	101	96.6	99.5
4-Bromofluorobenzene	460-00-4	0.2	%	103	102	104	95.5	104



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				DT06 50-300mm cmbo from sheep dip area	DT07 50-300mm combo for asbestos ID	----	----	----
Sampling date / time				27-Apr-2021 00:00	27-Apr-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ME2100721-006	ME2100721-007	-----	-----	-----
				Result	Result	---	---	---
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	5.4	----	----	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	No	----	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	----	No	----	----	----
Asbestos Type	1332-21-4	-	--	----	-	----	----	----
Sample weight (dry)	----	0.01	g	----	260	----	----	----
APPROVED IDENTIFIER:	----	-	--	----	B.SCHRADER	----	----	----
Synthetic Mineral Fibre	----	0.1	g/kg	----	No	----	----	----
Organic Fibre	----	0.1	g/kg	----	No	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	172	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	8	----	----	----	----
Copper	7440-50-8	5	mg/kg	5	----	----	----	----
Lead	7439-92-1	5	mg/kg	17	----	----	----	----
Nickel	7440-02-0	2	mg/kg	5	----	----	----	----
Zinc	7440-66-6	5	mg/kg	40	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	----	----	----



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				DT06	DT07	---	---	---
				50-300mm cmbo from sheep dip area	50-300mm combo for asbestos ID			
Sampling date / time				27-Apr-2021 00:00	27-Apr-2021 00:00	---	---	---
Compound	CAS Number	LOR	Unit	ME2100721-006	ME2100721-007	-----	-----	-----
				Result	Result	---	---	---
EP068A: Organochlorine Pesticides (OC) - Continued								
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	---	---	---	---
Dieldrin	60-57-1	0.05	mg/kg	<0.05	---	---	---	---
4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	---	---	---	---
Endrin	72-20-8	0.05	mg/kg	<0.05	---	---	---	---
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	---	---	---	---
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	---	---	---	---
4,4'-DDD	72-54-8	0.05	mg/kg	<0.05	---	---	---	---
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	---	---	---	---
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	---	---	---	---
4,4'-DDT	50-29-3	0.2	mg/kg	<0.2	---	---	---	---
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	---	---	---	---
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	---	---	---	---
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	---	---	---	---
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	---	---	---	---
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	---	---	---	---
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	---	---	---	---
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	---	---	---	---
Dimethoate	60-51-5	0.05	mg/kg	<0.05	---	---	---	---
Diazinon	333-41-5	0.05	mg/kg	<0.05	---	---	---	---
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	---	---	---	---
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	---	---	---	---
Malathion	121-75-5	0.05	mg/kg	<0.05	---	---	---	---
Fenthion	55-38-9	0.05	mg/kg	<0.05	---	---	---	---
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	---	---	---	---
Parathion	56-38-2	0.2	mg/kg	<0.2	---	---	---	---
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	---	---	---	---
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	---	---	---	---
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	---	---	---	---
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	---	---	---	---
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	---	---	---	---
Ethion	563-12-2	0.05	mg/kg	<0.05	---	---	---	---



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				DT06	DT07	----	----	----
				50-300mm cmbo from sheep dip area	50-300mm combo for asbestos ID			
Sampling date / time				27-Apr-2021 00:00	27-Apr-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ME2100721-006	ME2100721-007	-----	-----	-----
				Result	Result	---	---	---
EP068B: Organophosphorus Pesticides (OP) - Continued								
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	----	----	----	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	----	----	----	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	0.5	mg/kg	<0.5	----	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	----	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	----	----	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	----	----	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	----	----	----	----
2,4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	----	----	----	----
2,4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	----	----	----	----
2,6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	----	----	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	----	----	----	----
2,4,6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	----	----	----	----
2,4,5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	----	----	----	----
Pentachlorophenol	87-86-5	2	mg/kg	<2	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	----
Benzo(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	----	----	----	----



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				DT06 50-300mm cmbo from sheep dip area	DT07 50-300mm combo for asbestos ID	----	----	----
Sampling date / time				27-Apr-2021 00:00	27-Apr-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ME2100721-006	ME2100721-007	-----	-----	-----
				Result	Result	---	---	---
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	----	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	----	----	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	74.5	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	95.3	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								



Analytical Results

Sub-Matrix: **SOIL**
 (Matrix: **SOIL**)

				Sample ID	DT06 50-300mm cmbo from sheep dip area	DT07 50-300mm combo for asbestos ID	----	----	----
				Sampling date / time	27-Apr-2021 00:00	27-Apr-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit		ME2100721-006	ME2100721-007	-----	-----	-----
					Result	Result	---	---	---
EP068T: Organophosphorus Pesticide Surrogate - Continued									
DEF	78-48-8	0.05	%		70.2	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		88.6	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		90.9	----	----	----	----
2,4,6-Tribromophenol	118-79-6	0.5	%		88.1	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		97.9	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%		109	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		113	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%		125	----	----	----	----
Toluene-D8	2037-26-5	0.2	%		103	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		106	----	----	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Sample ID - Sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	DT0750-300mm combo for asbestos ID - 27-Apr-2021 00:00	Mid-brown soil.



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2,4,6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130



Inter-Laboratory Testing

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(SOIL) EA200: AS 4964 - 2004 Identification of Asbestos in Soils

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EA055: Moisture Content (Dried @ 105-110°C)

(SOIL) EP066: Polychlorinated Biphenyls (PCB)

(SOIL) EP066S: PCB Surrogate

(SOIL) EG035T: Total Recoverable Mercury by FIMS

(SOIL) EP080/071: Total Petroleum Hydrocarbons

(SOIL) EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions

(SOIL) EP080: BTEXN

(SOIL) EP080S: TPH(V)/BTEX Surrogates

(SOIL) EP075(SIM)B: Polynuclear Aromatic Hydrocarbons

(SOIL) EP075(SIM)A: Phenolic Compounds

(SOIL) EP075(SIM)S: Phenolic Compound Surrogates

(SOIL) EP075(SIM)T: PAH Surrogates

(SOIL) EP068A: Organochlorine Pesticides (OC)

(SOIL) EP068B: Organophosphorus Pesticides (OP)

(SOIL) EP068T: Organophosphorus Pesticide Surrogate

(SOIL) EP068S: Organochlorine Pesticide Surrogate

(SOIL) EG005(ED093)T: Total Metals by ICP-AES



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CHAIN OF CUSTODY AND ANALYTICAL REQUEST

Job Number	30336	Date	28/04/2021
Laboratory	ALS Mudgee	Report to	Nardus Potgieter npotgieter@barnson.com.au
Sample Temperature on Receipt		Notes	
14 °C	Signature:		

14 bricks

Sample ID	Description	Sample Date/Time	Analysis request						
			1	2	3	4	5	6	
DT01	50-300mm combo from waste area SW corner	27/04/2021	X						
DT02	50-300mm combo from paddock areas SW, SE and NE development area	27/04/2021	X						
DT03	50-300mm from cropping area 1 western boundary of site	27/04/2021	X						
DT04	50-300mm from cattle races	27/04/2021	X						
DT05	50-300mm combo from cropping area 2 (NE corner of site)	27/04/2021	X						
DT06	50-300mm combo from sheep dip area	27/04/2021	X						
DT07	50-300mm combo for asbestos ID	27/04/2021							X

Analysis Request		ALS Method Code
1	BTEXN, TRH(C6-C40), Phenols, PAH, OCP, OPP, PCB, 8Metals)	S-19
2	Asbestos in 50g soil sample	EA200G
3		
4		
5		
6		

Relinquished by / Affiliation	Accepted by / Affiliation	Date
	/ Barnson	28/04/2021
	ALS Mudgee	

1410