



Proposed cemetery site, Old Cooma Road

Detailed background studies – SUMMARY REPORT

Prepared for
Queanbeyan-Palerang Regional Council

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Contents

Executive summary	vi
1 Introduction	1
1.1 Site location	2
1.2 Proposed activities	2
2 Existing environment	4
2.1 Land use	4
2.2 Climate	4
2.3 Geology	4
2.4 Hydrology and hydrogeology	5
2.5 Biodiversity	9
2.6 Heritage	11
2.7 Noise	12
2.8 Traffic	13
2.9 Viewshed assessment	14
2.10 Social	25
3 Constraints analysis	27
4 Recommended management measures	31
4.1 Geology	31
4.2 Hydrology and hydrogeology	31
4.3 Biodiversity	31
4.4 Heritage	32
4.5 Noise	32
4.6 Traffic	33
4.7 Visual	34
4.8 Social	34
5 Relevant planning provisions and legislation	35
5.1 Queanbeyan LEP	35
5.2 Environmental Planning and Assessment Act 1979	36
6 Conclusion	37
References	38

List of figures

Figure 1-1: Study Area (red boundary indicates lot boundaries)	3
Figure 2-1: Monthly rainfall and temperature near the study area	4
Figure 2-2: Catchment and watercourses in the study area	7
Figure 2-3: Strahler Stream Order.....	8
Figure 2-4: Study area and inputs to viewshed analysis.....	15
Figure 2-5: Landscape positions with visibility of the Study Area	17
Figure 2-6: Site visibility from surrounding landscape positions (all modelled area)	19
Figure 2-7: Site visibility from surrounding landscape positions (Southern Extent)	20
Figure 2-8: Site visibility from surrounding landscape positions (Study Area Extent).....	21
Figure 2-9: Site visibility from surrounding landscape positions with increased observer or structure height (all modelled area).....	22
Figure 2-10: Site visibility from surrounding landscape positions with increased observer or structure height (Southern Extent)	23
Figure 2-11: Site visibility from surrounding landscape positions with increased observer or structure height (Study Area Extent)	24

List of tables

Table 2-1: Generalised soil and sub-soil conditions at the site	5
Table 2-2: Recommended riparian corridor widths*	6
Table 2-3: Area of surrounding landscape with visibility of different proportions of the study site	18
Table 2-4: Area with some visibility of the study site with increasing observer or structure height	25
Table 3-1: Summary of key environmental constraints	28

Abbreviations

Abbreviation	Description
AEP	Annual Exceedance Probability
ARI	Average Recurrence Interval
BAM	Biodiversity Assessment Methodology
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BoM	Bureau of Meteorology
DEM	Digital Elevation Model
DPE	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
EP & A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 2000</i>
ELA	Eco Logical Australia
GDE	Groundwater Dependent Ecosystems
KFH	Key Fish Habitat
LEP	Local Environment Plan
LGA	Local Government Area
NPW Act	NSW <i>National Parks and Wildlife Act 1974</i>
PCT	Plant Community Type
QPRC	Queanbeyan-Palerang Regional Council

Executive summary

Queanbeyan-Palerang Regional Council (QPRC) is considering the parcel of land comprising Lot 2 on DP 112382 and Lot 126 on DP 754881, located at the intersection of Old Cooma Road and Burra Road, for potential future use as a cemetery. QPRC submitted a planning proposal to the NSW Department of Planning and Environment (DPE) in August 2017 to allow for development of the site under an amendment to the Queanbeyan Local Environment Plan (LEP) 2012. The DPE issued a gateway determination stating that the proposal may proceed subject to conditions, including the undertaking of a number of detailed background studies of the site to assess and manage potential environmental and social impacts associated with use of the site as a cemetery. The background studies required by the gateway determination have been undertaken, including:

- Cultural Heritage
- Flora and Fauna
- Geotechnical
- Hydrology
- Traffic and transport impacts
- Visual and noise assessment
- Social impact assessment.

The site is currently used for agricultural (grazing) purposes and has been farmed since the 1800s. An existing cottage is located near the centre of the site. Church Creek, a 3rd order stream (Strahler System), drains NW through the site, with several other smaller tributaries draining into it. The surrounding land is predominantly zoned for environmental living purposes with a minimum lot size of 6 ha. The community title development 'Mount Campbell' is located west of the site, comprising dwellings on smaller rural lots.

Geotechnical investigations at the site indicate most of the site is suitable for excavation to at least 3.5 m, which is the proposed maximum depth required for excavation. With appropriate engineering and design plan considerations, excavations will not result in any constraints to the proposal. No groundwater was intercepted across the site to 3.5 m.

Hydrology modelling indicates that some minor flooding associated with Church Creek may occur at a low probability, however, the site is not considered to be flood prone. Groundwater investigations were high level and limited by a lack of available data, however, drilling depths from surrounding registered bores indicate groundwater is deep (>20 m) and there is little indication of groundwater constraints.

Vegetation at the site comprises mostly cleared and exotic pasture, with some stands of native (planted) trees. Three discreet patches of native vegetation, totalling 1.65 ha, were consistent with the Plant Community Type (PCT) 1330 *Yellow Box – Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion*. Although highly degraded, the areas of PCT 1330 were found to meet the *Biodiversity Conservation Act 2016* (BC Act) listing for the threatened *White Box – Yellow Box – Blakely's Red Gum Woodland*. The vegetation integrity score was calculated for this community in accordance with the Biodiversity Assessment Methodology (BAM) – owing mostly to the highly degraded condition, the score did not meet the threshold for offset requirement.

No threatened flora or fauna species were identified at the site. Fauna habitat features include nine hollow-bearing paddock trees, as well as active wombat burrows, mistletoe, small patches of outcropping

(embedded) rock, and active bird nests, as well as aquatic habitats associated with farm dams and Church Creek. The hollow-bearing paddock trees may provide habitat to a range of threatened of bird, arboreal mammal and Microchiropteran (micro) bat species that are known from the locality.

The cultural heritage assessment included preparation of both an Aboriginal Due Diligence assessment and a Statement of Heritage Impact assessment for the site. Eleven Aboriginal archaeological sites were identified in the assessment, all within 100 m of the Church Creek channel. This area represents an archaeologically sensitive zone which will require further assessment and approval if it is to be disturbed as part of the proposal.

Noise impacts are not expected to be significant due to the nature of the proposal, relating mainly to construction noise and vibration, and mobile outdoor machinery (for example, lawn mowers) throughout the operational phase of the proposal. These impacts can be managed through implementation of standard noise management practices in accordance with relevant guidelines.

Traffic numbers are not expected to increase significantly to accommodate the proposal. Traffic is unlikely to coincide with peak times and is consistent with the current and future projected traffic volumes for the surrounding road network. Design plans for the site should include carparking for 150 cars, and access to the site should be on Burra Road to avoid turning into the site from the busier Old Cooma Road.

The site visibility from the surrounding landscape was assessed using digital elevation data. This could be further refined once design plans and any concerned sensitive receptors are known; however, general mitigation measures such as landscaping and perimeter tree planting would be expected to minimise any visual amenity concerns.

The social report presents a number of potential impact scenarios which may arise if the proposal is to proceed. Formal community engagement is yet to be undertaken to appropriately quantify community concerns.

Key constraints to the development of the site include heritage, biodiversity and hydrology impacts should the proposal impact Church Creek, and biodiversity impacts should the removal of key habitat features (hollow-bearing trees) be required. Consideration and implementation of the mitigation measures and recommended management strategies would be expected to minimise these constraints and allow the proposal to proceed at the site without the need for significant further approval or assessment.

Further less significant constraints relate mainly to a lack of information on the site and can be satisfied following further technical investigation if the proposal is to proceed.

A community and stakeholder engagement strategy should be developed and implemented in accordance with the recommendations of the social report at the earliest possible stage of the proposal. This will allow identification and refinement of potentially unknown social constraints and development of further management measures where required.

1 Introduction

The Queanbeyan Lanyon Drive Cemetery is expected to reach capacity within the next five years. Queanbeyan-Palerang Regional Council (QPRC) needs to identify a new cemetery site to meet the future needs of the community. A parcel of land comprising Lot 2 on DP 112382 and Lot 126 on DP 754881, located at the intersection of Old Cooma Road and Burra Road, has been identified as a potential suitable site.

The site is zoned E4 Environmental Living in the *Queanbeyan Local Environmental Plan 2012* (LEP), which does not include cemetery as permissible development with consent. QPRC submitted a planning proposal to the NSW Department of Planning and Environment (DPE) to allow for development of the site under an amendment to the LEP. The DPE issued a gateway determination in August 2017, stating that the proposal may proceed subject to conditions, including the undertaking of a number of detailed background studies:

- Cultural Heritage
- Flora and Fauna
- Geotechnical
- Hydrology
- Traffic and transport impacts
- Visual and noise assessment
- Social impact assessment.

The gateway determination identified that the studies are required to assess and manage potential environmental and social impacts associated with use of the site as a cemetery.

Eco Logical Australia (ELA) were commissioned by QPRC to coordinate the detailed background studies and prepare this report, which includes the findings of the studies and provides a summary of the key constraints and considerations to allow QPRC to decide on the suitability of the site for the proposed development (cemetery). This report includes:

- An executive summary of the key outcomes of the background studies.
- A detailed description of the site including the existing landscape features and environment, including the identification of visual catchments into and out of the subject site.
- Visual representation of the location of key constraints identified.
- Recommended measures to manage any potential land use conflicts raised in the background studies, including options for locating the cemetery, parking and associated buildings/structures.
- An analysis of applicable legislative and regulatory requirements.

The flora and fauna, and geotechnical studies were completed in 2017. The remaining studies were undertaken in the first half of 2018. All study specific information in this report has been gained from the background studies and references can be found within the individual studies, which should be read alongside this report.

1.1 Site location

The 36.4 ha site is located approximately 11 km to the south of Queanbeyan on the eastern side of Old Cooma Road, at the Burra Road intersection, shown below in **Figure 1-1**. It includes the following lots:

- Lot 2 on DP 112382
- Lot 126 on DP 754881.

The site has been farmed since the 1800s and is currently used for grazing and other agricultural uses. An existing cottage is located near the centre of the site. Church Creek, a 3rd order stream (Strahler System), drains northwest through the site, with several other smaller tributaries draining into it.

The surrounding land is predominantly zoned for environmental living purposes with a minimum lot size of 6 ha. The community title development 'Mount Campbell' is located west of the site, comprising dwellings on smaller rural lots. The area to the north between the Googong township and the subject site is zoned RU2 Rural Landscape, part of which is identified as a 'future investigation area' for urban development in the Queanbeyan Residential and Economic Strategy 2015-2031.

1.2 Proposed activities

The proposed development of the site is likely to involve construction of:

- Public amenities.
- Potential water features.
- Access roads and onsite parking.
- Service sheds.

Development will also involve extensive tree planting, including a minimum 20 m wide perimeter buffer of trees and the establishment of landscaped gardens. Approximately 16 ha of land will be disturbed for the construction of the cemetery and memorial park. A 5 ha buffer will be established around the perimeter of the disturbed land, and an additional 6 ha dedicated to environmental restoration of biodiversity on site, including restoration of creeks and remnant vegetation within the site boundary.

Construction of the cemetery and memorial park is anticipated to take three to six months. The existing farm house and buildings onsite are expected to act as offices. On the completion of construction, the following operational activities would be expected to continue for the life of the cemetery and memorial park:

- An average of three to four burials per week. These will involve light excavation works, to a maximum of 3.5 m, using equipment equivalent to a backhoe or farm tractor.
- Cars associated with a funeral procession will come in and out of the memorial park on the day of the service using the on-site car parking.
- Routine garden maintenance involving lawn mowers, whipper-snippers and other garden maintenance equipment will be carried out on site on a regular basis.
- Hours of operations would likely be 7:00 a.m. – 4:00 p.m., Monday to Friday. There may be occasions where late or weekend services are carried out to meet religious or family needs.
- Three permanent staff members are expected to be employed during the cemetery's operational life.



Figure 1-1: Study Area (red boundary indicates lot boundaries)

2 Existing environment

2.1 Land use

The property is presently used for agricultural purposes (cattle grazing) and has been farmed since the 1800s. An existing cottage is located near the centre of the site. The surrounding land is predominantly zoned for environmental living purposes with a minimum lot size of 6 ha. A community title development known as Mount Campbell, which comprises dwellings on smaller rural lots is located west of the site. The area to the north between the Googong township and the subject site is zoned RU2 Rural Landscape, part of which is identified as a future investigation area for urban development in the Queanbeyan Residential and Economic Strategy 2015-2031.

2.2 Climate

Rainfall and temperature data was obtained from the Bureau of Meteorology (BoM) online climate database for the Tuggeranong (Isabella Plains) AWS (BoM site 070339) located approximately 10.2 km west of the study area (**Figure 2-1**). The regional climate is categorised as cool temperate, with year-round rainfall (average annual rainfall 631.3 mm) with a seasonal distribution showing greater rainfall in the summer months. Mean maximum temperatures range from 11.8 °C in July to 29 °C in January.

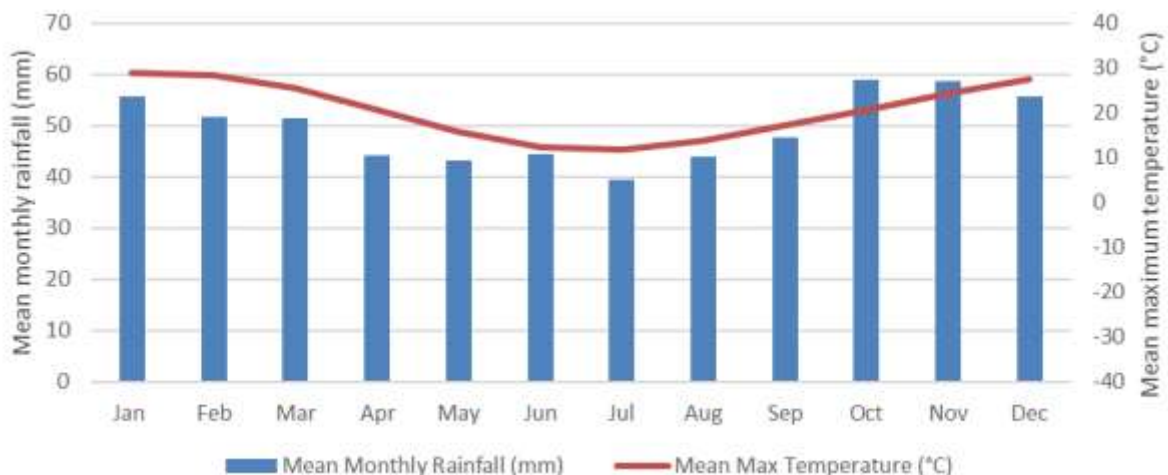


Figure 2-1: Monthly rainfall and temperature near the study area

2.3 Geology

A geotechnical investigation report was prepared by ACT Geotechnical Engineers in 2017. The study area is located within a complex structural corridor within rock sequences of Silurian age, regionally described as the Canberra Graben. This structural feature is bounded to the west by the Murrumbidgee Batholith, comprised of granodioritic intrusives, and to the east by the Cullarin Horst, a complex geological province represented by deformed Ordovician-aged sediments intruded by granites.

The 1:100,000 Canberra Geology map indicates that the site is located mostly on the Colinton Volcanics bedrock, with a small part south of the study area located on the Williamsdale Volcanics. Two faults separate the Colinton Volcanics from the Deakins Volcanics approximately 3.5 km west and from Cappanana formation approximately 4 km east of the study area.

2.3.1 Subsurface profile

The subsurface condition of the site was investigated via ten auger boreholes, drilled to a depth of 3.5 m, and are summarised in **Table 2-1**.

Table 2-1: Generalised soil and sub-soil conditions at the site

Geological profile	Typical Depth Interval	Description
Topsoil	0 m to between 0.1 m and 0.2 m	SILTY SAND; fine to coarse sand, low plasticity silt, brown, some grass roots, dry to moist, loose.
Slopewash	Between 0.1 m and 0.2 m to between 0.4 m and 0.6 m	SILTY SAND; fine to medium sand, low plasticity silt, pale grey-brown, dry to moist, medium dense.
Alluvial/ Residual Soil	Between 0.1 m to 0.6 m to between 0.3 m and >3.5 m	SILTY SANDY CLAY, SILTY CLAYEY SAND, & SANDY CLAY; fine to coarse sand, low to medium and some medium to high plasticity clay, red-brown, orange-brown, brown, grey, dry to moist and moist, stiff to very stiff and dense.
Bedrock	Typically, from 0.2 m to 1 m and below	DACITE; fine to coarse grained, orange brown, grey, highly weathered and weak rock grading to moderately weathered and medium strong rock.

Bedrock was encountered in four boreholes below 0.2 m/1 m, with refusal occurring at 1.5 m, 0.3 m, 0.6 m and 1.3 m depth in medium strong rock. The bedrock is predominantly on the elevated, northern portion of the site, towards the intersection of Old Cooma Road and Burra Road. Bedrock was not encountered within the remaining boreholes within the investigation depth of 3.5 m, although bedrock could be expected to be encountered at greater depths. The investigation indicates that burials to a depth of 3.5 m will be possible across most of the site.

Groundwater was not encountered in any of the boreholes and the soils were mostly dry to moist.

2.4 Hydrology and hydrogeology

A hydrological and hydrogeological review and constraints assessment was undertaken by ELA in 2018 to identify potential impacts and assess the suitability of the site for the proposed activity.

2.4.1 Hydrology

The study area falls within the Murrumbidgee catchment. The key water feature of the site is Church Creek, a 3rd order watercourse (Strahler System) marked on the Queanbeyan LEP Riparian and Watercourses Map, which crosses the site from the south to the west (**Figure 2-2** and **Figure 2-3**). The creek receives discharge from several smaller tributaries, and the flow direction is to the north-west. There are a number of other smaller non-defined overland flow paths that cross the site from culverts under the roads that border the site.

Two other unnamed first and second order water courses have also been mapped from the local contour maps as feeding into Church Creek (**Figure 2-3**). Detailed site survey information and production of Top of Bank mapping would be required in order to confirm the Strahler System order of these watercourse, and which of the watercourses within the subject lots meet the definition of a river under the *Water Management Act 2000*.

The NSW Department of Primary Industries (DPI) Office of Water *Guidelines for Riparian Corridors on Waterfront Land* recommends Vegetated Riparian Zones width based on watercourse order as classified under the Strahler System. The width of the Vegetated Riparian Zones should be measured from the top of highest bank on both sides of the water course. **Table 2-2** below shows DPI Water recommended riparian corridor widths based on the Strahler Stream Order.

Table 2-2: Recommended riparian corridor widths*

Watercourse type (Strahler System)	Vegetated Riparian Zones width	Total riparian corridor width	Relevant watercourse within study area
1 st order	10 metres	20 m + channel width	Unnamed, mapped watercourse
2 nd order	20 metres	40 m + channel width	Unnamed, mapped watercourse
3 rd order	30 metres	60 m + channel width	Church Creek
4 th order and greater	40 metres	80 m + channel width	n/a

*Detailed site survey required to confirm watercourse definition/stream order

A review of the NSW Office of Water surface water database identified no registered stream flow monitoring gauges near the site, with the closest stream gauge (# 410770) located on the Queanbeyan River at the ACT border (approximately 12.5 km north of the site).

To categorise the existing design flood conditions from Church Creek at the site, the use of regionalised flood models was required as no appropriate water level or flow information exists in or near the catchment of interest. The flood volumes and levels were determined by the Regional Flood Frequency Estimation (RFFE) model (University of Western Sydney), RORB (Monash University and Hydrology and Risk Consulting) and Hydrologic Engineering Centre's River Analysis System (HEC-RAS) (U.S. Army Corps of Engineers) programs, which calculate flow and water level conditions. The modelling results suggest that flow events up to the 1% Annual Exceedance Probability (AEP – the probability that a given rainfall total accumulated over a given duration will be exceeded in any one year) would be contained within the existing banks. Therefore, the site is not considered to be flood prone.

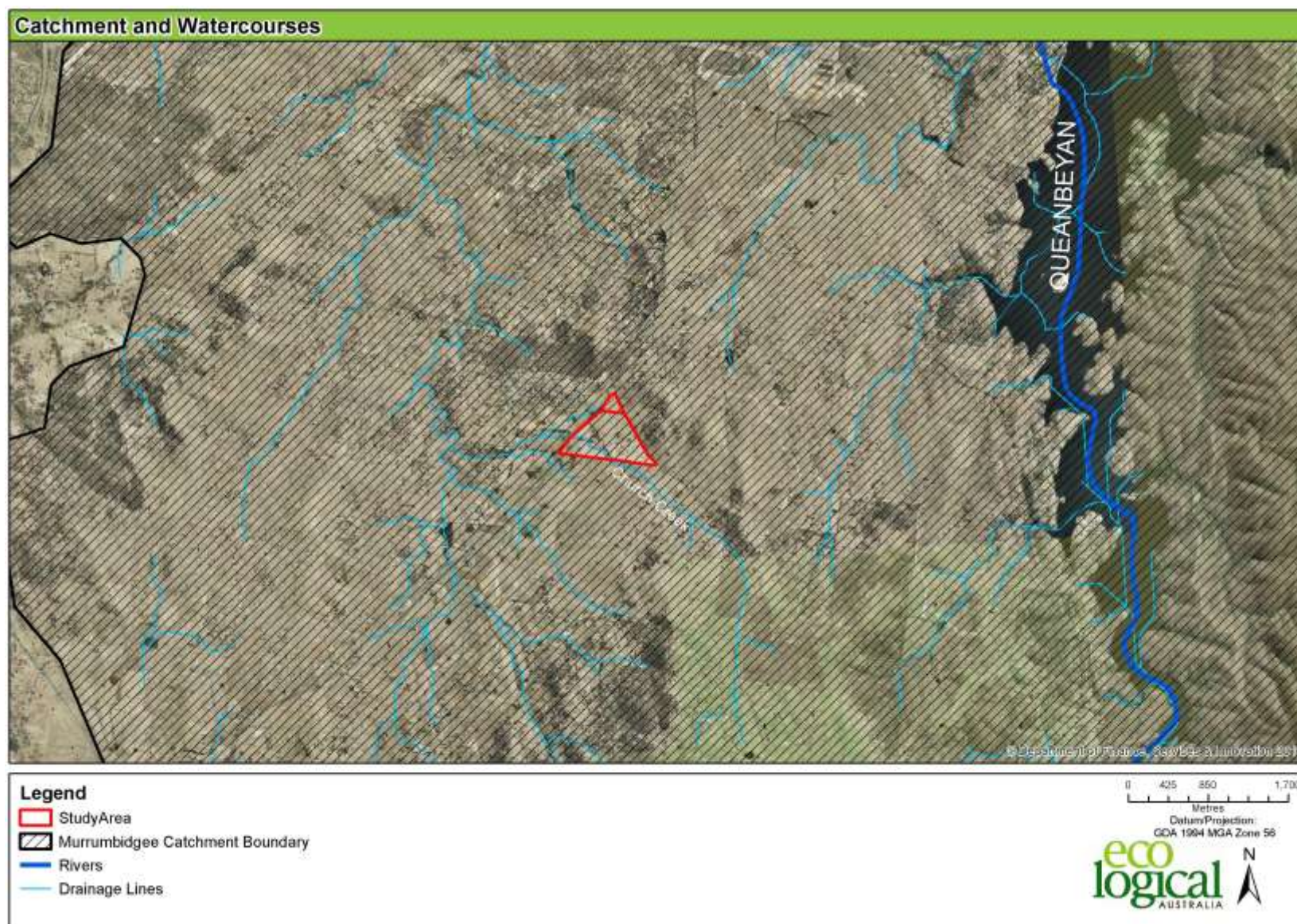


Figure 2-2: Catchment and watercourses in the study area

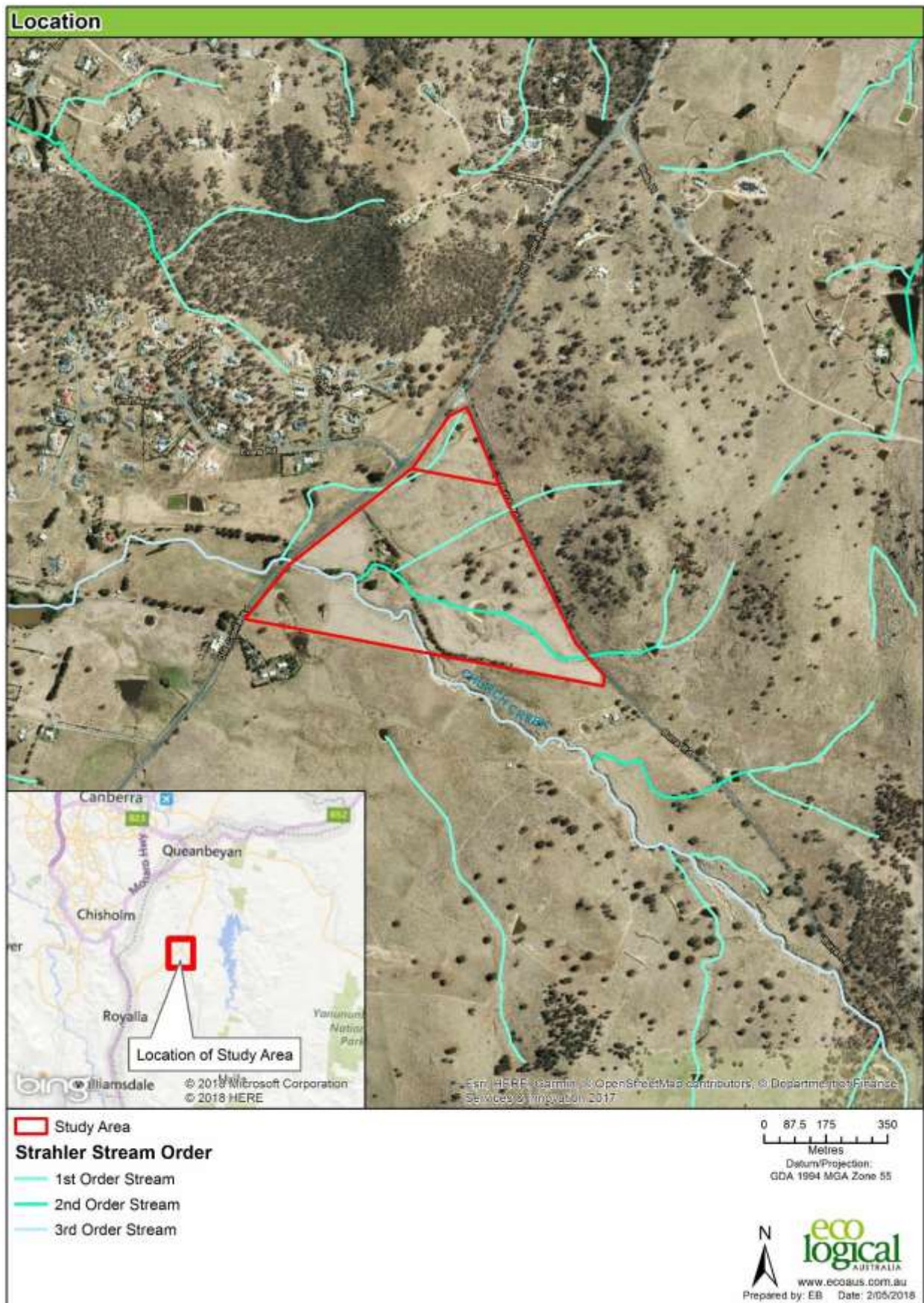


Figure 2-3: Strahler Stream Order

2.4.2 Groundwater

Thirty-eight registered groundwater bores were identified within approximately 2 km of the site, including two located within the site. Detailed interrogation of available groundwater databases did not return any information on water levels of groundwater quality. Database records showed that these bores were all drilled for household, stock use or unknown use, and as such, there is no requirement for these bores to monitor or report level or quality information (though property owners may have this information).

However, the records show that 34 of the 38 bores were drilled to about 20 m or deeper, giving good evidence that local groundwaters are deep and in the fractured rock aquifers. This is consistent with the geotechnical investigation at the site, which did not encounter groundwater in the ten boreholes drilled to the depth of 3.5 m.

Groundwater in the area is expected to be associated with fractures within bedrock and contained within joints, fractures, faults and fissures in the rock mass. Groundwater flow dynamics in the study area are not fully delineated as no active bores could be identified in or around the study area to allow for monitoring of groundwater levels. However, there is an old well located on the site that may have been used as a water source in the past.

Water chemistry

No salinity data was identified from the 38 registered bores located within 2 km distance of the study area. A previous study at Old Cooma Road (HGC, 2001), located approximately 3 km south-west of the site, reported that the likely total salinity is expected to be in the range of 500-800 mg/L, with elevated bicarbonate and total hardness in the range of 300-500 mg/L.

Groundwater Dependent Ecosystems (GDEs)

Review of the BoM GDE Atlas showed no potentially significant GDEs within a 2 km buffer around the site based.

2.5 Biodiversity

A flora and fauna assessment was undertaken by ELA in 2017 to identify the ecological values and constraints present at the site. The assessment was undertaken in accordance with the NSW Biodiversity Assessment Method (BAM), comprising a desktop assessment and field survey including vegetation mapping, threatened flora and fauna species survey and assessment of habitat features.

2.5.1 Vegetation

The 36.4 ha site comprises mostly cleared, exotic dominated and/or native planted vegetation. Three discrete patches of the native plant community type (PCT) 1330 *Yellow Box – Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion* were identified, comprising a total 1.65 ha.

The 1.65 ha of PCT 1330 was assessed against the listing criteria for threatened ecological communities under both the NSW *Biodiversity Conservation Act 2016* (BC Act) and the *Commonwealth Environmental Protection and Biodiversity Conservation Act 2000* (EPBC Act). Although highly degraded, the areas of PCT 1330 were found to meet the BC Act listing for the threatened *White Box – Yellow Box – Blakely's Red Gum Woodland*. Under the NSW Biodiversity Offset Scheme, local governments have the option to 'opt in' to the scheme where an offset requirement is determined under the BAM. The vegetation integrity score was calculated for PCT 1330 in accordance with the BAM – owing mostly to the highly degraded condition, the score did not meet the threshold for offset requirement.

2.5.2 Threatened flora

A total of 52 flora species were recorded within the study area, 24 of which were exotic. No threatened flora species were identified and no suitable habitat for threatened flora was found to be present. The field survey was conducted during spring which would indicate that if present, threatened flora species would be readily identifiable. It is therefore considered unlikely that threatened flora species listed under the BC Act and/or the EPBC Act occur within the study area.

2.5.3 Threatened fauna

Twenty-three fauna species were opportunistically recorded during field surveys, including 19 native and one exotic bird species, two native frog species and one native mammal species. The bird species recorded were either larger common bird species such as *Platycercus elegans* (Crimson Rosella), *Cracticus tibicen* (Australian Magpie) and *Eolophus roseicapilla* (Galah), or smaller bird species commonly associated with open grasslands and modified habitats, such as *Anthus novaeseelandiae* (Australasian Pipet) and *Rhipidura leucophrys* (Willie Wagtail). No threatened fauna species were observed.

Key fauna habitat features identified within the study area consisted of hollow-bearing paddock trees, active wombat burrows, mistletoe, small patches of outcropping (embedded) rock, and active bird nests, as well as aquatic habitats associated with farm dams and Church Creek.

The hollow-bearing trees (including stags) supported a range of small (< 5 cm diameter), medium (5 - 20 cm diameter) and large (> 20 cm diameter) hollows. These hollows may provide potential denning, roosting or nesting habitat for a range of bird, arboreal mammal and microchiropteran (micro) bat species that are known from the locality and that utilise agriculturally modified habitats.

The *Eucalyptus blakelyi* and *E. melliodora* hollow-bearing trees containing large hollows may support nesting habitat for the threatened bird species *Polytelis swainsonii* (Superb Parrot). One *E. bridgesiana* had dense infestations of mistletoe (greater than five individual mistletoe plants), providing potential nesting and foraging habitat for the threatened bird species *Grantiella picta* (Painted Honeyeater). One individual *Cacatua galerita* (Sulphur-crested Cockatoo) was observed emerging from a large hollow in an *E. bridgesiana*. An active nest of the introduced pest species *Sturnus vulgaris* (Starling) was present in a hollow-bearing stag. One bird nest was observed in an outer fork of a *E. blakelyi*. This was likely a nest of *Cracticus tibicen* (Australian Magpie).

Should removal of these trees be required for the development of the site, further targeted threatened fauna (species credit species) surveys will be required and QPRC may be required to decide whether to 'opt in' to the Biodiversity Offset Scheme.

The outcropping rock habitat may provide refuge habitat for a range of small reptile species. However, the rock habitat within the study area was not considered to be the partially embedded rock habitat that constitutes potential habitat for the threatened *Aprasia parapulchella* (Pink-tailed Worm Lizard).

The farm dams and Church Creek may support potential foraging habitat for the threatened micro bat species *Myotis macropus* (Southern Myotis).

2.5.4 Aquatic ecology

The riparian corridor categories within the study area were assessed in relation to the *Water Management Act 2000*. While the 1st and 2nd order drainage lines within the site are ephemeral and did not contain water at the time of survey, the 3rd order Church Creek contained a number of permanent pools. These were fringed with and/or had dense in-stream vegetation consisting of dense stands of native sedges and rushes and in moderate to good condition. In addition, there were four farm dams, which were observed

as providing habitat for a range of common waterbirds associated with agricultural environments, such as *Chenonetta jubata* (Australian Wood Duck). The common native frog species *Crinia signifera* (Common Eastern Froglet) and *Limnodynastes tasmaniensis* (Spotted Marsh Frog) were heard calling from the small dam in the far south-western corner of the study area.

Church Creek is a 3rd order stream, which is classed as key fish habitat (KFH) by DPI Fisheries. There is approximately 3.5 km of KFH upstream of the study area. The desktop study found no threatened freshwater fish communities have been previously recorded or modelled within Church Creek. Although the creek is, at times, hydrologically connected to Lake Burley Griffin, where *Tandanus tandanus* (Eel Tailed Catfish) are modelled to occur, the habitats are vastly different. It is unlikely that catfish would travel upstream (approximately 25 km) to the site because of the significant barriers posed by dense in-stream vegetation and large reaches of dry streambed. There are also no deep pools at the site to create suitable catfish habitat. *Euastacus armatus* (Murray Crayfish), *Macquaria australasica* (Macquarie Perch), *Maccullochella macquariensis* (Trout Cod) occur in the Murrumbidgee River, downstream of Lake Burley Griffin, but would be unable to migrate upstream beyond Scrivener Dam. It was concluded that threatened fish are unlikely to occur at the site and the proposal is not likely to directly impact threatened fish or their habitats.

2.6 Heritage

A Statement of Heritage Impact and an Aboriginal Due Diligence assessment were prepared by ELA in 2018. Preparation of the assessments comprised desktop searches of the relevant registers and a field survey by qualified archaeologists to identify any heritage features or objects present at the site.

2.6.1 Ethnographic Context

The southern Canberra / Queanbeyan / Googong region is the traditional lands of three clan groups: the *Ngunnawal*, *Ngarigo* and the *Walgalu*. The *Ngunnawal* Clan was recorded from Queanbeyan to Yass, Tumut to Boorowa, and east to beyond Goulburn; on highlands west of the Shoalhaven River. The *Ngarigo* Clan was recorded as being distributed across the Monaro tableland north to Queanbeyan; Bombala River from near Delegate to Nimmitabel; west to divide of the Australian Alps. *Walgalu* Clan lands were reported to span from the headwaters of the Murrumbidgee, and Tumut rivers; at Kiandra; south to Tintaldra; northeast to near Queanbeyan.

From the ethnohistorical accounts it is clear that the region was situated in cross over country. Clan boundaries were historically constructed according to language boundaries, with social interaction, ceremony, trade, exchange and resource procurement across boundaries common.

The site is located within a resource rich landscape comprised of both freshwater and open woodlands and grasslands environments and includes semi-permanent water sources in Church Creek, a 3rd order stream. This environment would have provided reliable food resources (aquatic, avian, plant and faunal) for traditional Aboriginal people.

2.6.2 Aboriginal Due Diligence

The Aboriginal Due Diligence Assessment aims to identify registered Aboriginal sites and/or sensitive landforms which may indicate the presence of Aboriginal sites and may therefore require further assessment and approval under Part 6 of the NSW *National Parks and Wildlife Act 1974* (NPW Act). An extensive search of the relevant databases and literature enabled development of a predictive model for the study area, identifying potential archaeological sensitivity and most common site types.

The predictive model identified that the margins of Church Creek were likely to be archaeologically sensitive, which was then confirmed during a visual field survey undertaken by ELA archaeologists.

During the survey, 11 Aboriginal archaeological sites were identified. All sites were within 100 m of the channel of Church Creek. These findings suggest that the margins of Church Creek are likely to be archaeologically sensitive, and it is likely that there are additional deposits of Aboriginal artefacts along the creek in a sub-surface and possibly *in situ* context.

2.6.3 Historical Context

The first recorded Colonial visitor to the Googong locality was Captain Mark Currie who lead a party that passed through the area in 1823 while returning from an expedition to the Murrumbidgee River and Mt Tennant to the south east. Within five years of that first visit Colonial settlers, squatters and graziers had taken up land in the area. Early recorded landholders included John McAuley (640 acres), John Swan (over 700 acres) and James, Edward and William Gibbs (total holding 440 acres), William Ryan (600 acres), WC and MG Beresford (487 acres).

John Gibbs succeeded Ewan Cameron as the overseer of Robert Campbell's Mt Campbell property (to the south of the study area) in 1852. James Gibbs subsequently succeeded his father as overseer of Mt Campbell. He also acquired land adjacent to the Church glebe in the 1860s and over the ensuing years became one of the largest resident landowners in the area. The St Pauls church was built in 1867 and opened in 1868, its construction paid for by the land owners on the Googong area including the Campbell family.

A 1905 map of the Parish of Googong shows the land included in Lot 2 and Lot 126 as belonging to William Gibbs. The Gibbs family continued to be significant landowners in the Googong area until the 1980s.

2.6.4 Statement of Heritage Impact

There are no significant heritage sites present which may be impacted by the proposed development of a cemetery at Lot 2 DP112382 and Lot 126 DP754881, Old Cooma Road. The proposal will not have a deleterious impact on the heritage values of the neighbouring heritage sites Mt Campbell and St Pauls Church of England.

The Mt Campbell property is significant for its long and historic association with the European settlement of the Googong region and subsequent pastoral activity in the area which date back to the 1830s when it was established as an outstation of Charles Campbell's property - Duntroon.

St Pauls Church of England was built with funds raised by the local community. It's foundation stone was laid in 1867 and the church opened in 1868. The church possesses high historic value and enduring social and community value for its association with the provision of religious service to the surrounding Googong community.

The heritage significance of both items rests in specific elements of the fabric of those places, their association with historic figures and importance to the Googong community, both past and present. The proposed development of Lot 2 DP112382 and Lot 126 DP754881 will not affect the fabric of these places and is unlikely to have any observable impact upon the setting or social values associated with these places.

2.7 Noise

A noise impact assessment was undertaken by WSP to assess the potential noise impacts associated with the proposed development. To quantify the existing ambient noise environment surrounding the proposed project site, unattended noise monitoring using remote noise logging equipment, as well as operator-attended observations were undertaken between 23 February to 9 March 2018 (inclusive).

Measurements were conducted at one location within the site along with the identified nearest sensitive receivers. The objective of the noise monitoring was primarily to establish the existing ambient background noise levels, which in turn would be used to determine the project specific trigger levels.

The existing local noise environment was found to be generally dominated by road traffic noise along Old Cooma Road. Contributions from natural sounds such as birds and wind in the trees were also observed.

An assessment of potential noise impacts to nearby sensitive receptors was undertaken, including construction and operational noise. There is potential for mobile outdoor machinery (for example, whipper snippers and lawn mowers) to exceed impact trigger levels at two sensitive receptors located to the south of the site. However, appropriate management actions would be expected to mitigate any impacts, further described in Section 4.

2.8 Traffic

A transport impact assessment was undertaken by WSP to assess the current conditions and potential impacts from increased traffic associated with the proposed cemetery. The site has frontages to both Old Cooma Road and Burra Road, which are both local roads with posted speed limits of 100 km per hour. Along the site frontage, Burra Road has a straight alignment and Old Cooma Road has two horizontal curves.

Old Cooma Road and Burra Road are two-way roads configured with one traffic lane in each direction and intersecting at a priority-controlled intersection with Give Way control on Burra Road. The following on-site observations were made regarding the intersection of Old Cooma Road and Burra Road:

- Vehicles turning left from Old Cooma Road to Burra Road typically turn at relatively high vehicle speeds.
- The Burra Road approach operates as two stand up lanes, with the potential for a right turn vehicle on Burra Road to block the sight lines for a left turn vehicle on Burra Road and vice versa.
- The majority of vehicles entering and exiting Burra Road were travelling to/from the north on Old Cooma Road.
- The intersection operates with no vehicle queues and minimal delays during the peak hours. South of Burra Road, Old Cooma Road intersects with Evans Road, providing access to the Mount Campbell Estate. This intersection is located on the inside of a horizontal curve, with some sight line implications.

Old Cooma Road connects Queanbeyan to the north with the Monaro Highway to the south, which in turn provides access to Cooma. Traffic data collected in mid-2017 indicates that in the vicinity of the site, Old Cooma Road currently carries approximately 2,540 vehicles per day, with a heavy vehicle proportion of 8.6% and weekday peak hourly volumes of approximately 310 to 350 vehicles in the AM and PM peak, respectively. Therefore, Old Cooma Road currently has a peak to daily traffic volume ratio of 12 to 14 per cent.

The weekday peak hours along Old Cooma road are 8.00 am to 9.00 am and 5.00 pm to 6.00 pm. On the weekend, traffic volumes were observed to be relatively consistent between 10.00 am to 4.00 pm (up to 270 vehicles per hour).

South of the site, Old Cooma Road carries approximately 1,700 vehicles per day.

Burra Road primarily provides access to the suburb of Burra and offers an alternative route to/from other nearby suburbs including Williamsdale and Urila. Burra Road carries approximately 1,100 vehicles per day, with a heavy vehicle proportion of 4.6 per cent. Applying a 12 to 14% peak to daily ratio to Burra Road results in estimated peak hourly traffic volumes of 132 vehicles and 154 vehicles in the AM and PM peak hours, respectively.

The surrounding road network does not currently accommodate walking and cycling facilities, or public transport services, with the exception of school bus routes and a school bus stop located on Old Cooma Road, approximately 65 m north of Evans Road.

2.9 Viewshed assessment

A desktop visual assessment has been undertaken using ArcGIS visibility tools. These tools identify 'line of sight' between positions in the landscape, based on elevation and the height of observers or target structures.

A 5 m Digital Elevation Model (DEM) was constructed from 10 m contours from the NSW LPI Digital Topographic Database and used to represent the surrounding landscape topography. The extent of the DEM is approximately 5 km from the study area boundary. In flat terrain, this distance is close to the distance at which the earth curves out of sight. The study area was represented by a grid of point locations, spaced 80 m apart (57 points in total) (Figure 2-4). An additional nine points were constructed from the vertices of the study area boundary (66 points in total). A viewshed was modelled which identified line of sight between each grid cell within the DEM and gridded or boundary points within the study area. Values within the viewshed model represent the number of points visible from a given landscape position. The study area is visible from a location in the landscape if at least one point within the study area is visible from that location. The horizontal extent of visibility is approximated by determining the percentage of input points visible at a location. A slight error (< 5%) in this horizontal extent occurs due to the variable distance of boundary vertices to the nearest internal grid point.

The viewshed is based on the line of sight between the ground surface of the landscape and the ground surface of the study area. Higher structures on the site (for example, mausoleums) will be visible from more positions in the surrounding landscape. Similarly, elevated observer positions in the surrounding landscape (for example, multi-storey dwellings or buildings) will observe a greater proportion of the landscape. An Above Ground Level model was created that identified the minimum height of observer position or site structure that will result in a line of sight to that landscape position.

Visibility maps have been presented for the modelled landscape extent, and for three smaller extents corresponding to nearby residential areas:

- The 'Study Area' extent incorporates the area immediately surrounding the study area, including the residential subdivision around Evans Road, Lynch Avenue and Shillington Avenue.
- The 'Southern' extent incorporates rural residential properties to the east of Old Cooma Road, near the boundary of Royalla and Googong, including Royalla Drive, Cockle Drive, Binowee Drive and Montague Place.
- The 'Northern' extent incorporates properties west of Old Cooma Road, Googong, including along Fernleigh Drive, Swan Drive and Cavanagh Close.

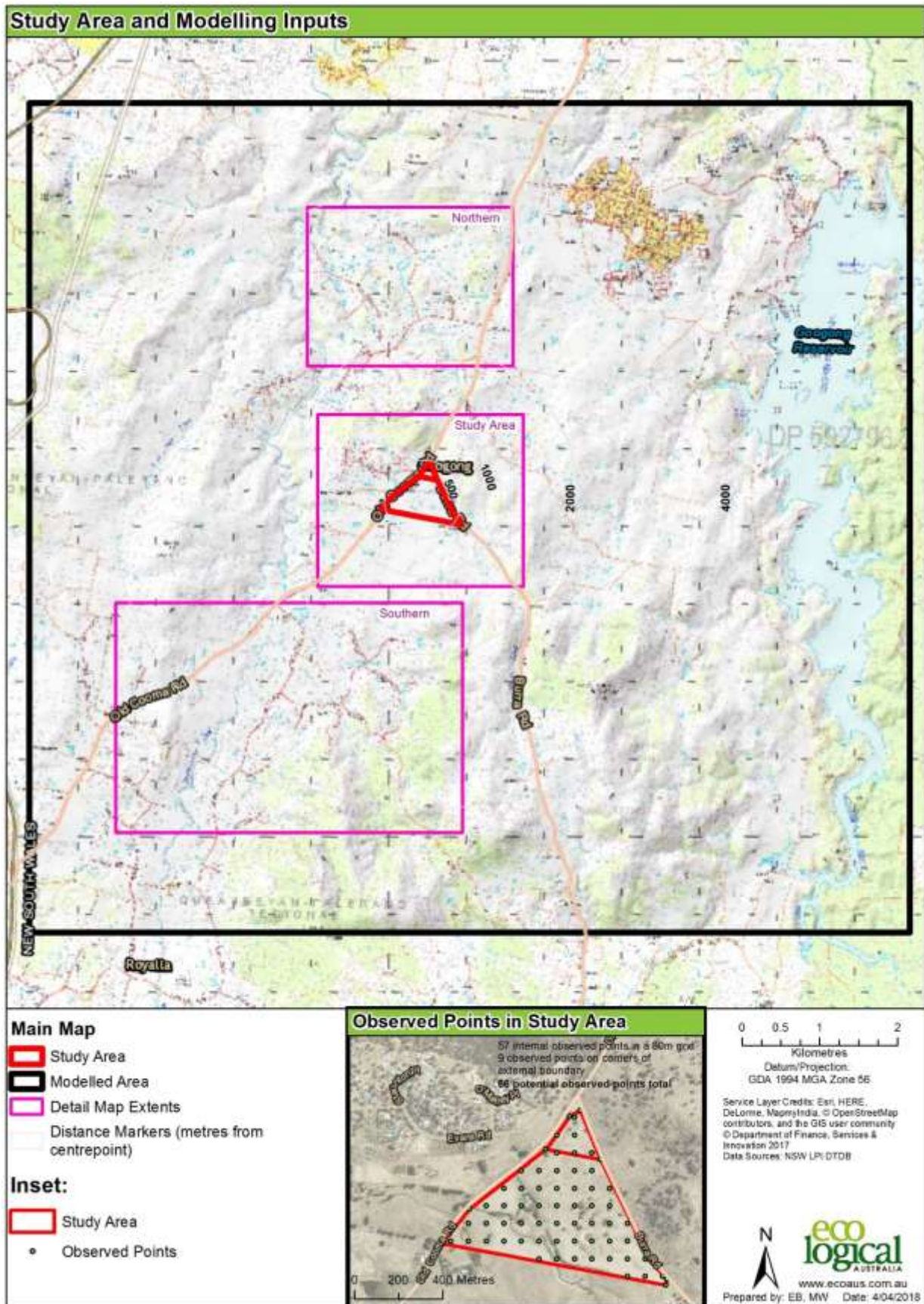


Figure 2-4: Study area and inputs to viewshed analysis

2.9.1 Regional viewshed

The regional viewshed, representing the line of sight between the ground surface of a landscape position and that of the study area, is shown in Figure 2-5. The study area is generally visible to locations immediately adjacent to the site, up to 1 km in the northeast and northwest, up to 2 km south of the study site. There is minimal visibility of the site to the north, and thus no further detailed maps of this region have been produced.

The site is also visible from higher slopes and ridges between 2 and 5 km from the site. Larger areas occur along the ridge to the west-southwest of the site, either side of Old Cooma Road, along the ridge to the south of Binowee Drive, and discontinuous areas along Royalla Drive. Smaller areas occur to the northwest of the site, along ridgelines west of Swan drive, and to the southeast, east of Burra road. There are very few private residences or public recreation facilities visible on these visible ridges.

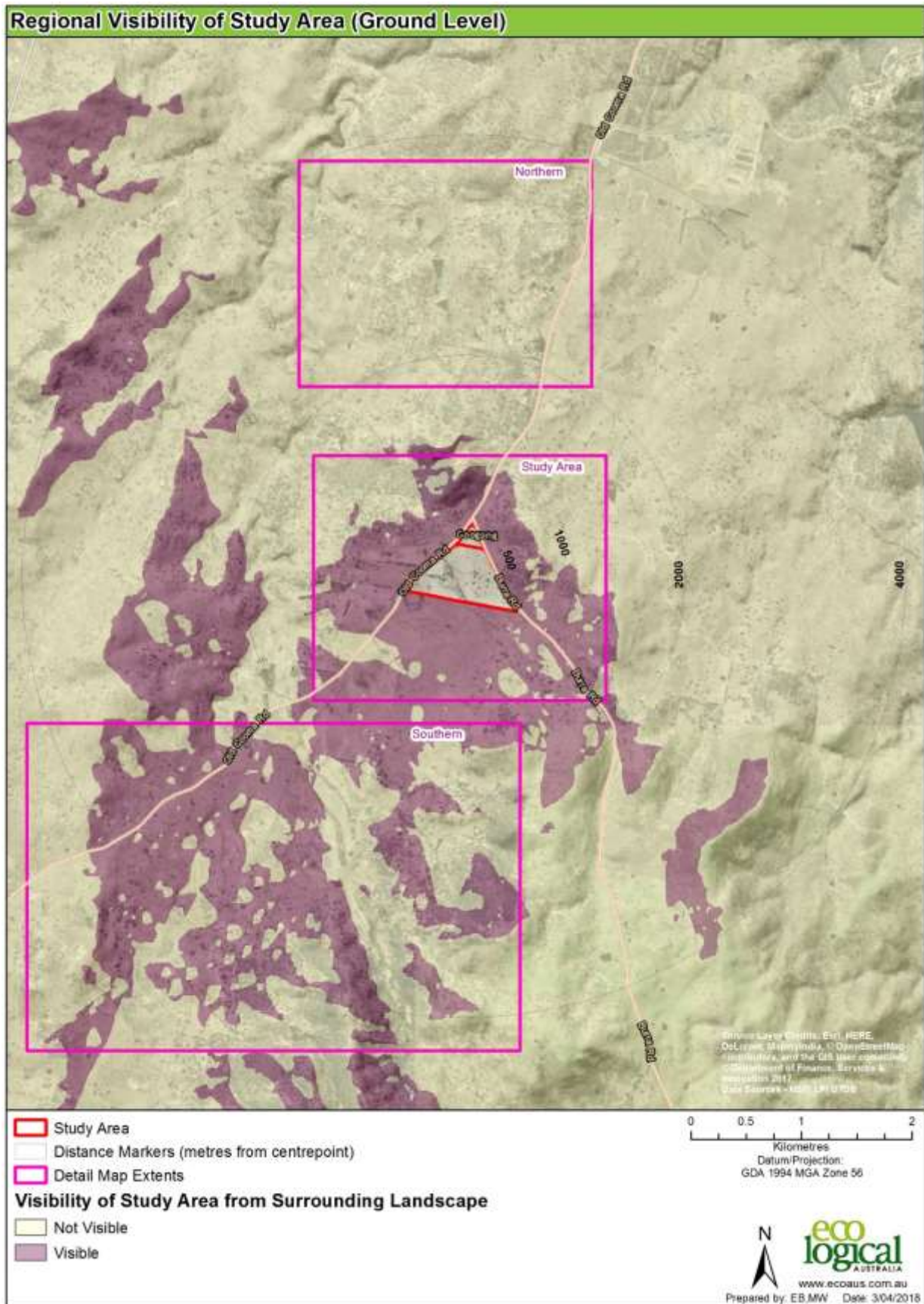


Figure 2-5: Landscape positions with visibility of the Study Area

2.9.2 Extent of study area visible and visibility of elevated positions or structures

The proportion of the study area visible from any location is shown in Figure 2-6 for the modelled area, and in greater detail in Figure 2-7 and Figure 2-8. Most locations from which the study area is visible are able to view more than 50% of the site (Table 2-3). This can likely be attributed to the areas with visibility of the site occurring in close proximity, or on higher ridges, and that relatively low relief of the study area and immediate surrounds. Small bands of reduced visibility occur lower on visible slopes. An area of reduced extent of visibility also occurs immediately adjacent to the west of the study area, likely due to a localised depression or road embankments for Old Cooma road.

Table 2-3: Area of surrounding landscape with visibility of different proportions of the study site

Percentage	Area (ha)
0%	10442
0-15%	211
16-25%	126
26-35%	90
36-50%	149
>50%	1064

Similarly, elevated structures on the site or observation positions in the landscape do not significantly increase visibility (Figure 2-9, Figure 2-10 and Figure 2-11). Small bands of increased visibility occur lower on visible slopes for increases in height of up to 10m. Larger areas of increased visibility occur for structures or positions greater than 10 m. However, this would only apply to the largest buildings on site or multi-storey dwellings.

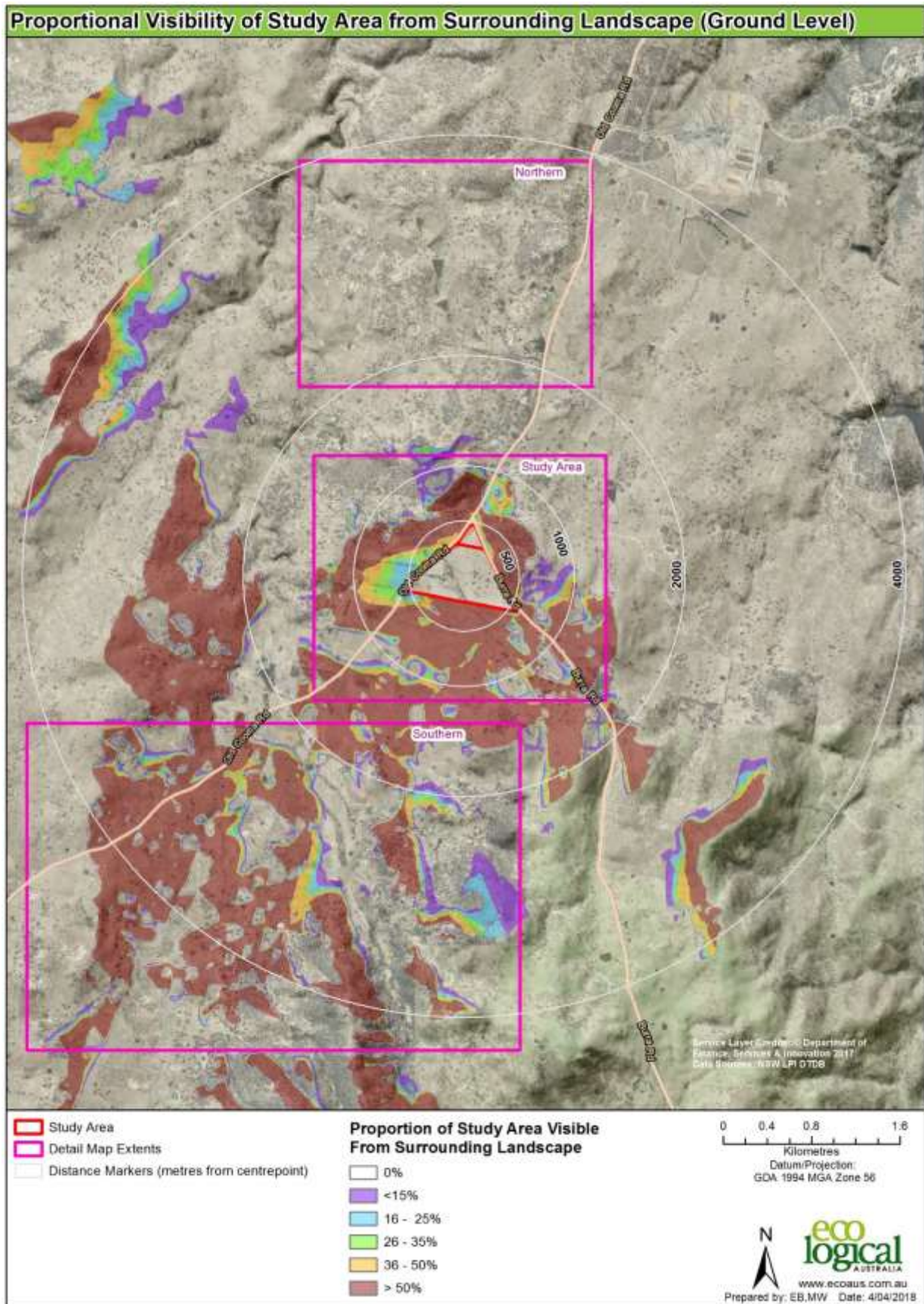


Figure 2-6: Site visibility from surrounding landscape positions (all modelled area)

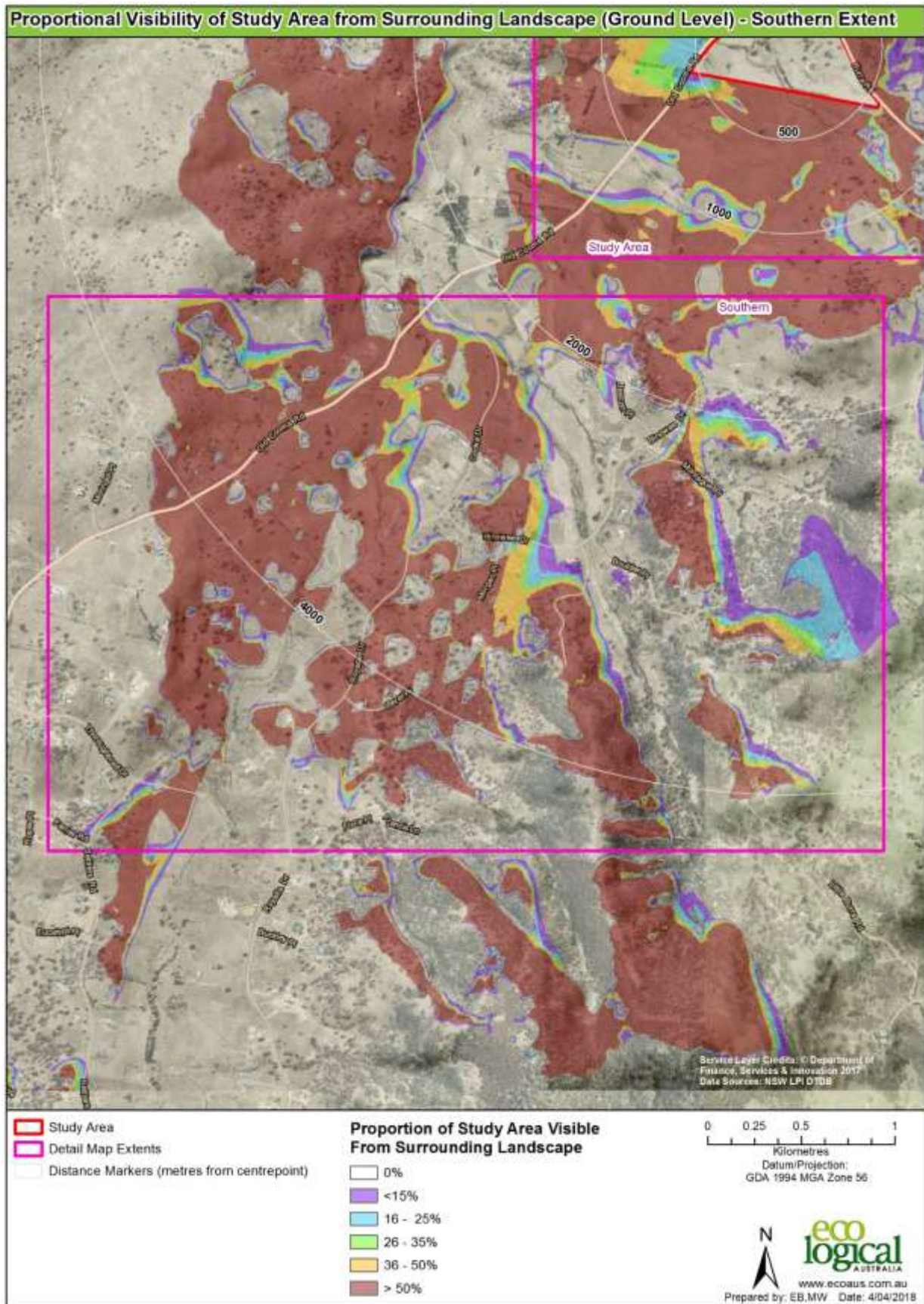


Figure 2-7: Site visibility from surrounding landscape positions (Southern Extent)

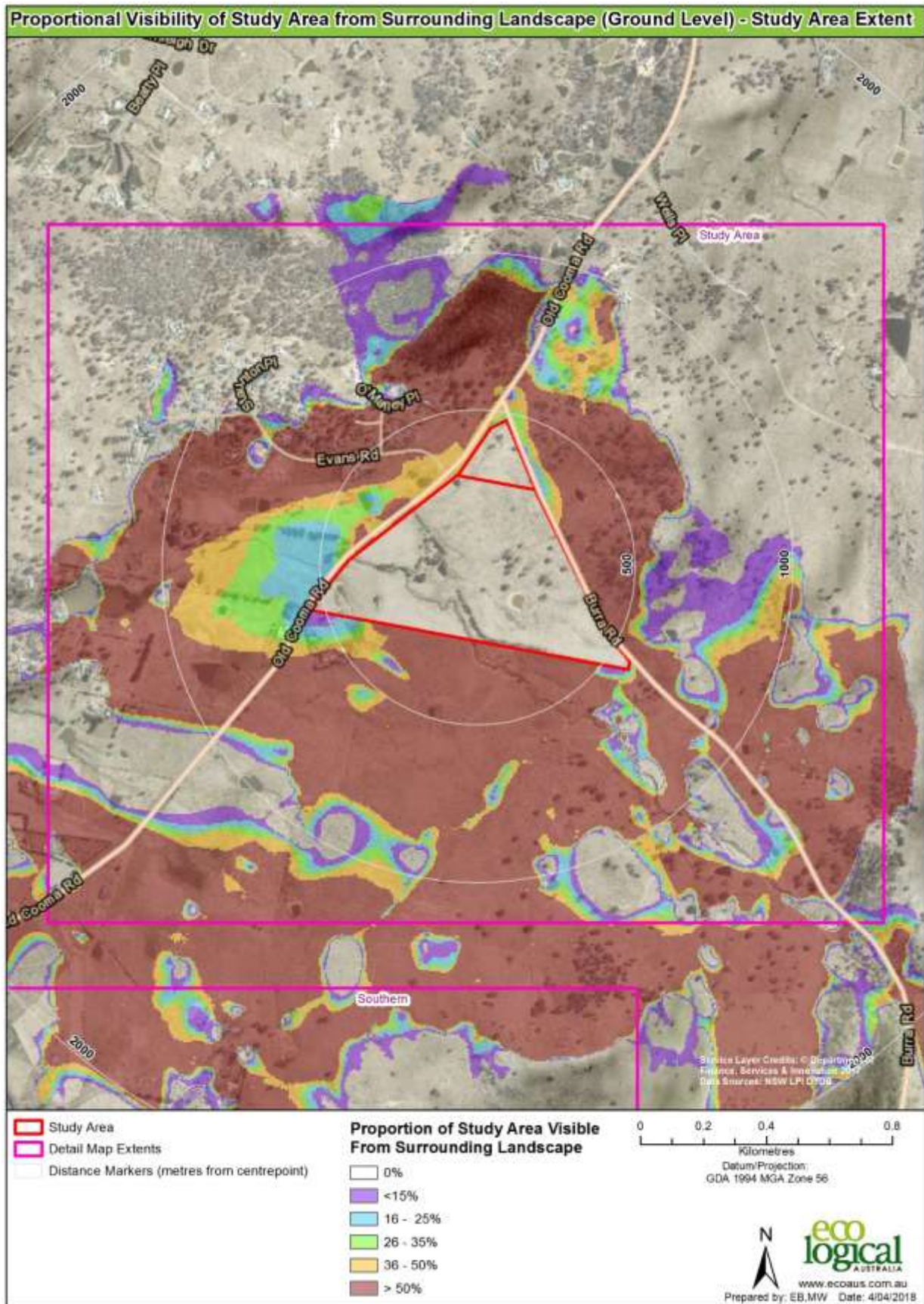


Figure 2-8: Site visibility from surrounding landscape positions (Study Area Extent)

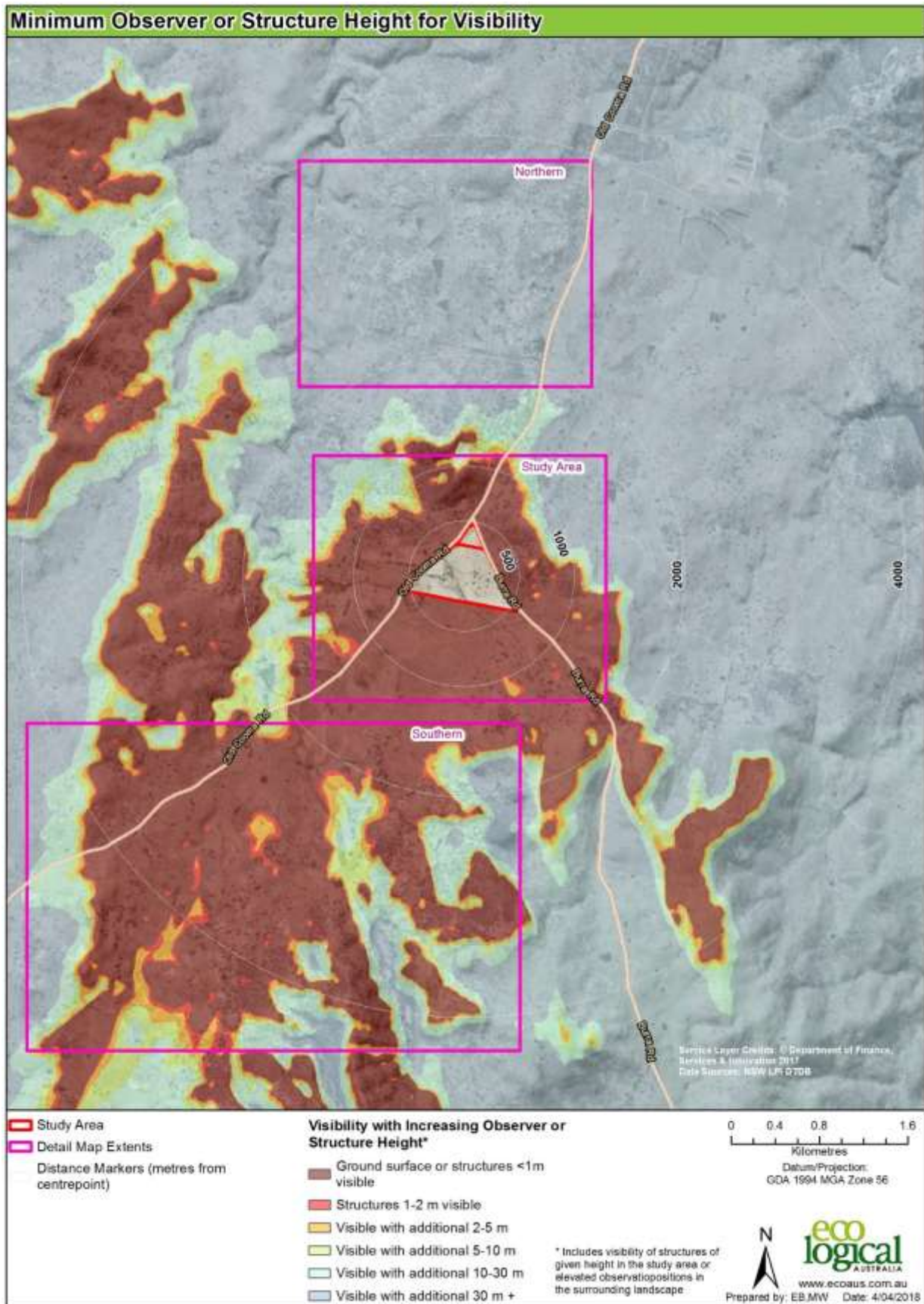


Figure 2-9: Site visibility from surrounding landscape positions with increased observer or structure height (all modelled area)

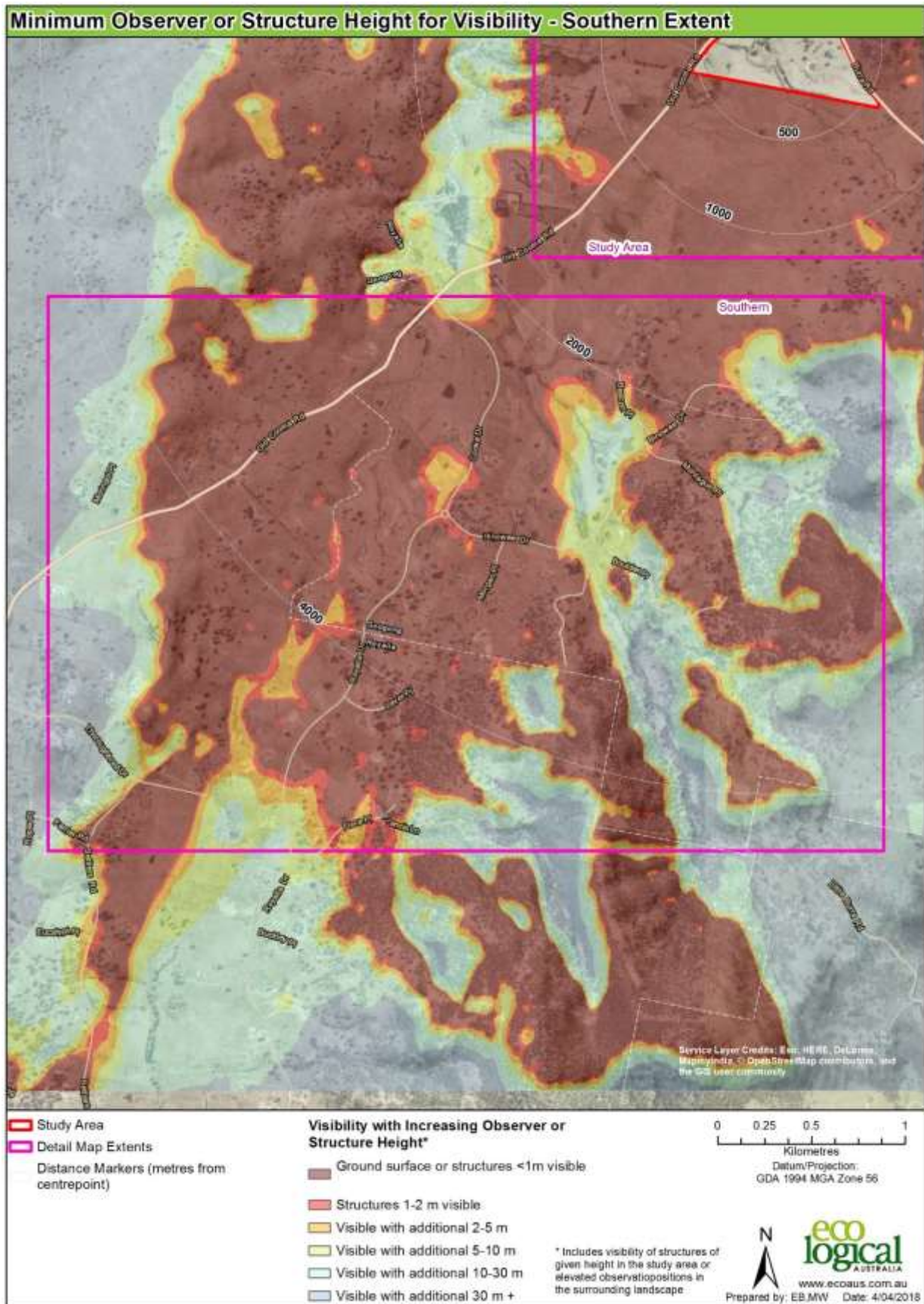


Figure 2-10: Site visibility from surrounding landscape positions with increased observer or structure height (Southern Extent)

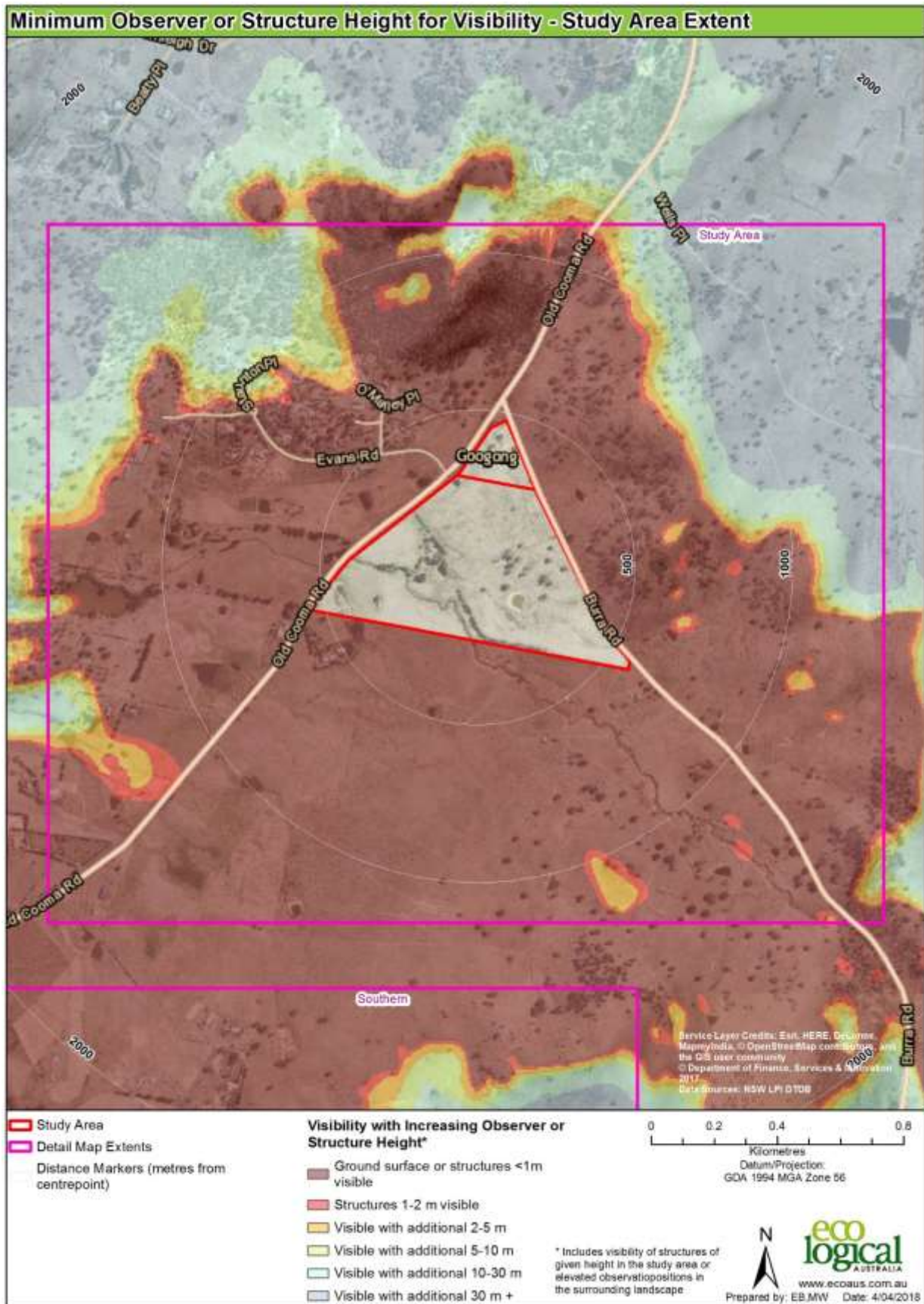


Figure 2-11: Site visibility from surrounding landscape positions with increased observer or structure height (Study Area Extent)

Visibility of the site is generally limited to the immediate area (up to 2 km to the south, less than 1 km in other directions), and higher ridgelines, mostly to the west and southwest (Table 2-4). Although more than 50% of the site is visible from over 1,000 ha of the surrounding landscape, many of the ridges from which the site is visible do not contain dwellings or public recreational facilities. Furthermore, many of these sites are more than 3 km away. At this distance, only larger buildings are likely to be discernible to a human eye. This assessment has not considered the screening effect of ground objects (other buildings or trees). Existing trees are likely to provide significant screening, particularly for distant viewing locations.

Table 2-4: Area with some visibility of the study site with increasing observer or structure height

Visibility Above Ground Level	Area (ha)	% of Study Area with Visibility at Given Structure/Observer Height
Ground or Structures/Observation Points <1m visible	1933	16%
Visible with additional 1 - 2 m	135	17%
Visible with additional 2 - 5 m	248	19%
Visible with additional 5 - 10 m	329	22%
Visible with additional 10-30 m	930	29%
Visible with additional 30 m +	8505	100%

2.9.3 Viewshed assessment limitations

The following limitations should be noted for the viewshed assessment:

- DEM has been developed from 10 m contours. Small changes in topography, particularly those associated with constructed embankments are unlikely to be included.
- The effect of screening from built objects or trees has not been considered. These factors will likely reduce the extent of visibility further.
- Limits to human ability to detect structures has not been fully considered beyond limiting the extent of modelling. While structures may be visible at distant locations, the extent to which objects fill a human field of vision will be significantly reduced.
- No assessment has been made as to the extent that visibility affects amenity within the surrounding landscape.
- No consideration has been given to placement of structures within the site and how this impacts the extent of visibility.

2.10 Social

The region to the south of Queanbeyan includes a number of areas designated as new growth areas, including Googong (where the proposed cemetery site is located), South Jerrabomberra and Royalla. Googong is a master planned township, with a projected population of 18,000 people in 6,200 residences over the next 20 years.

Googong currently includes a school, childcare centre, recreation centre, playgrounds and sporting fields, and a village centre incorporating a supermarket, café, health services, shops and a community centre. Further development of the town is projected to include construction of additional residential areas, shopping villages, recreational areas, a primary and secondary school, community centre and library.

Sensitive receptors close to the site include residential properties on 1291 Old Cooma Road and 102 Burra Road. Both properties share the southern boundary of the proposed site and appear to be used for grazing. The driveway to 1291 Old Cooma Road exits onto Old Cooma Road, just south of the proposed site and the driveway to 102 Burra Road exits onto Burra Road, just south-east of the proposed site.

The Mount Campbell Estate is located immediately west of the proposed site. The estate can be accessed via Evans Road, which runs off Old Cooma Road just south of the proposed site. Five properties to the east of the estate that can be accessed via O'Malley Place are closest to the proposed site (a minimum of approximately 170 m).

Other sensitive receptors close to the site include Fernleigh Park Community Hall, located approximately 1.6 km north-west of the proposed site on Swan Drive, and Avalanche Homestead (a sheep and cattle station that also operates as a farm stay and B&B and offers 4WD tours), located over 2 km south-east of the proposed site, on Burra Road.

Googong Foreshore is a recreational area located approximately 4 km east of the proposed site. The area is used for bushwalking, birdwatching, bike riding boating and fishing. No known tourist attractions are located close to the site.

2.10.1 Community engagement

A formal community consultation strategy is yet to be implemented by QPRC on the proposed use of the site as a cemetery, although information has been publicly available on the QPRC website and meetings.

In May 2017, the Canberra Times reported that local residents were rallying against the council over the proposed development. The Queanbeyan Age reported that the proposed cemetery was unlikely to be supported by residents of the Mount Campbell Estate. The main issue raised by residents in these media articles is the lack of community consultation and transparency about the proposal by the council. Other community concerns reported in the local newspapers include the potential for stormwater flooding at the site and the negative impact on one resident's visual amenity of the area.

Local media also reported that up to 50 people attended a community meeting on the proposed development in May 2017, with some residents voicing their objection to the cemetery.

3 Constraints analysis

The key constraints identified from the background studies include:

- Hydrology:
 - Extreme high flow events (less than 1% Annual Exceedance Probability [equivalent to 1 in 100 years]) may exceed the level of the creek banks at some locations.
 - Due to the absence of detailed survey information for the site, accurate modelling of the extent of drainage (overland) flows across the landscape cannot be undertaken.
 - Water quality impacts could occur to the creek through drainage across the site and erosion of creek banks.
 - 3rd order streams should maintain a 30 m vegetated riparian zone either side of the channel under the DPI Office of Water *Guidelines for Riparian Corridors on Waterfront Land*.
- Hydrogeology
 - Groundwater bore drilling depth information indicates that groundwater levels are deep and interaction (infiltration or recharge) with the proposed site activities is unlikely. However, as groundwater quality and levels cannot be conclusively verified through an absence of data, further groundwater assessment and monitoring may be required.
- Biodiversity
 - Paddock trees present within the site may provide habitat to a range of threatened fauna species.
 - Church Creek may support potential foraging habitat for the threatened bat species, the Southern Myotis.
- Archaeology
 - The margins of Church Creek are likely to be archaeologically sensitive, and it is likely that there are additional deposits of Aboriginal artefacts along the creek in a sub-surface and possibly *in situ* context.
 - Church Creek is classified as Key Fish Habitat.
- Social
 - Formal community engagement has not yet commenced for the proposal and has been raised as an issue by residents in the local media.

Table 3-1 below provides a detailed analysis of the project constraints identified in the background studies. The analysis includes a description of each constraint, an assessment of the level of significance and proposed management actions to mitigate the impacts of the constraints on the proposal.

Table 3-1: Summary of key environmental constraints

Item	Description	Significance	Action required / Mitigation
Hydrology			
Overflows from Church Creek	<p>Preliminary modelling based on creek depths indicates that extreme high flow events (less than 1% Annual Exceedance Probability [equivalent to 1 in 100 years]) may exceed the level of the creek banks at some locations, causing inundation across sections of the site. Due to the absence of detailed survey information for the site, accurate modelling of the extent of these flows across the landscape cannot be undertaken.</p> <p>However, the modelling undertaken indicates that flow events up to the 1% AEP event would be contained within the creek banks for all of the site, and larger events would be contained for some sections.</p>	Medium	<ul style="list-style-type: none"> A detailed survey should be undertaken on the site to allow for more conclusive flood modelling. Consideration of mitigation measures may be required, although these would be expected to be minor such as earthworks to form levees.
Site drainage	Due to the absence of detailed survey information for the site, accurate modelling of overland drainage across the site was not completed.	Low	<ul style="list-style-type: none"> Further modelling should be undertaken once detailed site survey information has been obtained. Appropriate stormwater infrastructure should be incorporated into site plans based on the results of the modelling.
Water quality	Ground disturbance during construction and operation could result in water quality impacts to Church Creek through site drainage. Existing erosion points occur along Church Creek.	Low	<ul style="list-style-type: none"> Appropriately designed stormwater infrastructure including sediment and erosion control should be incorporated into the site design. The banks within Church Creek may need to be armoured to protect the surrounding site from encroachment from the Creek. Any works would need to observe archaeological constraints (below).

Item	Description	Significance	Action required / Mitigation
Riparian zone	Church Creek is a 3 rd order stream, requiring a 30 m vegetated riparian zone to be maintained either side of the channel under the DPI Office of Water <i>Guidelines for Riparian Corridors on Waterfront Land</i> .	Medium	<ul style="list-style-type: none"> • Ensure the design plans incorporate a 30 m vegetated riparian zone either side of Church Creek. • Permissible development listed in the <i>Guidelines for Riparian Corridors on Waterfront Land</i> should only be undertaken in consideration of the abovementioned constraints to Church Creek. • Any works, including enhancement and conservation works would need to observe archaeological constraints (below).
Hydrogeology			
Absence of groundwater data	<p>A high level / qualified assessment of available online databases could not identify water quality/ water level data from the registered bores within the study area.</p> <p>Groundwater bore drilling depth information indicates that groundwater levels are deep and interaction (infiltration or recharge) with the proposed site activities is unlikely. However, as groundwater quality and levels cannot be conclusively verified through an absence of data, further groundwater assessment and monitoring may be required</p>	Medium	<ul style="list-style-type: none"> • Conduct sampling rounds for water quality assessments/ water level measurements at existing bores to obtain accurate data for the site.
Biodiversity			
Paddock trees as potential threatened fauna habitat	Nine hollow-bearing paddock trees were identified at the site. These may provide potential habitat for a range of threatened of bird, arboreal mammal and bat species. Removal of these trees will require prior survey for targeted threatened species and may result in an offset requirement for which QPRC may decide to 'opt in'.	High	<ul style="list-style-type: none"> • Avoid disturbance to hollow bearing trees. • Incorporate existing paddock trees into design plans. • Ensure the appropriate surveys and consideration of impacts is undertaken

Item	Description	Significance	Action required / Mitigation
			where disturbance to hollow-bearing trees is proposed.
Church Creek as potential habitat for threatened fauna	Church Creek may support potential foraging habitat for the threatened bat species, the Southern Myotis.	Medium	<ul style="list-style-type: none"> The site design should incorporate the required vegetated zone as stated above. Habitat enhancement and conservation works would need to observe archaeological constraints (below).
Archaeology			
Archeologically sensitive zone along the banks of Church Creek	<p>Eleven Aboriginal archaeological sites were identified within 100 m of the channel of Church Creek. This suggests that the margins of Church Creek are considered archaeologically sensitive zone, and it is likely that there are additional deposits of Aboriginal artefacts along the creek in a sub-surface and possibly <i>in situ</i> context.</p> <p>The 11 sites identified are protected under the NPW Act. It is an offence to disturb or damage these sites without first having obtained an Aboriginal Heritage Impact permit (AHIP) from the Office of Environment and Heritage. To obtain an AHIP further archaeological assessment in the form of an Aboriginal Cultural Heritage Assessment (ACHA), including sub-surface testing, will be required. This process will take a minimum of 20 weeks and include mandatory consultation periods with Aboriginal stakeholders.</p> <p>If any works or activity that could potentially disturb the ground surface including earthworks, construction, installation of services, landscaping (including planting and stream bank stabilisation measures) are proposed within the identified zone of archaeological sensitivity then an ACHA including sub-surface testing will be required.</p>	High	<ul style="list-style-type: none"> Avoid disturbance within the archaeologically sensitive zone. Include avoidance of the archaeologically sensitive zone in design plans. Ensure the correct ACHA is undertaken, and AHIP obtained if required, where disturbance to the archaeologically sensitive zone is proposed. This would likely include any proposed bank stability and remediation works.
Social			
Community engagement	Local media reports have suggested that there is community opposition to the proposal.	High	<ul style="list-style-type: none"> Develop and implement a community engagement strategy.

4 Recommended management measures

Management measures to mitigate impacts and minimise constraints to the proposal were developed for each of the individual background studies. These are summarised below, however, the individual studies should be reviewed to provide full detail.

4.1 Geology

The geotechnical investigation report includes detailed management measures and engineering specifications relating to:

- Building footings
- Excavation Conditions & Use of Excavated Material
- Stable excavation batters
- Low retaining walls
- Controlled fill construction
- Design CBR values
- Earthquake site factor
- Site drainage.

These should be reviewed in detail when developing design and construction plans.

4.2 Hydrology and hydrogeology

The following recommended management measures focus on further assessment and to better inform the hydrology, hydrogeology, water quality, and flooding aspects of the site:

- A detailed survey of the land contours and creek bathymetry needs to be undertaken to be able to accurately model the likely flood extents from Church Creek.
- Hydraulic modelling should be updated based on the recommendation above to provide flood extents for the property from Church Creek.
- Further modelling of site drainage and appropriate stormwater infrastructure should be incorporated into site designs.
- A climate change assessment of the hydrological aspects in the project area might be undertaken based on Australian Rainfall and Runoff guidelines.

4.3 Biodiversity

Mitigation measures and further assessment and approval requirements for flora and fauna at the site are detailed above in Section 3. The following management measures are recommended to further minimise impacts and conserve the biodiversity values of the site:

- A Construction Environmental Management Plan (CEMP) should be prepared prior to the commencement of any works. The CEMP should address potential issues which could arise during the construction phase of the proposal, including silt control and oil/fuel/chemical storage/spill management resulting in potential pollution or contamination.

- A Vegetation Management Plan should be developed for the site, with an emphasis on managing and restoring aquatic habitats and vegetation communities.
- Existing native vegetation should be retained. Additional plantings should utilise native species of local provenance to the greatest extent possible.
- Any waterway crossings should be designed and constructed in accordance with relevant guidelines. Crossings are to be designed to allow adequate fish passage during operation. Bridge, arch structure, culvert or fords should be designed in accordance with the preferred crossing type (in that order).
- The timing of works should coincide with low flow periods
- If dewatering of pools or farm dams is required, a qualified aquatic ecologist should be engaged to relocate fish and other aquatic fauna upstream.

4.4 Heritage

Mitigation measures and further assessment and approval requirements for Aboriginal archaeological sites are detailed above in Section 3. The following management measures are recommended to further minimise impacts and conserve the heritage values of the site:

- Aboriginal objects are protected under the NPW Act regardless if they are registered on AHIMS or not. If suspected Aboriginal objects, such as stone artefacts or midden material (shell) are discovered during future works, works must cease in the affected area and an archaeologist called in to assess the finds. If the finds are found to be Aboriginal objects, the OEHL must be notified under section 89A of the NPW Act. Appropriate management and avoidance or approval under a section 90 AHIP should then be sought if Aboriginal objects are to be moved or harmed.
- In the extremely unlikely event that human remains are found, works should immediately cease, and the NSW Police should be contacted. If the remains are suspected to be Aboriginal, the OEHL may also be contacted at this time to assist in determining appropriate management.

No impacts are expected to occur to non-Aboriginal heritage items as a result of the proposal, and as such, no further management measures are recommended.

4.5 Noise

Predicted noise impacts were found to be insignificant and not requiring specific mitigation measures to minimise noise to acceptable levels. Notwithstanding, the following measures are recommended for the construction and operational phases of the proposal to ensure noise levels are minimised and maintained:

Recommended management measures for construction noise and vibration include:

- Manage construction noise in accordance with guidance provided in the relevant guidelines (listed in the noise impact assessment report).
- Construction works to be scheduled within the standard hours nominated in the relevant guidelines. These hours are Monday to Friday 7.00 am to 6.00 pm, Saturday 8.00 am to 1.00 pm. No works on Sunday or public holidays.
- Where feasible, consider setting of solid construction hoarding to act as a noise barrier.
- Notify the surrounding receivers of the proposed construction program and upcoming specifically noisy activities.

- Adopt construction practices that will result in a lower noise impact where feasible as well as general good practice with the view of minimising construction noise.
- Discourage construction personnel from engaging in anti-social behaviour and unnecessary noise-generating activities.

Recommended management measures for operational noise and fixed plant include:

- Where possible, position these noise sources strategically on the subject development block (e.g. furthest from all sensitive receivers).
- More detailed acoustic assessment should be undertaken as soon as more detail on the proposed site is available.
- Limit the speed of on-site vehicles.
- Avoid any discontinuities along the access road as well as car park areas.
- These include traffic calming devices, humps, joints, boom gates or the like.
- Signage to discourage noisy driving behaviour such as honking, excessive/unnecessary accelerating.
- Limit any truck's access to site to occur during the day and evening time periods only.

4.6 Traffic

The transport impact assessment concluded that current and existing future upgrade plans for roads and intersections will be sufficient to accommodate any increased traffic associated with the proposal. The following recommendations should be considered by QPRC in the site design and future planning:

It is estimated that the site could generate a peak parking demand of 150 vehicles. Therefore, the site should be designed to accommodate approximately 150 spaces which would ideally be dispersed across the site.

- The car parking provisions would need to accommodate two to three per cent as accessible spaces.
- It is recommended that the site access be provided along Burra Road with the following provisions:
 - Positioned approximately 240 metres south of the intersection of Old Cooma Road and Burra Road
 - Include a right turn bay on Burra Road to accommodate the vehicle peak arrivals
 - Speed limit reduction on Burra Road from 100 kilometres per hour to 80 kilometres per hour.
- It is recommended that peak hourly intersection counts at the Old Cooma Road and Burra Road intersection be completed and used in any subsequent traffic assessments as part of the future development applications.
- Consideration for alternative transport modes including public transport and ride share services should be made to ensure access to the site for those that do not have access to a private vehicle.

4.7 Visual

The viewshed assessment is based on digital elevation data and doesn't include any design plans or proposed building heights or structures associated with the cemetery proposal. It is recommended that more detailed assessment be undertaken incorporating detailed site design, once available, and impacts on specific receptors of concern which may be identified through future community engagement. General recommendations for visibility include the retention of existing vegetation and site landscaping to include perimeter trees to provide further screening.

4.8 Social

Potential social issues were discussed in the social report, including amenity (noise, air and visual), traffic and access, safety and economic concerns. However, these will require further refinement and verification once stakeholder engagement is conducted by QPRC to accurately understand community concerns. Therefore, the key recommendation for the social aspect of the proposal is to develop and commence a community and stakeholder engagement strategy. The suggested approach to developing the strategy is detailed in the social report and includes community engagement forums such as drop-in sessions, workshops and government engagement. Should the proposal progress, community and stakeholder review and comment on design plans at the DA stage should be undertaken.

5 Relevant planning provisions and legislation

The proposal requires consideration under a number of planning and legislative instruments. Detail is provided in this report on the Queanbeyan LEP and directions issued by the Minister for Planning to relevant planning authorities under section 9.1 (formerly 117) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

Legislation specific to each of the individual background studies is listed, however, the individual studies should be referred to for detail.

5.1 Queanbeyan LEP

The Queanbeyan LEP 2012 makes local environmental planning provisions for land in the Queanbeyan-Palerang Regional Local Government Area (LGA) in accordance with the relevant standard environmental planning instrument under section 3.2 (formerly 33A) of the EP&A Act. The subject lots are located on land which is currently zoned as E4 Environmental Living. Council has prepared a planning proposal to allow for a cemetery on the subject land. This requires the definitions of ‘cemetery’ to be added to Schedule 1 Additional Permitted Uses as these land uses are otherwise prohibited in the E4 Environmental Living zone. This will be done as an amendment to the Queanbeyan LEP.

Clause 5.10 of the LEP details the aspects which must be considered for heritage conservation. This includes assessment and management planning provisions to ensure that the heritage values of a development site are conserved. The Statement of Heritage Impact and Aboriginal Due Diligence assessment prepared by ELA for the site satisfies the assessment conditions of this clause. Management measures and requirements for further assessment, planning and approvals are summarised above in Section 3 and 4, with full detail provided in the individual reports.

Clause 7.1 of the LEP states the criteria for granting consent for earthworks or development involving ancillary earthworks. This clause lists all the relevant considerations QPRC must make prior to commencing earthmoving works at the site. These include provisions already undertaken as part of the background studies, including heritage items and visual amenity. The geotechnical investigation report prepared by ACT Geotechnical Engineers in 2017 contains detailed information on earthworks procedures and control measures, which will ensure that all provisions of the Clause 7.1 are met.

Pursuant to clause 7.2, the objectives of the LEP for flood planning include minimising the flood risk to life and property associated with the use of land, allowing development on land that is compatible with the land’s flood hazard and considering climate change and avoiding significant adverse impacts on flood behaviour and the environment. The clause applies to land at or below the flood planning level. For the purposes of the LEP, “land at or below the flood planning level” means the level of a 1:100 ARI (Average Recurrence Interval) flood event plus 0.5 metres freeboard. Further assessment is required to understand the flooding extent of the site and determine what portions of the site are within the flood planning level.

Clause 7.3 of the LEP require the consent authority to consider terrestrial biodiversity. The comprehensive flora and fauna assessment undertaken for the site satisfies the assessment provisions of the clause. Consideration and implementation of the recommended management measures, as summarised above in Section 4 and detailed in the flora and fauna assessment, will ensure that the provisions of Clause 7.3 are met.

Pursuant to clause 7.4, the objective of the LEP for riparian land and watercourses include protecting and maintaining water quality within water courses, stability of bed and banks, aquatic and riparian habitats

and ecological processes. This clause applies to land identified as “Watercourse” on the Riparian Lands and Water Courses Map and all land within 40 m of the top of the bank of each watercourse on that land. QPRC must consider all potential adverse impacts to riparian and watercourses, whether the development is likely to increase water extraction and any appropriate measures to avoid minimise and mitigate impacts of the development. Church Creek which flows through the site is also marked on the LEP Riparian and Watercourses Map.

5.2 Environmental Planning and Assessment Act 1979

5.2.1 S9.1 Directions

Local governments must follow certain directions when preparing planning proposals for new and amended LEPs. The directions cover the following broad categories:

- employment and resources
- environment and heritage
- housing, infrastructure and urban development
- hazard and risk
- regional planning
- local plan making.

The specific directions relevant to this proposal include Section 6.2, reserving land for public purposes. The planning proposal application made to DPE by QPRC satisfies the conditions of this section. The heritage and environment clauses will remain consistent with the current LEP and therefore these directions are not likely to require further consideration.

6 Conclusion

The site has been comprehensively assessed for environmental constraints through the undertaking of detailed background studies. Key constraints to the development of the site include heritage, biodiversity and hydrology impacts should the proposal impact Church Creek, and biodiversity impacts should the removal of key habitat features (hollow-bearing trees) be required. Consideration and implementation of the mitigation measures and recommended management strategies would be expected to minimise these constraints and allow the proposal to proceed at the site without the need for significant further approval or assessment.

Further less significant constraints relate mainly to a lack of information on the site and can be satisfied following further technical investigation if the proposal is to proceed.

A community and stakeholder engagement strategy should be developed and implemented in accordance with the recommendations of the social report at the earliest possible stage of the proposal. This will allow identification and refinement of potentially unknown social constraints and development of further management measures where required.

References

ACT Geotechnical Engineers 2017. *Geotechnical investigation report – 1241 Old Cooma Road, Googong NSW*. Report prepared for Queanbeyan-Palerang Regional Council

Coffey 2018. *Social report – Proposal memorial park south of Queanbeyan*. Report prepared for Queanbeyan-Palerang Regional Council

Eco Logical Australia 2018. *Aboriginal Due Diligence assessment - proposed development of Lot 2 DP 112382, 1241 Old Cooma Road, Googong NSW 2620 and Lot 126 DP 754881, 1187 Old Cooma Road, Googong NSW 2620*. Letter report prepared for Queanbeyan–Palerang Regional Council

Eco Logical Australia 2018. *Statement of Heritage Impact - proposed development of Lot 2 DP 112382, 1241 Old Cooma Road, Googong NSW 2620 and Lot 126 DP 754881, 1187 Old Cooma Road, Googong NSW 2620*. Letter report prepared for Queanbeyan–Palerang Regional Council

Eco Logical Australia 2018. *Proposed cemetery site, Old Cooma Road – Hydrological assessment*. Prepared for Queanbeyan–Palerang Regional Council

Eco Logical Australia 2017. *Old Cooma Road Cemetery – Planning Proposal: Flora and fauna study*. Report prepared for Queanbeyan-Palerang Regional Council

WSP 2018. *Noise Impact Assessment – New cemetery at 124 Old Cooma Road, Googong*. Report prepared for Queanbeyan-Palerang Regional Council

WSP 2018. *Transport Impact Assessment – New cemetery at 124 Old Cooma Road, Googong*. Report

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