

Chapter 28
Visual amenity

ESMERALDA GRAPHITE PROJECT

aarc ENVIRONMENTAL SOLUTIONS
APEM Group

GRAPHINEX

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Glossary, acronyms and abbreviations

Acronym or Abbreviation	Meaning
AHD	Australian Height Datum
DEHP	Department of Environment and Heritage Protection
DEM	Digital elevation model
DES	Department of Environment and Science
DESI	Department of Environment, Science and Innovation
EA	Environmental Authority
EIS	Environmental Impact Statement
MLA	Mining Lease Application
NRM	Natural resource management
PRCP	Progressive rehabilitation and closure plan
SRTM	Shuttle Radar Topography Mission
TOR	Terms of Reference
TSF	Tailings Storage Facilities
WRD	Waste rock dump

28 Visual amenity

This chapter describes the visual amenity of the Project area and surrounds; and assesses the potential changes to the landscape character, visual amenity, and lighting impacts caused by the proposed Project.

As a general definition, the landscape character describes any key natural landscape features of the area; whereas the visual amenity describes the pleasantness of the views seen from a particular location. To determine the impact of lighting, the assessment describes the proposed Project's potential impacts, including light spillage and skyglow, on identified sensitive receptors and native nocturnal fauna.

The assessment considered and applied the following guidance:

- Australian Institute of Landscape Architects, Guidance Note for Landscape and Visual Assessment, 2018; and
- Landscape Institute and Institute of Environmental Management and Assessment, Guidelines for Landscape and Visual Impact Assessment, 2013.

The guidance, Landscape Institute, Photography and photomontage in landscape and visual impact assessment, 2018, was considered. However, photography and photomontage were determined not to provide any additional benefit to the methods utilised in the assessment, to quantify the pre-mining visual amenity or assessing the impact of the project. This is because the project cannot be seen from the identified sensitive receptors during daylight hours.

28.1 Environmental objectives

The purpose of this chapter is to identify the existing landscape character and visual amenity values in the impact assessment area; assess the potential impacts, including from light spillage and skyglow; and identify appropriate mitigation measures to address impacts relevant to visual amenity.

This chapter has been prepared to enable an assessment of the Project with respect to the environmental objectives stated in the Terms of Reference (TOR) in relation to visual amenity. A compliance review of this chapter content against the relevant components of the TOR is in Section 28.6 of this chapter.

28.2 Existing environment

28.2.1 Regional landscape and land use context

The Project is located within the Gulf Savannah natural resource management (NRM) region, with land surrounding and underlying Project site, used for low-intensity cattle grazing and resource exploration activities. Queensland Land Use Mapping classifies the Project site and surrounding area as 'Grazing Native Vegetation' (DES 2023) (Figure 28-8).

There are no recorded sites of cultural significance recorded in the vicinity of the Project area or protected areas (Chapter 11, First Nations cultural heritage, Chapter 12, Non-Indigenous cultural heritage, Chapter 18 Flora and Fauna). There is no recognised tourist area in the vicinity of the Project area (Chapter 9, Land use planning).

28.2.2 Vegetation

The Project is located 70 km south of Croydon, within the Gulf Plains Bioregion. This bioregion is dominated by grasslands (Figure 28-1), Eucalypt woodlands (Figure 28-2), *Melaleuca* and *Acacia* (Figure 28-3), which cover the landscape of plains and river channels, comprising clay and alluvial soils (DEHP 2015). Minor depressions have resulted in some seasonal swamp-type ecosystems (Figure 28-4).

The entire Project area is vegetated with remnant vegetation. No areas of high-value regrowth or non-remnant vegetation were identified.

Regional ecosystems in the Project area, as verified through field surveys and by the Queensland Herbarium, are listed in Table 28-1. Habitat associated with these regional ecosystem types, and the fauna species which may utilise this habitat, is presented in Chapter 18 (Flora and Fauna), and Appendix E (Terrestrial Ecology Baseline Report).

Table 28-1: Field-verified regional ecosystems in the study area

RE	Description	VM Act status	Biodiversity status[2]	Average canopy height
RE 2.3.22	Long-fruited Bloodwood (*Corymbia polycarpa*) and *Melaleuca* spp. woodland on sandy channels and levees	Least concern	Of concern	7 to 11 m
RE 2.3.26a	River Red Gum (*Eucalyptus camaldulensis*) woodland to low woodland, with *Melaleuca* spp., on fringes and in channels of minor watercourses	Least concern	Of concern	8 to 12 m
RE 2.3.26a / 2.3.50a	River Red Gum (*Eucalyptus camaldulensis*) low woodland, with *Melaleuca* spp., fringing minor watercourses, with areas of bare sand and rock, and scattered vegetation in channels	Least concern	Of concern	8 to 12 m
RE 2.3.26c	River Red Gum (*Eucalyptus camaldulensis*) low woodland, with Broad-leaved Paperbark (*Melaleuca viridiflora*), on fringes of minor watercourses in broad sand sheets	Least concern	Of concern	8 to 12 m
RE 2.3.29b	*Melaleuca* spp. low open woodland to low woodland on alluvial plains and drainage depressions	Least concern	No concern at present	4 to 9 m (11 m emergent layer)
RE 2.3.41	Annual tussock grassland on alluvial plains	Least concern	Of concern	Sparse tree layer to 11 m
RE 2.3.42b	Coolibah (*Eucalyptus microtheca*) low open woodland to woodland on alluvial plains	Least concern	Of concern	8 m
RE 2.3.55d	Seasonal swamp (wooded). Broad-leaved Paperbark (*Melaleuca viridiflora*) low woodland in shallow closed depressions on sand sheets	Least concern	Of concern	Sparse tree layer 10 to 14 m
RE 2.3.61c	Seasonal swamp (wooded). Coolibah (*Eucalyptus microtheca*) and Broad-leaved Paperbark (*Melaleuca viridiflora*) woodland in closed depressions on alluvial plains	Least concern	No concern at present	Sparse tree layer 10 to 14 m
RE 2.5.14a	Broad-leaved Paperbark (*Melaleuca viridiflora*) low open woodland to low woodland on sand sheets	Least concern	No concern at present	6 m

RE	Description	VM Act status	Biodiversity status[2]	Average canopy height
RE 2.5.14a / 2.5.17b / 2.3.29b / 2.3.51	Mixed community of *Melaleuca* spp. low open woodland to low woodland on fringes of alluvial plains and sand sheets, with seasonal swamps of River Red Gum (*Eucalyptus camaldulensis*) woodland	Least concern	No concern at present	6 m
RE 2.5.17b	Gulbarn (*Melaleuca citrolens*) low open woodland to low woodland on broad sand sheets	Least concern	No concern at present	6 m (10 m emergent layer)
RE 2.5.18a	Rough-leaved Bloodwood (*Corymbia setosa*) low open woodland to woodland on broad sand sheets	Least concern	No concern at present	6 to 10 m
RE 2.5.28a	Long-fruited Bloodwood (*Corymbia polycarpa*) woodland on broad plains of reworked sand deposits	Least concern	No concern at present	6 to 10 m

[1] Status may be: Endangered; Of concern; or Least concern. [2] Status may be: Endangered; Of concern; or No concern at present.



Figure 28-1: Annual tussock grassland



Figure 28-2: Eucalypt woodland along creeks



Figure 28-3: Paperbark woodland



Figure 28-4: Seasonal swamp

28.2.3 Topography

The local area is generally flat to gently sloping upwards to the east, with elevations ranging between 120 m and 140 m Australian Height Datum (AHD) (Figure 28-6). Elevation gently slopes upwards towards the east/south-east.

28.2.4 Hydrology

The Warrigal Creek, a 5th order stream that converges with the Clara River, is located to the south of the Project and intersects the western corner of the Project area. The Warrigal Creek originates approximately 50 km south-east of the transport corridor MLA boundary, flowing north-west before converging with the Borer River and flowing into the Clara River, approximately 45 km north-west of the MLA boundary. Several unnamed, ephemeral waterways (tributaries of Warrigal Creek) traverse the Project area (Figure 28-7). The proposed mining pit for the Project intersects a section of an unnamed tributary of Warrigal Creek – a stream order 3 waterway (Figure 28-5). This waterway has a moderate size catchment (114 km^2) and flows in an east west direction through the Project area.

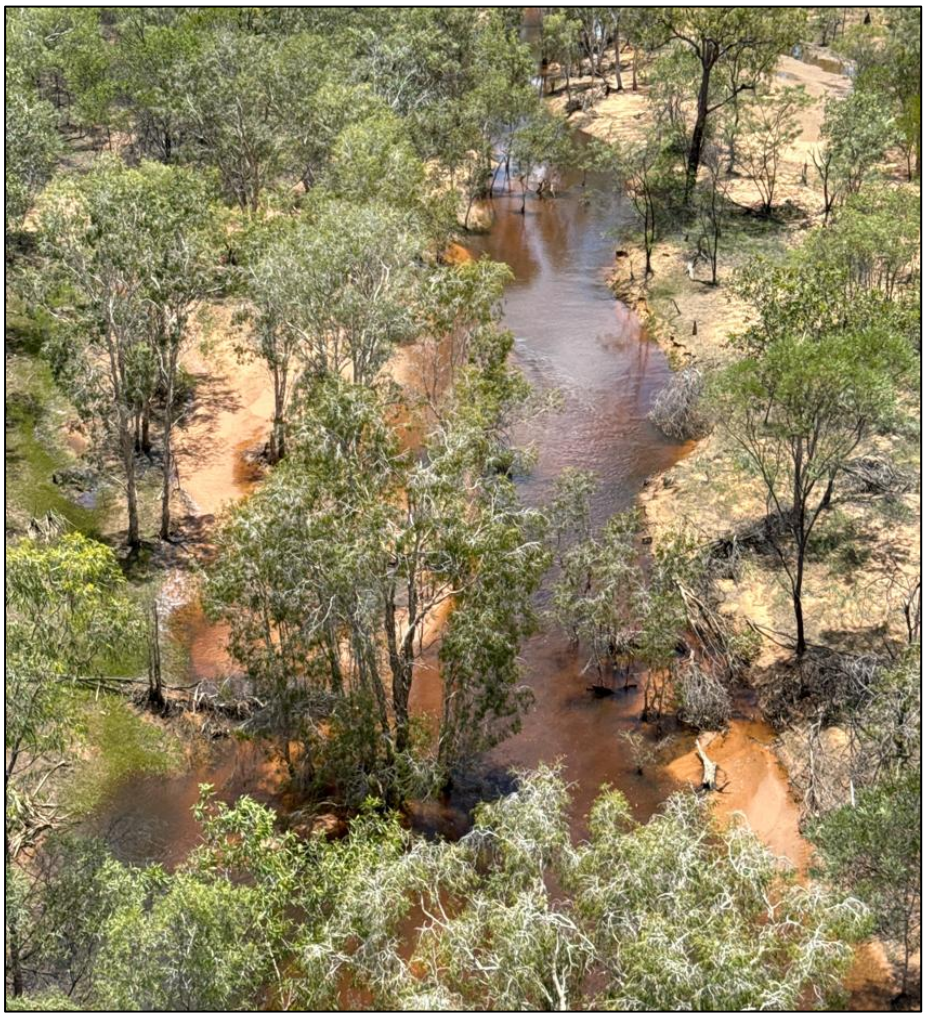


Figure 28-5: Unnamed tributary of Warrigal Creek

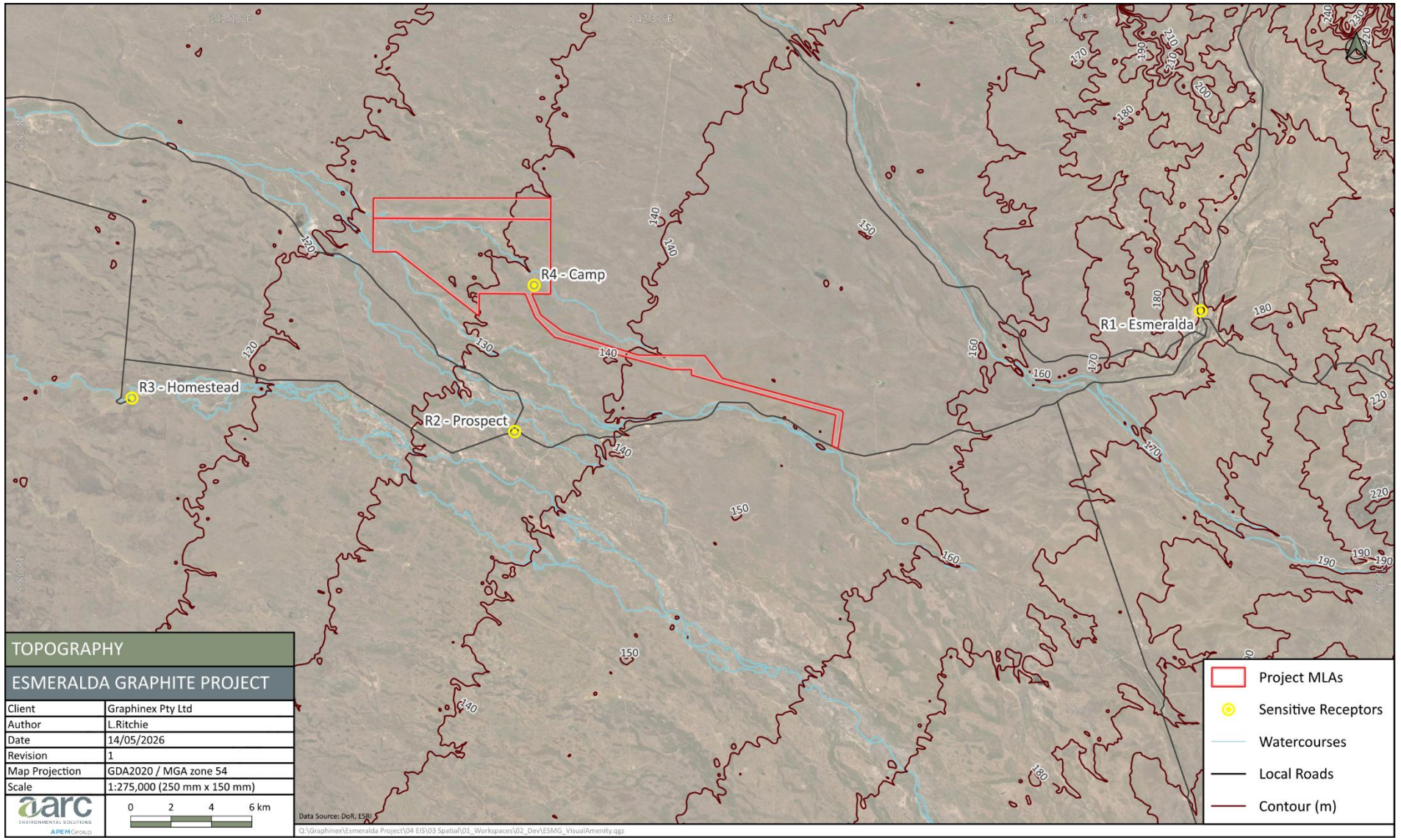


Figure 28-6: Regional topography

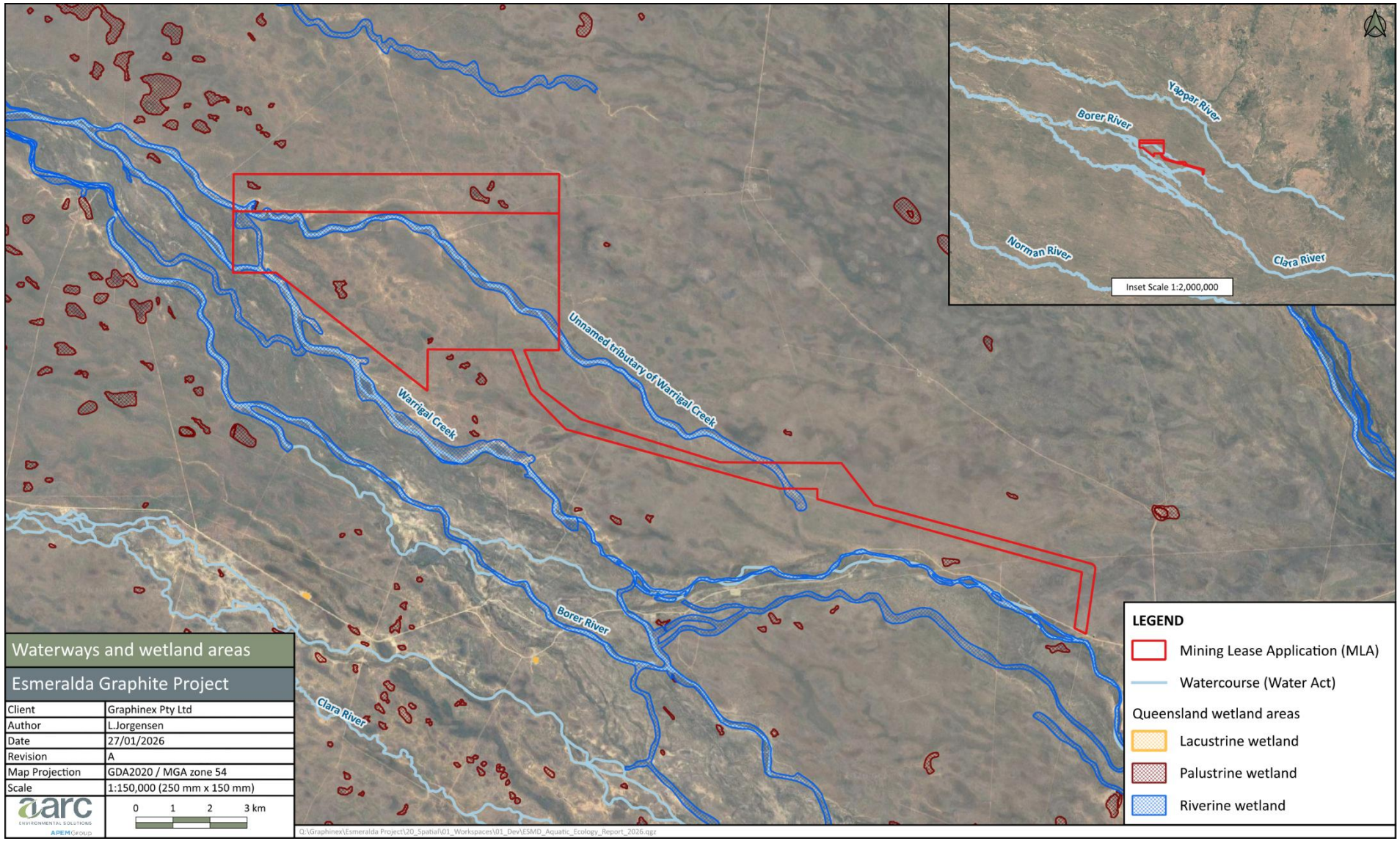


Figure 28-7: Waterways and wetlands in relation to the Project area

28.2.5 Sensitive receptors

The Project is located in a rural area surrounded by grazing land. There are isolated residences in the vicinity of the Project. The closest town is Croydon, which is located approximately 70 km north of the Project.

The nearest receptors that could be visually impacted by the Project are listed in Table 28-2 and displayed in Figure 28-8. These receptors are the nearest receptor to the Project in their respective directions and have the potential to be impacted by the Project. Receptor 2 (Prospect homestead) is the nearest sensitive receptor, approximately 7 km from the Project footprint.

The proposed on-site mine camp (R4) is subject to special conditions that limit it's applicability for consideration as a sensitive receptor. Specifically, it is noted that according to DESI (2017), '*the terms 'sensitive place' and 'commercial place' … do not include places that are within the boundaries of the mining lease, nor places that are owned or leased by the holder of the authority or its related companies. For example, a mining camp operated by the EA holder would not be a sensitive place'*. As such, the mine camp (R4) not considered in detail within this assessment. Notwithstanding this, it is acknowledged that human health related considerations will be monitored by the proponent to ensure the health and safety of resident contractors and employees is managed.

Table 28-2: List of nearest receptors and distance from MLA

Receptor ID[1]	Receptor description	Easting (GDA2020, Zone 54)	Northing (GDA2020, Zone 54)	Approximate distance (km) and direction from the Project footprint	Approximate distance (km) and direction from the Project access road
R1 – Esmeralda Homestead	Residential	665762	7914629	33 km east	18 km east
R2 – Prospect Homestead	Residential	631806	7908655	7 km south	5 km south-west
R3 – Homestead	Residential	612870	7910311	16 km south-west	20 km west
R4 - Camp	Mining camp	632773	7915899	0.5 km east	0.2 km east

Additionally, native nocturnal fauna, such as some bird and bat species that may be awake or active at night, live in proximity to the Project area and could potentially be impacted by Project lighting (Appendix E, Terrestrial Ecology Baseline Report).

The non-indigenous cultural heritage (NICH) report (Converge 2026) has indicated there are no potential NICH sites. Therefore, no NICH sites exist that could be considered sensitive receptors.

The Aboriginal and Torres Islander Strait cultural heritage database and register search report (DSDSATIP 2025) includes a number of search results, however, the nearest cultural heritage site is approximately 15 km from the access road, and 30 km from the pit and waste rock dumps (Figure 28-9).

The Esmeralda Nature Refuge (a state protected area established under the Nature Conservation Act 1992 (NC Act)), is located approximately 40 km east of the Project – and may have some tourism value. Due to the distance from the Project site, and topographical context of the region, this Nature Refuge is not considered a sensitive receptor for Visual Amenity purposes.

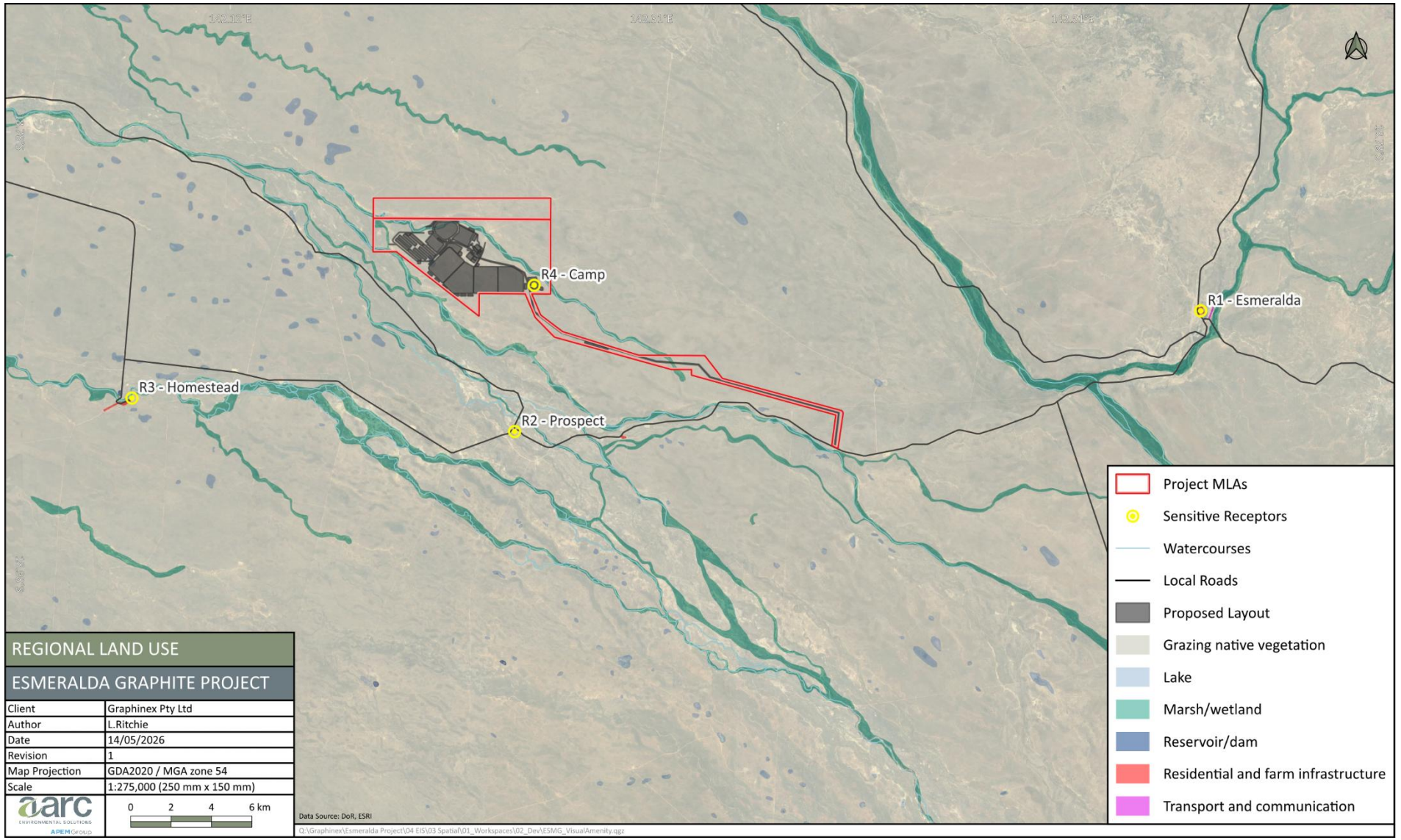


Figure 28-8: Regional land use and sensitive receptors

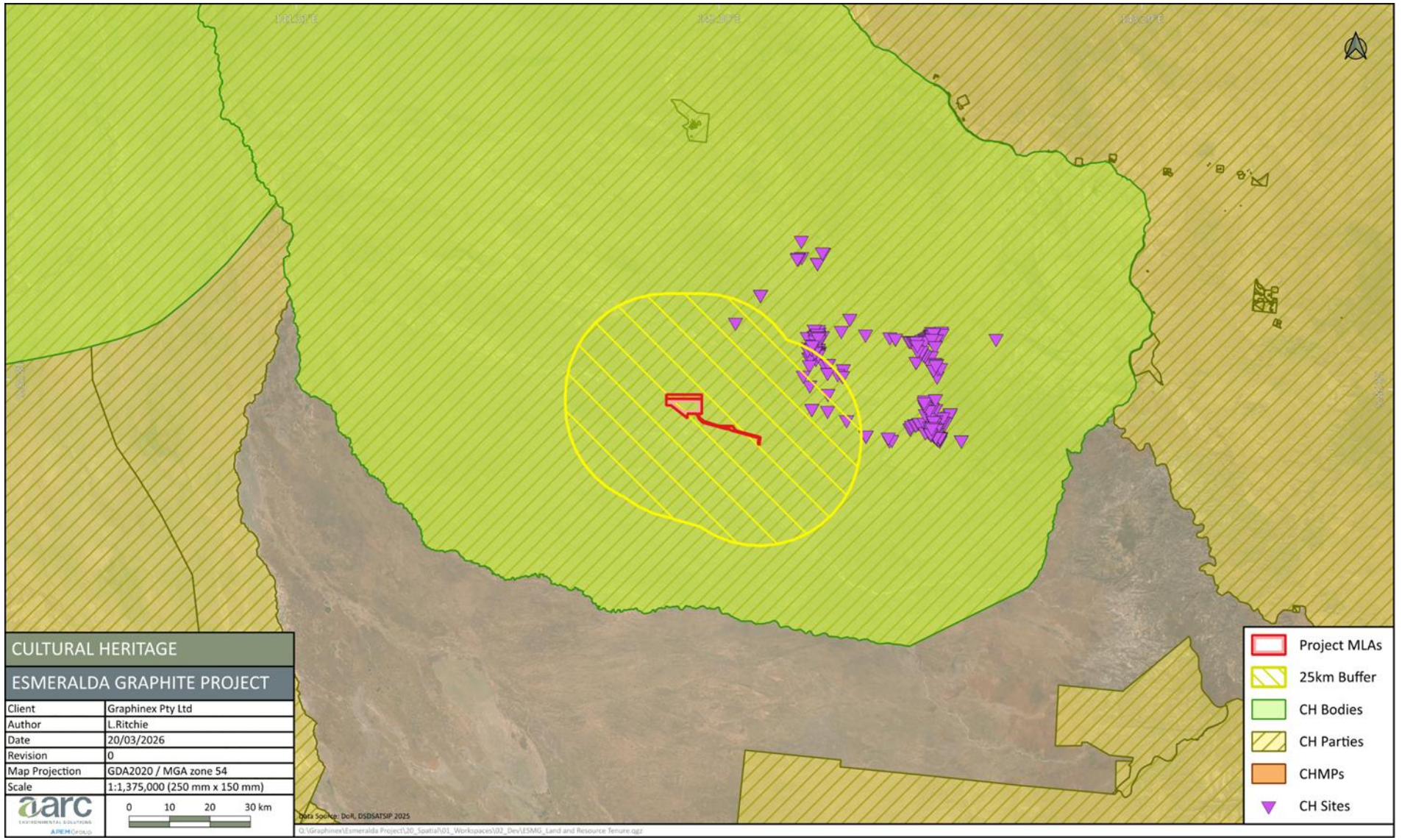


Figure 28-9: Recorded Aboriginal cultural heritage

28.2.6 Sensitivity of the existing landscape

The landscape surrounding the Project is assessed as being a low-sensitivity environment, which has a relatively high capacity to absorb changes to visual amenity. The topography is generally flat to gently sloping (as per Section 28.2.3), with a surrounding land-use of low-intensity cattle grazing across cattle stations which span thousands of hectares. The landscape type is not considered to be relatively rare nor distinctive, within either the Gulf Plains Bioregion or Queensland. Sensitive receptors are sparse and distant from the Project area. This includes the distance to homesteads, the closest mapped cultural heritage site, and further to the Esmeralda Nature Refuge, which reduce the sensitivity of the landscape to visual change.

The capacity of the landscape to absorb change to the existing visual landscape is supported by the context of the existing environment. That is, wooded vegetation – as part of the broader extensive remnant vegetation setting – surrounds the Project area and the sensitive receptors, and has a canopy generally between 6 m to 12 m in height. This would reasonably be expected to act as a visual screen. Topography to the east, approaching sensitive receptor R1 and the nearest mapped cultural heritage site, rises to an elevation that closely matches the maximum height of the waste rock dumps (WRDs) (as detailed in Section 28.2.7), which would shield views for these receptors.

On this basis, the landscape is assessed as having low sensitivity (very few visual impacts would be experienced as a result of the proposed change to the visual environment) and a high capacity to absorb the change proposed by the Project, both during operations and in the post-closure form.

28.2.7 Relevant Project features

Depending on elevation and a feature's height above the surface, the scale and magnitude of visual amenity and lighting impacts ('visual impacts' or 'the impacts') on sensitive receptors may vary. Hence, as the proposed Project progresses and the features of the Project change (e.g. the WRD increases or decreases in elevation), the scale and magnitude of the Project impacts may also change.

In this assessment, two scenarios have been considered: the maximum (temporary) theoretical visual amenity and lighting impacts of the Project; and the permanent visual impacts of the rehabilitated landforms. The theoretical visual amenity and lighting impacts do not consider vegetation acting as a visual barrier; so that they represent the maximum possible visual impacts in a theoretical world consisting of bare ground and infrastructures only.

The Project's WRDs, TSFs, and roads; which include the haul roads and mine access road; are the Project features that may cause visual amenity and lighting impacts on sensitive receptors. The Project will be a 24-hour operation, and therefore, it is expected that there will be lighting impacts arising from operating the mobile plant and other infrastructure utilised on-site.

28.2.7.1 Waste Rock Dumps (WRD)

The WRDs height above the surface will vary over the various stages of the Project, during operations and rehabilitation. The current land elevation of the proposed WRD sites is 125m (AHD). As the proposed Project progresses, the land elevation is expected to increase. In year 40 (in operations):

- the western WRD will reach an estimated maximum height of 109 m above the current surface (234 mAHD); and
- the eastern WRD is estimated to reaching a maximum peak height of 90 m above the current surface (215 mAHD) (Figure 28-10).

The WRDs will be the tallest features on the Project site and therefore produce the maximum theoretical visual amenity and lighting impacts. Mobile plants with lighting, including earthmoving machinery and haul trucks, will be operating on each WRD landform. There will also be infrastructure with lighting during the operational Project stage. Only the western WRD will remain post closure (Figure 28-10, Figure 28-11).

28.2.7.2 Tailing Storage Facilities (TSFs)

The current land elevation of the proposed TSF sites ranges from 125 m (AHD) to 128 m (AHD). They are proposed to reach an estimated maximum elevation of 24 m above the current surface (149 m AHD). The TSFs border the southern side of the main Project area, increasing the theoretical visual amenity impact for the sensitive receptors to the south. Only the most eastern TSF landform will remain post closure (Figure 28-10, Figure 28-11).

28.2.7.3 Haul Roads and mine access road

Haul roads, with haul trucks transporting ore and materials, may result in visual amenity and lighting impacts on the sensitive receptors. These impacts will occur during the life of mine, however while the road will be retained post-closure, the use by haul trucks will not persist and therefore impacts will not be sustained.

The mine access road may impact visual amenity. When the Project is operating, the road will be widened from an existing access track and engineered to accommodate two-way access for B-Double trucks. There will be an increase in vehicle use on the mine access road and the haul roads as a consequence of the Project. After mine closure, the roads are expected to be retained with agreement from the landowner (Figure 28-11).

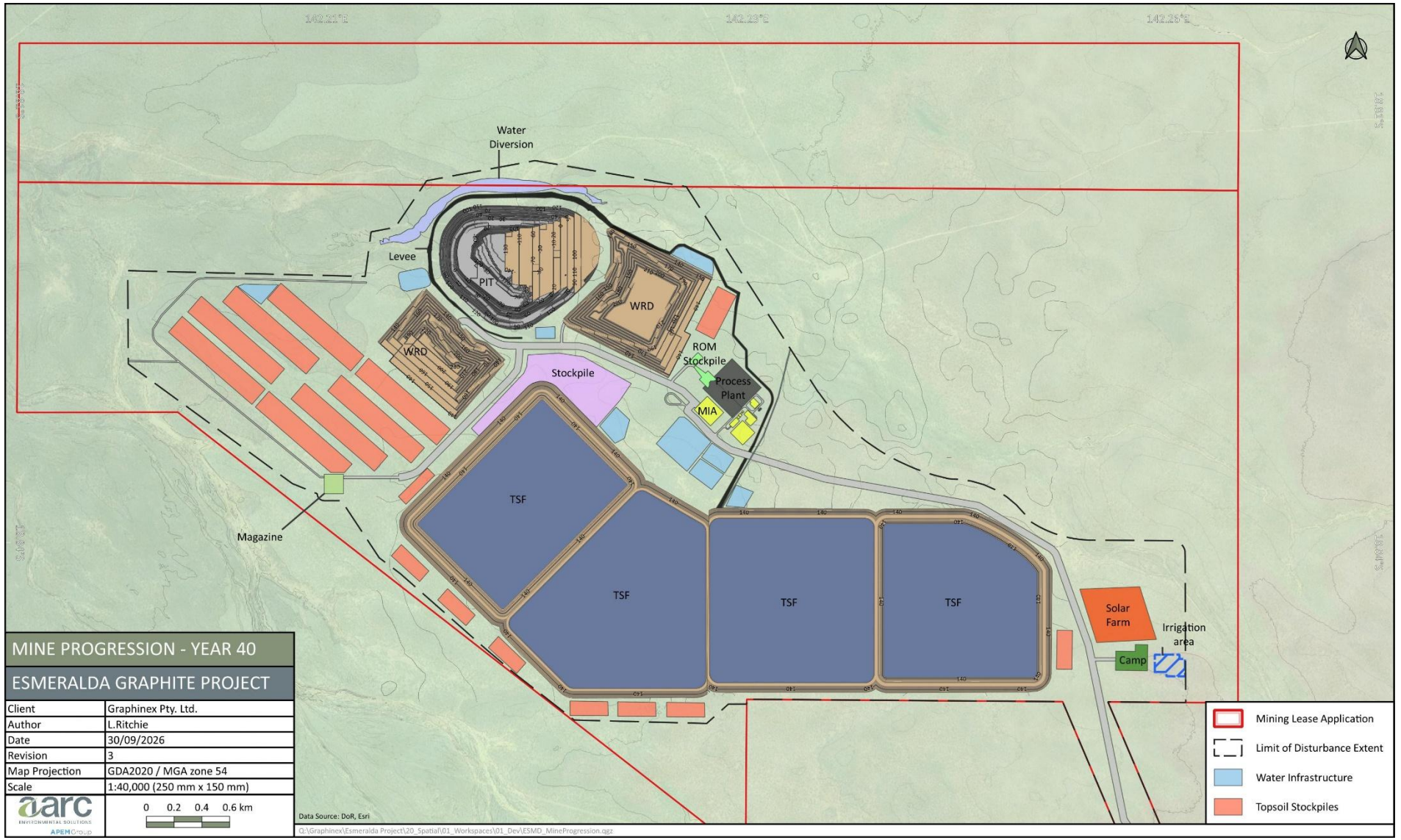


Figure 28-10: Proposed site layout at maximum disturbance

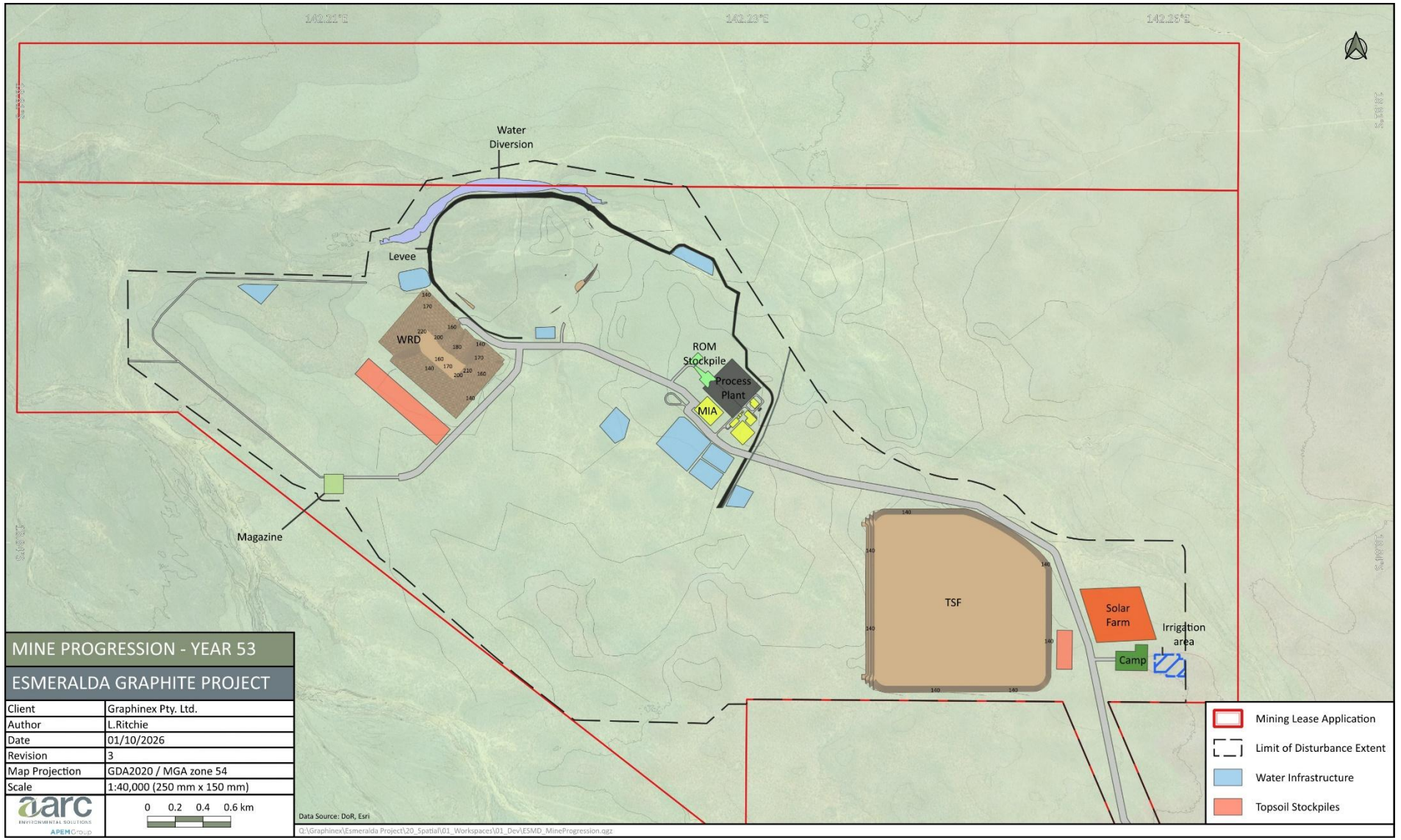


Figure 28-11: Proposed final rehabilitated landform

28.3 Methodology

The following Sections describe the methodology used to assess landscape and visual amenity impact.

28.3.1 Landscape impact

Landscape impact is described as the overall impact of a project on an area's character and sense of place, and can be quantified by:

1) understanding and analysing the existing landscape character;

2) determining the magnitude of the impact posed by the proposed Project on the landscape; and

3) assessing landscape character impact.

Analysis of the existing landscape character relied primarily on the information identified in Section 28.2, with consideration given to the topographic quality, ecological characteristics, and the existence and characteristics of the built environment, such as roads and buildings.

The landscape character impact was determined by considering the existing landscape character and the proposed Project development.

28.3.2 Visual impact

Visual impact is defined as the day-to-day visual effects of a project on people's views, and can be assessed by:

1) identifying the extent of the visibility of the Project and existing viewpoints;

2) identifying the existing viewpoints;

3) determining the magnitude of the impact from each viewpoint; and

4) assessing the visual impact.

The process to determine the extent of the visibility of the Project and the existing viewpoints is outlined in Section 28.3.2.1. The magnitude of the impact for each viewpoint was determined based on the form of the impact (i.e. scale, size and character) with respect to the proximity of each sensitive receptor. After determining those variables, the visual impact for each sensitive receptor was assessed by considering the visibility of the impact and magnitude of the impact.

28.3.2.1 Visibility extent and existing viewpoints

A viewshed analysis was conducted to assess the potential visual amenity and lighting impacts of the haul roads, TSFs and WRDs. The analysis incorporated land elevation derived from the following digital elevation model (DEM) datasets:

- surface model for the proposed Project for the year with maximum disturbance (i.e. year 40) and the year of the final landform (i.e. year 52);
- LIDAR of the project area at 0.5 m resolution; and
- Geoscience Australia's smoothed Shuttle Radar Topography Mission (SRTM) DEM at one arc-second resolution (Gallant *et al*. 2011).

Geoscience Australia's smoothed SRTM DEM (Gallant *et al*. 2011) was used for areas of sensitive receptors surrounding but not covered by the surface models and LIDAR for the proposed Project.

In QGIS 3.44.8, the surface model, LIDAR, and SRTM DEM were converted to rasters of 10 m resolution, and combined to create a single DEM, creating a single landform with the relevant project stages, detailed project surroundings, and the general topography of the landscape, where distant sensitive receptors are located.

Two viewshed assessments were conducted for the WRDs, haul road, and TSFs: long-term and short-term impacts. The short-term impacts will be during the Project operation stage; and hence, to assess the maximum short-term impacts, the year of maximum disturbance, year 40, was selected. The long-term impacts were assessed using the year when the final landform is expected to be completed, which is year 52. This landform will be revegetated over the following 10 years, consistent with the PRCP for the Project (Appendix T). After year 52, there will not be a substantial change from a visual amenity perspective.

For all assessments, different radii were chosen for the viewshed assessments depending on whether they were for daytime or night-time operations under the assumption that the visual impacts will vary by the presence of lights (i.e. night-time operation) or lack thereof (i.e. daytime operation). The radius of viewsheds for daytime operation was assigned as 5 km, which is approximately the visible distance to the horizon in flat terrain with good visibility for a person of average height; and 15 km was assigned for night-time operations.

All viewshed assessments were undertaken in QGIS 3.44.8 using the 'Visibility Analysis' plugin, which simulates the curvature of the earth, and allows for visibility analyses with simulated infrastructure/disturbance on top of an existing landform.

To assess the maximum disturbance impacts, a grid of 915 viewpoints at a resolution of 100 m were generated along the WRDs, TSFs, and haul roads. The WRD will be the tallest feature on the Project site in year 40. The observer height was set to 9 m to represent infrastructure such as the lighting towers and mining trucks. A target height of 2 m was set to represent a standing adult. Each point viewshed was combined into a single viewshed to display the overall reach of the projects visibility. It is acknowledged that the use of the WRD at peak height is a conservative assessment of impacts, given lighting and operations will not be undertaken at this height frequently.

To assess the long-term post-mining impacts, 189 viewpoints were generated along the western WRD and the TSF, to be retained at closure. A target height of 2 m was set to represent a standing adult. The cumulative visibility from each viewpoint in the landscape for daytime was recorded as a single viewshed from the top of the backfilled pit, at an elevation of 140 mAHD. For long-term post-mining impacts, a night-time viewshed was not generated as lights are not expected to be present at the end of the rehabilitation stage, and as such, night impacts are expected to be negligible.

To assess the impact of the project on visibility over the course of the project, viewsheds were also created from each sensitive receptor. Visibility was assessed against the pre-mining landform at day and night, with the maximum disturbance, and final rehabilitated landform scenarios, as described above. The target height was set at 9 m to represent infrastructure such as lighting towers and mining trucks on the landform. The observer height was set at 2 m to represent a standing adult.

Additionally, as the spatial resolution of the underlying DEM was 10 m, vegetation was not considered in the assessment to ensure the maximum impacts were considered. As a result, the assessment results are considered conservative. The assessment outcomes illustrate the maximum theoretical visual impacts on the sensitive receptors. However, vegetation will act as a visual screen and reduce the actual visual impacts of the proposed Project.

The potential impacts identified by the viewshed assessments are presented in Section 28.4.2.

28.3.2.2 Magnitude of impact

To evaluate the magnitude of the visual impact caused by the project, it was relevant to determine the visual angle of the WRDs and TSFs for the impacted sensitive receptors. The visual angle is the angle at which a viewed object subtends at the eye. That is, given the height of an object and the distance from the observer, the visual angle describes the angular size of the object that was converted to a percentage. The percentage ascribed the portion of the view impacted by each feature from comparing the visual angle to the average field of view, which is approximately 150° (Spector 1990). The visual angle of the haul road was not considered due to the inconsistent visual impact from vehicles.

28.4 Potential impacts

The following Sections describe the potential impacts of the proposed Project on landscape values and visual amenity values (Section 28.2), as per the visual impact assessment outcomes.

28.4.1 Landscape Impact

During mine operation, the two WRDs may impact the visual amenity of the surrounding sensitive receptors during night-time. By year 40 of the Project, the western WRD will reach an estimated maximum height of 109 m above the current surface (234 mAHD); and the eastern WRD is estimated to reaching a maximum peak height of 90 m above the current surface (215 mAHD).

However, during the final years of the operation stage, waste rock will be used to backfill the open-cut pit, and consequently, the eastern WRD will not be part of the final landform and the western WRD elevation will be significantly reduced to approximately 60 m above the surface with an elevation of 185 mAHD. Elevation changes during the operation and rehabilitation stages will be limited to within the Project site.

During operations, the WRDs will appear prominently on the relatively flat regional terrain. However, the terrain does gradually increase in elevation to the east, which is close to matching the WRDs height, near to sensitive receptor R1. This elevation change will shield views of the WRD from the east for quite a distance. Progressive rehabilitation of the remaining TSF, including incorporating vegetation, will further reduce the magnitude of its visual impact as the landform becomes more integrated with the surrounding landscape.

As the mine progresses towards closure, the impact of the TSFs will also reduce, with only one TSF remaining at end of mine life.

Haul roads, and the mine access road, may also appear integrated with the regional landscape character. Since the mine access road is existing before the Project commencement, further development of a haul road remains consistent with the pre-mining land use and landscape character.

In addition to the above elements, the Project has been designed to have a disturbance footprint reduced as much as practicable for safe and productive operations, which ensures that vegetation disturbance will also be kept to a minimum. This vegetation will play a role in reducing visual amenity impacts on sensitive receptors.

Thus, in summary, once the site features have been rehabilitated, the proposed Project is considered unlikely to create a distinct landscape character that would negatively impact visual amenity.

28.4.2 Visual impact

The assessment determined that the proposed Project is within the viewshed of two of the identified sensitive receptors, although the viewshed varies by the Project features and stages. The viewshed of each Project feature is explained more in detail in Section 28.4.2.1.

28.4.2.1 Visibility extent and existing viewpoints

The theoretical maximum visual amenity and lighting impacts of the landform on the sensitive receptors during the operational Project stage is presented in Figure 28-12 and Figure 28-13. The viewsheds represent the maximum theoretical visibility of the WRDs, TSFs, and roads.

During the day, it is predicted that the site will only be seen by receptor R4 (Camp). At night, however, the project may be seen by both R4 (Camp) and R2 (Prospect) (Figure 28-13). These receptors may be able to observe haul truck lighting and other infrastructure lighting utilised during night-time operations. One mapped cultural heritage site (Grinding Groove(s), Tagalaka People #2) is on the outermost limit of visual amenity impact by lighting at night. The other sensitive receptors are not predicted to be impacted by night operations. The Project lighting may have some impacts on nocturnal fauna species. For example, some bird or bat species may be attracted to insects around lights and could become prey for larger predators, such as owls (Appendix E, Terrestrial Ecology Baseline Report). Nevertheless, woodlands do partially surround the Project area and the

sensitive receptors, and they may act as a visual screen from the WRDs visual amenity and lighting impacts. The actual impacts, therefore, may be smaller than the theoretical viewsheds.

The theoretical maximum visual amenity and lighting impacts of the final landform on the sensitive receptors, at the end of year 52, is indicated in Figure 28-14. Only daytime impacts were assessed as lighting infrastructure will not be present and night impacts will be close to nil. The assessment predicts that no sensitive receptors aside from receptor R4 (Camp) will be impacted by the final landform.

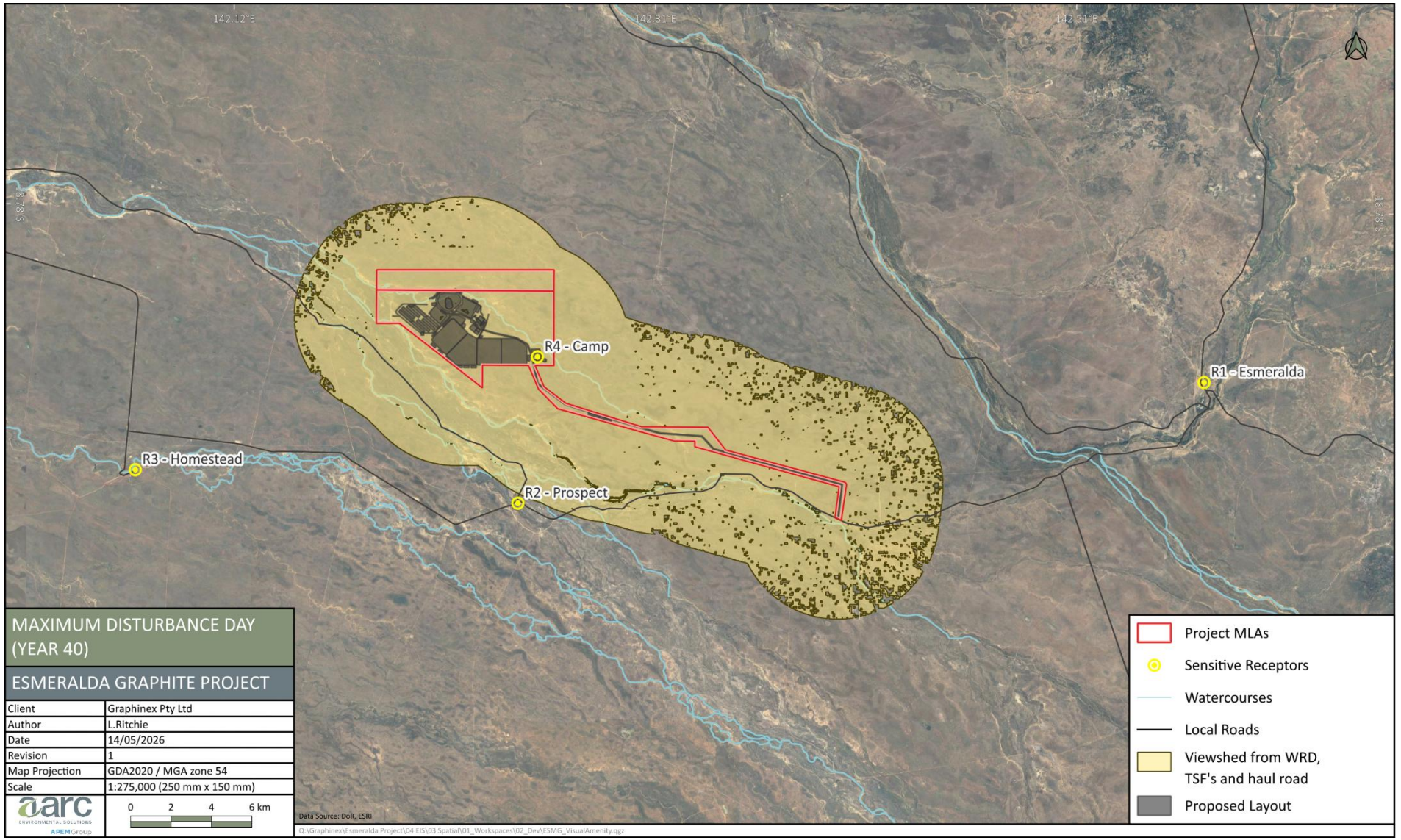


Figure 28-12: Visual impact of maximum disturbance landform during daytime (year 40)

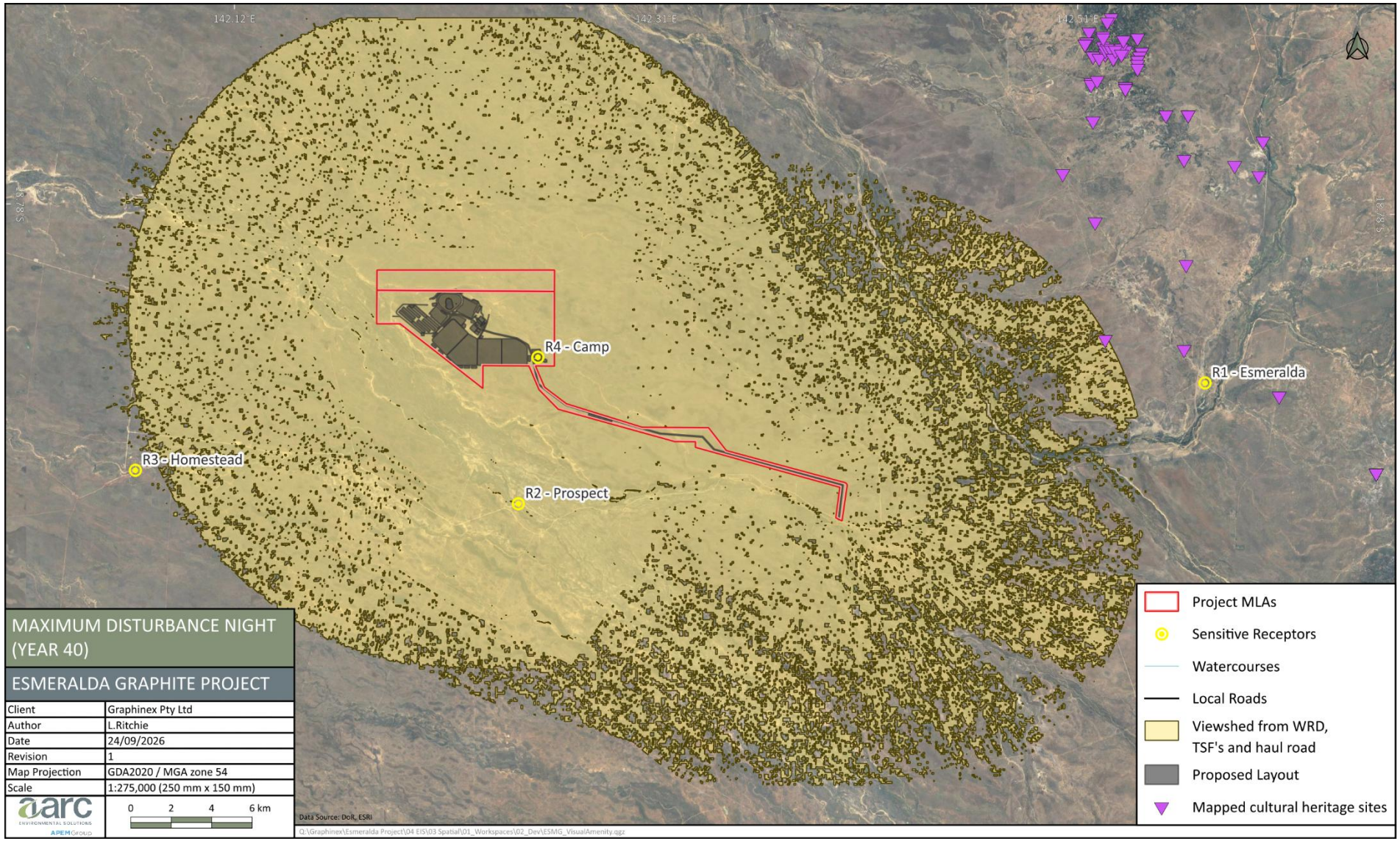


Figure 28-13: Visual impact of maximum disturbance landform during nighttime, including light (year 40)

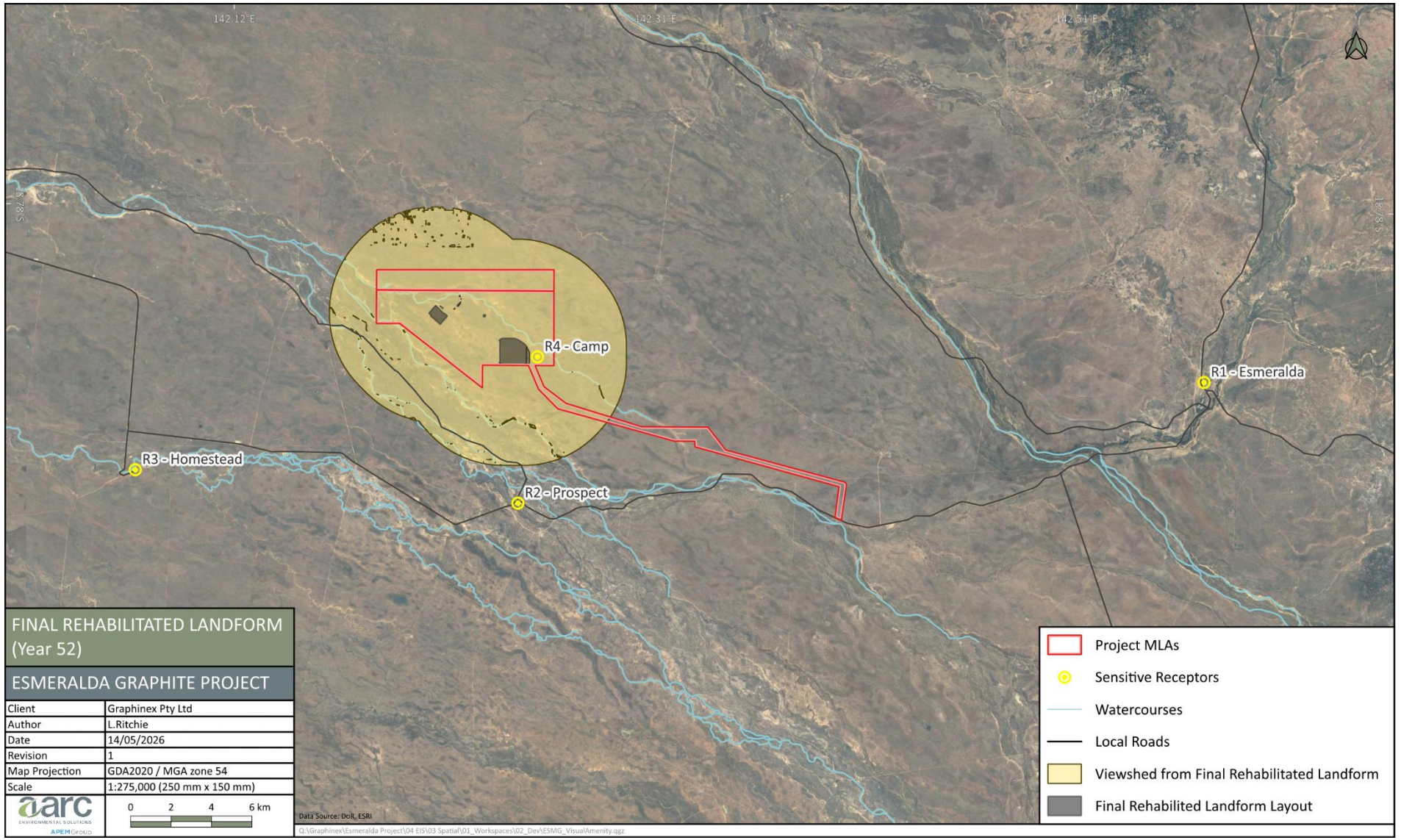


Figure 28-14: Visual impact of maximum disturbance landform during daytime (year 52)

28.4.3 Magnitude of impact

During the day, the only expected impact is on receptor R4 (Camp) that is located on site (Figure 28-15), which is not an external sensitive receptor. The closest receptor off site, Receptor R2 (Prospect) is only expected to be impacted at night time, with its visibility extending over the entire project, as shown in Figure 28-16.

Sensitive receptors R3 (Homestead) and R4 (Esmeralda) are not expected to be impacted, with their visibility being reduced both by their distance, and local topography (Figure 28-16). Of note, is the raised elevation of the land just west of sensitive receptor R1 (Esmeralda), which effectively shields views of the project.

The main visual impact expected is during night time at maximum disturbance, when sensitive receptor R2 (Prospect) could potentially be impacted by light spillage and skyglow from light fixtures on the site, and traffic activity on the haul roads. The location of the TSFs will reduce the potential impact of lighting structures/vehicle headlights on the WRDs. However, the peak of the WRDs will be visible to sensitive receptor R2 (Prospect) (Figure 28-18).

The magnitude of the impact of the haul roads is expected to be very low during the operational period as sensitive receptor R2 is approximately 6 km away from the haul roads. The direction of vehicles travelling on these roads is not expected to direct headlights towards the sensitive receptor, and within the main project area, the TSFs will shield vehicle headlights from sensitive receptor R2. The headlights or high beams potentially seen on the haul roads at night from such distances away are not expected to be impactful to the sensitive receptors, which is similarly the case for the single mapped cultural heritage site. Furthermore, at mine closure, the usage frequency of the haul roads will decrease significantly, and the haul roads are likely to be used only periodically by the landowners. Therefore, the magnitude of the impact of the haul roads during operation will be minimal; and nil post-closure.

Table 28-3: Visual angle from R2 to the WRDs and TSFs at maximum disturbance (year 40)

Visual Impact	Distance (m)	Approximate Impact Height (m)	Approximate Visual Impact (°)	Total View (%)
WRDs	9772	85 (approximate visible peak over TSFs including lighting)	2.08	1.33%
TSFs	6700	33 (including lighting)	2.96	1.97%

Combined, the TSFs and WRDs are expected to occupy a maximum of 3.3% of the view for sensitive receptor R2, assuming the sensitive receptor is looking directly at the landform. The approximate visual angles described (Table 28.2) takes into account the shape of the structures from the perspective of the sensitive receptor, however the visual angles and total views described are also conservative (i.e. worst case) as they do not consider the partial or full screening from vegetation within the view of R2. These values include estimates of potential lighting structures on top of the TSFs, however there is unlikely to be lighting on the TSFs at night. There is currently partial vegetation screening between the sensitive receptors and the project due to the presence of surrounding woodland vegetation that is expected to reduce the total view. The eastern WRD will be a temporary disturbance until rehabilitation is completed. Given the very low visual angles expected from the WRD, it is unlikely that the WRDs or TSFs will affect the visual amenity of sensitive receptors R2. As the mine progresses, the visual impact of the TSFs will also reduce as they are removed and rehabilitated with only one TSF remaining at closure.

In summary, it is expected that during daylight operations, the visual impact resulting from the developing the WRDs will be negligible; and the haul roads and TSFs will be nil. Furthermore, light impacts from the 24-hour operations will also be negligible for the WRDs, TSFs and haul roads; due to the distance from light sources and vegetation screening reducing the exposure of sensitive receptors to light spillage and skyglow.

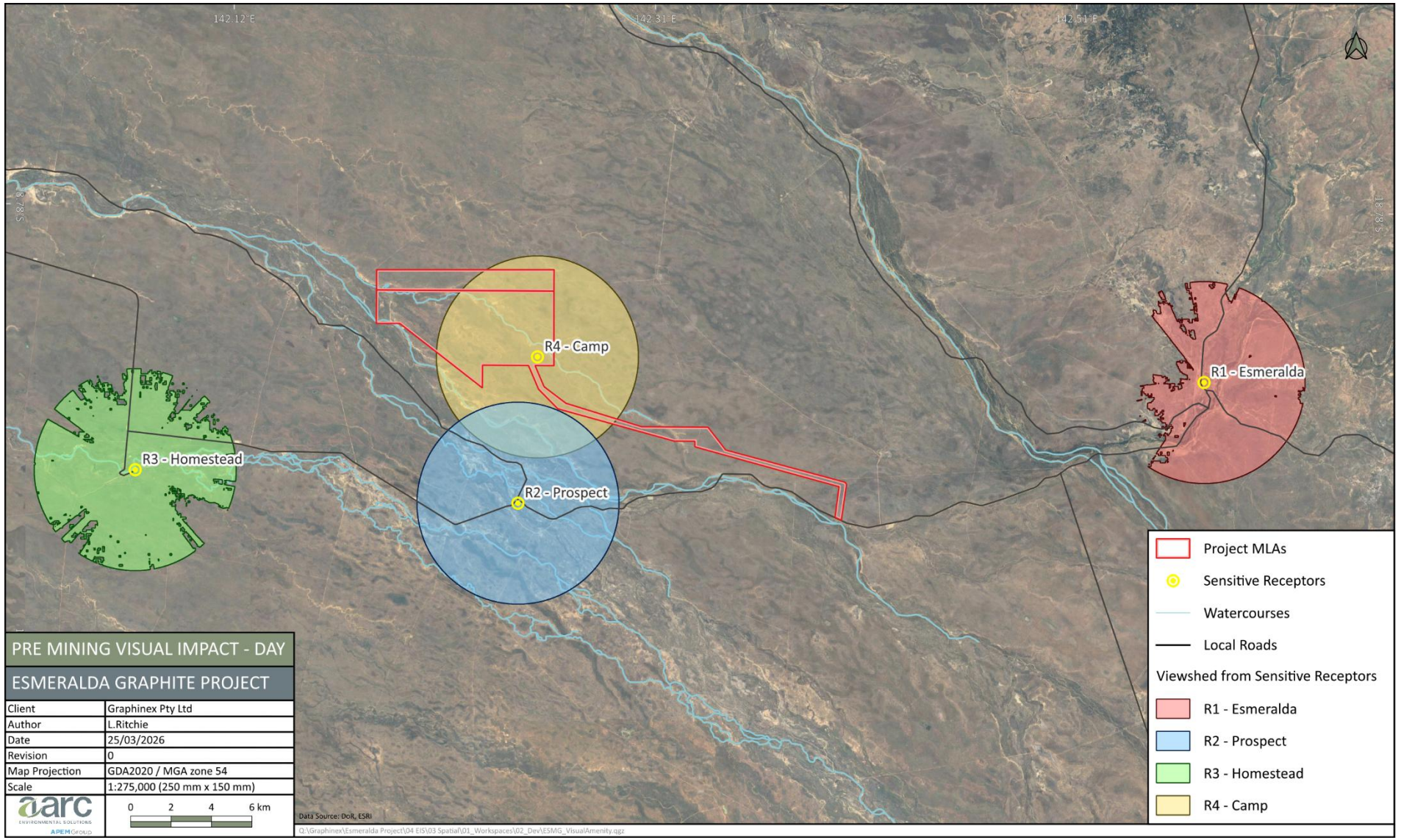


Figure 28-15: Viewshed of sensitive receptors pre-mining at day

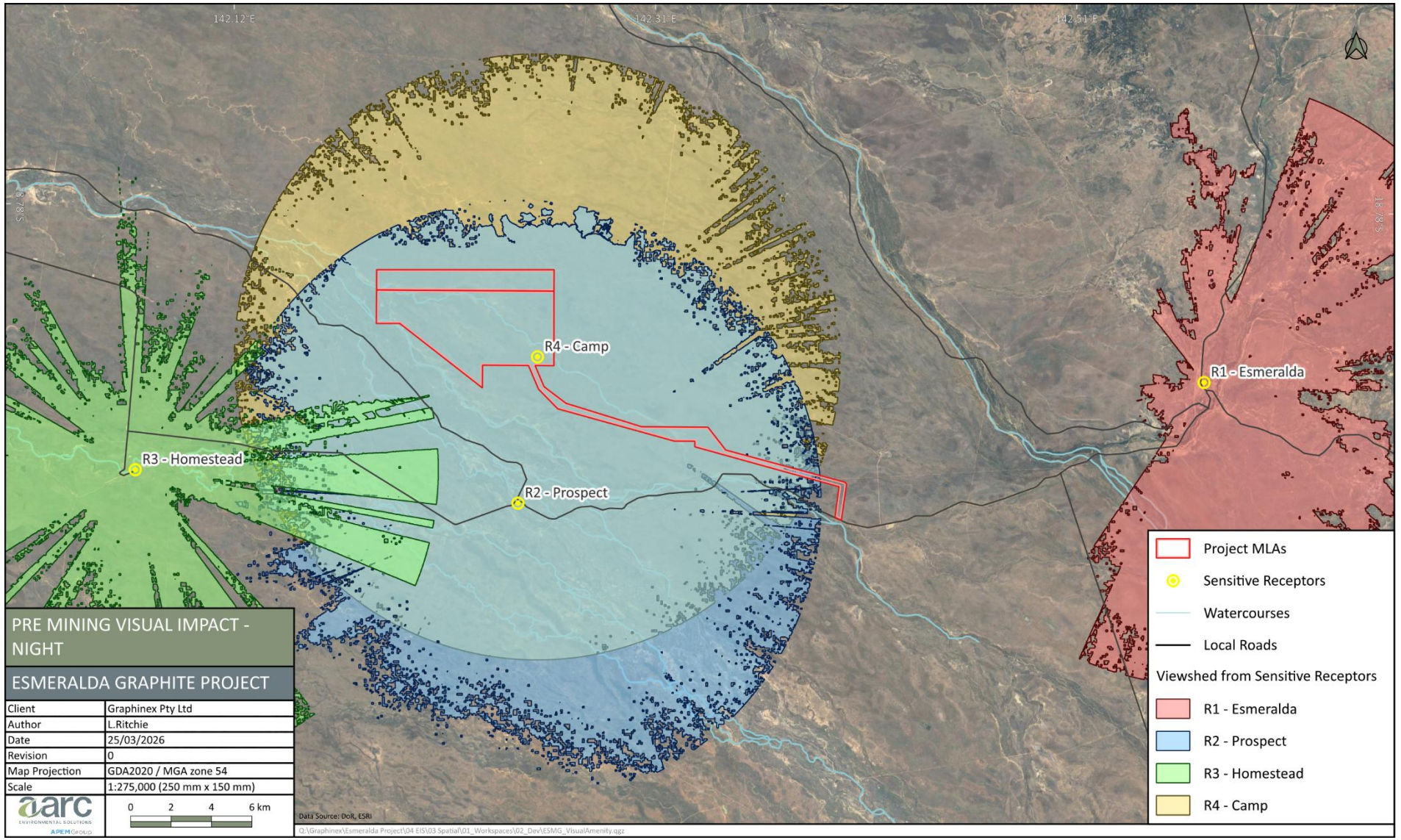


Figure 28-16: Viewshed of sensitive receptors pre-mining at night

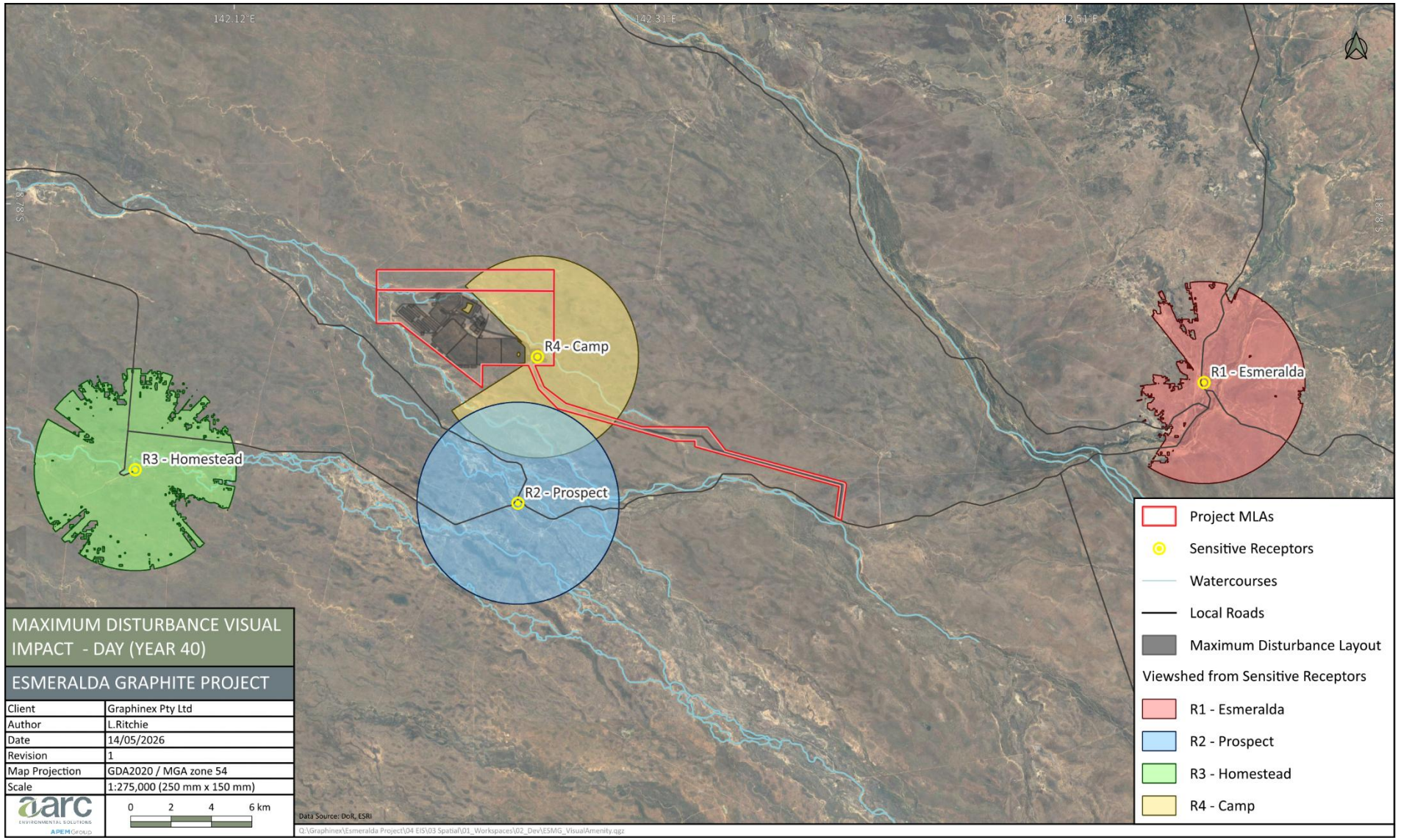


Figure 28-17: Impact of maximum disturbance layout on sensitive receptor visibility at day (year 40)

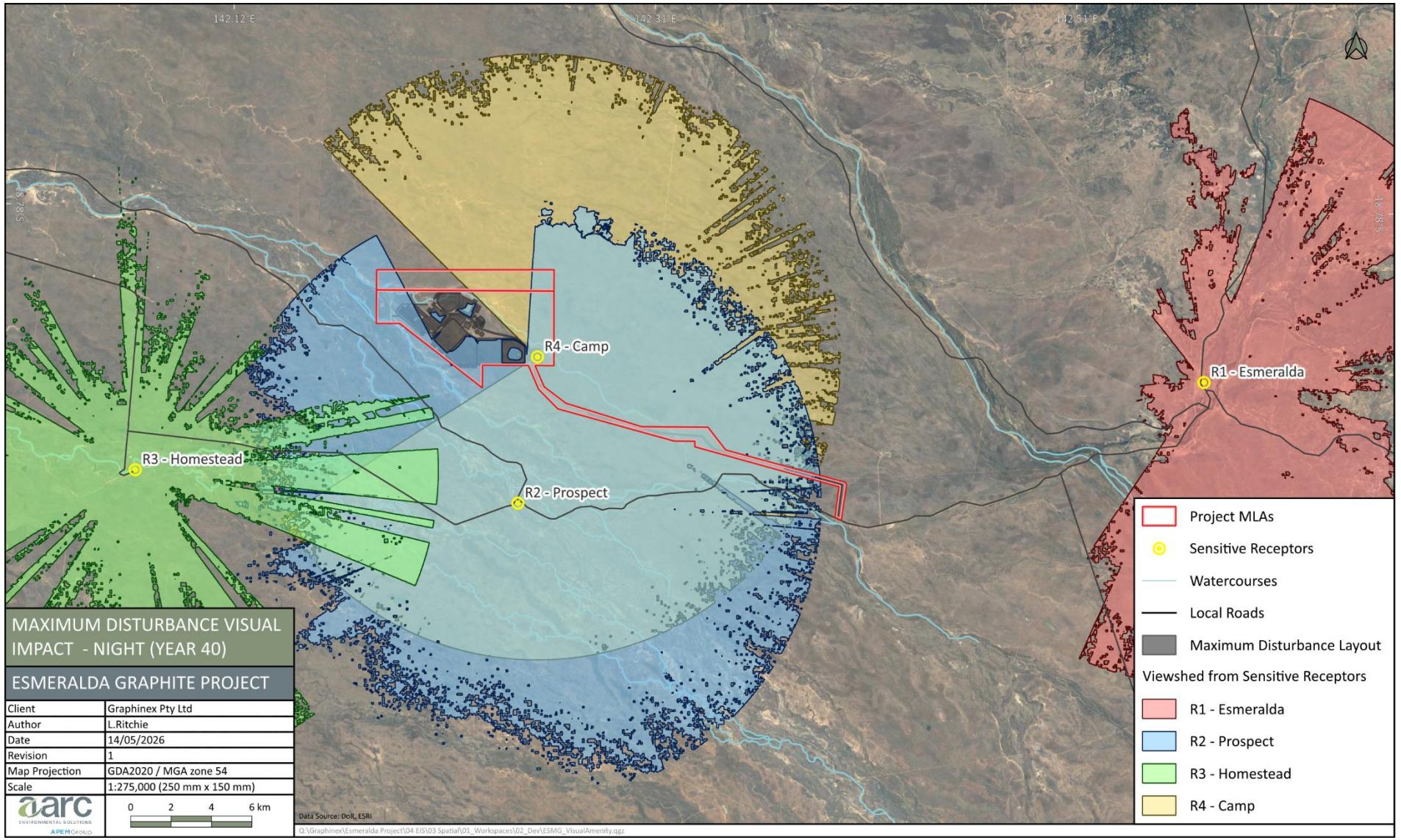


Figure 28-18: Impact of maximum disturbance layout on sensitive receptor visibility at night (year 40)

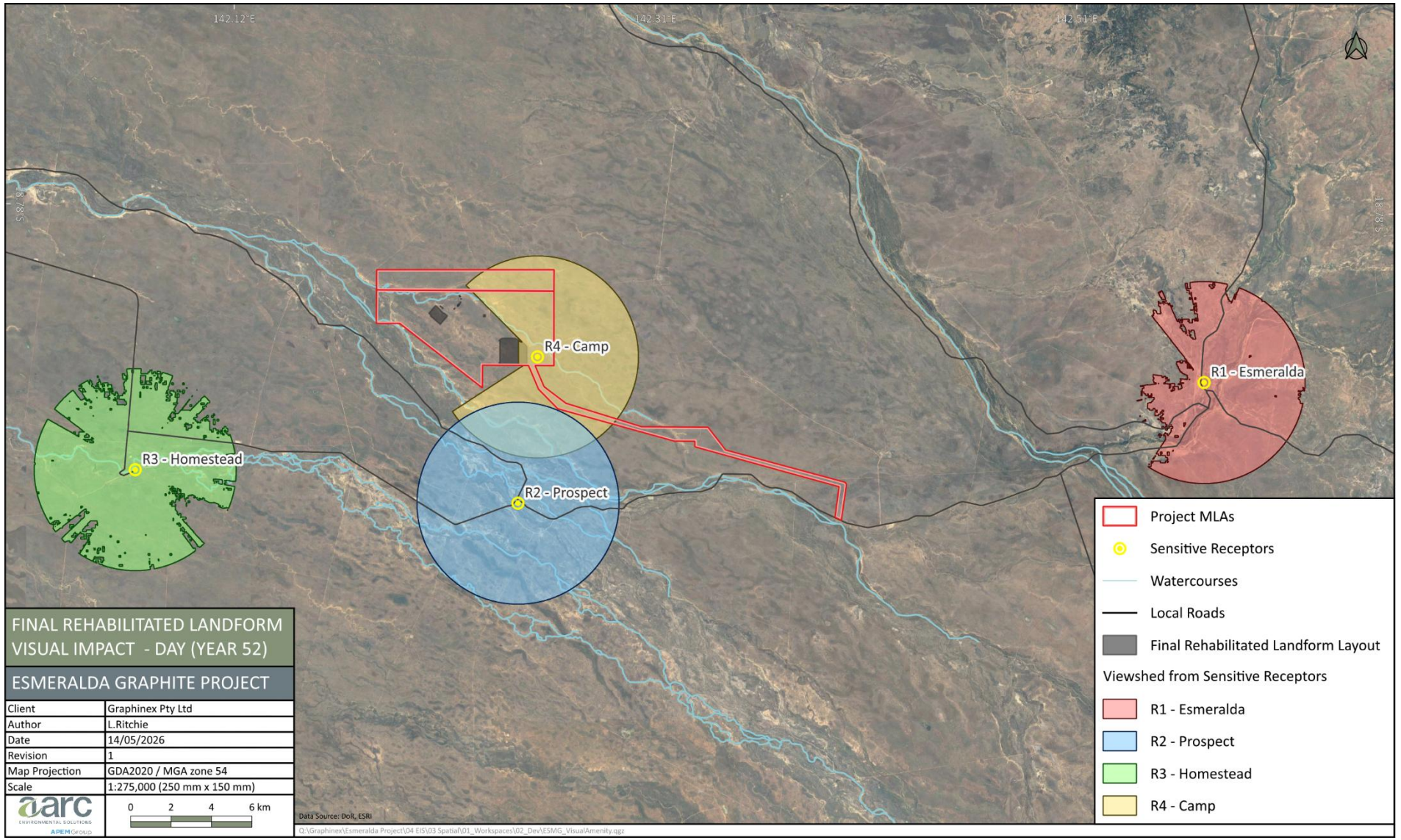


Figure 28-19: Impact of final rehabilitated landform on sensitive receptor visibility at day (year 52)

28.5 Mitigation and management measures

Impacts on visual amenity have been assessed as being of low risk and magnitude. Notwithstanding, for potential visual amenity impacts, the Project has considered mitigation and management measures that would be applied to minimise the visual impacts of the Project during its operation. These are informed by the Australian Standard AS/NZS 4282:2019 'Control of obtrusive effects of outdoor lighting', and include:

1) shielding and orientating lighting inwards to minimise lighting spill, including by using louvres, baffles, shields, or hoods, and limiting lighting to the requirements of safe operations and security where practicable;

2) assess the potential use of warm colour-temperature lighting in place of blue/cool colour- temperature lighting against task-lighting needs when selecting light sources;

3) careful aiming and orientation of floodlights/directional lights away from sensitive receptors;

4) confine Project operations and disturbance to the identified maximum disturbance extent, thereby minimising vegetation clearing, and retaining vegetation to screen the visual impacts of the Project activities where practicable;

5) progressively rehabilitate the Project site in accordance with the approved Project PRCP to a landform consistent with the baseline landscape character.

These mitigation measures will further reduce potential impacts from the conservative, theoretical assessment outlined in Section 28.4 - which assumes a 360^0 light source from the highest point of the Project (a waste rock dump).

The Project's final landform will largely be rehabilitated to a post-mining land use of 'grazing of native vegetation', with exceptions for infrastructure retained under agreement with the landowner and the rehabilitated landforms of the WRD and TSF. The WRD and TSF will be re-vegetated with grassland species, and the WRD will have a reduced height from the maximum disturbance height in year 40. There will be no visual impacts on sensitive receptors following rehabilitation and closure of the mine. Therefore, there are no further mitigation or management measures proposed for post closure stage of the Project.

28.6 TOR Reconciliation table

Terms of reference - Content requirements of the EIS		EIS Section
Section 28 - Visual amenity		
28.1	The following guidance is relevant for the assessment of visual amenity: (a) Australian Institute of Landscape Architects, Guidance Note for Landscape and Visual Assessment, 2018 (b) Landscape Institute, Photography and photomontage in landscape and visual impact assessment, 2018 (c) Landscape Institute and Institute of Environmental Management and Assessment, Guidelines for Landscape and Visual Impact Assessment, 2013.	Section 28
Visual amenity - **Existing environment**		
28.2	Characterise the existing visual landscape by describing, mapping and illustrating landscape aspects that influence visual amenity, including:	
	(a) topography and natural landscape features (inclusive of species habitat)	Section 28.2.3, Section 28.2.1
	(b) land use and character	Section 28.2.1
	(c) settlements, built features and infrastructure.	Section 28.2, Section 28.2.6
28.3	Identify visually sensitive locations, including residential properties, public viewpoints, recreation areas, tourist destinations, culturally relevant features (in consultation with Traditional Custodians), etc.	Section 28.2, Section 28.2.5
28.4	Evaluate the sensitivity of the existing visual landscape and its ability to absorb change.	Section 28.3.2.1, Section 28.3.2.2
Visual amenity - Impact assessment		
28.5	Identify key project features during all stages of project development that will be visually obtrusive, including project lighting, and undertake a viewshed analysis to identify locations from which project features will be visible.	Section 28.4
28.6	Assess the significance of project impacts on landscape character and visual amenity, supported by photomontage analysis from visually sensitive locations.	Section 28.4.3
Visual amenity - Mitigation measures		
28.7	Describe proposed mitigation measures to avoid or minimise predicted impacts on landscape character and visual amenity, including:	Section 28.5
	(a) how the project has been designed to integrate with the existing landscape	Section 28.5
	(b) strategies to protect visual amenity at visually sensitive locations	Section 28.5
	(c) how the obtrusive effects of diffuse and direct lighting have been minimised.	Section 28.5