



mainroads
WESTERN AUSTRALIA

Clearing Assessment Report – CPS 818

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Western Australia.*

Tanami Road Upgrade Stage 1
SLK 0-41

January 2023

EOS 1890

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Document Control

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Reviewer:	Principal Environment Officer	Revision 1	24/01/2023

1 PROPOSAL

1.1 Purpose and Justification

The purpose of this Clearing Assessment Report (CAR) is to provide a report detailing the assessment of native vegetation clearing that is proposed to be undertaken using the Statewide Clearing Permit CPS 818 issued to Main Roads Western Australia (Main Roads). The CAR outlines the key activities associated with the project, the existing environment and an assessment of native vegetation clearing. This assessment provides an evaluation of the vegetation clearing impacts associated with the project using the ten Clearing Principles, and the strategies used to manage vegetation clearing.

The Tanami Road is a Local Government Road under the care and control of the Shire of Halls Creek. In response to the Federal and State Governments committing funding to upgrade and seal the Road to the Northern Territory Border, the Shire of Halls Creek has requested Main Roads Western Australia's assistance in delivering the Project. Recent flooding events from ex tropical cyclone Ellie has highlighted the urgency for regional road upgrades to be all weather, to ensure connectivity of state and national road networks.

The existing road is unsealed and provides access to remote towns, Aboriginal Communities, Mine Sites and provides an alternative sealed route into northern WA from then Northern Territory. The road is regularly required to be closed during the wet season as it experiences flooding thereby cutting off the communities it services. The current Tanami Road is constructed on hilly terrain with many tight corners and blind crests creating a safety hazard for road users and resulting in several fatalities over the years. The proposed upgrade and resealing of Tanami Road will reduce the safety risk, reduce road closures during wet season, provide improved and safer access to remote Aboriginal communities and mine sites; decrease ongoing maintenance activities and facilitate travel for locals and freight companies.

The Tanami Road is over 300km in length, which will represent a substantial upgrade over many years. This proposal will see the first 41km sealed and realigned where road curvature is excessive and is compromising the safety of road-users.

1.1.1 Main Roads Approach to Road Safety and the Environment

Main Roads manages the State Road network to achieve balanced economic, social, safety and environmental benefits for the community and is committed to minimising the environmental impacts in all its activities. Main Roads recognises that Western Australia's environment is significant from a global perspective and the unique conservation values that are contained within its road reserve. The Main Roads road network often adjoins natural areas and, in some locations, the reserve itself hosts remnant vegetation with high environmental values. Although the reserves were not established for this purpose, Main Roads recognises that it has a responsibility to conserve the environmental values that occur within the State's road network and minimise the impact its proposals have on the environment. In addition to providing a safe and efficient road network for all people using the roads under its control, Main Roads is also committed to protecting and enhancing the natural environment.

In accordance with National and State Government road safety policies, Main Roads is also committed to substantially reducing road trauma on the road network through Safe System principles. The Safe System approach acknowledges that more than two thirds of all serious crashes

are due to human error rather than deliberate risk taking (e.g. speeding or drink driving) and seeks to improve behaviour through education and enforcement while managing the safety of vehicles, speeds and the road and road infrastructure. It is shown that improving sub-optimal road formation will substantially reduce the likelihood and severity of road crashes. For example, according to the Road Safety Management Guideline, increasing the sealed shoulder from 0.5 m to 2 m will reduce Killed and Seriously Injured numbers by more than 50%.

As the statutory authority responsible for providing and managing a safe and efficient road network in Western Australia, Main Roads focuses on improving road safety by thoroughly considering all environmental, economic and community benefits and impacts. It operates on a hierarchy of avoiding, minimising, reducing and then, if required, offsetting our environmental impacts. This has been achieved through changes in proposal scope and design. Main Roads regularly reduces its clearing footprint by restricting earthworks limits for proposals, steepening batters, installing barriers, establishing borrow pits in cleared paddocks and avoiding temporary clearing for storage, stockpiles and turn around bays to avoid and minimise its impacts.

Further details on measures to avoid, minimise and reduce are provided in Section 1.5.

1.2 Proposal Scope

Main Roads proposes to upgrade a 41km stretch of the existing Tanami Road between SLK 0 and SLLK 41. The upgrade activities will comprise the following components:

- Groundworks and surfacing the existing gravel road with bitumen to a width of 10m;
- Realignment and de/elevation of high-risk sections to decrease excessive road curvature and increase visibility;
- Upgrade drains as required to facilitate surface water runoff; and
- Installation of material laydown and turn around areas required to enable construction upgrade works to occur.

1.3 Proposal Location

The Development Envelope is located on Tanami Road SLK 0 – 41 approximately 17 km south-west of Halls Creek Townsite within the Shire of Halls Creek.

- Latitude: -18.545467
- Longitude: 127.568479

The location of the proposed works is at Figure 1 and detailed view of the Development Envelope in Figures 2 to 25.



Plate 1. The Tanami Road is a major unsealed national freight route

1.4 Clearing Details

Proposed Clearing to be undertaken using CPS 818:

Up to a maximum of 228 ha will be cleared of a 646 ha Development Envelope.

Areas of Native Vegetation Clearing:

A broad scale view of the clearing area is provided in Figure 1. A detailed view of the proposed clearing area is shown in Figures 2 to 25, where symbology indicates populations of species within the Development Envelope.

Type of Native Vegetation:

13 vegetation units of which 6 will be impacted in this proposal were identified from biological surveys,. None of the vegetation units represent listed Threatened Ecological Communities (TECs), or Priority Ecological Communities (PECs). The types of vegetation to be cleared under this Proposal are described in further detail in Section 4.

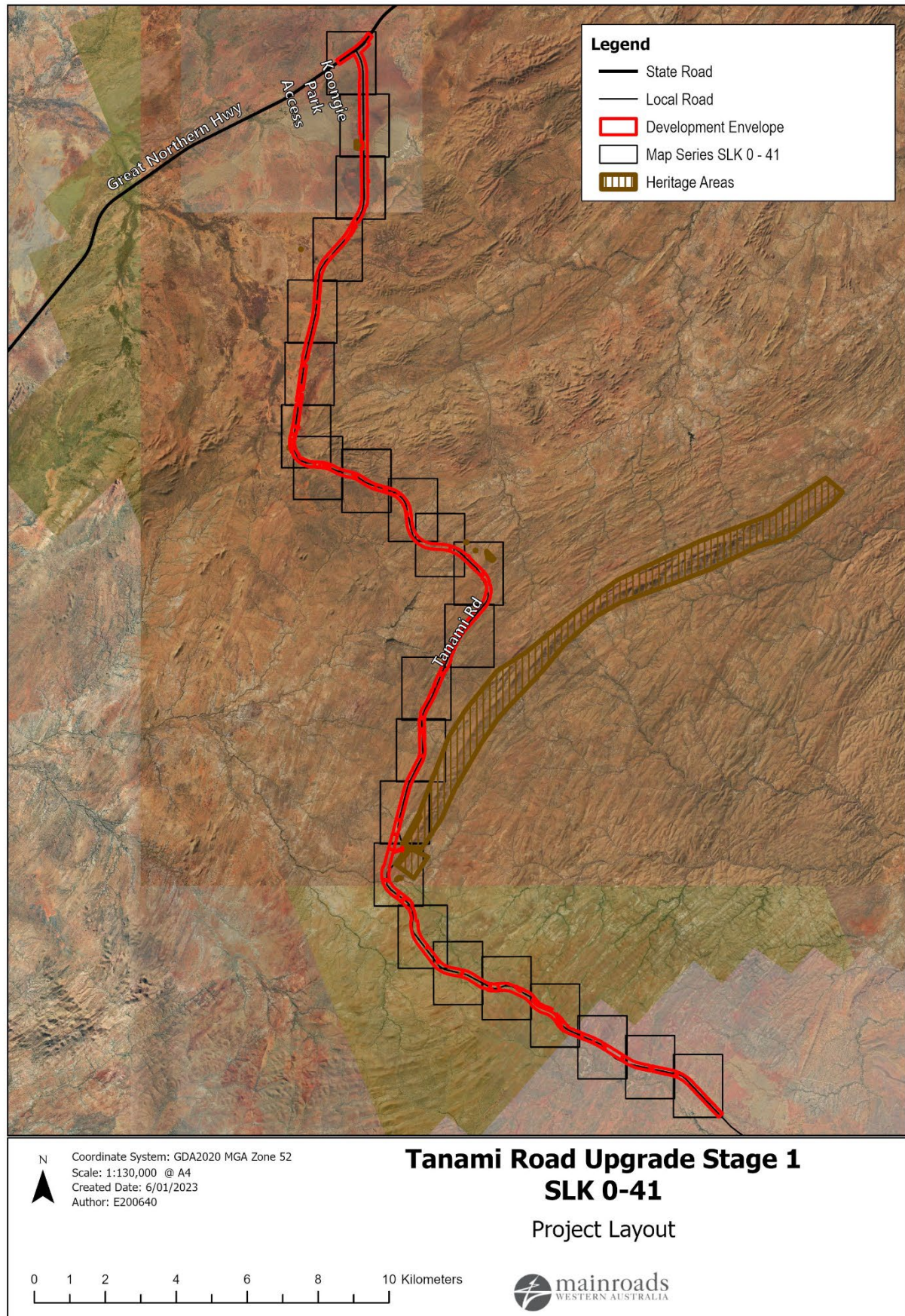


Figure 1: Project Area Tanami Road Upgrade Stage 1 SLK 0-41.

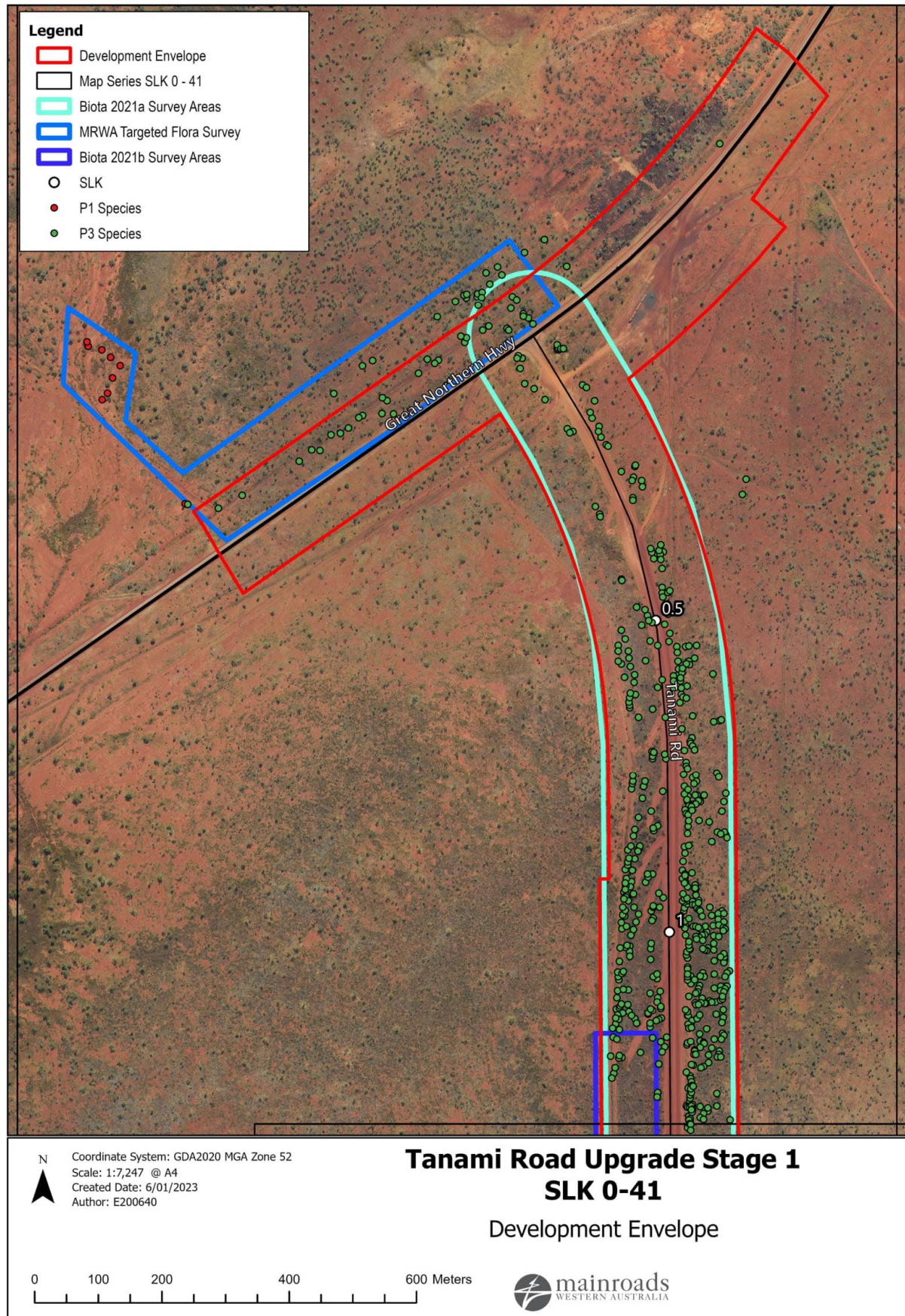


Figure 2: Map 1 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

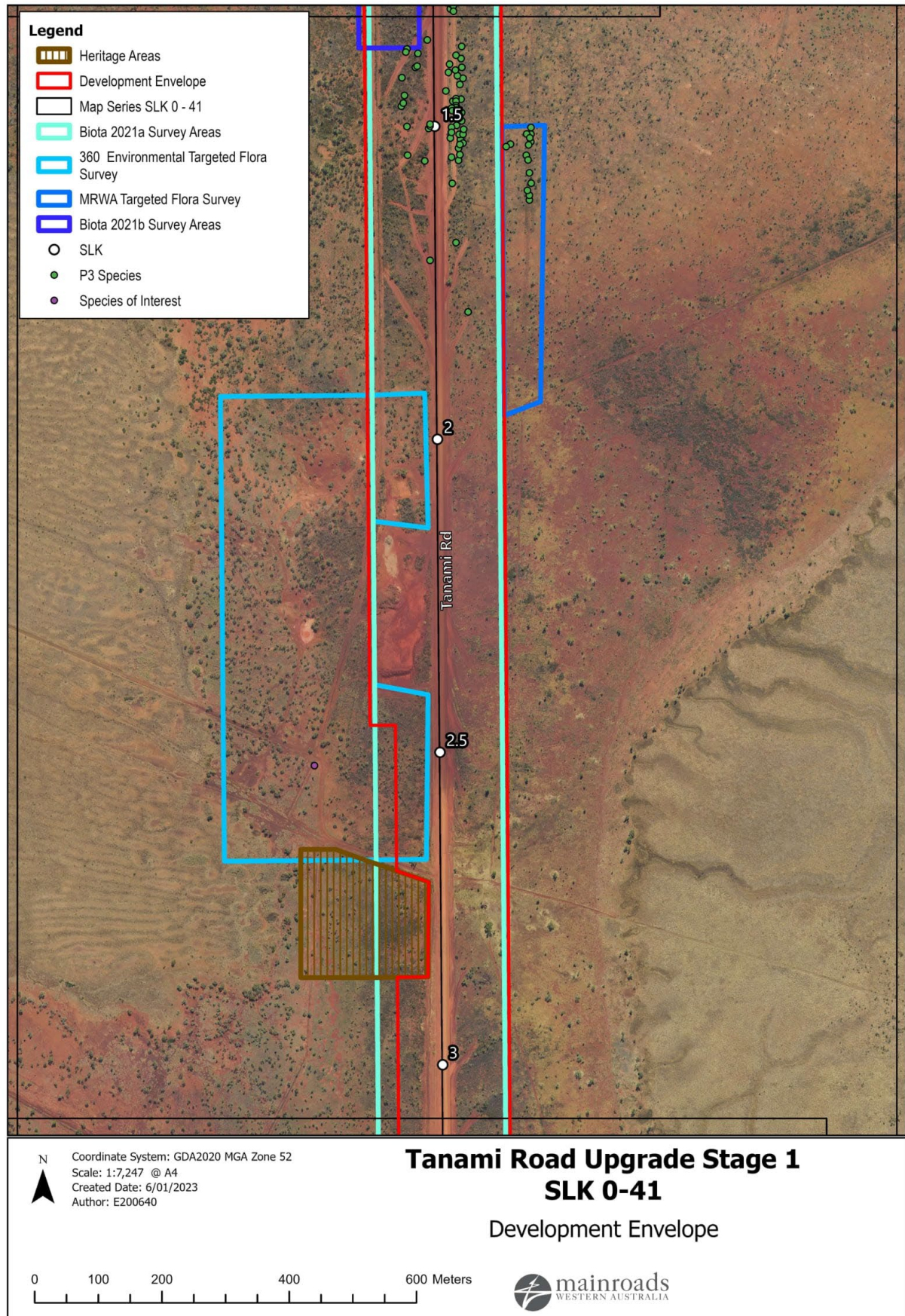


Figure 3: Map 2 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

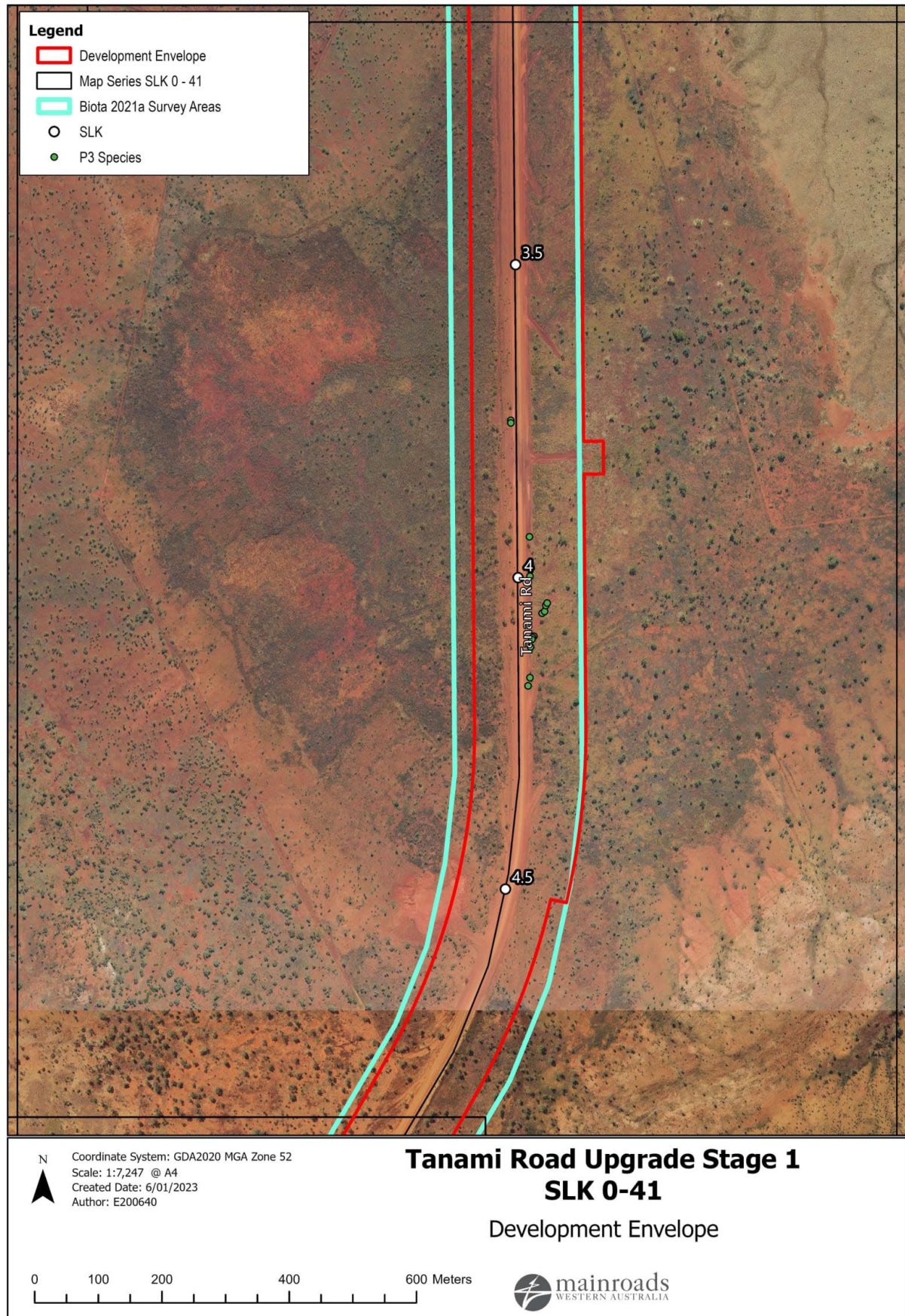


Figure 4: Map 3 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

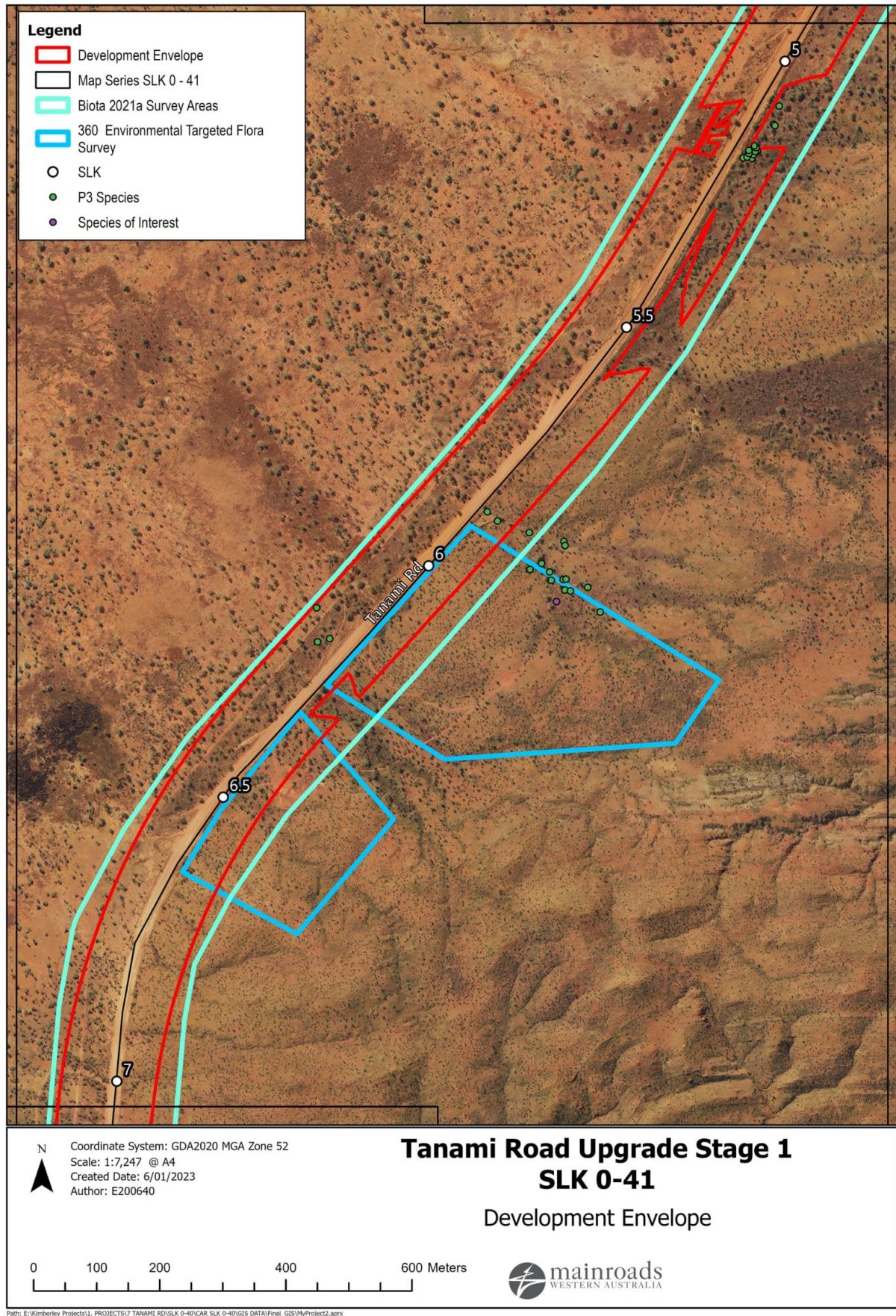


Figure 5: Map 4 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

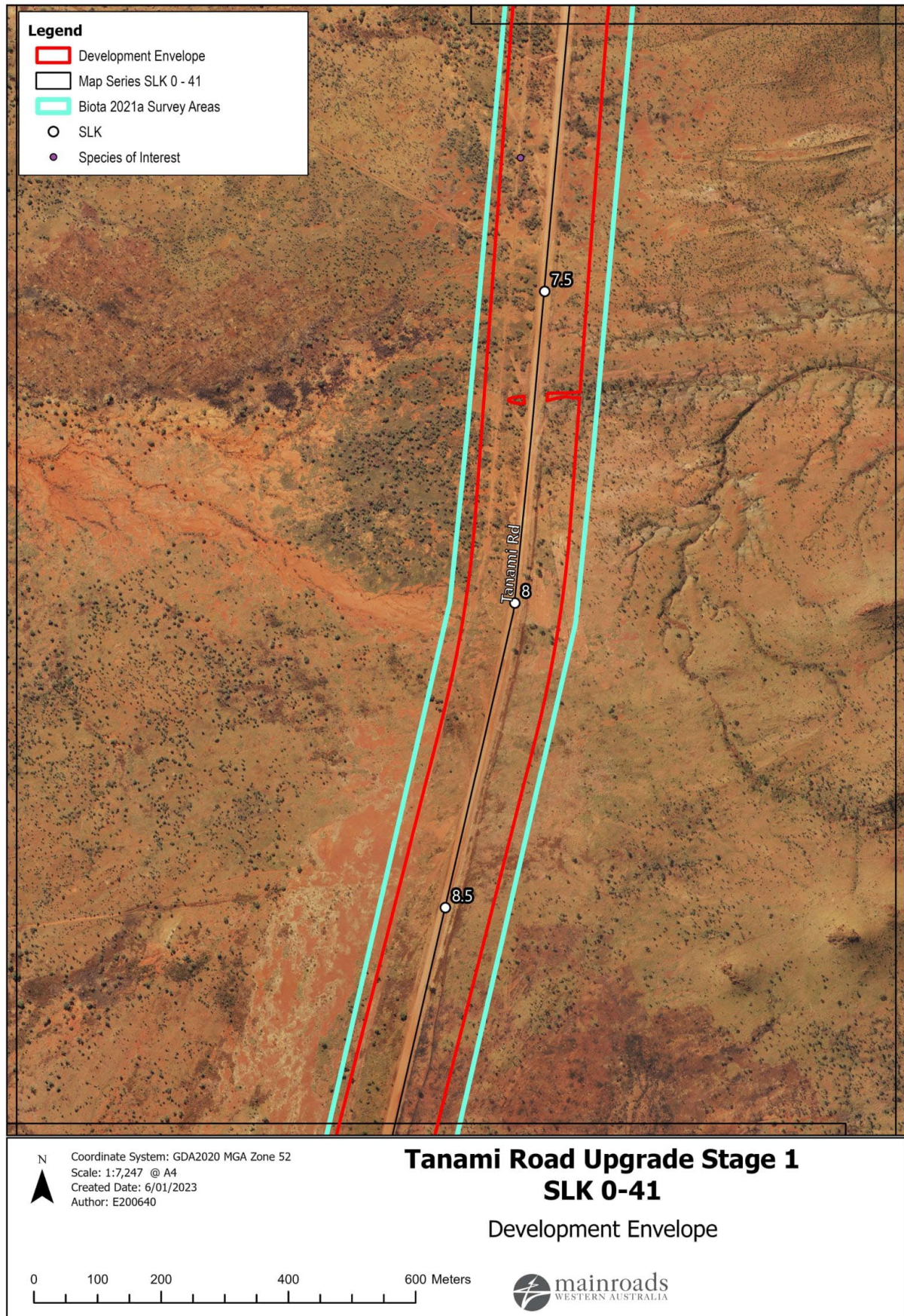


Figure 6: Map 5 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

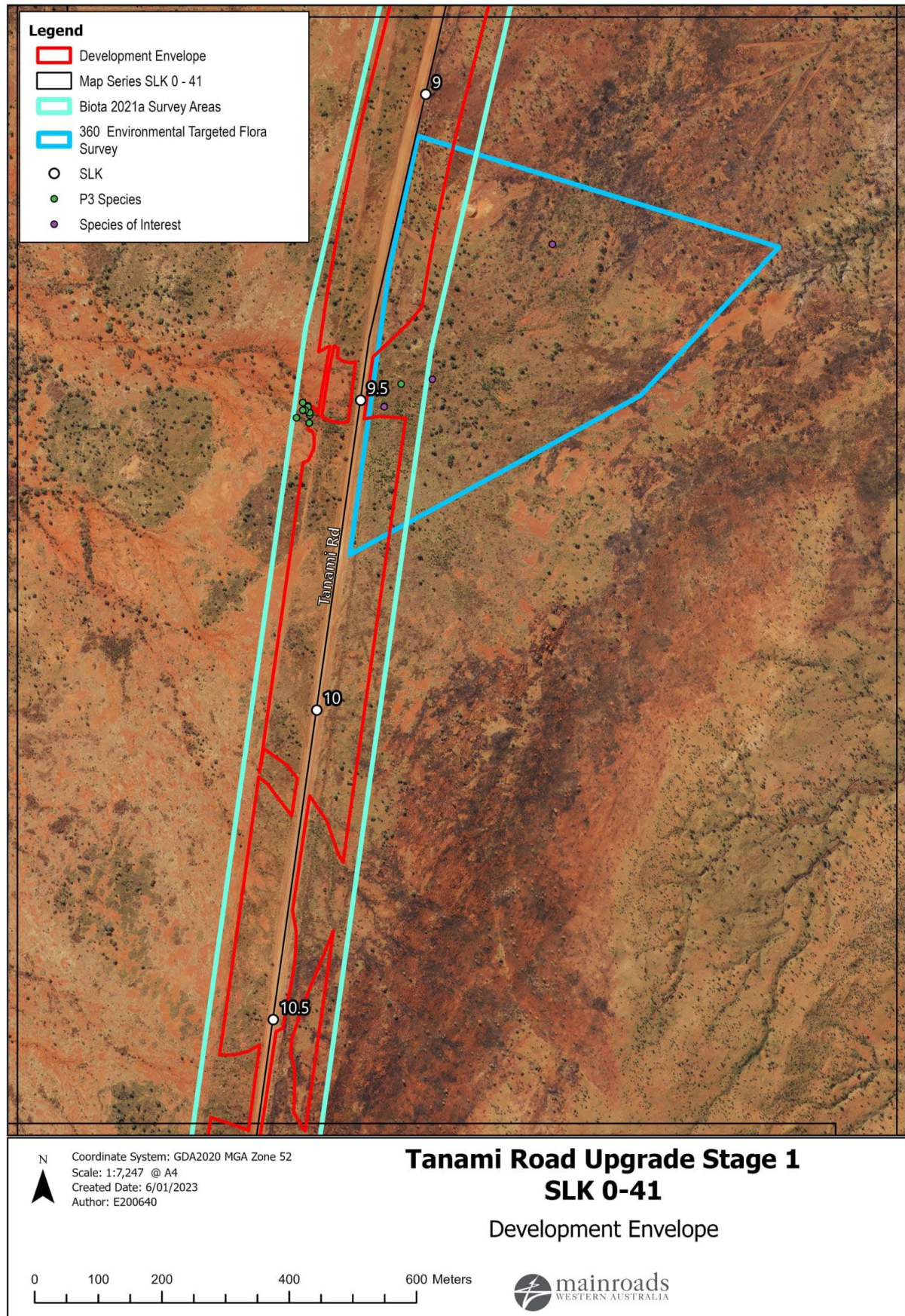


Figure 7: Map 6 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

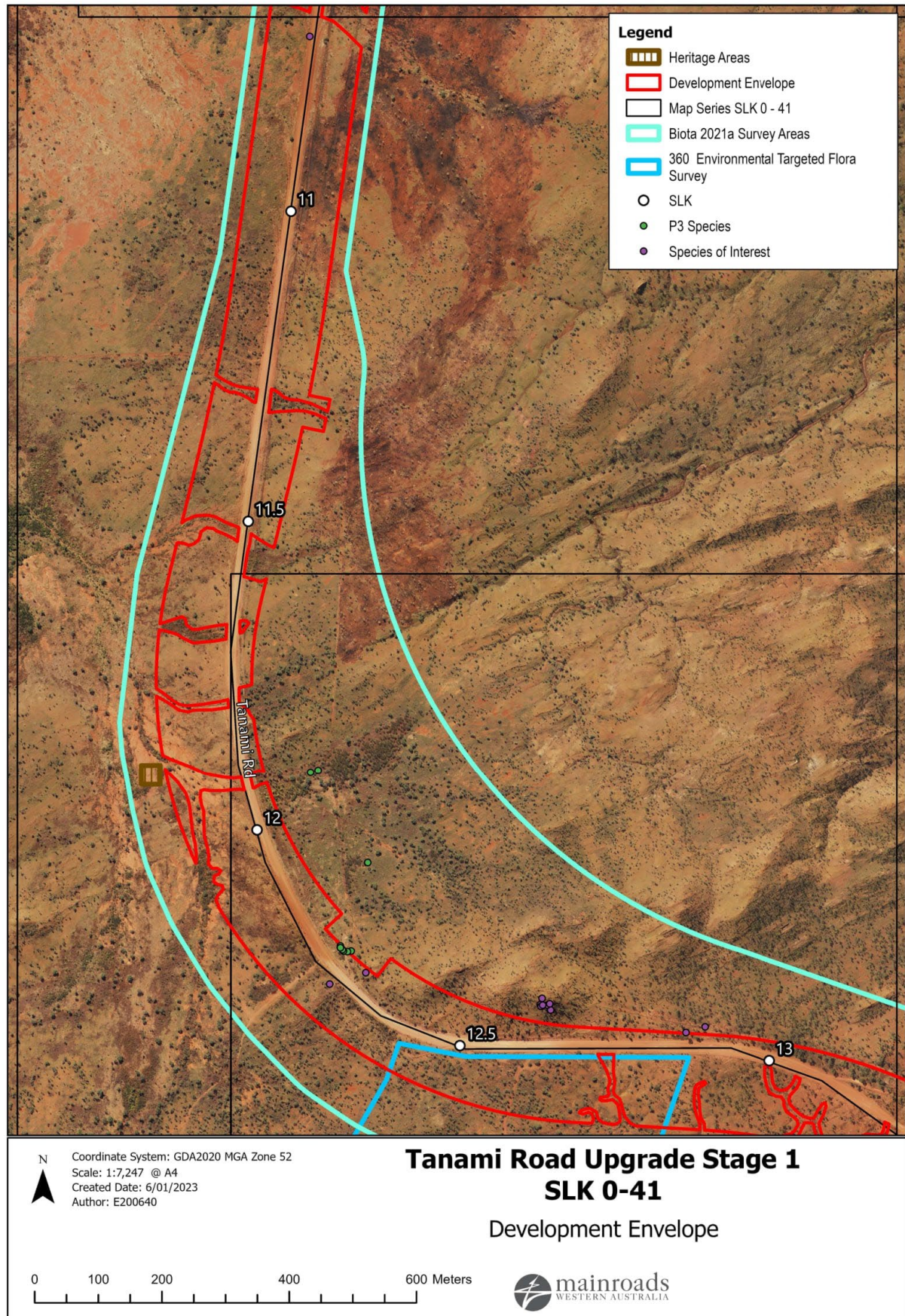


Figure 8: Map 7 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

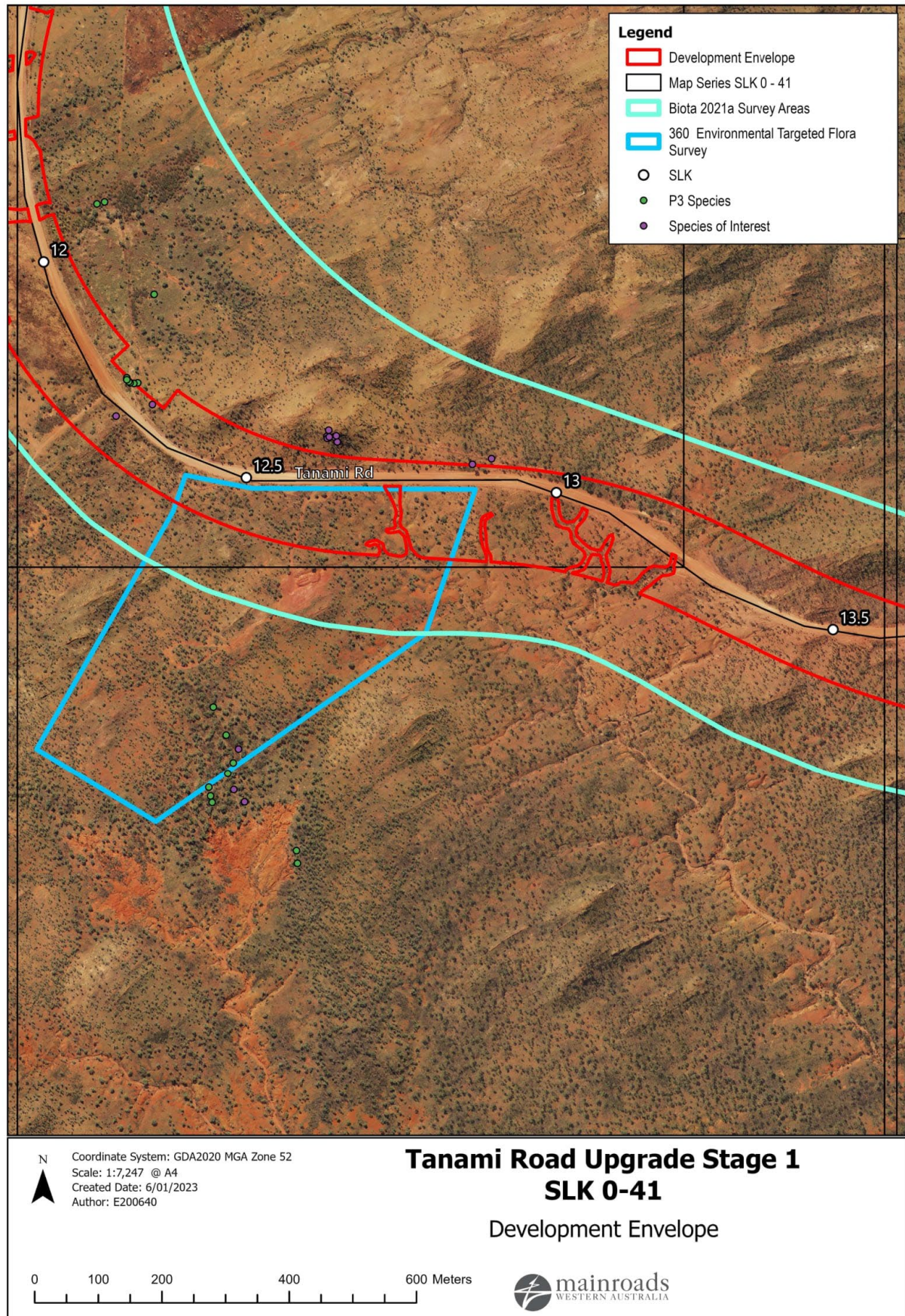


Figure 9: Map 8 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

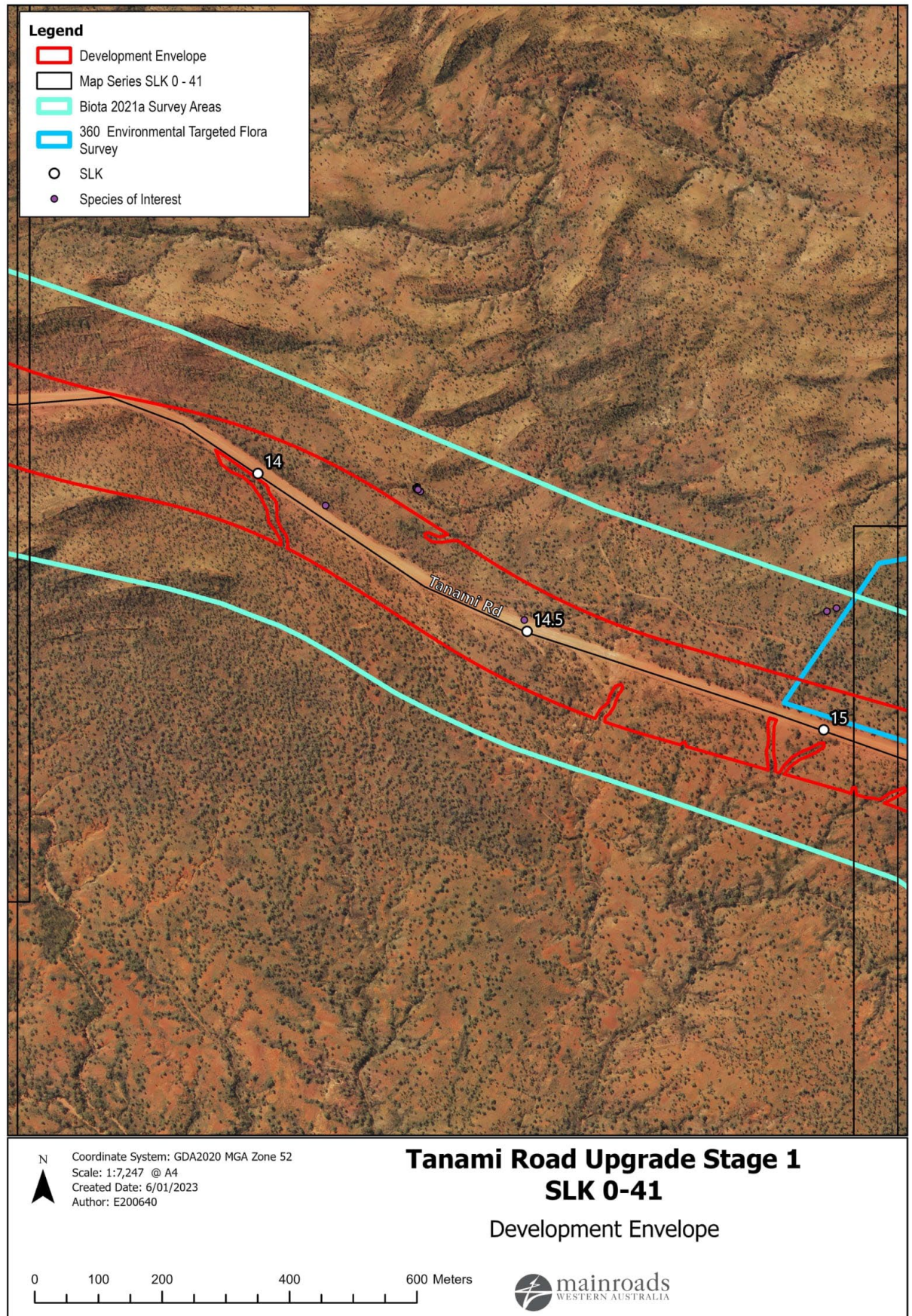


Figure 10: Map 9 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

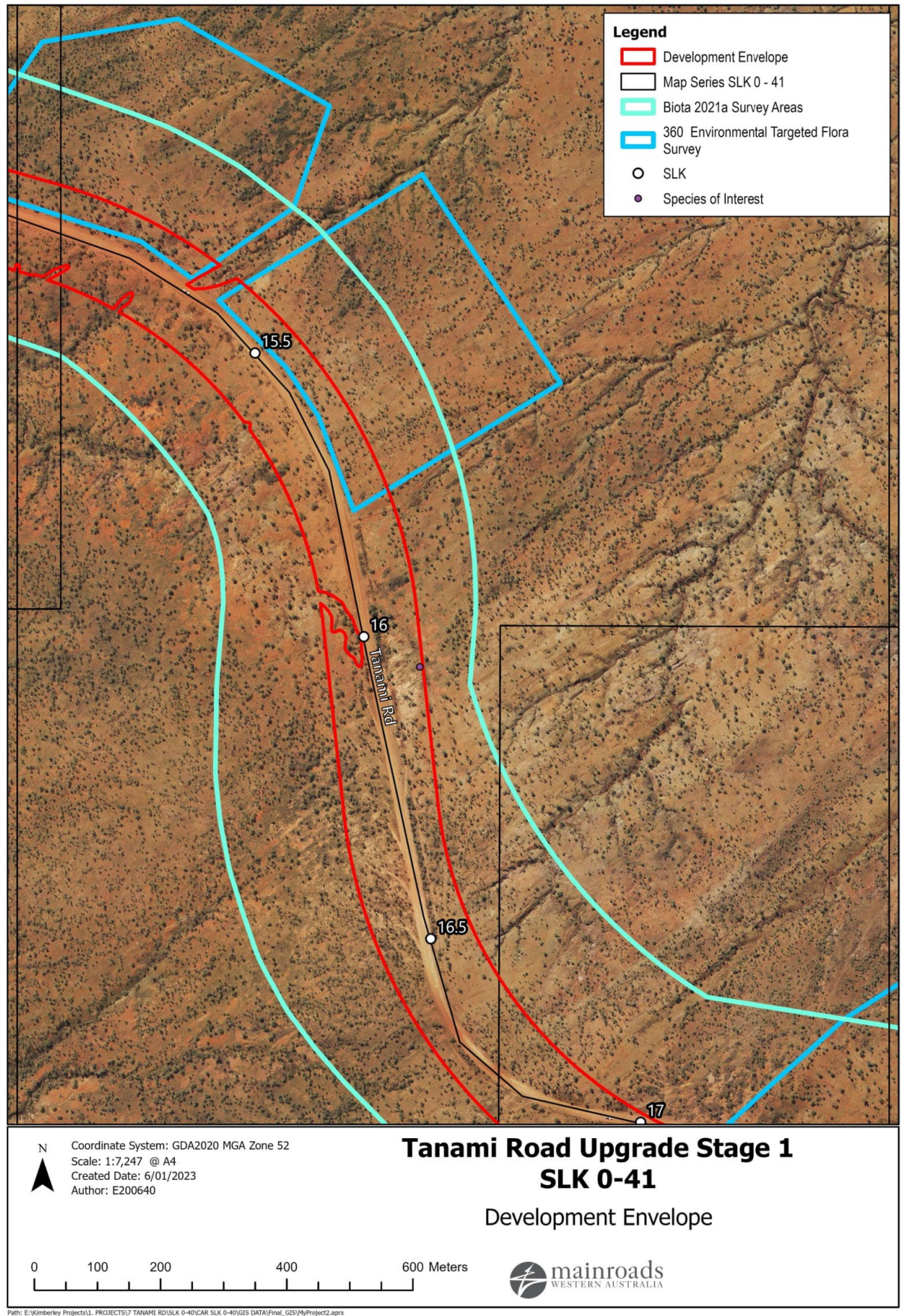


Figure 11: Map 10 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

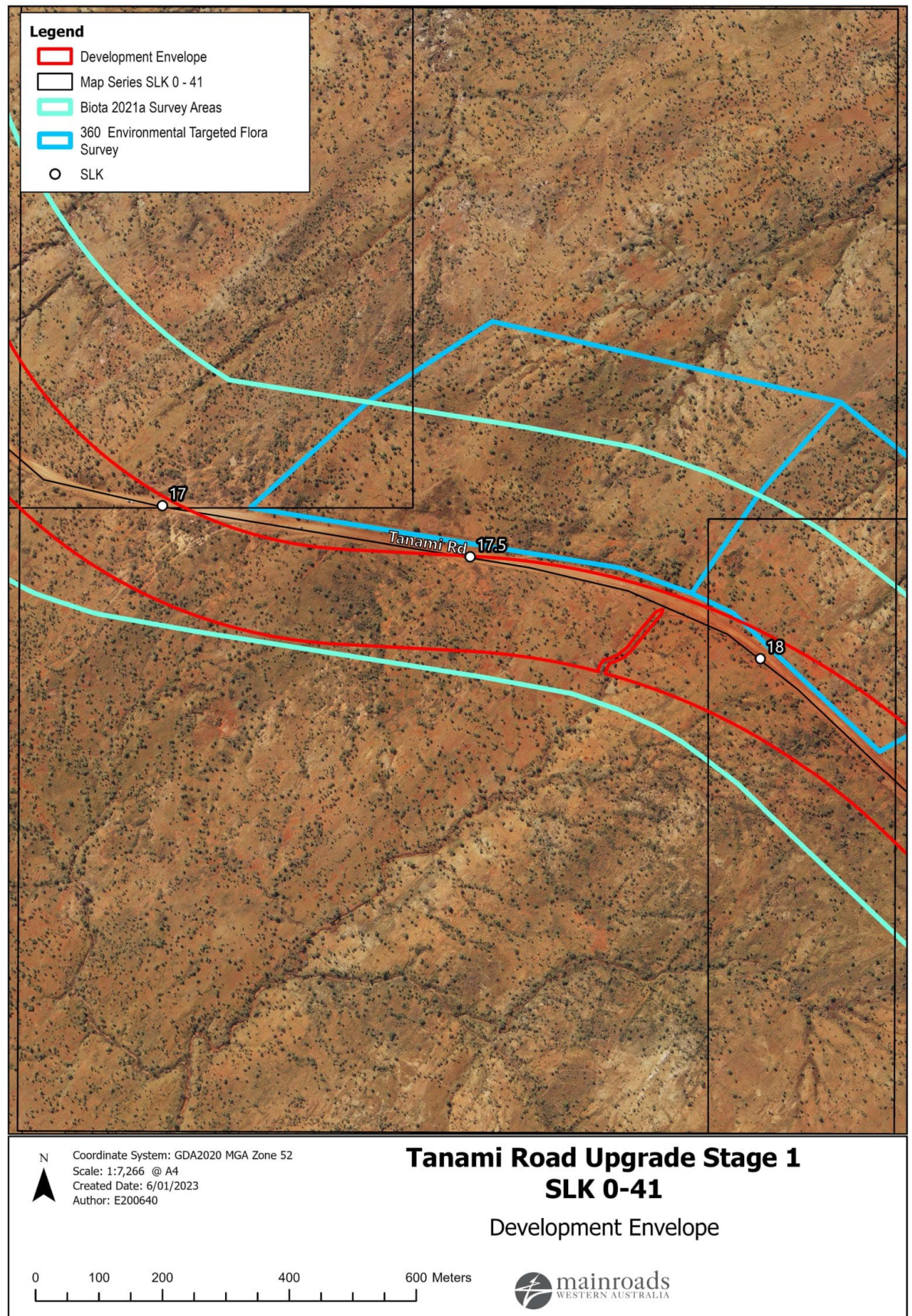


Figure 12: Map 11 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

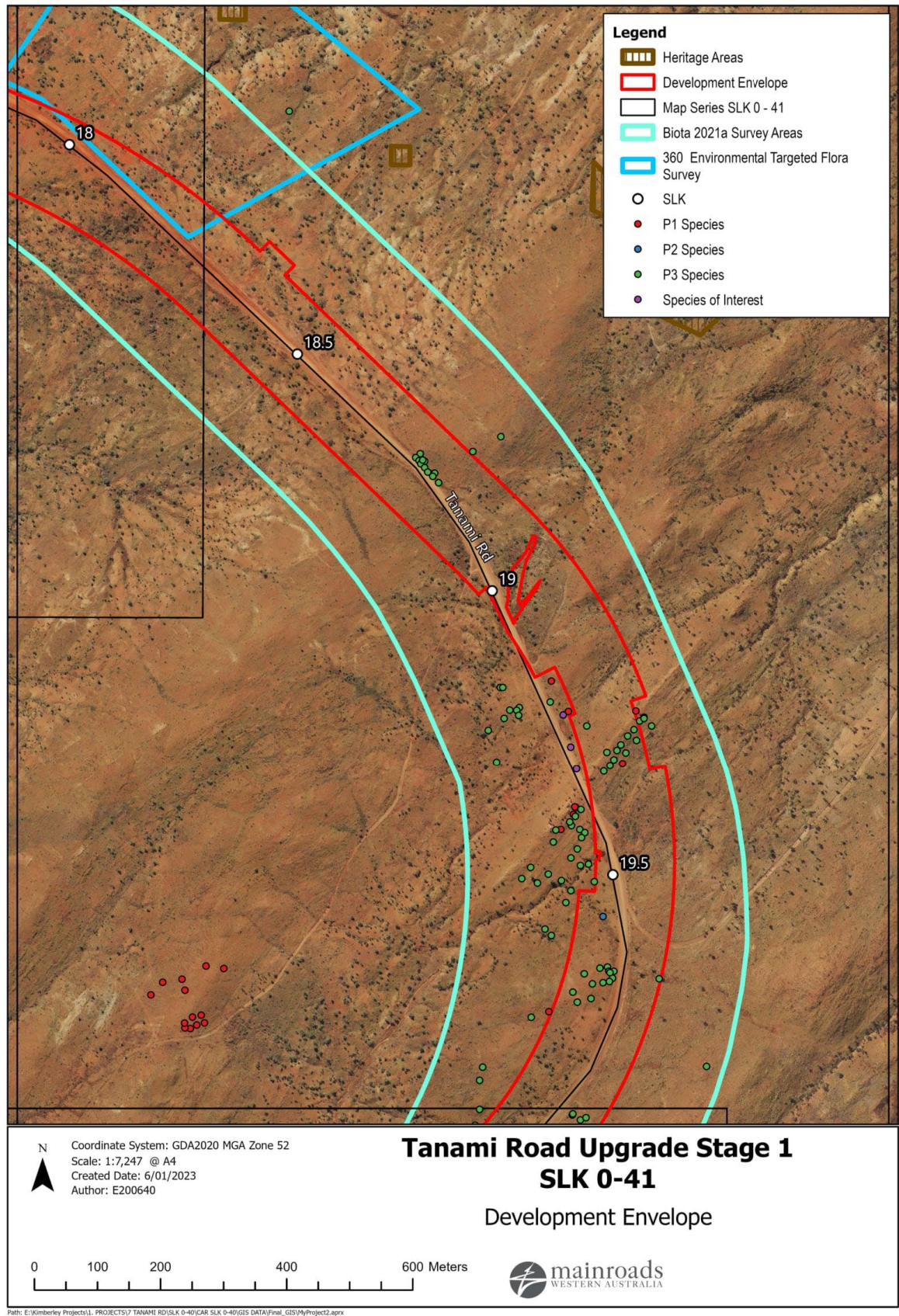


Figure 13: Map 12 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

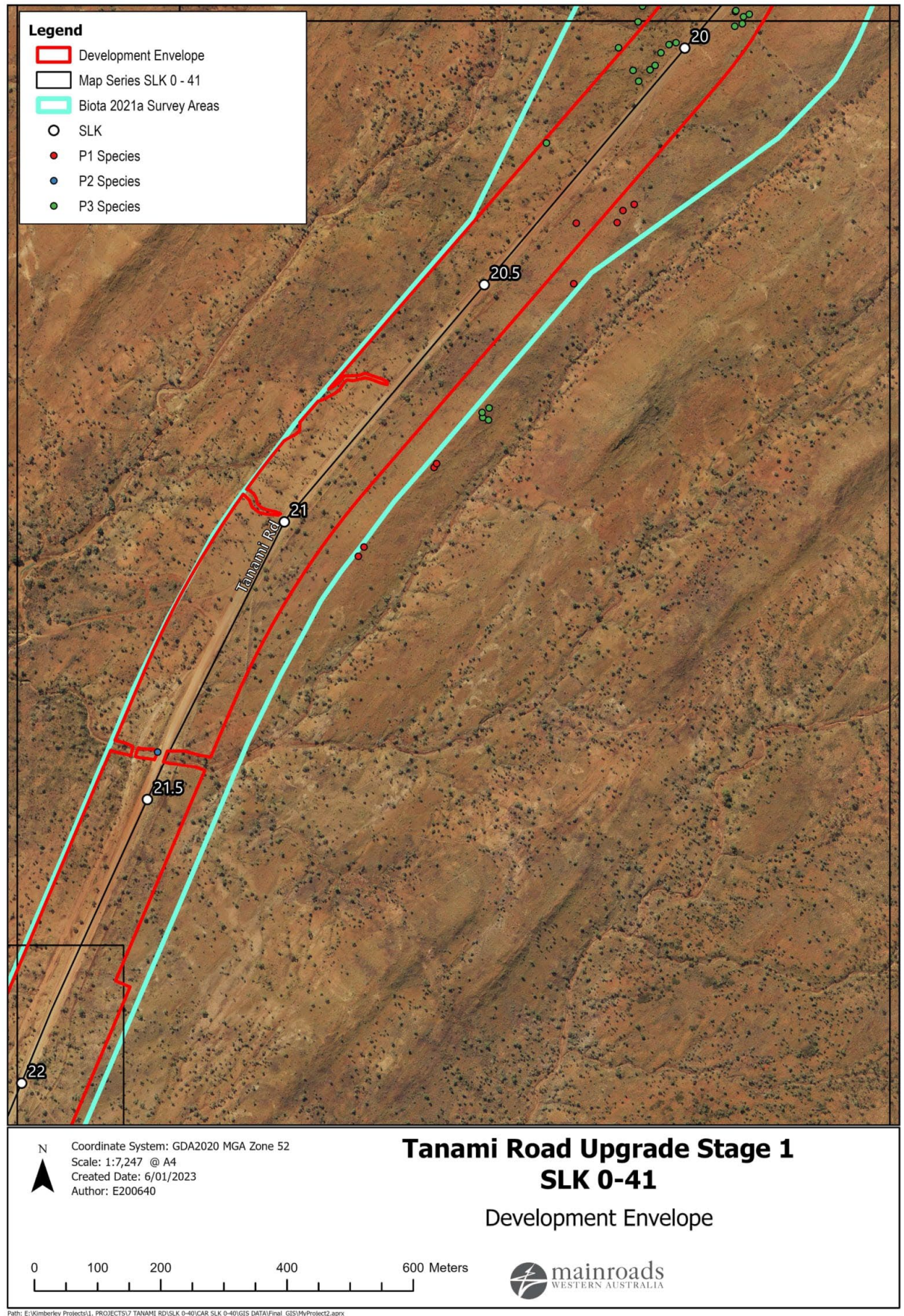


Figure 14: Map 13 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

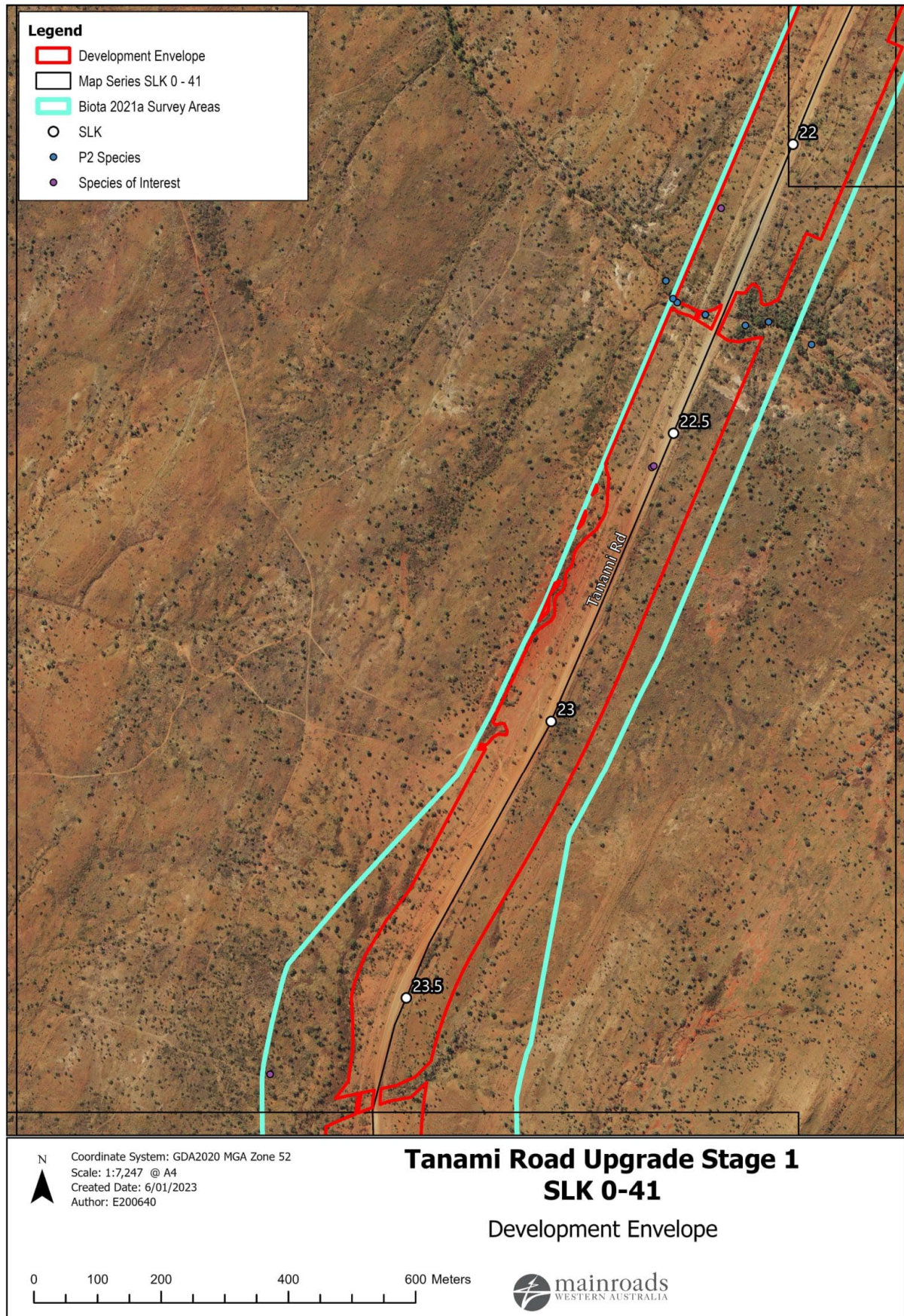


Figure 15: Map 14 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

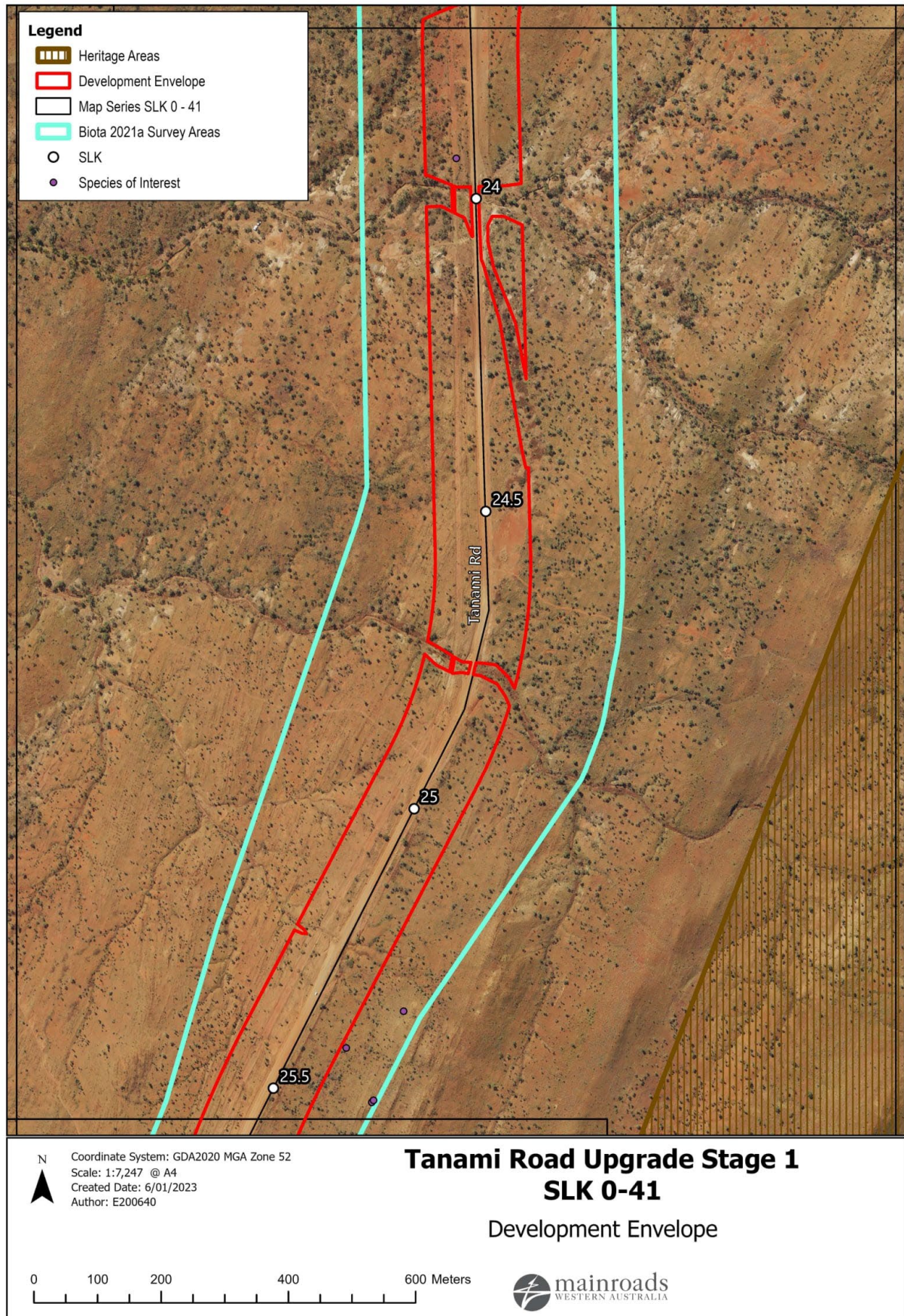


Figure 16: Map 15 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

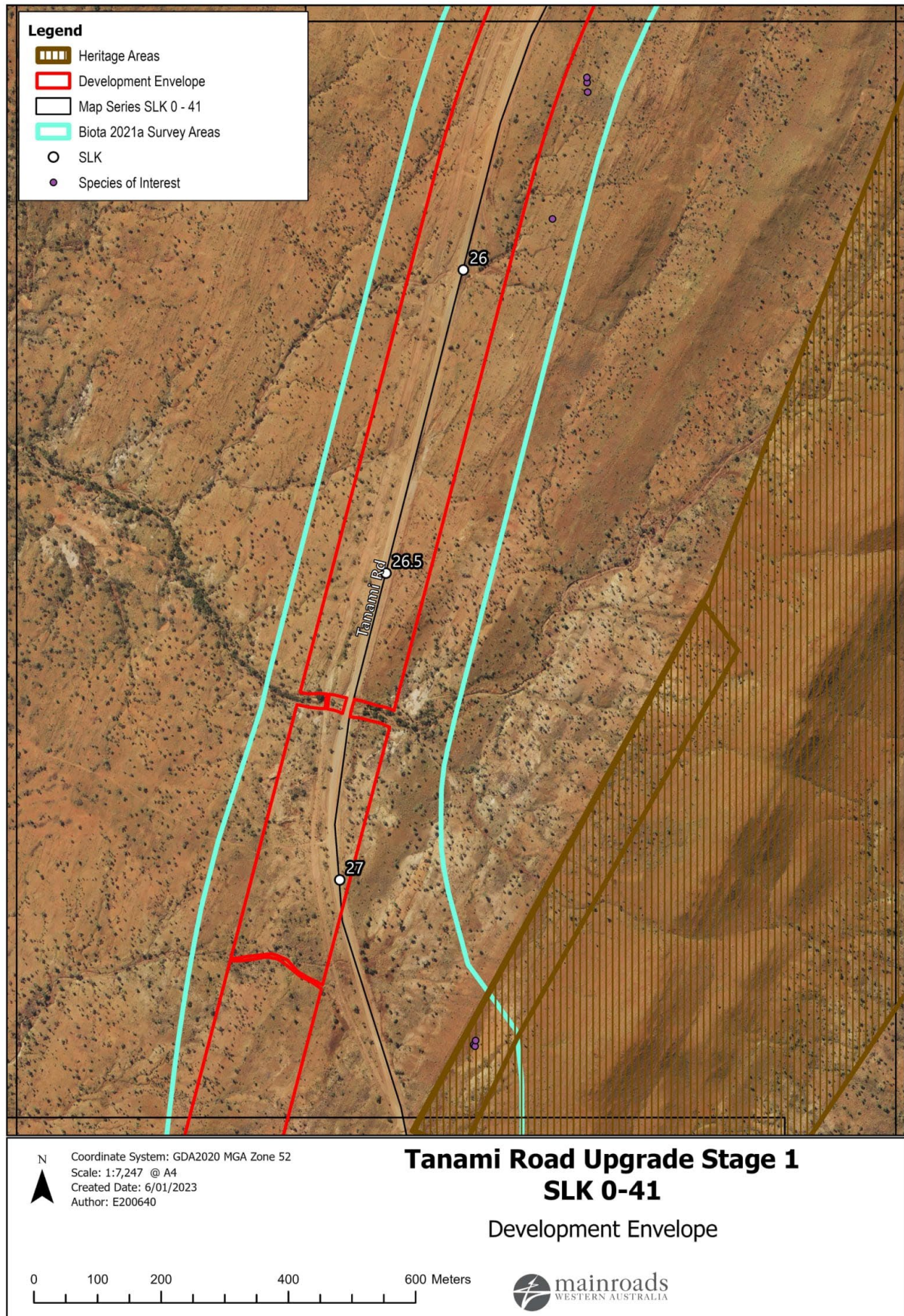


Figure 17: Map 16 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

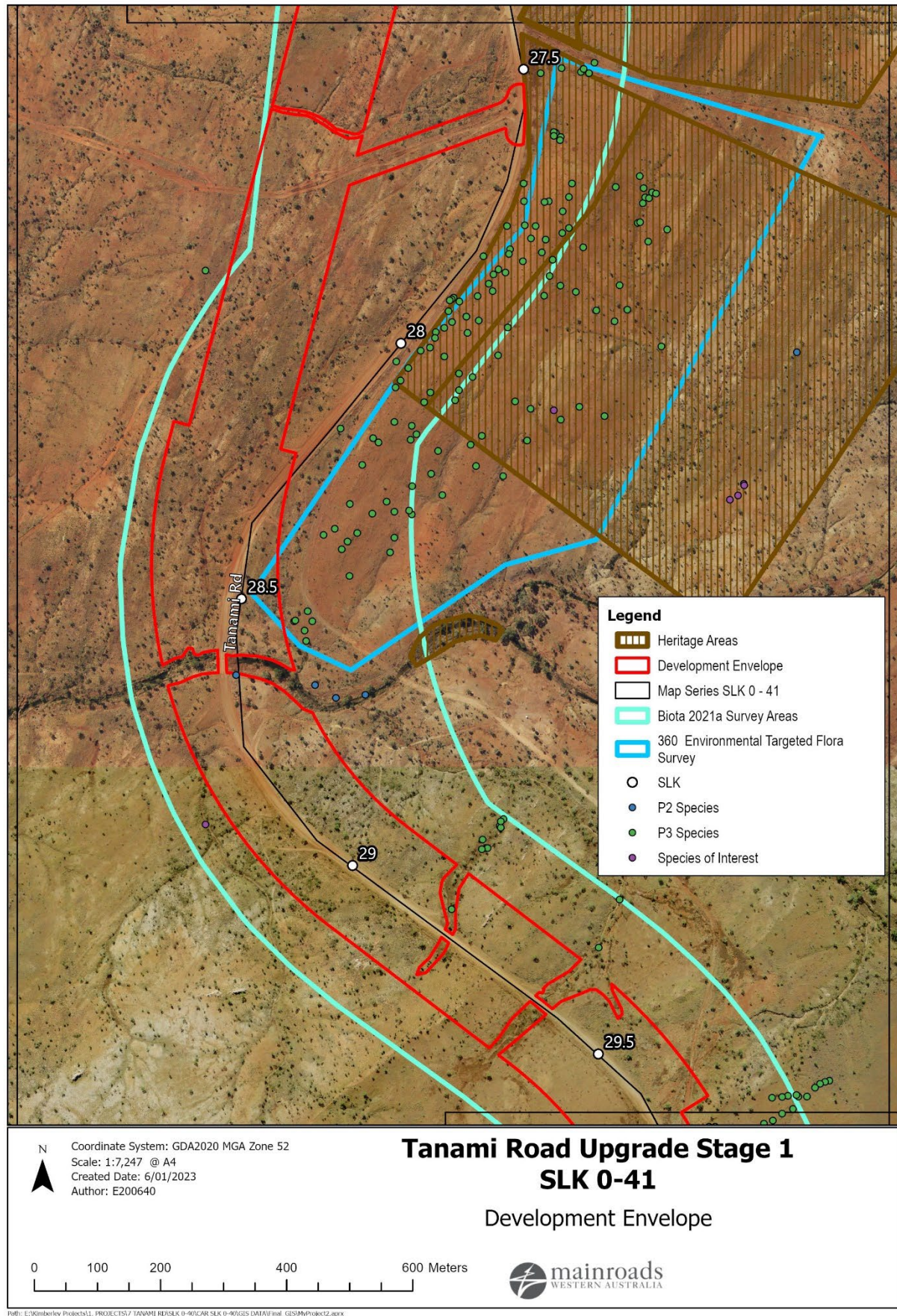


Figure 18: Map 17 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

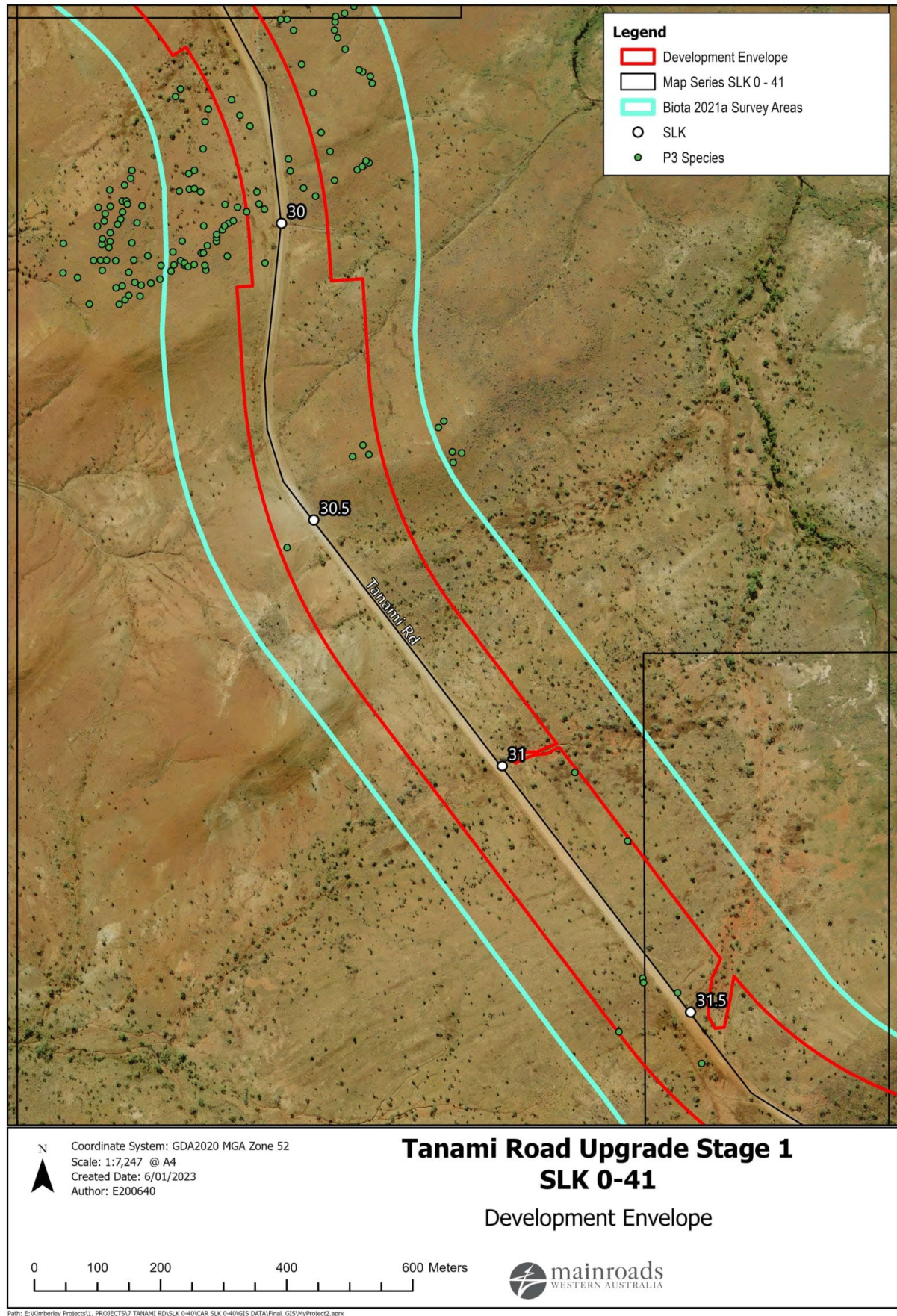


Figure 19: Map 18 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

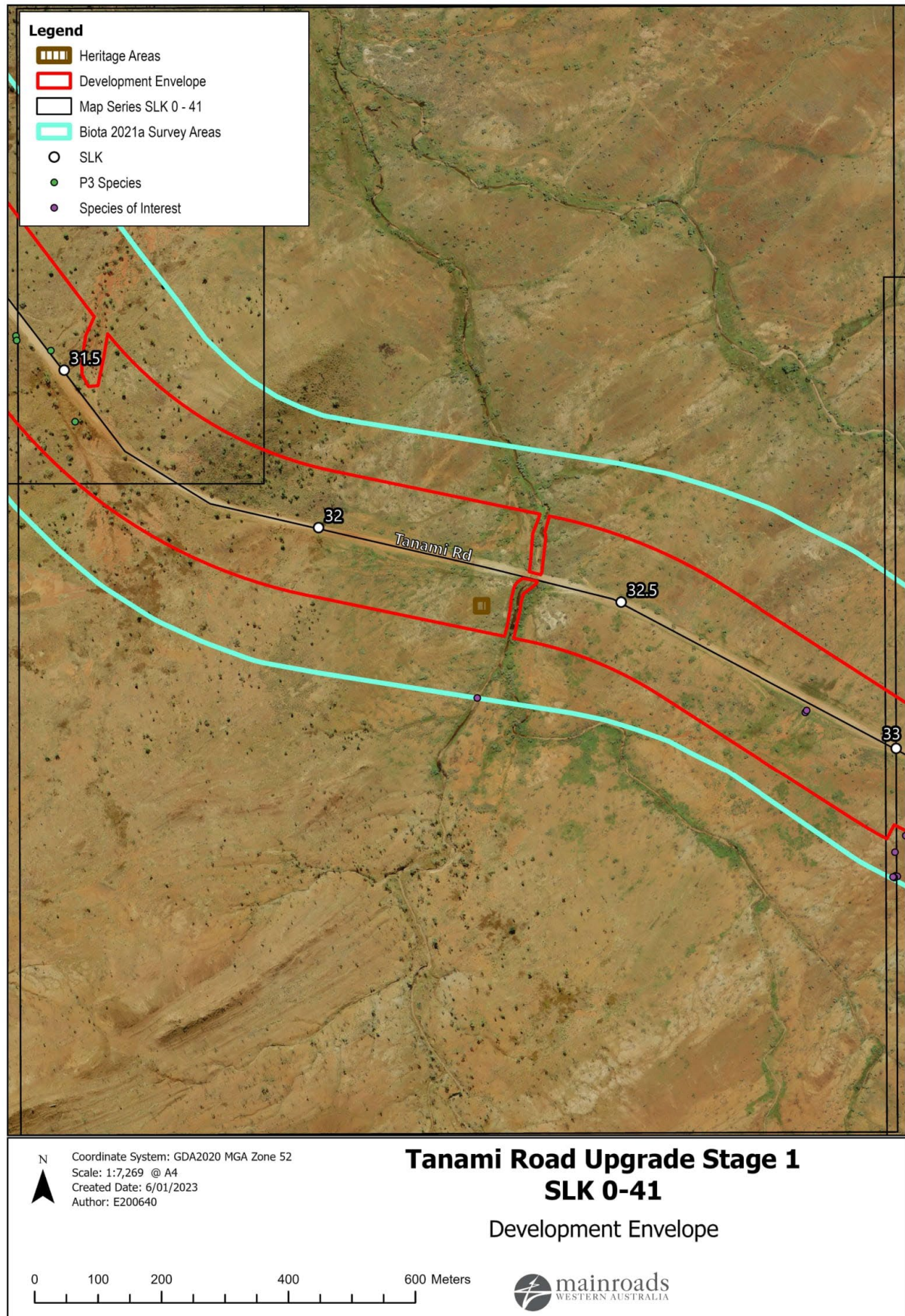


Figure 20: Map 19 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

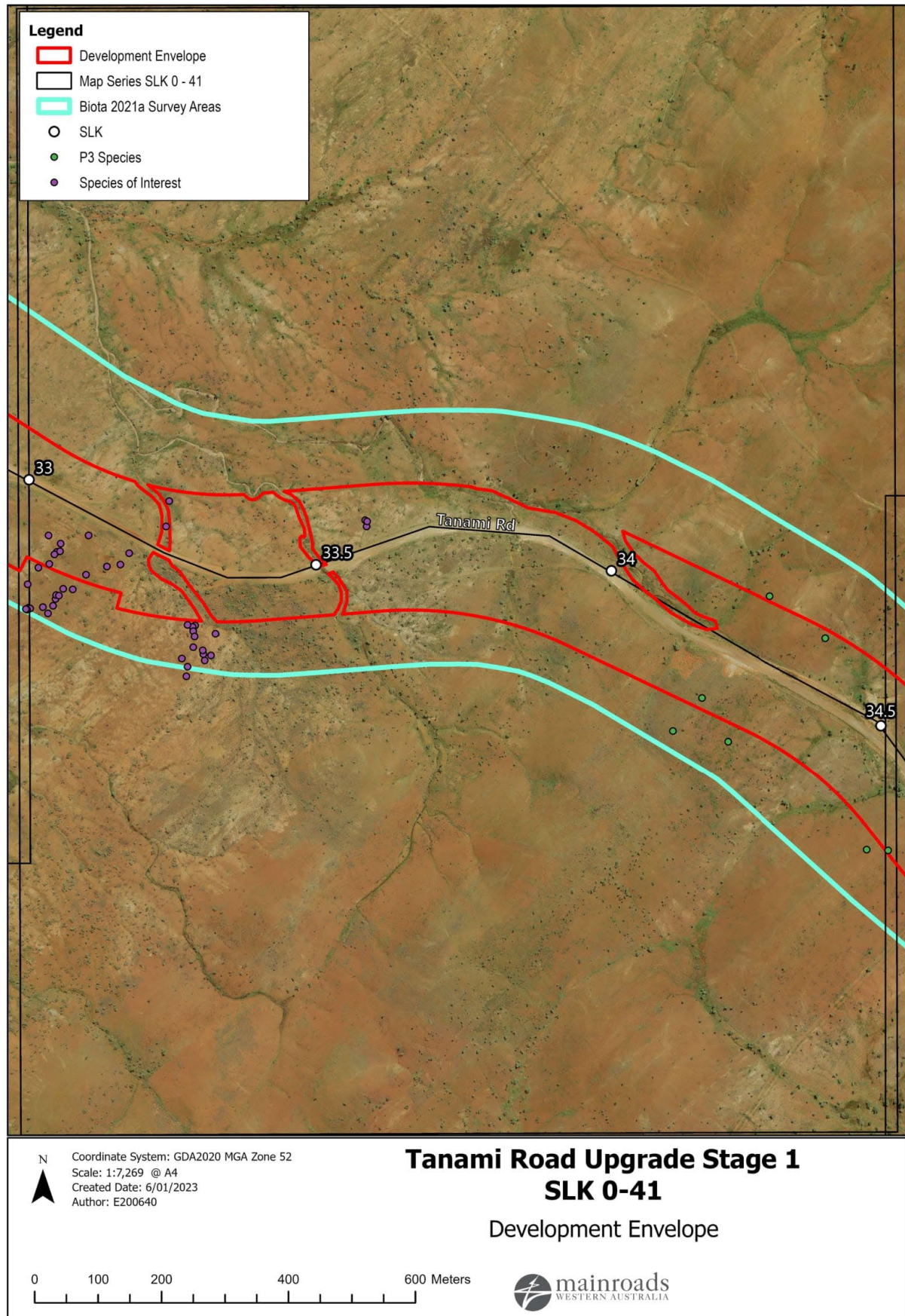


Figure 21: Map 20 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

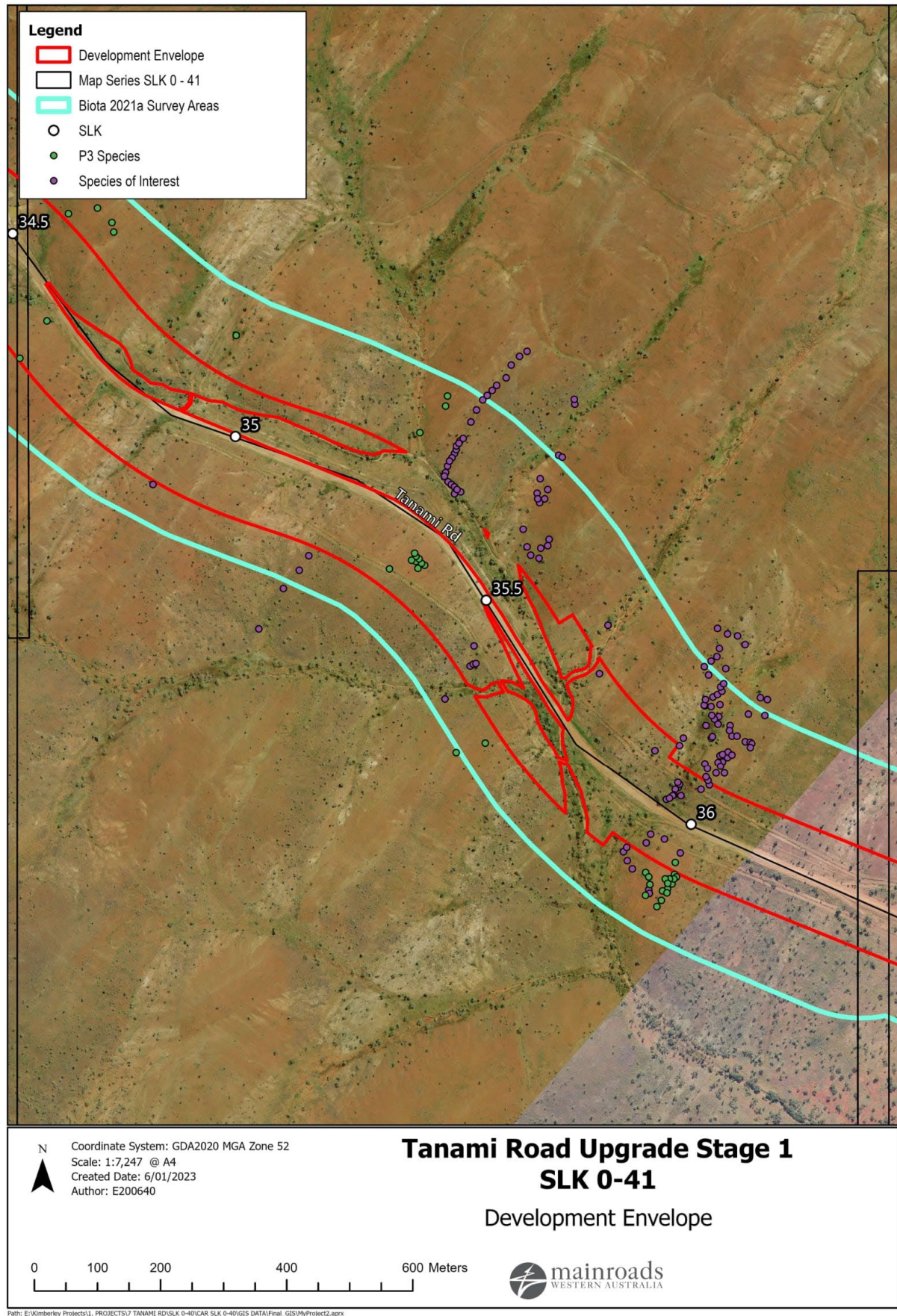


Figure 22: Map 21 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

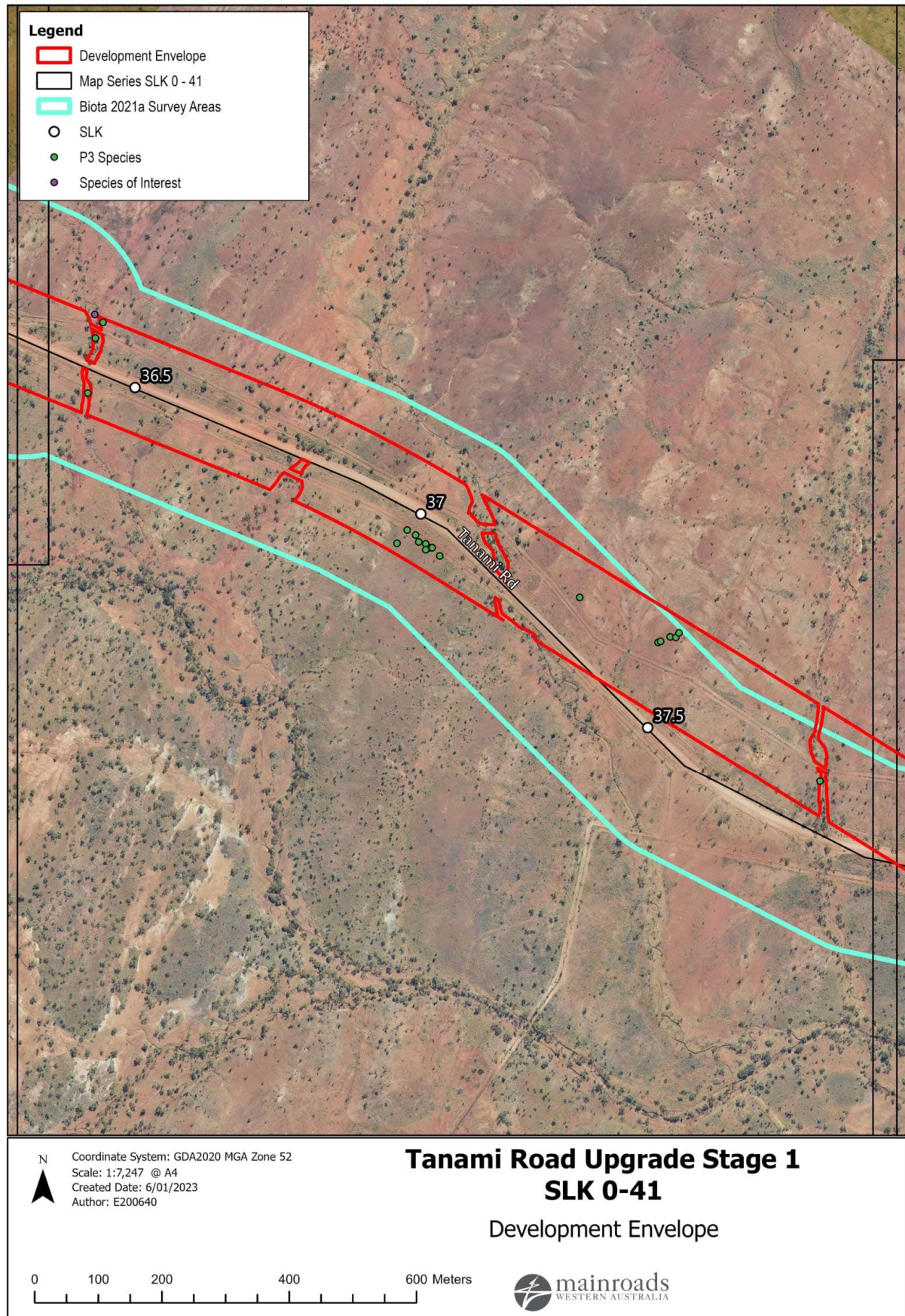


Figure 23: Map 22 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

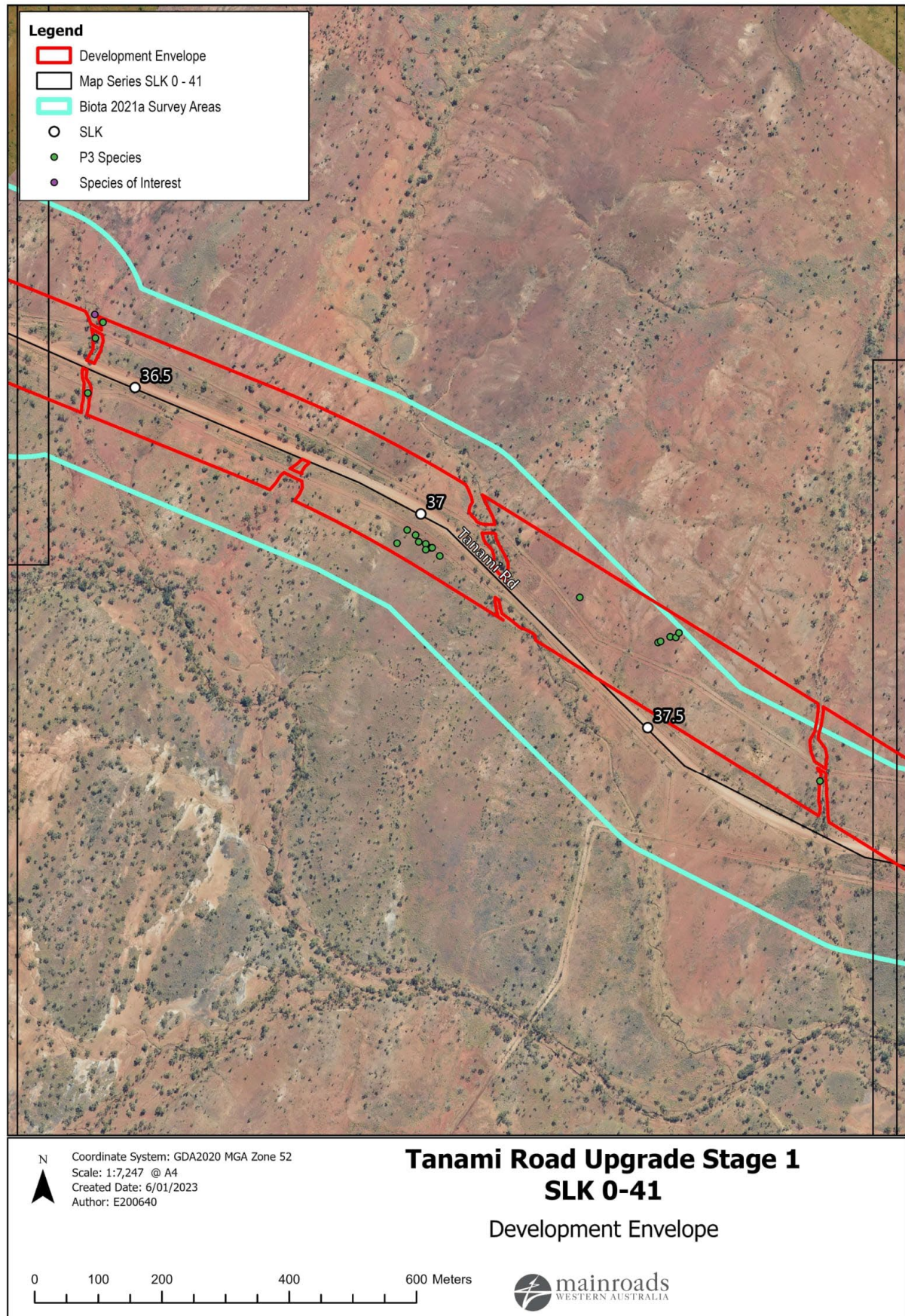


Figure 24: Map 23 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

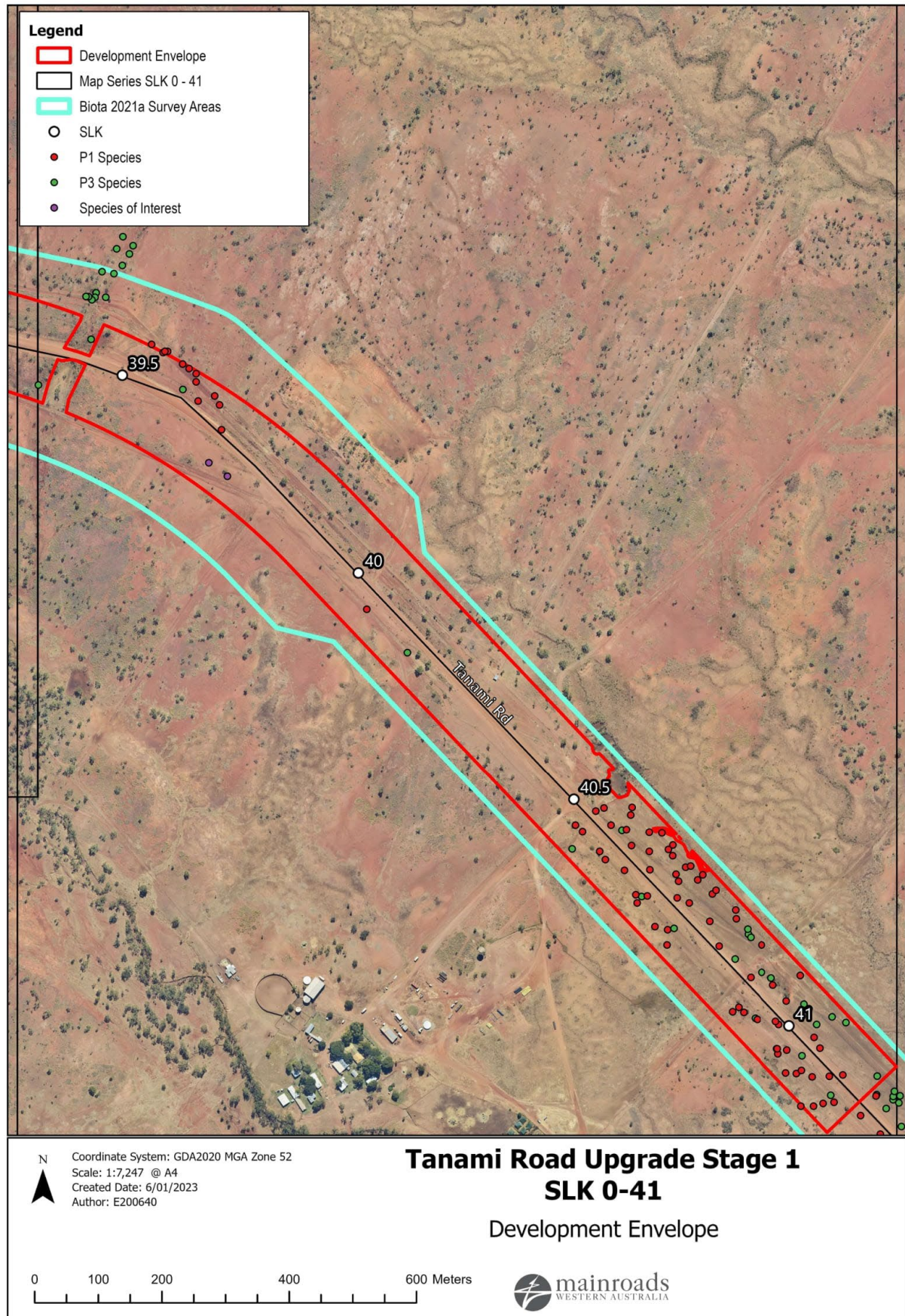


Figure 25: Map 24 - Tanami Road Upgrade Stage 1 SLK 0 – 41 Development Envelope.

1.5 Alternatives to Native Vegetation Clearing Considered During Proposal Development

The following alternatives to clearing were considered during the development of the proposal:

- Preferentially locating the new alignment entirely within previously cleared areas or areas devoid of vegetation. This alternative was not considered feasible as sufficient areas are not available and such a constraint introduces more safety risks (e.g. more sharp bends and corners);
- A balance between the materials required, safety requirements (ie reducing bends in the road) and cost was undertaken resulting in the proposed Development Envelope and indicative clearing footprint; and
- Not upgrading the road, however, this will potentially result in a poorer safety outcome and may result in future fatalities or serious injuries and further degradation of the asset.

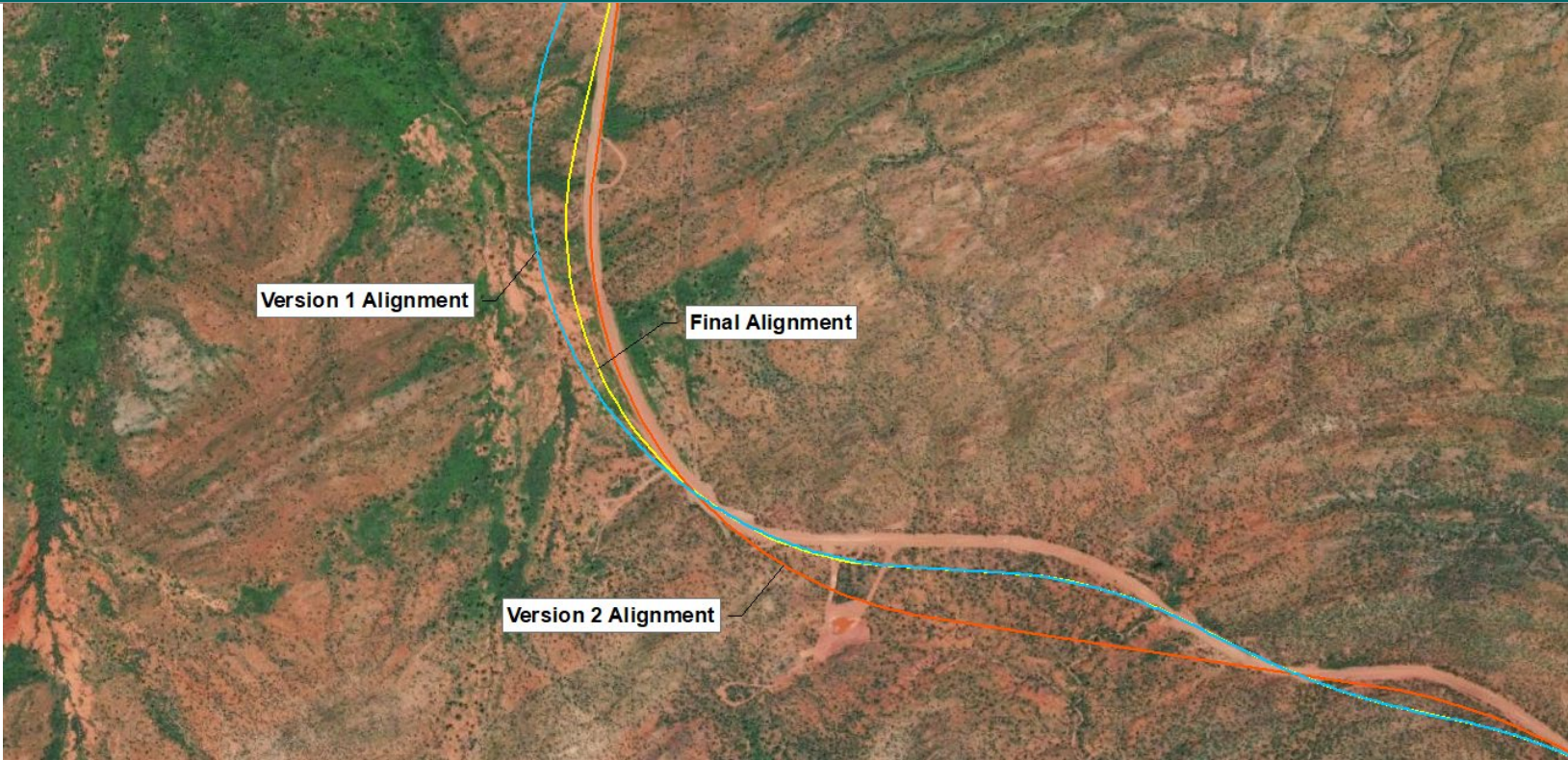
1.6 Measures to Avoid, Minimise, Reduce and Manage Proposal Clearing Impacts

The design and management measures implemented to avoid and minimise the clearing impacts by the project are provided in Table 1. In addition, the following measures have been considered:

- Avoid: The alignment has avoided areas of environmental or heritage significance;
- Avoid: Where possible, the Project design has been altered to avoid Priority Species and has gone through several road design iterations to do so (see Table 1);
- Avoid: Where possible, the Development Envelope has been altered to avoid Priority Species;
- Minimise: Where possible the road alignment has been designed to avoid ridgeline breakaways and scree slopes due to the value as fauna habitat, resulting in minimal impact (0.36ha).
- Minimise: Where possible, the alignment has stayed within the existing cleared area for Tanami Road to minimise native vegetation clearing.

Table 1. Measures Undertaken to Avoid, Minimise, Reduce and Manage the Proposal Clearing Impacts

Design or Management Measure	Discussion and Justification
Alignment to one side of existing road	The proposed alignment currently aims to balance safety outcomes by maintaining a suitable curve geometry for a 110km/h rated sealed national highway as well as environmental impacts. Subsequently, alignment to one side of the existing road is not feasible, however the proposal does utilise large portions of the existing road.
Development Envelope	The proposed Development Envelope has been reduced from >700 ha to approximately 646 ha to reduce the potential environmental impacts within which a maximum 228. ha is proposed to be cleared. The utilisation of a Development Envelope provides flexibility on ground during construction and allows for: • priority species to be avoided (e.g. avoidance of individuals that germinate following the wet season) • the utilisation of areas where vegetation is of lower quality eg. Using cleared areas for access tracks rather than undisturbed vegetation.
Drainage modification	Where possible, existing drainage lines will be utilised to minimise disturbance to existing vegetation.
Alternative alignment located within pasture or degraded areas	The proposed alignment currently aims to balance environmental impacts and safety outcomes by maintaining a suitable curve geometry for a 110km/h rated sealed national highway. The alignment is proposed to overlay the existing roads where possible. Some realignment is required between SLK 10 and 40, where terrain is hilly with many tight corners and blind crests necessitating a new alignment with larger turn radiuses and smoother vertical geometry changes. Preliminary design revisions were undertaken with the specific aim of reducing environmental impact through minimising clearing required for the upgrade as well as reducing the amount of fill required, thereby reducing future clearing for material pits. Clearing for the centreline has been reduced by 15% from the first concept design and subsequent impacts to Priority flora species reduced by 5% from the first concept to current design. Reductions to priority flora impact is considerably less than the reduction in clearing impacts due to the large numbers of flora that has colonised the existing road formation. Avoidance of priority species has been made a priority without compromising the safety of road design where realignments are necessary. Sections have been avoided through 4 iterations of road alignment, to reach a compromise between road design safety and mitigation of environmental impacts (Table 1).

Design or Management Measure	Discussion and Justification
	 <i>Several design alignments were considered. The final alignment is a better compromise between safety and environmental impact.</i>
Steepen batter slopes	Batters have been designed to reside within disturbed areas and require minimal clearing whilst maintaining a suitable curve geometry for a 110km/h rated sealed national highway as well as environmental impacts.
Stockpiling Topsoil	Cleared areas where <i>Goodenia crenata</i> and <i>Goodenia lunata</i> populations are present, topsoil will be collected and respread. This topsoil will be preferentially spread in drains and other low-lying areas where these species are most prominent.

Design or Management Measure	Discussion and Justification
Monitoring	Regrowth of priority species in areas of disturbance will be monitored as per the Vegetation Monitoring Plan (VMP) in Appendix 3.1.

1.7 Approved Policies and Planning Instruments

The clearing of native vegetation in Western Australia is regulated under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Clearing Regulations).

In addition to the matters considered in accordance with section 51O of the EP Act, Main Roads has also had regard to the below instruments where relevant.

Other Legislation potentially relevant for assessment of clearing and planning/other matters:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Conservation and Land Management Act 1984* (WA) (CALM Act)
- *Country Areas Water Supply Act 1947* (WA) (CAWS Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Planning and Development Act 2005* (WA) (P&D Act)
- *Soil and Land Conservation Act 1945* (WA)
- *Rights in Water and Irrigation Act 1914*
- *Aboriginal Heritage Act 1972* (WA).

Environmental Protection Policies:

- Environmental Protection (Peel Inlet – Harvey Estuary) Policy 1992
- Environmental Protection (Western Swamp Tortoise Habitat) Policy 2011.

Other relevant policies and guidance documents:

- Environmental Offsets Policy (Government of Western Australia, 2011)
- A guide to the assessment of applications to clear native vegetation (Government of WA, December 2014)
- Procedure: Native vegetation clearing permits (Government of WA, October 2019)
- Environmental Offsets Guidelines (Government of Western Australia, 2014)
- Technical guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016)
- Technical guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2020)
- Approved conservation advice under section 266B of the EPBC Act for threatened flora/fauna/vegetation communities.

2 SCOPE AND METHODOLOGY OF CLEARING ASSESSMENT

Native vegetation will be cleared to accommodate this Proposal. This clearing will be undertaken using the Main Roads Statewide Clearing Permit CPS 818.

To comply with CPS 818, Main Roads must prepare a Clearing Assessment Report (CAR).

The CAR outlines the key activities associated with the Proposal, the existing environment and an assessment of native vegetation clearing. This assessment provides an evaluation of the vegetation clearing impacts associated with the Proposal using the ten Clearing Principles listed under s51 of the *Environmental Protection Act 1986* (EP Act) and strategies used to manage vegetation clearing.

2.1 Report Terminology and Sources

The following terms are used in this Clearing Report:

- **Development Envelope** – The maximum extent within which the Clearing Area will be located. This envelope is larger than the Clearing Area and the Proposal Area to allow for minor changes to the Proposal footprint as the design process continues, and to account for minor and unexpected changes that may occur during construction, such as working to avoid a large tree or encountering buried boulders or services. This flexibility allows the site personnel to make modifications to the Proposal to avoid areas that may contain better environmental values. The CAR has assessed all environmental values within the Development Envelope as though all of these values will be impacted, up to the amount specified within the Clearing Area.
- **Proposal Area** – The total footprint of the Proposal including both cleared and uncleared areas. This is based on the current design and is less than the Development Envelope. It usually includes a buffer to allow for constructability and the movement of machinery during construction.
- **Study Area** – Area covered by the Desktop Assessment. The Study Area for the Proposal is confined to a local area of a 40 km radius to identify and examine potential environmental impacts.
- **Survey Area** – Area covered by the Biological Surveys, which is larger than the Development Envelope.
- **Contextual Survey Area** – Consists of a 500 m buffer area surrounding the biological survey where vegetation mapping was extrapolated using survey area data and aerial imagery.

2.2 Desktop Assessment

A desktop assessment of the Development Envelope was undertaken by viewing internal datasets and other government agency managed databases, and consulting with relevant stakeholders where necessary. Results from searches can be found in Appendix 2.

GIS layer viewing and mapping is done using ArcMap and/or Main Roads corporate mapping system known as iMaps. Referencing of the GIS layers accessed is done under the relevant methodology section of each clearing principle. Government managed databases were searched to locate additional information, which are found under References in Section 9.

2.3 Surveys and Assessments

The following surveys/assessments were undertaken to inform this CAR:

- Tanami Road Upgrade and Great Northern Highway Material Pit Areas: Flora Survey (Biota Environmental Sciences, 2021);
- Tanami Road Upgrade Targeted Flora Survey (360 Environmental, 2021);
- Tanami Road Upgrade SLK 0-60 Biological Survey (Biota Environmental Services, 2020); and
- Main Roads Targeted Survey 2022 (Main Roads, 2022)

A summary of the methodology and the results of the above surveys are provided in Section 3.

3 SUMMARY OF SURVEYS

3.1 Overview of Surveys

Main Roads commissioned 3 surveys for the project and conducted an additional targeted flora survey internally. Of these four surveys, one was completed in 2020, two in 2021, and one in 2022 (Table 2). The surveys identified 13 vegetation units with 9 corresponding fauna habitat types in condition ranging from Completely Degraded to Excellent. The surveys also determined that seven (7) priority flora species and twelve (12) flora species of interest (SOI) are likely to occur in the survey area. A combined total of 114 species of vertebrate fauna were recorded, including 10 mammals, 9 bats, 72 birds, 20 reptiles and 3 amphibians. No fauna species of significance were recorded.

Biological and targeted surveys conducted for the proposal are outlined in Table 2. A summary of the findings in these reports are presented in Sections 3.2 – 3.5.

Table 2. Summary of Biological and Targeted Surveys Relevant to the Proposal

Consultant & Survey Name	Survey Details
Biota Environmental Services (2020) Tanami Road Upgrade SLK 0-60 Biological Survey	Survey Area: Survey area comprised approximately 1650.7 ha and a contextual area of 5951.4 ha (7602.1 ha including survey area) adjacent along Tanami Road (SLK 0 – 60). This started at the Great Northern Highway (GNH) Tanami intersection and continued for 60 km at varying widths between 200m and 500m wide. Type: Detailed flora and vegetation survey, targeted flora survey and basic and targeted fauna survey. Timing: Fieldwork conducted on from the 23rd of May to 8th June 2020. Shapefile TRIM Ref: D21#506928 Document TRIM Ref: D21#125420
360 Environmental (2021) Tanami Road Upgrade Targeted Flora Survey	Survey Area: Nine polygons (material pit locations) were surveyed along Tanami Road, totalling 58.2 ha in area. Type: Targeted Flora survey for the proposed Tanami Road Upgrade (SLK 0 – 60) within nine areas (proposed material pits and construction water dams) on Tanami Road. Timing: Fieldwork conducted on 21st – 25th May 2021 Shapefile TRIM Ref: D21#1081780 Document TRIM Ref: D21#1081407

Consultant & Survey Name	Survey Details
Biota Environmental Sciences (2021a) Tanami Road Upgrade and Great Northern Highway Material Pit Areas: Flora Survey	Survey Area: Survey Area comprises 44.20 ha on Tanami Road and 132.15 ha on GNH. Type: Targeted surveys for Priority flora species and other species of interest that were identified as occurring or potentially occurring, during the initial botanical survey in 2020.. Timing: Fieldwork was conducted on 14 th – 25 th June 2021 Shapefile TRIM Ref: D21#1219428 Document TRIM Ref: D21#1020020
Main Roads (2022) Tanami Road Upgrade SLK 0-20 Targeted Flora Survey	Survey Area: Survey Area comprises 2.74 ha on Tanami Road and 10.21 ha on GNH. Type: Targeted surveys for <i>Goodenia crenata</i> Timing: November 2022 Shapefile TRIM Ref: D22#1201338 Document TRIM Ref: D22#1201339

3.2 Summary of Flora and Vegetation Survey – Biota 2021a

The “Tanami Road Upgrade SLK 0-60 Biological Survey” was conducted from the 23rd of May to 8th June 2020 by Biota Environmental Sciences covering an area of 1650.7 hectares. The spatial scopes for the biological survey comprised a Survey area (200-500 m from road corridor), a contextual area (500 m buffer around the survey area) and the study area (40 km buffer around the survey area). A desktop flora and fauna assessment were undertaken for the study area, followed by a field survey which comprised a detailed and targeted flora and vegetation survey and a basic and targeted fauna survey of the survey area.

Vegetation

A total of 13 vegetation units were identified from the survey area, associated with drainage lines, plains and hills. None of the vegetation units represent listed Threatened Ecological Communities (TECs), or Priority Ecological Communities (PECs). The vegetation unit P10 shared some similarities to the two tussock grassland communities in the study area that are listed as PECs and was considered to be of local significance. Two vegetation units from drainage line habitats (D3 and D4) were considered to represent Groundwater Dependent Ecosystems and were also considered to be locally significant. No drainage lines or P10 vegetation units are present in the project Development Envelope.

Flora

A total of 414 native vascular flora species from 165 genera and 57 families were recorded from the survey area. No Threatened flora were recorded. Five species were confirmed to be Priority species, while a sixth was tentatively identified as such. These comprised two P1 species- *Goodenia lunata* and *Pentalepis trichodesmoides* subsp. ? *incana*; one P2 species – *Ipomoea racemigera*; and three P3 species – *Glycine falcata*, *Goodenia crenata* and *Trachymene dusenii*. Nine taxa recorded were designated as “Species of Interest” as they may be new (undescribed) species or cannot be referred to any known taxa recognised for Kimberley. A total of 26 weed species were recorded, including one significant weed species **Calotropis procera* (Calotrope) which is a Declared Plant and was found scattered through plains and drainage lines throughout the survey area.

Fauna

A combined total of 114 species of vertebrate fauna were recorded, including 10 mammals, 9 bats, 72 birds, 20 reptiles and 3 amphibians. No fauna species of significance were recorded, however a cluster of burrows and diggings potentially belonging to Bilby *Macrotis lagotis* (VU) was recorded from the contextual area about 10 km to the south of the southern end of the Development Envelope. The assessment concluded that 8 fauna species of significance were considered likely to occur within the survey area. These included: Ghost Bat *Macroderma gigas* (VU), Grey Falcon *Falco hypoleucos* (VU), Peregrine Falcon *Falco peregrinus* (OS), Fork-tailed Swift *Apus pacificus* (MI), Oriental Plover *Charadrius veredus* (MI), Oriental Pratincole *Glareola maldivarum* (MI), Gravel Dragon *Cryptagama aurita* (P1) and Yellow-lipped Cave Bat *Vespadelus douglasorum* (P2). A further 17 species of fauna species of significance may occur within the survey area.

Nine fauna habitats were described for the survey area of which the *Acacia monticola* tall open scrub (AMS) was considered to have the highest local significance due to its potential provision of habitat for Bilby, however this restricted habitat occurs about 10 km to the south of Development Envelope. The Open shrubland/woodland on spinifex plains (OSP) has the potential to provide some habitat for Bilby where *Acacia* species are present that contain root-dwelling larvae. However, Biota (2021a)

conclude this is low prospectivity and is likely to occur to the south of the survey area, outside the Development Envelope.

3.3 Summary of Targeted Flora Survey – 360 Environmental 2021

Main Roads WA commissioned 360 Environmental Pty Ltd (360 Environmental) to undertake a follow up Targeted Flora survey of significant flora previously identified by Biota, (2021a). This survey focused on surveying material areas and proposed bore sites and covered an area of 58.2 hectares. Three priority flora and four species of interest were recorded by 360 Environmental via as detailed below:

Priority Species

- *Ipomoea racemigera* (P2) – 135 individuals from two locations outside the Survey Area.
- *Goodenia crenata* (P3) and *Goodenia* aff. *Crenata* (P3) – Total of 1,301 individuals from 32 locations.
- *Trachymene dusenii* (P3) – 2203 individuals from 155 locations

Species of Interest

Three species that are of interest recorded were:

- *Aristida* aff. *Jerichoensis* (Potential novel taxon) – 1 individual
- *Cyperus* sp. (TAN14-14) (Potential novel taxon) – 17 individuals from nine locations
- *Solanum echinatum* (Range Extension) – 45 individuals from nine locations

One additional species not previously identified was recorded:

- *Euphorbia schultzii* var. *comans* (Range Extension) – 1 individual

3.4 Summary of Targeted Flora Survey – Biota 2021b

Main Roads commissioned Biota to undertake additional targeted surveys for Priority flora species and other species of interest that were identified as occurring or potentially occurring in the Biota, 2021a survey. The survey area covered an area of 176.3 hectares and was traversed at 50-100 m intervals immediately adjacent to the main Biota (2021a) survey area. Areas that were considered relatively well surveyed in 2020, and areas surveyed in 2021 by 360 Environmental were excluded due to sufficient survey effort and timing to focus on areas that had not had additional survey effort between SLK 0-60. The survey also confirmed the presence of *Pentalepis trichodesmoides* subsp. *incana* (P1) due to good quality material

Additional populations were recorded for all six Priority species:

- *Goodenia lunata* (P1) –18,619 individuals from 440 locations;
- *Pentalepis trichodesmoides* subsp. *Incana* (P1) – 27 individuals from 18 locations;
- *Ipomoea racemigera* (P2) – 12 individuals from 10 locations;
- *Glycine falcata* (P3) –383 individuals from 77 locations;
- *Goodenia crenata* (P3) – 41,972 individuals from 1548 locations; and
- *Trachymene dusenii* (P3) – 2,566 individuals from 202 locations.

Additional populations were also recorded for eight of the 10 species of interest that were initially recorded:

- *Cullen* sp. (TAN-TW07) – 2,682 individuals at 194 locations;
- *Cyperus* sp. (TAN14-14) – 45 individuals at 9 locations;

- *Euphorbia ferdinandi* var. ? *appendiculata* – 23 individuals at 9 locations;
- *Euphorbia* sp. (TAN11-06) – 41 individuals at 16 locations;
- *Pittosporum* aff. *Angustifolium* – 4 individuals at 4 locations;
- *Portulaca* ? sp. Finely echinate (D.G.Tulloch 41) – 41 individuals at 8 locations;
- *43id asp.* (TAN01-17) – 66 individuals at 22 locations; and
- *Triodia* sp. (TAN07-02/34) – at least 15,000 individuals at 24 locations.

The remaining two species of interest appear uncommon in the area:

- *Aristida* aff. *Jerichoensis* was observed at the original collection location but no other populations were found; and
- Convolvulaceae sp. (TAN02-49) was not found at the original collection site or any other locations.
- *Kohautia australiensis* (P2) – 2 individuals at a single location on the eastern edge of the survey area, a new collection for the area, filling in a gap in the range of the species.

3.5 Summary of Targeted Flora Survey – Main Roads 2022

Main Roads conducted the “Tanami Road Upgrade SLK 0-20 Targeted Flora Survey” from the 6th of November to the 8th of November 2022 in accordance with EPA Guidance Flora and Vegetation Surveys for Environmental Impact Assessment. The purpose of this survey was to identify *Goodenia crenata* outside of the survey area for proposed road upgrades to Tanami Road (Biota, 2021a). The occurrence of *G. crenata* within the survey area was confirmed, along with *G. lunata*, a Priority 1 listed species. Two other species were collected opportunistically beyond the Survey Area which were identified as significant flora species in Biota’s survey (2021a).

The targeted species found in the survey area:

- One Priority 3 species:
 - *Goodenia crenata* (3,106 individuals at 59 locations);

Additional species of *Goodenia* were found in the survey area:

- Two Priority 1 species:
 - *Goodenia lunata* (268 individuals at 9 locations);

Additional species of interest were recorded opportunistically:

- Two Priority 1 species:
 - *Pentalepis trichodesmoides* subsp. *Incana* (57 individuals at 13 locations);
- One novel taxa (Biota, 2021a):
 - *Cullen* sp. (TAN-TW07) (12 individuals at 3 locations).

4 VEGETATION DETAILS

4.1 Proposal Site Vegetation Description

The Biological Survey undertaken by Biota (2021a) mapped 13 vegetation units (excluding Disturbed and Cleared) comprising three units on hills (H1, H2 and H4), seven units on plains (P2, P3, P4, P5, P7, P8 and P10) and three units in drainage lines (D3, D4 and D5). Of the 13 mapped units, 6 Vegetation units are present within the Development Envelope (Table 3).

Table 3, 4 and 5 provide details of the vegetation units, vegetation condition within the proposal areas, and the remaining extents of these associations.

Table 3. Vegetation units Representation within the Development Envelope (Biota, 2021)

Vegetation Unit		Survey and Contextual Areas Combined	Development Envelope	
Type	Description (Biota 2021a)	Ha	Ha	% of individual unit being cleared
Hills				
H1	<i>Eucalyptus brevifolia</i> , <i>Corymbia opaca</i> scattered low trees to low open woodland over <i>Triodia intermedia</i> hummock grassland.	1930.6	203.92	10.56%
H2	<i>Corymbia opaca</i> , <i>Eucalyptus brevifolia</i> low open woodland over <i>Triodia wiseana</i> hummock grassland.	1066.8	93.15	8.73%
Plains				
P2	<i>Eucalyptus brevifolia</i> , (<i>Corymbia opaca</i>) low open woodland over <i>Triodia intermedia</i> open hummock grassland over <i>Eulalia aurea</i> , <i>Chrysopogon fallax</i> open tussock grassland.	563	61.04	10.84%
P4	<i>Corymbia pachycarpa</i> , <i>Eucalyptus brevifolia</i> low open woodland over <i>Acacia calligera</i> , <i>A. lysiphloia</i> tall open shrubland over <i>Triodia epactia</i> , <i>T. intermedia</i> open hummock grassland.	131.8	27.35	20.75%
P5	<i>Corymbia opaca</i> , <i>Eucalyptus brevifolia</i> scattered low trees over <i>Triodia intermedia</i> open hummock grassland	1146.1	123.92	10.81%
P8	<i>Acacia synchronicia</i> , <i>*Vachellia farnesiana</i> , <i>Carissa lanceolata</i> scattered shrubs to tall open shrubland over <i>Chrysopogon fallax</i> , <i>Dichanthium fecundum</i> , <i>*Cenchrus</i> spp. Open tussock grassland	466.5	20.72	4.44%
Disturbed		97	21.58	22.25%
Cleared		148.4	94.11	63.42%
TOTAL (excluding "Cleared" areas)				

Tables 4 and 5 provide details of the Pre-European Vegetation Associations with the project area and the remaining extents of these associations.

Table 4: Summary of Project Area's Mapped Pre-European Vegetation Associations where reported maximum clearing is from the Development Envelope.

Pre-European Vegetation Association(s)	Clearing Description	% Vegetation Condition in Dev Envelope (Biota 2021a)	
Vegetation Association 831 described as Hummock grasslands, sparse tree steppe; snappy gum over hard spinifex <i>Triodia intermedia</i> & <i>T. inutulis</i> (Government of Western Australia, 2019)	Clearing of up to 147.34 ha for road upgrade activities for Tanami Road Upgrade Stage 1 SLK 0-41 in the Shire of Halls Creek.	Excellent	23.1%
		Very Good to Excellent	0.2%
		Very Good	21.0%
		Good to Very Good	24.8%
		Good	7.7%
		Poor to Good	0.0%
		Poor	3.8%
		Degraded	0.0%
		Completely Degraded	1.5%
		Cleared	17.8%
Vegetation Association 837 described as a Grasslands, short bunch grass savanna low tree; snappy gum over arid short grass on plains (Government of Western Australia, 2019)	Clearing of up to 4.02 ha for road upgrade activities for Tanami Road Upgrade Stage 1 SLK 0-41 in the Shire of Halls Creek.	Excellent	0.0%
		Very Good to Excellent	0.0%
		Very Good	0.0%
		Good to Very Good	0.0%
		Good	0.0%
		Poor to Good	0.0%
		Poor	0.0%
		Degraded	0.9%
		Completely Degraded	89.8%
		Cleared	9.3%
Vegetation Association 851 described as a Hummock grasslands, sparse tree steppe; snappy gum & bloodwood (<i>E. terminalis</i>) over hard spinifex, / & <i>T. intermedia</i> on basalt and dolerite (Government of Western Australia, 2019)	Clearing of up to 349.30 ha for road upgrade activities for Tanami Road Upgrade Stage 1 SLK 0-41 in the Shire of Halls Creek.	Excellent	46.9%
		Very Good to Excellent	0.0%
		Very Good	28.5%
		Good to Very Good	5.8%
		Good	2.7%
		Poor to Good	0.0%
		Poor	0.3%
		Degraded	1.1%
		Completely Degraded	6.0%
		Cleared	8.7%
Vegetation Association 871 described as a Mosaic: Grasslands, curly spinifex, low tree savanna; snappy gum over curly spinifex / Hummock grasslands, grass steppe; hard spinifex, <i>Triodia intermedia</i> (Government of Western Australia, 2019)	Clearing of up to 145.13 ha for road upgrade activities for Tanami Road Upgrade Stage 1 SLK 0-41 in the Shire of Halls Creek.	Excellent	0.8%
		Very Good to Excellent	3.9%
		Very Good	24.2%
		Good to Very Good	0.0%
		Good	24.6%
		Poor to Good	0.0%
		Poor	17.7%
		Degraded	0.0%
		Completely Degraded	3.2%
		Cleared	25.6%

Note: Vegetation description and condition determined from report – "Biota Environmental Sciences, (2021). Tanami Road Upgrade SLK 0-60 Biological Survey. Prepared for Main Roads Western Australia, May 2021."

Table 5. Pre-European Vegetation Representation

Pre-European Vegetation Association	Scale	Pre-European (ha)	Current Extent (ha)	% Remaining	% Remaining in DBCA reserves
Veg Assoc No. 831	Statewide	381,764.51	381,594.39	99.96	8.42
	IBRA Bioregion <i>Ord Victoria Plain</i>	380,910.53	380,744.09	99.96	8.44
	IBRA Sub-region <i>Purnululu</i>	379,001.70	378,835.26	99.96	8.48
	Local Government Authority <i>Shire of Halls Creek</i>	381,764.51	381,594.39	99.96	8.42
Veg Assoc No. 837	Statewide	172,815.95	172,553.02	99.85	-
	IBRA Bioregion <i>Ord Victoria Plain</i>	21,278.56	21,278.56	100.00	-
	IBRA Sub-region <i>South Kimberley Interzone</i>	21,182.37	21,182.37	100.00	-
	Local Government Authority <i>Shire of Halls Creek</i>	151,971.74	151,708.81	99.83	-
Veg Assoc No. 851	Statewide	111,037.36	110,983.69	99.95	0.05
	IBRA Bioregion <i>Ord Victoria Plain</i>	110,998.40	110,944.72	99.95	0.05
	IBRA Sub-region <i>Purnululu</i>	110,984.56	110,930.89	99.95	0.05
	Local Government Authority <i>Shire of Halls Creek</i>	111,037.36	110,983.69	99.95	0.05
Veg Assoc No. 871	Statewide	230,547.71	230,264.07	99.88	-
	IBRA Bioregion <i>Central Kimberley</i>	230,415.48	230,131.84	99.88	-
	IBRA Sub-region <i>Hart</i>	230,415.48	230,131.84	99.88	-
	Local Government Authority <i>Shire of Halls Creek</i>	230,547.71	230,264.07	99.88	-

4.1.1 Surveyed Vegetation Condition

The breakdown of vegetation conditions within the areas surveyed by Biota (2021a), along with the condition of vegetation in the Development Envelope is provided in Table 6.

Table 6: Vegetation units Representation within the Project Development Envelope (Biota, 2021)

Condition	Description (Trudgen 1988)	Extent within Survey Area (ha)	Development Envelope	
			Ha	% of category being cleared
Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.	2411	198.95	8.25%
Very Good to Excellent	Intermediate condition	61.5	5.99	9.74%
Very Good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.	1646.4	165.67	10.06%
Good to Very Good	Intermediate condition	942.8	56.74	6.02%
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.	473.8	56.36	11.90%
Poor to Good	Intermediate condition	33.8	0.00	0.00%
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds	1018	32.36	3.18%
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.	633.3	4.05	0.64%
Completely Degraded	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.	233	31.56	13.55%
Cleared	Areas devoid of native vegetation	148.4	94.11	63.43%

4.1.2 Priority Flora & Species of Interest

Table 7 presents fauna habitats recorded by Biota (2021a) along with the proportions within the Development Envelope.

Table 8 (see Principle A) presents the total counts and populations collected from the various surveys completed (Biota 2021a; Biota 2021b; 360 Environmental 2022; MRWA 2022).

Table 7. Surveyed Fauna Habitat Representation

Type	Fauna Habitat Description (Biota 2021a)	Survey and Contextual Area (ha)	Ha within Development Envelope	% of habitat type within surveyed area
Hills				
LSH	Low rolling stony hills – Dominant habitat of the contextual area, occurring on hills with rocky and stony substrates. Open <i>Eucalyptus brevifolia</i> and <i>Corymbia opaca</i> woodland over hummock grasslands dominated by <i>Triodia intermedia</i> and/or <i>T. wiseana</i> .	2942	296.04	10.06%
RBS	Ridgeline breakaways and scree slopes – Ironstone and granite ridgeline formations supporting overhangs, caves and rocky boulders. Scattered <i>Eucalyptus brevifolia</i> trees over mixed open hummock grasslands often dominated by <i>Triodia intermedia</i> .	124.6	0.36	0.29%
Plains				
LOD	Low open degraded plain – <i>Corymbia opaca</i> , <i>Eucalyptus brevifolia</i> scattered low trees over heavily degraded open hummock grassland and/or tussock grassland.	867.7	14.69	1.69%
OGP	Open shrubland/woodland on tussock grass plains – <i>Corymbia opaca</i> , <i>Bauhinia cunninghamii</i> , <i>Atalaya hemiglauc</i> a scattered low trees to low open woodland over <i>Dichrostachys spicata</i> , <i>Carissa lanceolata</i> scattered tall shrubs over <i>Triodia epactia</i> very open	375.5	6.69	1.78%
OSP	Open shrubland/woodland on spinifex plains – Open <i>Eucalyptus brevifolia</i> , <i>Corymbia opaca</i> low open woodland over <i>Triodia intermedia</i> spinifex hummock grasslands, over stony substrate on broad undulating plains; occasionally supporting termite mounds.	2573.3	212.31	8.25%
Cleared		241.4	115.71	47.93%

5 ASSESSMENT AGAINST THE TEN CLEARING PRINCIPLES

In assessing whether the Proposal's proposed clearing is likely to have a significant impact on the environment, the Proposal was assessed against the ten Clearing Principles (EP Act, Schedule 5).

Each principle has been assessed in accordance with the former Department of Environment Regulation (now Department of Water and Environmental Regulation (DWER) '*A Guide to the Assessment of Applications to Clear Native Vegetation*' (Department of Environment Regulation, 2014) and other relevant clearing permit application decision reports prepared by DWER.

The proposed clearing is at or may be at variance with one or more of the ten Clearing Principles.

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

Proposed clearing may be at variance to this Principle.

The proposal falls within the Ord Victoria Plain and Central Kimberley bioregions of the Interim Biogeographic Regionalisation for Australia (IBRA) of which approximately 99.6% of pre-European extent of vegetation still remains (Government of Western Australia, 2018).

The proposal requires the clearing up to a 228 ha of native vegetation within a 646 ha Development Envelope for the upgrades of a 41km stretch of Tanami Road.

Current guidance on the assessment of biological diversity, described in DER 2014, includes the following metrics as indicators of high diversity:

1. Flora and Fauna species diversity
2. Priority and other Significant Flora
3. Priority Fauna
4. Significant Ecological Communities
5. Vegetation Condition

Flora and Fauna Species Diversity

A total of 414 species of vascular flora and 114 species of vertebrate fauna were recorded during biological surveys (Biota 2021a; 360 Environmental 2022). Biota (2021a) notes that this represents a large proportion of species recorded from the surrounding IBRA subregions, however this is likely due to:

- The linear nature of the survey area, running perpendicular to local landforms (i.e. a large range of habitats are intersected);
- The length of the corridor crossing a broad geographic range; and
- The very high rainfall received prior to the survey resulting in optimal collecting conditions making comparisons disproportionate to other surveys.
- Limited surveying of Kimberley region has potentially increased the relative significance of species identified in these surveys due to lack of distribution data.

Biota noted that the Tanami Rd survey area comprises a greater level of diversity in comparison to available surveys from the surrounding areas, except for the Duncan Road Upgrade Survey, located 20km to the east (Biota 2021c). The only other known surveys were:

- Elvire to Sandy Creek section of the Great Northern Highway, surveyed by GHD in 2007 (an outdated survey); and
- Browns Range Mineral Sands Mine, surveyed by MWH in 2014 (a non-linear survey area focused on a smaller set of landforms [two land systems comprised of six landform units] in the Tanami Desert [MWH 2014]). In comparison, the Tanami Rd Project Development Envelope intersects four land systems comprised of 17 landform units (Payne and Schoknecht 2011). Despite the Project Development

Envelope containing almost three times as many landform types, the total vascular taxa was only 12.5% higher than the number recorded by MWH (2014).

The overall species diversity within the areas to be cleared is likely to be lower than surrounding areas because:

- All clearing areas are near an existing major road and existing gravel pits, which are likely to experience edge effects (as noted in weed data collected by Biota [2021a])
- There are areas of higher biological diversity in the surrounding areas, notably in the vicinity of the Duncan Road as in (Biota 2021c).

Priority and other Significant Flora

No known records of Threatened flora taxa were identified from the project study area, and no Threatened flora were recorded during the biological surveys (Biota 2021a, Biota 2021b, 360 Environmental, 2022). Seven priority flora taxa and 12 species of interest (SOI) were recorded during biological surveys (Biota 2021a; 2021b; 360 Environmental 2022). Six of the seven priority species, and four of the twelve SOI are within the Development Envelope (Table 8). Potential impacts to priority flora range from 2% to approximately 50% of known locations. The maximum number of individuals to be cleared are detailed in Table 8. The majority of species occur in adjacent habitat as supported by the follow up targeted surveys by Biota (2021b), 360 Environmental (2021) and Main Roads (2022).

Maximum potential impacts from the proposed clearing to Priority 1 species *Goodenia lunata* and *Pentalepis trichodesmoides* subsp. *incana* and Priority 2 species *Ipomoea racemigera* are 15.23%, 2.35% and 2% respectively. As the potential maximum impacts on *Pentalepis trichodesmoides* subsp. *incana* and *Ipomoea racemigera* are low (~2%) when assuming all individuals within the Development Envelope would be cleared, the proposed clearing is unlikely to be significant. Therefore, they are not discussed further.

Likely potential impact to the Priority 1 species *Goodenia lunata* based on the current indicative footprint is under 8%. *Goodenia lunata* is a perennial herb with a broad distribution from the eastern Kimberley to Queensland and as far south as Victoria with the eastern Kimberley being at the north western extent of the species range. Within the Biota (2021a,b) surveys, the species was recorded in a variety of vegetation types, including the maintenance zone of the road, drainage lines and on plains. The majority of populations occurred within areas mapped as 'Disturbed' or 'Cleared' by Biota. About 32% of individuals occur within areas mapped as 'Disturbed' or 'Cleared', despite these areas amounting to only 3.2% of mapped area. If the road upgrades were not going to proceed, all individuals within the maintenance zone would be cleared during routine maintenance activities. Therefore maintenance for the existing alignment would likely result in a higher impact to *Goodenia lunata* than upgrading the road and realigning.

As the Development Envelope is at the north-western extent of the range of the species, the proposed clearing is unlikely to significantly impact the species regionally or within the local area given the ability for the species to respond to disturbance and colonise new areas.

Maximum potential impacts to the Priority 3 species *Goodenia crenata* (P3), *Glycine falcata* and *Trachymene dusenii*, if the entire Development Envelope was cleared, would be 39.15%, 26.3% and 22.8% respectively. However, the likely potential impact based on the current indicative footprint is 23.3%, 9.9% and 16.4% respectively. Based on the design realignments to improve safety, it is highly unlikely the impact would increase given changes to the indicative road design would likely result in a poorer road geometry.

Goodenia crenata (P3) was recorded throughout the Biota (2021a, b), 360 Environmental (2021) and Main Roads (2022) survey areas and was locally common in some areas, with up to 50-100 individuals in numerous locations. Along with *G. lunata*, the species may be a disturbance specialist as it was commonly found within and adjacent to the maintenance zone of the road as well as on plains and along drainage lines and hilly areas. About 26% of the known individuals occurred in areas mapped as 'Disturbed' or 'Cleared', despite these areas comprising 3.2% of the total mapped areas. *Goodenia crenata* was thought to be endemic to the

eastern Kimberley and its distribution is poorly known, likely due to a lack of sufficient survey effort in the Kimberley region. A recent survey in the Western Kimberley recorded this species, resulting in over a 400 km range extension (Ecoscape 2021). As over 47,000 individuals have been recorded by these three surveys for Tanami Road and it is expected this species would be found in similar abundance in adjacent habitat that is broadly representative of the Development Envelope and likely to extend across contiguous habitat to the Western Kimberley. While clearing of approximately 18,500 individuals within the Development Envelope, a minimum of over 28,000 known individuals (>60%) will be retained outside of the Development Envelope. Clearing may temporarily result in a significant impact to the local known population, however long term, may encourage an increase in abundance post disturbance based on the species common occurrence in areas subject to previous disturbance. Based on surrounding habitat broadly representing that within the Development Envelope, it is likely there are substantially more individuals in similar abundance in the adjacent and surrounding areas. Therefore the proposed clearing is not anticipated to pose a significant, long term impact on the conservation status of the species at either local or regional scales, particularly given the species is likely far more widespread throughout the Kimberley than once thought.

Glycine falcata is a mat forming perennial herb that was recorded in vegetation type P8 within the survey area (Biota 2021 a,b). This species was also recorded along Duncan Road (Biota 2021c). The species has a wide distribution, with the known distribution for the species from the western Pilbara across to Queensland and down to southern New South Wales. Up to 101 (26%) of known *Glycine falcata* individuals are within the Development Envelope, yet the likely impact is 38 (~10%) to be cleared within the indicative footprint.

Trachymene dusenii is a distinctive perennial herb that occurs in vegetation types H1 and GH2 in hilly areas and varied in abundance, commonly in clumps of at least 10 or 20 individuals at recorded locations. The Development Envelope is around the southern extent of the range for *Trachymene dusenii* within Western Australia, however there is a record as far south as the Northern Territory/South Australian border suggesting that with more survey effort across the arid interior, more individuals would be recorded. Approximately 1200 (~23%) of known *Trachymene dusenii* individuals are within the Development Envelope, yet the likely impact is less than 900 (~16%) to be cleared within the indicative footprint.

Whilst the proposed clearing may have a moderate local impact on the P3 species *Goodenia crenata* (P3), *Glycine falcata* and *Trachymene dusenii*, if the entire Development Envelope was cleared, as Biota (2021a) commented, populations will extend into adjacent surrounding habitat in similar abundances, The proposed clearing may have a moderate impact of the local populations of the species however in consideration of the broader context for these species and recorded ranges across Australia, the proposed clearing is unlikely to significantly impact the species and specifically the conservation status of these Priority 3 species within Western Australia.

A further four species of interest are located within the Development Envelope. These are *Cullen* sp. (TAN-TW07), *Euphorbia ferdinandi* var. ?*appendiculata*, *Euphorbia* sp. (TAN11-06) and *Portulaca* ?sp. Finely echinate (D.G.Tulloch 41). Maximum potential impacts to these four species within the development envelope are around 50% for *Euphorbia* sp. (TAN11-06), 43.66% for *Cullen* sp. (TAN-TW07), 16.28% for *Portulaca* ?sp. Finely echinate (D.G.Tulloch 41) and 4% for *Euphorbia ferdinandi* var. ?*appendiculata*. Maximum potential impacts to *Euphorbia ferdinandi* var. ?*appendiculata* are low assuming all individuals within the Development Envelope would be cleared. As the proposed clearing is unlikely to be significant, for this species, it is not discussed further.

In consideration of the current indicative footprint, likely impacts to the remaining three species of interest drop to 2.11% for *Cullen* sp. (TAN-TW07), *Portulaca* ?sp. Finely echinate (D.G.Tulloch 41) is completely avoided, whilst *Euphorbia* sp. (TAN11-06) is at approximately 48%.

Portulaca sp. Finely echinate (D.G.Tulloch 41) has a wide distribution across over 1200 km from the eastern Kimberley to western Queensland. Maximum potential impacts to *Portulaca* sp. Finely echinate (D.G.Tulloch 41) may be moderate locally, however all individuals within the Development Envelope would not be cleared.

As the indicative footprint completely avoids the species and its range extends across into north-western Queensland, even if the entire population within the Development Envelope was to be cleared, the impacts to the species distribution are unlikely to be significant.

Cullen sp. (TAN-TW07) is a low shrub generally restricted to hilly units H1, H2 and adjacent plains P5 as present within the central area of the Development Envelope. Often this species was recorded in low abundances but in some locations, it was locally abundant with up to 100 individuals recorded. A total of 1177 (~44%) known *Cullen* sp. (TAN-TW07) individuals are within the Development Envelope, yet the likely impact is less than 60 individuals (~2%) to be cleared within the indicative footprint given not all of the Development Envelope will be utilised to complete the proposed works. In consideration of the approximately 1500 individuals retained outside of the Development Envelope that will not be impacted by the proposed works and the continuous adjacent habitat that would support the species occurrence, the proposed clearing is not considered to significantly impact the regional distribution of the species. Clearing may have a moderate impact on the species if all individuals within the Development Envelope were cleared, however clearing will be limited to that necessary and not likely to constitute the entire Development Envelope. Based on road realignments to improve safety and the location of species habitat, it is highly unlikely more than ~2% of the known population will be cleared as changes to the indicative clearing footprint would likely result in poorer road geometry.

Within the current indicative footprint, one species, *Euphorbia* sp. (TAN11-06) has the potential for a high level of impact with approximately 48% of the species (comprising 22 individuals) to be cleared within the Development Envelope. A total of 46 individuals of this annual herb were recorded in H1 hilly and adjacent P5 plains vegetation, usually in low abundance of one or two individuals, but up to 12 in one location. This species is likely to be far more widespread in similar H1 hilly and adjacent P5 plains vegetation found in the local area surrounding the Development Envelope and survey area. All efforts will be made to refine the indicative layout to avoid individuals and reduce the maximum impact, Based on the surrounding habitat broadly representing that within the Development Envelope, it is likely this species is far more widespread than Biota (2021a, b) recorded with more individuals in similar low abundances anticipated in adjacent and surrounding areas. The limited records outside the Development Envelope are a result of limited survey effort in this region.

Table 8: Priority Flora and Species of Interest

Taxon	Total Abundance in Survey Areas*	Development Envelope		
		Abundance in Development Envelope	% of Surveyed Population	Likely Impacts from clearing 228ha based on current indicative footprint
Priority 1				
<i>Goodenia lunata</i>	19,478	2,967	15.23%	6.74%
<i>Pentalepis trichodesmoides</i> subsp. <i>Incana</i>	85	2	2.35%	1.18%
Priority 2				
<i>Ipomoea racemigera</i>	150	3	2.00%	2.00%
Priority 3				

<i>Glycine falcata</i>	384	101	26.30%	9.90%
<i>Goodenia crenata</i>	47,292	18,514	39.15%	23.3%
<i>Trachymene dusenii</i>	5,444	1,241	22.80%	16.24%
Species of Interest				
<i>Cullen</i> sp. (TAN-TW07)	2,696	1,177	43.66%	2.11%
<i>Euphorbia ferdinandi</i> var. <i>? appendiculata</i>	25	1	4.00%	0.00%
<i>Euphorbia</i> sp. (TAN11-06)	46	24	52.17%	47.83%
<i>Portulaca</i> ? sp. Finely echinate (D.G.Tulloch 41)	43	7	16.28%	0.00%

*Includes the individuals recorded from Biota (2021a,b), 360 Environmental (2021) and Main Roads 2022. Further individuals occur across the Kimberley and they have not been included in these numbers, that is, these numbers do not include DBCA records.

Avoidance of priority species and species of interest has been key to the design of the indicative clearing footprint and Development Envelope without compromising the safety of road design where realignments are necessary. Sections have been avoided through four iterations of road alignment, to reach a compromise between road design safety and mitigation of environmental impacts (Table 1). Further minor refinements of the indicative layout will be made where possible.

Due to the preference of disturbed, low-lying habitat for disturbance specialist species such as *Goodenia lunata* and *G. crenata* in high numbers, further minimisation of impacts would require realigning the road design into areas of high-quality vegetation where these species are not present. This is not a practical approach, as this would require removal of higher quality vegetation away from cleared and disturbed vegetation due to edge effects from the existing road infrastructure; and would negate the benefits of utilising existing cleared areas. A Development Envelope has been implemented to avoid, minimise and reduce impacts to species, by adjusting infrastructure locations where practicable (and often favourable) to avoid clearing of significant species and/or high-quality habitat.

Significant Fauna

No fauna species of conservation significance were recorded during the biological surveys. Several old disused burrows and diggings signs, possibly attributable to Bilby *Macrotis lagotis* (VU), were recorded in a small patch of AMS habitat 10km south of the Development Envelope. No recent diagnostic evidence (e.g., tracks or scats) attributable to Bilby were found in the area. The Open shrubland/woodland on spinifex plains (OSP) habitat also has the potential to provide some habitat for Bilby where *Acacia* species are present that contain root-dwelling larvae. However, Biota (2021a) conclude this is low prospectivity and is likely to occur to the south of the survey area, outside the Development Envelope. Given the lack of recent evidence of occurrence of Bilby, the potential habitat identified being outside of the Development Envelope and the low prospectivity of habitat (for Bilby) within the Development Envelope, impacts to the species from the project clearing is unlikely.

A likelihood of occurrence assessment of all significant species identified in the desktop assessment was undertaken by Biota (2021a) based on availability of suitable habitat and previous known records in the study area. The assessment indicated that 8 significant species were considered likely to occur and 17 species may occur within the survey area. Despite these species being specifically targeted during the fauna component of the survey, none were recorded.

However, as the project area is within the mapped distribution of the species, the Development Envelope is considered to contain suitable foraging habitat, but not breeding habitat, for the following species:

- Bilby (VU)
- Gouldian Finch (P4) (EN)
- Ghost Bat (VU)
- Grey Falcon (VU)
- Gravel Dragon (P1)
- Yellow-lipped Cave Bat (P2)
- Short-tailed Mouse (P4)
- Peregrine Falcon (OS)

All species listed above are well represented in the surrounding area and have broad distributions across inland or northern Australia, See Principle B; DoE 2018). The proposed clearing will not significantly impact any species given the linear nature of the clearing and adjacent available habitat. More details of the fauna species that are assessed as likely or may occur within the Project Development Envelope are described in Principle (b).

The marine and migratory birds identified in the desktop assessment are mostly non-breeding migrants to Australia and breed in the northern hemisphere. These species have a wide range of occurrence across Australia and the extent of suitable foraging habitat within the project Development Envelope includes open shrubland/woodland on spinifex plains (OSP) and open shrubland/woodland on tussock plains (OGP) (Biota 2021a). These habitats consist of a relatively small section of their extent in the contextual survey area footprint, with the Development Envelope consisting of 8.25% of open shrubland/woodland on spinifex plains (212.31 ha) and 1.78% open shrubland/woodland on tussock plains (6.69 ha), (Table 7). This vegetation is a small portion of the extent within the contextual survey area and the majority of the vegetation to be removed is adjacent to the existing road infrastructure which represents a lower quality section of this vegetation unit due to edge effects. Considering the large availability of this vegetation within the contextual survey area and surrounding vegetation is likely to be contiguous and higher value foraging habitat, no impact to these marine and migratory species is anticipated from the removal of these foraging habitats.

Significant Ecological Communities

No Bush Forever sites, Environmentally Sensitive Areas (ESAs), or Threatened Ecological Communities (TECs) were identified in the 40km radius desktop database searches nor recorded during the field survey by Biota (2021a).

The desktop assessment identified four Priority Ecological Communities (PECs) from the 40km project Study Area however these do not lie within or intersect the Development Envelope (Biota, 2021a).

One vegetation unit was considered to be locally significant by Biota (2021a), **P10** - *Eriachne festucacea*, *Dichanthium fecundum* tussock grassland, however this is in their wider survey area and not within the Development Envelope.

Fauna Habitat Diversity

Biota (2021a) identified nine fauna habitats during the biological survey, of which five (5) are within the Development Envelope being OSP, LOD, LSH, OGP and RBS (Table 7). LSH habitat (low rolling stony hills) constitutes the largest proportion of the Development Envelope, at a total of 296.04 ha, or 10.06% of the extent mapped in the local area. All the fauna habitats are well represented outside of the Development Envelope and impacts are <1.8% for each of the habitats except for LSH (10.06%) and OSP (8.25%). These impacts would be far lower if more regional scale mapping was undertaken as habitats extend adjacent to the wider survey area. This is supported by the mapping undertaken by Biota (2021c) for the nearby survey of Duncan Road at SLK 6.5-86.5. As such, no significant impact on fauna habitat diversity on a local scale.

Vegetation Condition

Of the 13 vegetation units identified by Biota (2021a) from the survey area, six are located within the Development Envelope. This includes vegetation units H1, H2, P2, P4, P5 and P6 (see Table 3). None of the vegetation units represent listed Threatened Ecological Communities (TECs), or Priority Ecological Communities (PECs). Vegetation within the Development Envelope ranges from Completed Degraded to

Excellent with 68ha in Poor to Completely Degraded, 278ha in Good to Very Good and 204ha Very Good to Excellent condition (Table 6). There is also 94.11 ha within the Development Envelope which is cleared. Approximately 25% of the Development Envelope is cleared or in Poor to Completely Degraded condition. The proposal will entail clearing of less than 4% of the area surveyed.

Summary

The proposal will not impact any TEC's, PEC's, and no conservation significant fauna were recorded in the Development Envelope or the study area. Conservation significant flora will be avoided where practicable to minimise impacts within the Development Envelope. However, the proposed clearing is likely to be at variance with this principle due to the presence and impacts on several Priority and SOI species, specifically *Goodenia lunata* (P1, 15.23%), *Pentalepis trichodesmoides* subsp. *Incana* (P1, 2.35%), *Ipomoea racemigera* (P2, 2%), *Goodenia crenata* (P3, 39.15%), *Trachymene dusenii* (P3, 22.80%), *Glycine falcata* (P3, 26.30%), *Cullen* sp. (TAN- TW07) (SOI, 43.66%), *Euphorbia ferdinandi* var. ? *appendiculata* (SOI, 4%), and *Euphorbia* sp. (TAN11-06) (SOI, 52.17%). These impacts assume the total clearance of all individuals within the 646 ha Development Envelope however clearing will be limited to 228 ha. The impacts described above within the indicative clearing footprint are more realistic, noting flexibility of design is still required at this early project stage. Furthermore, the vegetation mapping completed within a contextual areas part of the original Tanami Road Upgrade survey (Biota 2021a) confirms that there is additional suitable habitat for most of the Priority and SOI species in the local area (i.e. within 500 m), and there are no geographic barriers to suggest that the species would not occur outside the survey area in similar numbers (Biota 2021b).

Based on the above, the project may be at variance to this Principle.

Methodology

- Biological Surveys (Biota (2021a, b)360 Environmental (2021), Main Roads (2022))
- BoM Website (Accessed November 2022)
- DCCEEW Protected Matters Search Tool Report
- Department of Natural Resources and Environment (2002)
- Government GIS Shapefiles:
 - DBCA Threatened and Priority Ecological Community database search (Accessed October 2022)
 - DBCA Threatened and Priority flora database search (Accessed October 2022)
 - Bush Forever (Region Scheme - Special Areas) (Accessed October 2022)
 - Ecological Linkages (Accessed October 2022)
- Natural Resource Management SLIP Soil Systems (Accessed October 2022)
- Statewide Vegetation Statistics (Government of Western Australia October 2022)

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Proposed clearing is not likely to be at variance to this Principle.

Nine fauna habitats were recorded by Biota (2021a) of which five (5) are present within the Development Envelope (Table 7). A combined total of 114 species of vertebrate fauna were recorded from within the survey and contextual area during the field survey of which no fauna species of conservation significance were recorded. A likelihood of occurrence assessment of all significant species identified in the desktop assessment was undertaken by Biota (2021a) based on availability of suitable habitat and previous known records in the study area. These species were also surveyed for in the field. The assessment indicated that 8 significant species were considered likely to occur and 17 significant species may occur within the survey area:

Likely to occur

<i>Macroderma gigas</i>	Ghost Bat (VU)
<i>Falco hypoleucos</i>	Grey Falcon (VU)
<i>Cryptagama aurita</i>	Gravel Dragon (P1)
<i>Vespadelus douglasorum</i>	Yellow-lipped Cave Bat (P2)
<i>Falco peregrinus</i>	Peregrine Falcon (OS)
<i>Apus pacificus</i>	Fork-tailed Swift (MI)
<i>Charadrius veredus</i>	Oriental Plover (MI)
<i>Glareola maldivarum</i>	Oriental Pratincole (MI)

May occur

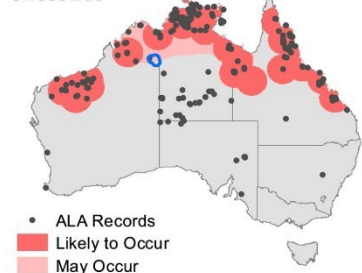
<i>Calidris ferruginea</i>	Curlew Sandpiper (MI) (CR)
<i>Rostratula australis</i>	Australian Painted Snipe (EN)
<i>Erythrura gouldiae</i>	Gouldian Finch (P4) (EN)
<i>Macrotis lagotis</i>	Bilby (VU)
<i>Crocodylus johnstoni</i>	Freshwater Crocodile (OS)
<i>Leggadina lakedownensis</i>	Short-tailed Mouse (P4)
<i>Gelochelidon nilotica</i>	Gull-billed Tern (MI)
<i>Motacilla tschutschensis</i>	Eastern Yellow Wagtail (MI)
<i>Numenius minutus</i>	Little Curlew (MI)
<i>Limosa limosa</i>	Black-tailed Godwit (MI)
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper (MI)
<i>Calidris ruficollis</i>	Red-necked Stint (MI)
<i>Calidris melanotos</i>	Pectoral Sandpiper (MI)
<i>Actitis hypoleucos</i>	Common Sandpiper (MI)
<i>Tringa stagnatilis</i>	Marsh Sandpiper (MI)
<i>Tringa glareola</i>	Wood Sandpiper (MI)
<i>Tringa nebularia</i>	Common Greenshank (MI)

Ghost Bat (VU) There are two known records of the species within 40km radius of the Development Envelope, recorded in 1964. Ghost Bats are known to occur in a broad range of landforms, with distribution influenced by the availability of suitable caves for roost sites. They forage over large areas, with foraging ranges of over 60 ha. Despite targeted searches, no Ghost Bats nor suitable roost caves for the species were detected during the biological survey. It is considered likely to forage within the Project Development

Envelope particularly over ridgeline breakaways and scree slopes (RBS) and major drainage lines and associated tributaries. No major drainage lines and minimal ridgeline breakaways and scree slopes habitat (0.36 ha) is present within the Development Envelope. Given the RBS habitat type is higher in elevation, it is highly unlikely that the entire 0.36 ha will be cleared.

Whilst the Development Envelope contains a minor amount of RBS habitat, no individuals were recorded and the species has a wide distribution across a broad range of landforms. Subsequently no significant impact to the species is anticipated from the proposal.

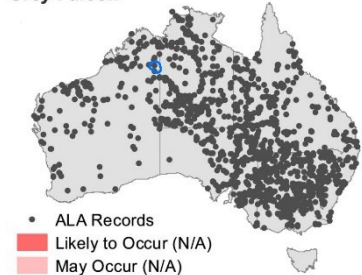
Ghost Bat



(DoEE 2018)

Grey Falcon (VU) There is one record of the species within 9km northeast of the norther end of the proposal collected in 1979. Grey Falcon typically nest in the tallest trees along watercourses, particularly River Red Gum (*Eucalyptus camaldulensis*) and Coolibah (*E. coolabah*) (DAWE, 2021b) associated with major drainage lines of which none are located within the Development Envelope. Grey Falcon was not detected during the biological survey. The Grey Falcon is likely to utilise all the fauna habitats within the Project Development Envelope for foraging however, a major portion of suitable habitat types are located outside the Development Envelope and contextual survey area. Major drainage line habitat is likely to be higher quality outside the contextual survey area as watercourses become denser and of “major” status (e.g. Laura River 6.5km west of the contextual survey area). Noting the transient and mobile nature of the species across vast areas of inland Australia, the abundance of higher quality habitat outside the Development Envelope and contextual survey area, no significant impact to this species is anticipated from the proposal.

Grey Falcon



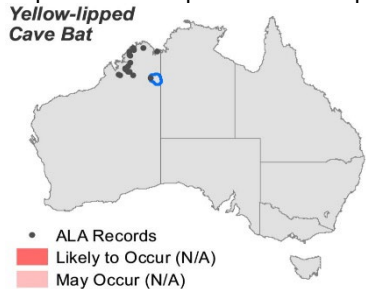
(DoEE 2018)

Gravel Dragon (P1) There are three historical records of the species approximately 17 km east and 47 km south of the Project Development Envelope collected in 1979. The species is known to occur in the North-eastern interior of WA and in the adjacent Northern Territory. It is superbly adapted to mimic a gibber stone and has so far only been recorded from stony ‘gibber’ soils with spinifex. This species was not recorded during the biological survey, however there are areas of suitable habitat – OSP: Open shrubland/woodland on spinifex plains. There is 212.31 ha of OSP habitat in the Development Envelope with over 2,500 ha of OSP occurring in the surrounding survey area. Given the species is cryptic and not recorded during extensive searches, and due to the wide availability of OSP habitat in the surrounding area, clearing for the Proposal is not considered to significantly impact this species.

Gravel Dragon

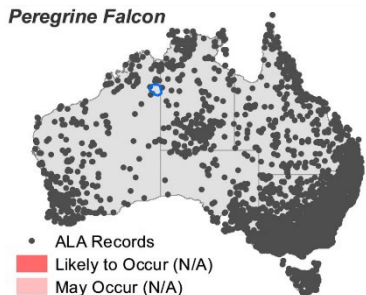
(DoEE 2018)

Yellow-lipped Cave Bat (P2) There are two historical records of the species collected in 1965 more than 26 km east of the Development Envelope. They are restricted to the Kimberley region but are widespread within this range (Atlas of Living Australia, 2021) mostly associated with areas of rainfall greater than 800 mm per annum (Australian Museum, 2021). The proposal area receives an average rainfall between 476.7 mm (Ruby Plains, Site No .002026) and 578 mm (Halls Creek Meteorological Office, Site No. 002012) per year (BoM, 2022). They utilise caves in both sandstone and limestone, typically near water. Typical habitats from which the species has been recorded include melaleuca and pandanus-lined waterways and adjacent open woodlands. This species was not detected during the analysis of the ultrasonic sound recorders deployed during the survey (Biota 2021a). No core roosting habitats (caves) occur within the Ridgeline Breakaways and Scree Slopes (RBS) habitat type, and foraging habitat for the species along drainage lines (MDL) is not present within the Development Envelope. 124.6 ha of RBS habitat was recorded in the survey with 0.36ha occurring within the Development Envelope. As no species were detected in the survey, annual rainfall is below the typical habitat range, and potential habitat range within the Develop Envelope is very limited, no impact to this species is anticipated from the proposal.

Yellow-lipped Cave Bat

(DoEE 2018)

Peregrine Falcon (OS) – Two known records by DBCA occur within the project's 40km study area in 2000 and 2009 at Sawpit Gorge, 25km east of the contextual survey area. This species inhabits a wide range of habitats including forest, woodlands, wetlands and open country and nest in cliff faces, tree hollows and along rivers. They were not recorded during the survey and suitable cliffs for breeding do not occur but most habitats within the Development Envelope are likely to be used for foraging on occasion as well as surrounding areas. Given the wide availability of suitable habitat for the species and breeding habitat occurring outside the Development Envelope, clearing will not significantly impact to the foraging habitat for this species.

Peregrine Falcon

(DoEE 2018)

Marine and Migratory Species (MI) - The marine and migratory birds that are assessed as likely or may occur in the area are non-breeding migrants to Australia and breed in the northern hemisphere. Shorebirds forage primarily on muddy margins and shallow waters of wetlands and other inundated habitats, with some exhibiting preferences for saline or freshwater habitats. They may use freshwater habitats regularly and may use the margins of wetlands and other inundated habitats within the contextual survey area on occasion (DAWE 2022). However, these species have a wide range of occurrence across Australia and the extent of suitable habitat within the Development Envelope is limited and no watercourses within the Development Envelope. Surrounding areas contain suitable habitat that can be utilised by migratory bird species. No impact to these species are anticipated.

Bilby (VU) *Macrotis lagotis*- A disused burrow system possibly attributable to the Bilby was recorded outside the Development Envelope approximately 10 km to the south but within the broader survey area, in - *Acacia monticola* tall open scrub over scattered tussock grasses and herbs on sandplain habitat (AMS). AMS habitat is highly restricted and does not occur within the Development Envelope. The Open shrubland/woodland on spinifex plains (OSP) also has the potential to provide some habitat for Bilby where *Acacia* species are present that contain root-dwelling larvae. However, Biota (2021a) conclude this is low prospectivity and is likely to occur to the south of the survey area, outside the Development Envelope. Given the lack of recent evidence of occurrence of Bilby, the AMS habitat identified outside of the Development Envelope and the low prospectivity of habitat (for Bilby) within the Development Envelope, impacts to the species from the project clearing is unlikely.

Gouldian Finch (EN, P4) *Erythrura gouldiae*- Gouldian Finch habitat includes savannah woodland on stony hills with eucalypts over dense, tall native grasses; grassy flats; trees by water; vegetation on watercourses; and scrublands with spinifex. The Gouldian Finch is granivorous, primarily feeding on *Sorghum* species during the breeding season and *Triodia* species during the wet season. Gouldian Finches are obligate cavity nesters, utilising hollows of eucalypt trees between January and August (Biota 2021a).

There are no nesting areas for the Gouldian Finch within the Development Envelope and foraging habitat within the Development Envelope is marginal. However, given the recent record along Duncan Road in 2020, the Gouldian Finch may forage following rainfall in tussock grassland and spinifex hummock grassland on plains (OGP and OSP) habitat. Given the wide availability of suitable habitat for the species outside the Development Envelope and no breeding habitat occurring within the Development Envelope, clearing will not significantly impact this species.

Short-tailed Mouse (P4) *Leggadina lakedownensis* - The Short-tailed Mouse is known to occur in areas of open tussock and hummock grassland, *Acacia* shrubland and savannah woodland, on sandy soils and cracking clays as well as hilltops (Biota 2021a) and sandy coastal areas (Biota, pers. obs.). Population sizes vary dramatically by season. The Short-tailed Mouse was not recorded by Biota (2021a) however there is suitable habitat for the species within the Development Envelope in tussock grassland and spinifex hummock grassland on plains (OGP and OSP). It is therefore considered that the mouse may occur during optimal seasonal conditions. As the availability of OSP habitat in the surrounding area is greater than within the Development and the proposed impact area, clearing for the Proposal is not considered to significantly impact this species.

It was considered by Biota (2021a) that the Australian Painted Snipe and Freshwater Crocodile may occur within their survey area, however there are no drainage lines within the Development Envelope and the closest record for the Australian Painted Snipe is 50 km south-west of the survey area along GNH and for the Freshwater Crocodile approximately 15 km to the north-west of the survey area in Halls Creek. As such they are considered unlikely to occur. The Northern Brushtail Possum was also identified in database searches and was considered as unlikely to occur as detailed below.

Northern Brushtail Possum (Kimberley) (VU) *Trichosurus vulpecula arnhemensis* - Two DBCA records within 15km from Development Envelope in Halls Creek. Both records for this species are considered to be

unreliable. One record is from 1931 from a skin held by Aboriginal People with general location notes and the other was identified through skin and skull without a collection date (collected by John Tunney suggesting this record is from 1901-1903; [Storr 1965]). The species was not recorded in the field nor expected to occur. The species is known to occur or shelter mainly in tall eucalypt open forests with large hollow-bearing trees, particularly where the understorey includes some shrubs that bear fleshy fruits (DAWE, 2021b). Though the proposal is within its distribution range, the Development Envelope does not contain core habitat suitable for the species. As such this species is considered unlikely to occur and no impact to the species is anticipated.

Overall, there is a low potential to significantly impact fauna or their habitats that are indigenous to Western Australia. All habitat types within the Development Envelope are well represented in the surrounding area and the proposed clearing will not significantly impact any species given the linear nature of the clearing and adjacent available habitat. Based on the above, the project is not likely to be at variance to this Principle.

Methodology

- Biological Surveys (Biota (2021a, b), 360 Environmental (2021), Main Roads (2022))
- DCCEE Protected Matters Search Tool Report
- Government GIS Shapefiles:
 - DBCA Threatened and Priority fauna database search (Accessed October 2022)
 - Ecological Linkages (Accessed October 2022)
- Species specific conservation listing advice and recovery plans

(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Proposal is not at variance to this Principle.

Desktop Database Searches (Main Roads ArcGIS files and PMST report) identified no known records of rare flora listed under the Biodiversity Conservation Act 2016 from the project 40km radius desktop search.

The Biological Survey undertaken by Biota, (2021a) and the subsequent Targeted Flora Survey by Biota (2021b) and 360 Environmental (2022) did not record any rare flora taxa from within the broader surveyed areas and none are considered likely to occur.

Based on the above, the project clearing is not at variance to this Principle.

Methodology

- Biological Surveys (Biota (2021a, b), 360 Environmental (2021), Main Roads (2022))
- Florabase (Accessed October 2022)
- Government GIS shapefiles:
 - DBCA Threatened flora database search (Accessed October 2022)
- Species specific conservation listing advice and recovery plans

(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

Proposed clearing is not at variance to this Principle.

The Desktop database searches (PMST report and DBCA Shapefiles) show no known records of State or Federally listed Threatened Ecological Communities (TECs) within 40 km of the Development Envelope.

No vegetation communities representative of TECs were recorded during the biological Survey carried out by Biota (2021) and none are considered likely to occur.

Based on the above, the proposed clearing is not at variance to this Principle.

Methodology

- Biological Surveys (Biota (2021a, b), 360 Environmental (2021), Main Roads (2022))
- Community specific conservation listing advice and recovery plans
- Government GIS shapefiles:
 - DBCA Threatened Ecological Community database search (Accessed October 2022)

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Proposed clearing is not at variance to this Principle.

The National Objectives and Targets for Biodiversity Conservation recognise that the retention of 30% or more of the pre-clearing extent of each ecological community is necessary if Australia's biological diversity is to be protected (Commonwealth of Australia 2001) except in constrained areas (Perth & Peel) where 10% representation should be maintained.

The vegetation of the project area has been broadly mapped as the following pre-European vegetation associations:

- 831: Hummock grasslands, sparse tree steppe; snappy gum over hard spinifex *Triodia intermedia* & *T. inutulis*
- 837: a Grasslands, short bunch grass savanna low tree; snappy gum over arid short grass on plains
- 851: Hummock grasslands, sparse tree steppe; snappy gum & bloodwood (*E. terminalis*) over hard spinifex, / & *T. intermedia* on basalt and dolerite
- 871: Mosaic: Grasslands, curly spinifex, low tree savanna; snappy gum over curly spinifex / Hummock grasslands, grass steppe; hard spinifex, *Triodia intermedia*

All 4 of the vegetation associations within the Development Envelope have more than 99% of their pre-European extent remaining intact (Table 4). As such, the project is not located in an area with a regionally significant remnant vegetation. Given that the vegetation associations are widespread throughout the area and are well-represented locally and regionally, impacts due to project clearing is not likely to be significant.

Based on the above, the project is not at variance to this Principle.

Methodology

- Aerial photography
- Biological Surveys (Biota (2021a, b), 360 Environmental (2021), Main Roads (2022))
- Government GIS shapefiles:
 - Pre-European vegetation (Accessed October 2022)
 - Vegetation complexes (Accessed October 2022)
- Statewide Vegetation Statistics (Government of Western Australia 2018)

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Proposed clearing is not at variance to this Principle.

The Development Envelope intersects the Fitzroy River and Tributaries, Ord River Tributaries, and the Ord Irrigation District (Sub-Area 2). No vegetation associated with watercourses or wetlands are included the Development Envelope. The nearest defined watercourse or wetland to the Development Envelope are:

- Two non-perennial lakes, FID 90481, Hydro ID 8279100 and FID 57445, Hydro ID 8246064 located 23km and 26km South of the Development Envelope respectively.
- Lake Gregory which is located 120km south from the Development Envelope.

Due to the absence of watercourses and wetlands from the Development Envelope, no impact to watercourses or associated environments is anticipated from the proposed clearing.

The proposed clearing is not at variance to this Principle.

Methodology

- Biological Surveys (Biota (2021a, b), 360 Environmental (2021), Main Roads (2022))
- Government GIS shapefiles:
 - Geomorphic Wetlands (Accessed October 2022)
 - Ramsar Wetlands (Accessed October 2022)
 - Important Wetlands (Accessed October 2022)
 - Watercourses (Accessed October 2022)
 - RIWI Act Rivers (Accessed October 2022)

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Proposed clearing is not likely to be at variance to this Principle.

The project is in an area prone to severe rainfall events, which could contribute to land degradation via flooding and heavy runoff. As clearing works will be completed in a dry period and no excavation below the groundwater table will occur, impacts to groundwater and interruption of nature surface water flows is not expected. As such the risk of the project causing appreciable land degradation is minimal.

The majority of clearing is expected to take place within the Dockrell and Geebee Land Systems (Figure 5; Schoknecht and Payne 2011). The Development Envelope is comprised of approximately 22% of Geebee System and 73% of the Dockrell System. The Geebee system is considered to have low or very low susceptibility to erosion, likely due to the gravelly soils. The Dockrell System is also considered to be stable with very low susceptibility to erosion, as it is predominantly rocky ground with skeletal soils. 5% of the Development Envelope falls within the O'Donnell System, which is moderately susceptible to erosion. The proposal has not changed the road alignment in this system to minimise disturbance in this area.

Based on the rainfall patterns of the Kimberley region, short term impacts to surface water quality may occur through sedimentation and minor risks of land degradation through water erosion. Management of these minor short-term risks will be addressed through the implementation of the Main Roads Standard environment management plan which include:

- 1) construction activities will be undertaken in dry periods to reduce the potential for soil erosion and drainage line siltation;
- 2) exposed soil working surfaces will be minimised and watered down to encourage the formation of a crust which minimises erosion and stabilises areas; and
- 3) Topsoil, vegetation and mulch will be re-spread over completed work areas (e.g. drainage and batters) to encourage regrowth and to stabilise exposed surfaces during the wet seasons.
- 4) Loose soil and materials will be removed from drainage areas and creeklines to minimise erosion and sedimentation.

Acid Sulphate Soils (ASS) have an extremely low probability of occurring in the proposal area (Cq(p4) & Cn(p4): C Class) - 1-5% chance of occurrence in mapping unit with any occurrences in small localised areas. Water/Wind erosion, and ASS are unlikely to have an impact on conservation or other areas from this proposal.

The proposed clearing is linear in nature and largely adjacent to the existing Tanami Road. Main Roads' standard environmental management measures will be implemented and address erosion and other land degradation processes. Based on the above the proposed clearing is unlikely to cause appreciable land degradation and as such, the project is not likely to be at variance to this Principle.

Methodology

- Biological Surveys (Biota (2021a, b), 360 Environmental (2021), Main Roads (2022))
- Government GIS Shapefiles:
 - Acid Sulphate Soil Risk Map (Accessed October 2022)
 - Soil landscape land quality – Water Erosion Risk (Accessed October 2022)
 - Soil landscape land quality – Wind Erosion Risk (Accessed October 2022)
 - Soil landscape land quality – Salinity Risk (Accessed October 2022)
 - Soil landscape land quality – Surface Acidity (Accessed October 2022)
 - Soil landscape land quality – Waterlogging Risk (Accessed October 2022)
 - Soil landscape land quality – Flood Risk (DPIRD-007) (Accessed October 2022)

(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Proposed clearing is not at variance to this Principle.

The development envelope does not intersect any known conservation areas or DBCA managed lands, and there are no DBCA managed lands in close proximity of the development envelope. The closest nature reserve or conservation area is the Ord River Regeneration Reserve which is located 16km east of the Development Envelope. The distance between Development Envelope and the Ord River Regeneration Reserve ranges from 16 km to 24 km to the Development Envelope. The Ord River Regeneration Reserve is a DBCA-managed conservation estate established to revegetate a degraded portion of the Ord River catchment and reduce downstream siltation. The Regeneration Reserve will not be impacted by the proposed activities.

The clearing under this proposal will not impact any buffers, ecological linkages or outliers to conservation area, and subsequently not impact the environmental values of nearby conservation areas.

Based on the above, the project is not at variance to this Principle.

Methodology

- Biological Surveys (Biota (2021a, b), 360 Environmental (2021), Main Roads (2022))
- Environmental Offsets Register
- Government GIS Shapefiles:
 - DBCA Legislated Lands and Waters & Lands of Interest (Accessed October 2022)
 - Geomorphic Wetlands (conservation category wetlands only) (Accessed October 2022)
 - Ramsar Wetlands (Accessed October 2022)
 - Important Wetlands (Accessed October 2022)

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Proposed clearing is not likely to be at variance to this Principle.

The proposal area does not intersect with a Country Areas Water Supply Act (CAWS) water catchment area and the nearest is located 1,843 km south-west of the proposal area. The nearest lake is over 23 km south of the proposal area. Impacts on these areas are not anticipated due to their distance from the proposal area.

The proposal area lies within the Canning-Kimberley Groundwater Area and the below proclaimed Surface Water Areas:

- Fitzroy River and Tributaries (RIWI Act);
- Ord River and Tributaries (RIWI Act); and
- Ord Irrigation District (Sub-Area 2) (RIWI Act).

The proposal area is entirely located within one or more of the above areas except for SLK 35-41 which is only situated in the Canning-Kimberley Groundwater Area. Existing drainage lines will be utilised where practicable and topsoil will be stockpiled when practicable to reintroduce specialist species (*Goodenia crenata* and *Goodenia lunata*). The proposed works are inclusive of upgrades of drainage management to ensure the natural hydrology is maintained and as such no change to local hydrology is anticipated.

The nearest PDWSA is Halls Creek Water Reserve area located over 12km North-east of the Proposal area, consisting of Priority 1, 2 and 3 sections (GIS Database). The proposed native vegetation clearing is not likely to alter groundwater quality in the Halls Creek Water reserve.

The Development Envelope is located in an area mapped extremely low probability of Acid Sulphate Soils - 1-5% chance of occurrence in mapping unit with any occurrences in small, localised areas.

The Main Roads Standard environment management plan also contains appropriate provisions to manage possible contamination risk as spill incidents due to fuel leakage during on-ground works. Operational controls will include:

- all hazardous materials fuels or oils storage areas will be bunded; and
- spill kits will be in place at all storage areas and Induction program to make all personnel aware of the appropriate response to spills.

The proposed clearing will be linear in nature predominantly along the existing road corridor which would unlikely be detrimental to the current surface hydrology. Drainage design will maintain flows similar to those in place for the existing road alignment. The proposed realignment activities are unlikely to impact existing levels of surface runoff, or adversely alter surface and underground water quality. Clearing of native vegetation for the material areas will not involve excavation below the water table.

Based on the above, the proposed clearing of native vegetation is not at variance to this principle.

Methodology

- Biological Surveys (Biota (2021a, b), 360 Environmental (2021), Main Roads (2022))
- Government GIS Shapefiles:
 - RIWI Act, Surface Water Areas and Irrigation Districts (Accessed October 2022)
 - CAWSA Part 2A Clearing Control Catchments (Accessed October 2022)
 - RIWI Act, Groundwater Areas (Accessed October 2022)
 - Soil landscape land quality - Salinity Risk (Accessed October 2022)
 - Groundwater Salinity Statewide (Accessed October 2022)

- Soil Mapping (Accessed October 2022)
- Acid Sulphate Soil risk mapping (Accessed October 2022)
- Soil landscape land quality - Subsurface Acidification Risk (Accessed October 2022)

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Proposed clearing is not likely to be at variance to this Principle.

The proposal area receives an average rainfall between 476.7 mm (Ruby Plains, Site No .002026) and 578 mm (Halls Creek Meteorological Office, Site No. 002012) per year (BoM, 2022). The area has not been identified as a significant risk of flooding, waterlogging or erosion from soil landscape land quality analyses. The proposal area has a range of elevations, from approximately 438 m to 517 m, with a slight upward trend as road SLK increases.

This Development Envelope does not include any watercourses. The proposal area lies within the Canning-Kimberley Groundwater Area and the below proclaimed Surface Water Areas:

- Fitzroy River and Tributaries (RIWI Act);
- Ord River and Tributaries (RIWI Act); and
- Ord Irrigation District (Sub-Area 2) (RIWI Act).

The nearest:

- Wetland is the Lake Gregory System which is located over 163km south of the proposal area.
- Lake is over 23km south of the proposal area (FID 90481, Hydro ID 8279100) which is non-perennial.
- Ramsar Wetland (international importance) is Lake Gregory (proposed Ramsar addition) 120km south of the proposal area.
- CAWS catchment area is located 1843km south-west of the proposal area.
- PDWSA is Halls Creek Water Reserve area located over 12km North-east of the Proposal area, consisting of sections that are Priority 1, 2, and 3.

These systems are of considerable distance from their nearest point to the Development Envelope. Whilst the proposed clearing of native vegetation covers a large footprint, this is spread across four (4) pre-European vegetation units and three (3) soil systems. It is unlikely for any of these systems to be significantly impacted by the proposal considering their distance from the proposal area and clearing to be spread across multiple systems, decreasing their overall impact.

Due to large amounts of rainfall during the wet season, the proposed works will be completed in the dry season. No changes to the existing levels of flooding are anticipated as the proposal is an upgrade of existing infrastructure and will continue to intersect the same systems where alignment varies. Furthermore, the proposed works are inclusive of upgrades of drainage management to ensure the natural hydrology is maintained. The proposed linear clearing along an existing road is unlikely to cause or exacerbate the incidence or intensity of flooding.

Given the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology

- Biological Surveys (Biota (2021a, b), 360 Environmental (2021), Main Roads (2022))
- BoM Website (Accessed October 2022)
- Government GIS Shapefiles:
 - Soil Mapping (Accessed October 2022)
 - Contours (Accessed October 2022)
 - Soil landscape land quality - Waterlogging Risk (Accessed October 2022)
 - Soil landscape land quality - Flood Risk (Accessed October 2022)

6 VEGETATION MANAGEMENT

Main Roads will avoid clearing native vegetation where possible. Where clearing cannot be avoided then this clearing is kept to a minimum. A Vegetation Management Plan (VMP) has been developed to manage and minimise vegetation clearing for the Proposal (refer to Appendix 1).

7 STAKEHOLDER CONSULTATION

Main Roads have consulted interested parties on the future upgrade works, and the proposed layout takes into consideration the recommendations. The following stakeholders were consulted as part of the Project:

1. Koongie Park Community
2. Shire of Halls Creek
3. General Halls Creek Community
4. Koongie-Elvire Native Title Group
5. Jaru Native Title Group
6. Ruby Plains Station
7. Balgo Community
8. Mulan Community
9. Bililuna Community
10. Kimberley Land Council
11. Lamboo Pastoral Lease holders

Consultation events are listed below:

1. Koongie Elvire Traditional Owners – Consulted through a number of meetings and an Aboriginal Cultural Heritage Survey (Cultural Research Management 2022a).
2. Jaru Traditional Owners – Consulted through several meetings and an Aboriginal Cultural Heritage Survey (Cultural Research Management 2022b).
3. Halls Creek Community – Consulted through three community consultation information sessions where the proposed alignment was presented.
4. Shire of Halls Creek – a key partner for the road upgrade and have been involved throughout the design process.

No concerns relating to clearing of native vegetation were raised by any of the above stakeholders, however Traditional Owners have requested clearing impacts are minimised where possible, and the retention where possible of large termite mounds and trees. No objections to previous versions of the alignment of the project have been raised and the upgrade was locally supported and heritage areas have been excluded from the proposal Development Envelope. Suggestions on the locations of material areas and the road alignment were provided during stakeholder consultations and were incorporated into the Project's design. This proposed alignment has shifted since these consultations occurred, and so this process will be repeated for the new proposed alignment.

Further stakeholder consultation will be undertaken accordance with CPS 818 Condition 8.



Plate 3. Tanami Road information and Material Areas at Halls Creek Community Hall



Plate 4. Main Roads team presenting on the project to the Halls Creek Community at one of several sessions

8 COMPLIANCE WITH CPS 818

Table 9 summarises what further pre-clearing impact assessment is required in accordance with CPS 818.

Table 7. Summary of Additional Management Actions Required by CPS 818

Impact of Clearing	Yes/No or NA	Further Action Required
1. The CAR indicates that the clearing is 'At Variance' or 'May be at Variance' with one or more of the Clearing Principles.	Yes	1. Clearing Report to be published on website and submissions sought for 21 days. 2. Submissions invited from relevant parties, including the LGA, the owner or occupier of the land and other stakeholders in accordance with Condition 8 of CPS 818. 3. VMP has been completed, refer to Appendix 1. 4. An offset proposal for approval by DWER be prepared. 5. Summary of submissions and a statement addressing each of those submissions to be published on website.
2. Clearing is at variance or may be at variance with Clearing Principle (g) land degradation, (i) surface or underground water quality or (j) the incidence of flooding.	No	No further action required.
3. Clearing is at variance with Clearing Principle (g) land degradation, (i) surface or underground water quality and (j) the incidence of flooding.	No	No further action required.
4. The Proposal involves clearing for temporary works (as defined by CPS 818).	Yes	CPS 818 Condition 9 Revegetation and Rehabilitation requirements will be implemented.
5a. Proposal is within a Region that: • has rainfall greater than 400mm; and, • is South of the 26th parallel; and, • works are necessary in 'Other than dry conditions'; and, • works have potential for uninfested areas to be impacted.	No	Standard Vehicle and Plant management actions from Principal Environmental Management Requirements (PEMRs) and <u>Hygiene Checklists</u> will be applied (<i>which include relevant sections of Condition 10</i>).
5b. Do the proposed works require clearing within or adjacent to DBCA managed lands in non-dry conditions?	No	No further action required.

Impact of Clearing	Yes/No or NA	Further Action Required
6. Main Roads has been notified by DWER or an environmental specialist that the area to be cleared is susceptible to a pathogen other than dieback.	No	No further action required.
7. Weeds are likely to spread to and result in environmental harm to adjacent areas of native vegetation that are in good or better condition.	Yes	Site will be added to Regional Vegetation Management Plan and into Environment Online System (EOS) Compliance Tab to ensure weeds growing within the cleared area are removed or killed at least once in every 12-month period for five years from the commencement of clearing. Records of annual weed control will be recorded in EOS Compliance Tab.
8. Did an environmental specialist conduct the survey or field assessment?	Yes	The Environmental Specialist undertaking the biological assessments was suitably qualified and had more than three years' experience.
9. Did an environmental specialist prepare the Assessment Report and any other associated documentation including the VMP, Dieback Management Plan or Offset Proposal?	Yes	The Environmental Specialist preparing the Assessment Report and any other associated documentation including the VMP, Dieback Management Plan or Offset Proposal was suitably qualified and had more than three years' experience.

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Appendix 1: Vegetation Management Plan

TANAMI ROAD UPGRADE STAGE 1 SLK 0-41

Purpose and Scope

This Vegetation Management Plan (VMP) has been prepared by Main Roads for the purpose of managing native vegetation clearing impacts associated with the Tanami Road Upgrade Stage 1 SLK 0-41.

Main Roads is undertaking the Upgrade Road Works for the Tanami Road between SLK 0 - 41 for Stage 1 works. The project will be upgrading the road from SLK 0-41 which includes the:

- realignment of hilly sections which limit vision;
- realigning (straightening) unsafe bends;
- surfacing existing and proposed realignment with bitumen;
- increasing safety of the road;
- elevating low points and cutting high points where visibility is limited; and
- constructing laydown and turn around areas.

In specified circumstances, Main Roads VMP is required to be approved by Department of Water and Environmental Regulation (DWER) as a condition of the Main Roads Statewide Clearing Permit CPS 818.

Action

Appendix 1.1 references the standard Principal Environmental Management Requirements (PEMRs) (Tables 1 to 9) that will be utilised for all proposals that involve clearing to avoid, mitigate and manage the environmental impacts of the Proposal.

Proposal specific environmental management actions are contained in Appendix 1.1.

Actions will be undertaken in accordance with those described in the relevant PEMR and the Proposal Specific Environmental Management Requirements.

Timeframes

Actions to be undertaken during pre-commencement of works, during works or after the works.

Responsibilities

It is the responsibility of the Superintendent's Contract Management Team to ensure that the requirements are implemented by the Contractor. This shall be done by adhering to the Environmental Measurement and Evaluation Checklist.

Appendix 1.1: Vegetation Management

Refer to the *PEMRs* (D19#260830) for Specific Management Actions commonly used and guidance notes are provided.

VMP Requirement	Standard Management Actions	Specific Environmental Management Actions
Clearing	Refer to Table 1: Clearing PEMR • Specification 204 Environmental Management • Construction Environmental Management Plan • Specification 301 Vegetation Clearing and Demolition • Environment Measurement and Evaluation Checklist (for release of HOLD POINTS) Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Final project footprint refined prior to clearing to minimise impacts as far as practicable. • The locations of Priority flora and the requirements to protect vegetation outside of the pegged clearing line will be clearly communicated through site inductions and pre-start meetings, particularly on dates when clearing is undertaken. • Trained personnel on site to monitor clearing where environmental sensitivities are within 5m of Development Envelope. • Regular on-site toolbox meetings will raise awareness of environmental sensitivities for the area being cleared. • Routine inspections of the Limits of Vegetation Clearing boundary and demarcation will be conducted to ensure no clearing outside the Development Envelope.
Pegging and Flagging	Refer to Table 7: Pegging and Flagging PEMR • Specification 204 Environmental Management • Construction Environmental Management Plan • Specification 301 Vegetation Clearing and Demolition Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable

VMP Requirement	Standard Management Actions	Specific Environmental Management Actions
Erosion and Sedimentation Control	Refer to Table 3: Erosion and Sedimentation Control PEMR • Specification 204 Environmental Management • Construction Environmental Management Plan Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable
Fauna Management	Refer to Table 4: Fauna Management PEMR • Specification 204 Environmental Management • Construction Environmental Management Plan Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable
Machinery and Vehicle Management	Refer to Table 5: Machinery and Vehicle Management PEMR • Specification 204 Environmental Management • Construction Environmental Management Plan Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable

VMP Requirement	Standard Management Actions	Specific Environmental Management Actions
Mulch and Topsoil Management	Refer to Table 6: Mulch and Topsoil Management • Specification 204 Environmental Management • Construction Environmental Management Plan • Specification 301 Vegetation Clearing • Specification 304 Revegetation and Landscaping Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable
Water Drainage Management	Refer to Table 8: Water Drainage Management PEMR • Specification 204 Environmental Management Construction Environmental Management Plan	• Not Applicable
Weed Management	Refer to Table 9: Weed Management PEMR • Specification 204 Environmental Management • Construction Environmental Management Plan Contract Tender Documents available at • https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable

VMP Requirement	Standard Management Actions	Specific Environmental Management Actions
Monitoring	• Specification 204 Environmental Management • Construction Environmental Management Plan • Superintendent's Contract Management Plan & Environmental Measurement and Evaluation Checklist. Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable
Auditing	• Specification 204 Environmental Management • Superintendent's Contract Management Plan & Environmental Measurement and Evaluation Checklist. Contract Tender Documents available at https://www.mainroads.wa.gov.au/technical-commercial/tender-preparation/	• Not Applicable

Principal Environmental Management Requirements (PEMR's)

Table 1: Clearing PEMR

STANDARD MANAGEMENT REQUIREMENTS
PRE WORKS 1. The Contractor must prepare, implement and maintain processes to ensure that the movement of all vehicles, plant and machinery does not occur outside of the Limits of Vegetation Clearing. This must include all turnaround areas. 2. The Contractor must minimise vegetation clearing and the area of disturbance on ground by utilising existing cleared area where possible.
DURING WORKS 1. The Contractor must report any damage to vegetation beyond the Limits of Vegetation Clearing as an Environment Incident. 2. The Contractor must ensure Movements are confined to the Limits of Vegetation Clearing during the works. 3. The Contractor must undertake the clearing in accordance with the Fauna PEMR. 4. The Contractor must obtain the Superintendent's approval prior to any clearing undertaken outside the estimated impact area, but within the Development Envelope. Alternatives to minimise environmental impacts must be investigated by the Superintendent prior to approving any clearing.
POST WORKS NIL

Table 2: Erosion and Sedimentation Control PEMR

PRE WORKS 1. The Contractor must develop, implement and maintain processes and procedures to ensure that: a. The Contractor is responsive to and addresses incidents of erosion and sedimentation within and adjacent to the work areas; b. Prevent water and wind soil erosion within and adjacent to the works areas; c. Prevent the sedimentation and siltation of watercourses located within and adjacent to the works area; d. Ensure that sedimentation and siltation of drainage lines due to the removal of riparian vegetation is avoided, minimised and mitigated; e. Ensure that loose surfaces and recently cleared areas are protected from wind and soil erosion; f. Minimise exposed soil working surfaces or protect them from stormwater erosion; g. Ensure material such as gravel, crushed rock and excavated material is stockpiled away from drainage paths and covered to prevent erosion; and, h. Ensure that water quality monitoring is undertaken when turbidity and sedimentation is an issue.
DURING WORKS 1. Implement, monitor and adhere to the sedimentation and erosion processes developed to address the requirements in the pre-works.
POST WORKS 1. If required, the Contractor must continue to monitor water quality until the turbidity/sedimentation dissipates. 2. The Contractor must ensure that disturbed areas are stabilised as soon as is practicable after construction activities are completed.

Table 3: Fauna Management PEMR

PRE WORKS 1. The Contractor must ensure that fauna management requirements are communicated to the crew undertaking the clearing works during the induction and pre-start meeting. 2. Where active nests, burrows or dens are identified, works must not proceed until the Contractor obtains the Superintendents approval of the management of active nests, burrows or dens adheres to the Superintendents advice.
DURING WORKS 2. The Contractor must undertake the clearing in the following manner to allow fauna to move out of the clearing area; a. Prior to the clearing activities commencing, use machinery to tap large trees with habitat hollows to encourage any animals evacuate; and, b. Undertake the clearing in one direction and towards areas of native vegetation to allow the animals to escape to adjacent habitat. 3. The Contractor must ensure that all onsite personnel undertake visual monitoring and are vigilant to the presence of fauna. Any sightings of fauna, including injury or fatality, must be reported as an Environmental Incident. 4. The Contractor must ensure that: a. No pets, traps or firearms are brought into the project area; b. Fauna are not fed; c. Fauna are not intentionally harmed or killed; and, d. Fauna that venture into the work area are encouraged to leave in a manner that does not harm the animal or operator (loud noise, slowly approaching in a vehicle etc.). 5. The Contractor must ensure that in the event that sick, injured or orphaned native wildlife are located on the project site, the WILDCARE Helpline ((08) 9474 9055) will be contacted for assistance. The Contractor must maintain records of any animal taken to a wildlife carer.
POST WORKS 1. The Contractor must provide any records of fauna impact to the Superintendent.

Table 4: Machinery and Vehicle Management PEMR

PRE WORKS 1. The Contractor must ensure that all areas associated with the storage, parking, servicing, wash down and refuelling of all vehicles, plant and machinery is located within the Limits of Clearing and approved by the Superintendent. 2. The Contractor must ensure that all vehicles, machinery and plant are clean on entry (i.e. free of all soil and vegetation material) and comply with the requirements of 204.B.32. 3. The Contractor must ensure that vehicle servicing and refuelling will be undertaken at designated areas approved by the Superintendent. 4. The Contractor must ensure that all staff suitably qualified and competent to undertake works, especially refuelling activities.
DURING WORKS 1. The Contractor must maintain records of checking all vehicles, machinery and plant are clean on entry.
POST WORKS NIL

Table 5: Mulch and Topsoil Management PEMR

PRE WORKS 1. The Contractor must ensure that the movement of soil and vegetation is only undertaken in dry conditions unless otherwise approved and / or directed by the Superintendent. 2. The Contractor must ensure that poor quality topsoil and mulched vegetation does not contaminate the good quality topsoil and vegetation.
DURING WORKS 1. The Contractor must ensure that all machinery used in the removal of weed-infested topsoil must be cleaned down before and between operations to prevent the introduction and spread of weeds. 2. The Contractor must ensure the movement of large equipment over topsoil materials is avoided to minimise compaction. 3. The Contractor must ensure that Dieback and weed infected topsoil and mulch vegetation must be handled separately to minimise the risk of spreading dieback and weed species across the site and stockpiles. 4. The Contractor must ensure that stockpiling operations must occur in a manner to ensure that the properties of the topsoil are not degraded and the topsoil made unsuitable for use in revegetation are not degraded and the topsoil made unsuitable for use in revegetation.
POST WORKS Nil

Table 6: Pegging and Flagging PEMR

PRE WORKS 1. Pegging must be done in accordance with the requirements detailed in Specification 301. 2. The Contractor must clearly communicate, either at the pre-start meeting or equivalent, to the crew undertaking the clearing works, through clear maps and other additional means, what the Pegging represents.
DURING WORKS 1. The Contractor must peg the Limits of Clearing using flagging tape of a visible contrasting colour that is agreed upon in project documentation and inductions 2. The Contractor must peg/demarcate vegetation proposed to be retained by using flagging tape of a visible contrasting colour that is agreed upon in project documentation and inductions 3. The Contractor must ensure that the vegetation demarcated to be cleared is consistent with the approved clearing areas.
POST WORKS 1. The Contractor remove and dispose of appropriately any demarcation, pegging or flagging once proposal works are completed.

Table 7: Water Drainage Management PEMR

PRE WORKS 1. Use pollution control and containment strategies for proposal activities in Public Drinking Water Source Areas (PDWSAs) / Underground Water Pollution Control Areas (UWPCAs) and liaise with the DWER where necessary.
DURING WORKS 1. Existing natural drainage paths and channels along the road or the vicinity of the project area will not be unnecessarily blocked or restricted. 2. Temporary drainage systems may be installed to carry surface water away from the areas where excavation and foundation construction work is taking place or from any other area where the accumulation of water could cause delay or damage to the work. 3. Maintain these drainage systems in proper working order at all times. 4. Runoff from disturbed areas must be managed to minimise adverse impacts on surrounding vegetation, watercourses and properties. 5. Booms and silt fences must be used when working over or adjacent to areas of surface water in order to protect the quality of surface water from construction impacts.
POST WORKS 1. Water quality monitoring to be undertaken (if turbidity/ sedimentation is an issue). 2. Prior to backfilling the completed pipe work, certify that the entire system is flushed clean and tested. 3. Disturbed areas will be stabilised soon after construction activities are completed. 4. Culvert and drainage structures will be free of all grass, weeds, silt and debris.

Table 8: Weed Management PEMR

PRE WORKS 1. The Contractor must remove or kill any weeds growing in proposal area that are likely to spread and result in environmental harm to adjacent areas of native vegetation that are in good or better condition. 2. The Contractor must develop, implement and maintain procedures to identify and control declared (e.g. <i>Calotropis procera</i>) and invasive weed species within the Contract areas, to the satisfaction of the Superintendent. 3. The Contractor must prepare a weed control program, for nominated weed species for control and disposal, to the satisfaction of the Superintendent. 4. The Contractor must undertake weed management in Stockpiles as directed by the Superintendent.
DURING WORKS 1. The Contractor must implement the weed control procedures and management plan and record and manage records of its implementation. 2. The Contractor must treat nominated weed infestations as many times as necessary to control and eradicate the weed species in accordance with the approved weed control program. 3. The contractor must ensure that no known weed, pest or diseased affected soil, mulch, fill or other material is brought into the Site.
POST WORKS 1. The relevant Vegetation Maintenance Record Forms available at: https://www.mainroads.wa.gov.au/technical-commercial/contracting-to-main-roads/ must be completed and sent to the Superintendent.

Appendix 2: Project Study Area

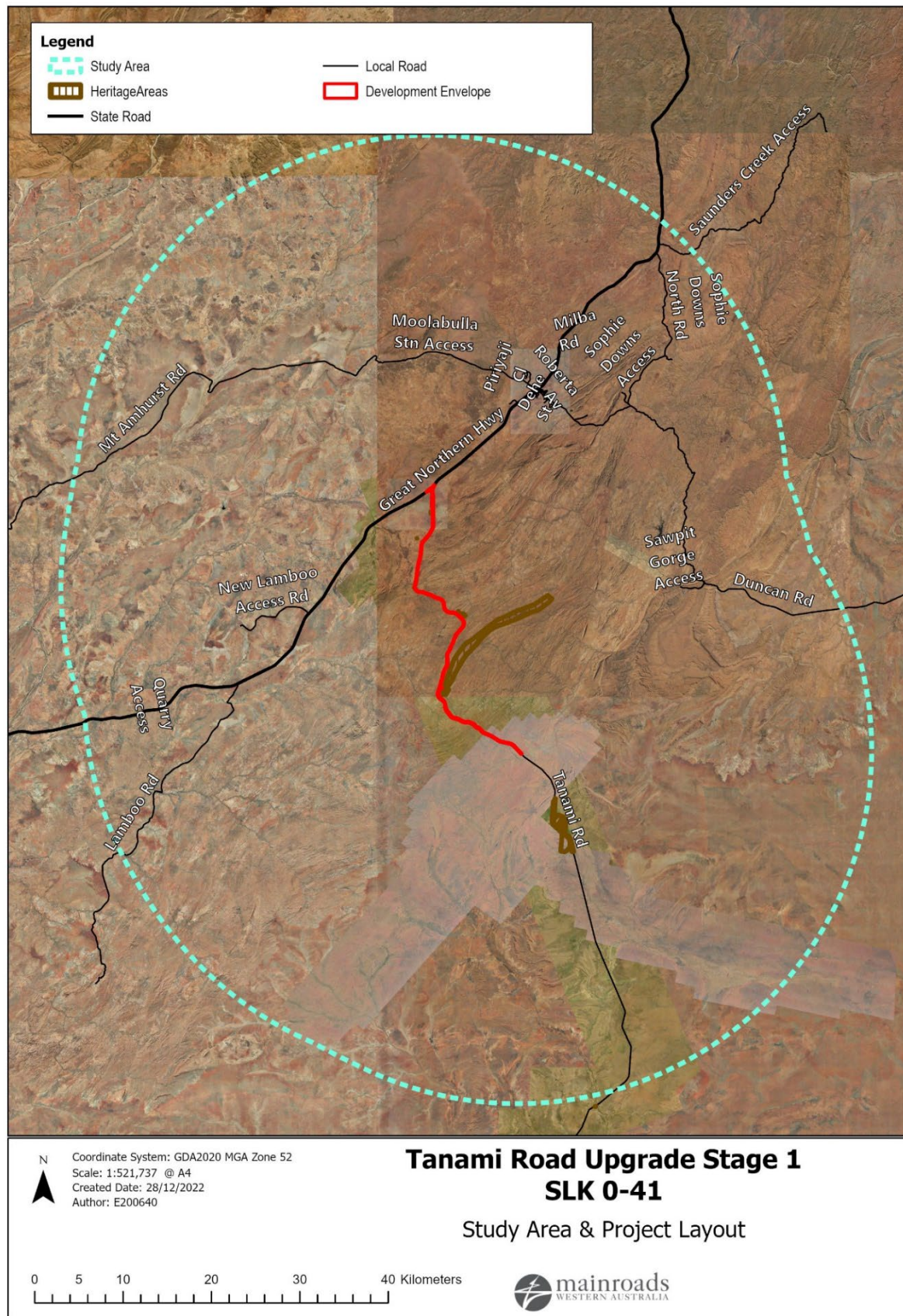


Figure 26: Project Area Tanami Road Upgrade Stage 1 SLK 0-41.